Sanitation

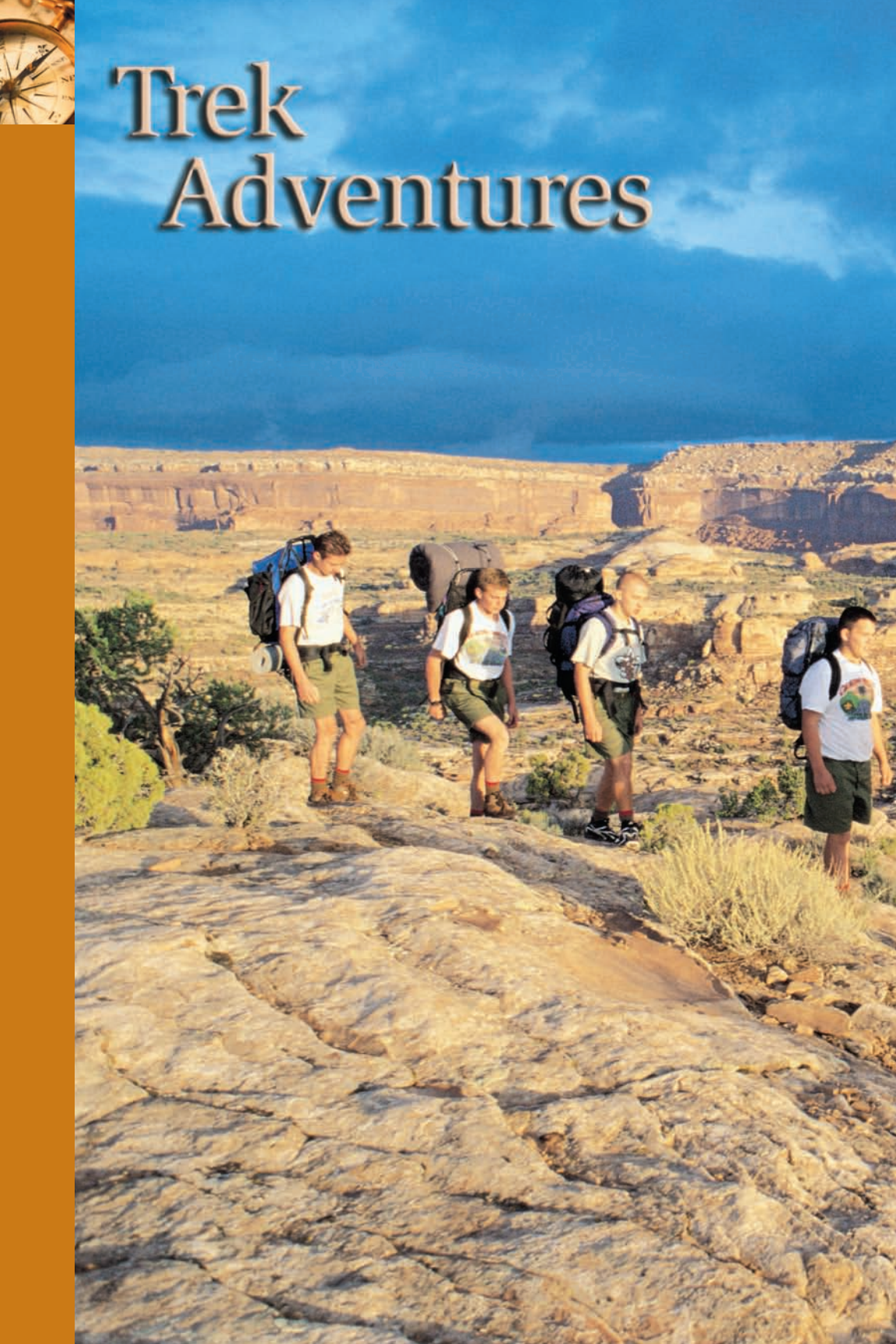
Avoid using scented lotions, soaps, deodorants, and shampoos while in bear habitat. Wash early enough in the day that residual aromas will have time to dissipate before bedtime.

Bear Safety Checklist

Review this list before setting out on a bear country trip. Go through it again each morning and each evening while you are in bear habitat.

✓ YES	
	While hiking, alert bears to your approach by making noise. Never approach or provoke a bear.
	Set up your sleeping area at least 200 feet away from where you will cook and eat.
	Ensure there are no smellables in sleeping tents.
	Clean up any spilled food, food particles, and campsite trash.
	Use a bear bag, bear box, or bear canister to protect all unattended smellables.
	Dispose of strained dishwater at least 200 feet from your campsite and sleeping area.
	Clean fish far from campsites. Toss entrails in flowing water, or pack them out.
	Wash early in the day. Avoid using scented lotions, soaps, deodorants, or shampoos.
	Change into clean sleeping clothes before going to bed.

Trek Adventures



"A mind that is stretched by a new experience can never go back to its old dimensions."

—Oliver Wendell Holmes (1809–1894), American author and scientist who also was an associate Supreme Court justice from 1902 to 1932

Chapter 11

Gearing Up

"Go light; the lighter the better, so that you have the simplest material for health, comfort and enjoyment."

—Nessmuk (George Washington Sears, whose writings about his canoe adventures in the Adirondack Mountains encouraged many readers to set off on treks of their own), *Woodcraft,* 1884

As a boy wandering the Cascade Range of Washington State, future Supreme Court Justice William O. Douglas rolled his provisions inside a blanket, lashed on his frying pan and hatchet, and hiked with the bundle draped over his shoulder. Author Henry David Thoreau used a 10-foot square of white cloth for shelter on a trip into the wilds of Maine. Naturalist John Muir sometimes explored California's High Sierra carrying little but a blanket, some bread, and a bag of tea. When Scouts hit the trail in the early years of the Boy Scouts of America, many pinned together the edges of blankets to make bedrolls, kept warm with bulky woolen clothing, and set up their camps using heavy military surplus tents and gear.

While food, clothing, and shelter are still the basic needs of outdoor travelers, equipment and clothing for the outdoors have become tougher, lighter, and more versatile than ever before. Surplus gear and inexpensive clothes can still form the bulk of a group's outfit, while groups with specific requirements can find items designed to fit the most demanding activities. Add what you need for safety and comfort, and you'll be prepared for any trek.

Whatever you take probably will ride in a pack on your shoulders, or be loaded onto livestock, or be stowed aboard a sled, kayak, raft, or canoe. The lighter the load, the easier it will be to carry. The more you can do without, the less complicated your camps and the greater your ability to enjoy the outdoors without leaving a trace. John Muir's blanket, tea bag, and crust of bread is too little for most of us today, but he had the right idea—keep it light, keep it simple, but include all the essentials.

Shakedown

Get together several days before you depart on a trek and conduct a *shakedown*. Spread all your equipment, clothing, and provisions on the floor or on a ground cloth outdoors, then consider each item. Is it essential? If so, place it beside your pack. If not, put it in a separate pile. Can you cut down on weight by sharing small containers of some items with others (sunscreen, insect repellent, etc.)? Check off each item on your lists of food and gear to be sure you have all the basics and your portion of the group equipment and provisions, but nothing more.

Next, take a look through the pile of nonessentials. Some of the items could make your trip more pleasant, but you'll have to decide whether they are worth the extra weight. In the case of a plant identification book, binoculars, or a camera, the answer might well be yes. Ounces add up quickly, though; the more thorough your shakedown, the lighter your load will be. A review *after* a trip can make you aware of items you didn't use and might want to leave at home next time.

For more on deciding what foodstuffs to carry on a trek, see the chapter titled "Outdoor Menus."

Outdoor Essentials

The outdoor essentials form the core of gear and provisions for any outdoor journey. While you might go on many trips without using some of the essentials, you will find them of tremendous value when situations develop that you must manage using only what you have on hand.

The Outdoor Essentials

- Pocketknife
- First-aid kit
- Extra clothing
- Rain gear
- Water bottle
- Flashlight
- Trail food
- Matches and fire starters
- Sun protection
- Map and compass

A Timely Piece of Gear

Many outdoor travelers consider a watch another basic essential. Knowing the time of day allows you to note your progress and calculate when best to start back or begin making camp. A watch with an alarm can be vital if you intend to get up early to set out on the next leg of a journey.

Pocketknife

Why: Cut a cord, trim a bandage, slice some cheese, whittle a tent stake, tighten a screw on a camp stove—a pocketknife is the all-purpose tool for the out-of-doors.

What: Choose a quality knife that includes among its tools one or two cutting blades, a can opener, and a screwdriver. Keep it sharp and clean.

First-Aid Kit

Why: Carrying a few first-aid items on treks will allow you to treat scratches, blisters, and other minor injuries, and to provide initial care if more serious emergencies arise.

What: Each member of the group should carry basic first-aid items in a self-sealing plastic bag.

Personal First-Aid Kit

- Adhesive bandages—6
- 3-by-3-inch sterile gauze pads—2
- Adhesive tape—1 small roll
- Tweezers
- 3-by-6-inch moleskin—1
- Soap—1 small bar
- Antiseptic—1 small tube
- Roller bandage

Patrol/Crew First-Aid Kit

Each patrol or crew should carry a first-aid kit commensurate with the type of outdoor activity, the location of the outing, and the level of training of the assigned first-aider. This kit should include items for protection against blood-borne pathogens including latex gloves, a mouth-barrier device (for rescue breathing), and goggles or other eye protection. Symptoms and treatment given, along with the time and date, should be recorded using a crew first-aid log. For more on being prepared for emergencies, see the chapter titled "Managing Risk."

Extra Clothing and Rain Gear

Why: Weather conditions in the outdoors can change, sometimes with surprising quickness. Have the clothing you need to deal with extremes of weather—heat, cold, and storm.

What: See the discussion of outdoor clothing later in this chapter.

Water Bottle

Why: The amount of water you need to carry depends on the activities of the day and the sources of water you will encounter. While heat and humidity can make you more thirsty, it is very important to drink plenty of fluid in cold weather, too.

What: Water containers should be light, unbreakable, and secure.

- **Disposable water bottle.** A recycled plastic soda or water bottle is cheap and available at any grocery store. Secure a piece of parachute cord to the bottle with duct tape to form a carrying loop.
- **One-liter, widemouthed plastic water bottle.** Easy to fill and to clean; available at most outdoors or camping supply stores.
- **Collapsible water jug.** If you will be camping in a site where water must be carried some distance, a collapsible one-gallon plastic jug can be very convenient. It also protects stream and lake banks from excessive damage due to frequent trips to get water.

For information on treating water you collect outdoors, see the chapter titled "Hygiene and Waste Disposal."

Flashlight

Why: Even the best-planned trips sometimes take longer than expected. A flashlight will help you set up camp in the dark or find your way home after the sun has gone down. Carry spare batteries and an extra bulb for your flashlight.

What: Several types of flashlights are useful during treks.

- **Headlamp.** By keeping your hands free, a headlamp is terrific for nighttime hiking and mountain travel, and for dealing with nighttime emergencies.
- **Penlight.** A rugged penlight designed for the outdoors casts a narrow, bright beam, takes up little space, and doesn't weigh much. It is best suited for use in camp rather than for lighting your way on the trail.
- **Regular flashlight.** A regular flashlight can serve all of your trek needs, but some are heavy. Regular flashlights are most helpful on trips when you are not limited as to how much you carry.

Trail Food

Why: You'll burn a lot of energy in the outdoors. A stash of trail food will keep you going through planned activities and is especially important if a trip lasts longer than expected.

What: Choose high-energy foods. Make your own trail mix with nuts, raisins, and diced dried fruits. Bring along a small bag of granola and an apple or an orange.

For more about food for the outdoors, see the chapter titled "Outdoor Menus."

Matches and Fire Starters

Why: Plan your clothing, shelter, and meals well enough so that you can conduct your activities without relying on an open fire, but be prepared to build one in an emergency.

What: Carry several fire starters that are reliable, durable, and protected from the elements.

- **Butane lighters.** Stow them in self-sealing plastic bags.
- **Matches.** Store these in plastic bags or in empty plastic medicine bottles with secure lids. Matches can be further protected from moisture by dipping them one by one in melted paraffin.
- **Stubby candles, pitch pine, lint,** and other personal favorites for starting fires in difficult circumstances can be sealed in plastic bags.

For guidelines on deciding when a fire is appropriate and how best to build one, see the chapter titled "Using Stoves and Campfires."

Sun Protection

Why: Sunburn is a common injury among people who enjoy being outdoors. Repeated burns can cause long-term damage and the potential for skin cancer. People with lighter skin are most at risk, though others are not immune.

Sunscreens with zinc oxide provide extra protection against the sun's harmful rays and can be applied to areas—like the nose—that burn easily.

What: Discourage sunburn by using plenty of sunscreen with a *sun protection factor* (SPF) of at least 15. (An SPF of less than 15 provides insufficient protection; an SPF greater than 30 adds little extra safety from the sun.) Reapply sunscreen after swimming or if you are perspiring. A broad-brimmed hat, a long-sleeved shirt, and long pants provide even more protection. For travels across snowfields, in deserts, and on open water, wear sunglasses for your comfort and safety.

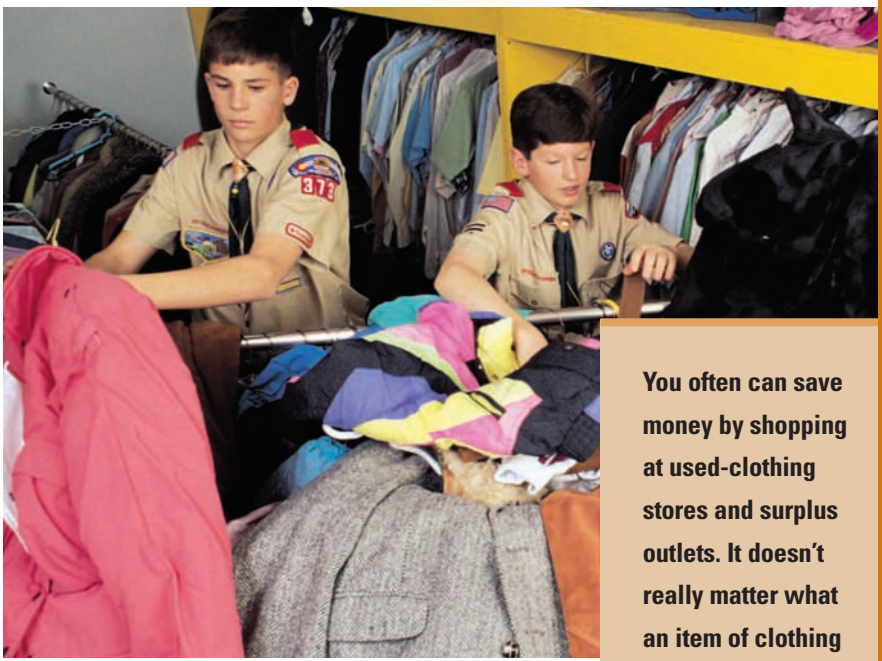
For more on dealing with the sun, see the chapter titled "Hot-Weather Travel and Camping."

Map and Compass

Why: The deeper you travel into the backcountry, the more important a map and compass become. Use them to find your way through unfamiliar terrain, when visibility is poor, and where expected trail signs are missing. Even when a map and compass aren't essential for route finding, practicing with them is fun and will help prepare you for times when you must rely on them.

What: You will need a compass with a good-sized baseplate, a topographic map of the area in which you intend to travel, and the knowledge to use them both separately and together.

For more on selecting and using compasses and maps, see the chapter titled "Navigation."



You often can save money by shopping at used-clothing stores and surplus outlets. It doesn't really matter what an item of clothing looks like on the trail, just so it does the job.

Clothing for the Outdoors

Clothing is your first line of defense against the elements. It keeps you warm in the winter, cool in the summer, dry in storms, and protected from insects, sun, and wind. To help decide what you need, learn about the materials from which clothing is made.

Wool

For generations of outdoor travelers, wool was the fabric of choice. Of course, that's about all there was for making warm clothing. Wool still is terrific for many cold-weather adventures because it is durable and water resistant, and will help you stay warm even when the fabric is wet. A wool shirt or sweater will ward off the chill of summer evenings, too. Wool also is an excellent choice in hiking socks, hats, and mittens. If wool irritates your skin, you might be able to wear wool blends or wear woolen layers over clothing made of other fabrics.

Cotton

Cotton clothing is cool, comfortable, and a good choice for hot-weather shirts and shorts in dry climates. If cotton becomes wet, though, it loses its ability to insulate, and it can be slow to dry in cold weather. In hot weather, the evaporation from wet cotton gives a cooling effect. Wearing cotton clothing can be a real danger on cool days, especially when mist, rain, and wind bring with them the threat of hypothermia. (For more information on hypothermia, see the chapter titled "Managing Risk.")

Synthetics

Outdoor clothing made of fleece, polypropylene, and other manufactured fabrics can be sturdy and comfortable, and can maintain warmth even when wet. Look for synthetics in underwear, shirts, sweaters, vests, jackets, pants, mittens, and hats. Lightweight nylon shorts and shirts are ideal for hot weather because nylon dries quickly. Waterproof and breathable synthetic fabrics are used in parkas and rain gear, and in the shells of mittens and gloves.

Layering System

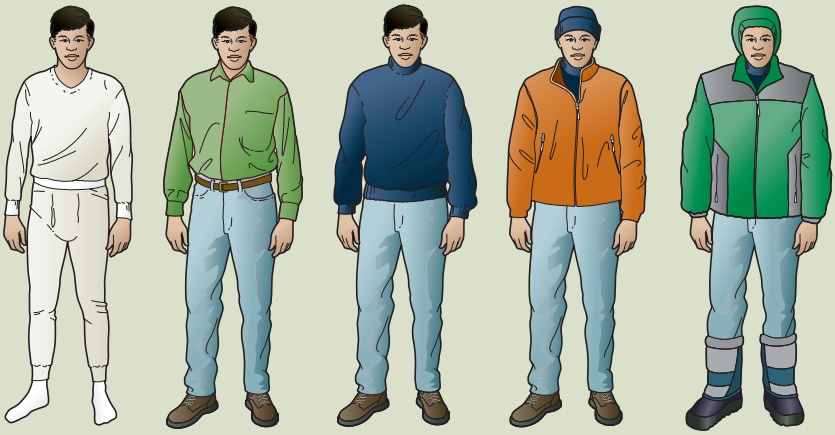
For the most comfort in the outdoors with the least weight in your pack, use the layering system. Choose layers of clothing that, when combined, will meet the most extreme weather you expect to encounter. On a chilly autumn day, for example, you might set out from the trailhead wearing long pants, a wool shirt, a fleece sweater, mittens, and a stocking hat. As you hike, the effort will cause your body to generate heat. Peel off the sweater and stuff it in your pack. Still too warm? Loosen a few buttons on your shirt or slip off your mittens and hat.

When you reach your campsite and are no longer exerting yourself, stay warm by reversing the procedure, pulling on enough layers of clothing to stay comfortable. After the sun goes down, you might want to add an insulated parka and fleece pants or long underwear.

You also can use the layering system to keep cool in hot climates by stripping down to hiking shorts, a T-shirt, and a brimmed hat. Lightweight long pants and a long-sleeved shirt will shield you from insects, brush, and the sun.

For more on managing your clothing to stay comfortable in challenging weather, see the chapters titled "Cold-Weather Travel and Camping" and "Hot-Weather Travel and Camping."

The WWW of Layers



A wicking *layer,* warmth *layers, and a* windproof *layer make up the WWW of an outdoor clothing system.*

Versatility in your clothing is the heart of a successful layering system. Several shirts, a sweater, and a jacket will allow you to adjust your clothing in many more ways than would a single heavy coat. The *kinds* of layers matter, too:

Wicking layer. The layer closest to your body is made of synthetics that can *wick,* or draw, moisture away from your skin.

Warmth layers. Intermediate layers have effective insulating properties to trap the warmth your body generates.

Windproof layer. An outer layer prevents wind from blowing away the heat trapped in the other layers of your clothing.

Wool gloves with water-repellent shells are ideal for cold weather.

✓	Basic Cold-Weather Clothing Checklist
	Long-sleeved shirt
	Long pants (fleece or wool)
	Sweater (fleece or wool)
	Long underwear (polypropylene)
	Socks (wool or synthetic blend)
	Warm hooded parka or jacket
	Stocking hat (fleece or wool)
	Mittens or gloves (fleece or wool) with water-resistant shells
	Wool scarf
	Rain gear

✓	Basic Warm-Weather Clothing Checklist
	T-shirt or short-sleeved shirt (lightweight)
	Hiking shorts
	Underwear
	Socks
	Long-sleeved shirt (lightweight)
	Long pants (lightweight)
	Sweater or warm jacket
	Brimmed hat
	Bandannas
	Rain gear

"The main problem with rain is, of course, that it tends to get you wet."

—Raymond Bridge,
America's Backpacking Book, 1973
(An expert in wilderness survival, Bridge wrote many books on outdoor adventures.)

Rain Gear

No matter how clear the skies might be as you pack for a trek, prepare for nasty weather. Rain pants and a rain jacket with a hood should serve you well in most situations, especially if, for warmth, you have other clothing to layer beneath your rain gear.

When you are active, moisture from sweat can condense on the inside of your rain gear, making you feel clammy and chilled. Here are two solutions:

- Choose rain gear that fits loosely enough to give you freedom of movement and to allow perspiration to vent through the neck, cuffs, and waist.
- Choose rain gear made of a *breathable* fabric that allows moisture to escape but prevents rain and snowmelt from coming in.

Footwear for the Field

Many outdoor treks involve miles of trail hiking. Other treks, including kayaking, rafting, mountain travel, and cross-country skiing, require specialized shoes or boots, but even then you might find that you need to walk some distance to reach a river, a mountain, or a snowfield. No matter how you spend your time in the outdoors, you'll probably want to have a pair of good, durable hiking boots. In most cases, that will mean boots made of leather or trail shoes composed primarily of nylon.

Conventional wisdom holds that a pound of weight on your feet is equal to about 5 pounds in your pack. Don't buy more boot than you need.

Leather Boots

Your feet and ankles can take a pounding when you are traveling over rugged terrain, especially if you are carrying a backpack. Most leather boots have a steel shank between the upper and the sole for stiffness and lateral stability—important factors when you are toting heavy loads or traveling cross-country. Leather boots also can shed water and insulate your feet in cold weather.

A drawback of leather boots can be their weight. For serious mountaineering, you might want stiff, rugged boots. For most trail hiking and camping, though, flexible leather boots at half the weight and cost should be just right.

Trail Shoes

A wide range of lightweight footwear builds on the technology of athletic shoes beefed up for use on trails. Combining nylon uppers with rugged soles, some trail shoes are cut higher like hiking boots, and some are cut below the ankle like running shoes. They offer varying degrees of stability, durability, and protection from the elements. This type of shoe is best suited for treks when you are carrying a day pack or a lightweight backpack.

Trail shoes

Trail running shoes

Selecting Footwear

Trek adventure footwear must fit extremely well. Boots or shoes that are too tight or too loose are an invitation to blisters. Spend as much time as you need to find the footwear that is right for you and for the activities you intend to enjoy.

When you go to a store to try on trekking footwear, put on the socks you will use in the outdoors. Find a clerk who is knowledgeable about the activities you will be doing, and who also knows a lot about how to fit shoes. Lace up a pair of boots or shoes, then walk around the store. Kick your toes forward—they should not jam against the front of the boot. Kick your heel back into the heel pocket—your foot should feel secure. The widest part of your foot should not slip, nor should it feel squeezed. Try several other models, giving each the same careful tests.

SPECIALIZED FOOTWEAR

Outdoor sports and activities can best be enjoyed when your footwear matches your challenges. Ski touring, horseback riding, canoeing, kayaking, rafting, caving, and cold-weather camping all benefit from the right boots or shoes.

Breaking In Boots

Regardless of the design and material of your new boots or shoes, wear them several times before using them in the field. Gradually extend the length of the walks on which you wear them, and soon they'll feel like a natural part of your feet.

Caring for Outdoor Footwear

Clean your boots or shoes after every outing. Use a stiff brush to remove mud, or wash them off with water and mild soap, then allow footwear to dry at room temperature. (Placing shoes too close to a campfire can dry out leather and damage nylon.) The manufacturers of leather boots might recommend treatment with a boot dressing or waterproofing agent; follow their instructions.

Socks

Hiking socks made of wool or a blend of wool and nylon are terrific. Synthetic liner socks worn underneath them increase comfort and reduce the chances for blisters to occur by wicking moisture away from your skin.

Gaiters

Gaiters shield your feet and lower legs from rain, dew, dust, and mud; help keep gravel and snow out of your boots; and help prevent spreading seeds of noxious plants.

Sleeping System

For the best possible rest, put together a sleeping system keyed to the temperatures and weather conditions you expect to experience.

Sleeping Bag

The cloth part of a sleeping bag is called the *shell.* The shells of most modern sleeping bags are made of nylon. Some use a breathable fabric that fends off mist and light rain. *Fill material* inside the shell traps your body heat and holds it close to you. Choices of fill materials are *goose down* and *synthetic fibers.*

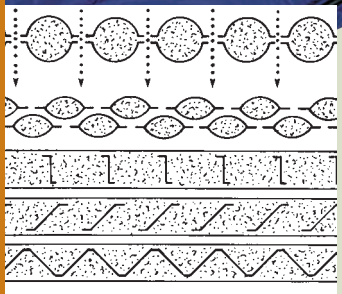
Goose Down

Down is the fluffy feathers geese grow next to their skins. It provides the most warmth for the least weight of any fill material used in sleeping bags and insulated clothing. Its major drawbacks are its expense and the fact that it loses its loft and can no longer keep you warm when it becomes wet. Although down must be sheltered from the elements, usually with a good tent, it can be the best choice for cold-weather camping in relatively dry conditions and for treks requiring very light gear.

The key to camping comfort is to carry a good sleeping bag that will help you keep warm at night but not become a burden to carry during the day.

Synthetic Fibers

Synthetic fill is made of polyester fibers spun in various ways to provide warmth-trapping loft even when wet. The disadvantages of some synthetic-filled bags are their weight and bulk.



Simple quilting. *Loses heat where the stitching passes through the fabric.*

Double quilting. *Two quilts fastened together in an offset way to eliminate cold spots. Material tends to be heavy.*

Box wall. *Prevents the filling from moving about.*

Slant wall. *Prevents down from moving about and gives it room to expand.*

Overlapping tube or V-baffle. *Very effective, but because it uses a lot of material, it tends to be heavy.*

Packing and Caring for Your Sleeping Bag

Stow your sleeping bag in a stuff sack lined with a plastic trash bag. That will protect your sleeping bag even in bad storms or the capsizing of a kayak, canoe, or raft.

Air out your sleeping bag at the end of a trip. Keep it in a large cloth laundry sack or hang it in a dry, out-of-the-way spot until your next adventure. Don't store a sleeping bag in its stuff sack; fill that is compressed for a long time loses some of its loft and insulating capacity.

With ordinary use, a sleeping bag should not need to be cleaned very often. If it has become excessively soiled or has lost a good deal of its loft, though, you might be able to restore it by laundering. per the manufacturer's directions. Some bags can be laundered using a mild, fragrance-free detergent, and washing the bag in cold water in a commercial-sized washing machine. Run the rinse cycle a second time to remove any soap residue. A wet bag is heavy and prone to damage; support its full weight as you move it from the washer to a drier. Dry it on the coolest setting and expect the drying process to take from two to five hours.

Sleeping Bag Comfort Ratings

Manufacturers often assign a *comfort rating* to a new sleeping bag—an estimate of the lowest temperature that bag is designed to address. People differ in the amount of insulation they need to stay warm, so use comfort ratings as a general, rather than absolute, guide. Sleeping inside a tent can enhance a sleeping bag's insulating power. A fleece *bag liner* can add another 10 degrees to the warmth of a bag and help keep it clean.

Bags shaped to be snug against your body tend to be warmer than looser bags. Added features, such as collars, hoods with drawstrings, and tubes of fill material backing the zippers, will further slow the loss of body heat.

Sleeping Pad

What you have beneath you at night is as important in keeping you warm and dry as what's on top. A *sleeping pad* will prevent the cold ground from drawing away body heat, and gives you a comfortable surface on which to sleep. Your best choices are *foam pads* and *self-inflating pads.*

Foam Pad

Foam pads vary in the degree of insulation and comfort they provide. *Closed-cell* foam pads tend to be effective at preventing heat loss, but at the expense of comfort. *Open-cell* foam pads are softer, but might not be as warm or as durable. Though lightweight, bulky foam pads can be challenging to stow in a pack.

Self-Inflating Pad

The choice of many outdoor travelers, a *self-inflating* sleeping pad is an airtight nylon shell covering open-cell foam. It provides maximum insulation and warmth. Self-inflating pads often are more expensive and heavier than other kinds of pads, and they should be accompanied by a small repair kit for patching punctures.

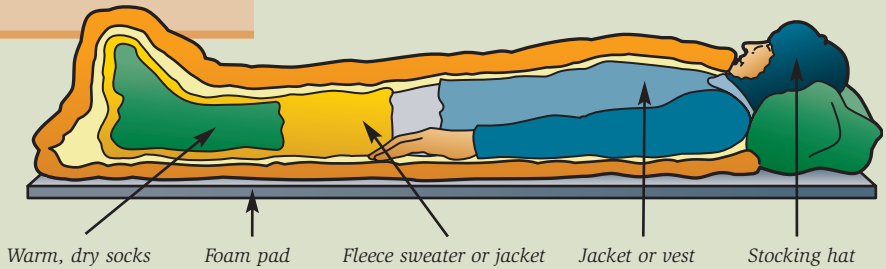
Unroll your sleeping bag early on dry days so it can fluff up as much as possible. In humid or rainy weather, however, leave the bag in its stuff sack until bedtime so it won't absorb moisture from the air.

Using Your Sleeping System

Just as you wear layers of clothing that can be adjusted to meet changing weather conditions, you can set up your sleeping system for night temperatures any time of the year. Start with a good general-use sleeping bag and leave the zipper open on warm evenings. If the night is cold, zip the bag to your chin and pull the hood snugly around your head. For more warmth, put on long underwear, a stocking hat, dry socks, and mittens. Add a fleece sweater or jacket, too, or wrap it around your hips and thighs.

Make a pillow in any weather by arranging some extra clothing (in bear country, clean clothing only) in a stuff sack or inside a sweater with the sleeves tied together.

Cross Section of the Sleeping System



"A good tent is a luxury, a poor tent an abomination."

—Francis H. Buzzacott, *Complete Campers Manual: Or How to Camp Out and What to Do,* 1903 (His expeditions as an outdoor guide for 40 years included treks to the Arctic Circle and Antarctica.)

Shelter

Desert campers need shelters that are open and airy yet will shade them from the sun. Long-distance hikers, kayakers, and cyclists need shelters that are lightweight yet appropriate for many variations in the weather. The safety of mountaineers and winter campers can depend largely on tight, strong tents that will withstand the force of wind-driven snow and sleet.

Fortunately, there are shelters available for almost every traveler. Among the options for modern outdoor adventurers are tarps, bivouac bags, and tents.

