

## 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.

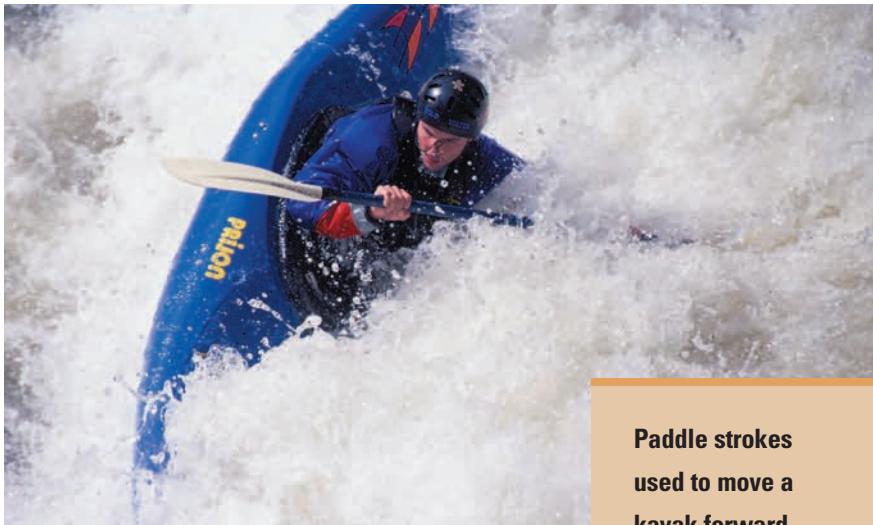




### Getting Into a Kayak

A kayak is an extension of your body, responding not only to the thrust of the paddle, but also to the motion of your torso, legs, and hips. You won't sit in a kayak so much as wear it, the tight fit helping you move the kayak with you as you maneuver.

Put the spray skirt around your waist. Provide stability to the floating kayak by placing one paddle blade across the back of the cockpit and resting the other blade on the shore or dock. Grasp the center of the paddle and the back edge of the cockpit with one hand, then ease yourself into the boat. Attach the spray skirt to the cockpit rim and you're ready to paddle off.



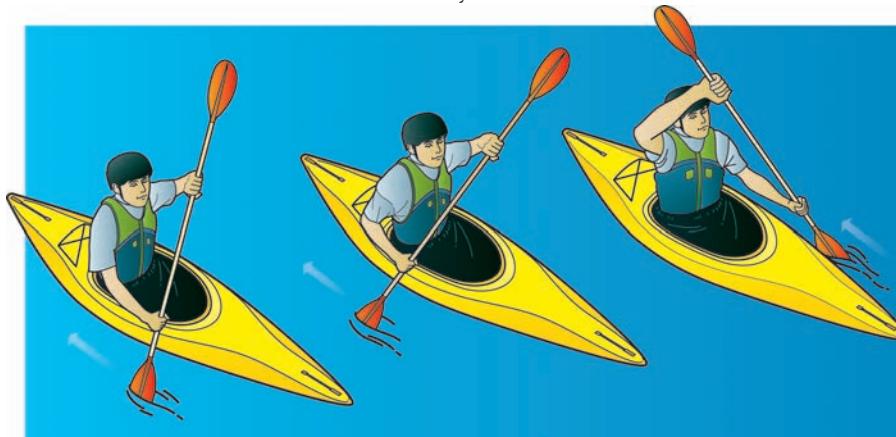
## Propelling a Kayak

With a few basic strokes, you can make a kayak dance. The best place to learn is in quiet water, practicing until the strokes are automatic.

### **Forward Stroke**

Use the *forward stroke* to move a kayak forward: Extend the right paddle blade as far toward the bow of the boat as you can, rotating your body to increase your reach, but not leaning forward. Extending your right arm, place the blade in the water close to the bow. Power comes primarily from the strong muscles of your torso as you pull your right arm back and push your left arm forward to move the kayak past the blade. When your shoulders are fully rotated to the right, knife the paddle out of the water, drop your right wrist to turn the left blade into proper position, and begin a forward stroke on the left side of the kayak.

**Paddle strokes used to move a kayak forward employ the *power face* of a paddle blade. Strokes for moving backward use the *back face*.**



### Reverse Stroke

Use the *reverse stroke* to slow a moving kayak or move it backward. Perform this stroke by reversing the steps of the forward stroke. Begin by twisting to the right and placing the right paddle blade in the water behind you and close to the boat. Push forward by rotating your torso to the left. As the right blade slips out of the water at the end of the stroke, drop your right wrist to position the left blade, and begin a reverse stroke on the opposite side of the kayak.



### Sweep Stroke

A *sweep stroke* on the right side of a kayak turns the bow to the left as it pushes the boat forward, while a sweep on the left side turns the bow the other way. A sweep is useful for moving around obstacles, though it will also slow your boat considerably. Begin a sweep by holding the paddle horizontally over the boat. Extend one arm and rotate your shoulders, then insert a blade into the water as far forward as possible, the power face turned away from the kayak's bow. Pull the paddle in a wide arc that continues all the way to the stern, powering the stroke with the twist of your shoulders and torso.



### **Reverse Sweep**

A reverse sweep slows the forward motion of a kayak and turns the boat toward the side on which the stroke is performed. Use it when you need a quick, forceful course change. Holding the paddle horizontally, twist sideways and insert the blade into the water behind the cockpit. Sweep the paddle toward the bow, rotating your shoulders as you do. For best results, sweep wide.



### **Drawstroke**

Executing a *drawstroke* with the paddle aligned with your seat (a *midship draw*) will move a kayak sideways; a draw with the paddle closer to the bow will turn the boat to the stroke side, making the *bow draw* a good turning stroke.

To perform a midship draw, hold the paddle nearly vertical, your upper hand reaching out across the boat. With the power face turned toward the kayak, place the blade in the water and pull it toward the center of the boat. Before the paddle touches your craft, rotate your wrist and knife the blade under water to the starting point of the stroke.

For a bow draw, reach out and place the blade at an angle in the water, then move it toward the boat.



Midship draw



Bow draw

**Braces**

You can use your paddle to balance a kayak in much the same way outriggers give stability to Pacific island canoes. If you hold a paddle blade against the water with its leading edge tilted up slightly and sweep it back and forth, the force of the blade on the water will lift the paddle and, by extension, the boat.

Apply this principle to kayaking by trying a *low brace*. It is similar to a short sweep, but with the paddle blade nearly horizontal rather than vertical. Lean hard on the shaft during the brace; as long as the paddle is moving relative to the water, the back face of the blade will support your

weight. If your kayak does begin to tip away from the sweep, roll your hips to right the boat.



*Low brace*

A *high brace* can save you from capsizing in rough water and larger waves. The paddle shaft is held at eye level to better position the power face, rather than the back face, of the blade against higher water. Tilt the leading edge of the blade against the push of the current to create a virtual three-point stance. Protect your upper body from injury by keeping your hands in front of your shoulders.



*High brace*



Kayakers can position themselves below rapids to assist boaters who might capsize.

### Capsizing and Righting a Kayak

Capsizing is a part of kayaking. It might be a rare event for a sea kayaker, but in white water it can happen frequently. Practice capsizing in warm, gentle waters—a swimming pool is ideal—so that you will know what to do in a river or on open water. (Wearing a diving mask can make your experience more pleasant and enable you to study the physics of upsetting from a capsizer's point of view.)

Become accustomed to making a *wet exit* from a capsized kayak by first pulling the skirt's release loop. Then lean forward to pull your legs from the boat by pushing it forward, with your hands grasping the back edges of the cockpit coaming.

Sea kayakers can use the help of other boaters to get back into their craft, or can do it alone with the aid of a *paddle float*. Both whitewater and sea kayakers can use the *Eskimo roll*, a way of righting themselves without exiting their kayaks.

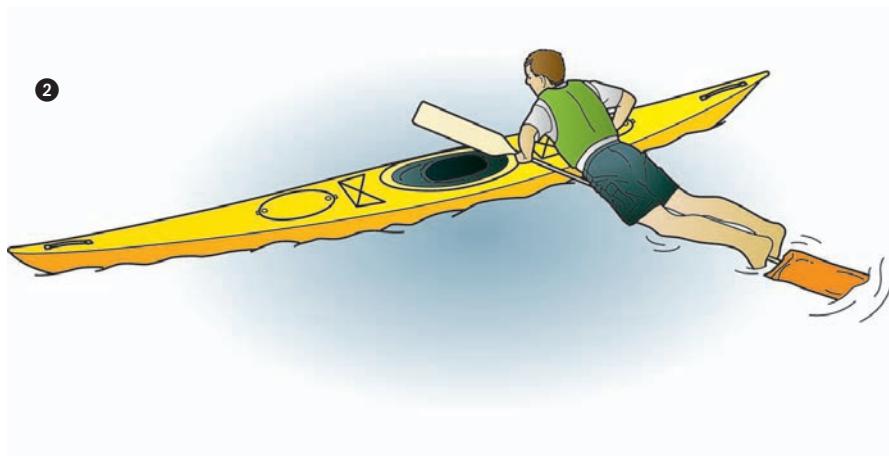
### Assistance From Other Boaters

Fellow kayakers can corral your capsized boat and lift one end to let water dump out of the cockpit. They also can stabilize your kayak by grasping the cockpit from one side while you scramble back in from the other side.

**Hang onto your capsized kayak. It will help keep you afloat, shield you from river obstacles, and enable others to find you more easily as they come to your assistance. Keeping the boat upside down will trap air inside and cause it to float higher in the water.**

**Paddle Float**

A *paddle float* is an inflatable bag that is carried under the bungee cord on the deck of a sea kayak. When an upset occurs, you can fit the bag over the blade of a paddle and inflate it with your breath. Then, place the opposite paddle blade across the stern deck of the swamped kayak, and scramble aboard using the floating paddle as a brace. Once you are in the cockpit, empty the boat with the bilge pump, reattach the spray skirt, and continue on your way.

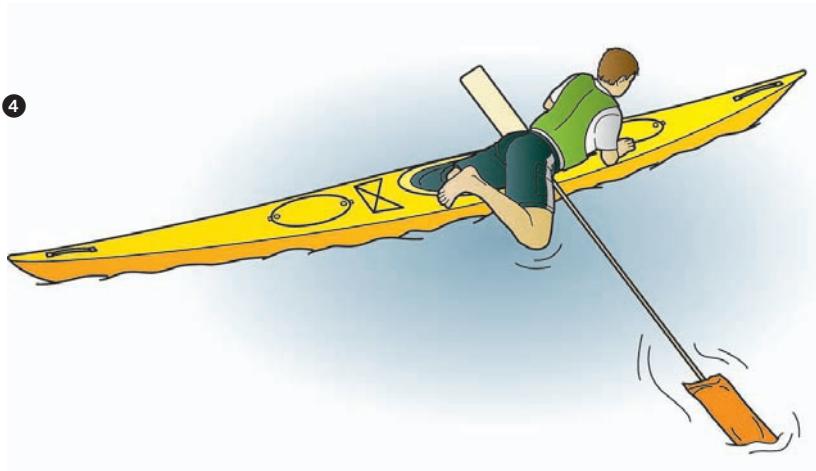




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**Whenever a kayak capsizes, other boaters must focus their attention on that situation until the paddler is back in the boat or has reached shore. Everyone must stand ready to help a swimming person, right a capsized craft, gather up floating gear and paddles, and render any other assistance that might be called for at the moment.**

### Eskimo Roll

An *Eskimo roll* allows you to recover from capsizing without having to get out of your kayak, a real advantage when you are running a rapids or in a sea kayak far from shore. Before practicing an Eskimo roll, it is crucial to know how to exit an overturned kayak. As with other responses to upsets, the Eskimo roll should be learned in quiet water. You almost certainly will need the assistance of a capable instructor to guide you through the steps.

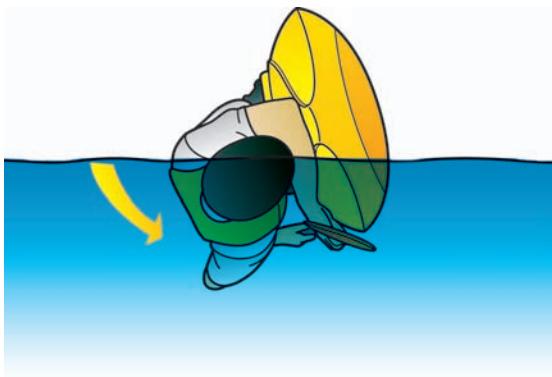
Here's how the Eskimo roll works. As your kayak goes over, lean forward against the deck. Extend so that your face is down and one arm is across the deck. Position the paddle with the front blade's power face up and the shaft parallel to the boat. Use your shoulders, arms, and torso to move the blade in a strong sweep stroke to the kayak stern (keep the front blade on top of the water as it sweeps out from the boat). Wrap your back arm over the hull to give yourself a fulcrum for a powerful stroke. As the force of the stroke rolls you toward the surface of the water, snap the boat upright with your hips.

- ① Position the paddle parallel and alongside the kayak.



- ② Lean toward the deck.





- ③ As you sweep,  
you will roll  
toward the surface.



- ④ Keep the paddle  
entirely above water  
and bend forward  
over the deck.



- ⑤ Snap your hips  
to set the  
boat upright.



- ⑥ Recover the boat's  
balance with a  
high brace.

## Sea Kayaking Considerations

Getting lost is an unlikely possibility for whitewater paddlers. Open water, though, especially that of large lakes, oceans, or straits and sounds dotted with islands, brings with it conditions much different from those facing river runners. Sea kayakers must develop an understanding of tides, waves, currents, and nautical navigation, and keep their skill levels ahead of the adventures on which they embark.

Essentials carried by a sea kayaker should include a personal flotation device, a spare paddle, a compass, a whistle or similar audible signal for attracting the attention of other boaters, a paddle float, and a bilge pump. The whistle can be attached to a short loop on your PFD (not the zipper pull). The compass also can be clipped to your PFD or secured to the deck where it can be seen from the kayak cockpit. More ambitious sea kayaking trips might require charts, tide tables, a marine VHF two-way radio, a GPS (global positioning system) receiver, emergency shelter and rations, a parasail, and rigging for one sea kayak to tow another.

As with many outdoor activities, sea kayaking is a social sport. Going with others allows you to enjoy an experience with your friends and, through sheer numbers of people and boats, adds considerably to everyone's margin of safety.

For more on the challenges of open water, see the chapter titled "Watercraft Adventure Safety."



### ***Leave No Trace Kayaking***

The shallow drafts and extensive range of sea kayaks allow paddlers to venture into salt marshes and mangroves, and along rocky coastlines that are largely inaccessible to other boaters or visitors on foot. Among the most pristine places on Earth, these areas serve as refuges for a tremendous range of wildlife. Enter and treat these environments with the greatest care.

For more on responsible kayaking, see the "Leaving No Trace" section of this book.



## Whitewater Kayaking Considerations

A whitewater kayaking trip might be an hour or two of playing in the rapids on a short section of river, or it could be a multiday wilderness adventure with camping gear carried on a support raft. Whatever the case, stay within your abilities. Scout rapids from shore to get a good read on the river ahead so that you will know what you are getting into and how to get back out again. If an upcoming stretch of river appears to be beyond your skill level or if there are strainers, drops, or other water hazards that concern you, make a portage and rejoin the river downstream from the obstacles. There is never

any shame in carrying your boat around a rapid you aren't convinced you should run.

For more on sizing up river conditions, see the chapter titled "Watercraft Adventure Safety."

## Kayak Storage

When not in use, store a kayak in a dry place sheltered from the sun. Allow it to rest upright, fully supported by its keel, or suspended on edge by three or more wide slings.





## Rafts

Many early explorers making their way down the great rivers of the American West rowed wooden boats large enough to carry their gear and rugged enough (they hoped) to withstand raging rapids. While wooden boats are still used by some traditional river runners, the sport of whitewater

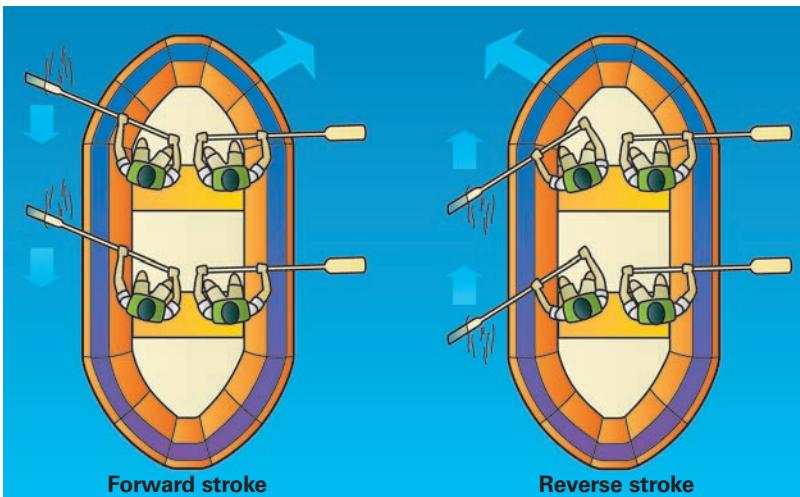
rafting was born shortly after World War II when adventurers began using large Army surplus rafts to challenge the enormous hydraulics of the Colorado River in the heart of the Grand Canyon.

The rafts navigating wild rivers today are direct descendants of those military rafts, but are now made of neoprene or rubberized materials resistant to abrasion and puncture. They are constructed with several inflatable chambers, each capable of keeping a raft afloat even if all the others are damaged. Many modern rafts are *self-bailing*—water they take on drains out through grommet holes surrounding an inflatable floor. Depending upon their configuration, human-powered rafts can be propelled either with paddles or with oars.

A wooden boat (Grand Canyon style)

## Paddle Rafts

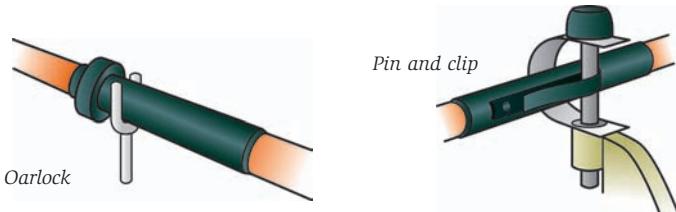
Paddling a raft is a group activity requiring the cooperation of everyone on board. Facing forward, several river runners sit on each side of the boat and use canoe paddles to guide their raft. A group leader calls out commands, instructing the team how to stroke in order to maneuver the boat. The leader might be one of the paddlers, or might sit in the stern and use a paddle as a rudder. Paddle rafts have a distinct advantage in rock-strewn rivers with channels too tight for oar-manuevered craft. They also allow everyone on board to take an active role in the progress of the trip.



*Paddlers using a forward stroke on one side of their raft will cause it to turn away from the paddling side. A reverse stroke will pull the bow toward the paddling side.*

## Oar Rafts

A raft equipped with oars can best be steered by a single experienced person. Perched atop a platform in the middle of the raft, he or she has a commanding view of the river and can control the motion of the raft by pulling on oars secured to the boat's rigid frame.

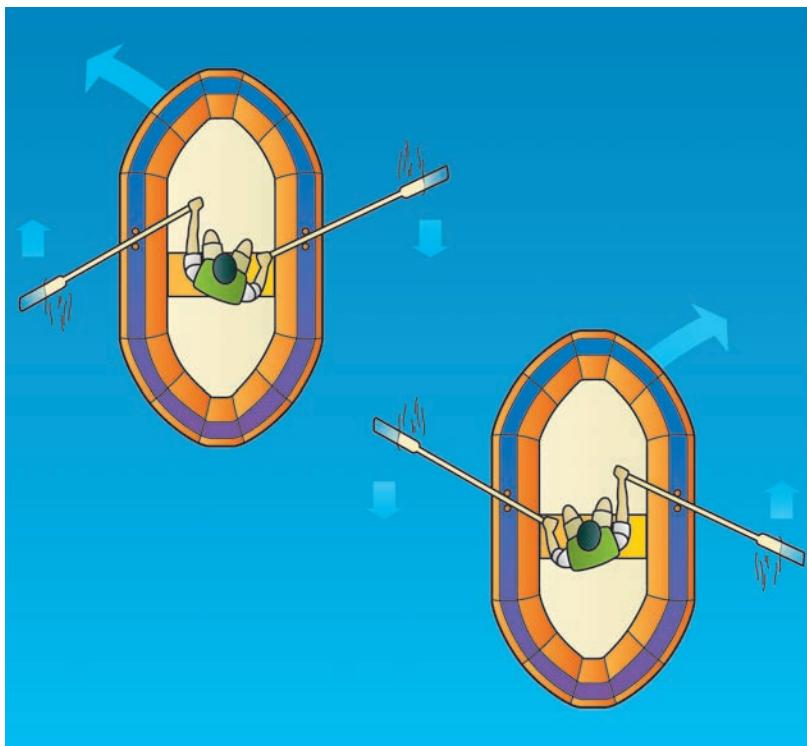


*Pins and clips securing oars to a raft set the blades of the oars at the best angle to the water and make it difficult for a big wave to jerk the oars out of a rafter's hands. Oars set in oarlocks can be drawn into the boat when rafters are negotiating swift, narrow passages.*

Since a raft with oars needs only one seasoned boater on board, passengers can sometimes run a river even if they don't have much white-water experience. Of course, they'll need to know how to swim, must wear personal flotation devices, and might need helmets. As the raft splashes and churns downstream, they can learn some of the basics of handling a raft in rough water by watching the person at the oars.

### **Steering an Oar Raft**

On moving water, a rafter faces downstream and rows against the current, moving the raft laterally as the boater ferries left and right across the river for the best line through the obstacles ahead.



A pull stroke on one side of the raft will cause the boat to turn in that direction. A push stroke on one side will turn the boat away from the oar. Combine a pull stroke with one oar and a push stroke with the other to make a quick double oar turn, or pivot.

For more on managing river hazards and maneuvering rafts by ferrying, see the chapter titled “Watercraft Adventure Safety.”



### Rafts and River Journeys

While running rapids is often the highlight of a river trip, floating through a linear wilderness can open opportunities for ecology studies, fishing, camping, navigation, and many other outdoor activities.

The carrying capacity of rafts makes them ideal for river trips of several days or more. A raft might be the watercraft of choice for everyone on a journey, or it might serve as the supply vehicle for a fleet that includes several kayaks or canoes.