Tarp

A tarp is the simplest of outdoor shelters; it weighs just a few pounds and can be set up in dozens of ways. Use it as your primary shelter or as a dining fly to protect your group's gear or cooking area from sun and storm. Rig it the way you want with lengths of parachute cord at the corners and as a ridgeline. A tarp has no floor, which can pose challenges in soggy terrain, nor does it have netting to keep insects at bay. Still, for a flexible shelter in mild or hot climates, a tarp is hard to beat.

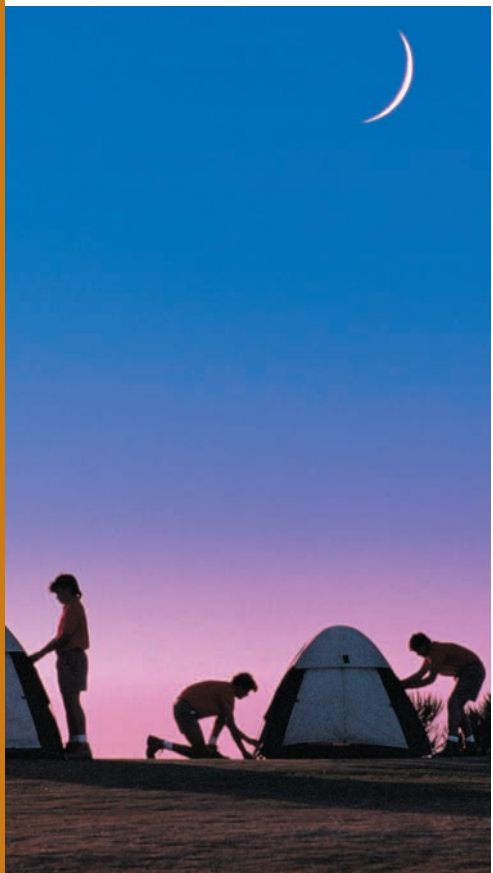
Bivouac Bag

The *bivouac bag,* originally intended as an emergency refuge for mountain climbers forced to spend nights on cliffs far from their camps, is a waterproof envelope that slips over a sleeping bag. Most bivouac bags are made of fabrics that shed rain, dew, and snowmelt, yet allow body moisture to pass through into the night air.

Bivouac bags are very light, but they also are confining. That's something to consider if you intend to travel where you might need to stay inside for a day or two waiting out a storm.

Tent

Most campers rely on tents for their shelters. The great variety of tents on the market allows you to select one matched to your adventures. In addition to noting a tent's weight, among the factors to consider when comparing tents are *season, size,* and *shape.*



Season

Three-season tents are intended for use in the spring, summer, and autumn. Many have mosquito-netting panels to allow plenty of warm-weather ventilation.

Four-season tents are built to withstand the strong winds and snow loads of winter. Some have extra poles for added stability, and they tend to be heavier than three-season tents.

Convertible tents have panels that can be zipped closed over mosquito-netting vents. Leave them open for ventilation on warm nights, then close them to block the wind and spindrifts of snow during cold-weather trips.

Size

Tents are marketed as suitable for one, two, three, or four sleepers. Consider the way you will most often travel and the sort of group with whom you will camp.

Shape

The *A-frame* tent, essentially a pup tent made light and strong with modern materials and engineering, is roomy and usually has a waterproof floor and mosquito-netting vents and doors. Breathable fabric allows moisture to escape from inside the shelter, while a waterproof rain fly protects the tent from exterior moisture. A two-person A-frame tent weighs 5 to 9 pounds and will keep a couple of hikers and their gear dry.

A-frame tent

Flexible poles have allowed tent makers to develop *dome*-shaped tents. These tents stand up well in rain, wind, and snow, and the spaciousness of their interiors makes them great for two to four campers. A dome tent can be flipped upside down in the morning to dry the bottom of the tent floor.

Tent designers are constantly trying to improve their products by altering or combining basic tent shapes, adding features, and even removing basic features. The resulting *hybrid* tents sometimes look odd, but occasionally there are real advances that make tents lighter, roomier, stronger, and more functional. One of these tents might be exactly what you need.

Dome tent

Choosing a Tent

With so many tents on the market, you'll want to shop around until you find the shelter that is just right for you. If you can, borrow or rent different tents and use them on overnight treks to see what they are like. Ask a salesperson to help you pitch tents in the showroom, then crawl inside and check them for size, comfort, quality of construction, and ease in setting up and taking down.

If possible, choose a tent that will blend in with the outdoor surroundings. Earth-toned shades of green, brown, gray, or blue help reduce the visual impact of a campsite.

Guidelines for Choosing a Tent

Answer the following questions before you shop for a tent to help you think through your needs:

1. In what weather extremes will you be using your tent?
2. How will you transport your tent? (Carry it yourself, split the load with others, haul it by pack animal or watercraft, etc.)
3. Do your adventures involve a base camp or do you plan to move to a new campsite every day or two?
4. How many people will share the tent?

Ground Cloth

A sheet of plastic under your tent will protect the floor from rocks and twigs and keep moisture from seeping through. Prevent rain from running between the tent floor and the ground cloth by placing the cloth so that it doesn't extend beyond the area covered by the tent, or by using the cloth to line the interior of the tent.

Gear for Cooking, Eating, and Drinking

The gear you need for cooking, eating, and drinking depends upon what you intend to cook, eat, and drink. Expect to carry personal utensils, a cook kit, and one or more stoves.

Personal Eating Gear

An insulated mug cup that won't burn your lips is just the thing for hot and cold drinks. A large plastic cereal bowl or a kitchen storage bowl is all you need for most meals, and you can dig your way through the majority of trail dishes with nothing more than a spoon.

Cooking Gear

As you plan the menus for an outdoor adventure, match your meals to your cooking gear. One or two lightweight pots will form the foundation of your kitchen. Add another pot or frying pan for more complicated meal preparations. Don't forget the lids; they hold in heat, shorten cooking times, and prevent dust and insects from blowing into your food.

Stoves

Backpacking stoves are easy to carry and convenient to use regardless of the weather. Stoves also make it easier for you to leave no trace as you are camping.

For more on cooking gear, see the chapter titled "Outdoor Menus." For more on stoves, see the chapter titled "Using Stoves and Campfires."

Water Treatment System

Any water taken from untested sources must be treated. Your options include boiling, treating with chemicals, and filtering. Each method requires planning before you leave home and carrying a few items once you embark on a trail.

For more about treating water, see the chapter titled "Hygiene and Waste Disposal."

Toiletry Kit

When it comes to toiletries, a small amount will go a very long way. You can, for example, buy the smallest tube of toothpaste you can find, or save a nearly empty tube to carry in your pack.

The following are basic toiletry items to take with you:

- Toothbrush and toothpaste
- Dental floss
- Soap
- Waterless hand cleanser
- Small towel
- Toilet paper
- Trovel for digging cathole latrines

For more on personal cleanliness, see the chapter titled "Hygiene and Waste Disposal."

Other Gear

Specific outdoor activities can be enhanced with specialized gear. Depending on what you will be doing, you might wish to carry some or all of the following items:

- Whistle
- Nylon cord
- Insect repellent
- Notebook and a pen
- Repair kit
- Hiking stick or trekking poles
- Camera
- Binoculars
- Fishing gear
- Animal identification books, plant keys, geological studies, star charts, or other guides

Journal

Much like Lewis and Clark did while exploring more than two-thirds of the American continent, many outdoor enthusiasts carry a small notebook and pen to record the events of their travels, to note unusual flora or fauna discovered along the way, to compose a bit of poetry, or to record the distance and time spent traveling each day. A journal offers an opportunity to relive the experience years later and to share it with others.

Packs, Panniers, Dry Bags, Duffels, and Saddlebags

Many journeys require special gear for transporting food and equipment. Bicyclists and horse packers might need panniers or saddlebags to hold their supplies, while winter campers might choose to haul their gear on sleds. Waterproof *dry bags* will protect the equipment and provisions of canoeists, rafters, and kayakers even if they capsize. Backpackers carry a wide range of both internal- and external-frame packs.

More information on packs, bags, and duffels can be found in other chapters of this "Trek Adventures" section.

"I never knew a camper who did not burden himself, at first, with a lot of kickshaws that he did not need in the woods; nor one who, if he learned anything, did not soon begin to weed them out; nor even a veteran who ever quite attained his own ideal of lightness and serviceability."

—Horace Kephart, *The Book of Camping and Woodcraft,* 1906
(An encyclopedia of living in the open, Kephart's popular book was a favorite of Scouts during the BSA's early years.)


CHAPTER
12
VOYAGEUR

Navigation

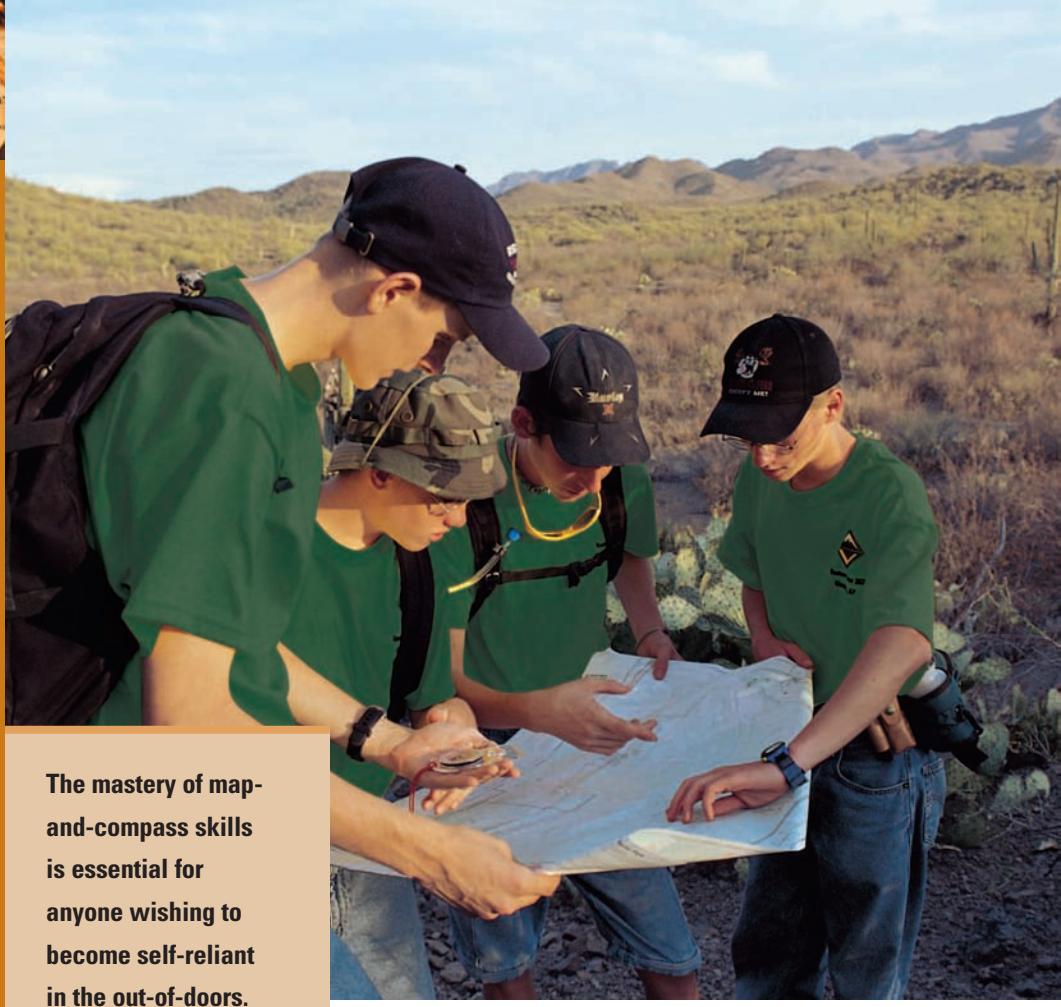
"No, I can't say as I was ever lost, but I was bewildered once for three days."

—Daniel Boone (1734–1820), frontiersman

Nature has provided many of its creatures with keen senses of direction. Species of birds migrate thousands of miles between warm southern climes and northern breeding grounds. Some butterflies also are migratory, and animals as diverse as honeybees, bats, whales, and reindeer seem to move with great certainty about where they are and where they wish to go.

Humans do not have the gift of strong directional instinct. What we do possess, however, is the ability to think clearly. By supplementing our reasoning with a few navigational instruments, we can make our way through even the most complicated wilderness terrain.

Navigation is problem solving of the highest order. It demands that you pay attention to details and make sense out of many bits of information. As with most outdoor skills, navigational competence can be developed only with practice. Increase your awareness of topography by observing your surroundings on outdoor trips and noting the lay of the land. Imagine the most likely locations for trails, campsites, portages, and summit routes, and then see if your guesses are right. Hone your ability to use maps and compasses by referring to them from the time you leave the trailhead. Before long you will seldom find yourself confused.

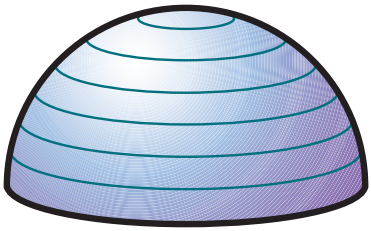


The mastery of map-and-compass skills is essential for anyone wishing to become self-reliant in the out-of-doors. Electronic navigational aids, especially those referencing global positioning systems, can augment travelers' ability to find their way but are no substitute for the importance and the pleasure of learning to use compasses and maps.

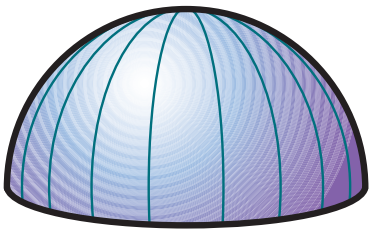
Maps

Maps are written records of places. Featuring both natural and constructed features, *planometric maps* offer an artistic representation of an area. *Topographic maps* go a step further by including three-dimensional representations of the shape of the terrain. The most useful maps for trek adventures are those based upon data prepared by the U.S. Geological Survey (USGS) of the Department of the Interior. Sporting goods stores often carry maps of nearby recreational areas. Maps for many parts of the country can be downloaded from Internet sites or ordered directly from the USGS.

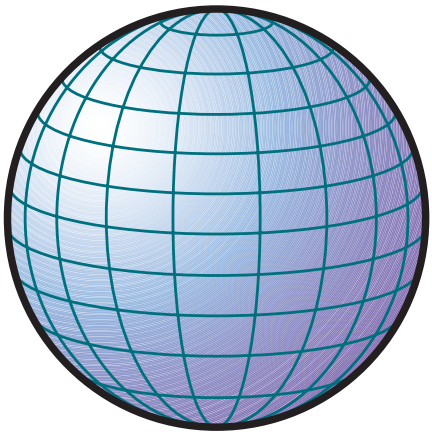
For more on the U.S. Geological Survey and on downloading maps, see the *Fieldbook* Web site.



Latitude



Longitude



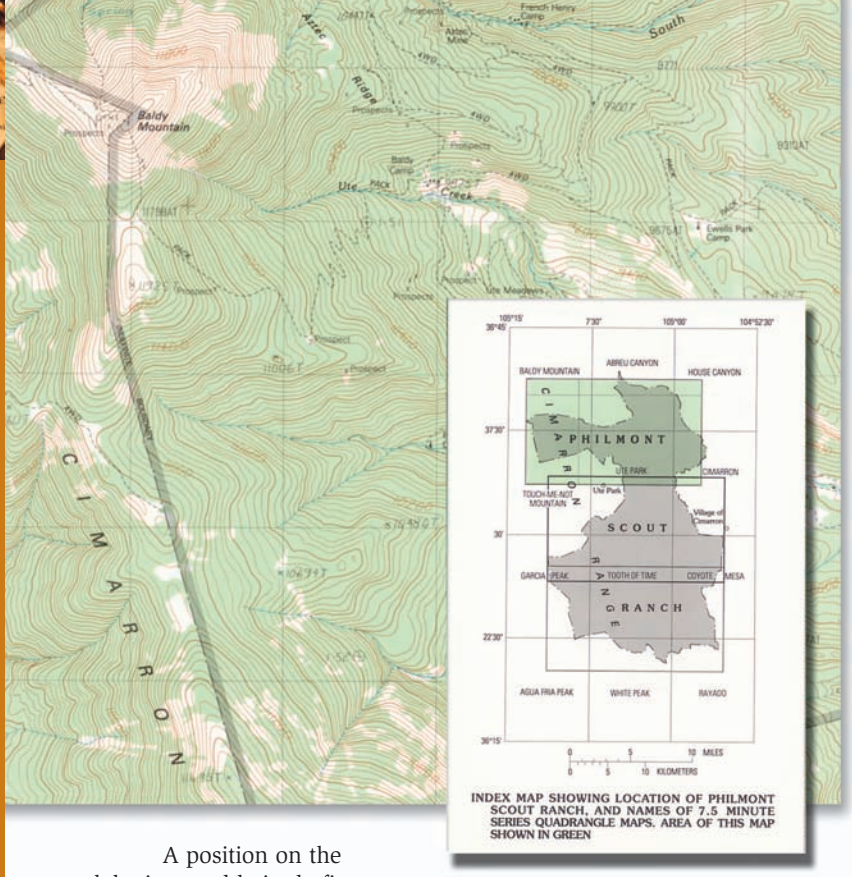
Latitude and longitude

Latitude and Longitude

As a means of pinpointing geographic locations, *cartographers* (those who make maps) have overlaid the globe of Earth with a grid of numbered, intersecting lines. The north-south lines—*meridians of longitude*—are drawn from the North Pole to the South Pole. Just as there are 360 degrees in a circle, there are 360 lines of longitude. The *prime meridian*—the line passing through the Royal Observatory at Greenwich, England—is *zero degrees longitude.* The numbering of meridians proceeds both westward and eastward from the prime meridian, meeting in the Pacific Ocean at 180 degrees longitude. (This 180th meridian also serves as the *international date line.*)

The east-west lines of the grid are *parallels of latitude.* The equator serves as *zero degrees latitude.* Lines running parallel with it are numbered sequentially to the poles. The North Pole is 90 degrees of latitude north of the equator; the South Pole is 90 degrees south. In a manner similar to that by which an hour of time is divided into smaller units, each degree of longitude and latitude is divided into 60 *minutes,* and each minute of longitude and latitude is divided into 60 *seconds.*

A downloaded map that you print out at home might not stand up very well to moisture. Ink can run when exposed to rain or snow, and the paper might disintegrate when wet. Fold a map so that the critical information shows, then keep the map in a self-sealing plastic bag.

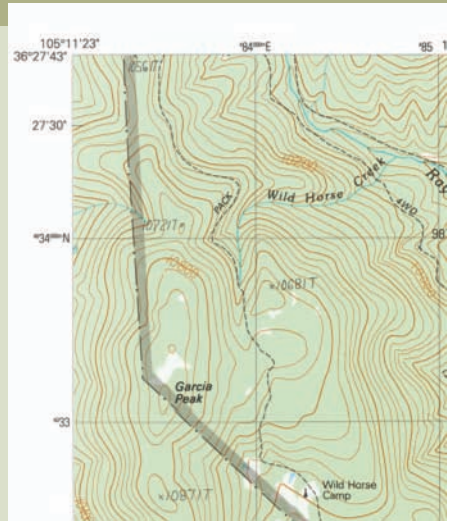


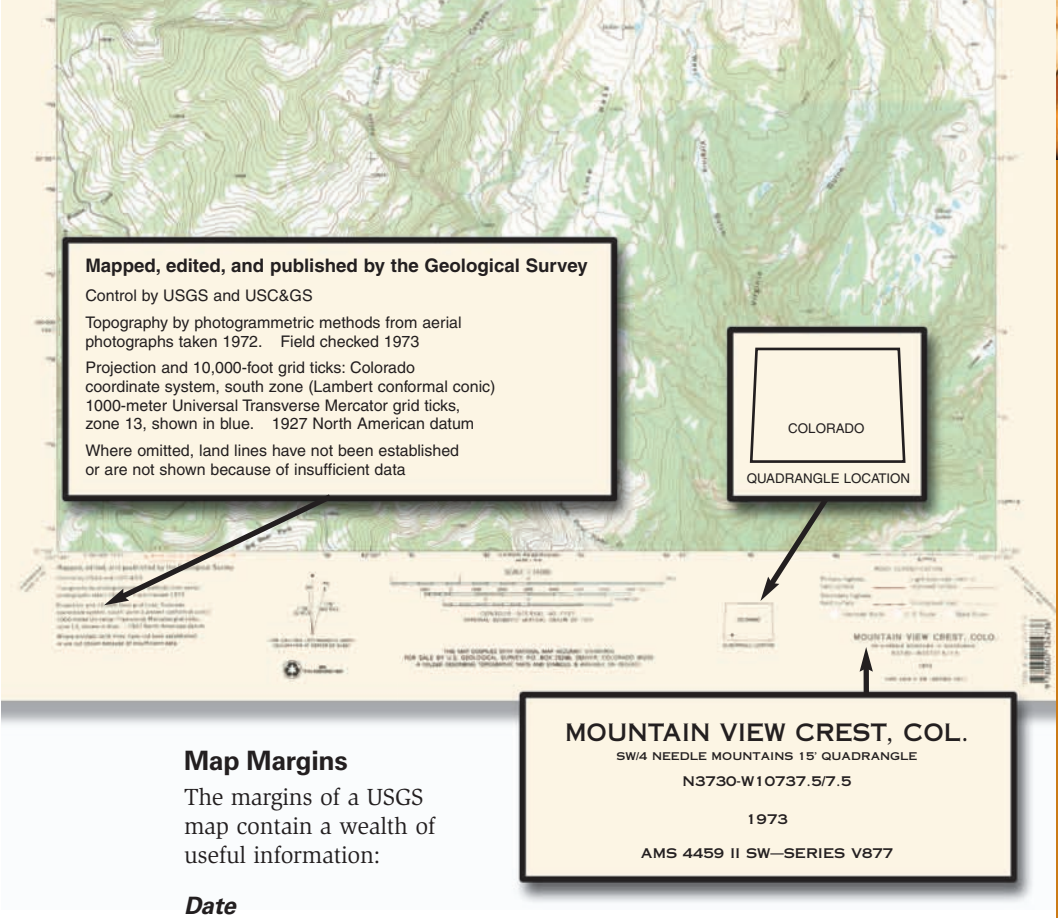
INDEX MAP SHOWING LOCATION OF PHILMONT SCOUT RANCH, AND NAMES OF 7.5 MINUTE SERIES QUADRANGLE MAPS. AREA OF THIS MAP SHOWN IN GREEN

A position on the globe is stated latitude first, followed by longitude. For example, the coordinates of latitude and longitude for the summit of Baldy Mountain, the highest point on Philmont Scout Ranch in New Mexico, are *36°37′45″ N* and *105°12′48″ W.* That means that hikers standing atop Baldy are 36 degrees, 37 minutes, 45 seconds north of the equator, and 105 degrees, 12 minutes, 48 seconds west of the prime meridian.

The UTM Grid

Often used by search-and-rescue teams, the *universal transverse macerator (UTM)* grid is a metric coordinate system designed to pinpoint any location on Earth, with the exceptions of north and south polar regions. UTM grid lines are always 1 kilometer apart (about six-tenths of a mile) and are aligned with true north (discussed later in this chapter). Numerical notations for the UTM grid appear in the margins of many topographic maps.





Map Margins

The margins of a USGS map contain a wealth of useful information:

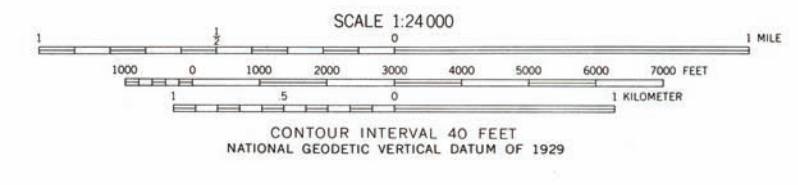
Date

Time is the enemy of map accuracy. The newer a map, the more precisely it can portray the current appearance of an area and the more exactly it will note the declination of magnetic north (discussed later in this chapter). The date printed in a map's margin indicates the year the map was created or most recently revised.

Location and Size

The geographical area covered by a topographic map is indicated by the coordinates of latitude and longitude printed in the map's corners. (Each map also will bear the name of a prominent geographic feature appearing somewhere within its boundaries—Knox Bluffs, for instance, or Waubonsie Peak.) The size of that area can be cited in the margin in terms of minutes. The maps most useful for backcountry travelers are *7.5-minute* maps and *15-minute maps:*

- *7.5-minute maps* encompass an area that is 7.5 minutes of latitude south to north, and 7.5 minutes of longitude east to west. (Since 1 minute of latitude on the ground is 6,200 feet, a 7.5-minute map will cover about 9 miles, north to south. The area covered by a 7.5-minute map ranges from 49 to 71 square miles, depending upon its latitude. The width of a minute of longitude, and thus the width of the map, will vary depending on the map's distance from the equator.)
- *15-minute maps* enclose an area that is 15 minutes of latitude south to north, and 15 minutes of longitude east to west.



Scale

The *scale* of a map compares the size of the map itself to the dimensions of the land it represents. A 7.5-minute map has a scale of 1:24,000 (1 inch on the map representing 24,000 inches on the land; thus, a mile is about $2^1/_2$ inches on a map). A 15-minute map features a scale of 1:62,500. (Maps downloaded from the Internet might print out in formats sized differently from the original maps. To ensure accuracy, always use the *distance rulers* printed near the scale indicator in the bottom margin to translate the scale into map distances of feet, miles, and kilometers.)

Map Colors

Cartographers rely on different colors of ink to indicate the various landscape features of a topographic map:

- **BLUE** ***is used for aquatic features—streams, lakes, oceans, wetlands, etc. Contour lines of glaciers and permanent snowfields are also blue. Aquatic landmarks such as rivers and lakes are further denoted by having their names written in*** *italics.*
- **GREEN** ***indicates vegetation, usually forests sufficiently dense to hide a group of travelers.***
- **WHITE** ***signifies land such as meadows and boulder fields with little or no tall vegetation. A group of travelers would be visible from the air.***
- **BLACK** ***ink is used for anything that is the work of humans—buildings, railroads, trails, etc. Names of geographical features are always written in black.***
- **RED** ***ink can be applied to certain survey lines (township and range, for instance) and to highlight primary highways and other significant constructed features.***
- **PURPLE** ***overlays revisions to a map that are based on aerial photos but have not yet been fully verified in the field.***
- **BROWN** ***is reserved for contour lines and elevations.***

Contour Lines

A topographic map is a two-dimensional model of the three-dimensional world. The sense of three dimensions is portrayed through the use of *contour lines,* which are drawn with brown ink. Each contour line represents a specific elevation above sea level. The vertical difference between adjacent lines is indicated in the margin of a map as that map's *contour interval*—anywhere from 10 feet to 200 feet, depending on the scale of the map and the ruggedness of the terrain.

Each contour line forms a loop. Hike a line and, because you will stay at exactly the same elevation, you eventually will return to your starting point. Lines close together indicate steeper areas than regions with contour lines far apart. Maps with few contour lines signify relatively flat territory such as that forming a prairie or wetland.

Map Symbols

For more information on map symbols, see the *Fieldbook* Web site.

TOPOGRAPHIC MAP SYMBOLS

Roads, Railroads, and Other Features

- Primary highway
- Secondary highway
- Light-duty road
- Unimproved road
- Trail
- Railroad: single track
- Railroad: multiple track
- Overpass; underpass
- Power transmission line
- Landmark line

Telephone

Land Surface Features

- U.S. mineral prospect
- Quarry; gravel pit
- Mine shaft
- Mine dump
- Tailings
- Tailings pond
- Dune area
- Sand area
- Levee
- Distorted surface
- Gravel beach
- Glacier
- Woodland
- Orchard
- Vineyard
- Mangrove
- Scrub

Buildings and Related Features

- Buildings
- School
- House of worship
- Cemetery
- Tanks
- Wells
- Picnic area
- Landmark
- Airport, paved landing strip, runway, taxiway, or apron
- Campground; campsite
- Winter recreation area
- Ranger district office
- Guard station or work center

Cem

Water Tank

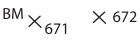
Oil

Gas

Water Features

Dam with lock		Rapids	
Canal with lock		Falls	
Exposed wreck		Intermittent lake	
Rock or coral reef		Dry lake bed	
Rock: bare or awash		Marsh (swamp)	
Wide wash		Submerged marsh	
Narrow wash		Wooded marsh	
Perennial streams		Aqueduct tunnel	
Intermittent streams		Channel	
Water well; spring		Sounding; depth curve	

Elevation

Horizontal control station		Index contour	
Vertical control station		Supplementary contour	
Checked spot elevation		Intermediate contour	
Unchecked spot elevation		Depression contours	

Boundary

Federally administered park, reservation, or monument (internal)	

Meaning of Map Colors

Green	Major vegetation (forest, brush, orchard)
Blue	Water (lake, stream, spring, marsh, water tank)
Red	Highways or boundaries
Black	Human-made structures and place names (buildings, roads, trails, bridges, railroads)
White	Absence of major vegetation, (prairie, meadow, tundra—above timberline)
Brown	Contour lines and standard elevations

Determining Distance

A compass bearing can point you in the direction you wish to travel, but it can't tell you how far along that route you will need to go in order to reach your destination. For that, you can refer to the distance rulers in the map's margin.

1. Place one end of a piece of string on the map at your starting point.
2. Lay out the string on top of the route you plan to use, bending the string to conform with any twists and turns of the route.
3. Pinch the string where it touches the map symbol for your destination.
4. Stretch the string on the bar scale in the bottom margin of the map and measure it to the point where you are pinching it. That's the approximate length of your route.

Compasses

The sextant is a navigational device used since Columbus' time.

For directional guidance, early explorers relied on the North Star, the prevailing winds, the movements of ocean currents, the migrations of birds, and other observations of the natural world. When they could, they followed sketchy maps and the reports of fellow wanderers. Then came the compass, appearing a thousand years ago in Asia and a century later in Europe. At first it was nothing more than a magnetized bit of metal floating on a piece of wood in a bowl of water. By Columbus's time it had evolved into an instrument sufficiently reliable to guide the explorer's three ships across the Atlantic. Today, the liquid-filled compass is an indispensable navigational tool.

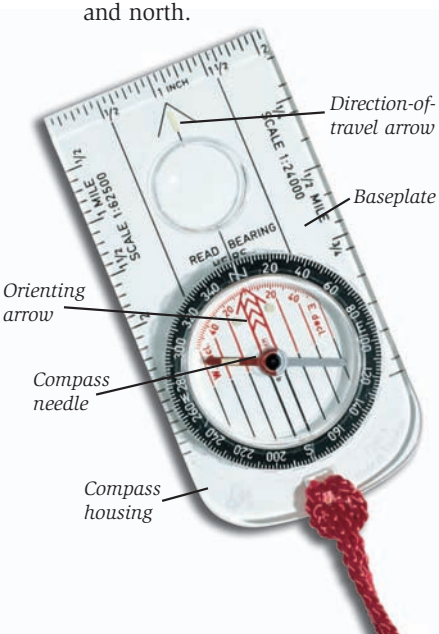
Celestial Navigation

Before compasses, people who needed to move from one place to another often guided their travels by looking to the stars. Perhaps you can already identify the North Star and prominent northern constellations, such as Ursa Major and Cassiopeia. Maybe you know how to find Orion and Scorpius in the southern sky. Whenever they are visible, these and other skymarks can serve as reliable references of direction.