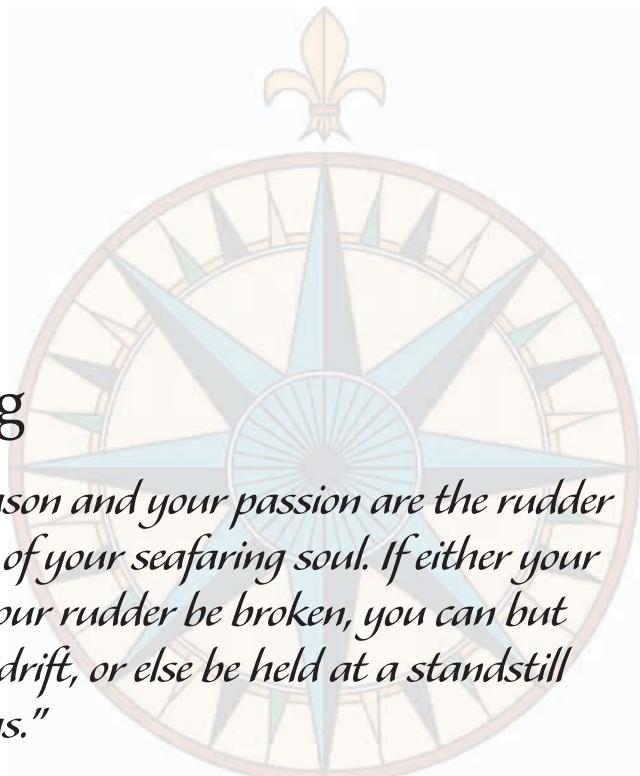
The ability of rafters to haul lots of cargo and large numbers of people into remote areas brings with it a tremendous responsibility to understand and use the principles of Leave No Trace. That begins during the planning stages of a trip. Contact the agencies managing the river system you wish to visit and learn about any permits or restrictions that apply to you and your group. Of great importance will be methods of waste disposal (perhaps involving bringing along portable toilets called *rocket boxes* for carrying human waste to the end of your journey), fire management (using camp stoves or fire pans), and food handling (leaving shorelines and campsites as clean as you found them).

For more on kayaking and rafting responsibly, see the “Leaving No Trace” section of this book.



# CHAPTER 19





## Sailing

*"Your reason and your passion are the rudder and sails of your seafaring soul. If either your sails or your rudder be broken, you can but toss and drift, or else be held at a standstill in midseas."*

—Kahlil Gibran (1883–1931), Lebanese novelist, poet, philosopher, and artist



A boat, the wind, open water. Nothing could be simpler, and yet no other three factors, when mixed in proper proportion, possess so much potential for adventure and delight. Cast off from a dock, hoist a sail, grasp the tiller or wheel, and you are embarking into a realm of motion, of closeness with nature, and of the pleasure of nonmotorized travel for which there simply is no comparison.

As a sailor, you can go where the wind lets you go, traveling on the wind's schedule rather than your own. While you can't force a boat to move, you can enjoy the constant adjustments of sails and rigging to take advantage of invisible vectors of sky and sea as you will your boat to cruise along a course you have plotted. With your weight to the windward, you can feel the sail pulling your boat through the water, the hull heeling to one side, water humming past the keel, the breeze a steady force in the rigging.

Sailing is one of humankind's oldest modes of travel, steeped in tradition and lore. The wisdom of sailing comes to modern sailors through thousands of years of experimentation, experience, and simple human intuition. While sailing might seem complicated to someone just starting out, it is, at its heart, the union of wind, water, and craft in constantly changing variations. You can learn the basics in an afternoon. You can spend the rest of your life striving to master them.



### **PERSONAL FLOTATION DEVICES**

**Cruising vessels greater than 20 feet in length must have at least one readily accessible Coast Guard-approved personal flotation device for each person on board. Anyone taking part in activities involving smaller watercraft (including rowboats, canoes, kayaks, rafts, and sailboats smaller than 20 feet in length) must wear a Coast Guard-approved personal flotation device.**

### **First Things First**

Whether you are sailing for the first time or are one with the wind and confident in your abilities to navigate open seas, safety always must be your highest priority. Knowing the safety rules, knowing your boat, knowing the weather and the body of water are all essential ingredients to a safe and rewarding sail. (Novices should sail only in the company of those whose experience is more than a match for the conditions and situation.)

In addition to ensuring that the boat is in top condition, look after your own comfort and safety by having the following items with you:

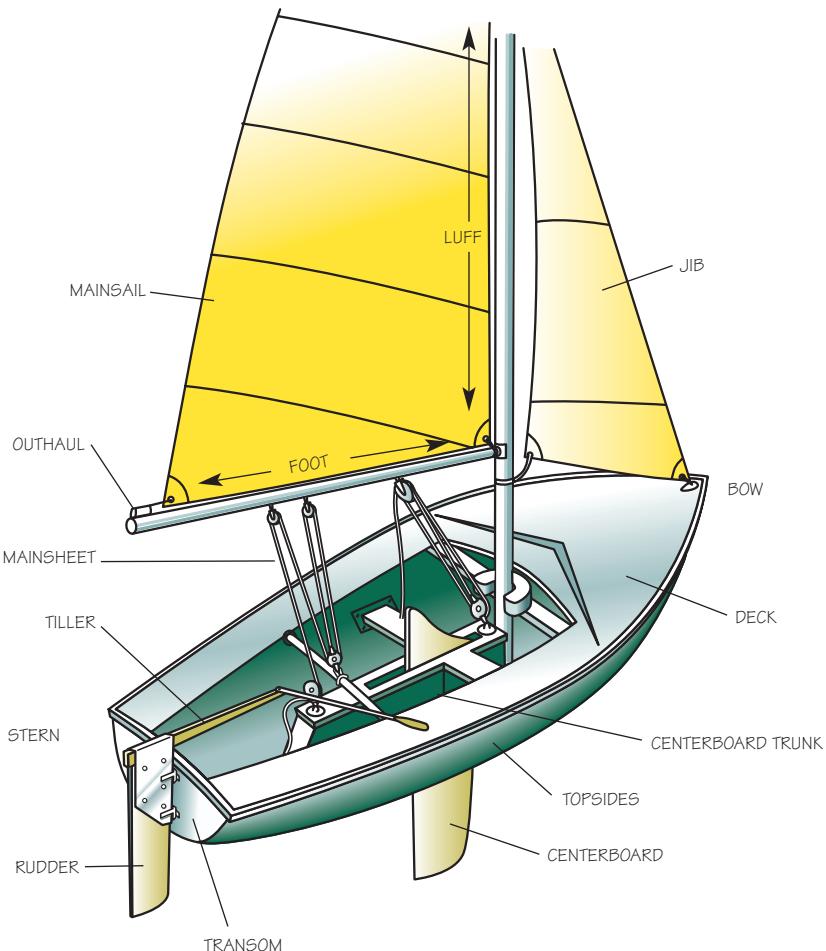
- U.S. Coast Guard-approved personal flotation device (PFD)
- Rubber-soled, nonskid shoes you won't mind getting wet
- Drinking water
- Food
- Sun protection and sunglasses
- Extra clothing
- Emergency communication and signaling equipment (radio, flares, etc.)

You also might want to wear sailing gloves to protect your hands and improve your grip as you handle lines aboard a boat. Stow anything you want to keep dry in dry bags or sealed inside plastic bags. Stash the bags below decks or in some other boat storage compartment.

For more on issues of concern for sailors, see the chapters titled "Managing Risk" and "Watercraft Adventure Safety."

## Sailboats

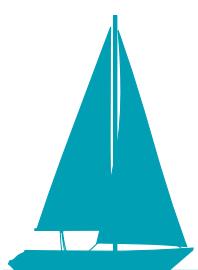
Boats designed for sailing feature either a *centerboard* or a *keel*. A centerboard is a movable plate of wood, metal, or fiberglass that can be raised and lowered through the bottom of the boat. (Variations of the centerboard are the *daggerboard* that can be removed from the hull, and the *leeboard* that pivots on a dinghy's gunwale.) A keel, on the other hand, typically is a portion of the hull and does not move. It extends beneath the boat in much the same manner as a centerboard and serves the same purposes of providing stability and lateral resistance. Keels (found on *keelboats*) are weighted with enough ballast to keep the boat upright despite the forces of water and wind.



*Typical sailboat with a centerboard*

Beyond their classification based on keels or centerboards, boats come by their names based in part on the number and orientation of their masts and sails: One-masted boats include *sloops*, *cutters*, and *catboats*. Two-masted boats include *ketches*, *yawls*, and *schooners*.

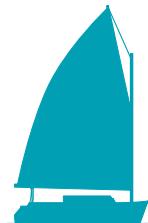
There also are boats with more than one hull. *Catamarans* feature two hulls, and *trimarans* have three.



Sloop



Cutter



Catboat

*One-masted boats include the sloop, the cutter, and the catboat.*



Yawl



Ketch

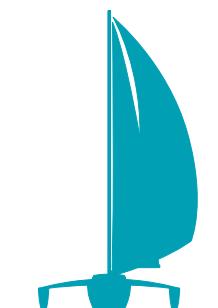


Schooner

*Two-masted boats include the yawl, the ketch, and the schooner.*

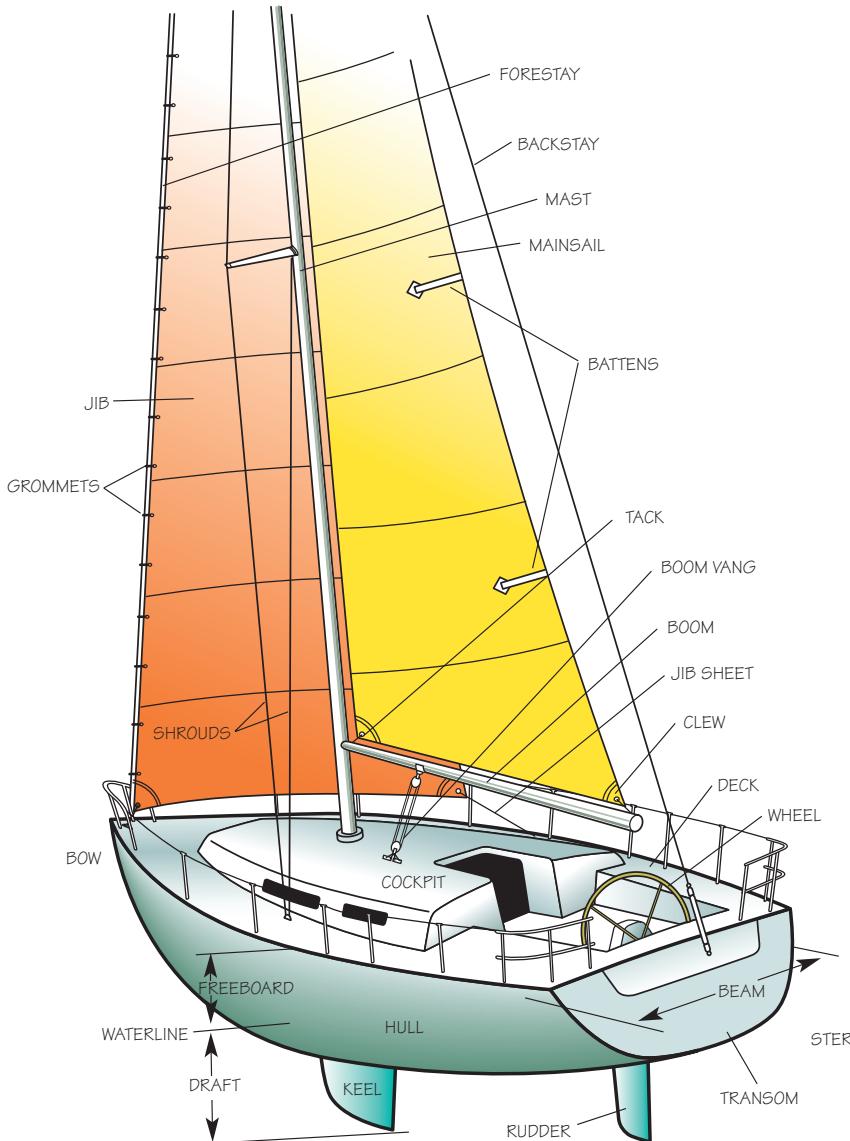


Catamaran



Trimaran

*A two-hulled boat is a catamaran. A trimaran has three hulls.*



*Typical sailboat with a keel*

### ***The Vocabulary of Sailing***

Sailing has a vocabulary all its own. The words *starboard* (the right side of the boat as you face forward), *port* (the left side), *windward* (toward the wind), and *leeward* (away from the wind) give sailors clear spatial orientation as their boats move across the water. Speed across the water is measured in *knots*, each knot being *one nautical mile per hour*. A nautical mile is  $1/60$  degree (1 minute) of latitude, or 6,076 feet, whereas a *statute mile* used to measure distance on land is 5,280 feet. A boat traveling at 10 knots is moving at about 11.5 miles per hour.

For more on latitude, see the chapter titled "Navigation."

## Getting Aboard

The smaller the boat, the more care you'll need while boarding, since your weight can upset a small craft. Hold the mast or the rigging securing the mast, then step into the center of the boat. Larger boats often can be boarded by stepping from the dock to the deck, again grasping lines for balance.

## Rigging the Boat

Preparing small boats for sailing can include raising, or *stepping*, the mast and securing the standing rigging that holds it in place. For almost all boats, it will require getting sails out of storage and attaching them to the mast so

that they are in position to be hoisted. There are many variations on the ways in which sails are matched to boats. Your best bet in learning to rig a particular boat is to work alongside sailors experienced with that craft. With their guidance, you can complete some or all of the following steps:

- ➊ Slide fiberglass or wooden *battens* into pockets on the trailing edge of the mainsail. The battens will stiffen the sail and help it maintain the optimum shape for taking advantage of the wind.
- ➋ Slide the foot of the mainsail into the *boom*—the horizontal arm of the mast. Attachments made of plastic or metal, or a rope sewn onto the sail's lower edge, are designed to slip into a groove in the boom. Once the foot is in place, secure the corners with the *tack*—a fitting near the mast—and the *clew*—a fitting at the far end of the boom. The final corner of the sail is attached to the *halyard*—the line used to hoist the sail.
- ➌ Rig the *jib*—the sail ahead of the mast—if the boat has one. Jib design varies every bit as much as does that of mainsails; follow the lead of those who have rigged the boat before.

Rigging a boat also involves checking all the lines to ensure they are correctly positioned and ready for use. If the boat is equipped with a

centerboard, it must be lowered and locked into position. Any loose objects should be stowed away. Everyone going on the trip must be on board, wearing a PFD, and ready to carry out any responsibilities he or she will have while the boat is under way.

**COILING LINES**  
**Keeping lines**  
**coiled and**  
**neatly stowed**  
**are matters both**  
**of sailing safety**  
**and of pride in**  
**seamanship.**





## Raising the Sails

Before raising the sails, turn the bow of the boat into the wind. That way you can get the sails fully hoisted before the wind begins to fill them.

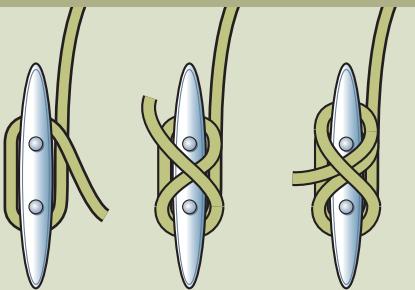
Sails are raised by hauling the *halyard*—a line running through a block at the top of the mast and fastened at one end to the sail's upper corner. The halyard can be hauled by hand or, on larger boats, by winding it on a winch. The leading edge of the mainsail might have a rope sewn into it that must be fed into a groove in the mast as the sail is being raised.

### **Securing a Line to a Cleat**

Lines that control sails must be secured in such a way that they will hold under great tension, but can be released quickly. The simplest means of achieving that goal is to use a cleat. Bring the line around the horns of the cleat, then wrap it several times in a figure-eight fashion.

The turns of the line against itself will create enough friction to prevent the line from loosening. A final half hitch thrown around one of the horns will secure the running end of the line. Loosening the line is simply a matter of undoing the half hitch and releasing only enough of the loops to allow the line to run out in a controlled manner.

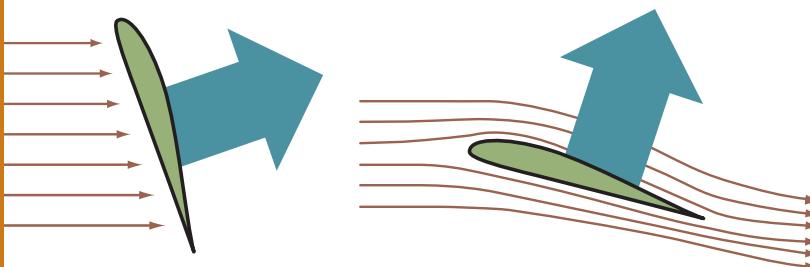
Some boats also have *jammers* or *rope clutches* to secure lines, particularly if the sails are large and the rigging is complicated.



## How a Boat Sails

If there is no wind, you aren't sailing—you're just floating. Sailing is much more fun than floating, especially when you understand the physics of how moving air affects the sails. Whether that motion is graceful, awkward, or counterproductive often depends upon sailors' understanding of the forces coming to bear on a boat, and a crew's ability to adjust to changing circumstances.

A sail mounted on a mast can catch breezes and move a boat in the same direction the wind is blowing. However, when the sail curves into the shape of an airfoil similar to the profile of an aircraft wing, wind flowing



past creates an area of low pressure in front of the fabric and an area of high pressure behind it. The sail is pushed from high pressure toward low pressure, carrying the boat with it. That allows the boat to move with greater efficiency at angles to the wind than otherwise possible with a flat sail.

A *rudder* at or near the stern of a boat sets the direction the craft will go. A keel or a centerboard extending downward from the center of the hull serves as an underwater wing preventing the boat from being blown sideways by the wind. The rudders of smaller boats are controlled with a *tiller*—a lever providing direct response to the rudder. Larger boats have rudders managed by wheels; sailors make directional changes as they would with the steering wheel of an automobile.

### **Two Kinds of Wind**

**True wind**—the wind you experience while standing still and having your hair blown by a breeze.

**Apparent wind**—air motion you experience while moving forward, even on a windless day. If you are riding a bicycle, for example, the movement of the bike causes your hair to blow with the oncoming breeze. This wind created by the bicycle's motion, along with any true wind, is known as *apparent wind*.



## Sailing Maneuvers

Manage a sailboat well and you can travel in any direction you wish—your *points of sail*—with one exception. You cannot sail directly into the wind. Turning the bow of the boat into this *no-sail zone* is a no-go proposition. The wind will work contrary to your wishes, causing the sails to flutter uselessly, or *luff*, and gradually pushing the boat backward.

While sailing directly into the no-sail zone is impossible, sailing at an angle to the wind can be extremely fast. You can make headway by setting the sails in various ways. Adjusting the rudder and, on smaller boats, the positioning of the weight of the crew will further influence the heading and speed of a boat.

Depending on the course you wish to travel in relation to the wind, the basic maneuvers of sailing are *running*, *reaching*, and *beating*. The primary means of changing directions are *tacking* (coming about) and *jibing*.

### Running

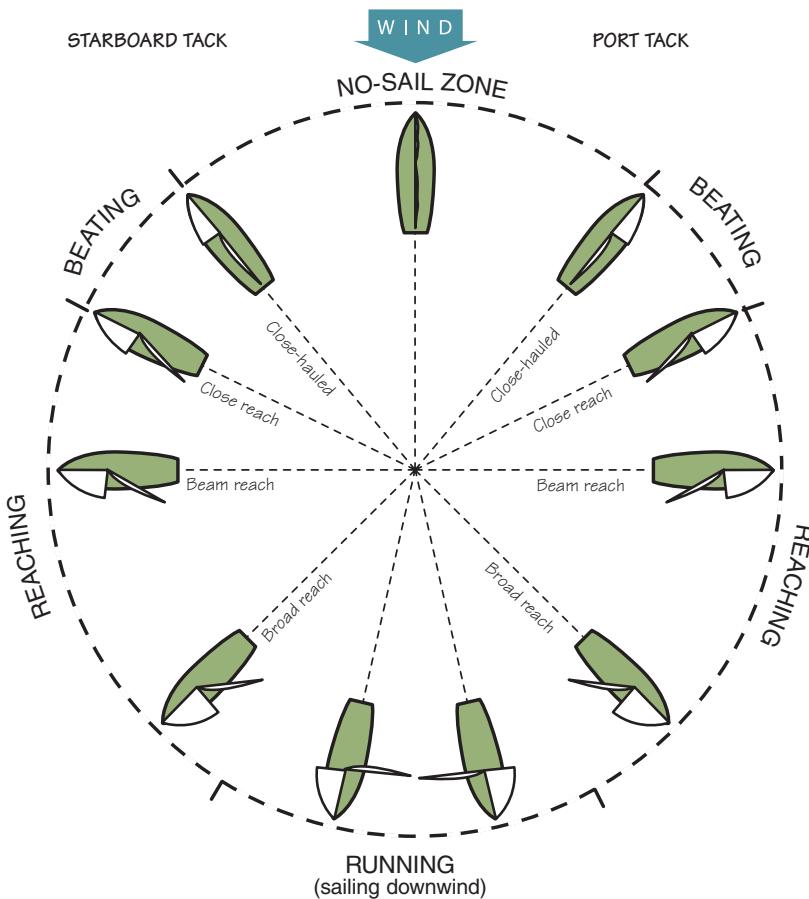
Sailing a boat downwind, or *running*, requires close attention, but setting the sails is easy. Simply let out the sails so that they gather in the wind and carry the boat forward. Since the wind is coming over the stern of the boat rather than over a side, the boat will stay level rather than heel over.

**Practice your sailing skills in the clear, aquamarine waters of the Florida Keys at the Florida National High Adventure Sea Base. Located in Islamorada, Florida, the BSA's high-adventure facility offers a variety of aquatics programs for older Boy Scouts, Varsity Scouts, Sea Scouts, and Venturers.**

## Reaching

As the bow of a boat begins turning away from a run and toward the wind, the sails no longer will be positioned to act simply as wind collectors. You can take advantage of the fact that the sails now form airfoils that help pull the boat forward. Sailing at an intermediate angle to the wind is called *reaching*.

Reaching can occur whenever a boat is on points of sail between running and beating—from about 7:00 to 10:00 on the *starboard* (right) side, and 2:00 to 5:00 on the *port* (left) side. A boat on a beam reach travels faster than it can with sails set for any other bearings.



## Beating

*Beating* makes it possible for a boat to sail as close as possible to the no-sail zone—points of sail with bearings at about 10:30 starboard and 1:30 port. If the sails begin to lose their airfoil shape even though they are trimmed as much as possible, the boat must turn a little more away from the direction of the wind in order for the sails to fill.

### Trimming the Sails

Adjusting the sails, known as *trimming*, will position them for maximum efficiency for the bearing you are following. Sails that are too loose will flutter, or *luff*, along the leading edge. Pull in the lines controlling the set of the sails until the luff disappears and the sails are taut and full.

*Overtrimming* the sails by setting them too tightly also can diminish their airfoil effect and rob the boat of speed. To determine if that is the case, let out on the lines until the sails begin to luff, then haul them in just until the luffing disappears. That should be the perfect amount of trim for your current heading.

Of course, wind direction will continually change and your heading might not long remain the same. Trimming the sails will be an ongoing part of sailing, requiring your focused attention throughout a journey under sail.