For more on stars and constellations, see the chapter titled "Watching the Night Sky."

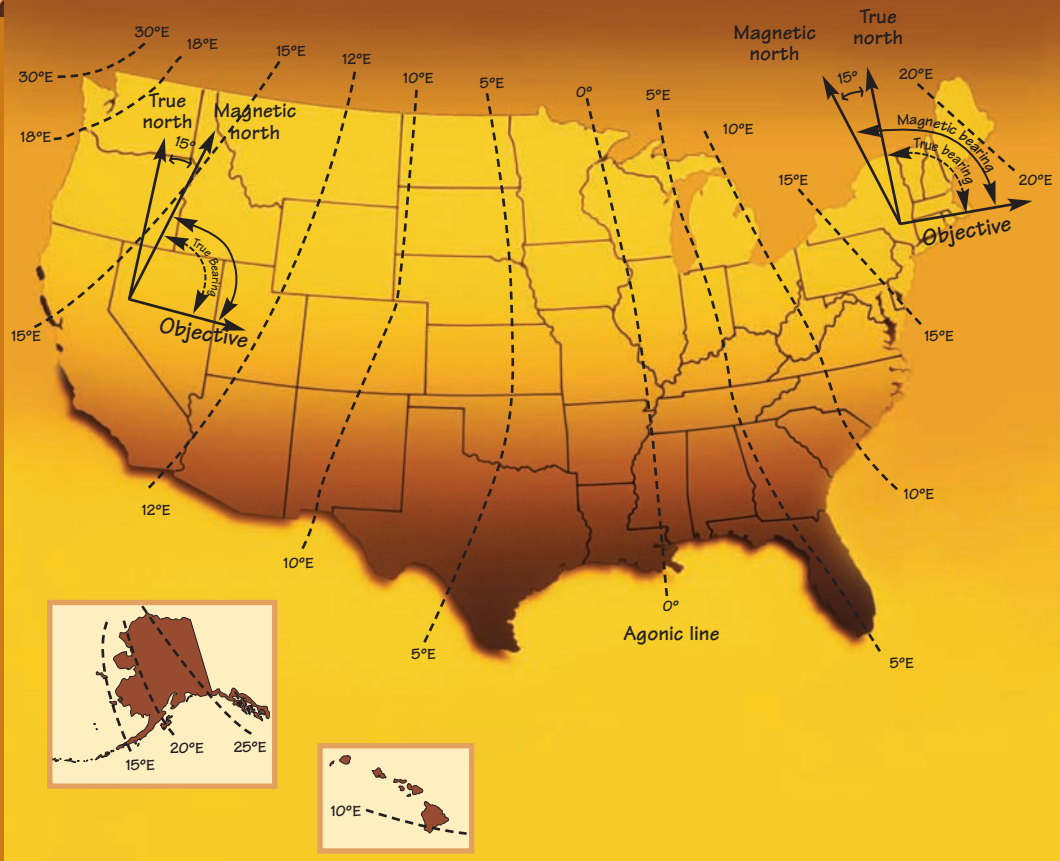
The compass most useful for adventure-trek navigation consists of a magnetized needle balanced inside a circular, rotating housing mounted atop a baseplate. The plate is etched with a *direction-of-travel arrow.* The floor of the compass housing is engraved with an *orienting arrow* and, parallel with it, several north-south *orienting lines.*

The circumference of the housing is divided into directions—north, south, east, and west—and further divided into 360 degrees, just as in any circle: *0º* coincides with north, *90º* with east, *180º* with south, *270º* with west, and *360º* is again north (*0º* and *360º* overlap as they close the circle). Any direction can be expressed in degrees. For example, *95º* is a little south of straight east, while *315º* is midway between west and north.



"There has always been a romantic fascination to persons who could find their way through the wilderness and over hidden trails—the Indian, the pioneer scout, the guide, the tracker, the explorer."

—Bjorn Kjellström, orienteering enthusiast and founder of the Silva compass company



Because magnetic north continually drifts westward across the United States, declination for a particular area is always changing. The National Geographic Data Center's Web site (http://www.ngdc.noaa.gov/seg/potfld/geomag.shtml) *provides up-to-date declination information to help you determine your true bearing.*

Declination

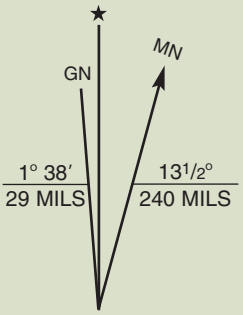
Somewhere north of Canada's Hudson Bay lies the center of a natural magnetic field strong enough to pull the tip of a compass needle toward itself. This area is called *magnetic north,* and it is toward magnetic north that all compass needles point. Magnetic north is more than a thousand miles away from the North Pole, or *true north.* (You can find the approximate location of magnetic north on a globe or other map of the world at latitude 78° N, longitude 104° W.)

Draw an imaginary line from the North Pole to the point where you are standing. Draw a second line from magnetic north to your position. The difference between those two lines, expressed as the degrees of the angle they form, is the *declination* for a particular location.

In the American Midwest, the lines drawn from the two norths will be close to one another and the declination small. In fact, a line drawn northward through Mississippi and Wisconsin will intersect both the magnetic and geographic North Poles. Along that *agonic line,* a compass needle pointing at magnetic north will also be pointing at true north.

However, if you move west of the agonic line, the angle between a line drawn from your location to the geographic North Pole and a line from your location to magnetic north will gradually increase. At Philmont Scout Ranch in New Mexico, the magnetized compass needle will point about 10 degrees to the right of true north, while in Seattle it will point about 18 degrees to the right. Take the compass east of the agonic line to New York City, and the needle will swing about 14 degrees to the left of true north. On the coast of Maine, the declination will have increased to 18 degrees or more.

On older USGS maps, a margin diagram of two arrows indicates the declination for that map's area. The arrow representing true north may be labeled *True North,* or topped by a representation of the North Star. The arrow indicating magnetic north will probably be labeled *Magnetic North* or *MN.* The angle formed by the two arrows is the declination for that map. (Newer maps might include degrees of declination, but not the arrows, in their margins.)



Citations in the margins of many USGS maps indicate the declination of an area.

Dealing With Declination

Where declination is greater than a few degrees—that is, anywhere except in a narrow corridor near the agonic line through the center of North America—failing to account for declination can lead to errors in navigation that could render a compass and a map almost useless. Over the course of a mile's travel, an error of just a few degrees can pull you off your intended route by hundreds of yards.

Most maps are drawn with true north as their reference and can be said to "speak the language of true north." (Remember those lines of longitude extending to the North Pole? They form the left and right borders of the majority of maps.) Compasses, however, rely on a magnetized needle and thus have magnetic north as their native language. To use a map and compass together, you must resolve this difference, either by changing the compass or by changing the map.

Magnetic north is drifting westward at a rate that changes declination in much of the United States by about one degree each decade. Note the date of a map; the older the map, the less accurate its stated declination.

Marking a Compass for Declination

A basic baseplate compass can be marked to help travelers adjust for declination. On the compass housing, place a tiny *declination dot* of indelible ink, brightly colored enamel paint, or fingernail polish at the degree reading that matches the declination of the area where you intend to travel. For example, if the declination is 15 degrees to the east of true north, place the dot at 15 degrees on the circumference of the compass housing. If the declination is 15 degrees to the west of true north, place the dot at 345 degrees—that is, 360 degrees (true north) minus 15 degrees. A careful look at the declination information in the map margin should make it clear whether magnetic north is to the left or to the right of true north.

Marking a compass for declination

When your adventures take you to a region with a different declination, remove the original declination dot of ink, paint, or polish with a cotton swab dipped in denatured alcohol. Replace the dot with a fresh one correctly positioned on the compass housing.

Turn the compass housing so that *N* (true north) touches the direction-of-travel arrow. Then, holding the compass in the palm of your hand, turn your body until the red tip of the magnetic needle points at the declination dot. The needle is pointing to magnetic north, but the rest of the compass is speaking the language of true north.

Adjusting a Compass for Declination

For a few dollars more than the price of a basic compass, you can purchase a compass that can be corrected for declination. Follow the manufacturer's instructions to make the adjustment, usually by turning a small screw or gently twisting an inner portion of the compass housing to change the position of the orienting arrow etched on the housing floor.

Adjusting a compass for declination

After you have adjusted it, turn the entire housing of the compass so that north on the circumference of the housing (indicated by *0°* or the letter *N*) is aligned with the direction-of-travel arrow on the baseplate. For the moment, think of that as the line drawn to true north. The angle the true-north line forms with the newly adjusted orienting arrow should be the same as the angle formed in the map margin by the true-north and magnetic-north lines.

Changing the Map for Declination

Another way to deal with declination is by teaching a map to understand the language of magnetic north. Use a protractor (and the skills you learned in geometry class) to transfer the angle of declination to the map, then use a straightedge ruler to extend a magnetic-north line across the map. Draw additional lines parallel with the first line, a ruler's width apart. Use these *magnetic-north lines* as your references when using an unadjusted compass (that is, one that is also speaking the language of magnetic north) to orient the map and find your way.

(*Note:* The margin arrows indicating the angle of declination of older maps might not be drawn to scale. Though good for suggesting the general aspect of declination, they are not a reliable guide for extending magnetic-north lines across a map.)

Draw magnetic-north lines on a map with the help of a protractor and a straightedge.

Using Maps and Compasses Together

Maps and compasses used together serve as a much more powerful navigational aid than either a map or a compass alone.

Orienting a Map

A map that is *oriented* is aligned with the topography it represents. North on the map points toward the North Pole. Landscape features in the real world have the same directional relationships to one another as are indicated on the map.

To orient a map, first rotate the compass housing until *N* lines up with the direction-of-travel arrow on the baseplate. The *compass bearing* is north.

Next, place the long edge of the compass baseplate alongside any true-north line on the map—the left or right border, any line of longitude, township boundaries, etc. Turn the compass and the map as a unit until the red tip of the compass needle points toward the declination dot (for declination-marked compasses) or the compass needle settles inside the orienting arrow on the floor of the compass housing (for declination-adjusted compasses). When that happens, the map is oriented. (If you have adjusted the *map* for declination but not the compass, line up the baseplate with any magnetic-north lines you have extended across the map and allow the compass needle to settle inside the orienting arrow.)

True-North Lines

True-north lines on a map are any lines that parallel meridians of longitude—most notably the map's vertical boundaries. Based on longitude meridians, north-south township lines and UTM grid lines also can be used as true-north lines. In the field, a map without many true-north lines can prove difficult to use with a compass. Prepare the map ahead of time by using a straightedge and a pencil to scribe lines on the map running parallel with the map's north-south borders.

Identifying Landmarks

Have you ever seen a mountain range and wondered what each summit was called? With a compass and a sharp eye, you can identify any landmark prominent enough to appear on your map. Here's how:

Hold the compass in the palm of your hand, and point the direction-of-travel arrow on the baseplate at the landmark in question. Turn the compass housing until the red end of the needle points at the declination dot (for declination-marked compasses) or until the needle is aligned with the orienting arrow (for declination-adjusted compasses). That will give you the *bearing* from your position to the landmark.

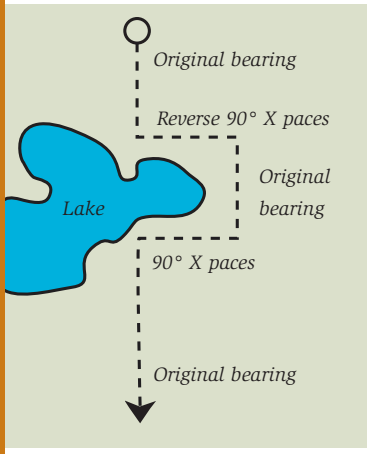
Next, place the compass on your map with the long edge of the baseplate touching the spot that represents your present location. (The map does not need to be oriented.) Ignoring the needle, rotate the compass baseplate around that point on the map until the orienting arrow and orienting lines are parallel with any true-north lines on the map. Beginning from the map symbol for your location, draw an actual or imaginary line *away from yourself* along the edge of the baseplate. The line should intersect the point on the map representing the landmark.

To identify landmarks with a compass that has not been adjusted for declination, use the *magnetic-north lines* you have drawn across the map instead of the *true-north lines.* The same is true of other map-and-compass procedures, including pinpointing your location and finding your way.

Take a bearing on the landmark. *Orient the map.* *Identify the landmark.*

Avoiding Obstacles

To avoid an obstacle such as a lake or rock outcropping, take a 90-degree reading to both sides of your course of travel and count your paces as you go. When you have cleared the obstacle, continue on your original bearing until you completely bypass the obstacle. Then take a reverse 90-degree reading and take the same number of paces as you did previously. At that point, continue on your original course of travel.

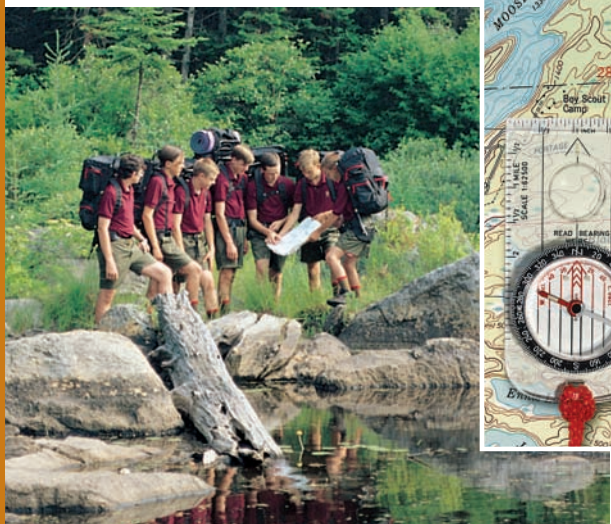


Pinpointing Your Location

If you're not sure where you are but you can see a couple of features on the land that are also indicated on your map, it's easy to determine your location. First, point the baseplate direction-of-travel arrow on your compass at one of the landmarks—a mountaintop, the outlet of a lake, a building, etc. Then, holding the baseplate still, turn the compass housing until the red tip of the needle points at the declination dot (for declination-marked compasses) or until the needle lines up in the outline of the orienting arrow (for declination-adjusted compasses). You've just taken a bearing on the landmark.

Now place the compass on your map with the edge of the baseplate touching the symbol representing the landmark. (The map does not need to be oriented.) Ignoring the needle, rotate the entire compass around that point on the map until the orienting lines on the floor of the compass housing are parallel with any true-north lines on the map. Lightly pencil a line *toward yourself* along the baseplate edge from the landmark symbol.

Find a second landmark and repeat the process of taking a bearing, placing the compass on the map, and drawing a line toward yourself. The spot on the map at which the two lines intersect indicates where you are. To confirm your readings, repeat the procedure with another landmark.

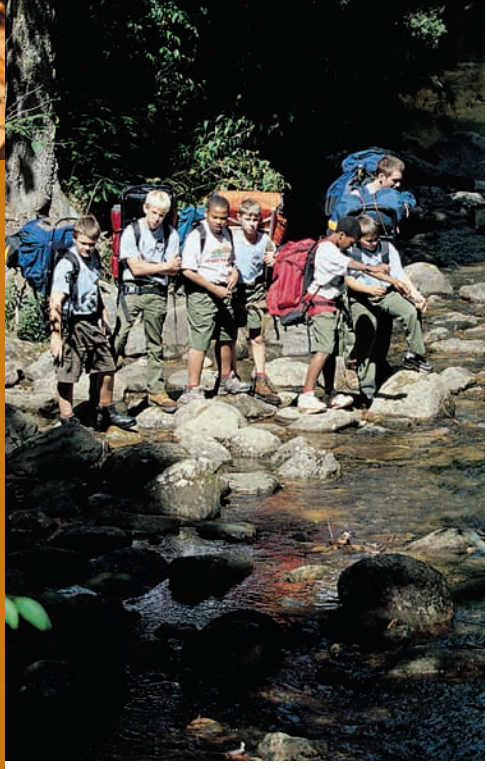


Finding Your Way

Assume you know where you are. On the map you see a lake you would like to reach by the most direct route. Place the long edge of your compass baseplate on a real or imaginary line connecting the map points representing your present location and that of the lake. Turn the compass housing until the orienting lines in the compass housing parallel any true-north lines on the map.

Hold the compass at waist level with the direction-of-travel arrow on the baseplate pointing *away from you.* Without changing the compass setting, turn your body until the compass needle aligns itself with the orienting arrow (for declination-adjusted compasses) or the red tip of the needle points to the declination dot (for declination-marked compasses). When that happens, the direction-of-travel arrow will be aimed at the lake. You have just taken a bearing for the route to your destination.

Look up along the direction of travel. If you can see the lake, you need make no further use of the compass. If the lake is out of sight, though, locate an intermediate landmark toward which the direction-of-travel arrow is pointing—a tree, boulder, or other feature—and walk to it. Take another bearing, identify the next landmark in line with the direction-of-travel arrow, and go to it. Continue until you reach your destination.



Offset Technique

Hiking uphill, crossing streams, ducking under brush, and scratching bug bites as you navigate your way through the backcountry can cause *lateral drift,* an accumulation of small errors in taking and following compass bearings that can throw you off your intended course. Compensate for lateral drift by using *offset technique*—deliberately aiming a little to the left or right of your destination.

For instance, assume the lake you want to reach is very small. You notice on the map that a creek flows from it to the left, perpendicular to your line of travel. Rather than take a bearing on the lake itself and risk missing it by passing too far to the right, set a course for a point on the creek a few hundred yards below the lake. When you reach the creek anywhere along its length, all you need to do is follow it upstream until you arrive at the lake. (Streams, power lines, fences, drainage ditches, trails, roads, and ridges all make good *backstops* or *handrails* for offset technique.)

Measuring Distances in the Field

Counting your steps is a good way to estimate distances as you travel. Learn the length of your step this way:

1. Using a tape measure, mark a 100-foot course on the ground.
2. Walk at a normal speed from one end of the course to the other, counting your steps as you go.
3. Divide the total number of steps into 100 and you'll know the length of one step.

For example, if you used 50 steps to go 100 feet, your step length is 2 feet. If it took you 40 steps, figure 2 1/2 feet per step. In the field, you can measure distances by counting every step along the way, or by counting each time your right foot touches the ground. (A 2 1/2-foot *step* becomes an easier-to-count 5-foot *pace.)*

Global Positioning Systems (GPS)

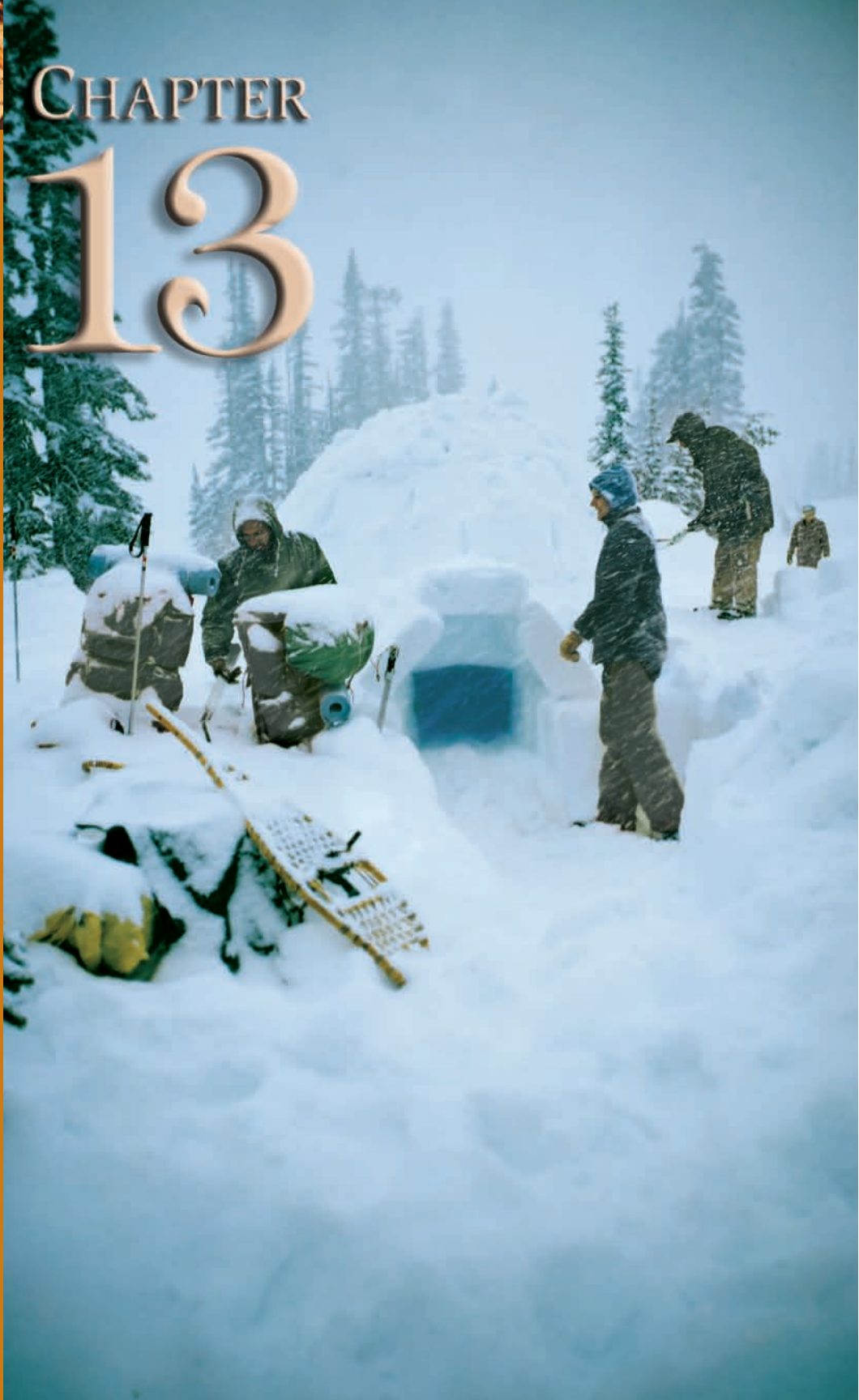
Modern technology has provided travelers with a powerful electronic means of navigation—the global positioning system. A GPS receiver accurately calculates the latitude and longitude of any spot on the globe by taking bearings on satellites orbiting 12,000 miles above Earth. Small enough to carry in the pocket of a pack, a GPS receiver can be used to

- Identify precise locations.
- Note elevations above sea level.
- Chart routes by inputting coordinates of latitude and longitude, or by downloading entire maps.
- Plot the record of a trek, creating a history that can guide a group retracing its steps.

Electronic navigational instruments surely will continue to improve in accuracy, versatility, and ease of use. But just as having a calculator does not eliminate the need to know how to add and subtract, a GPS receiver (especially one with dead batteries) is no substitute for being able to navigate with traditional tools. Develop confidence in your ability to use maps and compasses and then, if you wish, augment them with a GPS receiver.

For more on augmenting navigational skills with the global positioning system, see the *Fieldbook* Web site.

Chapter 13



Cold-Weather Travel and Camping

"Those hours spent monitoring the skies taught me a lot about the weather and have literally saved my life during my explorations, when I've been trapped in snowstorms thousands of miles from the nearest weatherman."

—Will Steger, writer, photographer, polar explorer, and member of the BSA Northern Tier National High Adventure committee

Cold-weather camping is among the most challenging and rewarding of outdoor activities. In northern latitudes and at higher elevations, camping in the cold can happen almost any time of the year. As temperatures drop and winter conditions move in, the familiar meadows, campsites, and trails of summer disappear beneath the drifts and can become a wonderland sparkling with ice and snow. A day of traveling by snowshoes or skis, a hot meal cooked over a backpacking stove, steaming mugs of soup made from melted snow, and a camp beneath a frosty sky are pleasures reserved for those willing to learn how to thrive when even the thermometer seems to be in hibernation.

Living well in the cold requires planning and experience. You can do the planning with others in your group and master the skills you need on short trips and journeys when conditions are not so severe. As for experience, you'll gain plenty of that when you pack up your winter gear, pull on your warm clothing, and head for the chilly outdoors to see how well your plans play out. It won't be long before you discover the satisfaction of being in the outdoors year-round, staying comfortable no matter what the weather throws your way.

Many outing clubs, colleges, and universities sponsor public classes in winter camping, as do some sporting goods stores and military units. A number of BSA local councils conduct cold-weather camping programs. Philmont Scout Ranch and the Northern Tier National High Adventure Program bases offer courses in the best techniques of winter camping. The *Fieldbook* Web site can lead you to plenty of online resources exploring winter gear, books, and training for cold-weather adventure.

Staying Warm in Cold Weather

To function well, your body must maintain a core temperature of a little higher than 98 degrees. Chief among the sources of that heat are the conversion of food and water to energy, and warmth absorbed from external elements such as the sun, the earth, and campfires.

Heat can be transferred away from your body in several ways:

- *Radiation*—body heat dissipating into cooler surrounding air (from bare hands and head, for example)
- *Evaporation*—sweating
- *Convection*—wind stealing away the layer of warmth next to your skin
- *Conduction*—direct contact with cold surfaces, such as sitting or lying on snow, ice, or frozen earth
- *Respiration*—exhaling

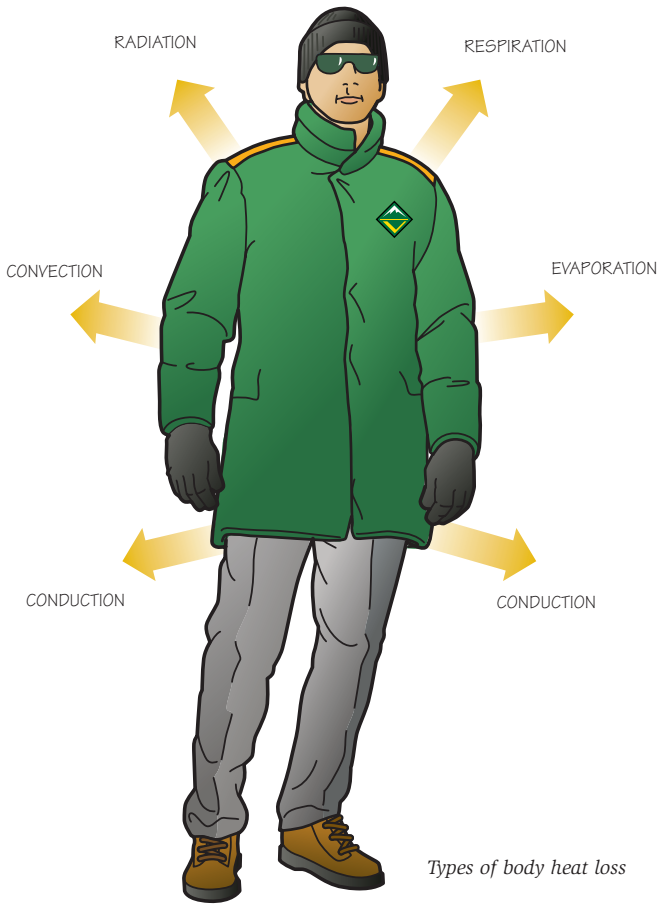
The challenge of staying warm in cold weather is a matter of maximizing heat generation and minimizing heat loss. That can be done with a threefold approach—*cold-weather clothing, food and fluids,* and *shelter.*

Cold-Weather Clothing

The clothing you wear and carry should be made of materials such as wool and fleece that can insulate even when damp. Do not wear cotton, even for inner layers, because it will retain body moisture. There should be several layers so that you can better regulate your body temperature—peeling off a sweater as you generate heat during exertion, for example, or pulling on a hat, mittens, and a parka as you are beginning to cool down. Various layers also should wick away moisture, insulate for warmth, and block the wind, as discussed earlier in this section of the *Fieldbook*.

Clothing insulates by trapping dry, warm air inside the fabric and between layers of garments. Perspiration can crowd out that warmth by filling fabric with moisture-laden air that conducts heat away rather than maintaining it. Cut down on sweating during periods of exertion by loosening or removing clothing layers *before* you become overheated. Try to stay comfortably cool by resting now and then as you travel. Replace damp clothing with items that are clean and dry.

For more on selecting outdoor clothing, see the chapter titled "Gearing Up."



Types of body heat loss

Staying Warmer by Keeping *COLDER*

Keep the word *COLDER* in mind when assembling your clothing system for outings in winter conditions. Each letter in the word stands for an important guideline to follow in order to maximize warmth:

CLEAN. Clothing free of grime insulates best.

OVERHEATING. Avoid it. Clothes will stay drier and warmer.

LAYERS. Rely on loose, light layers for the greatest range of adjustment.

DRY. Use protective layers to shield clothing from external moisture.

EXAMINE REGULARLY. Pay attention to the condition of your clothing.

REPAIR QUICKLY. Take care of tears, broken fasteners, frayed edges, and other damage as soon as you notice them. Duct tape is ideal for temporary patches in the field.

Cold-Weather Headgear

Heat loss by radiation from an uncovered head can be enormous, much greater than from any other area of the body. Experienced winter travelers know that when hands and feet begin to chill, it's time to put on a hat.

Stocking Hat

Hats made of wool or fleece will insulate your head even if the material becomes damp.

Balaclava

A *balaclava* is a stocking hat that can be pulled completely over your head and neck, leaving only a small portion of your face exposed.

Hood

A parka for winter wear should have a permanently attached hood to block the wind and provide insulation. A ruff encircling the face will protect it from harsh winds and gather frost from your breath rather than allowing it to saturate the hood's shell.

Scarf

Wrap a wool or fleece scarf around your neck for warmth. Pull it up beneath your eyes to shield your face from the wind. Tuck the ends inside the front of your clothing.

Neck Warmer

A fleece or knit-wool neck warmer has enough stretch for you to pull it over your head, and enough insulating power to slow the loss of heat from your neck and lower head.

Cold-Weather Footwear

The keys to warm feet in the winter are keeping them dry, keeping them insulated, and keeping the blood circulating through them. Thin liner socks will wick moisture away from your skin. Winter-weight socks made of wool, synthetics, or blends of both materials insulate well as long as they stay dry, and will retain some insulating power even when damp. Boots and other winter footwear should fit well enough so that circulation is not constricted even when your socks are bulky.

Layers of insulation between your feet and the cold ground slow the rate at which heat is drawn away from your feet. The rubber soles of hiking boots provide some protection from the cold ground. Even better are foam insoles. Buy them at sporting goods stores or make your own by cutting pieces of an old closed-cell foam sleeping pad and shaping them to fit inside your footwear.

Leather hiking boots might be the most frequent choice for winter camping trips, snowshoeing, and mountain travel. (Follow manufacturers' instructions to waterproof your boots, giving special attention to the seams.) Other winter footwear choices to consider, especially as the temperature drops, are mukluks, shoepacs, plastic mountaineering boots, insulated cross-country skiing boots, and vapor-barrier boots.

Mukluks

Plastic mountaineering boots

Shoepacs

Tip: Standing on a small square of closed-cell foam will keep your feet much warmer while in camp.

Leather hiking boots

Cross-country skiing boots

Shoepacs

Cold-Weather Handgear

As distant outposts of your body's circulatory system, your hands are likely to feel the chill early and often. Prepare for the worst with cold-weather handgear that is the best.

Gloves and Mittens

Synthetic or wool gloves trap body heat and still allow a maximum of hand flexibility. Mittens will keep your hands warmer than gloves of the same weight because your fingers are together inside mittens and can share warmth through direct contact. The disadvantage of mittens is that they decrease your dexterity for picking up items and manipulating gear.

Mittens and gloves are the clothing items most likely to get wet during cold-weather activities. Stow a backup pair in your pack when your travels will take you into snowy or wet terrain. To keep from losing mittens or gloves, thread a length of parachute cord through your sleeves and use an alligator clip tied to each end of the cord to secure your handgear.

Zippers on clothing, tents, and packs can be a challenge to manage when you are wearing bulky mittens or gloves. Give yourself something larger to grip by tying a loop of nylon cord to each zipper pull.

Shells

Many models of gloves and mittens are sewn into waterproof shells. Separate shells worn over mittens or gloves are a good choice because they serve as a layer that you can remove if you become too warm. Also, mittens and gloves that become damp are easy to remove from shells for drying.

Mittens allow fingers to share warmth through contact.

Cold-Weather Food and Fluids

The most efficient cold-weather heat generator is the one you always carry with you—your own body. Keep it well-fueled by eating plenty of nourishing food. Peanut butter, nuts, cheese, hard sausage, and butter or margarine add fats that provide lots of slow-burning calories. Carry plenty of snack food where you can reach it easily, and eat whenever you feel hungry or chilled. A stick-to-the-ribs evening meal and a bedtime snack will help you stay warm through the night.

Drinking fluids is every bit as important in cold weather as during hot-weather adventures. Thirst is an unreliable measure of your body's need for fluid, especially when conditions are cold. A better gauge is the color of your urine. If it is dark yellow, you aren't getting enough fluid in your system. Drink frequently so that your urine stays light-colored or clear.

For more on fluids and trek menus for any weather, see the chapter titled "Outdoor Menus."

Gathering and Storing Winter Water

A good place to replenish your water supplies is a stream flowing too swiftly to freeze. To dip from a stream without the risk of falling in, hang a widemouthed water bottle by a cord from a long stick or a ski pole.

You also can get water by melting clean snow. If you have a cup of water, add it to a pot full of snow before melting the snow over a stove. That will speed the melting process and prevent the pot from scorching. Ice and slab snow will produce more water than powder snow.

A bottle of water won't freeze overnight if you take it with you into your sleeping bag. Fill it with hot water, tighten the lid, slip it into a sock, and use it for a foot warmer. You can also count on the insulating power of snow by burying widemouthed water bottles or a covered pot of water under a foot of snow. Place the bottles upside down, clearly mark the spot, and in the morning when you dig up the cache you'll have water for cooking breakfast.

For information on treating water, see the chapter titled "Hygiene and Waste Disposal."

"Just what causes most people to refrain from outdoor life in winter is the fear of cold."

—Claude P. Fordyce, *Touring Afoot,* 1916

Cold-Weather Shelters

Four-Season Tents

Tents for winter camping usually are sturdier than summer-weight tents. Some have an extra pole or two to help them stand up to snow loads and wind, and there might be a vestibule for storing gear. Tents designed for arctic conditions have large vents so that water vapor can escape, and frost liners to trap moisture before it can infiltrate the tent fabric.

Cover the dead man with a generous layer of snow.

Tie loops of cord through the tent loops so you need only cut the cord if you cannot remove the dead man anchor.

Since tent pegs are intended to hold in the ground rather than in snow, staking out a tent on a snowfield can be a challenge. Try tying tent lines to skis, ski poles, or ice axes jammed into the snow, or to trees or large rocks. Another possibility is the *dead man,* made by securing a tent line around sticks buried in a foot or more of snow. Use brightly colored parachute cord instead of white tent cord so that the lines will be visible against the snow. Lines should be longer for snow camping to accommodate a wider range of anchoring options.

Snow Structures

Shelters made of snow can be ideal refuges on winter camping trips and a unique part of a cold-weather adventure. With an interior temperature just below freezing, a snow shelter insulates much better than a tent, which will have an inside temperature almost matching that of the outdoors. Unlike tents, snow shelters won't flap in the wind. They do take time to construct—several hours for a snow cave, half a day or more for an igloo—and the right snow conditions must be present. In snow that's not too deep, the best snow structure might be a snow dome.

DRY CLOTHES

Building a snow shelter can be a strenuous effort that might leave you with wet clothing. Plan ahead by bringing dry clothes and mittens to replace those dampened by sweat and snowmelt.

Snow Shovel

An essential tool for building snow caves and other winter shelters is a snow shovel. The shovel you choose should be strong, light, and durable. Those designed to be packed by cross-country skiers, snowshoers, and mountaineers are just right.

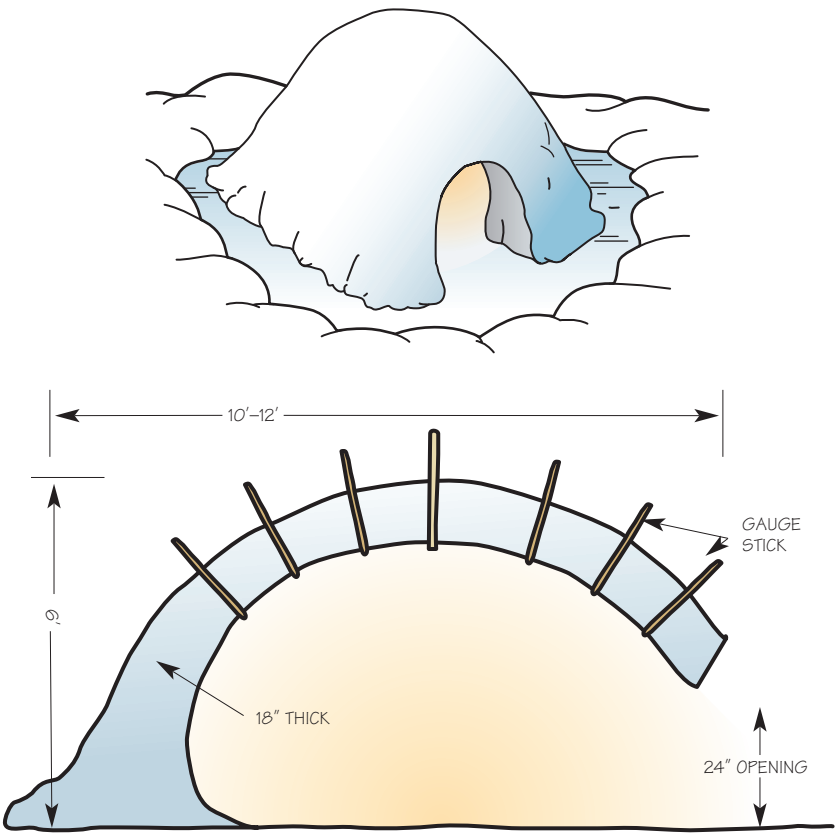
Snow Saw

When the snow is deep and well-packed, use a snow saw or an ordinary carpenter's saw to cut blocks for constructing wind breaks, igloos, and snow trenches. Snow saws are available at military surplus stores and at outdoors supply shops specializing in winter adventures. The best carpenter's saw to use has a stiff blade and large teeth. Make a sheath for your saw by cutting a piece of old fire hose to length and tying it in place with short nylon cords secured through holes in the hose.

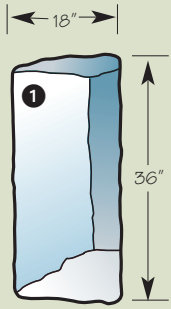
Snow Dome (Quinzee)

Begin by shoveling up a mound of snow 6 feet high and 10 to 12 feet in diameter at the base. Leave it alone for a couple of hours to give the snow a chance to settle (the drier the snow, the longer it will take). If they are readily available or you have brought them from home, push several dozen 18-inch-long sticks into the mound at regular intervals, aiming them toward the center. (Do not break branches off trees for this purpose.)

Cut a 24-inch-high entrance into the mound and hollow out the inside of the dome. Dig until you've exposed the ends of all the sticks, or until the snow inside of the dome takes on the light blue color of light refracted through snow. Either way, you should end up with a roomy, secure shelter inside an 18-inch-thick shell. Fashion a door by piling snow on a ground cloth, gathering up the corners, and tying them with a cord. The snow will crystallize into a ball that can be pulled with the cloth against the entryway to trap warm air inside the dome. Punch several ventilation holes in the dome with a ski pole or stick, orienting them at different angles so that drifting snow will not cover them all.

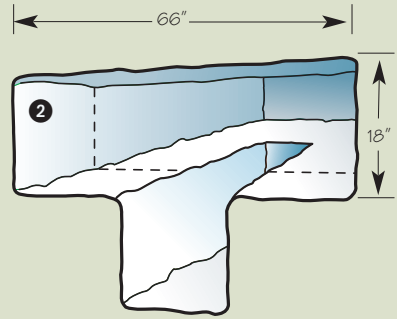


T-Front Snow Cave



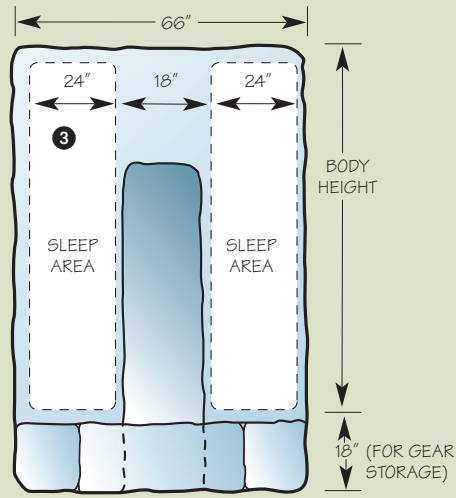
A variation on the classic snow cave design can be quick and efficient:

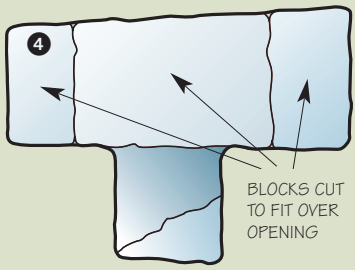
1. Dig an entrance about 18 inches wide and as high as your chest.



2. Widen the top to form a T shape.

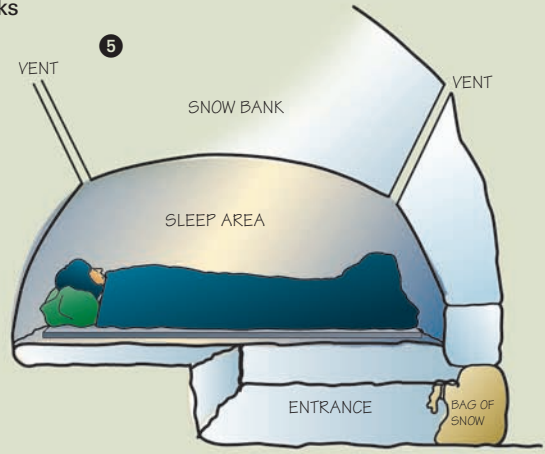
3. Dig several feet farther into the drift and excavate the interior of the cave. The floor of the cave will be at about waist level, so much of your digging will be upward and to the sides.





4. When the interior space is fully formed, use blocks of snow, bags of snow, or snowballs packed together to seal the top of the T.

5. Use a ski pole or shovel handle to poke several ventilation holes in the ceiling at a 45-degree angle to the floor.



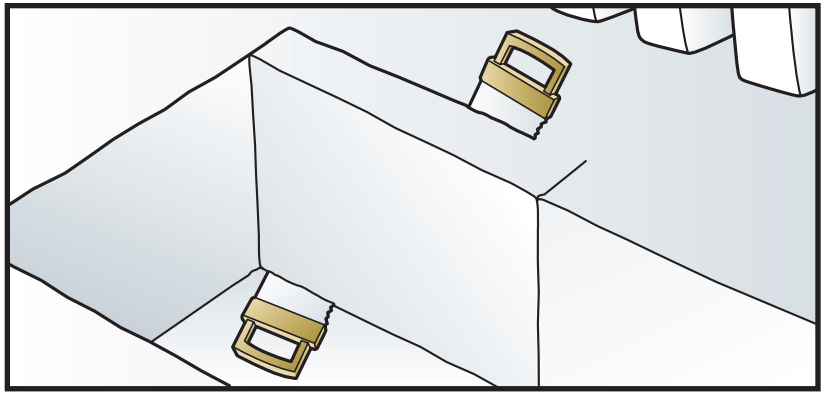
Snow Cave

For terrific protection in the worst winter storms, dig a snow cave into a deep drift or a steep, stable snow slope. Start by burrowing a tunnel into the drift, angling it upward for several feet. Next, excavate a dome-shaped room at the top of the tunnel, judging the thickness of the roof by watching from the inside for a light blue color of the snow that indicates the wall thickness is about right. Smooth the curved ceiling to remove sharp edges that could cause moisture to drip onto your gear. Finally, use a ski pole or shovel handle to punch several ventilation holes in the ceiling at a 45-degree angle to the floor. Since the entrance to the cave is lower than the sleeping area, rising warm air won't escape through the entrance and heavier cold air can't seep in.

Igloo

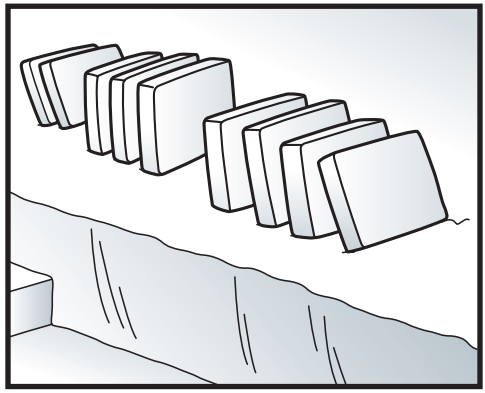
Although you'll need practice to build an igloo, the finished structure will be as windtight and pleasant to use as it is attractive. The best snow for building an igloo is found on open, gentle, windswept slopes. For the snow to be firm, temperatures must be no higher than 25 degrees Fahrenheit during the day and no higher than 10 degrees Fahrenheit at night—snow hard enough that your boots leave only faint prints. Test the hardness and depth by pushing the handle of a ski pole into it; there should be firm resistance for at least 36 inches.

For an igloo large enough to sleep five campers, first clear away any soft surface snow from an area about 20 by 40 feet. This will be the "quarry" from which you'll harvest snow blocks for the igloo.



Use a snow saw or a full-sized carpenter's saw to cut from the quarry blocks measuring about 6 by 30 by 36 inches. The first block or two won't come out cleanly; clear away the debris with a shovel until you can hop into the hole left by the removal of the initial blocks. From then on you can cut each block cleanly along its back, sides, and base, and lift it from the quarry. Line up the blocks on the slope above the quarry. Keep the sides of the quarry square as you work, and make the blocks uniform in size. You will need 40 to 50 full-sized, well-shaped blocks.

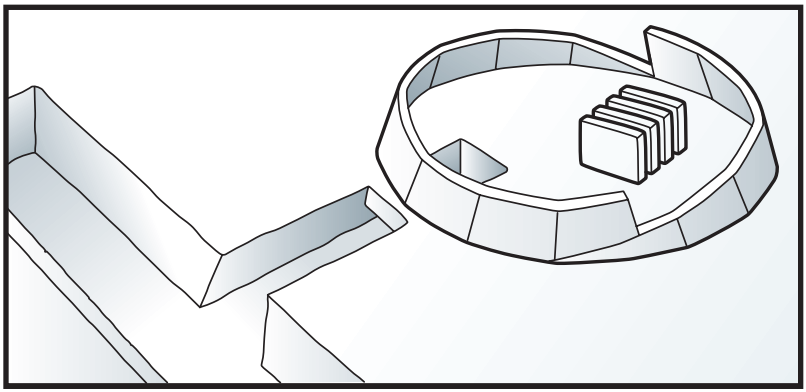
After the blocks are cut, use a piece of cord and a ski pole to scribe a circle 10½ feet in diameter. The outside of the circle should be about 8 feet up the slope from the quarry. Tramp down the snow along the outside of the line marking the circle, then set the snow blocks side by side around it to form the first tier of the igloo. Using the saw for precision shaping, taper the base of each block slightly and lean it inward just a little so that all the blocks lock solidly against one another. Pack snow against the outside of the blocks.



Next, remove one of the blocks to create an opening in the tier. Carry as many blocks as possible into the igloo; it's much easier to build with them when both you and the blocks are inside the structure. Replace the entrance block, then use the saw to cut two side slopes in the first tier of blocks. Called *spirals,* these slopes are essential to the success of your igloo-building efforts.

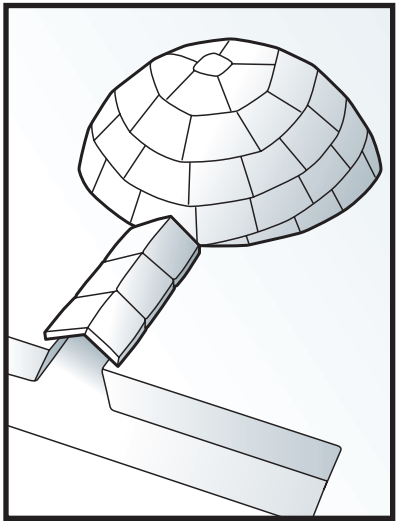
Trim the tops of the first tier's blocks with the saw so that they are banked inward toward the center of the igloo. That done, begin the second tier by placing a block at the low point of a spiral. If the spiral rises from left to right, note that the upper left-hand corner and the lower right-hand corner of each second-tier block bear the weight of that block. When those

two corners are secure, gravity will lock the block in place on the sloping spiral and banked top of the first tier. Lift the next block into position, again locking the upper left-hand and lower right-hand corners into place. For a perfect fit, trim the edges of the block with the saw.



Continue to build your way up the spirals, leaning each successive tier more sharply toward the igloo's center. As the blocks near the top, they will be almost horizontal. Trim every block so that the two critical corners fit properly. The last few blocks might require extensive shaping before you can ease them into place, but the shell of the igloo will be strong by then, and you shouldn't have much trouble securing the blocks. The final block is known as the *keystone.* To get out of the igloo, create a maintenance entrance by removing a block from the first tier on the side away from the quarry, but save the block so that you can replace it later.

Use a saw and shovel to cut a tapered trench from the quarry to the base of the igloo. The trench should be as deep as the floor of the quarry, about 24 inches wide at the top and 36 to 48 inches wide at the base.



Burrow under the igloo wall and up through the floor to create an entrance, then lean blocks of snow against each other over the trench to form a gabled roof over it. Fill any gaps between the igloo blocks with snow.

Add a few last touches to make your winter house a home. Cut ventilation holes near the top of the roof. Bring in your sleeping bags and pads through the maintenance entrance, and then close it off by replacing the snow block. Stow the rest of your equipment in the entrance tunnel.

An igloo is a very efficient winter shelter, one that can last for

weeks if temperatures remain low. If built correctly, it is tremendously strong and, after the snow has settled for several hours, it can easily support the weight of a person standing on top of it. Cold air will drain out of the igloo into the quarry below, and even when the outside temperature is well below zero the interior of an igloo can be a relatively comfortable 25 to 30 degrees Fahrenheit. The quarry also can serve as a patio and kitchen; use your saw to carve benches on which to do your cooking and eating.

Emergency Winter Shelters

While not as comfortable as snow caves or igloos, tree pits and snow trenches have the advantage of quick construction. They are good examples of alternative winter shelters that can serve you well in emergency situations.

Tree Pit

The area beneath the branches of a large evergreen tree can be nearly free of snow. Crawl underneath and form a small living space. Bare earth radiates some heat, so remove the snow from the tree pit floor if you can. Use a foam pad protected by a ground cloth as insulation beneath you. A fir or spruce tree will shed snow outside of the pit.

Snow Trench

Build a snow trench by using the same method as for an igloo entryway. Insulate the trench floor with a foam sleeping pad if you have one. Cut blocks of snow to shape a 36-inch-deep trench that tapers from 24 inches at the top to 36 to 48 inches at the base. Place the blocks on edge along the sides of the excavation, then lean them against each other to form a pitched roof.

Snow Pit

Where snow is deep enough, you can dig a long, narrow pit for an emergency shelter. Insulate the floor of the pit with a foam sleeping pad if you have one. Form a roof by stretching a tarp or ground cloth over the top of the trench. Weigh down the edges with snow, stones, or branches, then cover the roof with several inches of snow to provide insulation. Tunnel into one end of the pit and, when you are inside, fill the entry with snow to keep out the cold. Poke a few ventilation holes near the entrance and check them occasionally to ensure that they remain clear.

Winter Sleeping Systems

When the thermometer plunges, a well-insulated sleeping bag is essential to your nighttime comfort. Adding layers—fleece clothing, mittens, a hat, warm socks, and even one or more additional sleeping bags—extends the range of a bag. A fleece liner will keep the bag clean and add a few more degrees of insulating power, as will a bivouac bag. (Liners must not be made of cotton.) Sleeping inside a tent or snow shelter can prevent wind from sapping away warmth, too. Of course, insulation beneath your bag is vital, usually in the form of a foam sleeping pad.

With all the emphasis on insulation, don't become so warm that you perspire during the night. That can rob your sleeping system of its ability to keep you cozy. Ventilate by opening the bag, taking off your hat, or removing other clothing layers.

For more on sleeping systems, see the chapter titled "Gearing Up."

Carrying Your Gear

A winter trek requires more gear, provisions, and fuel than a summer trip of equal duration. A large backpack can serve you well if you will be hiking and works fine for mountain travel in rugged terrain. With some practice, you also can snowshoe or cross-country ski with a backpack.

Many snow campers depend on sleds for moving their gear. A smaller sled with a harness is sized for one person to pull, especially while on skis or snowshoes. Larger sleds can carry the bulk of a group's equipment and food with several people hitched to the harness to haul the load. Whether on foot or using skis and snowshoes, cold-weather travelers will find their balance enhanced with the use of ski poles.

Making Camp

Transformed by snow, frost, and cold, a winter camp can be a place of wonder. The campsite itself might be your destination for an adventure, or it might serve as a base from which you can range out each day to ski, snowshoe, and explore. In either case, settle in and make yourself at home with a secure shelter, a convenient cooking area, and an eye toward the weather.

Stowing Your Stuff

Drifts have a habit of swallowing up unattended camping gear. Snowmelt can soak into clothing, equipment, and food. Organize your clothing and provisions in plastic bags before departing from home, and leave your sleeping bag and extra clothing inside your pack until you need them. Tie fluorescent tape or brightly colored nylon cord to knives, compasses, and other small items so that you can find them if they slip away. Keep your mittens and gloves on your hands or tied to a cord threaded through your sleeves. Stash cooking utensils inside pots when you aren't using them. Before going to bed, make sure everything is stored in your pack, on your sled, or in your shelter; items left outside could become buried by snow during the night.

Cold-Weather Camping Expertise

Every time you camp out in the winter, you'll figure out a few more ways to make your cold-weather adventures more rewarding. Here are a few hints from the experts:

Carry waterproof matches (in a plastic container), flashlights, and extra batteries in the inside pockets of your clothing, where body heat can help improve their performance.

Fill an unbreakable vacuum bottle each morning with hot drinks or soup to be enjoyed later in the day. Fill it before going to bed, too, so that you'll have something hot to drink when you wake up the next day.

The lids on widemouthed water bottles won't freeze up as quickly as can those on smallmouthed ones. The larger caps also are easier to manage when you are wearing mittens. Insulate a water bottle with a piece of closed-cell foam sleeping pad sized to encircle the bottle and duct-taped in place.

Choose an insulated mug that will retain the heat of soup and drinks, but won't burn your lips.

A 12-by-12-inch piece of 1/4- or 1/2-inch plywood will insulate your stove from surface cold and prevent a lit stove from melting into the snow. A windscreen designed specifically for your stove will concentrate heat. Cover pots with lids to speed up cooking.

Pack along a small whisk broom to sweep snow off your clothing and out of your tent.

Travel into areas prone to avalanches is beyond the scope of the *Fieldbook*. If your interests lead you in that direction, prepare by taking winter backcountry travel courses and learning how to use avalanche beacons, probes, and snow shovels.

Avoiding Cold-Weather Emergencies

Prepare well and keep your wits about you, and you should seldom encounter cold emergencies. Increase your comfort and safety by wearing layers of clothing to stay warm and dry. Eat plenty of food and drink lots of fluids. If bad weather catches you, make camp and crawl into your sleeping bag.

Visit the outdoors in small groups—*never alone.* Use the buddy system, pairing up so that all group members are watching out for one another. Stay alert for symptoms of hypothermia, frostbite, and dehydration—the medical emergencies most often associated with cold weather. The intensity of reflected sunlight can make sunscreen and a broad-brimmed hat vital protection when you are traveling and camping on snowfields. Protect your eyes with sunglasses and your lips with zinc oxide or a lip balm with an SPF of at least 15.

For more on hypothermia, frostbite, avalanches, and other cold-weather hazards, see the chapter titled “Managing Risk.”

Leave No Trace While Cold-Weather Camping

Winter conditions provide unique challenges and opportunities for travelers to leave no sign of their passing except for prints in the snow.

Plan Ahead and Prepare

Learn about the area where you are going and know what to expect. Check weather reports before setting out, and prepare for the worst conditions that might occur.

If visibility on your return trip might be a concern, be ready to mark your route with flagging tape or pin flags. (Both are available at hardware stores. Or you can make flagging with strips of brightly colored cloth.) Remove all flags and flagging on your way home.

Travel and Camp on Durable Surfaces

Stay on deep snow whenever you can. Walk in the middle of muddy pathways to avoid damaging trailside plants. Choose campsites on snow, rock, or mineral soil well away from avalanche paths, cornices (overhangs), and steep snow slopes. Take care not to trample tundra vegetation.

Dispose of Waste Properly

Frozen ground, snow cover, and frigid conditions can make disposal of human waste an interesting endeavor. Plan ahead by asking land managers of the area you intend to visit for guidelines on what to do about waste. *Pack-it-out kits* might be a workable solution, as can using snow for toilet paper. A small dispenser of waterless hand cleanser rounds out your ability to make outdoor hygiene simple and convenient.

For information on making and using pack-it-out kits, see the chapter titled “Hygiene and Waste Disposal.”

Leave What You Find

Leave dead branches on trees—breaking them off for firewood leaves sharp, ugly protruding ends.

Minimize Campfire Impacts

The ease of using lightweight stoves makes them a natural choice for cold-weather camping and travel. Factor in additional fuel if you expect to melt snow for water. Where fires are appropriate, gather wood from the base of trees, where doing so will have no lasting impact on the appearance or health of the environment. Where the ground is bare, follow the Leave No Trace fire-building principles. When the earth is covered with snow, you can use a fire pan to contain a blaze and prevent it from extinguishing itself by sinking into the snow.

For more information, see the chapter titled "Using Stoves and Campfires."

Respect Wildlife

Winter can be an especially vulnerable time for animals. Low temperatures, scarcity of food, and greater danger from predators can place a great deal of stress on them. Observe wildlife from a distance.

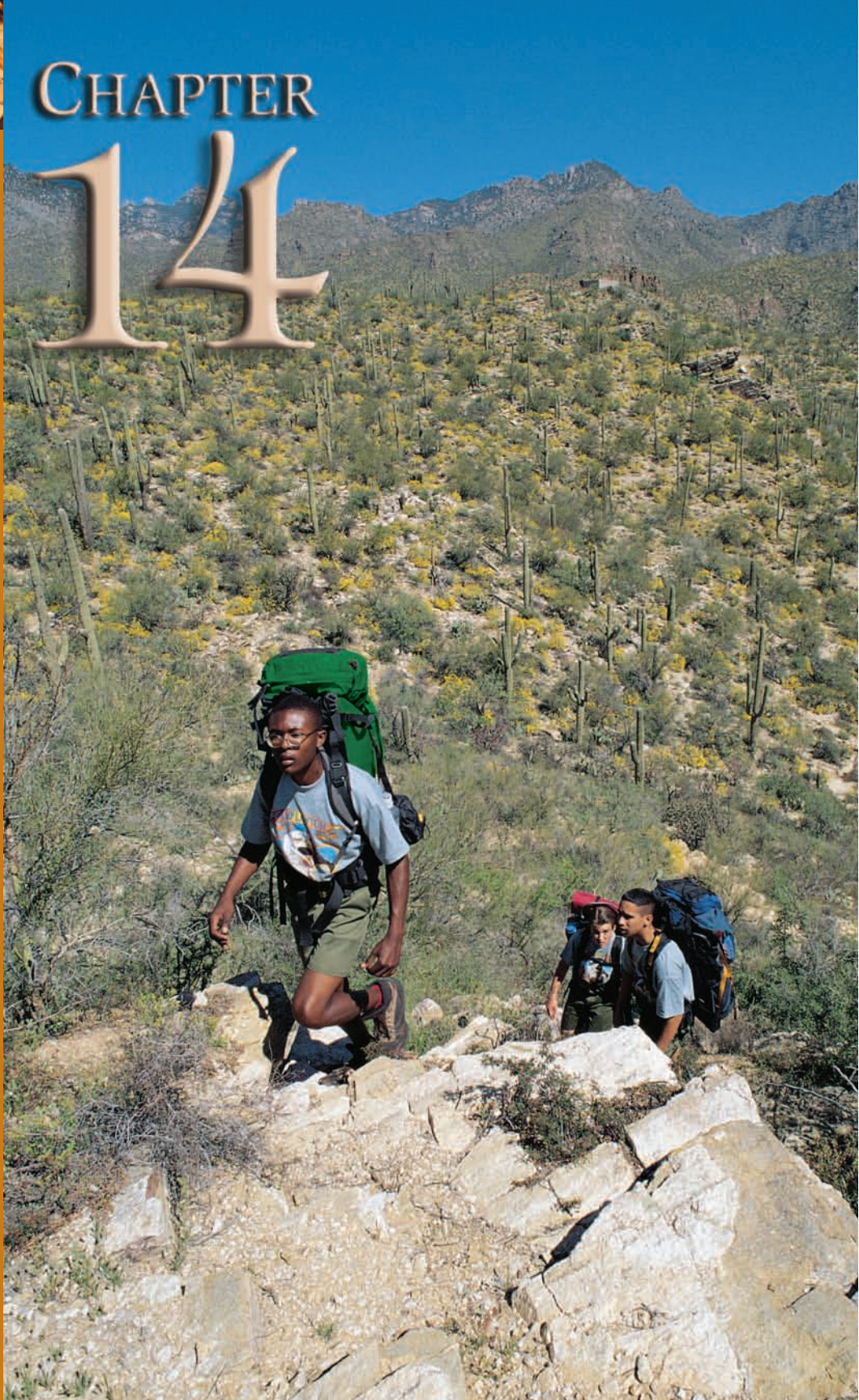
Be Considerate of Other Visitors

Share winter trails with other users. Don't hike or snowshoe on ski tracks. While traveling on skis, yield to downhill traffic and those catching up with you from behind, and be especially diligent as you approach blind corners. When you stop to rest, move off the trail.