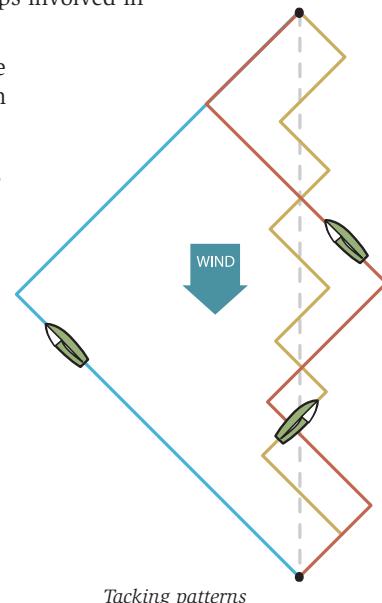
### Tacking (Coming About)

A boat cannot sail directly into the wind. However, you can make headway toward the wind by *tacking*—beating in one direction, then turning the bow through the no-sail zone and beating in another direction. The boat can zigzag to a destination upwind either by using one tack with legs long enough to make the distance, or by making a series of short tacks that gradually work the boat close to its goal.

Tacking requires cooperation of everyone on a boat's crew, both to reset the sails for the new bearing and to be alert as the boom swings over the deck. On smaller boats, crew members also might need to shift their weight to the windward side of the craft to help prevent it from capsizing.

If you are the boat's captain, the steps involved in tacking are these:

- ① Announce “Ready about!” and then give your crew the time they need to position themselves for the maneuver.
- ② When you are certain all is in readiness, shout “Tacking!”
- ③ If the boat has a jib, release tension on the lines controlling it.
- ④ Instruct crew members to switch sides on the boat.
- ⑤ Move the tiller or turn the wheel *toward* the boom to turn the bow of the boat through the no-sail zone. Crew members must be alert to avoid the boom as it swings over the cockpit.
- ⑥ Trim the sails and set out on the new heading.



### **Caught in Irons**

A boat beating too close to the no-sail zone, or one moving too slowly through that zone while tacking, might stall as the wind comes directly over the bow and renders the sails useless for making forward progress. This situation, known by the traditional sailing term *caught in irons*, can be frustrating, to say the least.

To get out of irons, loosen the mainsail and, if you have one, extend the jib to one side or the other. The wind will push the bow toward the side on which the jib is set. Once the bow clears the no-sail zone, trim the mainsail and continue on your way. If the boat has no jib, loosen the mainsail, then move the tiller or turn the wheel hard to one side and wait for the wind to push the bow out of the no-sail zone.

### **Jibing**

Tacking involves turning *into* the wind. *Jibing* is a maneuver that changes the boat's heading from starboard to port as the boat is running (sailing downwind). The boom will be extended far out from the boat, and can swing back and across the deck with a suddenness that sailors must anticipate in order to keep themselves out of harm's way.



- ❶ If not already on a run, gradually adjust the bearing of the boat until the wind is almost directly behind it.
- ❷ Shout the command “Prepare to jibe!” Anticipate the maneuver so that your crew will have time to get themselves ready to do whatever needs to be done.
- ❸ Shout “Jibing!” and move the tiller or turn the wheel *away* from the boom to turn the boat toward the new bearing.
- ❹ Shorten the line attached to the boom to move it toward the deck as wind pressure on the sail lessens, then ease the line out as the boom swings over the cockpit and the sail begins to refill.
- ❺ Trim the sails for the new bearing. In smaller boats, crew members should move to the other side to improve the balance of the craft.



## Righting a Small Sailboat

Many sailboats are small enough and light enough to capsize on occasion, especially as you are learning sailing maneuvers. Be prepared for this by practicing the following steps:

- ❶ Loosen the sheet to free the mainsail, then climb or swim around the hull so that you can put your weight on the centerboard.
- ❷ As you grasp lines or the edge of the deck, gently push down on the centerboard with your feet.
- ❸ Pull the boat upright.
- ❹ Get yourself and everyone else back on board before turning your attention to bailing out the boat and resetting the sail.



1



2



3



4



## Leadership and Sailing

A crew on a sailboat must carry out many tasks that require cooperative effort. The responsibilities of each crew member often are obvious, though at times someone must call for quick action. The most experienced sailor often serves as a boat's captain, exercising authority when decisions must be made. In some cases, though, a person with outstanding leadership skills may guide the crew with the support and advice from crew members with more seamanship experience. Likewise, a crew member learning to sail might serve as a boat's captain, mentored by an experienced sailor prepared to step in and take command if situations arise that are beyond the skill of the novice.

Human waste and litter should be properly disposed of at the next port in facilities designed for that purpose, never tossed overboard. Leave No Trace applies to sailing similarly to other outdoor activities.

Even when a crew is composed of no more than two or three people, leadership can become a critical issue. A chain of command should be worked out before a crew leaves dry land.

For more on responsibilities of crew members and leaders, see the chapters titled "Organizing for Adventures" and "Outdoor Leadership."

Several knots familiar to Scouting take their name from sailing terms, such as the *bowline*, which is named after the front end (*bow*) of the boat, and the *sheet bend*, which comes to us from both the bend formed in one of the ropes and from *sheet*, a nautical term for a line used to haul a sail.

## Setting a Lifelong Course

The way to become proficient at sailing is to go sailing. Have fun, learn from your mistakes, and seek out opportunities to learn from others.

Sea Scout units provide terrific opportunities for mastering the basics of sailing and enjoying plenty of time on the water. (See the *Sea Scout Manual*.) Many Venturing crews also specialize in sailing as one of their primary activities. Sailing clubs, community colleges, and universities around the country offer courses in sailing and opportunities for young people to join sailing crews.

*"You'll need a modicum of sailing aptitude,  
some grasp of mechanical concepts,  
and a willingness to pitch in and work.  
Most veteran world sailors fall into the  
classification of restless adventurers who  
are always looking at distant horizons."*

—Hal Roth (writer, photographer, and worldwide sailor),  
*After 50,000 Miles*, 1977



# CHAPTER 20



## Be Prepared

Always wear a helmet.  
Bring water, food, an  
extra tube, pump, and  
patch kit & know how  
to use them.





## Bicycle Touring and Mountain Biking

*"The flying abandon of a bicycle, legs pumping, body and wheels skimming above the land, cycling for the sake of cycling, because it felt good in my body, because the drip of salty sweat, the deep, rhythmic breathing, the stretching, pushing muscles were pure and cleansing and glorious."*

—Erika Warmbrunn, *Where the Pavement Ends*, 2001 (An actor, writer, and Russian translator, she pedaled solo across Mongolia, China, and Vietnam.)



Bicycling is human-powered adventure at its best. The whir of spoked wheels and the click of a chain are sounds of independence, of possibility, and of the potential of the open road. On bike tours of a few days, weeks, or even months, you and your group can pedal anywhere from the Pacific to the Atlantic, and from the Florida Keys to the northernmost point in Alaska. Mountain bikes also offer the means for you to journey away from well-traveled routes. With a clear understanding of Leave No Trace principles, you can find hours of challenge and fun on quiet backroads and on durable trails designated for cycling.

*Bicycle touring* is an act of chasing the horizon. The goal is to move forward, feeling the Earth roll beneath your wheels as the landscape flows past on either side. *Mountain biking*, on the other hand, is a vertical pursuit highlighted by demanding climbs and steep downhill runs. At times, riders might even become airborne to clear an obstacle, or just for the sheer delight of two-wheeled flight.

This chapter takes a look at the basics of bicycle touring and the essentials of mountain biking, providing guidelines for you to make the most of cycling opportunities in ways that are safe, fun, satisfying, and environmentally responsible.

## Fitting a Bike

Like hiking boots, bicycles for touring or mountain riding must fit well if you are to get the best use out of them. An experienced bicycle salesperson can help you select a bike matched to the size of your body. With your feet flat on the ground, you'll want to be able to straddle the top tube of the bike frame with a couple of inches to spare, and you'll need to be able to reach the handlebars comfortably when you are seated in the saddle. Adjust the height of the saddle so that your leg will be slightly flexed at the low point of each pedal rotation.

Another way to find a bicycle that fits is to measure the inside of your leg from your inseam to the floor and subtract 10 inches. The figure you get is the approximate frame size of the bike you should have. Don't confuse frame size with the diameter of the wheel; most bikes have 27-inch wheels regardless of the size of the frame.



### Bicycle Helmets

Put on a bicycle helmet every time you step into the pedals. Your helmet must be designed specifically for cycling; have ANSI, SNELL, or ASTM certification; and fit well. With the strap secured, you shouldn't be able to push your helmet very far forward, backward, or sideways.





## Bicycle Touring

Plan a bicycle tour and you'll find yourself and a group of your friends setting out to discover the world one turn of the pedals at a time. Your two-wheeled adventures can start right outside your door and might lead to the far reaches of the continent.

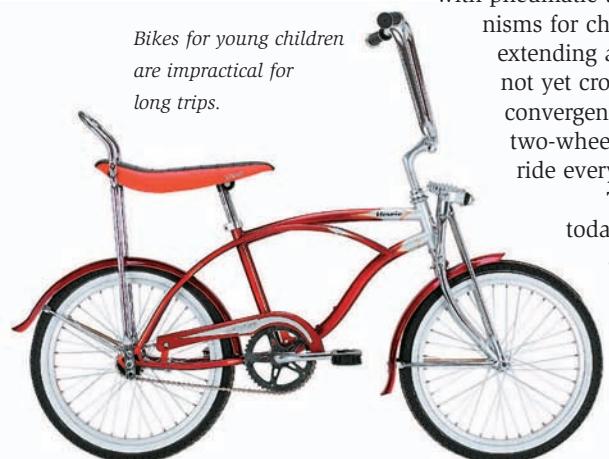
Along the way, you are sure to be traveling in the tracks of many who pedaled before you, as long-distance cycling has a long tradition in the story of adventure travel.

Bicycle touring in America dates back to the 1890s, a golden age of cycling. "Boneshaker" bikes with steel wheels and the "regular" bikes with a huge front wheel were giving way to modern safety bicycles equipped with pneumatic tires, efficient brakes, and mechanisms for changing gears. Passable roads were extending across the United States but were not yet crowded with motor vehicles. This convergence of factors led to an explosion of two-wheeled activity as cyclists set out to ride everywhere their bikes could take them.



*Boneshaker, a nineteenth-century ancestor of today's efficient bikes*

*Bikes for young children are impractical for long trips.*



The impulse to ride is as strong today as it was more than a century ago. What has changed is the equipment available to make touring journeys easier, and the fact that there are more places than ever to explore on two wheels.

## Touring Bikes

Almost any bicycle will get you a few miles down the road on a sunny day. When you begin setting your sights on more distant destinations, though, a touring bike of the right size can maximize your pedaling efficiency and riding comfort.



### Touring Bike Frame

Bicycles devoted to touring are built with stiff, lightweight frames that allow an effective transfer of power from the pedals to the wheels.

### Drop Handlebars

The drop handlebars on touring bikes offer riders a variety of hand placements, allowing them to lean over the frame in the most efficient position for pedaling.

### Pedals

Clipless pedals and pedals with toe clips position a rider's feet for optimum pedaling power. A *toe clip* is a metal or plastic cage set atop a pedal. Slip the toe of your shoe into the toe clip and tighten the strap over the arch of your foot. Rather than a cage, a *clipless pedal* relies on a shoe-sole cleat matched to a spring-loaded pedal fitting. Click the cleat into the pedal and you're on your way. To release the clip, turn your heel sharply outward and the cleat should snap free.



Pedals with toe clips



Clipless pedals



## Ankling

With your shoes secured by toe clips or clipless pedals, you can push down on a pedal, then pull it back, up, and over. Known as *ankling*, the maneuver allows you to apply power throughout the full rotation of the chainwheel.



## Derailleurs

Most touring bikes feature *derailleur gears* controlled by levers on the handlebars or on the bike frames. The rear hub of a typical touring bike has five gearwheels. Shifting the rear derailleur moves the chain from one toothed wheel to another, offering a rider five gear options. The larger the gearwheel, the farther the chain must go on each revolution, resulting in easier pedaling at the cost of shorter forward progress.

The front derailleur of a touring bike moves the chain among two or three gearwheels set around the pedal crank. If there are two front gearwheels and each can be used with the five rear gearwheels, the bicycle has a total capacity of 10 gears—thus, a 10-speed bike. Add a third front gearwheel, and it becomes a bicycle with 15 speeds.

Derailleur mechanisms shift gears most efficiently when the pedals are turning and the chain is in motion. Experiment as you ride to find the gear combination that feels right for the moment. Expect to shift often so that you can maintain a steady, sustainable pedaling cadence even as terrain, wind, and your energy level alter. Anticipate changes and shift to a new gear before you need to apply full pressure to the pedals.

## Brakes

On most touring bikes, *caliper brakes* slow momentum by squeezing the wheel rims with brake pads. Brakes in good working order can stop a bike very quickly. Use the front and rear brakes at the same time, gradually increasing the pressure on the levers to slow the bike smoothly. Stopping with only the rear brake might be less effective than you want, while using the front brake by itself might cause the wheel to seize and send you flying over the handlebars.



### Packing a Touring Bike

A small pack attached to the back of the seat, or a fanny pack around your waist, may offer enough capacity for you to carry your lunch, some extra clothing, and a bicycle repair kit. One or more water bottles in cages attached to the frame will round out your basic outfit for day rides. Many touring bicycles have mounting points for attaching racks for *panniers*—packs for bikes—to stow camping gear for more extended travels. Panniers should fit securely with no chance of swinging loose as you pedal. They should be set low on the bicycle so that their weight will not upset your balance.

Just as backpackers shed all the weight they can from their packs, bicycle tourists will want to carry only what they need. A lightweight tent and sleeping bag, a backpacking stove, rain gear, and adequate clothing that can be layered for warmth will form the heart of your long-distance touring outfit. Conduct a shakedown before each trip to help you eliminate unnecessary items. Unlike wilderness journeys, you often can buy food each day along the route of a bicycle tour. That can simplify menu planning and offer the option of preparing meals with plenty of fresh, nutritious ingredients.

Rather than stowing your tent inside a pannier, you can strap it on top of your bicycle's rear fender. Your sleeping bag can go on the fender, too, but protect your sleeping gear from rain by lining its stuff sack with a plastic trash bag. A handlebar pannier will give you quick access to items you will want during the day, and it might have a clear, waterproof pocket

built into the top flap for holding maps. If that's not the case, slip your map into a self-sealing plastic bag and carry it where you can get it out without leaving the saddle.

For more on deciding what to carry while bicycle touring, see the chapter titled "Gearing Up."

### Touring Bike Techniques

A fully loaded touring bicycle handles differently from one without the weight of provisions and gear. Get used to controlling your bike by riding it in a parking lot or other area free of traffic. Notice, too, if anything is loose. Your touring bike and all your gear should be a tight unit with nothing shifting around except the derailleurs, and those only when you are changing gears.

Once you and your group are on the road, settle into a pedaling rhythm that you can maintain over the miles. In most cases, you will want to ride single file on the far right side of the road. Tucking in just behind the rider in front of you, a technique called *drafting*, will draw you along in the windbreak formed by the first rider's bike and body. Riders can take turns in the lead position, especially when riding into a headwind.

Keep an eye on the weather. Rain, fog, and mist can make roads slippery. They also can impair the vision of the motorists with whom you share the road. If conditions are not conducive to riding safely, seek shelter and wait out the storm.

Hills shouldn't discourage you too much if you gear down, stay in the saddle, and keep your pedaling cadence steady. Control your speed on descents by braking occasionally, applying pressure evenly to both brake levers. A headwind can be as demoralizing as a tailwind is refreshing. Shift into a low gear when the wind is in your face, keep up your cadence, and be patient. In both wet weather and dry, approach railroad tracks, bridge joints, and other potentially slippery road obstacles at a perpendicular angle, slowing to make a controlled crossing.



## Hand Signals



Right turn



Stopping



Left turn

## Bicycling Road Rules

Consider yourself to be a part of the traffic. Obey all regulations that apply to motorists, and do everything you can to make it easy for drivers to see you and to pass safely. Learn and follow these common sense safety and courtesy guidelines:

1. Stay close to the right side of the road.
2. When riding abreast, be ready at all times to merge back into single file.
3. Don't delay traffic.
4. Plan routes that avoid busy roads.
5. Ride defensively. Be visible and anticipate the actions of motorists, pedestrians, and other cyclists.

### ***Seeing and Being Seen***

Make yourself clearly visible with brightly colored clothing. An orange fluorescent construction-worker vest, reflectors, and lights are a good idea, too.

A mirror attached to your handlebars or helmet can give you a sense of what's happening behind you. Even more important, though, are listening carefully for approaching traffic and glancing over your shoulder now and then to see what traffic might be overtaking your group.





## Mountain Biking

Mountain biking can take you along back-country roads and designated trails into the rugged terrain beyond the pavement. Today's riders are fully embracing the responsibilities that come with the opportunity to pedal away from highways and other paved routes. They are riding only on trails and backroads where cycling is appropriate, and are sharing those pathways with hikers, horseback riders, and other outdoors enthusiasts in ways that present mountain biking in a positive light. Most importantly, these riders are protecting the environment by making good decisions about where, when, and how they ride.

Used wisely, a mountain bike can be a wonderful vehicle for exploring rural roads and designated trails. Ridden thoughtlessly, though, a mountain bike has the potential to cause serious environmental damage and to spoil the experiences of other backcountry users. Making the right choices about where, when, and how to ride will help ensure that roads and designated trails will stay open for you and other riders to enjoy in the future.

### Where and When to Ride a Mountain Bike

Two words are at the heart of mountain bike routes—*designated* and *durable*.

*Designated* routes are those that land management agencies have deemed appropriate for mountain bikers to use. Find out which trails are designated by checking at agency offices or Web sites, or by asking at local bicycle shops. Agencies often provide maps with mountain bike routes highlighted. Signs at trailheads also can give clear indications of the trails that you can ride.

### INTERNATIONAL MOUNTAIN BICYCLING ASSOCIATION RULES OF THE TRAIL

- 1. Ride on open trails only.**
- 2. Leave no trace.**
- 3. Control your bicycle!**
- 4. Yield to other trekkers.**
- 5. Never scare animals.**
- 6. Plan ahead.**



Even more important than finding designated routes is learning which trails are off-limits to bike riders, and then avoiding them. Trails might be closed to bicycles for any number of reasons: fragile surfaces, heavy use by other outdoor enthusiasts, wet weather, wildlife issues. Respect all trail closures by staying off trails not specifically designated for mountain biking.

*Durable* mountain bike routes are trail surfaces that are hard, dry, and able to withstand the impact of many bicycles passing over them. When you set out on a designated mountain bike trail, your responsibilities to protect the environment still rest on the decisions you make with each turn of the pedals.

#### ***Leave No Trace Mountain Biking***

Avoid muddy trails. The tread of mountain bike tires can churn up wet earth, gouging out tracks that can lead to erosion and trail degradation. Leave your mountain bike at home when the weather is wet. If an otherwise dry ride brings you to a muddy stretch of trail, it might be best to dismount and walk your bike through it. Don't detour by riding on the edges of the trail, though—that can break down the soil and vegetation, causing unnecessary widening of the trail.



Stay on the trail. Resist the temptation to take shortcuts down hill-sides. That's a sure invitation to erosion and to the closing of areas to future mountain biking. Go all the way around trail switchbacks, making your turns in a controlled manner that prevents the wheels from skidding and causing damage to tread surfaces.

## Mountain Bikes

Mountain bikes first appeared in California in the 1970s and early 1980s. Early mountain bikes were simply regular bicycles that riders wheeled up and down steep trails. Over time, the bikes have become sturdier and more fun to ride, evolving into machines that are distinctly different from the bikes used for touring or for riding around town.

### **Mountain Bike Frame**

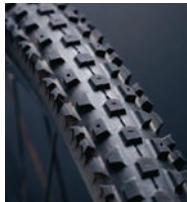
In order to absorb the impact of rough roads and trails, the frames of mountain bikes are not as stiff as those used for touring. Advanced mountain bikes are equipped with suspension springs and flexible joints for diffusing the force of hard riding on rugged terrain.

### **Straight Handlebars**

Straight handlebars will help you maintain the most effective body positions for climbing, descending, and negotiating obstacles.

### **Knobby Tires**

Mountain bikers often choose tires with knobby tread patterns because they are ideal for gaining traction without spinning out and are just right for creating maximum braking power.



### **Pedals**

The clipless pedals of many mountain bikes will keep your feet positioned even when the going gets crazy. Harder to tighten and to release, toe-clip pedals are less popular among riders.

### **Brakes**

The brakes of most mountain bikes are caliper brakes similar to those found on touring bicycles. Use both brakes to slow your bike, but rely more on the rear brake during descents. Clamping down hard on the front brake alone might cause you to overturn.





## Mountain Bike Techniques

### **Body Position**

Mountain bikes are built to withstand tough territory, but the real suspension system of mountain biking is a rider's body. Stay relaxed and ride with your knees and elbows flexed to dissipate jolts from the bike. By moving forward or backward over the seat, you also can shift your weight from one wheel to the other. This ability to *weight* and *unweight* the wheels plays a major role in handling a mountain bike as you climb and descend trails and negotiate tight turns.

### **Climbing**

Mountain bike gearwheels offer a high ratio of power to distance, allowing you to crank steadily up slopes even when your speed is very slow. Lean into the handlebars as a route steepens, and keep your weight hovering above the seat. If the rear wheel begins to lose traction, move your body back to put more weight over that wheel. Stalling out during a climb means you might need to twist a foot out of a pedal, so anticipate the gears you will need and shift the derailleurs while you are on the move.

### **Descending**

Controlled descents on a mountain bike involve more than simply pointing the front wheel down a road or trail and letting go of the brakes. Shift your body position so that your weight is over the back wheel—the steeper the route, the farther back your weight should be. That will provide the most stability as you ride and can maximize the stopping power of your brakes. Scan the route ahead, envisioning where you want to go rather than locking your eyes onto obstacles that you want to avoid. Ride no faster than the route, your level of skill, and the presence of other trail users will allow.



### Rollovers

Mountain bikers often get past logs, water bars, and other low obstacles simply by rolling over them. Keep up your speed as you approach an obstacle and shift your position to weight the rear wheel. As the bike rolls over the obstruction, don't touch the front brake—that could send you hurtling over the handlebars. Grip the handlebars so that they can't twist out of your grasp when the front wheel reaches the obstacle.

### Bunny Hops

To overcome an obstacle too high to roll over, try going airborne with a bunny hop. Flex the frame as you approach by pushing down on the handlebars, then spring the bike upward, lifting the front wheel with the handlebars and the back wheel with your body. Keep your weight shifted toward the rear, and don't touch the front brake as you come down. Land on the back wheel first.



### Trackstand

Now and then you will want to stop your bike for a moment to size up the route ahead. Performing a *trackstand* allows you to do that without taking your feet off the pedals. Learn to do a trackstand by aiming your bike up a slight slope. Rotate the pedals until they are level, and turn the front wheel a little to one side of the bike. Standing in the pedals, hold the bike in position with enough weight on the forward pedal to prevent the bike from rolling backward, but not so much pressure that the bike moves forward.

### Upsets

Occasional extremes of mountain biking make tumbles a possibility. Minimize that risk by riding in a controlled manner with your full attention on the route ahead. A helmet is essential for every mountain biker, and cycling gloves will help protect your hands. If you do go down, tuck your body and roll to absorb the impact of your fall rather than trying to catch your weight with straight arms. Stay with the bike if you can—it might absorb some of the impact to your body.