"Take long walks in stormy weather or through deep snow in the fields and woods, if you would keep your spirits up. Deal with brute nature."

—Henry David Thoreau (1817—1862), American author, philosopher, and naturalist

CHAPTER 14



Hot-Weather Travel and Camping

"The weather was hardly the best for walking. Across the first two States it was oppressively hot, and then I had several days of trudging in a pouring rain. However, it did not drench the spirits within, and it was welcome as an experience."

—Charles F. Lummis (long-distance hiker, journalist, archaeologist, and adviser to President Theodore Roosevelt), *A Tramp Across the Continent,* 1892

The ability to travel and camp in hot weather can expand the range of your adventures to include magnificent portions of North America throughout the year. Go to the desert and find yourself surrounded by space and sagebrush, shimmering clarity and quiet. Discover a fragile environment of arid lands, wildlife, and vegetation shaped by water, and by its absence. Go to the tropics and find yourself deep in complicated ecosystems millions of years in the making.

Explore the magnificent wetlands and tangled forests of the Southern states, delighting in terrain you might have thought you already knew. Set off in rafts, canoes, and kayaks to paddle the rivers of summer, drifting through the timbered territory of the Southeast and Midwest and between the sheer canyon walls of the Southwest. Make your way to the sparkling coastlines of bays, gulfs, and oceans where you can camp just above the high-tide mark and then snorkel, swim, and hike as you enjoy the rich ecology where the land meets the sea.

Why go in hot weather? You'll find your own reasons when you get there; environments baked by the sun can stir your soul like no other landscapes on Earth.

THE THERMIAS—HYPO- AND HYPER-

***Thermia* is the Latin word for "heat." *Hypo* means "less than." *Hyper* is the equivalent of "too much."**

- ***Hypothermia* is the condition of having too little heat—being cold.**
- ***Hyperthermia* occurs when there is too much warmth—being hot.**

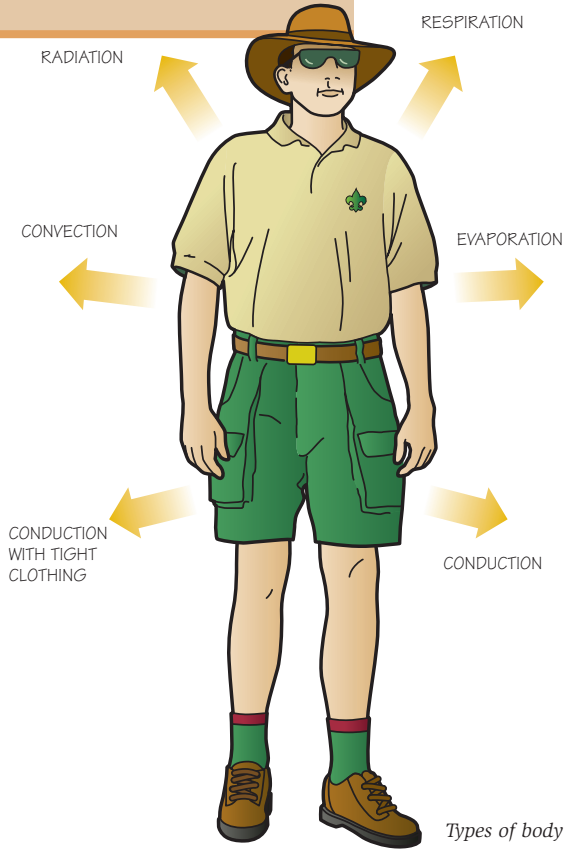
Staying Cool in Hot Weather

Coping with heat is the flip side of camping and traveling in cold weather. Just as winter adventurers must plan ahead, choose your hot-weather equipment and food with care, and then use lots of common sense. In frigid conditions, the focus is on staying warm and well-hydrated. When the thermometer soars, the most important factors are keeping yourself hydrated and cool and matching your activities to the conditions.

Understanding how your body reacts to high temperatures can help you plan your clothing, gear, and provisions for the trek. It also can guide you in deciding *when* to carry out activities during a trip. The big issues to cope with are *heat, humidity,* and *hydration.*

Heat

Your body operates best with a core temperature of about 98 degrees, shedding excess warmth primarily by means of *radiation* and *evaporation. Radiation* takes place when body heat dissipates into cooler surrounding air. That ceases to be effective as the outside temperature rises. *Evaporation* is your body's other mechanism for staying cool, occurring when you perspire. As moisture on the skin evaporates, it carries heat away with it.



Types of body heat loss

Humidity

Dry climates are ideal for evaporation to occur. However, air saturated with humidity can't absorb much additional moisture from evaporation. People sweating heavily on a hot, humid day might not be losing much heat at all.

Hydration

Perspiration draws a great deal of fluid from the body, depleting it of water and essential electrolytes. Water requirements vary among people, based on their size, physical makeup, activity levels, and general health, as well as environmental factors.

Drink, Drink, Drink

Thirst is not always the best indicator of your body's need for water. Instead, drink often enough for your urine to remain light-colored or clear.

- In hot weather, refresh your water containers at every opportunity. Drink your fill, then refill your container before leaving a water source.
- Keep water readily available and drink small amounts frequently.
- Don't ration water. If you are thirsty, you need to drink.
- Avoid consuming a lot of caffeinated drinks, which can act as *diuretics*—agents that purge fluids from the body.
- Don't underestimate your need for water. During strenuous activities in hot weather, your body might require two to three gallons of water per day.

Planning Hot-Weather Trips

In some ways, planning adventures for hot weather is not much different from getting ready in any season of the year. Your group will need food and gear, a route to travel, and a way to get to and from the trailhead. You will check with the land managers of the area you wish to visit for current information on conditions, for permits you might need, and for guidelines on the best ways to use Leave No Trace principles as you travel and camp. Permits for popular stretches of rivers, canyons, and other public lands might be in great demand and could take weeks or months to acquire.

Preparing for hot-weather journeys also demands a few special considerations not common for trips into more hospitable climes. The following are among the most important:

- Water weighs about 8 pounds a gallon. You can carry only so much. Determine where you will be able to refill your water bottles—desert route selection might be a matter of stringing together a series of reliable water sources. For longer trips with critical water needs, have backup plans—points where you can change your route and get to certain water in a reasonable amount of time.

- Once in the field, travel early in the morning and in the evening rather than in the midday heat.
- Be aware of seasonal trends. Some years are drier than others, and that could have an impact on your ability to find water in the region you intend to visit.
- Packing lightly lessens the effort it takes to hike. That, in turn, reduces the exertion that generates body heat.
- If you know that the area where you are going is remote with few visitors, then be prepared to camp in pristine areas and practice stringent Leave No Trace techniques. In areas popular with the public, expect to see more people and plan on camping in existing campsites. Check with land managers for camping regulations, permit information, and suggestions about your route.

Hot-Weather Nutrition

Hot weather can cause you to feel less hungry than you might in more temperate conditions. Even so, a nourishing diet is important to maintaining your health and keeping up the energy you need to make the most of outdoor activities. A balanced menu with a higher percentage of carbohydrates will serve you well. Some people prefer eating snacks and light meals throughout the day rather than having a large lunch and supper.

When planning provisions, shy away from fresh meat, eggs, dairy products, and other protein-rich foods that can spoil in the heat; grains, dehydrated foods, and trail mix are durable and lend themselves to a diet more appropriate for hot weather. Groups planning canoe journeys without long portages can take along heavier provisions than groups toting everything on their shoulders. Rafts, sailboats, and other watercraft might be equipped with ice chests capable of keeping almost any foodstuffs fresh for several days or more. The larger the raft or boat, the less the concern over the weight and bulk of provisions.

For more on selecting food for a trek, see the chapter titled "Outdoor Menus."

Finding Water in Arid Regions

To be certain of your water supply in dry environments, bring plenty of fluids with you. Embarking on any trip beyond a day hike, though, will probably require you to refresh your water containers along the way and to treat any water you intend to drink.

Up-to-date information provided by land managers and other travelers can be your best guide to the locations of backcountry water. Check your map for springs, wells, stock watering tanks, and windmills. Look for bright green vegetation that might indicate a seep or spring. Clusters of cottonwoods, sycamores, and willows are indicators that water might be close at hand. Damp sand or earth might yield seepage if you dig far enough, and in canyon country, water sometimes collects in shaded depressions in the rock. Assume that potential water sources could be dry when you reach them, though, and carry enough water to enable you to reach second and third sources of water.

Hot-Weather Clothing and Body Protection

Selecting the right clothing will go a long way toward keeping you happy and healthy in hot weather. As with any form of adventure travel and camping, use the layering system to ensure the greatest versatility in the clothing that you carry and wear. Keep these basics in mind:

- Nylon shorts and shirts are the favorites of many hot-weather travelers. The fabric is cool, durable, and quick to dry. Shirts might be most comfortable when made of a nylon-cotton blend.
- Cotton can be a good choice for warm days. It absorbs sweat and ventilates well. However, it will prove useless if it becomes wet in chilly weather.
- Polyester is a good insulator, does not hold water, and dries easily.
- Pick light-colored fabrics not as likely to absorb heat, and stay dressed. Going without a hat or a shirt can lead to an increase in water loss and much greater potential for sunburn and overheating.
- Temperatures at night can be chilly or even cold. Plan your clothing and sleeping gear accordingly.
- In insect-infested areas, you might want a head net, long-sleeved shirt, long pants, and lightweight gloves.

Beyond Clothing

Use sunscreen to protect exposed skin, giving special attention to your face, ears, nose, and neck. Although skin appears to recover from sunburn, damage to the cellular structure accumulates and can, in later years, lead to skin cancer. (To be effective, sunscreen should have an SPF of at least 15. SPF numbers greater than 30, however, add little extra protection.) Sunlight reflected off open water can intensify the negative impact of solar radiation, and a wet T-shirt offers little defense against the sun. Wear sunglasses to prevent eyestrain, and shield your lips against chapping and sun damage by applying a lip balm with an SPF of 15 or higher.

Insect repellents containing the chemical DEET (N, N-diethyl-meta-toluamide) are effective but, to avoid the possibility of negative side effects, closely follow the manufacturer's recommendations for use. Hot-weather travelers in wooded regions might successfully ward off ticks, chiggers, and other insects by lightly spraying their clothing with repellent containing permethrin.

Hot-Weather Gear

Your pack for hot-weather camping can be much lighter than the one you carry in the winter. You'll need less in the way of clothing, and you won't require nearly as much in the way of a shelter and a sleeping bag. Because you won't be melting snow for water, you can get away with less fuel. Regions experiencing high humidity might be subjected to frequent showers and occasional storms, so pack your rain gear. Layers of warmer clothing will see you through a chilly night.

Shelters for Hot-Weather Camping

For hot, dry weather, a lightweight sleeping bag spread out under the stars is ideal. A ground cloth will keep it clean, and a sleeping pad will provide plenty of cushioning and insulation. If you need more shelter, choose from among bivouac bags, tarps, lightweight tents, and hammocks.

Tarp

A nylon tarp or a 4-mil sheet of plastic, offering maximum ventilation with minimum weight, often are just right for hot environments, especially if there aren't many insects.

Leave No Trace in Hot-Weather Environments

For traveling and camping in deserts, see the chapter titled "Traveling and Camping in Special Environments."

In addition, the *Fieldbook* Web site can lead you to plenty of online resources for techniques, gear, training opportunities, and destinations for hot-weather adventure.

Hot-Weather Tent

A tent might be the most practical shelter in humid climates and where insects and crawling creatures are an issue. A tent with large mosquito-netting panels can be used without the rain fly unless the skies threaten. Four-season tents, single-wall tents, and other shelters that don't allow much ventilation can be stuffy, damp, and uncomfortable.

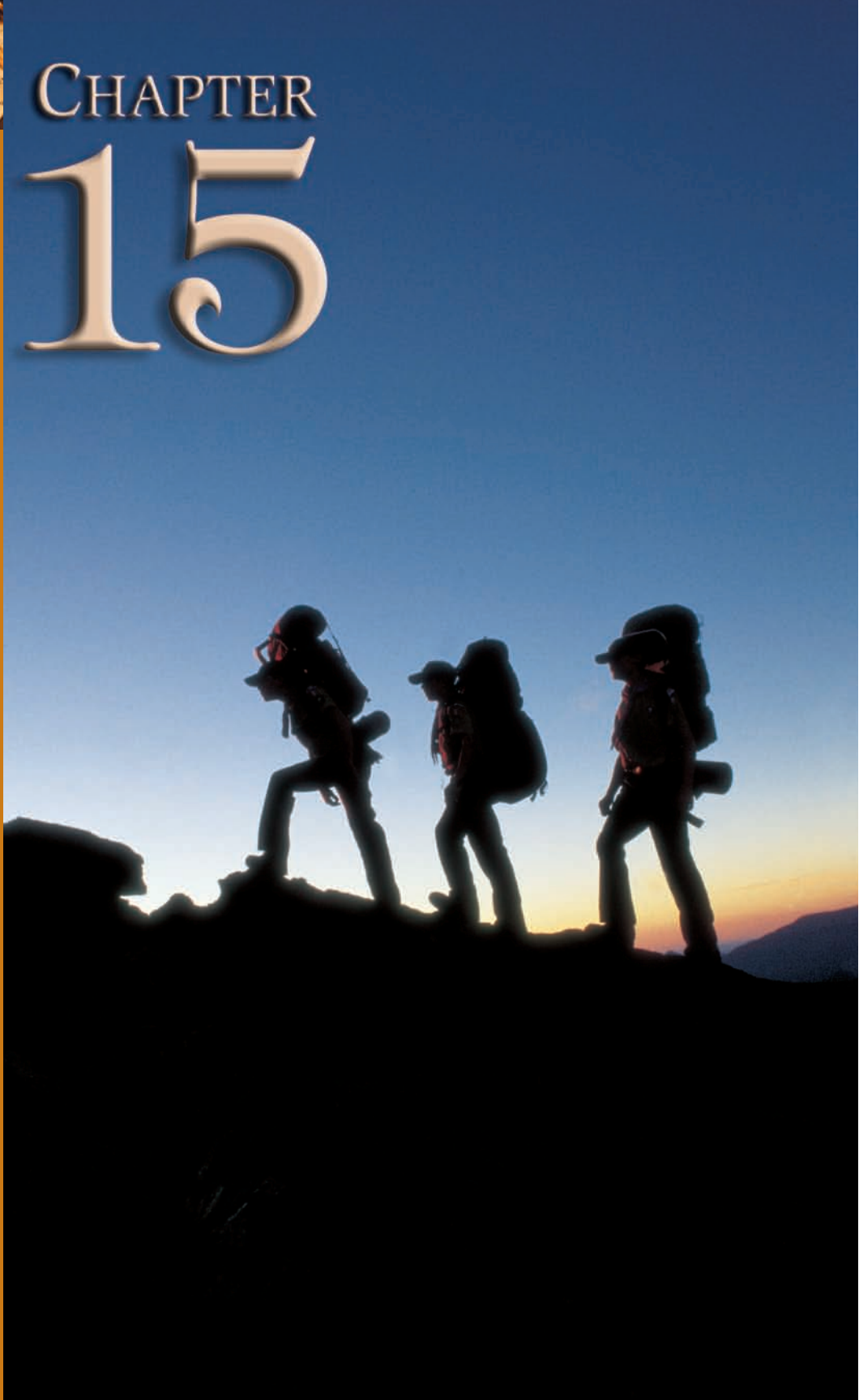
Hammock

A hammock designed for tropical camping is essentially a small shelter complete with mosquito netting and a pitched nylon roof to shed the rain.

"If you cannot endure a certain amount of thirst, heat, fatigue, and hunger without getting cross with Nature, it is best to stay home."

—William T. Hornaday (author, wildlife advocate, and founder of the National Zoo in Washington, D.C.), *Campfires on Desert and Lava,* 1913

CHAPTER 15



Backpacking

"We are born wanderers, followers of obscure trails, or blazers of new ones. The mind, too, is a natural wanderer, ever seeking, and occasionally discovering, new ideas, fresh insights."

—Royal Robbins, U.S. mountaineer and climber whose interest in the outdoors was stimulated by Scouting

Nothing promises adventure so clearly as a pack loaded and ready for the trail. Add to it a group of like-minded friends and a well-considered plan, and you are almost certain to discover much more in the out-of-doors, and in yourself, than you had ever hoped to find. With a pack on your shoulders, you can go wherever your legs will take you. Use your navigation skills to find your way, and rely on your knowledge and experience to make the right decisions as your route leads you far from any road. Live simply and well with only the gear and provisions you've chosen to carry, and take pride in knowing how to keep yourself comfortable and well-fed. In the freedom of backpacking you will find yourself closer to the land, closer to your companions, and closer to the core of life itself.

What You Carry in Your Head

Backpacking well requires a good grasp of many outdoor skills. The gear and provisions you take along can make your travels easier. More important, though, is the knowledge you have in your head to keep yourself and those with you safe and to appreciate and protect the country through which you travel.

Every outdoor experience you have will add to your storehouse of backpacking know-how. Information found throughout the *Fieldbook* and on the *Fieldbook* Web site can guide you in preparing for your journeys and in making the most of your time on the trail.

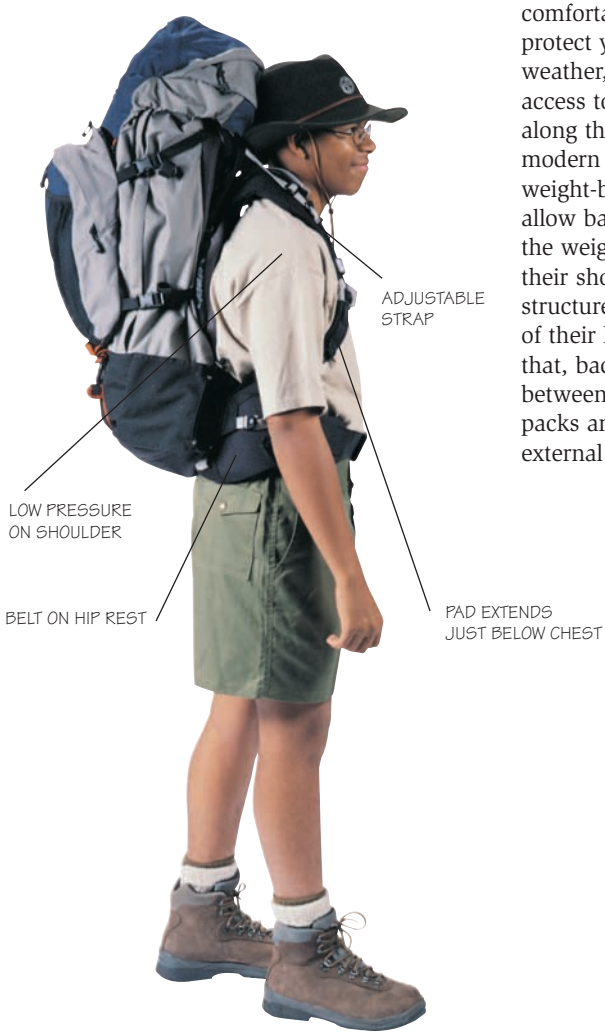
15

What You Carry on Your Back

In 1913 a man named Joseph Knowles went sans clothing into the New England woods where he claimed he was able to build a campfire, live on berries, kill a partridge and a bear, and use charcoal on birch bark to write accounts of his adventures. Perhaps somewhat fanciful, Knowles' experience does point out the fact that much of what backpackers carry today could just as well be left at home. The chapter titled "Gearing Up" will help you decide what you need for backpacking and what you don't. One item you are almost certain to require is, of course, a backpack.

Backpack

A good backpack will ride easily on your shoulders, sit comfortably on your hips, protect your gear from the weather, and provide easy access to things you need along the way. Nearly all modern backpacks have weight-bearing hip belts that allow backpackers to shift the weight of pack loads from their shoulders to the bone structure and strong muscles of their hips and legs. Beyond that, backpackers can choose between internal-frame packs and those with external frames.



Invention of the Modern Backpack

An American inventor named Merriam patented the load-bearing hip belt in 1886. However, the widespread use of belts to transfer the weight of a pack load had to wait until after World War II, when aircraft riveters and welders turned their skills from building fighter planes and bombers to manufacturing aluminum canoes and pack frames. Before long, lightweight frames outfitted with hip belts and nylon packs had transformed backpacking into an activity accessible to almost anyone eager to lace up a pair of hiking boots and set off on a trail.

Internal-Frame Pack

Stiff metal or plastic *stays* positioned inside a pack act as its frame, providing structural rigidity for transferring the weight of the pack load to the hip belt. With their compact shapes and snug fit, internal-frame packs are ideal for travel through heavy brush, in steep terrain, and while snowshoeing or cross-country skiing. They also are comfortable on open trails. Some are outfitted with removable top flaps or rear compartments that can be converted into day packs for hikes from a base camp.

External-Frame Pack

The weight distribution principles of an external-frame pack are essentially the same as for a pack with an internal frame, but because the frame is on the outside of the bag it can be larger and more rigid, and can efficiently transfer the weight from the shoulder straps to the hip belt. Most external frames also provide room for lashing on a sleeping bag or tent.

Internal-frame pack

External-frame pack

Pack Weight

How much your pack weighs depends on the length of the adventure you've planned, the amount of food and equipment you must carry, and your personal preferences. Traveling with a troop or crew lets you divide up tents, food packages, cooking equipment, and other group gear. For comfort on the trail, a pack containing everything you need for a safe trek should tip the scales at no more than 25 percent of your body's weight. If your pack weighs less, so much the better.

Pack Capacity

The capacity of packs is often noted in cubic inches:

- ***2,500 to 3,000 cubic inches. Good as a large day pack or for overnight trips in warm weather when you need only a lightweight sleeping bag and a minimum of other gear.***
- ***3,000 to 4,500 cubic inches. With space for camp essentials, extra food, and additional layers of clothing, a pack of this size works well for two- or three-day trips in the spring, summer, and autumn.***
- ***4,500 to 6,000 cubic inches. The majority of standard backpacks are of this dimension. Intended for trips of several days or more, they have the room to haul all the food and equipment you need, as well as a few extras.***

Choosing a Backpack

Look for a backpack that best matches the kinds of adventures for which you'll use it most. The pack might be a little large for one-night campouts, but just right for treks of several days. Put some weight in a pack you like and wear it around the store to see how it feels. Will it ride close to your back? Does the weight rest on your hips rather than on your shoulders or waist? Could you carry it all day? Many packs have adjustment features to fine-tune the fit. Knowledgeable backpackers and salespeople can help you find a pack that will seem tailored just for you.

Prepack your clothing and food in stuff sacks to protect them from the elements and to organize your pack. A few nylon sacks with drawstrings and a handful of self-sealing plastic bags will do the trick.

Loading a Pack

Once you've determined what to carry, the next step in preparing for a backpacking trip is to pack everything for the trail. Frequently used items can go in the pockets of your clothing or pockets on the outside of your pack—your pocketknife, compass, map, water bottle, sunscreen, insect repellent, personal first-aid kit, and perhaps a notebook and pencil. Stow your tarp or tent where you can reach it without digging through everything else; on a stormy day, you might want to get a shelter up quickly.

Equipment you won't need until you have made camp can go deeper in your pack, but rain gear, a fleece or wool sweater, clean socks, and food for the trail should ride where you can easily reach them. Reserve at least one pack pocket for your fuel containers so that they will be isolated from the rest of your supplies.

Anything you carry on the outside of the pack—cup, water bottle, cook pot, etc.—should be securely tied, strapped, or clipped in place so that nothing can swing or fall off.

If you will be hiking on open trails, arrange the contents of your pack so that its center of gravity is high and close to your back. For cross-country hiking, skiing, or snowshoeing, trade a little comfort for a lot of stability by placing heavier gear in the bottom of the pack and thus lowering the center of gravity. In either case, pad the front of the pack's interior with a layer of clothing to provide extra cushioning against your back.

Most backpacks will shield your gear from light showers, but heavy rains might seep through the pack fabric. Carry a waterproof nylon rain

cover sized to the shape of your pack, and slip it on when the weather turns bad. It's a good idea to put the cover in place when you leave your pack outside during the night, too. If you're caught on the trail without a rain cover, you can use one of the large plastic trash bags you have along for stashing litter. Cut a slit in one side of the bag, then cover the pack and tuck the loose ends of the bag beneath the straps or under the frame in a way that leaves the shoulder straps free. Some outdoor travelers make their packs completely watertight by lining the compartments with trash bags and sealing their food and gear inside.

Hoisting and Carrying a Pack

An effective way to get a pack on your shoulders is to enlist the aid of a partner who can lift the load while you slip your arms through the shoulder straps. Return the favor by hoisting your buddy's pack.

To get into a pack on your own, loosen the shoulder straps, then grasp them and lift the pack waist high. Rest the bottom of the pack on your thigh and slip an arm through the appropriate shoulder strap. As you do so, smoothly swing the pack onto your back and slip your other arm through the remaining strap. Lean a little forward at the waist to hoist your pack into position, buckle and tighten the hip belt, and adjust the shoulder straps so that when you stand upright most of the pack's weight rides on your hips.

Many packs have additional straps to stabilize the load or compress it closer to your back. Play around with these straps to see if they improve the way the pack feels.

Hitting the Trail

Hiking with a backpack can be much different from walking without one. A pack on your shoulders alters your sense of balance. Its weight puts extra strain on your feet, ankles, and knees, especially when you're pounding downhill. Begin each day's journey by stretching to warm up and loosen your muscles, then hike slowly at first to allow your pack to settle into place. Match clothing layers to changing weather conditions, check your feet for hot spots, drink plenty of water, and adjust the way your pack is riding on your hips and shoulders. When taking breaks, do so on durable surfaces off the trail—rocks, sandy areas, dry grasses—rather than on vegetation that could suffer from being trampled.

Over the course of a long hike, the straps and belt on your pack might make your shoulders and hips sore, especially if you're lean and don't have a great deal of natural padding on your bones. Ease any discomfort by occasionally adjusting the pack straps to shift the weight of the load. You also can use a couple of socks for padding by folding them over the hip belt or tucking them under your shoulder straps.

Setting a reasonable pace will enable everyone to enjoy a trek. Position slower hikers near the front where they can more easily maintain a steady stride. Stronger backpackers can carry a greater proportion of group gear, though no one should be made to feel inferior for toting a light load, or superior for enduring a heavier pack.

Hiking Sticks and Trekking Poles

The hiking stick has long been a symbol of the traveler. It swings comfortably in your hand, giving balance and rhythm to your pace. Use it to push back branches or brush. A hiking stick can be especially useful when you are wading a stream; added to your own two legs, a stick will give you the stability of a tripod. (For more on stream crossings, see the chapter titled "Mountain Travel.")

Some backpackers like to use a pair of trekking poles for balance and to reduce weight on their knees, much as a skier uses ski poles. Telescoping poles can be adjusted in length or collapsed and strapped out of the way on your pack. Be kind to the environment by using blunt, rubber-tipped poles that minimize impact on trail margins.

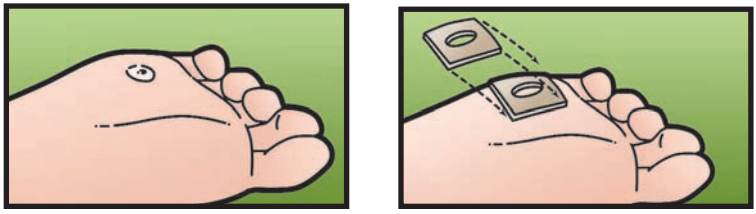
If you have a history of blisters forming at particular locations on your foot, try reinforcing the areas with moleskin or gel pads before you start hiking.

Preventing Blisters

Blisters develop when skin is irritated, usually by friction or heat. For outdoor travelers, blisters on the feet are the most common. Prevent them by wearing boots or hiking shoes that fit well, by breaking in your footwear before a trek, and by changing into dry socks whenever your feet become damp. Many hikers find success in deterring blisters by wearing two pairs of socks—a thin liner sock of a synthetic material (not cotton), and a thick wool hiking sock.

Treating Blisters

A *hot spot* is a warning that a blister might be forming. Treat a hot spot or blister as soon as you notice it. Gel pads can be taped directly over a hot spot or blister to reduce friction and speed healing. Follow the instructions on the package. To treat a hot spot or blister with moleskin, cut the moleskin into the shape of a doughnut and fit it around the injury to shield it from further rubbing. Used together, a gel pad and a moleskin doughnut can provide maximum relief for hot spots and blisters. Change bandages every day to keep wounds clean and to avoid infection.

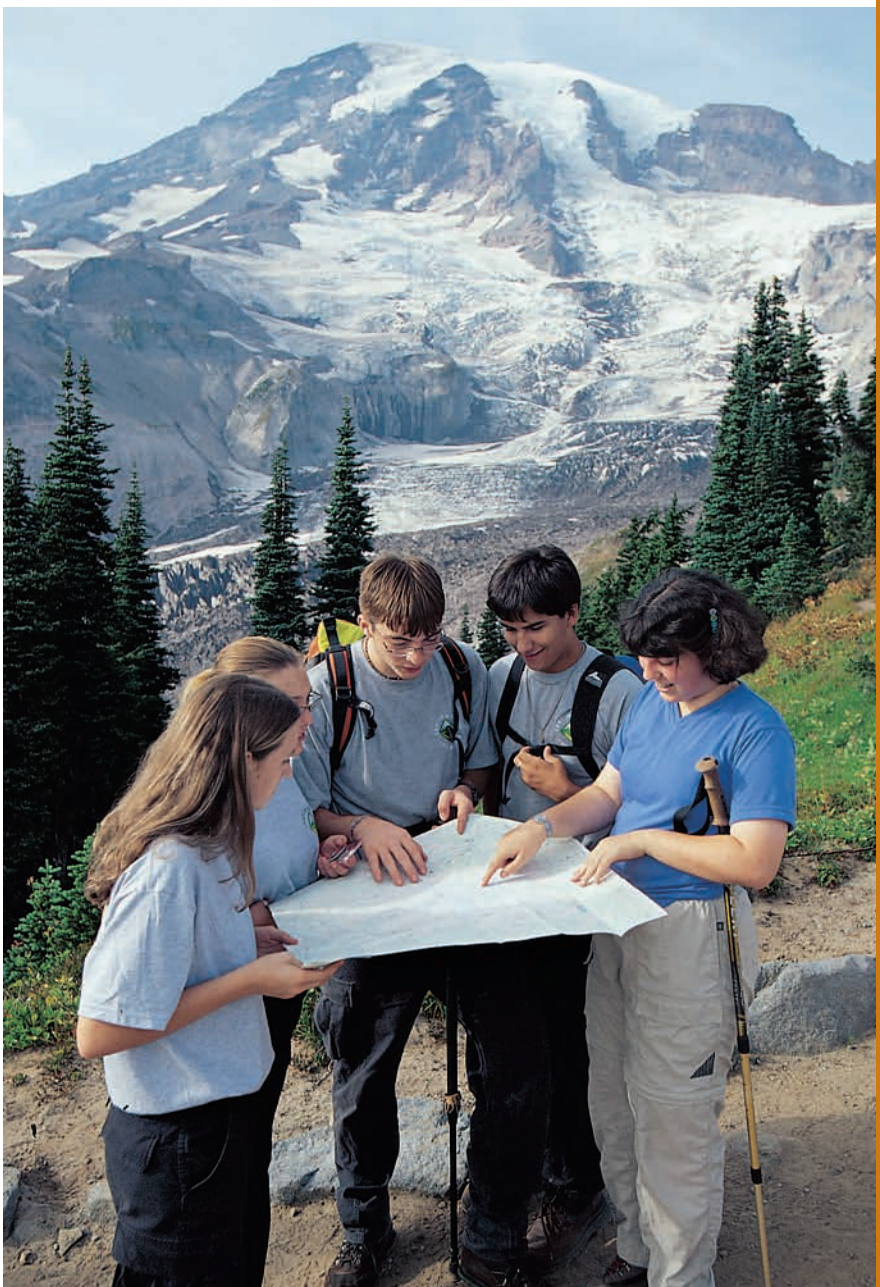


A hot spot is a warning that a blister might be forming. As soon as you notice it, treat a hot spot or blister with a "doughnut bandage" to relieve the pressure on your skin.