## Bicycle Care and Repair

Among the great pleasures of bicycling is learning to maintain and repair your own machine. Local cycling clubs often offer opportunities for learning bicycle mechanics, and some cycling stores present classes in tuning up bikes, trueing wheels, and making other adjustments. Experienced riders in your group also can be storehouses of information as you master the art of bicycle repair.

Whether you do your pedaling on mountain trails or open roads, keeping your bike in top mechanical condition will add to the joy of every journey. A well-tuned machine also is much less likely to break down when you are miles into a ride. The maintenance concerns are the same for both mountain bikes and touring bicycles, and many of the mechanical difficulties you encounter in the field can be resolved, at least long enough for you to get home, by using a bicycle pump and the contents of a repair kit carried in your panniers, a fanny pack, or a small pack attached to the saddle.

<b>Repair Kit</b>	
	<b>Screwdrivers sized for your bicycle's various screws</b>
	<b>Allen wrenches and box wrenches to fit your bike's nuts and bolts</b>
	<b>Chain rivet extractor</b>
	<b>Spoke wrench</b>
	<b>Chain lube</b>
	<b>Tire patch kit</b>

## Pre-Ride Mechanical Check

Look over your bike before a ride to be sure everything is in order. Some of the items you will want to check follow:

### **Brakes**

Squeeze the brake levers to ensure that the brake pads will securely grip the wheel rims. Brake pads should be clean and not badly worn. The cables controlling the brakes should not be frayed or damaged.

### **Chain**

The chain should be clean and properly lubricated to prevent squeaking and excessive wear. Apply a good lubricant to the moving chain as you turn the pedals backward, then wipe off any excess with a rag.

### **Gears and Derailleurs**

Derailleurs and the cables controlling them must be free of road grit. Run through the gears as you begin pedaling to be sure that you can click smoothly into all combinations of front and rear gearwheels.

### **Wheels**

Feel for loose spokes, then spin each wheel and watch the rim to see that it spins true. Any wobble needs to be corrected in the shop.

### **Tires**

Press down on each tire with your hand to get a general idea of whether or not there is sufficient air pressure for a ride. Better yet, use a pressure gauge. Keep tires inflated to the pressure noted on their sidewalls.

### **Patching Tire Punctures**

An absolute truth of bicycling is that flat tires happen. Carry a patch kit and perhaps even a spare tube, and you'll be ready to repair most tire damage and quickly get back in the saddle.



*"As a kid I had a dream—I wanted to own my own bicycle. When I got the bike I must have been the happiest boy in Liverpool, maybe in the world. I lived for that bike."*

—John Lennon (1940–1980),  
British cyclist and member  
of the Beatles rock group



### Post-Ride Bicycle Care

The end of a ride might be the best time of all to attend to the mechanical needs of your bicycle. Checking and tuning up your bike right away means it will be ready to go the next time you want to hit the road or the trail. You also can deal with any time-consuming mechanical problems that you discover.

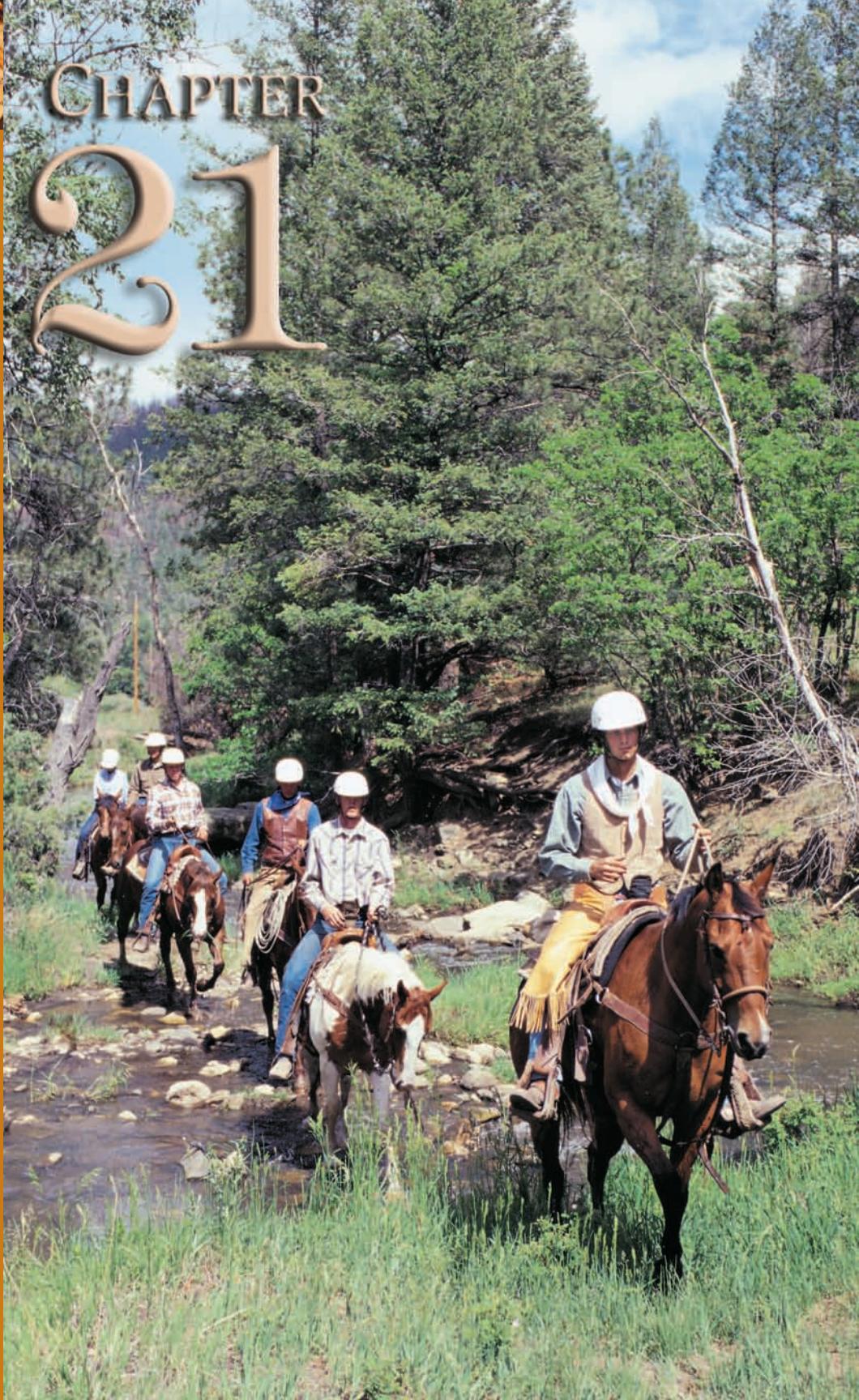
Clean mud and grit from your bicycle and, if necessary, lubricate the chain. Test bolts, screws, and fittings to see that everything is secure. In addition to examining derailleurs and brakes, pull sideways on the wheels and the pedal crank to ensure that there is no play in the hubs and bearings.

Lastly, store your bike in a safe, out-of-the-way place, but don't expect it to stay there very long. The whir of wheels against the highway and the thrill of pedaling hard up a mountain trail are temptations you won't be able to ignore for long.





# CHAPTER 21



# Riding and Packing

*"The surest thing there is is we are riders,  
And though none too successful at it, guiders,  
Through everything presented, land and tide  
And now the very air, of what we ride."*

—Robert Frost (1874–1963), American poet



Explorers, mountain travelers, American Indians, miners, cowboys, soldiers, and settlers all have used horses and pack animals, and for good reason. The animals increase by many miles the distances that travelers can cover, and allow them to haul heavy loads over rough terrain. Today, you can swing into the saddle, touch your heels to a horse's sides, and know the pleasure of riding. You can feel the confidence that comes with knowing how to groom a horse, saddle it, and care for it in the stable and on the trail. You can learn to manage mules and burros, too, getting to know their habits as they carry your provisions and gear on extended treks.

Much of the American outdoors can be enjoyed on horseback and with pack animals. A successful trip requires sound planning, dependable livestock, and a commitment to using the principles of Leave No Trace. Veteran horse handlers can give you guidance as you learn the ways of saddle and pack stock, and to get you equipped.

Members of a Philmont Cavalcade ride horseback over some of Philmont's most scenic trails. Designed for chartered troops or Venturing crews, Cavalcade participants acquire riding and packing skills long in use in the American West. The final day of the eight-day Cavalcade is spent in competition at an equestrian gymkhana.





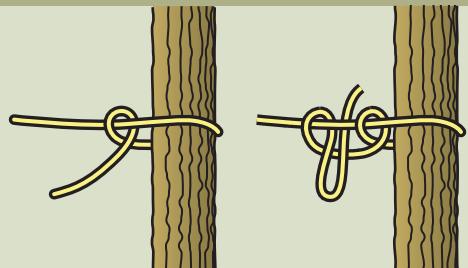
## Horses

For much of human history, horses provided the fastest means by which anyone could travel. Horses were introduced to North America by Spanish explorers, rapidly becoming an indispensable means of transportation for many American Indians, explorers, settlers, and wilderness wanderers. The traditions and techniques of those riders have been passed down through the centuries, forming the basis of the ways in which humans and horses still relate to each other.

A calm, reassuring voice can be one of your best tools for dealing with horses and pack animals. So can an understanding of the ways in which horses perceive the world. Each horse has its own set of preferences and habits. Perhaps it is shy about gates, doesn't want to be approached from a certain direction, or likes to have its nose rubbed. Moving objects might alarm a horse until it is able to identify them, usually with its keen senses of hearing and smell. When horses feel threatened, their first instincts are to run or to fight. On the other hand, horses will respond well to your confidence, kindness, and quiet authority and, over time, likely will come to trust you and be willing to work easily with you.

### **Quick-Release Hitch**

Use a quick-release hitch when tying the lead rope of a saddle horse or pack animal. The hitch will hold even if the animal pulls against it, but unties easily when you tug the end of the rope.



## Bridling and Saddling

Getting a horse ready for the trail will become second nature after you've done it several times, especially if you've mastered that skill with the help of experienced wranglers. Begin by catching your mount, slipping the halter over its nose, and leading it to a hitch rail near the tack room or saddle shed. Tie the lead rope to the rail with a quick-release hitch, then use a curry comb and brush to groom the horse's back, sides, and belly. Remove any dirt, sweat, and matted hair by combing in the direction that the hair naturally lies. Lift and inspect the hooves, cleaning them if necessary with a hoof pick, and check for loose shoes.

### Saddle

The Western stock saddle is the most versatile saddle for trail riding. Rugged enough to take a hard pounding, the saddle has a shape that helps a rider stay seated on steep climbs and descents. Sturdy blankets or pads placed beneath the saddle help to cushion and protect the horse's back.

### TACK

**The gear used for preparing a horse to ride is called *tack* and includes a saddle, bridle, and halter.**



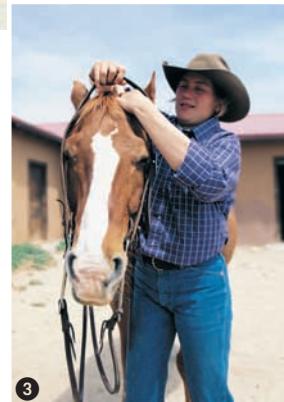
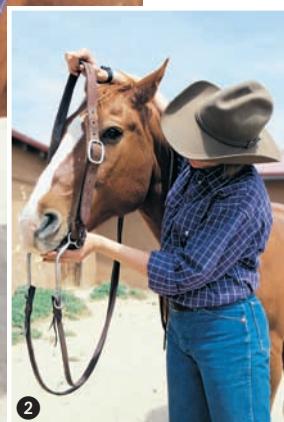


### ***Halter***

A halter with a lead rope is used to control a horse—to lead it around or to tether it for brief periods, such as for grooming, bridling and saddling, or hoof care. For trail trips, leave the halter on your horse before bridling; then, you can snap the lead rope onto it and use that to tie your mount to hitching posts. (A horse should not be tied with the reins; if the animal spooks and jerks its head, it can break them.)

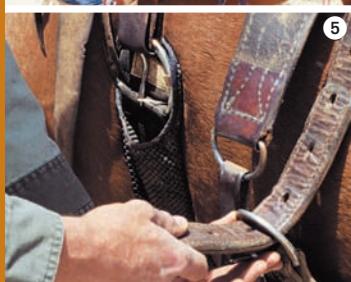
### ***Bridle***

A bridle consists of a headstall, bit, and reins, and is used to control and guide a horse from its back. Bits come in various shapes and sizes to match the age, experience level, preference, and training of different animals.



### Bridling a Horse

- ① Working from the left side of the horse, put the reins around the horse's neck. Hold the top of the bridle in your right hand and the bit in your left.
- ② Without bumping the teeth, ease the bit into the horse's mouth and pull the headstall over its head. Be gentle with the horse's ears.
- ③ Pull out the forelock, straighten the brow band, and buckle the throatlatch.



### **Saddling a Horse**

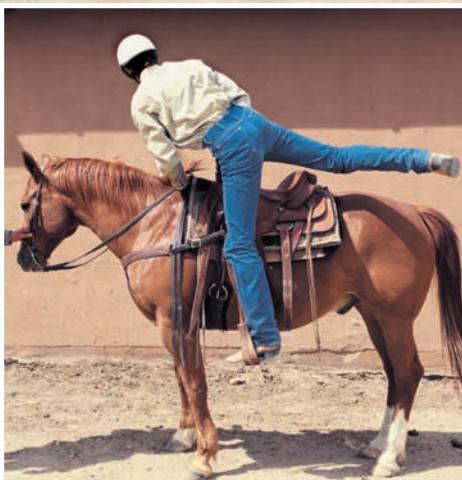
- ❶ Use a curry comb and brush to remove dirt, sweat, and matted hair from the horse's back, sides, and belly.
- ❷ Position the saddle blankets or pads well forward on the horse's back. The hair beneath must lie flat.
- ❸ Lift the saddle onto the blankets or pads and shake it into position. Straighten the cinches on the far (right) side of the horse.
- ❹ On the near (left) side, place the stirrup over the saddle seat and reach under the horse for the front cinch ring. (Note: Another option is to hook the stirrup over the saddle horn to prevent it from slipping.) Thread the latigo twice through the cinch ring and rigging ring, then pull it snug and secure it.
- ❺ Buckle the rear cinch just tightly enough to be snug against the horse's belly.
- ❻ Buckle the breast collar onto a near-side rigging ring, snap the lower strap into the center ring of the cinch (6a), then buckle the other end of the breast collar onto a far-side rigging ring.

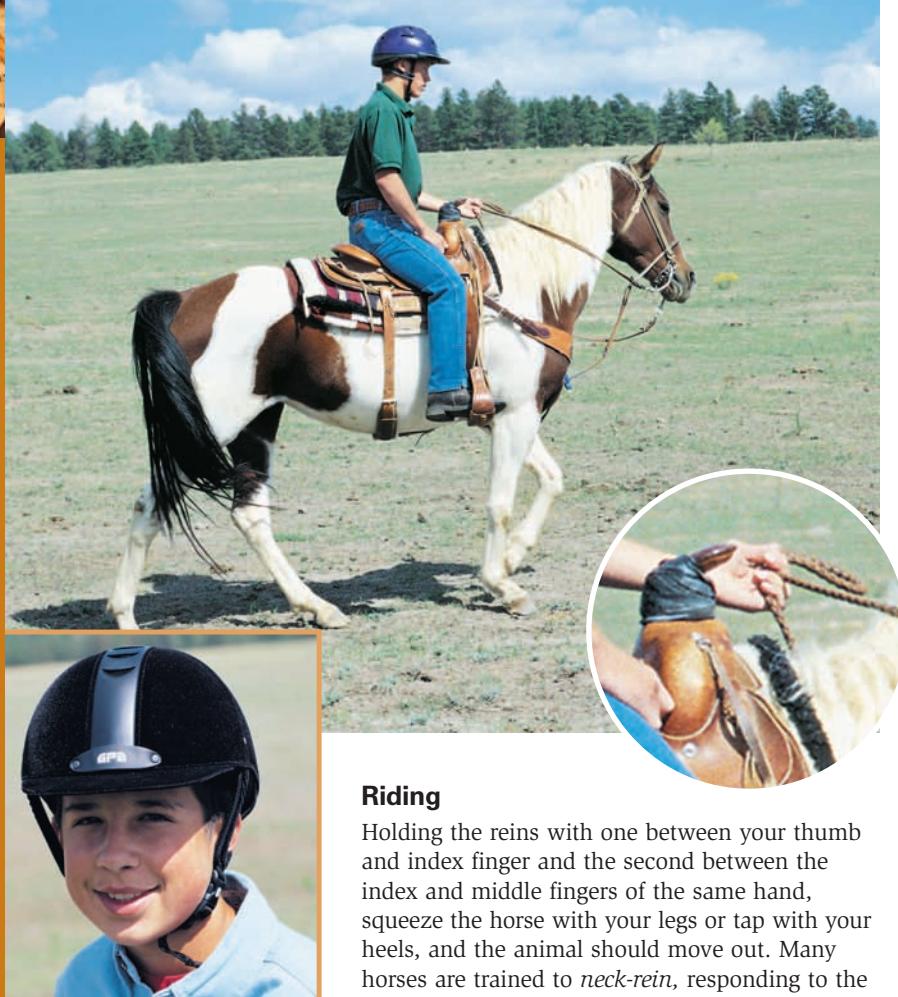




### Mounting a Horse

First, check the front cinch and retighten it if necessary. Then, standing on the horse's left side, grasp the reins around the animal's neck in front of the saddle horn, holding them short enough in your left hand so that you can control the horse if it should move while you are mounting. With the same hand, grab some of the horse's mane. Use your free hand to position the left stirrup and guide your left foot into it, then grasp the saddle horn and step up in the stirrup. Swing your right leg over the horse and ease yourself into the saddle. The balls of your feet should rest in the stirrups with your heels slightly lower. You might need to dismount and adjust the length of the stirrups if they are too long or too short.





#### **RIDING HELMET**

**Riding helmets are growing in popularity, and are strongly recommended to help protect horseback riders from head injury. A helmet must be correctly sized, adjusted, and always worn with the chin strap secured.**

#### **Riding**

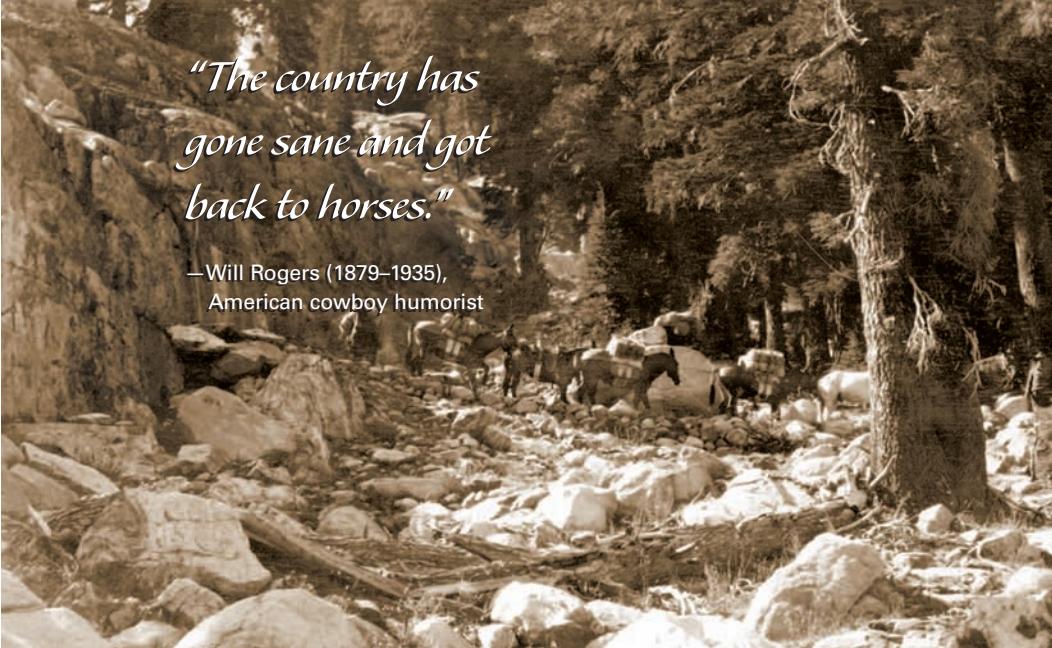
Holding the reins with one between your thumb and index finger and the second between the index and middle fingers of the same hand, squeeze the horse with your legs or tap with your heels, and the animal should move out. Many horses are trained to *neck-rein*, responding to the pressure of reins against their necks. To turn left, move the reins to the left and touch the horse's neck with the right rein. For a right turn, move the reins the other way. To stop, pull back lightly on the reins and then release the pressure. The bit serves only to cue the animal; too much force on the reins can cause pain and perhaps injury.

Match the speed at which you ride with the terrain you are covering. Allow your horse to walk when the grade is steep or rocky, and whenever you are leading pack animals. To ride up a steep grade, stay seated in the saddle but shift your weight forward so that the horse bears more of your weight with its shoulders and front legs. When riding downhill, lean back in the saddle. You can let the horse lop across level ground where the footing is sure. On a long day's ride, get off your horse and walk now and then to give the animal a breather.



*"The country has  
gone sane and got  
back to horses."*

—Will Rogers (1879–1935),  
American cowboy humorist



## Pack Animals

No history of the American West is complete without the image of prospectors making their way through the mountains, their pack animals loaded with shovels, hardtack, beans, and maybe even a poke of gold. Mules, burros, and pack horses provided the power to move settlers across the continent, pull the plows of farmers, and transport the supplies of soldiers and trappers as well as prospectors.

You'll probably get your first taste of working with pack animals under the watchful eyes of veteran packers. They might begin by explaining that a burro is a species that can reproduce its own kind, while a mule is a sterile cross between a male burro and a female horse.

## Equipment

Pack animals need saddles if they are to carry heavy loads. The most common pack saddle is the *sawbuck*, named for its resemblance in appearance to the wooden stand used to hold logs for sawing. Each saddle is shaped to fit a particular size of animal. The saddle will be rigged with a double cinch to keep it and its load on the animal, and a breast strap and back breeching to prevent the saddle from sliding backward or forward.



*Sawbuck saddle with panniers*

A pack animal is groomed and saddled in much the same way as a saddle horse, the sawbuck resting on two or three saddle pads and the cinch pulled tight. The breast strap and breeching should be snug, but not so tight that they hamper the animal's movement. A pack animal doesn't wear a bridle; a hiker or horseback rider can control it with a halter and a lead rope.

### Llama Packing

Wooly haired natives of South America, llamas are being used with increasing frequency as pack animals on North American trails. They are easy to handle and train, and they travel at a pace comfortable for most hikers. Even though their foot pads cause less environmental impact than do the hooves of horses and mules, llamas must be managed according to the same principles of Leave No Trace.



### Packing Up

Pack horses and mules can carry up to 180 pounds each, a llama can carry 90 pounds, and a burro can haul about 60 pounds. Even though pack animals might be able to bear much more weight than you can, keep their loads light. There's no reason for them to haul equipment you don't really need. A smaller load makes it safer for the animals to travel rugged trails, and will ease your challenge of following the principles of Leave No Trace.

Provisions and gear are commonly stowed in *panniers*—wooden or plastic boxes, or large leather or canvas bags designed to hang by loops from a sawbuck. Use a scale hung from a tree branch or fence rail to check pannier weight. Each pannier in a pair should weigh the same, since an unbalanced load can cause the sawbuck to slip or rub sores into an animal's back. Pack provisions and gear in such a way that nothing will rattle. Strange noises coming from a pannier can spook even the steadiest trail animal.

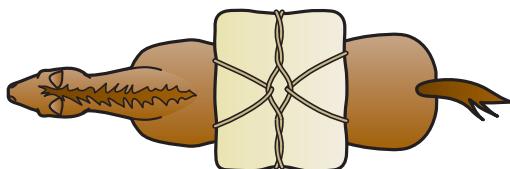
### Clothing

The traditional clothing of the American cowboy evolved over many years to serve the needs of horseback riders. A long-sleeved shirt and long denim pants will guard you against the sun and dust. The wide brim of a cowboy hat will shade your face and keep rain from running down your collar. A bandanna around your neck can be pulled over your mouth and nose when the trail becomes dusty. The pointed toes and slick soles of traditional Western boots evolved to slide easily into and out of saddle stirrups. Avoid riding while wearing boots with big soles that could get caught in the stirrups.

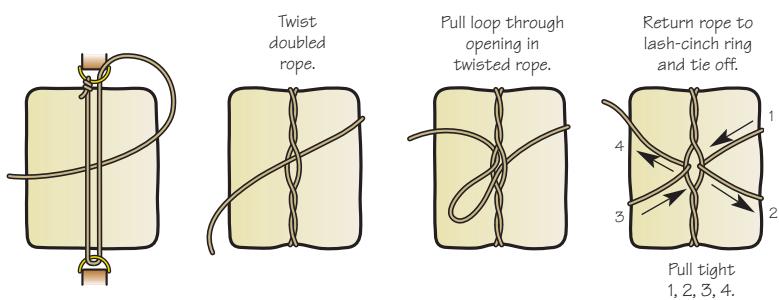


### Loading Panniers on a Pack Animal

- ① Set a balanced pair of panniers on a sawbuck so that they hang evenly. Place tightly rolled tents, sleeping bags in stuff sacks, and other soft baggage on top of the saddle.
- ② Position a tarp over the load and tuck the ends under the panniers.
- ③ Toss a lash cinch over the load and pull the end under the animal's belly. Keeping the rope taut, secure the load with a diamond hitch.



*Diamond hitch*



Pull tight  
1, 2, 3, 4.

### Mantie Loads

Another traditional means of packing grub and gear is to form *mantie loads*. Mantie loads offer greater flexibility than panniers for securing odd-sized equipment, and are ideal for food supplies packed inside square plastic buckets with snap-on lids. Items are placed on a tarp, then folded into a tight bundle and tied with a mantie rope.

### On the Trail With Pack Animals

If you will be riding, you might find it most convenient to mount your horse and then have a partner hand you the lead rope of your pack animal. Hold the rope in your hand as you travel, or give it one loose wrap around the saddle horn, but *never* tie it to any part of the saddle or wrap it around your hand in such a way that it will not easily come loose.

When leading several pack animals, tie the lead rope of one animal to the pack saddle of the animal in front of it. Keep each lead rope short enough so that the animals cannot step over it, but not so short that they impede one another's motion. Ideally, a second rider following the pack string stays alert for signs of shifting loads, loose saddles, or fatigue or lameness in the animals. Correct problems as soon as you notice them so that they don't become serious.





## Leave No Trace Riding and Packing

Lightweight gear and well-planned menus will allow you to minimize the number of animals required to support a trek. Choose animals that are fit, calm, and accustomed to rugged travel. Take care to prevent hoof damage to stream banks, wetlands, tundra, and other sensitive areas. Well in advance of a journey, contact the management agencies of the area you wish to visit and learn about any permits you will need and restrictions affecting the use of livestock. Land managers also can provide information about trailhead access, designated sites for horse camps, and trail conditions. Check for updates a few days before departure; there could be trail closures or other developing situations that would make it necessary for you to alter your plans.

### Selecting Campsites

Use sites designated for horse groups whenever possible. Most will have hitch rails or corrals to accommodate livestock. Allow animals to graze only if there is enough feed for them *and* for native wildlife—livestock overgrazing an area could be removing food needed by deer, elk, and other wild animals during winter months. Avoid soft meadows and fragile shorelines that could be torn up by hooves. Water the stock by leading them to stream banks that can withstand hard use.

**Horses, mules, and burros, generating pressure of up to 1,500 pounds per square foot with each hoof, have great potential for causing wear and tear on the land. Horseshoes intensify the shearing force of hooves on soils and vegetation. Pack animals and riding stock that graze can compete with wildlife for available feed. Responsible riders and packers can lessen these concerns by following Leave No Trace principles as they plan and take part in trips with livestock.**



### Confining Stock in Camp

Take care of your animals as soon as you reach your destination. They've worked hard for you and have earned their rest. Get the weight off your pack animals before you unsaddle your riding horse. Loosen the sawbucks, then fold the cinches, breast straps, and breechings over the top. Place the saddles on a log or pole, lay the pads on top (wet side up), and cover everything with tarps. Then do the same for the riding horses.



After the animals have been cooled, brushed, fed, watered, and checked for saddle sores and foot damage, you may be able to set them out to graze. Allow them freedom to wander, and thus reduce their impact on the land, by using as little restraint as possible. *Hobbles*—leather or nylon straps buckled onto the lower front legs of animals—permit livestock a degree of freedom without straying too far. If livestock must be tied to stakes, picket pins, or high lines, keep an eye on your animals and move them before signs of trampling become evident.

Taking along supplemental feed for livestock can help prevent overgrazing around camp. In areas where grazing is not permitted, you will need to bring enough feed and hay for the entire trip. Land management regulations might require the use of certified feed and hay that prevents the spread of noxious plants.



### Breaking Camp

Scatter manure to aid in its decomposition, to discourage concentrations of flies, and as a courtesy to other travelers. Fill areas dug up by animal hooves. Remove excess hay or other feed, and pack it with you. When all is in order, swing back into the saddle, tap your horse with your heels, and set off to see where the trail will take you next.



*"When you are on a great horse, you have the best seat you will ever have."*

—Sir Winston Churchill (1874–1965),  
British statesman, prime minister,  
and author



# CHAPTER 22





## Ski Touring and Snowshoeing

*"In the end, to ski is to travel fast and free—free over untouched snow country . . . to follow the lure of peaks which tempt on the horizon and to be alone for a few days or even hours in clear, mysterious surroundings."*

—Hans Gmoser, Canadian mountain guide and a founder of heli-skiing



The tracks of snowshoes and skis can be traced over the snows of thousands of years of human history. Modern skis and snowshoes are durable and easy to use, and the challenge of getting outdoors in winter is every bit as inviting. Combining vigorous exercise with agility and endurance, cross-country skiing and snowshoeing can be ideal additions to your physical fitness routine. Once you have mastered the basics, skis and snowshoes might become an essential part of your cold-weather camping gear, launching you into some of the best winter treks of your life.



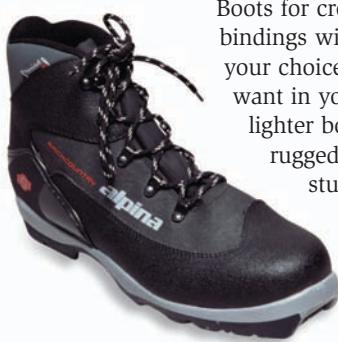


## Cross-Country Skiing

Cross-country skiing is a magnificent means of winter travel. In recent years, skis for traveling cross-country have evolved dramatically. Many are intended for specific conditions of snow and terrain—groomed tracks, for example, or deep powder. Variations in length, width, shape, base, edge, and flexibility can make ski selection bewildering for a beginner. Fortunately, just about every ski shop will have people who can help you find the right skis in the correct size to match your activities and level of expertise.

You can learn a great deal about what you need by renting cross-country skis, poles, and footwear. It won't take very many trips for you to discover the advantages of various styles of gear, and to narrow down your choices to the equipment that is just right for you.

### Boots



Boots for cross-country skiing must be matched to the bindings with which they will be used. Beyond that, your choices depend on the weight and warmth you want in your footwear. For most recreational skiing, lighter boots are just the thing, while treks into rugged mountain country demand the security of sturdy, insulated boots. Check the fit of ski boots as you would hiking boots. Break them in on short trips before attempting any extensive touring, and wear gaiters to keep out the snow.



## Bindings

Despite their differences, something that all skis have in common is a binding to hold a ski boot in place.

### **Three-Pin Binding**

This traditional cross-country ski binding consists of a movable bail and three pins protruding upward from a metal plate attached to the ski. Holes in the sole of a boot made to fit the binding slip over the pins, and the bail snaps down to hold the boot toe against the ski. The heel of the boot is free to move up and down as the skier kicks and glides across the snow.

### **Nordic Binding**

The Nordic binding features a horizontal bar rather than pins. A fitting molded into the toe of a Nordic boot clips around the bar. As with three-pin bindings, boot heels are free to rise and fall with the skier's movements.



*Nordic binding*

### **Cable Binding**

A cable binding holds the toe of a skier's boot with a three-pin or Nordic binding, and includes a cable tensioned around the heel of the boot. The cable increases a skier's lateral stability for making turns on downhill runs.



*Cable binding*

### **Alpine Touring Binding**

An alpine touring binding employs a rigid, hinged plate designed to accommodate a stiff leather or plastic mountaineering boot. The heel is free to rise and fall while a skier is on flat terrain or going uphill, and many are fitted with *heel lifts*—braces that can be positioned to allow better foot position and more comfort on steep ascents. Alpine bindings also can be locked to the skis so that touring skiers can use the same descent techniques as downhill skiers.



*Alpine touring binding*

### **Berwin Binding**

The Berwin binding will accommodate mukluks, shoepacs, and just about any other sort of winter footwear. Toe cups and straps position the skis and hold boots in place. Berwin bindings are a good choice for travelers crossing gentle terrain, especially if they are pulling sleds loaded with gear.



*Berwin binding*

## How Cross-Country Skis Work

Perhaps you've seen a good cross-country skier skimming over the snow. The traveler kicks forward on one ski, glides on it a moment, then kicks the other ski ahead. One motion flows into the next, and soon the skier is out of sight.

How can a ski that slides forward also provide the traction a skier needs to kick along a track? The problem has two solutions—*waxless* and *waxable* skis.

### **Waxless Skis**

Look at the underside, or *base*, of a waxless ski and you probably will discover that the middle third of the length has a molded pattern that resembles overlapping fish scales, diamonds, half-moons, or ripples. Notice that the raised edges of the pattern face the tail of the ski. It is much easier to run your hand over the ski base from tip to tail than it is to go the other way.

Now place the ski flat on the floor and look at it from the side. It's slightly bent, a characteristic known as *camber*. With no weight on the ski, the patterned portion of the base doesn't touch the floor. However, when someone stands squarely in the binding, the ski flattens until nearly all the pattern is in contact with the floor. On snow, the weight of a skier pushing off on a ski flattens it, pressing the pattern down where it can grip the snow. When the skier glides, there is less pressure on the ski, allowing it to flex upward and lift the pattern clear of the snow. The ski coasts forward on the smooth areas of the base.

Waxless skis can be noisy on downhill runs and a bit slow, but they are great for beginners, for skiing in variable temperatures and snow conditions, and for any skier who doesn't want to deal with waxes.



### **Waxable Skis**

The base of a waxable ski has no molded pattern. Instead, a skier applies a thin layer of special wax to the middle third of the base. As the skier's weight presses the ski down, microscopic crystals of snow dig into the wax and hold the ski steady. As the skier's weight shifts to the other ski, the waxed portion of the base rises a little above the snow, allowing the tip and tail of the ski to glide.

Waxable skis can be swifter and quieter than waxless models, but using wax effectively takes experience. Different snow conditions require different waxes for maximum efficiency, and you'll need to know the approximate temperature of the snow in order to choose the right wax.

Packed in tubes or sticks marked with effective temperature ranges, waxes can be rubbed directly onto the base and then smoothed with a block of cork.

<b>Typical Ski Waxes and Temperature Ranges</b>	
<b>WAX</b>	<b>TEMPERATURES</b>
<b><i>Universal</i></b>	<b><i>Variable wet snow conditions</i></b>
<b><i>Yellow</i></b>	<b><i>34 to 39 degrees Fahrenheit</i></b>
<b><i>Red</i></b>	<b><i>32 to 36 degrees Fahrenheit</i></b>
<b><i>Purple</i></b>	<b><i>32 degrees Fahrenheit</i></b>
<b><i>Orange</i></b>	<b><i>21 to 31 degrees Fahrenheit</i></b>
<b><i>Blue</i></b>	<b><i>14 to 23 degrees Fahrenheit</i></b>
<b><i>Green</i></b>	<b><i>-22 to 14 degrees Fahrenheit</i></b>



The Kanik snow camping program offered by Philmont Scout Ranch is a premier cold-weather camping experience featuring ski touring, snow shelter building, snow camping, and winter ecology. Philmont awards a distinctive patch to each youth and adult participant who successfully completes the Kanik program. *Kanik* (pronounced *CAN-ick*) is from the Eskimo word for "snowflake."

## Track Skiing

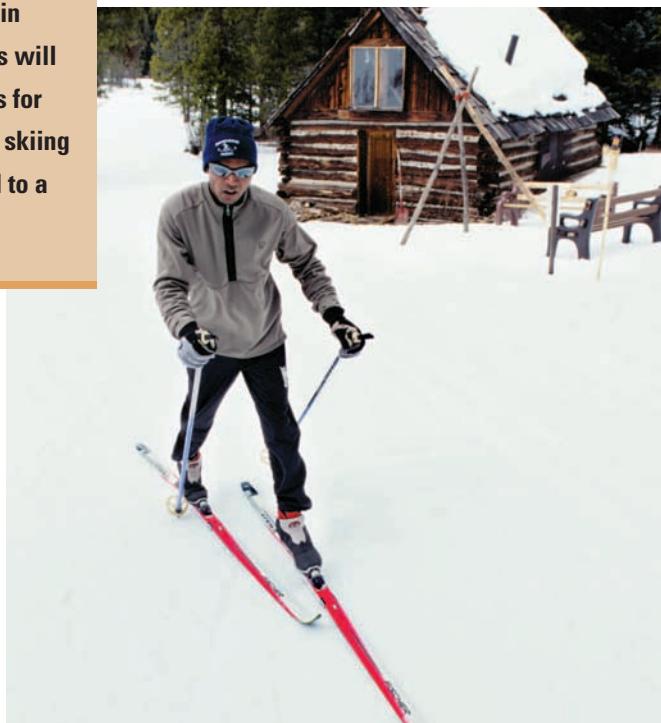
A good way to learn to ski is to follow the tracks of other skiers over rolling terrain. The tracks will help guide your skis while you practice the skills you'll use later for backcountry treks. Low hills will give you a chance to try gradual ascents, easy downhill runs, and plenty of kicking and gliding.

### Getting Started

Begin by striding forward, putting your weight on your left ski while you slide the right one out in front. Shift your weight to your right foot as if you were taking a step and, as the right ski grips the snow, slide the left ski ahead of it. Repeat the sequence in steady rhythm—kick and glide, kick and glide—using your skis as platforms from which you propel yourself along.

Improve your balance and control by leaning forward as you ski. Check the way you use your poles; rather than gripping the handles, let your wrists press against the straps. As the left ski moves forward, plant the right pole ahead of yourself and push off with it. Do the same with the left pole as the right ski glides ahead. The motion of your arms will be much the same as when you swing them while walking, though a bit more exaggerated. The power of your arm and shoulder muscles will enhance your speed, and the smooth use of the poles will help you perfect the forward motion of cross-country skiing.

**The right length of skis depends on the skier's weight, the width of the skis, and the ways in which the skis will be used. Poles for cross-country skiing should extend to a skier's chest.**





### Double Poling

Another way to make headway on flat routes is *double poling*—that is, using both poles in unison to push yourself along. Leaning forward at the waist with your knees flexed and feet together, plant your poles a little ahead of your boots. With a light grasp on the handles, push against the wrist straps and let your skis slide forward. Recover the poles by swinging your arms like pendulums, and plant the poles again, repeating the sequence with a relaxed, steady rhythm.

### Turning

If you are skiing in a track, the track itself usually will guide the ski through gradual turns. Step out of the tracks, though, or set out across pristine snow, and turning is up to you. Several techniques can be used to change direction.





### **Step Turn**

Make small route changes while you are in motion with the *step turn*. Lift one ski and turn the tip in the direction you wish to travel. As you put your weight onto that ski, lift and turn the other ski. For larger changes in direction, you might need to make a series of step turns.



### **Kick Turn**

Reverse your direction while standing still by using the *kick turn*. Lift one ski above the snow, raise its tip, and carefully rotate your leg until you can put the tip down beside the tail of your other ski. Shift your weight off that ski, then lift it and twist around to place it in the normal position alongside the first ski.



### **Snowplow Turn**

Influence the direction and speed of your descents with *snowplow turns*. Position the skis in the shape of a V—the snowplow—and lean on the skis' inside edges. More pressure on the right ski will cause you to turn left, while pressure on the left ski will take you to the right. Equal pressure on the skis can slow your progress or bring you to a full stop.



### **Telemark Turn**

As your skiing skills increase, you might want to learn to *telemark*. It will give you more versatility and control while you make your descents. The best way to learn is by having an experienced telemarker coach you, though you might be able to ease into the telemark turn from a snowplow turn. The primary difference between the two turns is one of position. In a snowplow turn, the skis form a V shape; in a telemark, the skis are parallel and one is a bit ahead of the other.

As you make a series of turns, gradually adjust the position of your skis from the V of the snowplow to the single line of the telemark. Put your weight on the forward ski, twist it to the outside with your ankle to begin the turn, and as the forward ski carves an arc in the snow, shift your weight to the back ski. To turn the other direction, slide the back ski forward, twist

it with your ankle, and let the inside edge of the ski lead you where you want to go.

You'll find you can balance best if you keep your hips turned downhill. That means you'll twist your torso to the right as you turn left, and to the left as you turn right. Lean downhill, too; leaning backward might cause your skis to slide out from under you.





Sidestep

### Climbing

The pattern or wax on the base of your skis should grip the snow well enough for you to kick and glide up gradual slopes. For moderate slopes, switch to the *herringbone step*. Spread the tips of your skis until they form a 90-degree angle, plant your poles behind the skis with each step, and walk up the snow.

On ascents too steep to herringbone, turn your skis sideways to the hill and either *zigzag* (making switchbacks as you go) or *sidestep* (stepping up with the uphill ski, then bringing the downhill ski close to it). If a climb will be long, you might want to attach *climbing skins* to your skis.



Herringbone step



### Climbing Skins

As a winter route becomes steeper, waxes and molded bases lose their ability to give a skier enough traction to proceed. One answer is to attach a *climbing skin* to each ski. Once made of animal hides, the best modern climbing skins feature mohair or nylon fibers secured to a tough, narrow strap about as long as a ski. A loop on one end slips over the ski tip, and a sticky adhesive holds the skin on the base of the ski. The fibers are angled toward the tail of the ski, providing a maximum of traction on kicks while still allowing a skier a bit of forward glide. Remove the skins before a descent, roll up each one with the sticky surface adhering to itself, pack them up, and head down the slope.

A more economical option is the *snakeskin*, a flexible plastic skin that can be strapped to a ski. The snakeskin works very well for climbing; it allows no forward glide, effectively turning a ski into a very long snowshoe.

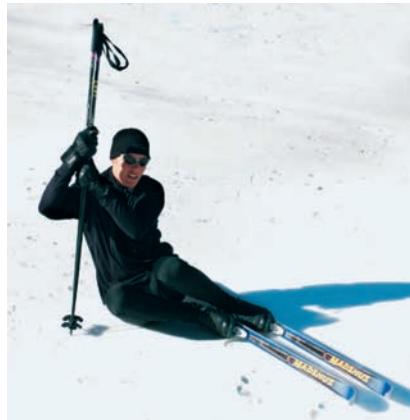


### Falling and Getting Up From a Fall

Every skier falls, and beginning skiers fall often. It's important to know how to fall without injury and, when you do go down, how to untangle yourself from your skis and get back on your feet.

First of all, don't fall if you can avoid it. Size up the terrain ahead. Is there room for you to make your way? Are there trees or drop-offs to avoid? Rocks or logs you would rather not hit? Is the snow soft and forgiving, or will an icy surface make turns difficult and stopping all but impossible? Where falling is likely, consider changing your route.

Rest a moment after a tumble to gather your wits. Slip out of your pack and, if there is a chance the pack might slide, anchor it to the slope with a ski pole. Twist around until your skis are on your downhill side and sideways to the hill. Plant your poles next to your hip and pull yourself onto your knees, then brace yourself by pushing downward on the poles as you regain your feet. Brush yourself off, swing your pack onto your shoulders, and you'll be ready to go.



## Breaking Trail

When the snow is relatively settled, kicking and gliding, double poling, and downhill running will get you where you want to go. However, when you sink into fresh powder with every step, the track in the snow made by the first skier can be used by those who follow. Breaking trail can be exhausting, so group members will want to take turns; the lead skier simply steps to the side of the track, waits for the line to go by, then falls in at the rear. Rotate every few minutes to give each skier opportunities to lead and to rest.

## Skiing With a Pack

On day trips, a small pack on your shoulders or a fanny pack strapped around your waist can hold the food, water, and extra clothing you'll need, but it shouldn't interfere with your skiing. You might need a backpack for overnight trips. For skiing, those with internal frames are easier to manage than ones with frames on the outside. Load the pack so that the center of gravity is a little lower than usual and adjust the straps so that the pack fits securely against your back and can't sway from side to side.





## Skiing With a Sled

Pulling your gear in a sled takes less effort than supporting the same weight in a pack on your back. You might want to carry a small pack with water, food, and other items you will need during the day, then stash the rest of your load in the sled.

## Caring for Ski Gear

If something goes wrong with your skis miles from civilization, you could be in for a long, weary trudge home. Avoid that possibility by carrying an emergency kit containing a pair of pliers, a small roll of duct tape, a screwdriver that will fit the screws on your bindings, an emergency ski tip that can be slipped over the end of a broken ski, and any other items that could come in handy for making repairs.

Pay attention to the surfaces over which you ski. Beware of rocks and sticks poking through the snow; they can gouge the bases of your skis and cause them to become sluggish. Keep your speed under control, especially as you ski through forests. Go around ditches, drops, and other sharp depressions that could excessively bend your skis.