Leave No Trace Backpacking

Just as carrying a lightweight pack can make your outdoor adventures easier and leave you with more time and energy for enjoying your surroundings, following the principles of Leave No Trace can ensure that your impact on the land is as insignificant as possible.

For more on backpacking responsibly, see the "Leaving No Trace" section of this book.



Extended Backpacking Treks

Have you ever reached the end of a weekend camping trip and wished you didn't have to go home? Have you ever looked out over ranges of mountains that seemed to invite you to hike all the way to the horizon and beyond? Ever wanted a challenge that would put your backcountry skills to a real test? If your answer to these questions is yes, you and your group might be ready for an extended backpacking trek.

Terrific challenges await long-distance backpackers on famous footpaths including the Appalachian Trail, Pacific Crest Trail, and Continental Divide Trail. Of course, you can plot an extended trek anywhere in the country by studying maps, finding interesting hiking trails, and figuring out ways to link them into a continuous route.

The Rhythm of a Long Hike

The first days of a long backpacking trip are a time of adjustment as you and your companions get used to carrying your packs, the hours of walking, and the rigors of spending all of your time outdoors. Along with the excitement of the adventure, you might even have some doubts about the wisdom of so distant a goal.

However, changes will begin to occur as soon as you take your first step. As the miles roll beneath your boots, calluses will form to protect your once-tender feet. You will gradually become accustomed to the weight on your shoulders. The routines of camp chores will become quick and efficient. Your legs and heart will strengthen, and before long you will find yourselves settling into the rhythm of motion of long-distance hikers.

Food for Extended Treks

Just as your mind and muscles become attuned to long stretches of trail, your digestive tract will become streamlined and more efficient. The food you carry on an extended trek will differ little from what you take on any backpacking trek, though you might find yourself hungry for greater volumes of food in the later stages of a journey. Scrutinize your food lists with weight of ingredients in mind, and make sure that nothing in your pack will spoil before you can use it.

For more on selecting and preparing food for backpacking trips, see the chapter titled "Outdoor Menus."

Resupplying

When a trek will keep you on the trail more than a week, it's unlikely you will be able to carry all the provisions and fuel you will need. Some routes come close enough to towns for you to shop at a grocery store for the menu items you need. If that isn't possible, two other ways to resupply are *trailhead rendezvous* and *mail drops.*

Whichever of these two methods you choose, gather and pack supplies for the entire trek before you leave home. Use sturdy cardboard boxes reinforced with strong tape. Line the interior of each box with a large plastic trash bag and stow your provisions inside. Don't seal the box until absolutely necessary. That way you or your support crew can add last-minute items.

Trailhead Rendezvous

Unless your trek takes you into the heart of a huge wilderness area, you probably will cross roads now and then where you can arrange to meet up with leaders of your Scout unit or other reliable adults. They can bring the food and stove fuel you need for the next leg of your journey.

Mail Drop

Mail drops are particularly effective when you hike a long trail far from home. Research the route ahead of time and find post offices to which you can send parcels to yourself. (Ask a postmaster to explain the packing and mailing regulations you should follow.) You also can contact park and forest rangers who might know of addresses within parks to which you can mail your provisions.

Time the shipment of mail drops so that your boxes will have plenty of time to arrive, then schedule your pickups for hours you are certain the post offices will be open. Keep in mind that most are closed on Saturday afternoons, Sundays, and holidays, and those in remote areas also might have limited hours during the week. When you're hungry, tired, and eager to get into your next box of food, there's nothing more frustrating than reaching a post office just after it has closed for the weekend.

Few adventures can compare to the experience of Philmont Scout Ranch in northern New Mexico. Older Scouts and Venturers can backpack or ride horses over Philmont's 137,000 acres of rugged, mountainous terrain and enjoy a variety of exciting programs in backcountry camps.

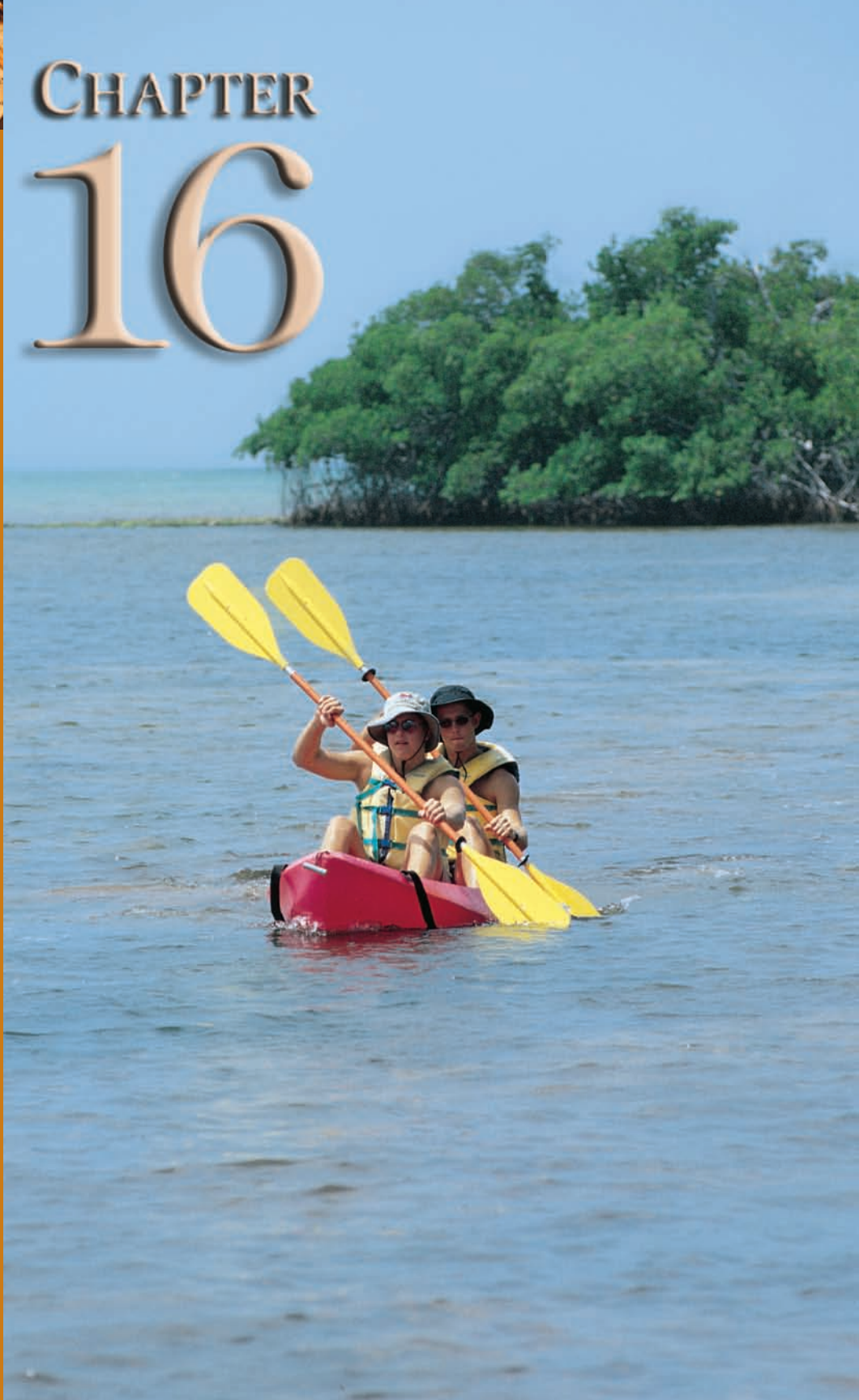
A Final Word on Backpacking

Regardless of your destination, the real joy of any adventure is the journey itself. Allow yourself plenty of time to delight in every aspect of a trip. Don't be in such a hurry that you can't stop to watch the wildlife, study the flowers, and take in the beauty of the landscape through which you are passing.

"What do you suppose will satisfy the soul, except to walk free and own no superior?"

—Walt Whitman (1819–1892),
American author and poet

Chapter 16



Watercraft Adventure Safety

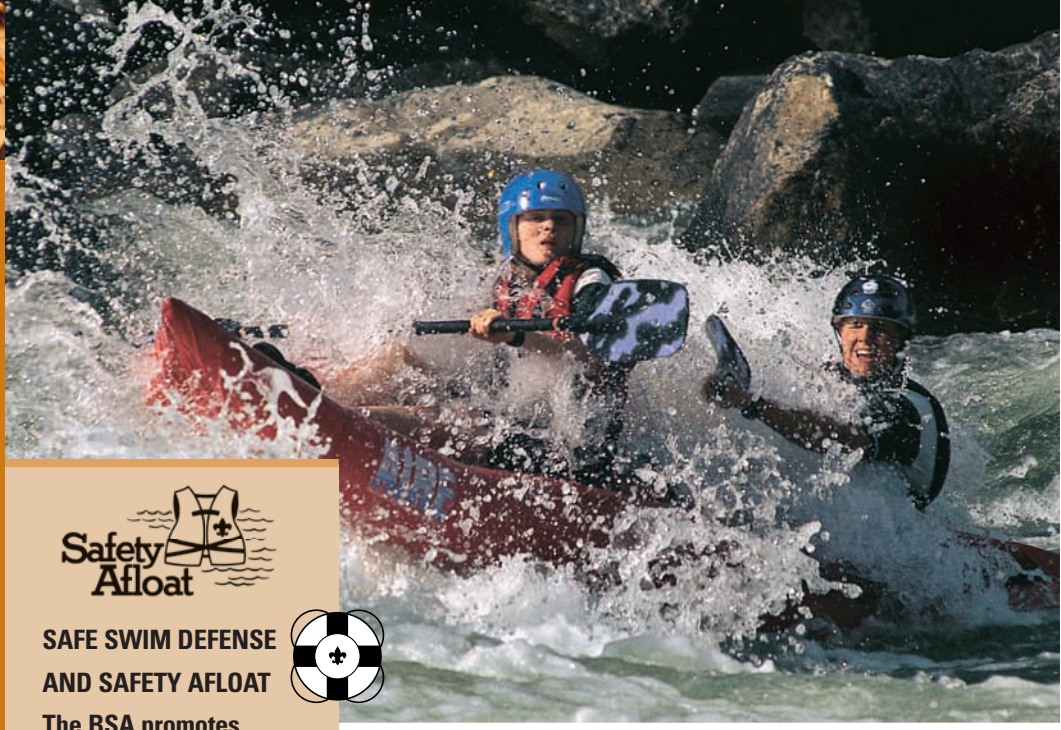
"Boat smart from the start. Wear your life jacket."

—North American Safe Boating Campaign slogan

Rivers and their environments are always changing. Water levels, current speeds, temperatures, and the presence or absence of obstacles can vary from one hour to the next. The same is true of open water where, in a matter of minutes, wind can transform mirror-smooth lakes and salt water into maelstroms. That tremendous variety brings with it magnificent opportunities for setting out in human-powered watercraft to enjoy streams, rivers, lakes, and the sea. With those opportunities comes the responsibility to do all you can to maximize your safety and that of the people around you.

Some concerns are easy to address. You're likely to get wet. You will often be out in the sun. You might get thirsty and hungry. Having the Outdoor Essentials with you (and knowing how to use them) will allow you to deal with those situations in the same ways on water as you would on land. (For more on the Outdoor Essentials, see the chapter titled "Gearing Up.")

Water also carries with it the potential of more serious danger. Conditions ideal for hypothermia lurk in the chill of rivers, lakes, and oceans. Possibilities of impact injuries hide against boulders in a rapids and at the foot of cliffs pounded by the surf. Every year, several hundred Americans drown, many while taking part in watercraft activities. From the quietest pond to the roughest sea, managing risks begins by following the guidelines of the Boy Scouts of America's Safe Swim Defense plan and those of Safety Afloat.



Safety Afloat

SAFE SWIM DEFENSE AND SAFETY AFLOAT

The BSA promotes safety on the water through the guidelines of Safe Swim Defense for people involved in swimming activities, and of Safety Afloat for those setting out on watercraft. Reviewing these guidelines and then adhering to them while on the water are important steps for anyone taking part in aquatic activities.

For links to the full texts of the BSA's Safe Swim Defense and Safety Afloat, see the *Fieldbook* Web site.

Watercraft Adventure Safety Equipment

Personal Flotation Device

People participating in watercraft adventures will, from time to time, find themselves in the water. If that happens to you, a personal flotation device (PFD) will keep you afloat.

Properly fitted U.S. Coast Guard–approved PFDs must be worn by all persons engaged in activity on the open water (rowing, canoeing, sailing, boardsailing, motorboating, waterskiing, rafting, tubing, and kayaking). Type II and Type III PFDs are recommended; Type III PFDs can be more comfortable for persons involved in strenuous watercraft activities.

Wear a PFD *all the time* while in watercraft, and while scouting rapids, loading gear, or lining a watercraft from shore (holding ropes attached to a watercraft that is allowed to float).

A personal flotation device is lifesaving equipment deserving of good treatment. Never sit on a PFD or leave it lying around in camp. Secure it when you have come ashore so that wind cannot carry it into the water. At the end of a trip, allow each PFD to dry, and hang it in a sheltered storage area.

Emergency Whistle and Rescue Knife

Since you will be wearing your PFD at all times, emergency items attached to it will be close at hand if you need them:

- Clipped to a loop on the PFD, a loud, sturdy whistle can be used if you must signal your position. (Don't attach the whistle to a PFD's zipper; currents pulling on a whistle might loosen the zipper and cause you to lose your PFD.)
- Advanced watercraft adventurers often attach a sheathed rescue knife to their PFDs. The knife must be sharp and used only for emergencies—cutting free a tangle of lines, for example.

Testing the Fit of a PFD

Never set out on a watercraft unless you are wearing a personal flotation device that fits well. To see if a PFD fits well enough to use, put it on and cinch any adjustments until it is tight but comfortable. Kneel down and stretch your arms overhead. Have a buddy grasp the PFD at the shoulders or by the shoulder straps and try to tug it up over your head. If the PFD slips upward very far, it is poorly fitted or simply too large for you. A PFD that can be pulled out of position while you are on dry land will slip even more readily if you are being tossed about by currents, white water, or waves.

Double bowline on a bight

Boats and Ropes

Ropes are a necessity around watercraft, but every line on a canoe, raft, kayak, or sailboat must be there for a reason. It should be of the correct length and must be stowed so that it is readily available but will not become an entrapment hazard if the boat capsizes. The ideal choice for line used with boats is floating polypropylene rope, soft laid, in diameters of 3/8 inch, 5/16 inch, or 7/16 inch.

For more on stowing ropes, see the chapters titled "Canoeing," "Kayaking and Rafting," and "Sailing."

Clothing for Canoeing, Kayaking, Rafting, and Sailing

The clothing you choose for watercraft adventures should be quick-drying and should help you stay warm even when the fabric is wet (and it *will* become wet)—in other words, layers of nylon, fleece, and wool. Choose clothing based on the temperature of the water rather than the temperature of the air, keeping in mind that bodies of water often are much colder than the air above them. Cotton clothing should be avoided altogether because it provides no insulation when it is wet, even in midsummer heat. Hypothermia can be a serious danger, and wet cotton is no defense.

Rain gear and spare clothes are a must, even on short watercraft trips. Stow extra clothing in a waterproof bag or a watertight compartment so that it will stay dry even if your boat capsizes.

For more on selecting outdoor clothing, see the chapter titled "Gearing Up."

Watercraft Footwear

The shoes you wear while boating should provide traction and comfort, especially while you are moving about on shore, along portage trails, and on the sometimes-slippery decks of sailboats, or when you are wading as you load and launch canoes, kayaks, and rafts. Shoes also should protect your feet from the sun and from insect bites as well as from glass, thorns, fishhooks, sharp stones, and other unpleasantries underfoot. A pair of old tennis shoes or running shoes can be just right.

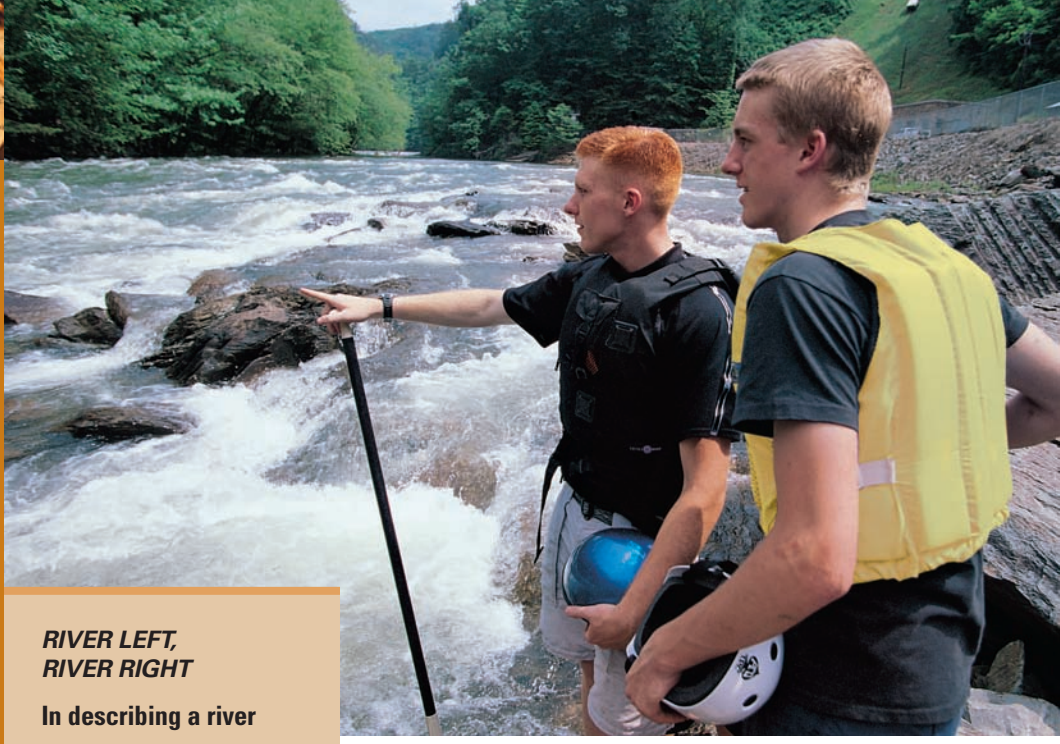
Shorty wet suit *Dry suit*

Wet Suits and Dry Suits

Cold water poses a real danger for kayakers, rafters, and canoeists, especially when they are likely to capsize or to be soaked by waves, rapids, and spray. Wet suits and dry suits provide maximum protection and make possible watercraft adventures in conditions conducive to hypothermia.

- A *wet suit* traps a layer of water next to the skin where it can be warmed by body heat. Among the most popular styles is the sleeveless "Farmer John" two-piece wet suit with overalls and a jacket.
- A *dry suit* serves as a barrier that keeps water away from the skin. It does not insulate; a boater wears fleece insulating layers under a dry suit. Dry suits must be protected from abrasion and tears that could cause leakage.
- Neoprene booties and paddling gloves can extend the coverage of wet suits and dry suits to include boaters' feet and hands.

Neoprene booties and paddling gloves



RIVER LEFT, RIVER RIGHT

In describing a river and its features, boaters refer to *river left* (the left side of the river as one faces downstream) and *river right* (the river's right side, as seen from upstream).

Characteristics of Rivers

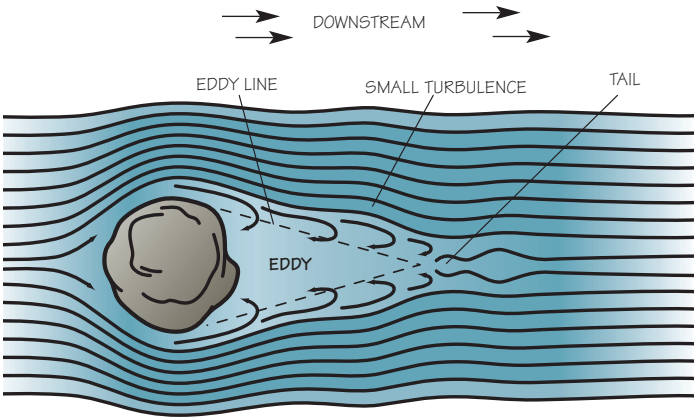
The power of a river can be astounding, especially if the current is squeezed between narrow banks. An obstacle such as a boulder will force the water to go around and sometimes over it, causing turbulence downstream where the river becomes whole once more. A series of obstructions can create the standing waves, eddies, and holes that are the sources of delight and of potential danger for whitewater enthusiasts. The key to kayaking, rafting, and canoeing these waters safely lies in understanding the dynamics involved as a river tumbles along, and then managing a boat so that it works with the stream rather than fighting against it.

When in Doubt, Scout

Before running a section of white water, a blind corner, or a potential drop of any sort, land your boat and scout ahead along the shore to ensure that there are no upcoming obstacles that might be beyond your ability to navigate. As a rule of thumb, don't try running any stretch of water that you wouldn't feel confident about swimming.

Scouting ahead also will allow you to pick a route through rough water. Begin by identifying the end of the run, then work your way back upstream. (There's a hole to avoid on the left, for example, and above that is an eddy that will slow the boat and give you a chance to rest, and above that are three rocks to skirt on the right, and to make that happen you'll need to enter the rapids just off the right shoreline.) In this way, a section of river that at first appeared to be an imposing plunge of foam and spray can be broken down into a series of controlled maneuvers.

If you can, walk the shore next to a section of white water so that you can see how it appears up close. Identify alternative routes to use in case the chaos of the rapids overwhelms your route planning midway through a run. Careful inspection of the river also could reveal features and obstacles that you otherwise might not have noticed. In addition to the standing waves that give white water much of its drama, watch for eddies, strainers, heavy hydraulics, and drops.



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

Eddies

A boulder in the water or a stream bank jutting out will absorb the brunt of the river's force on its upstream side. Just downstream, the water swirls back toward the obstruction, forming a quiet pool called an *eddy.* Proficient boaters can slip into eddies to take momentary refuge from the full impact of the current, and they sometimes run a rapids by moving from eddy to eddy rather than racing the full length of the wild water in a single dash.

Strainers

Strainers are among the most hazardous river obstacles. A *strainer* is created when a tree leans over the water with its trunk or some of its branches submerged, or when the current flows through a fence, logjam, junked automobile, industrial debris, or other obstacles in the stream. Water can flow under, around, and through a strainer, but it will snare and trap

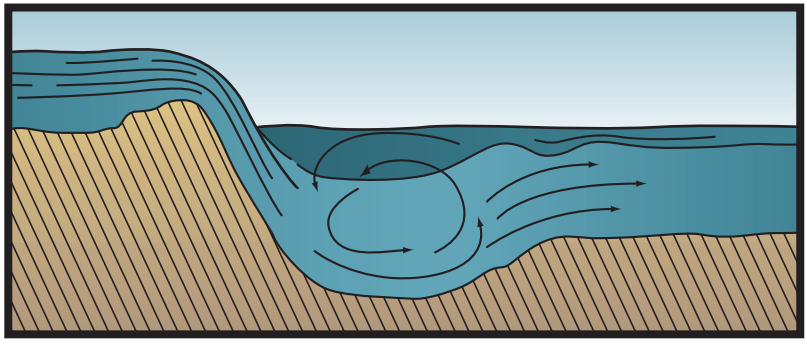
A strainer can be caused by low-hanging tree branches.

anything or anyone the current draws in. Cracks in rocks also can act as strainers, allowing water to pass but trapping unwary paddlers.

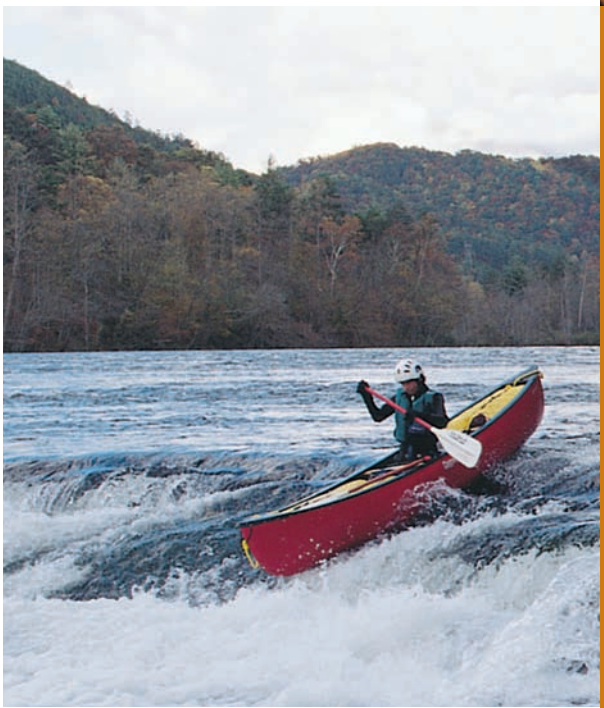
When you see a strainer up ahead, plot a route that will keep you far away, a maneuver that might involve leaving the stream's main current. If that's not possible, paddle ashore and carry your boat, or *portage,* around to safer water farther downstream.

Heavy Hydraulics

The standing waves, whirlpools, and holes that make up the *heavy hydraulics* of white water can be a paradise for rafters, kayakers, and canoeists playing out the best of their sport. The key to enjoying hydraulics is to take on stretches of water that are within your level of skill and your degree of preparation.



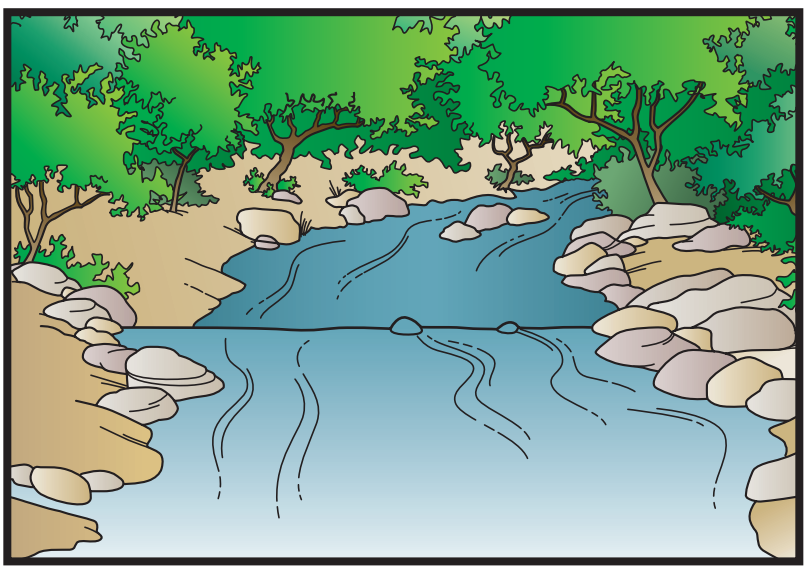
Currents moving over and around boulders form the heavy hydraulics typical of white water.



Drops

The *drops* that occur when a stream goes over a ledge or a dam might seem like obvious dangers, but even experienced boaters can be surprised by them if they haven't scouted their routes. As with strainers, changing water levels might expose drops that were not present even a few hours before.

Drops no more than a few feet high can force a river into a spinning reversal of current that could be all but inescapable for boaters who wander into it. An unbroken horizontal line on the water (an almost certain sign of an upcoming drop) should be a shrill warning to get ashore, scout ahead, discover its cause, and plan the portage around it.



A horizontal line on the water is a warning of a dangerous drop ahead.

Broaching and Wrapping

Broaching happens when a strong current traps a raft, kayak, or canoe against the upstream side of a boulder or other river obstacle. If a broached boat capsizes, tons of pressure from the river's current can literally *wrap* it around an obstacle.

Make every effort to keep your craft far from anything upon which it could broach. If despite your best efforts you cannot avoid crashing into a boulder, logjam, strainer, or other obstruction, lean into the obstacle to help prevent your craft from being flipped over. Try to get past the barrier by pushing the boat around one side or the other. Failing that, climb as high as you can and await the assistance of rescuers using throw ropes. Never lean upstream—that can cause the boat to tip far enough into the current to be flooded and wrapped.

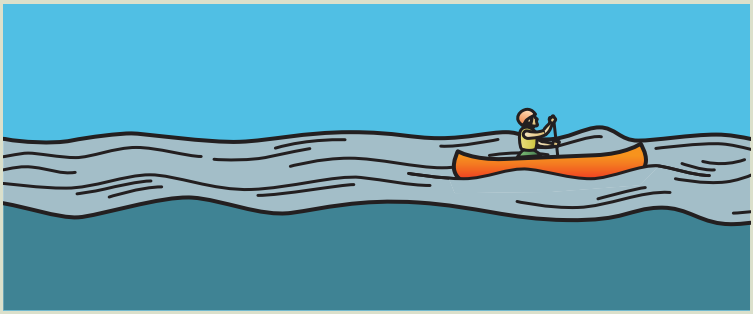
Rating the Difficulty of Rivers

The International Scale of River Difficulty provides a standard classification system for rating the difficulty and gauging the risks of running rapids. The scale is at best a rough estimate; it will vary depending on who does the evaluation, when the rating applies (during spring runoff, summer low water, etc.), and the condition of the stream. Bank erosion, fallen trees, flooding, and other factors can significantly affect the difficulty of a particular stretch of river. (Increase each rating by one class if the temperature of the water or the air is below 50 degrees Fahrenheit, or if your trip is an extended trek in a wilderness area.)