Store your skis upright in camp by leaning them against a tree or by sticking the tails into the snow, so they will not be covered by falling or drifting snow. Face the bases east before you bed down; the morning sun might warm them and make waxing easier.

When you get home, let your gear dry at room temperature and use a metal scraper and/or a wax remover to clean the bases of waxable skis. Recondition ski boots as you would any outdoor footwear, and stow your equipment where you can get at it quickly. It won't be long before you glance out the window on a cold day and give in to the joy of clipping into your skis and pushing off for another winter adventure.

*"There is only one way to learn to walk on snowshoes, and that is to put them on and try."*

—Daniel Carter Beard, 1925 (Beard served as the first national Scout commissioner.)



## Snowshoeing

Snowshoes might well have been around every bit as long as skis. By the time European settlers arrived in North America, American Indians of the northern woodlands had developed snowshoe making into a high art, shaping wood and rawhide into snowshoes that were as beautiful as they were efficient. Since then, wanderers of the winter wilderness have found snowshoes to be an invaluable part of their gear, allowing them to move over snow that otherwise would be impassable. With a little practice, you, too, can enjoy the quiet, rhythmic stride of snowshoeing.

### How Snowshoes Work

When you hike in snow with only boots on your feet, all of your weight presses down on a relatively small surface area, causing your feet to punch into the drifts. Snowshoes put a larger platform beneath your soles, spreading your weight over a much greater surface area. If they are the right size for the snow conditions and the amount of weight put on them, your snowshoes will float near the top of the snow, and you will be able to travel about with ease.



## Kinds of Snowshoes

The gorgeous wood and rawhide snowshoes of generations past have almost all been replaced by snowshoes featuring lightweight metal frames and flotation decks made of plastic, neoprene, rubberized fabric, and other durable materials. Today's snowshoes are specialized for certain kinds of adventures, too. Those used for short jaunts near a cabin or by fitness runners can be very light and just slightly longer and wider than running shoes. At the other end of the scale are expedition snowshoes—up to 4 feet long—that provide enough flotation to support a wilderness traveler carrying a backpack loaded with camping gear. Some snowshoes have traction bars secured to their bases and crampons built into their bindings to give snowshoers a secure grip on steep slopes, while snowshoes with smooth bases can be used to slide down hillsides.

Local experts might be able to provide the best guidance for choosing the right snowshoes in the correct size. Check with outing clubs in your area and with winter sports equipment stores for advice. If you can, rent snowshoes before you buy and see what you think of them in the field.



*From expedition snowshoes to those used for fast dashes over the drifts, modern snowshoes are tough, lightweight, and easy to use.*

## Bindings

Bindings do just what the word implies—they bind your footgear to your snowshoes. All bindings are similar in that they can be used with almost any boots, mukluks, or other winter wear. They allow the easy up-and-down motion of your heels, and are balanced so that the toe of each snowshoe rises and the tail drags on the snow.

### **Ski Poles and Ice-Ax Baskets**

Many snowshoers use one or two ski poles to help them maintain their balance. You'll find that poles can be especially helpful as you make turns and get up from falls.

Some mountain travelers attach a special basket to the end of an ice ax and use it for balance in much the same manner as they would a ski pole. The ax can be a lifesaver in stopping a fall on a steep slope.



## Using Snowshoes

“If you can walk, you can snowshoe.” That bit of traditional advice for beginning snowshoers is most of what you need to know to get started. Put on your snowshoes, head out across snowy terrain, and your body mechanics will do the rest.

As you step forward, let the inside edge of the snowshoe in motion pass over the inside edge of the stationary snowshoe. Swing your foot just far enough forward so that the snowshoes don't touch when you step down. Firmly plant the leading snowshoe to create a stable platform on which to place your weight, and pause an instant after each step. That will allow the snow to consolidate beneath the snowshoe and will give you a momentary rest. Lift each shoe just high enough to make forward progress, allowing the snowshoe tail to drag on the snow.



The BSA's Northern Tier National High Adventure Program offers the perfect setting for cold-weather camping, cross-country skiing, and snowshoeing. Visitors to the Charles L. Sommers High Adventure Base in Ely, Minnesota, are treated to a winter wonderland and allowed a chance to hone winter camping and sports skills with such activities as dog sledding, ice fishing, and shelter building.

### **Turning**

The easiest way to change your direction of travel is by using the *arc turn*. Simply turn your snowshoes a little with each step, gradually curving around until you're lined up on your new course.

A *step turn* alters your direction more quickly. While standing in one spot, lift and turn your snowshoes one after the other, repeating the motion until the toes are facing the direction you want to go. Your movements should be smooth and precise, with your legs spread apart far enough to prevent the tail of one snowshoe from being pinned beneath the edge of the other.

For a fast 180-degree reversal, use the *kick turn*. Leaning on a ski pole for balance, lift one snowshoe, twist around until you are facing the opposite direction, and plant the shoe firmly beside the stationary one. Lift the second snowshoe, rotate around, and then plant it beside the first.

### **Traveling Uphill**

Many snowshoes are equipped with traction bars or with crampons on their bindings that allow snowshoers to make their way directly up steep hills. When the snow is soft, travel technique is much the same as on flat ground. On harder snow, kick the toes of your boots into the slope, forcing the crampon teeth to grip the crust. Lean forward a bit and take shorter steps.

### **Traveling Downhill**

Downhill travel can be surprisingly difficult on snowshoes. Bindings must be snug to handle the increased pressure on your feet, and you'll need to alter your stride to keep your snowshoes flat on the snow. You can do that on gradual grades by leaning back enough

to put extra weight on the tails of your snowshoes. On steeper slopes, tie a cord to the tip of each snowshoe; pulling up on the cords as you plant your snowshoes can keep them ideally positioned.





### ***Breaking Trail***

As you snowshoe you'll soon discover what cross-country skiers know—travel is much easier if you have a track to follow. The tracks of other snowshoers will pack down the snow ahead, allowing you to make good time.

Break your own trail where there are no tracks, shortening your steps and keeping the tips of your snowshoes high to prevent them from becoming loaded with snow. Trail breaking can be tiring work, especially in deep snow, so organize your group to allow lead changes every few minutes.

#### ***Ski and Snowshoe Within Your Level of Skill***

In flat or gently rolling regions of the country, skis and snowshoes can allow you to explore wintry landscapes that would prove difficult or impossible to reach on foot. Snowshoes and skis also are terrific for travel in steeper terrain. Stay within your skill level as you plan journeys into snowy areas. If avalanches are a possibility, go somewhere else until you have gained the training and experience you need to size up avalanche potential and to carry out rescues if avalanches do occur.

For more on winter safety, equipment, and concerns, see the chapters titled “Managing Risk,” “Gearing Up,” “Cold-Weather Travel and Camping,” and “Mountain Travel.”

## Snowshoe Care and Storage

Inspect snowshoes after every outing for signs of wear. Frames might become dented or bent, and the webbing can be nicked or cut. Repair minor damage before it can become severe, and your snowshoes will be in top condition whenever you're ready to head for the hills.

*"The goal of all blind skiers is more freedom. You don't have to see where you are going, as long as you go. In skiing, you ski with your legs and not with your eyes. In life, you experience things with your mind and your body. And if you're lacking one of the five senses, you adapt."*

—Lorita Bertraun, blind American skier



# CHAPTER 23



## Mountain Travel

*"Double happy . . . is the man to whom lofty mountaintops are within reach, for the lights that shine there illumine all that lies below."*

—John Muir (1838–1914), 19th-century naturalist, mountain traveler, and a founder of the Sierra Club



Climb far above the meadows and valleys into a lofty world of summits, ridges, boulder fields, and snow. There you'll find a remarkable ecology thriving in harsh alpine conditions. In yourself, you can find a keen sense of confidence in your ability to travel safely and well through even the wildest territory. Reaching the high country often involves cross-country travel over tough terrain. That's where a knowledge of mountain travel pays off. It can take over where the trail ends, lift you far above the lowlands, and help you explore the great, solitary realm where the summits meet the sky.

Mountain travel can be done as day hikes from trailheads or base camps, or might include nights of camping at high elevations. It is an advanced form of adventure that draws on a mastery of backpacking, wilderness navigation, and risk management. Most of all, it demands maturity and judgment.



### Climb On Safely

The skills of mountain travel bridge the gap between trail hiking and *technical mountaineering* (mountain travel that involves the use of ropes, anchors, and other technical expertise). Unlike rock climbers who seek out steep, difficult routes, mountain travelers strive to reach their destinations with a minimum of exposure to potential danger. The techniques described in this chapter are intended to alert you to important considerations for planning and enjoying treks in mountainous terrain.

Leaders of Scout units interested in rock climbing or any forms of technical mountaineering must follow the points of Climb On Safely—the Boy Scouts of America's recommended procedure for organizing climbing and rappelling activities at a natural site or a specifically designed facility such as a climbing wall or tower—to provide qualified instruction and adult supervision, and to conduct these activities in a manner that conforms with the policies and guidelines of the BSA.

For the full text of the BSA's Climb On Safely, see the *Fieldbook* Web site. →

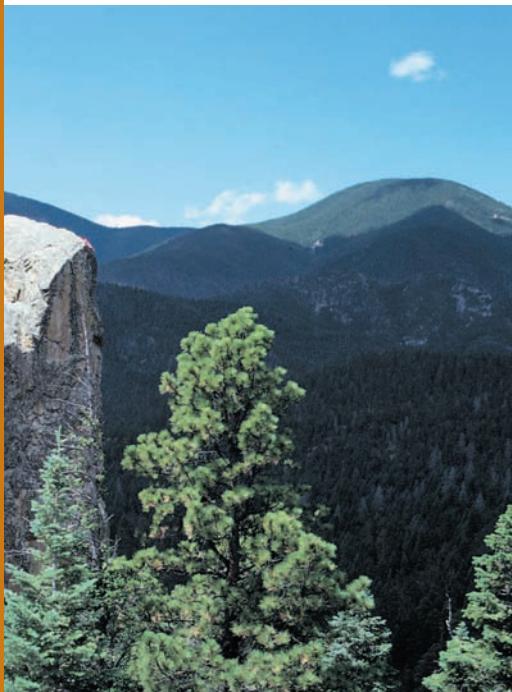


### Deciding Where to Go

Perhaps you have heard of a lake high in a mountain valley that you would like to visit, or a mountain you want to climb, or an alpine pass that can lead you to a faraway destination. On visits to parks, forests, and high-adventure bases you might have seen inviting summits and decided you

would someday make your way to the top. Choosing a destination for your mountain travel is often a matter of narrowing down a wealth of opportunities.

Nearly every mountain of any size is featured in local guidebooks that include descriptions of routes, degrees of difficulty, permits required, group size limitations, and hazards to avoid. Land management personnel might also provide information that will help you determine whether destinations are within your skill levels and, if so, how best to reach them.





## Planning a Mountain Travel Journey

The challenges raised by mountain travel often are matters of distance and remoteness. You and your group will require appropriate gear and provisions, just as for any trek adventure, but you also might need to prepare to be more self-reliant than when you are close to a trailhead. Risk management, first-aid training, and reliable means of emergency communication must be carefully considered in the planning stages of a trip. So should writing down a detailed trip plan and leaving it with responsible adults.

Monitor weather forecasts in the days leading up to your departure and check with land management personnel for the latest reports. Use your best weather sense while you are in the field, too. If stormy conditions turn you back, remember that the mountains will still be there the next time you want to head for the high country.

For more on preparing for a mountaineering adventure, see the chapter titled “Planning a Trek.”

### Leave No Trace Mountain Travel

Alpine environments can be especially sensitive to human impact. The principles discussed in the chapter titled “Implementing Leave No Trace” are excellent guidelines for conducting mountain travel adventures in ways that are enjoyable and environmentally sound. Respect limitations on group size, stay on trails whenever you can, and use designated campsites. Otherwise, hike and camp on rock, gravel, dry grasses, or snow, and minimize your impact as much as possible.

For more on responsible mountain travel, see the “Leaving No Trace” section of this book.





## Mountain Travel Teams

Team development and leadership issues that are important during any outdoor activity are vital for the success of a mountain trip. For safety, a team should be made up of at least four people. Everyone needs to understand the challenges ahead and prepare for them both physically and mentally. Group members who have succeeded together during Project COPE (Challenging Outdoor Personal Experience) or other trek adventures should be well on their way to developing the trust and teamwork that will see them through journeys involving mountain travel.

For more on the dynamics of travel teams, see the “Leadership and Trek Preparation” section of this book.

## Mountain Travel Route Finding

Researching a trip before leaving home can give you a general sense of the lay of the land. You might be able to figure out the hiking trails that will lead you to your destination, and designated sites where you can camp. Once you are on your way, though, you might need to adjust your route in response to local conditions. With the landscape in front of you, study your topographic map. Identify landmarks and consider the shape of the terrain. The map will provide clues to the twists and turns of water courses, the shapes of ridges, any obstacles that might lie between you and your objective, and the possibilities of practical ways to get there.

Studying the territory ahead also will reveal what maps and guidebooks cannot—the conditions of the moment. Snow levels, vegetation, and weather conditions can have dramatic effects on potential routes. Experience

and common sense come into play, too, as you evaluate what you see and determine how you will proceed. A skyline ridge might be the best way to go. A boulder slope might offer a virtual highway to the top. A snowfield could be the easiest means of negotiating a climb. Heavy brush, a swollen stream, or a change in the appearance of the clouds all can influence your on-site route-finding decisions, or perhaps convince you that going farther would not be wise until conditions improve, that you should change your intended route, or that you should go home.

The most important steps you can take to make your way off a mountain happen on the way up. Pay close attention to the route behind you, looking back often to see how it will appear when you are coming down. Take note of landmarks that will help you find your way—a boulder where you need to turn, for example, or a large tree near your camp. A group equipped with a global positioning system (GPS) receiver can program in waypoints while they climb, then use the instrument as a backup navigational tool while retracing their steps later in the day.



### **Summit Packs**

*Summit packs—day packs used on the day of a climb to the top of a mountain—will allow you to leave large backpacks at your base camp. Include in your summit pack the outdoor essentials and any other gear you might need. A sleeping bag and bivouac bag or tarp will come in handy if you are overtaken by darkness or if a member of your group suffers an injury or illness and must be treated far from camp.*

For more on the outdoor essentials, see the chapter titled “Gearing Up.”





Rain, snow, fog, and darkness can obscure your ability to see very far, compounding the difficulties of finding routes. Awakening to the sound of wind blowing rain or snow against your tent might be a strong indication that it would be better to stay in camp and read a good book. There's not much point in climbing high if you can't make out which way to go.

When weather is more inviting, accurate compass bearings taken on your way up can be invaluable during your descent, especially if landmarks are few and far between. As you cross large snowfields, you might want to mark your route with *wands*. Usually made of bamboo and topped with strips of brightly colored flagging, wands will show you the way home even in deteriorating weather. Retrieve them as you descend.

If you become disoriented, stop where you are. Gather whatever information you can from what you are able to see. Are there footprints in the snow? Breaks in the clouds that allow you to glimpse your route, or at least a few recognizable landmarks?

Get out your map and compass, talk with others in your group, and figure out where to go next. Whatever you do, don't wander blindly. It is far better to settle in where you are and wait until you can see where you are going, even if that means a night bivouacked on the mountain.

For more on finding your way and staying found, see the chapter titled “Navigation.”





## Time Management

Start early on the day of an ascent, perhaps even before dawn. That will give you the greatest number of daylight hours for traveling—an important factor if the climb is more strenuous than you had anticipated or if an emergency arises—and allow you to return from exposed heights before unstable afternoon weather moves in.

Enthusiasm to reach a summit or other remote destination can sometimes cloud the judgment of mountain travelers. A late departure from camp, changing weather conditions, and unexpected delays can slow a group's progress. Even though a destination might seem within reach, the lateness of the day could make the return trip difficult and even risky as fatigue and darkness set in.

Before leaving home, decide on an appropriate turnaround time to use on the day of a summit attempt. When that moment comes on the mountain—2 o'clock in the afternoon, for example—all members of your group will begin descending even if they have not reached the summit. The turnaround time should allow you to reach your camp or the trailhead with plenty of daylight to spare.

For more on preventing accidents by planning well and using good judgment, see the chapters titled "Planning a Trek" and "Managing Risk."





**Reaching a summit  
can be the high point  
of a mountain travel  
trip, both literally  
and emotionally.  
The real goal,  
though, is getting  
down safely.**

### Descending

The focus on reaching a mountaintop can energize travelers and push them to remarkable achievements. More accidents occur on the descent to camp than on an ascent. People often are weary from the ascent. Hunger and thirst can dull their senses, impair their judgment, and take the edge off their physical abilities. Impatience to get back to the comforts of camp will cause teamwork to suffer if some group members hurry ahead of others.

Travelers retreating down a mountainside might be further tested by deteriorating weather, evening cold, and the dark of night.

Throughout a descent, refer to the compass bearings you took and the mental pictures you made of how the route looked behind you during your ascent. If your group is using a GPS receiver, refer to the waypoints you recorded. It also is important to keep the big picture in mind. The heights can afford you a bird's-eye view of the terrain below and, when coupled with a close look at a topographic map, a good understanding of your primary route and any feasible alternatives. Small changes in direction high up can lead to dramatically different destinations. From a ridge top, for example, it might be easy to start down any of several valleys or to turn your footsteps down either side of a wide snowfield. Consider where you will end up with each of the options presented to you, then choose the one that holds the most promise. Keep your group together, traveling at a pace that can be managed by the slowest member of the team.



## Challenges of Mountain Travel

Surrounded by heavy brush, deep forests, rushing streams, rocky slopes, and snowfields, many mountains seem to defy hikers' attempts to climb them. However, overcoming the difficulties of an ascent can make the view from the top all the sweeter. Here are some pointers on dealing with common mountain challenges:

### Brush

Brush can be the bane of cross-country travel. Brambles and briars sometimes choke hillsides and streambeds. Mountains scarred by fire or logging operations can be covered with thick, low, second-growth timber. Avalanches can scour steep slopes, leaving them inhabitable only by dense thickets of low-growing vegetation.

The best way to negotiate brush might be simply to avoid it. Look for a clear route around overgrowth, perhaps by running the crest of a ridge or by ascending the side of a valley until you can pass above the heaviest of the vegetation. When you must wade into the brush, wear clothing that will protect you from snags and scratches. If you will be in the tall tangles for a while, follow a compass bearing so that you can come out where you want on the other side of the thicket.

### Streams

Crossing streams is always serious business. Twisting your foot on a mossy rock, soaking a sleeping bag in the current, or falling into the water on a chilly day can quickly complicate the best travel plans. Unless it is a brook you can step over or a stream with a bridge you can use, take plenty of time before crossing to size up the situation.

Water more than knee-deep can make you buoyant; add a swift current, and you might have difficulty keeping your footing. Your best crossing places often will be where the stream is widest and the water is calm. Next, look downstream. If you should fall, is there a chance you could be swept into a rapids, against rocks,

**Before crossing any stream, unbuckle the waist belt of your backpack and loosen the shoulder straps so that you can quickly escape from the load if you fall into the water.**



or over a falls? Don't tempt fate by challenging a stream that might not give you a second chance.

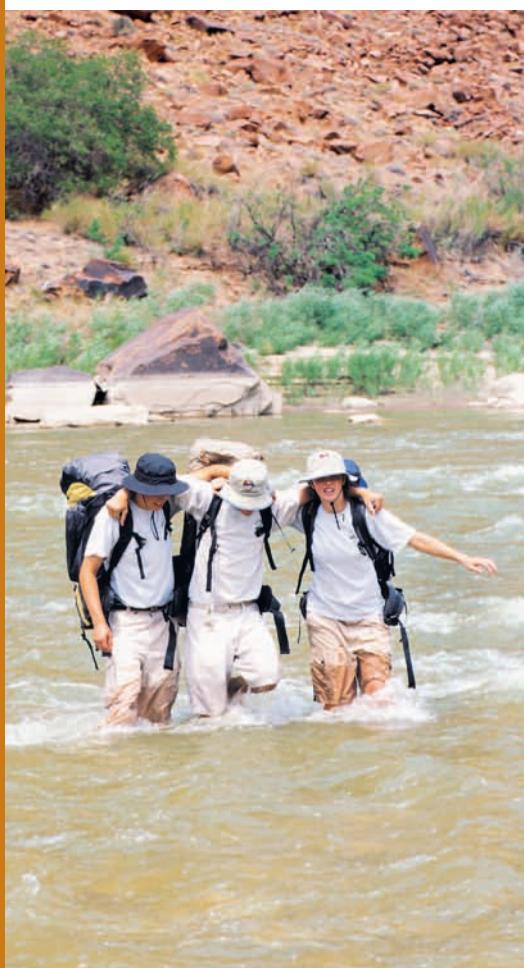
In mountainous country where snowfields blanket the peaks, snow melting on warm spring and summer afternoons can cause streams to rise. A raging torrent at midday might, after a cool night, be tame enough at dawn to negotiate with ease. When you come upon such a stream, make camp and wait until morning when the crossing can be made safely.

### ***Stepping Stones***

Decide which rocks you can use as a route across a stream, and in what order. Plant your feet squarely in the center of large stones, moving smoothly from one to the next. Are the rocks wet or mossy? Expect them to be slippery. A walking stick will help you maintain your balance.

### ***Fallen Logs***

While it's usually not too difficult to walk the backs of large, stable logs close to the surface of the water, a more secure (though less graceful) means of crossing is to straddle the log and scoot your way to the far bank. Beware of loose bark and bare wood slick with sap, spray, or rain.



### ***Wading***

Wearing shoes while you wade streams will give you better footing on wet rocks and protect your feet from cuts and bruises. If you're carrying running shoes to wear in camp, you can put them on for stream crossings and keep your boots dry. If not, wear your boots without socks. Station one person downstream with a rescue line in case someone loses his or her footing. When you reach the far side, dry your feet before you put your socks and boots back on.

Members of a group usually can wade shallow streams one at a time, but if the water is deep or the stream is wide, they might do better crossing in pairs or groups of three.



### Scree, Talus, and Boulder Fields

As mountains break down over the centuries, cliffs fracture, fall, and cover slopes with broken rock. The largest of these stones are *boulders* heavy enough to wedge together. Smaller rocks prone to moving under a traveler's weight are known as *talus*. If the material resembles gravel, it's called *scree*.

Climbing on scree is similar to walking on snow. You sometimes can make headway by kicking toeholds or by pointing your toes out and herringboning up an incline like a cross-country skier. Think of snow as you descend, too, leaning well forward to keep your weight over your feet.

Many rocks on a talus slope are large enough to hold the soles of your boots, but due to their modest size, they can be easily tilted or dislodged. Place your weight in the center of each rock rather than near the edge, and be ready for a seemingly stable stone to move underfoot. Members of a group traversing a scree or talus slope should stay on the same horizontal plane so that rocks loosened by one of them will not endanger others.

Negotiate boulder fields by stepping lightly from one rock to the next. When possible, step to the center of large, dry boulders that are likely to be more stable. Be ready to catch yourself if your feet slip or a boulder tips and upsets your balance. Point out loose boulders to those following you so that they can avoid them or prepare for unstable footing.

## 23

***The Rest Step***

During long climbs, the *rest step* can give your body a moment to recover after every stride. Move your right foot ahead and place the sole of your boot flat on the ground. Swing forward and lock your knee for a moment or two; the bones of your leg and pelvis will support your weight, allowing your thigh and calf muscles a momentary rest. Swing your left foot forward and repeat the sequence. Even though you might be moving slowly, a rhythmic pace will lift you steadily up a mountainside.

**Snowfields**

In the winter and at higher altitudes during much of the summer, snowfields can be inviting routes for cross-country travel and for reaching summits. Snow on flat terrain and gentle slopes can be traversed with few concerns for hazards. Snowshoes or cross-country skis can add speed and range to your travels, and might be essential if snow is deep and too soft to sustain the weight of your footsteps.

Before venturing onto steeper mountain snow, however, you must understand the danger of avalanches and avoid those areas where avalanches are possible. You also must know how to stop yourself if you lose your footing and begin to slide. For that, you need an ice ax and plenty of practice using it.

For more on avalanches, see the chapter titled “Managing Risk.”

### ***Ice Axes and Self-Arrest***

An ice ax can greatly enhance your security as you travel on snowy slopes. Have an experienced snow hiker demonstrate proper ice-ax technique, and master it before you need it.



*Ice ax for mountain travel*

The head of an ice ax features a *pick* for self-arrests and a short, wide blade called an *adz* for chopping steps in hard snow. Some mountain travelers choose axes with shafts long enough to reach from their palms to the ground so that they can use the axes as walking sticks between snow-fields. Mountaineers usually select shorter axes, finding them easier to manage on steep slopes. On the trail, carry an ice ax as you would a cane, or slip it through a loop on your pack and lash the shaft to the pack itself.

The primary reason to have an ice ax is for *self-arrest*—stopping yourself if you fall on a steep snow slope. As you begin to slide, grip the head of your ice ax with one hand (the point of the pick turned away from you) and hold the shaft with the other. Roll *toward* the head of the ax until you are on your belly. The pick will embed itself in the snow and stop you in a surprisingly short distance. If a fall turns into a headfirst tumble, roll toward the pick and, as it bites into the snow and begins to slow your descent, swing your feet around until they are below you.

Self-arresting is a technique that requires expert instruction and plenty of drill. Practice by purposely sliding on a slope with a safe runout (that is, it flattens gradually). Slide in every imaginable position, even headfirst on your back. When you can automatically make the right moves to arrest your fall, you will have mastered one of mountain travel's most effective safety skills.



### **Snowfield Travel**

The consistency of the snow will affect the speed with which you can travel on a snowfield. Deep, powdery snow can engulf your feet and make you feel as though you are wading, while hard, windblown slabs can be slippery. When a snowy slope is not too steep, you can zigzag your way up. On more severe inclines, you also might need to kick steps with the toes or edges of your boots. Holding your ice ax in your uphill hand, drive the shaft into the slope and use the momentum of your strides to kick steps. Settle into your new stance, then move the ax forward and plant it again. Having made the ax a solid anchor before you move your feet, you'll have something sturdy to grip if you lose your footing.



### ***Descending Snowfields***

Where a snowfield is free of rocks, trees, and other obstacles, you might be able to descend by *glissading*. Holding your ice ax in the ready position, aim your toes down the slope and ski on the soles of your boots. Keep your knees bent and lean forward. When leaning forward over your boots, you are less likely to slip or fall. Carve small turns by angling your feet and digging the sides of your boot soles into the snow in much the same manner as if you were on skis.

The *plunge step* is another effective descent technique. Lean forward (“nose over toes”), kick out with your foot, lock your knee, and goose-step down the snowfield. The farther forward you lean, the more stable your footing will be.

### ***Crampons***

Climbers in the early years of mountain travel wore hobnailed boots for traction and used their ice axes to chop steps in difficult, frozen pitches. Today's mountain travelers can put crampons on their boots and make good progress across slippery and steep snow slopes. They nearly always have ice axes at the ready to self-arrest if they do begin to slide.

Crampons must be matched to the boots on which they will be used. More traditional models are hinged, can be strapped in place, and can be used with some hiking boots. The latest crampons are designed to snap in place on plastic mountaineering boots.





### Glacier Travel

Mountain travel, as it is described in this book, does not include the skills required to travel on glaciers.

Glaciers occur when snowfall does not completely melt each year, compressing into slowly moving rivers of ice. The primary hazards awaiting glacier travelers are *crevasses*—cracks in a glacier that can be extremely deep and quite wide. The opening of a crevasse can be hidden by a roof of snow.

Glacier travel demands training in specific mountaineering techniques, and should be done only by teams of experienced mountaineers roped together, ready to stop a climber's fall into a crevasse, and able to conduct a crevasse rescue.

### Acute Mountain Sickness

The human body requires a week or more to adjust to higher elevations, compensating for the thin air by producing additional red blood cells to carry oxygen to the cells. Ascending no more than a thousand feet of elevation during each day helps avoid acute mountain sickness. It is not unusual for people traveling into the mountains to feel more fatigued than usual and perhaps to experience mild headaches. Ward off the effects of altitude by drinking plenty of liquids, getting enough rest, and spending one or more layover days partway up an ascent.

At elevations above 8,000 feet, some people may suffer *acute mountain sickness* (also known as *AMS* or *altitude sickness*). In its severe forms, fluid passes through membranes of the brain (*cerebral edema*) or of the lungs (*pulmonary edema*). A victim might become confused, lethargic, nauseated, and incapacitated. If any of these symptoms appear, escort the ill person to lower elevations as quickly as possible. The person should consult a physician upon returning home. Also, prior to high-elevation travel, consult a physician about medication to help avoid AMS.



## A Final Word on Mountain Travel

Mastering the fine points of mountain travel will prepare you to meet the challenges of the most rugged terrain. You also can apply many of these skills to your adventures in less demanding regions. The joy of traveling with confidence, with good judgment, and with an openness for discovery is there for you in any direction you go.

*"The mountains can be reached in all seasons. They offer a fighting challenge to heart, soul, and mind, both in summer and winter. If throughout time the youth of the nation accept the challenge the mountains offer, they will keep alive in our people the spirit of adventure."*

—William O. Douglas (20th-century conservationist  
and U.S. Supreme Court justice)





# CHAPTER 24



## Caving

*"Mystery, adventure, discovery, beauty, conservation, danger. To many who are avid cavers and speleologists, caves are all of these things and many more, too."*

—David R. McClurg (caver, subterranean photographer, caving skills instructor, and longtime member of the National Speleological Society), *The Amateur's Guide to Caves and Caving*, 1973



Beneath the Earth's surface lies a magnificent realm darker than a moonless night. No rain falls. No storms rage. The seasons never change. Other than the ripple of hidden streams and the occasional splash of dripping water, this underground world is silent, yet it is not without life. Bats fly with sure reckoning through mazes of tunnels, and eyeless creatures scurry about. Transparent fish stir the waters of underground streams, and the darkness is home to tiny organisms seldom seen in broad daylight.

This is the world of the cave, as beautiful, alien, and remote as the glaciated crests of lofty mountains. Just as climbers are tempted by summits that rise far above familiar ground, cavers are drawn into a subterranean wilderness every bit as exciting and remarkable as any place warmed by the rays of the sun.

Water is the most common force involved in the creation of caves. As it seeps through the earth, moisture can dissolve limestone, gypsum, and other sedimentary rock. Surf pounding rocky cliffs can, over the centuries, carve out sea caves of spectacular shape and dimension. The surface of lava flowing from a volcanic eruption can cool and harden while molten rock runs out below it, leaving behind lava tubes. Streams running under glaciers can melt caves in the ice that stay around for a season or two, or a century or two.

Boulders tumbling down a mountainside sometimes come to rest against one another in ways that form passageways.

Many caves are so small that people can barely enter, while others extend for miles and include rooms of tremendous dimensions. Features come in all sizes, too, from soaring rock columns to tiny needles of stone. While most caves are stable enough to survive earthquakes, the contents of caves are often extremely fragile.

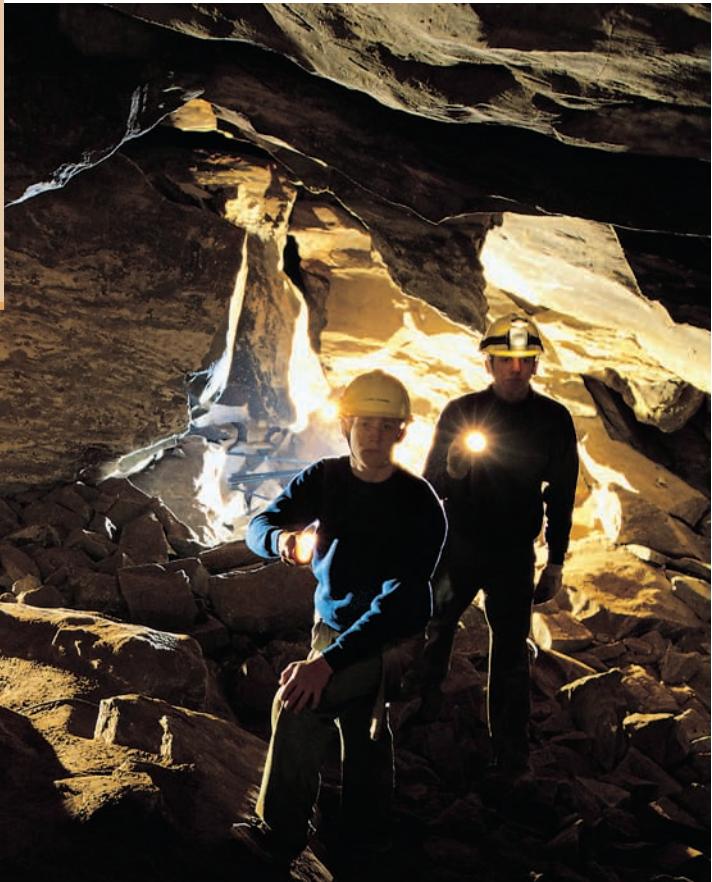
The forces shaping caves and their features work with exceeding patience. Centuries may pass before groundwater widens a chamber or lengthens a passage by even an inch. A drop of water hanging from the point

of a *stalactite* leaves behind a trace of mineral residue when it finally falls, lengthening the stalactite ever so slightly, then splashing on a *stalagmite* rising from the cave floor and depositing a hint of minerals there, too.

Massive and delicate, living and stony, a cave is almost timeless, little touched by the world above. We have the power to explore and enjoy the underground world of caves, but we must always do so in ways that protect these pristine environments.

### WHAT IS A CAVE?

**A *cave* is a naturally formed void located beneath the surface of the Earth. By definition, it must have passages or rooms large enough to admit a human, and by popular definition, must be long enough so that a caver can get out of the twilight to enter a zone of total darkness.**



## The Importance of Caves

Cave environments are tightly entwined with the world above. Caves often play a role in rapidly transporting water and providing means for recharging aquifers. Bats, snakes, frogs, insects, and other cave visitors, all known as *troglobiontes*, form webs of interdependency near cave entrances. Permanent underground dwellers such as blind crayfish, blind Texas salamanders, blind shrimp, and the endangered tooth cave spider—the *troglodytes*—can live nowhere but in caves. They are parts of fragile ecosystems unique on the planet.

Caves can provide a window into the past for *archaeologists* (those studying past human life), *biologists* (those studying animals), and *paleontologists* (scientists studying fossilized remains to better understand earlier geological periods). For many people, caves are places of breathtaking beauty, challenging adventure, and the promise of the unknown.



*Cavers find many strange sights underground, such as the remains of a bat encased in a stalagmite.*

## Leave No Trace Caving

Caves and the formations within them evolve with such exceeding slowness that underground environments have little capacity for recovering on their own from the negative impact of human visitors. A broken stalactite or stalagmite may grow back, but only after thousands of years. Marks left on stone will be visible for centuries to come. Discarded batteries, orange peels, and other bits of litter will stay exactly where they are until someone carries them away.

Only by protecting caves can today's subterranean travelers ensure that future cavers will have a chance to enjoy their own underground discoveries and adventures. If you aren't willing to protect fully the condition of the caves you want to visit, stay aboveground and find some other way to spend your time.

In addition to following the general Leave No Trace principles, following the guidelines below will ensure that you are caving responsibly:

- Go to the bathroom before entering a cave and/or carry out human waste in containers designed for that purpose.
- In well-traveled caves, stay on established trails. In caves without pathways, choose routes that will have the least impact on the subterranean environment.
- Watch for roosting bats and other cave dwellers, and try not to disturb them. Keep noise down to respect wildlife and other visitors.

- Enjoy viewing and photographing cave formations, but don't touch them. Oils and dirt from your hands can impede their growth. Leave cave formations, rocks, and artifacts for others to see.
- Nutrients foreign to a cave ecosystem can be harmful to microbes and may attract mice and other nonnative creatures underground. Before eating in a cave, spread a plastic trash bag on the floor to catch crumbs and other bits of food, then carry them home with you.
- Human waste is disastrous to cave environments. Every caver should consider carrying a *pack-it-out kit* for solid waste removal, and a designated bottle for carrying out urine.
- Wear only boots or shoes with nonmarking soles. Boots with blonde soles or gum rubber soles are acceptable; black-soled hiking boots are not.

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



Leave interesting cave finds like this calcium formation for future cavers to enjoy.

### Caving Organizations and Land Management Agencies

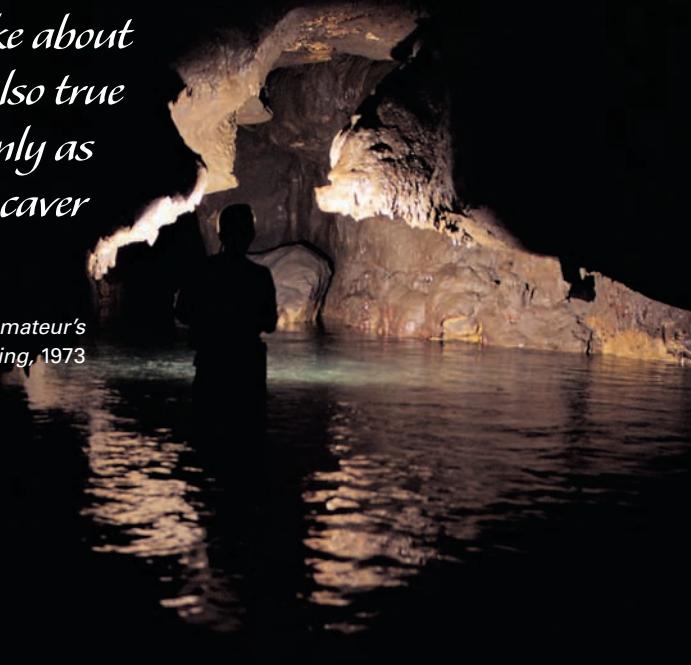
Dedicated to promoting responsible caving, local chapters (or *grottos*) of the National Speleological Society can be very helpful to Scout groups. Two other organizations are the American Cave Conservation Association and the Cave Research Foundation. Public agencies overseeing certain caves are essential resources for cavers of any age and experience level. Among them are the National Park Service, USDA Forest Service, and Bureau of Land Management.

Caving organizations and public agencies might also be able to provide guidance to Scout groups interested in assisting with the restoration of damaged caves. No projects should be undertaken without the permission of the agency or landowners in charge of a cave, and all work should be supervised by people with a knowledge of cave restoration and repair.

For links to these organizations and agencies, see the *Fieldbook* Web site. ➔

*"Caving is dangerous,  
make no mistake about  
that. But it is also true  
that caving is only as  
dangerous as a caver  
makes it."*

—David R. McClurg, *The Amateur's Guide to Caves and Caving*, 1973



## Caving Safety

The hazards of caving probably are no greater than those encountered by mountain travelers. However, rescues can be more complicated when a person is injured underground in the remote interior of a cave. Thorough planning and preparation can help you minimize caving's inherent risks. Underground hazards can include flooding, falling, equipment failure, disorientation, hypothermia, heat exhaustion, and exposure to histoplasmosis (a bronchial disease caused by a fungus), rabies, and other biological concerns.

Prepare for safe caving through careful planning, proper leadership and training, carrying the right equipment, and exercising good judgment. Keep the following guidelines in mind when planning for and participating in caving:

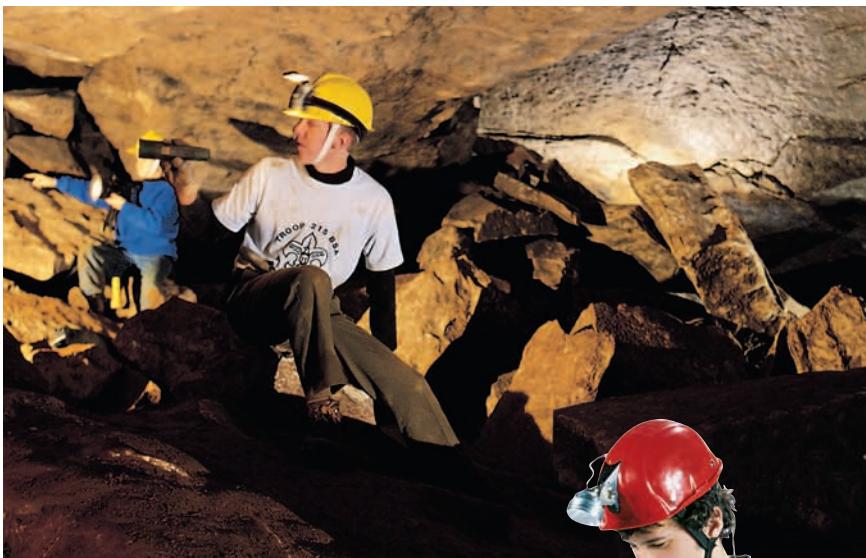
- Never cave alone. A group entering a cave should consist of a minimum of four people, at least one of them an experienced caver. If there is an emergency, one person can stay with an injured person while the other two go for help.
- Before you embark, always file a detailed trip plan with a responsible adult. Write down the exact location of the cave entrance, where you intend to go while you are underground, and when you expect to come out. Then stick to your itinerary. If you have not returned by the time noted on your trip plan, the person expecting you must assume you have encountered difficulties and should notify authorities to begin search-and-rescue operations. (For more on trip plans, see the chapter titled "Planning a Trek.")

- Each person should carry at least three reliable sources of light—ideally, good flashlights with fresh batteries. A headlamp will allow you to use both hands while crawling and climbing.
- Don't exceed your capabilities. Caving is a learned skill. Begin with short, easily manageable trips underground. As your understanding of caving grows, you can gradually extend the time and distance of your subterranean journeys.
- Stay out of mines. Caves have endured eons of motion by the earth and can generally be assumed to be relatively stable. The same cannot be said of mines and other excavations created by humans, which are much more prone to rockfall and collapse.
- Be aware of the potential for flooding. It might seem odd that weather can have an impact on the conditions of a cave, but it can. Rainwater seeping underground can have dramatic effects on the levels of subterranean pools and streams long after a storm. As a rule of thumb, enter caves only after several days of fair weather.
- Never use ropes, ladders, anchor points, or other installations in caves unless absolutely assured of their security by group leaders who had a hand in the initial selection and placement of the components and who have made a thorough evaluation of the current status of each item. Mountaineers don't trust ropes or hardware they did not themselves bring on a climb; the same holds true for cavers.
- Caving involves a set of skills that should be learned under the supervision of qualified instructors who have mastered their craft through many caving experiences. Seek out good teachers and group leaders, and study the skills of caving from the ground down.

### ***Lost in a Cave***

Do all you can to keep track of your location as you move about underground. Sticking to established routes, traveling in the company of cavers familiar with particular underground passages, and following published maps can all be means of staying found. Turn frequently and study the way you have come, the better to recognize the appearance of your return route.

If you do become confused about where you are while caving, stop immediately and stay as calm as you can. Switch off your headlamp to conserve its power. Have a bite to eat and a sip of water, pull on some extra clothing to help you stay warm, then wait to be found. Give a shout every minute or two and listen for an answer, but don't wander about aimlessly searching for a way out. It might take time, but if you left your trip plan information with a responsible person, someone will come for you.



## Caving Equipment and Supplies

Even though you will always travel in caves with several companions, equip yourself to function independently. Carry a day pack or fanny pack that contains the outdoor essentials with a few variations. You won't need rain gear or sun protection, but a pocketknife and a first-aid kit could come in handy underground. A map of the cave and a compass also could prove useful.

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

### Clothing

Old, rugged clothing or coveralls are a must underground. A caver walks, crawls, climbs, and squirms through passages that may be sloppy with mud, water, and bat guano. Some caves are chilly and damp, conditions conducive to hypothermia, so you might need to pull on layers of wool or fleece to stay warm. Pads for your knees and elbows will provide protection if you will do extensive crawling, and so will gloves. Leave a set of clean clothes outside the cave for the trip home, and a plastic trash bag for stowing your muddy clothing and shoes.



## Light

The only illumination in a cave is what you take in, so you must carry dependable sources of light that will last as long as you are underground. Nothing is more vital to your safety; a caver stranded without a light has no choice but to sit still in the darkness and wait to be rescued. To be sure that won't happen to you, have at least three independent, reliable sources of light. Even if two of them fail, you can still see to find your way to the cave's entrance. The best caving lights are electric headlamps (with fresh batteries) that can be attached to caving helmets.

### ***Battery-Powered Headlamps vs. Carbide Lamps***

Battery-powered headlamps are powerful, reliable, and inexpensive, and have all but replaced the carbide lamps that were the choice of earlier generations of cavers. Carbide lamps do generate bright light, but they also produce undesirable by-products in the forms of acetylene gas and spent fuel residue. Agencies managing many caves have discouraged or banned the use of carbide. You can help ensure the health of other cavers and of the caves you visit by choosing battery-powered lights for all your underground journeys.

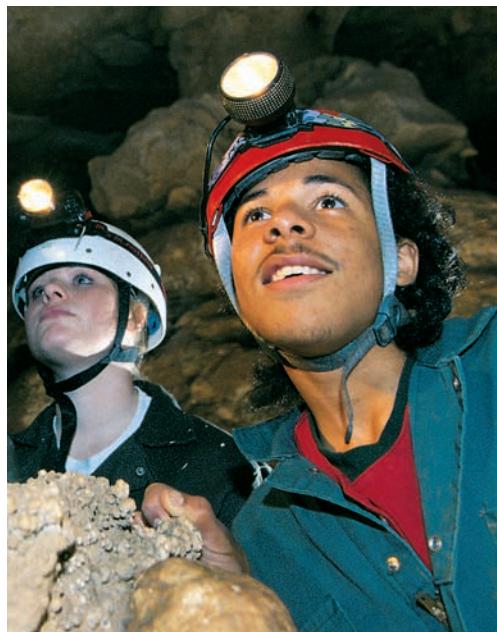
## Helmet

Think of low, dimly lit cave ceilings, and you'll realize the importance of always wearing protective headgear. Helmets made especially for caving are the best choice, though rock-climbing helmets also are well-suited for cavers.