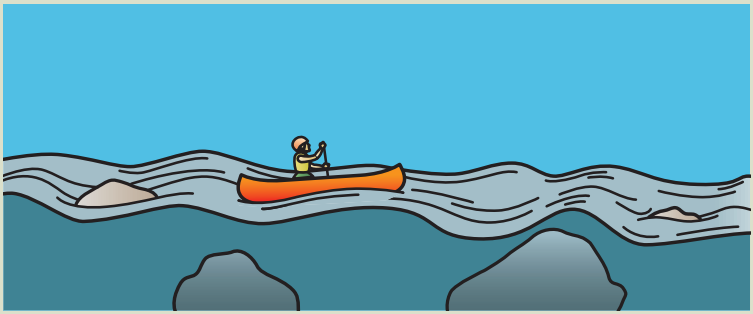
Use the scale to help decide whether to embark on a section of a river. Remember, though, that the scale is useful only if you understand your own capabilities and limitations, and those of others who will participate in a watercraft outing. The most important rating still will be the one you base on your firsthand observations.

International Scale of River Difficulty

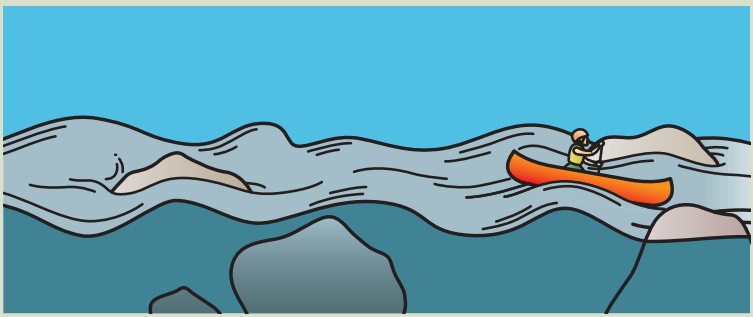
The International Scale of River Difficulty distinguishes six classes of difficulty:



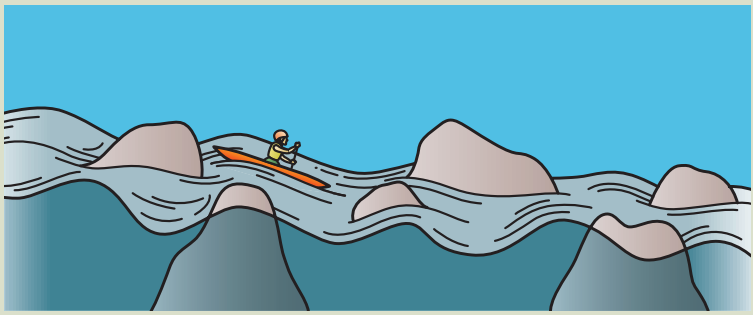
Class I. Moving water with a few riffles and small waves. Few or no obstructions.



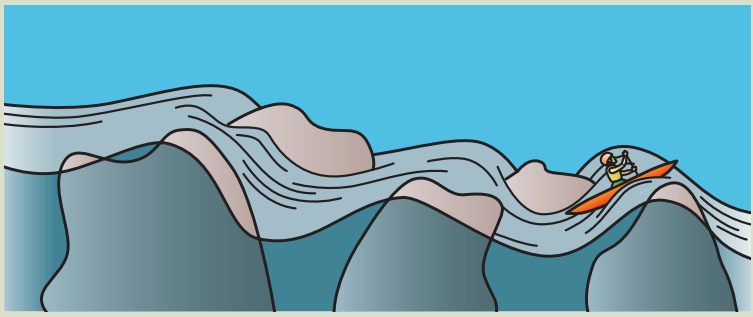
Class II. Easy rapids with waves up to 3 feet, and wide, clear channels that are obvious without scouting from shore. Some maneuvering required.



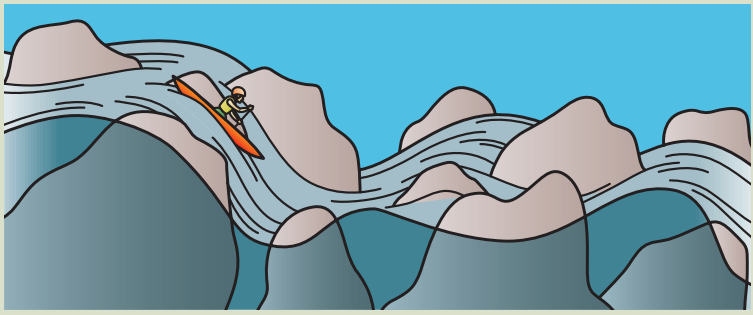
Class III. Rapids with high, irregular waves capable of swamping an open canoe. Narrow passages that often require complex maneuvering. Might require scouting from shore.



Class IV. Long, difficult rapids with constricted passages that often require precise maneuvering in very turbulent waters. Scouting from shore is often necessary, and rescue could be 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. The ability to Eskimo-roll kayaks is essential.



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

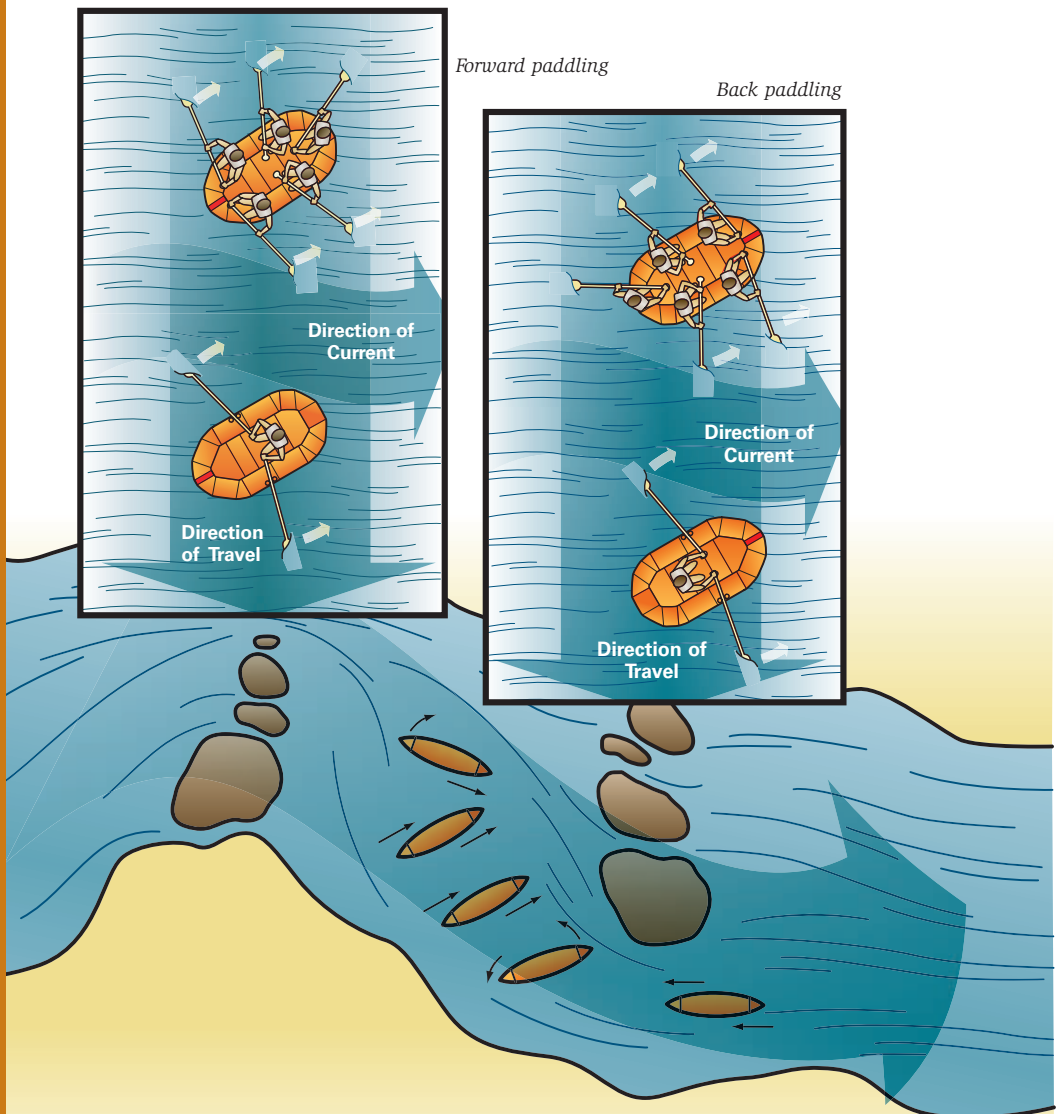
River Runner Signals

River runners scouting a river downstream from their fellow boaters or going first on a stretch of water can use signals to let those behind them know important information about what awaits them. Before beginning a day on a river, a group should agree upon the signals they will use and then practice them so that there will be no confusion later on.

Ferrying

Much of the maneuvering employed by river canoeists, kayakers, and rafters involves *ferrying*—moving a boat laterally as those at the paddles or oars seek out optimum routes. Here's how ferrying works:

A craft going straight down a river generally will hold that course. If you turn the boat at an angle to the current and paddle against the flow, however, the boat will begin to move across the current. Boaters can row or paddle to maintain the correct ferrying angle and to move more quickly toward different portions of the stream. Ferrying can be used to position a boat to miss an upcoming obstacle, to tuck into an inviting eddy, or to catch a tongue of smooth water for a fast, easy ride through the rapids. There are many fine points to the art of ferrying, some applying to all kinds of boats, others specific only to kayaks or canoes or rafts.



Watercraft Emergency Procedures

Every kayaker, rafter, and canoeist capsizes now and then. Whenever that happens, the safety of people comes first. You can always retrieve watercraft and equipment after everyone has been brought ashore. Arranging for competent leaders trained in coping with watercraft emergencies is an important preparation for groups setting out on trips into challenging waters.

(Dinghies and other sailboats also can capsize. For additional guidelines on what to do when that happens, see the chapter titled "Sailing.")

THINGS CAN BE REPLACED; YOU CAN'T

Life is more valuable than gear. **Regardless of what happens to boats and equipment, always focus your efforts on ensuring the safety of yourself and everyone else.**

When You Capsize

When you do capsize, follow these steps:

1. If you can, stay in your righted boat even though it is flooded. The hull of the craft can protect you from banging into obstacles, and you might be able to paddle to shallow water. (Experienced kayakers often right their craft using an Eskimo roll.) Whitewater canoeists may be able to right the canoe in less turbulent water.

2. If you have been tossed into the water, hang onto your boat. It will stay afloat, and it will be easy for rescuers to spot. Quickly work your way to the upstream end of the craft to shield yourself from being slammed or pinned against upcoming obstacles.

3. In the following situations, swim aggressively for shore:

   a. You have been thrown clear of your boat.

   b. The water is very cold.

   c. You are approaching worsening rapids.

   d. No rescue is imminent.

4. If you must ride out a rapids before swimming to safety or catching a rescue line, go downstream feetfirst with your legs acting as shock absorbers to fend off rocks. Use a backstroke to maneuver past obstacles, and watch for eddies that might protect you.

5. Do not stand up in swift-moving water. You risk foot entrapment in the rocks on the river bottom, which could pull you under.

6. When rescuers are trying to assist you, do all you can to help them help you.

Using a Throw Rope

A rescue line, or *throw rope,* is floating rope 60 to 70 feet in length. When stuffed into a *throw bag,* the rope will pay out neatly when the bag is tossed. Whether in a throw bag or coiled, a throw rope should be secured to the floor of your canoe, kayak, or raft in such a way that in case of an upset it cannot ensnare people in the water or snag on obstacles and trap the boat.

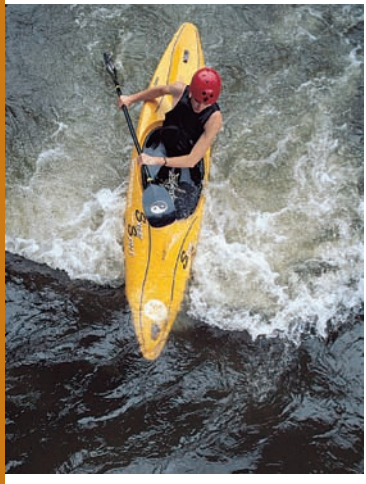
In rapids where upsets are likely, station people with throw ropes on shore or in boats at the end of the section of rough water. If a boat capsizes, follow these steps:

1. Get the attention of people in the water by yelling or blowing your emergency whistle.
2. Grasp the free end of the throw rope and toss the throw bag or the coiled rope directly at the boater in the water. If you miss, coil the rope and try another throw.
3. Pull in the line to bring the person to safety, but take great care not to be pulled into the water or otherwise get yourself into a situation where you must be rescued, too. Walking along the shore as you haul in line might help the person you are rescuing cope with the current.

Advanced techniques of watercraft rescue require practice and qualified instruction. Find out about good training courses by checking with your BSA local council service center and with organizations such as the American Red Cross, American Whitewater Association, and American Canoe Association. (Links to boating organizations and to other information about rescue on the water can be found on the *Fieldbook* Web site.)

Characteristics of Open Water

Boaters on large lakes and salt water will encounter many of the same safety challenges as do kayakers, rafters, and canoeists on rivers. Additional concerns include navigating, encountering marine traffic, and changes in the weather while a group is afloat.



Sea kayakers who have spray skirts to keep rain out of their boats and rain gear to keep themselves dry might not be discouraged by wet weather as long as the water remains calm and the visibility good. Making headway into the wind can be difficult, however, rain or shine. Wind also can pile up waves, increasing the challenge of getting anywhere. Kayakers and open-water canoeists might find that their best course of action in foul weather is to get ashore and wait until the wind dies down or changes direction.

Tides can be the friend or foe of sea kayakers, sailors, and canoeists. In regions such as Puget Sound or the coast of Maine with many small islands and inlets, an incoming tide creates strong currents through channels and passes. Six hours later, the outgoing tide forms currents of equal power running in the opposite direction. Boaters can time their saltwater travels to use those currents, knowing full well it can be all but fruitless to paddle against the tide.

Local forecasts often are available from commercial radio and television stations. Weather information also is provided by the National Oceanic and Atmospheric Administration over AM/FM radios with a weather frequency, and via VHF marine weather and distress radios.

For more on weather, see the chapter titled "Monitoring Weather." For more on open-water concerns, see the chapters titled "Canoeing," "Kayaking and Rafting," and "Sailing."

"Swift or smooth, broad as the Hudson or narrow enough to scrape your gunwales, every river is a world of its own, unique in pattern and personality. Each mile on a river will take you further from home than a hundred miles on a road."

—Bob Marshall, wilderness advocate, mountain traveler, and principal founder of the Wilderness Society

Chapter 17

Canoeing

"The movement of a canoe is like a reed in the wind. Silence is part of it, and the sounds of lapping water, bird songs, and wind in the trees. It is part of the medium through which it floats, the sky, the water, the shores . . . ."

—Sigurd Olsen, *The Singing Wilderness,* 1956 (A naturalist, backcountry traveler, and one of the founding fathers of the Boundary Waters Canoe Area, Olsen received the 1974 John Burroughs Medal, the highest honor in nature writing.)

Perhaps it would be best to discourage you from paddling away in a canoe. Maybe you should be warned not to stow your camping gear beneath its gunwales and aim its bow toward territory you've never seen before. It might be a good idea to discourage you from ever taking a whitewater canoe into the rapids of a wild river. If you don't want to become hooked, stay away from canoes, because once you dip a paddle in the water, your life will change.

Canoeing has been part of the Scouting experience since the earliest days of the Boy Scouts of America. Materials used to build canoes have changed, and so has the world in which people paddle them. The basic skills of canoeing are the same as they have always been, though, and the joy of canoeing is as strong today as ever.

So turn your bow toward open territory. Push off from shore and you could be setting out on a lifelong journey of canoeing adventures that will take you farther, show you more, and bring you a greater abundance of joy than almost any other means of outdoor travel.

"A fine canoe is never the result of chance."

—J. Henry Rushton, 19th-century canoe builder

SAFETY ESSENTIALS FOR CANOEING

For a discussion of safety issues that apply to canoeists, see the chapter titled "Watercraft Adventure Safety."

Canoes

The classic birch-bark canoe is one of our continent's great technological and artistic achievements. American Indians of the northeastern woodlands long ago perfected the art of using split roots to stitch birch bark over wooden frames, then sealing the stitch holes and seams with tree pitch. The results were swift, elegant watercraft ideal for maneuvering on rivers and lakes and for hauling heavy loads. If bark canoes were damaged by rocks or snags, paddlers could find repair materials as close as the next birch tree on shore.

Modern canoes bear a striking resemblance to the design of their birch-bark ancestors, although the materials from which they are made have changed dramatically. By the late 1800s birch-bark canoes were being replaced by canoes made of thin strips of wood carefully fitted together, or of canvas laid over wooden frames and stiffened with lacquer. Aluminum canoes appeared in large numbers after World War II when several aircraft manufacturers retrofitted their production lines to build canoes from metal. Today aluminum is giving way to specialized fabrics, epoxy, vinyl, and resin forming solo and tandem canoes designed for activities ranging from quiet journeys on gentle waters to long-distance wilderness expeditions and runs through the rapids of whitewater rivers.

The canoes you learn to paddle are likely to be whatever boats are handy—the aluminum fleet at a camp or high-adventure base, the canoes of a local watercraft organization, boats available to your family or neighbors. As you move beyond the basics, you might want to find a canoe of a size, material, and design that better matches your activities on the water. Solo canoes, tandems, and canoes outfitted for white water are just a few of the options from which to choose. Don't let a lack of options hold you back,

though. Every canoe floats, and any adventure on the water is better than not going at all. Settle into the best boat you can find, and the rest of the journey will fall into place.

Types of Canoes

Aluminum canoes are durable and relatively inexpensive, factors that make them common at many summer camps. They can be noisy on the water, are often less sophisticated in shape and design than canoes made of other materials, and can get hung up on rocks in shallow passages, but they withstand hard use and are the only canoes that can be stored outdoors for long periods without suffering damage from weather or ultraviolet light.

Fiberglass canoes also are sturdy, but vary widely in weight, quality, and price. Fiberglass can be molded into hull shapes that make good flatwater canoes.

Royalex® canoes are made of *acrylonitrile butadiene styrene,* a material with a strength and flexibility beyond that of aluminum, fiberglass, or polyethylene. These canoes are the choice of many experienced paddlers for running rapids and embarking on extended expeditions. A Royalex® canoe will slide over rocks just beneath the surface of the water without damaging the hull of the canoe.

Polyethylene canoes are tough, economical, and reliable. They are similar in design to Royalex® canoes, but they are heavier and more difficult to repair.

Kevlar® canoes are constructed with layers of Kevlar®, a material also used to make bulletproof vests. Light and expensive, Kevlar® canoes often are finished with a fiberglass skin that is easy to maintain.

Folding canoes can be disassembled and compressed to a size that will fit in the trunk of a car or the cargo hold of a bush plane. Composed of metal or plastic frames covered with sturdy vinyl fabric, folding canoes can be a good solution when reaching the put-in point is as challenging as the journey itself. Well-built folding canoes are surprisingly sturdy and have considerable grace and maneuverability on the water.

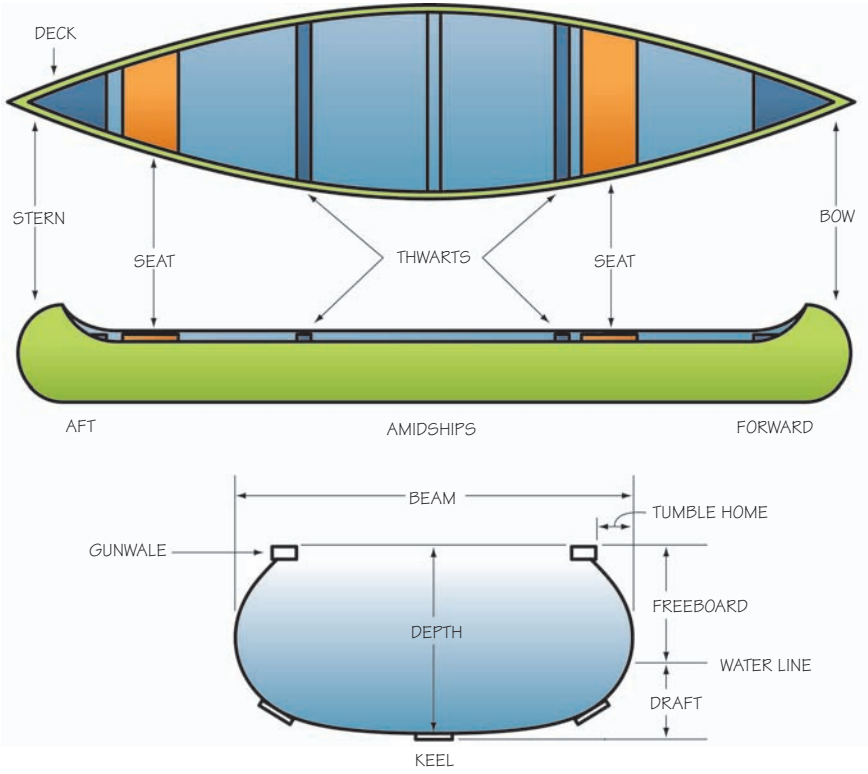
Wood-strip canoes and canvas canoes employing construction methods more than a century old still hold a place in canoeing. Canoes fashioned from strips of cedar sandwiched with fiberglass can be beautiful and capable of high performance. Lacquered canvas over wooden ribs and planks can be challenging for avid watercraft crews to construct and maintain, and a delight to use on the water.

Whitewater Canoes

Long the domain of kayaks and rafts, an increasing number of paddlers are taking on rapids in whitewater canoes built to turn quickly and provide stability through heavy hydraulics. Many whitewater canoes carry flotation bags and have decks—features also found in kayaks. While whitewater canoe designs might vary, the basics of watercraft safety remain the same for any boaters setting out for adventure on rivers and open water.

For more on whitewater considerations, see the chapter titled "Kayaking and Rafting."

Parts of a Canoe



Outfitting Your Canoe

Whether you're setting out for an hour of paddling on a lake, a day of playing in whitewater rapids, or a month of wilderness exploration, your canoe must be outfitted with essentials to propel it and to protect its passengers.

Personal Flotation Device

A personal flotation device (PFD) for each person is as important as any piece of gear you have on the water, perhaps even more vital than the canoe itself. PFDs work only if they are worn and if they fit well. For guidelines on selecting, fitting, and caring for PFDs, see the chapter titled "Watercraft Adventure Safety."

Lines

Any lines on a canoe must float and should be securely stowed when not in use. Those used for tethering gear must be as short as possible so that they cannot become entanglement hazards if the canoe capsizes. *Painters*—lines attached to the bow and stern of a canoe—are helpful for maneuvering the craft through shallow waters and for tying up ashore. Each painter should be half again as long as the canoe to which it is attached.

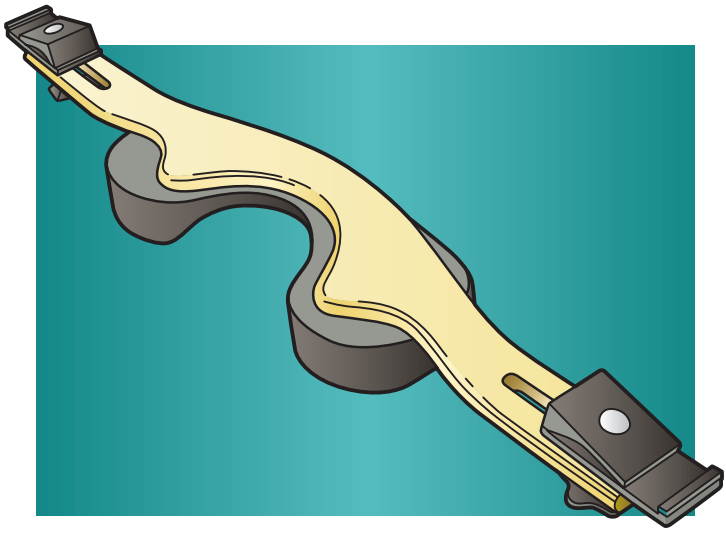
Bailer and Sponge

Canoes are bound to take on some water no matter how calm a lake or stream. A large sponge secured to a thwart with a very short bungee cord is handy for sopping up puddles. You can make a bailer for emptying greater volumes of water from your canoe by cutting a section out of a 1-gallon plastic jug. An ideal way to secure a bailer to a boat is with a plastic buckle. Secure one portion of the buckle to a D-ring cemented to the floor of the boat. Attach the other part of the buckle to the handle of the bailer with no more than an inch or two of slack in the buckle webbing. Clipping the buckle will hold the bailer in the boat when you don't need it, but will keep it readily available for use when you do.

By all means, avoid tying a bailer to your canoe with a long length of cord. A five-cent bailer that snags on submerged rocks can trash a capsized thousand-dollar canoe by anchoring it in a bad spot in the river. Secure bailers—and all other gear—to your canoe with short pieces of line, leaving minimum slack.

Yoke

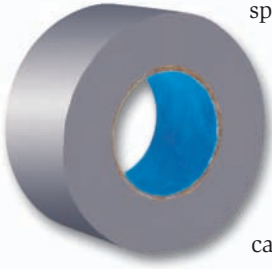
Whether on a long wilderness portage or a short trip down a trail from a road to the edge of a lake, there are going to be times when you carry your canoe. A yoke makes it possible for one person to do that. Some yokes are built into canoes as a center thwart while others can be temporarily clamped to the gunwales. Using a yoke is discussed later in this chapter.



Knee Pads

Knee pads glued into a canoe with contact cement can provide essential comfort during long days of paddling and for strenuous workouts in white water. Pads are commercially available, or can be cut from closed-cell foam sleeping pads.

Duct Tape



Duct tape is handy for everything from repairing torn canoes and splintered paddles to plugging boat leaks and patching the seat of your pants. Stow a roll in your repair kit, or wind some tape around a canoe thwart where it will be handy when you need it. Be sure that the duct tape you carry is waterproof and sturdy enough for watercraft repair.

Paddles

On even the shortest canoe journey, you'll lift your paddle thousands of times, making a lightweight paddle worth plenty. Paddle shape is important, too. Some paddles are noisy in the water, splashing canoeists and providing little propulsion for the effort. Avoid heavy, all-plastic paddles that flex. Other paddles, though, are hydrodynamically gifted, moving through the water as if by magic and giving pleasure with each stroke.

Canoe paddles are made of wood, aluminum, plastic, or combinations of all three. Wooden paddles have a classic look and feel. Shorter blades are best for shallow rivers, while blades that are long and narrow can be quieter and easier to manage, and are ideal for canoeing on lakes. A blade width of seven to eight inches is good for beginners.

The blade of a paddle might be in line with its loom or it might be bent at an angle of up to 15 degrees. Because the paddle remains at a right angle to the surface of the water through most of a forward stroke, a *bent-loom paddle* allows a canoeist to maximize the power of each stroke. Canoeists playing in white water often choose straight-loom paddles for better control.

Sizing a Canoe Paddle

The length of paddle you need depends in large part on the kind of canoeing you will be doing (a solo canoeist might prefer a longer paddle for flat water and a shorter paddle for white water), whether you will be sitting or kneeling in your canoe, and whether the paddle is straight or bent (many bent-loom paddles are sized a little shorter than paddles with straight looms).

To get a general idea of the paddle length that's right for you, take your normal paddling position sitting or kneeling in a floating canoe, then have someone measure the vertical distance from your nose to the surface of the water. That's about the length of the *loom* of your first paddle. Add to that the length of the *blade*—usually another 20 to 25 inches. Lighter paddles are better than heavier ones, if all else is equal. As you gain experience, you will be able to fine-tune paddle size and design to match your needs on the water.

Loading, Launching, and Landing a Canoe

Canoes are creatures of the water. Get them on land or in the transition zone between land and water, and they can be awkward to handle and prone to damage. Before loading and launching a canoe, put on your PFD and shoes that you won't mind getting wet. Team up with another person to lift the canoe by the bow and stern thwarts or decks, then carry it into water deep enough for it to float. Never *bridge* a canoe by resting it on a small section of its bottom or side, and never leave the bow on a dock or the shoreline while the stern is afloat.

A canoe should be in calf-deep water, parallel to the shore as you load it and get aboard. Stow packs, duffels, and dry bags low and close to the middle of the canoe, packing them in tightly and tying them down with short lines so that they will stay in place if the canoe overturns. Hold the craft steady while your partner gets aboard and settled, then place your hands on the gunwales and keep your weight centered and low as you step into the canoe and take your position. Push off and you're on your way.

Land a canoe by reversing the steps of launching. Bring the canoe parallel to the shore and step out of the craft while it is still fully afloat. Stabilize the canoe while your partner disembarks, then remove the paddles and gear before carrying the canoe onto land. Never run the bow of a canoe onto the shore—that's a sure way to cause damage.

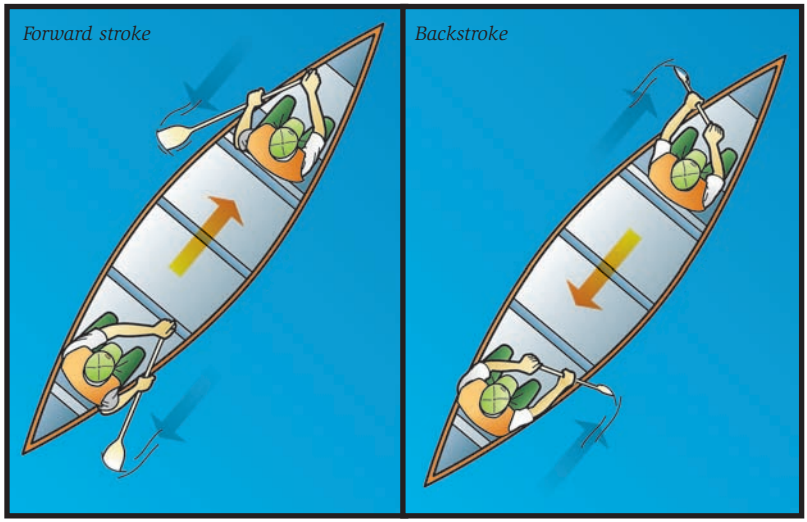
Paddling a Canoe

Good position and body mechanics lead to effective paddling. Whether you canoe with a partner or alone, either kneel in the canoe with your weight against a thwart or the front edge of a seat and your knees wedged against the sides of the craft, or sit solidly on a seat and brace your knees against the gunwales. Think of yourself as a part of the canoe, locked in place. Maintain a smooth rhythm with your paddle, keeping your strokes steady and light. Use your arms to guide your paddle, but power the strokes with the larger muscle groups of your abdomen, shoulders, and back. To maintain a steady pace over long distances, practice the *forward stroke, J-stroke, solo-C stroke,* and *hit-and-switch (Minnesota switch).* To maneuver through currents, eddies, and white water, become familiar with the *backstroke, drawstroke,* and *pry.*

Forward Stroke and Backstroke

Bow paddlers, stern paddlers, and solo canoeists all can use the *forward stroke.* Hold the paddle by the grip and loom, your hands about shoulder-width apart, and twist your torso to move the paddle forward. Keeping your grip hand over the gunwale and lower than the top of your head, submerge the paddle blade, then use the muscles of your abdomen and back to pull the canoe ahead of the paddle. The sensation should be that the paddle remains stationary in the water while the canoe moves to it and then beyond. As it comes out of the water, flip the blade sideways, or *feather* it, so that it will cut through the wind as you swing the paddle ahead to begin the next stroke. Tandem paddlers can synchronize their strokes on opposite sides to keep a canoe running true.

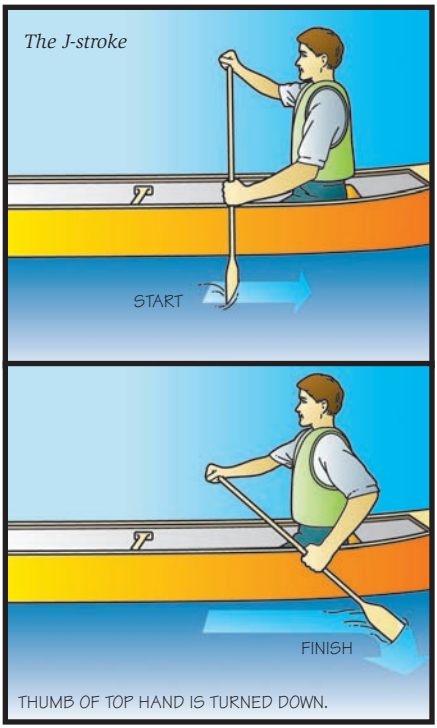
Stop a canoe's forward progress and move it backward by using the *backstroke.* Place the paddle blade in the water near your hip at a right angle to the water. Push forward until paddle comes out of the water. Feather it back to the starting point and repeat the stroke.



J-Stroke

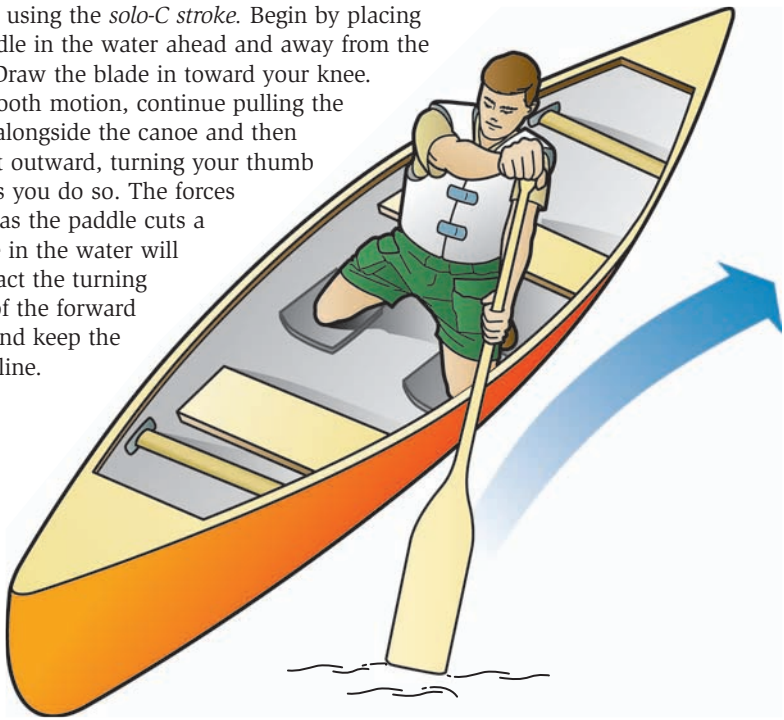
The forward strokes of a paddler in the stern of a canoe will have more effect on the direction a canoe travels than will those of a paddler in the bow, causing the craft to turn away from the strokes of the stern paddler. One way to counteract that mechanical advantage is for the paddler in the stern to use a *J-stroke.*

Begin this stroke as you would a forward stroke. When you have pulled the paddle past your hip, rotate your grip hand so that your thumb rolls down and the paddle blade is vertical. Push the paddle *away from the canoe.* Seen from above, the stroke forms the shape of the letter J, the hook in the J forming as you push the paddle away from the canoe to correct its course.



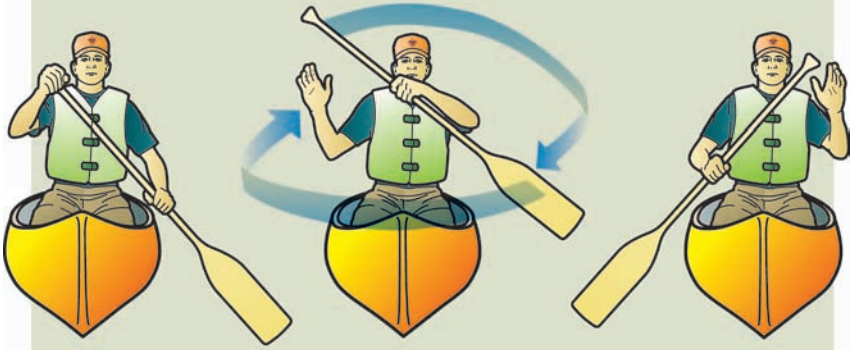
Solo-C Stroke

A solo paddler kneeling in the center of a canoe can steer by using the *solo-C stroke.* Begin by placing the paddle in the water ahead and away from the canoe. Draw the blade in toward your knee. In a smooth motion, continue pulling the paddle alongside the canoe and then sweep it outward, turning your thumb down as you do so. The forces created as the paddle cuts a C shape in the water will counteract the turning power of the forward stroke and keep the craft in line.



Hit-and-Switch (Minnesota Switch)

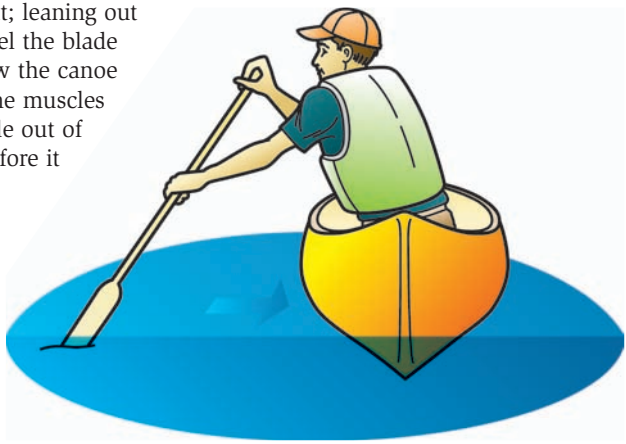
An effective means of maintaining a canoe's bearing is by using a forward stroke and switching your paddle from one side of the craft to the other after every few strokes. In a tandem canoe, the stern paddler calls out, "Hut!" to let the paddler in the bow know they will make the switch before the next stroke so that they always have one paddle on each side of their boat, a technique known as the *hit-and-switch* or *Minnesota switch.* A solo paddler can make the switch whenever the canoe's heading begins to drift. Unlike other forward strokes, paddles are not feathered during these switches.



This means of paddling works well on flat water and when traveling into the wind. Accomplished canoe racers can hit and switch without missing a beat, maintaining a paddling rate of 60 to 70 strokes a minute. The hit-and-switch is not appropriate for white water, though, since during changeovers it leaves canoeists without the stability of paddles in the water serving as braces.

Drawstroke

A *drawstroke* will move your canoe sideways toward the paddle. Keeping the paddle loom vertical and the blade facing the canoe, place the blade into the water. (Keep your center of balance over the center line of your boat; leaning out can capsize the canoe.) Feel the blade stick in the water and draw the canoe toward the paddle using the muscles of your torso. Slip the blade out of the water sideways just before it touches the canoe.



Pry

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

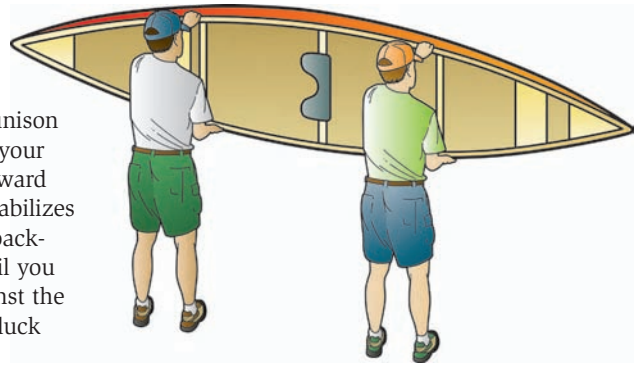
Draw and Pry Combinations

When paddling tandem, draws and prys can be used to move the canoe sideways or spin it in place. If the bow paddler does a draw while the stern paddler does a pry, the canoe will move sideways toward the side of the bow paddle. To move in the opposite direction, reverse the strokes—a pry in the bow and a draw in the stern. To change direction from a stop, you can pivot or spin the canoe in place by both paddlers doing a draw at the same time. To spin in the other direction, both do a pry.

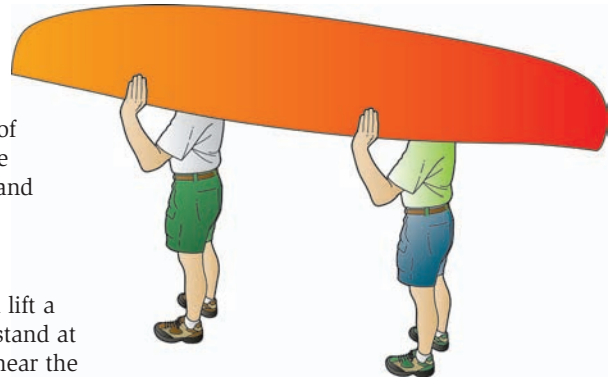
Portaging

Canoes are best carried over long distances by one person, though hoisting overhead for a carry is often better done by a team of two.

Two-Person Portage Lift

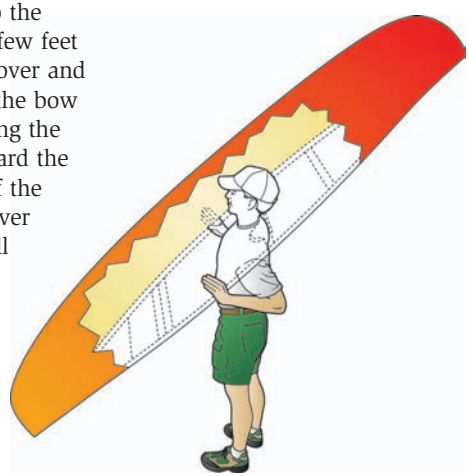


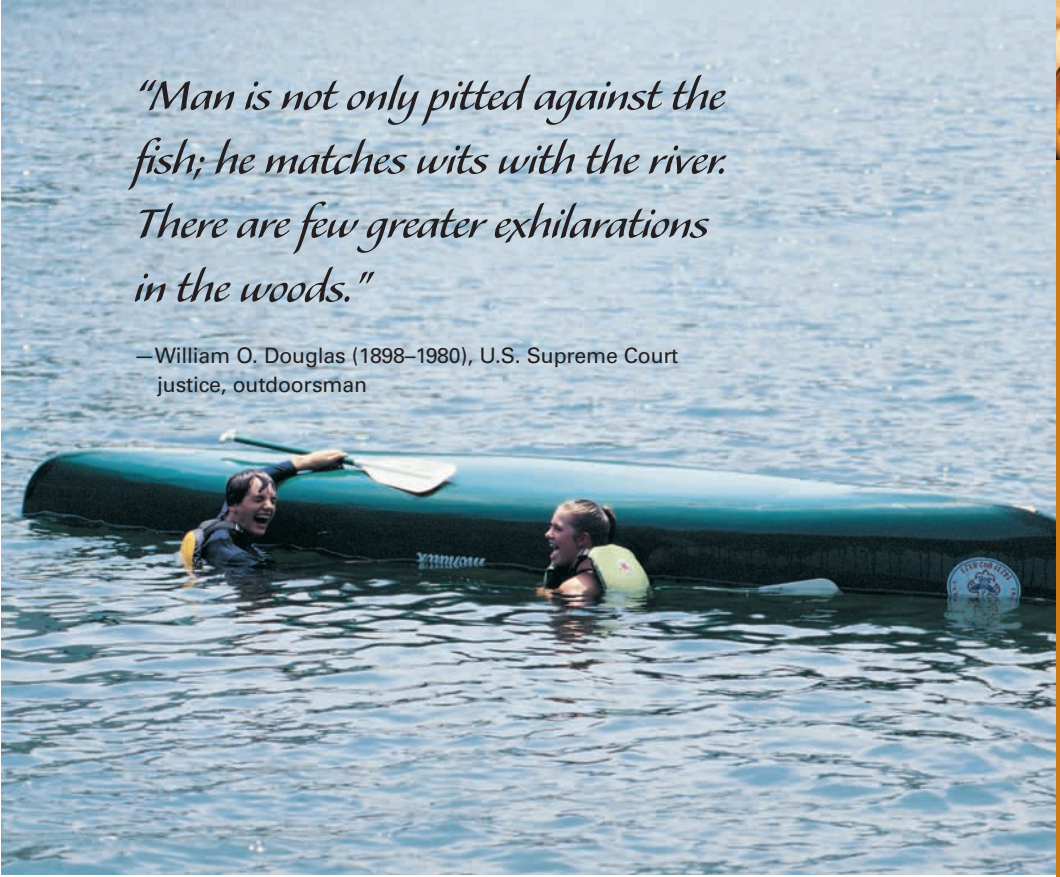
Position yourself near the bow of the canoe, your partner near the stern. Reach across the canoe and grasp the gunwales, then in unison lift the canoe and flip it over your heads, turning yourselves forward as you do. As your partner stabilizes the canoe, walk your hands backward along the gunwales until you can tuck your shoulders against the yoke. Your partner is free to duck out from under the canoe, and you are ready to begin a portage. Your partner leads the way as you walk, alerting you to obstacles or turns in the trail. If you tire before the end of the portage, lean the bow of the canoe into the crotch of a tree and rest the stern on the ground.



One-Person Portage Lift

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





Canoe Safety and Rescue

Safety is the most important word in canoeing. Every water sport has its hazards, but if you are aware of the dangers and are prepared to manage common risks, you can enjoy a lifetime of canoeing adventures without serious mishap.

For starters, you should be a good swimmer. Training in lifesaving will give you added confidence. While you are on the water, wear a PFD. Stay within shouting distance of other canoes in your party, and be aware of weather and water conditions. When paddling on lakes, keeping near a shoreline will allow you to get ashore quickly if a storm is brewing or if the wind whips up waves that make you uneasy.

On rivers, tie up your canoe and scout ahead on foot if the water downstream is rough or you have any suspicion that there might be snags, rapids, or drops. Before running a rapids, gather all the canoes in your group and plan not only how to navigate the stretch of white water, but also how to support one another should a canoe overturn. Precautions might include stationing people with throw ropes at the end of a rapids. If in doubt about the wisdom of paddling through any stretch of water, portage around it.

For more on canoeing safely and using throw ropes, see the chapter titled "Watercraft Adventure Safety." The BSA's Safe Swim Defense plan and Safety Afloat provide guidelines for appropriate ways to conduct activities in and on the water. For the full text of these publications, see the *Fieldbook* Web site.

Rescues

A canoe will stay afloat even if it is full of water. Usually your best bet after capsizing, especially on a quiet lake or stream, is to stay with the canoe. Rocking it back and forth might slosh much of the water from your craft. Climb back in, sit on the bottom, and use your hands or a paddle to propel yourself to shore.

If there are other paddlers nearby, they can bring their canoes alongside the swamped craft, assist wet canoeists, retrieve floating gear, and help get the waterlogged canoe to shallow water where it can be righted and repacked. (Never tie a line from a capsized canoe to yourself or your watercraft. A swamped canoe is heavy; if the current carries it off, you don't want to be dragged along with it.)

Every canoeist manages now and then to swamp a canoe. Intentionally capsize your craft in calm water and practice various kinds of rescues and recoveries until they become automatic. That way you'll know what to do when you upset accidentally.

Canoe-Over-Canoe Recovery

If paddlers capsize far from shore in a calm lake, a canoe-over-canoe procedure might be in order to empty a swamped canoe.

❶ Come alongside the capsized canoe on the side away from people in the water.

❷ Hold the capsized canoe and direct canoeists in the water to hang onto your canoe near the ends on the side opposite the swamped canoe.

❸ Swing the capsized canoe at a right angle to yours. As you raise the bow, tilt the canoe to let the water drain out. Then lift the canoe and set it on your gunwale.

❹ Ease the canoe across the gunwales of your canoe, scooting it along until it is balanced.

❺ Roll the capsized canoe upright on your canoe's gunwales, then slide it back onto the water.

❻ Hold the emptied canoe alongside yours and stabilize it as its crew climbs back aboard.

Packing for a Canoe Trip

For canoe trips involving overnight camps, you'll need all the gear a backpacker would use. Even though the capacity of a canoe allows you to carry plenty of cargo, pack light and tight. That will make it easier for you to complete portages and can increase the ease of traveling and camping without leaving a trace. Pack as if you are certain your canoe will be capsized, too, even though you hope it won't.

There are many watertight containers on the market for canoeists, rafters, and kayakers, or you can pack all your items into heavy-duty plastic bags. Close each bag with a *gooseneck* by twisting the top and then bending it over and wrapping it with a strong rubber band. Put the bags into packs or duffels lined with larger plastic bags such as trash-can liners and gooseneck those, as well. Stow cameras, binoculars, maps, compasses, lunches, and other items you'll want during the day in neoprene or nylon dry bags that can be rolled closed to keep out moisture. Double-bag anything that must be kept absolutely dry.

Secure each pack, duffel, and bag tightly in your canoe so that nothing can come out if the craft overturns. Put the heaviest gear on the floor of the canoe and lash everything to D-rings cemented to the floor or under the inside of the gunwales. Use short pieces of floating rope for tying in gear and leave no

more than a couple of inches of loose ends beyond the knots. If your canoe does flip over, you want everything in it to stay positioned deep inside the canoe where it will add flotation. Tethered bags that float out of the canoe will, at best, make righting the boat more difficult, and at worst can snag on obstructions in a river or entangle swimming paddlers in tether lines.

Canoe Storage and Care

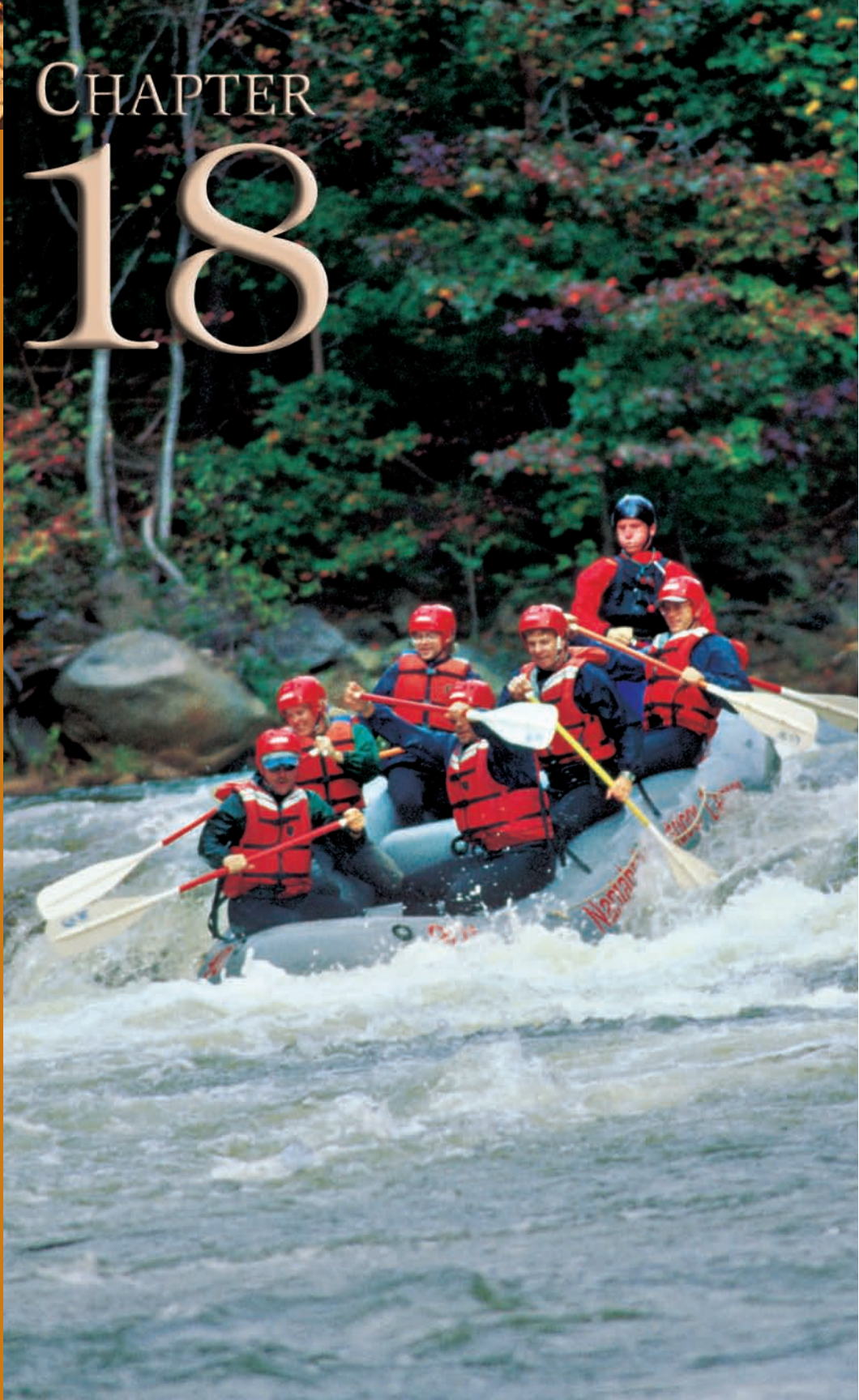
Caring for a canoe between trips will ensure that it will be in top condition when you are ready to put it back on the water.

- Wash a canoe inside and out with fresh water. Check bolts, rivets, and other fasteners, and survey joints for cracks. Repair any damage.
- Regularly treat wood trim with a good marine finish. Several times during the canoeing season, apply an ultraviolet barrier to plastic trim and plastic boats. Follow manufacturers' instructions.
- Store the canoe upside down on a canoe rack or sawhorses.

"The canoe is the simplest, most functional yet aesthetically pleasing object ever created."

—Bill Mason (Canadian author, filmmaker, and canoe enthusiast), *Path of the Paddle,* 1984

Chapter 18



Kayaking and Rafting

"It is calm, the smooth sea heaves in a long swell towards the rocky islets that fringe the shore, a light haze still lies over the sounds between them, and the seabirds floating on the surface seem double their natural size. The kayaks cut their way forward, side by side, making only a silent ripple."

—Fridtjof Nansen, *Eskimo Life,* 1894

Tumbling down mountain valleys, foaming through sandstone canyons, heaving, boiling, and swirling between the walls of narrow gorges, wild rivers were once the bane of travelers. They were to be avoided rather than relished, gone around rather than down. Today, all of that has changed. Kayakers and rafters are discovering that rivers can be fluid pathways into some of the finest unspoiled country anywhere. Many offer the bonus of rapids challenging river runners of every skill level. Sea kayaks are expanding the range of possibilities beyond streams, too, as paddlers explore shorelines, coves, and bays, and set out on extended journeys across open water.

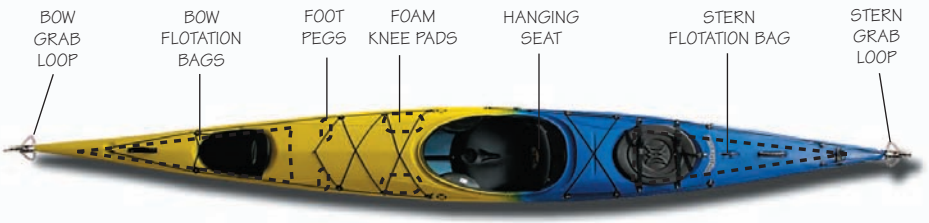
Terrific adventures await you just beyond the bows of kayaks and rafts. With some essential preparation and basic training, you'll soon be taking a paddle in hand or grasping a pair of oars and launching out on your own great watercraft trips.

Kayaks

Natives of the far northern latitudes have been building kayaks for thousands of years, stretching sealskins over sturdy frames fashioned from driftwood to make light, streamlined boats. Modern sport kayaks, while similar in appearance to their sealskin ancestors, are constructed of some of the same durable materials as modern canoes. The most obvious distinctions can be seen in the differences between kayaks built for white water and those intended for the sea.

Touring Kayaks

Touring kayaks are shaped to maintain a course over long distances rather than to make rapid changes in direction. Touring kayaks also are known as sea kayaks, although many never touch salt water, instead leaving their wakes on quiet rivers, lakes, and inland waterways. They are quite a bit longer and flatter than whitewater kayaks, and some have a movable rudder or a stationary fin, called a *skeg,* to help them track a true line—a useful feature when paddlers must contend with winds, tides, and currents.



Touring kayak

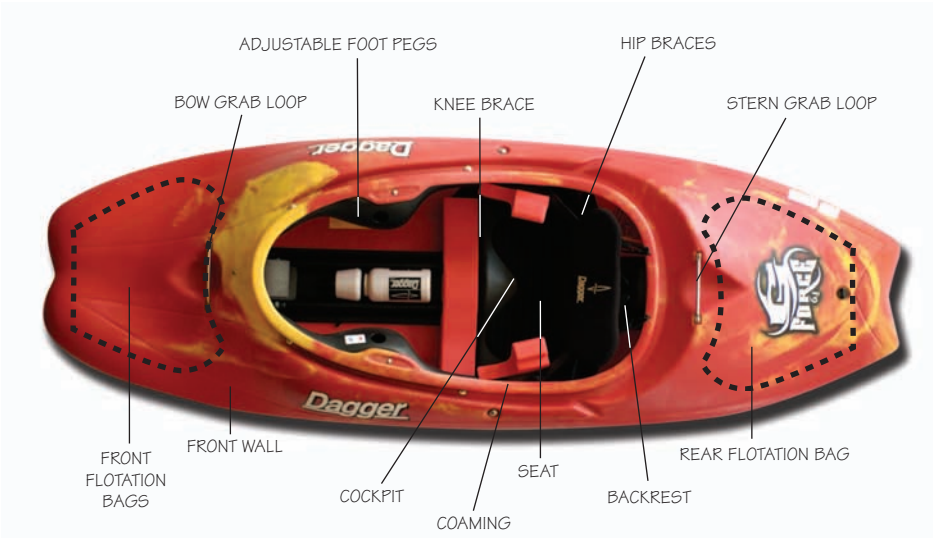
Storage compartments and roomy interiors allow kayakers to carry provisions and gear for camping trips of several days or more. Some touring kayaks feature two cockpits so that partners can paddle in tandem.

Folding and Inflatable Kayaks

Kayaks that can be dismantled for packing and transport make it possible for boaters to reach put-in points on rivers and lakes that might be inaccessible for more conventional boats. Inflatable kayaks offer terrific portability and ease of storage, and they are less expensive than many rigid kayaks, though inflatables don't have decks or cockpits, and thus no way to seal out water.

Hybrid Kayaks

Thanks to its rounded hull and pronounced bottom curve, or *rocker,* a hybrid kayak can manage the quick maneuvers needed for running rapids. The compact interiors of whitewater kayaks offer little room for storing gear.



Hybrid kayak—squirt or stunt boat

Kayak Materials

Anyone familiar with canoe construction will recognize that many of the same materials are used to build kayaks. The *polyethylene* found in most molded whitewater kayaks is tough and relatively inexpensive. *Fiberglass* kayaks are durable and lightweight. They can be more easily damaged than boats made of other materials, but they are easy to repair. A kayak that includes layers of *Kevlar®* fabric can be strong, light, and pricey.

Outfitting Your Kayak

There is more to a kayak than simply the boat. As with canoeing, rafting, sailing, and any other activities involving watercraft, you'll need a personal flotation device (PFD), clothing appropriate for the conditions, and protection from the sun. Kayakers and canoeists venturing into white water also must wear helmets. Sea kayakers might require navigational aids and additional items of emergency gear. A spray skirt, paddle, flotation bags, and bilge pump round out the basic kayaking equipment. (For more on preparing for watercraft activities, see the chapter titled "Watercraft Adventure Safety.")

SAFETY ESSENTIALS FOR KAYAKING AND RAFTING

For a discussion of safety issues that apply to kayakers and rafters, see the chapter titled "Watercraft Adventure Safety." For the text of the BSA's Safe Swim Defense and Safety Afloat, see the *Fieldbook* Web site.

Spray Skirt

A spray skirt made of neoprene or coated nylon fits tightly around your waist and, when you are seated in a kayak, attaches to the rim of the cockpit. The skirt will prevent water from flooding the craft while you negotiate rapids, are hit by spray and waves, or roll upside down. A release loop at the front of the skirt allows you to detach it quickly if you must bail out of the boat.

Paddles

Kayak paddles are made of fiberglass, plastic, wood, aluminum, or combinations of materials, and feature double blades that are either *feathered* or *unfeathered.* Seasoned kayakers argue both sides of the paddle angle issue, revealing the advantages of each:

- *Feathered paddles.* The blades are offset from one another, or *feathered,* most commonly at an angle of about 45 degrees. As one blade pulls against the water, the other blade is positioned to cut through the wind. With a twist of the wrist, a kayaker rotates the paddle shaft to position the blades for each stroke. The shafts of most paddles are oval rather than round, enabling paddlers to sense by feel the pitch of the blades.

- *Unfeathered paddles.* The blades share the same alignment. Unfeathered paddles require no wrist adjustment between strokes, and can be easier for beginning kayakers to manage. However, as each blade is lifted above the water, it can catch the brunt of the wind and reduce forward momentum.

Breakdown paddles are two-piece paddles with a joint in the center of the shaft; this allows them to be stowed in smaller spaces than required for one-piece paddles, which makes them excellent spares. Breakdown paddles often are the choice of boaters using inflatable or folding kayaks. They can be feathered or unfeathered, depending on how they are assembled. *One-piece paddles* have no joints, and thus little can go wrong with them.

Sizing a Kayak Paddle

Hold a kayak paddle over your head with your elbows bent at a 90-degree angle. For a whitewater paddle, there should be about 6 inches of shaft between your hand and the paddle blade. For a touring paddle, that distance should be at least 12 inches. In general, a paddle that is too short is better than one that is too long, and narrow blades will be easier to manage than wide ones.

Flotation Bags

The watertight storage compartments of most sea kayaks double as flotation chambers. A whitewater kayak, however, might not possess enough buoyancy by itself to stay afloat when filled with water. *Flotation bags* inserted in the bow and stern prevent water from completely filling a capsized craft, and will keep it from sinking. Vertical walls under the bow and stern decks strengthen the kayak and help prevent it from collapsing when the boat is under the extreme pressure of rough water.

"The best bilge pump is a scared man with a bucket."

—Traditional maritime lore

Bilge Pump

A spray skirt will keep most of the water out of a kayak, but during a long paddle on open seas or on an outing when a spray skirt isn't essential, some water is bound to get into your boat. A handheld pump can be the answer for getting rid of it while you are afloat. When not in use, the pump can ride under elastic cords on the deck. (Some boats are equipped with built-in pumps that can be operated by a kayaker without removing the spray skirt. Sponges and bailers, common in canoes, also are efficient means for rafters and kayakers to remove water from their boats.)

Carrying a Kayak

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