Secure the chin strap to prevent your helmet from slipping off.  
(Construction hard hats are not suitable for cavers.)

## Food and Water

Carry drinking water and enough high-energy food to see you through a caving trip even if you are underground longer than you had planned.





## Caving Techniques

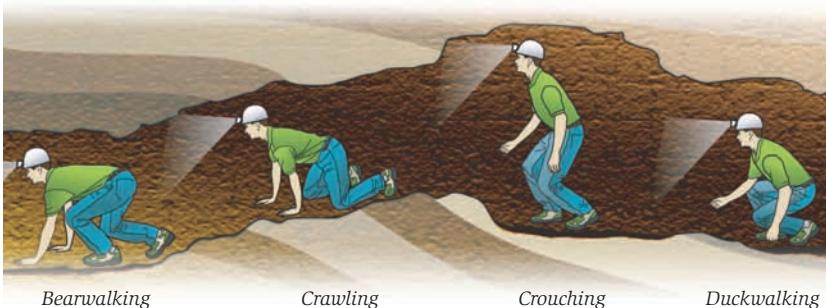
The goal of every caving expedition is to get in and out of the cave safely, to enjoy yourself while you are underground, and to leave no trace of your passing. That requires planning, beginning by contacting the agency responsible for managing that area. There might be limitations on the size of groups going into a cave, and permits might be required. Agency officials might be able to provide you with maps and suggestions for ways to enhance your experience.

Move slowly and deliberately in a cave. Avoid jumping and be especially cautious if you cross ledges or work your way over loose rocks and alongside streams. The most experienced cavers go first and last. Should the party become scattered, the skilled caver can bring the stragglers along.



## Horizontal Caving

Moving horizontally in a cave can involve a variety of movement methods including bearwalking, crawling, crouching, and duckwalking.



*"The memory of a cave  
I used to know at home  
was always in my mind,  
with its lofty passages,  
its silence and solitude,  
its shrouding gloom, its  
sepulchral echos, its flitting  
lights, and more than all,  
its sudden revelation of  
branching crevices and  
corridors where we least  
expected them."*

—Mark Twain (Mississippi River steamboat pilot, journalist, and acclaimed author of books including *The Adventures of Tom Sawyer* and *Huckleberry Finn*), *Innocents Abroad*, 1869

## Vertical Caving

Many caves include cliffs and pits that rival those encountered by rock climbers aboveground. Descending and ascending these obstacles—vertical caving—can require ropes, harnesses, and hardware, and should not be attempted without extensive training and supervision by qualified caving instructors. The BSA's climbing/rappelling guidelines require that any climber or rappeller more than shoulder height above the ground must be protected by a belayer. Vertical caving is beyond the scope of this book.

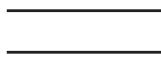
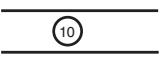
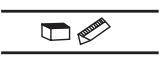
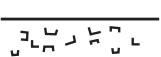
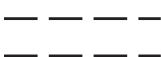
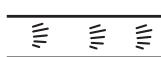
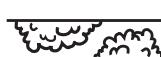
For more on the BSA's guidelines for climbing and rappelling, see the *Fieldbook* Web site, and BSA publications *Climb On Safely* and *Topping Out*. 

## Speleology

*Speleology* is the study of caves; a *speleologist* is one who does that studying. Your own explorations and studies of caves can encompass a wide variety of activities, from photographing subterranean features to examining subterranean geology and finding evidence of the creative forces at work. Perhaps you can discover some of the habits of tiny inhabitants of the darkness.

The more caves you visit, the more time you'll want to spend underground. One day you will come to the surface tired and covered with mud, but there will be a smile on your face and you'll know you have become a caver. You will have realized that a caver's happiest moments come when you can visit a cave and then leave it exactly as you found it.

### Cave Map Symbols

Surveyed passage		Passage ceiling height	
Underlying (dotted) passage		Large breakdown	
Vertical drop in passage with depth		Small Breakdown	
Sketched passage		Clay	
Sloping passage		Sand	
Stream and pool		Bedrock pillar in passage	
Flowstone		Survey station	
Rimstone dam		Cross section	

Underground experts mapping caves use special symbols to indicate subterranean features.



# CHAPTER 25



## Fishing

*"Ours is the grandest sport. It is an intriguing battle of wits between an angler and a trout; and in addition to appreciating the tradition and grace of the game, we play it in the magnificent out-of-doors."*

—Ernest G. Schwiebert Jr. (American author, architect, and lifelong fisherman), *Matching the Hatch*, 1955



When it comes to fishing, it's good to accept the fact that fish are a lot smarter than you are, at least when it comes to being fish. To become fish of much size, they have learned to find enough to eat. They also have figured out how to avoid predators, including the likes of you. If catching fish were easy, you would quickly tire of it. As it is, though, the challenge of matching your wits with those smarter-than-you fish can last a lifetime.

Fishing is many things to many people. It can fill a quiet hour on a summer afternoon. It can be the reason for a week-long backpacking trip to reach remote mountain trout streams. It can be enjoyed with any tackle, from a simple pole with a line, hook, and worm to a fly-casting outfit with homemade lures keyed to the season, the weather, the water, and the species of fish. The larger experience of fishing—enjoying the scenery, appreciating natural surroundings, finding an escape from otherwise busy lifestyles—is heightened when your fishing takes you far from the beaten path.

Every angler has opinions about the best ways to fish, advice on the most effective lures, and sweet memories of favorite fishing holes. And everyone who fishes has a few fish tales. You will, too. As for the size of your fish tales, that's up to you.



**Catch-and-release fishing allows you to enjoy the experience of fishing without depleting the species population. Follow the principles of Leave No Trace while you are fishing, and you can be sure that you are reducing your impact on the environment, too.**

**For more, see the “Leaving No Trace” section of this book.**

## First Things First

Lakes and streams far from roads often are prime fishing spots that are far less crowded than bodies of water accessible by motor vehicle. Wherever you intend to fish, take care of a few preliminary responsibilities before you bait your hook.

## Licenses and Permits

Check with your state's fish and game department to find out if you need a fishing license. If most of your fishing will be near your home, you probably can get an annual license to cover all of your trips. Before traveling to other waters to fish, especially in other states, inquire about any legalities you must follow. A search of Internet Web sites should turn up the licensing requirements for an area, as well as lead you to lots of local information about fishing spots, lures, and seasons.

## Keeping or Releasing?

Decide ahead of time whether you will be keeping the fish you catch or releasing them. Many parks and forests permit only catch-and-release fishing, thus making the choice for you. Consider using barbless hooks on your lures to reduce the chances of injuring the fish you will

release. (You can permanently disarm a barbed hook by flattening the barb against the hook with a pair of needle-nose pliers.)

Another factor in your decision to release or keep fish may be the presence of bears in the area where you intend to camp. Bears are attracted to aromas, and if there is anything standard about fish, especially those being cooked, it's the fact that they smell. Check with the local land manager, or toss fish remains and entrails in flowing water or carry them out. When bedding down at night, wear clean clothing that is free from any fish smell. If that will be a difficult challenge, you would be wise to practice catch-and-release fishing, or to save your fishing for trips in places where you are not competing with bears.

## Finding Fish

Fish like to dwell where there is an abundance of food and an absence of danger. That often means water with a current that will keep a fresh supply of potential food flowing past. Fish also want shelter of some sort—an eddy, the quiet water behind a big rock in a stream, the darkness below a submerged log, or a bed of underwater grasses.

A fish is equipped with a sensory organ running the length of its body, called the *lateral line*, that picks up vibrations from its surroundings. That can be good for an angler using lures that give off vibrations resembling those of an injured minnow or some other enticing morsel. It can be bad, though, when the vibrations come from footsteps, unintended splashes in the water, and other noises that fish perceive as threatening rather than inviting. Fish are wary of predators on land and in the air as well as in the water, and will dart away from shadows suddenly cast on a pond or stream.

**It's highly unlikely that the fish you want to catch will come looking for you. To find them, you'll need to figure out what a fish needs.**



### Mastering Fishing Skills

Fishing involves these steps:

- ① Choose a lure or bait that will attract fish.
- ② Cast effectively and persuade a fish to strike.
- ③ Set the hook and play the fish close enough to land it.
- ④ Gently release the fish, or clean and cook it.

### Pole Fishing

One of the simplest ways to catch fish requires little more than some tackle and a lightweight pole—a cane pole is ideal, though fish won’t mind if you use a straight stick. Tie one end of a fishing line to the pole; to the other end of the line attach a bobber, a sinker, and a hook baited with a worm, grasshopper, grub, or other natural food of the fish you’re after. You might be able to gather the bait you need from grass and bushes along the shore. Toss your line into the water, make yourself comfortable, and wait for the bobber to jiggle.



## Casting Systems

Fishing with a pole and bobber consists of brief moments of excitement interrupted by long periods of patient waiting, appreciating the scenery, and napping in the shade. Anglers eager for a more active role in the outcome of their efforts can graduate to one of several casting systems, using rods and reels to cast and retrieve lures that simulate the shape and motion of a fish’s natural food. Fishing becomes a game of wits as anglers try to guess which lures to use, where to cast them to attract fish, and how to retrieve them to entice a fish to strike.

A casting system, or *tackle*, is made up of a rod, a reel, some line, and a lure or bait. Figure on several lures, since you might occasionally lose one. When your fishing adventures will take you far from the trailhead, your choices of tackle will depend in part on how you plan to travel. The rod will be the most critical; it’s an awkward item to carry in any case, and particularly so as you make your way through brush or along a trail.

A collapsible rod can be dismantled, stored in a lightweight plastic tube, and strapped to the outside of a backpack. Rods of modest length that don’t come apart can be lashed under the gunwales of canoes and along the decks of kayaks. Reels can be removed from rods for ease of packing. A small lure box will round out your carrying gear by providing a secure place to stow lures and prevent the hooks from finding their way into your other gear or into you.

Whatever tackle you choose, casting is simply a means of getting a lure or bait onto or into the water where fish are likely to strike it. Each of the four types of casting systems—*spin-casting*, *spinning*, *bait-casting*, and *fly-casting*—is suited to particular kinds of lures, baits, and methods of fooling fish.



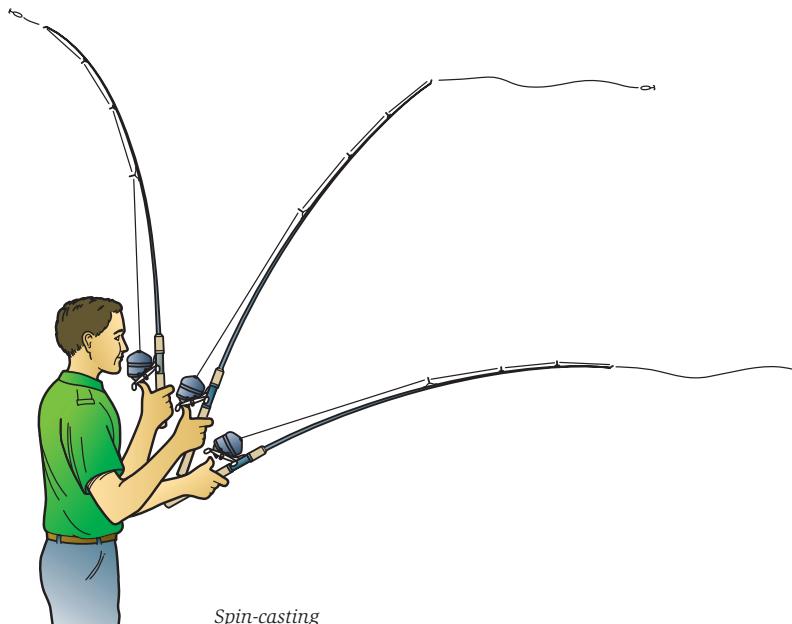
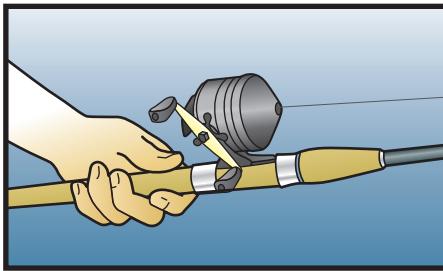
## Spin-Casting

The easiest casting system to master is the closed-faced *spin-casting* rig. The equipment you'll need includes a rod (often made of fiberglass) and a reel with the line spool enclosed in a cone-shaped housing. The line comes out of a hole in the point of the cone, and its release is controlled by a push button mounted on the back of the reel. Because the spool is enclosed, the system is difficult to tangle—a great advantage for beginning anglers.

To cast with spin-casting gear, thread the line from the reel through the line guides of the rod and tie on a lure or a hook with bait. (For practice on dry land, use a hookless rubber casting

weight instead and a bucket or a circle drawn on the ground as a target.)

Hold the rod in front of you with the reel up, the tip of the rod pointed toward the target. Reel the lure or bait to about 6 inches from the rod tip and depress the button beneath the thumb of your rod hand. While holding the button in, swing the rod back and up until it is nearly vertical, then smoothly snap it forward. When the tip of the rod is about halfway back to its starting position, lift your thumb from the button to release the line and send the lure or bait flying. If it goes too high, your release was early; if it goes low, the release was late. It will take you a few casts to get a feel for the instant to release the line and for the right amount of power needed to arc the lure or bait into the center of your target.

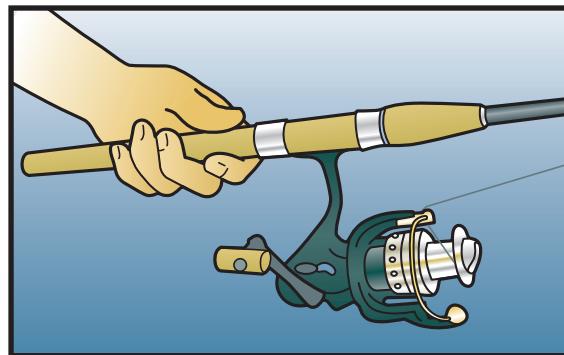


*Spin-casting*

## Spinning

An open-faced *spinning* reel has no cone covering the spool, relying instead on a wire bail to control the line. The reel hangs below the rod handle, and the line feeds out through guides on the underside of the rod.

Reel the lure or bait to about 6 inches from the tip of the rod. Use the index finger of your rod hand to press the line against the rod handle, then move the bail to the open position. Make a cast by moving the rod as you would with a spin-casting outfit,

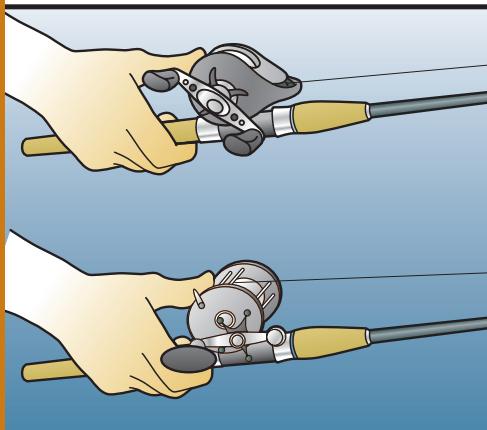


moving your index finger to release the line and send the lure or bait on its way. As the lure or bait approaches its target, you can bring your finger close to the rod handle so that the moving line brushes against it and slows (called *feathering*), causing the lure or bait to drop gently into the water. Turning the reel crank after each cast will return the bail to its closed position and allow you to wind the line back onto the spool.

## Bait-Casting

In spin-casting and in spinning, the line peels over the rim of the reel spool but the spool itself does not turn. In *bait-casting*, the spool rotates during the cast, allowing the line to unwind. Anglers often choose bait-casting for fishing with live baits such as minnows, as well as with artificial lures.

To use bait-casting gear, wind the lure or bait to within a few inches of the rod tip. Most bait-casting reels have a button that disengages the crank and allows the spool to turn freely, or *freespool*. Grasp the rod and place your thumb against the back of the spool to secure the line. Depress the freespool button and you're ready to cast.

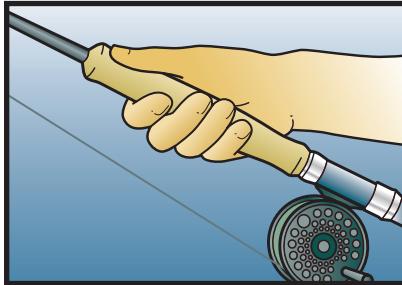


The casting motion is basically the same as with spin-casting and spinning rigs. Let the line go by lifting your thumb just enough to reduce tension on the spool, keeping your thumb in light contact with the spool to control the distance of the cast and to prevent the tangling overrun, or *backlash*, that can occur if the reel releases line faster than the lure or bait can pull it away.

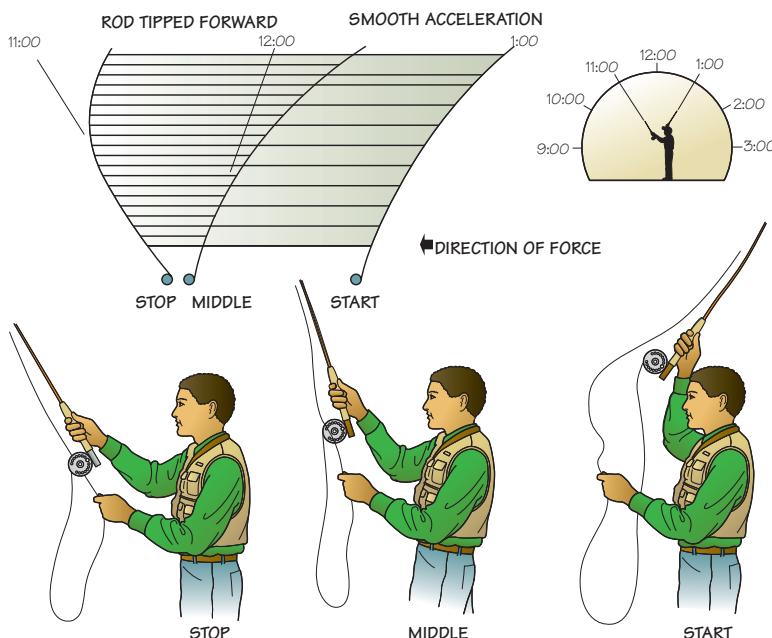
## Fly-Casting

The fourth casting system is the oldest and, with good equipment and instruction, not very difficult to use. While other systems rely on the weight of the lure or bait to pull line from the reel, fly-casters use nearly weightless lures made of bits of feather, fur, hair, and thread. The line itself provides the weight that carries a lure through the air.

Fly rods are long—6 to 10 feet. The reel, located below the rod, is a simple winch to wind line in and out. The line is relatively thick and is made especially for fly-fishing. Some lines will float when they reach the water, while others are designed to sink. Several feet of thin, transparent *leader* is attached to the end of the line, and the lure, usually in the form of an artificial *fly*, is tied to the end of the leader.



Fly-casting is a skill you can learn in a few minutes, then spend the rest of your life trying to perfect. Slowly arc the rod back and forth over your head, each time feeling the loading energy being transferred from the line to the rod and back to the line again. Control the line with your free hand as you feed out line from the reel. When you've got enough line looping through the air, swing the tip of the rod toward your target. Let the line curl out over the water and lightly place the fly just where you want it. In still water, drop the fly directly over the fish. If the water is moving, cast upstream and let the lure drift near feeding fish where they lie in wait.



*Fly-casting technique*



*"When you catch your fish do as I do—only keep those you specially want for food or as specimens, put back the others the moment you have landed them."*

—Robert S. S. Baden-Powell  
(1857–1941), founder of the worldwide Scouting movement

## Fishing Lures

Knowing how to cast will help make you a good angler. Knowing what lures to use can bring you success, since you will be casting lures that will appeal to fish.

### Spinners

*Spinners* are shiny metal lures that, as their name implies, spin through the water as you reel them in. Steadily retrieve a spinner to make the lure twirl, or reel and stop, reel and stop, allowing the lure to sink a little with each pause.

### Spoons

*Spoons* essentially are spinners that flutter rather than spin. Many are painted red with diagonal white stripes. Spoons with hooks shielded to discourage entanglement in weeds will reach fish that hide in underwater beds of grass and beneath lily pads.

### Plugs

*Plugs* are intended to look like little fish, crawdads, frogs, or other aquatic prey. Some always float; others dive as they are retrieved. Some wobble and gurgle, some make a popping sound, and some wiggle slowly through the water. The goal of using a plug is to manipulate it so that it attracts the attention of hungry fish.





Floater/diver

### Floater/Diver Lures

Lures that both float and dive typically have the appearance of small fish or frogs. Retrieve them slowly and they'll stay near the surface. Reel them in quickly and they will swim a few feet underwater.



Injured minnow

### Injured Minnows

Another effective lure is shaped like a minnow and outfitted with shiny propellers on one or both ends. Retrieve it in fits and starts, causing the lure to struggle along like a hurt minnow trying to escape.

### Crank Baits

A crank bait dives deeply as you reel it in. It vibrates and rattles to attract fish far below the water's surface.



Crank bait

### Jigs

A *jig* has a heavy, blunt body embellished with skirts made of hair, feathers, rubber, or plastic. It will sink to the bottom of a stream or lake and bounce as you raise and lower, or *jig*, your rod, reeling in line whenever there is slack. Jig lures come in many sizes and styles, and are effective for catching everything from small panfish to big trout, bass, walleyes, pike, and many saltwater species.



Jig

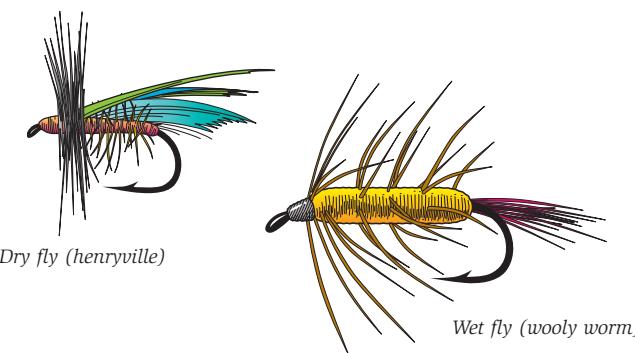
## Soft Plastic Lures

While some *soft plastic lures* are molded to mimic insects, grubs, and small aquatic animals, the most popular type looks like an earthworm. Hooks embedded in the worm and attached to a leader provide the bite of the bait, and a small lead sinker provides extra weight to increase casting distance. A good way to fish with a plastic worm is to cast it near a submerged log or stump, or into the shallows close to shore, then jig the rod to drag the worm along.



## Flies

There was a time when a lure called a *fly* looked much like what its name implied—an insect called a mayfly, one of the primary food sources of trout. Many fishing flies still match the appearance of insects near trout streams, but variations abound. *Dry flies* are designed to float on the surface of the water; *wet flies* and *nymphs* are meant to sink. *Streamers* look like small minnows. Bass and some saltwater fish also can be taken with fly-fishing tackle, often by using flies you have made yourself.



### Live Bait

Live bait, including minnows, earthworms, and leeches, should never be released. It can cause undesirable environmental impacts.

## Rigging Your Tackle

Successful fishing relies on well-tied knots. The most important knots are those used for tying lines to lures, hooks, and leaders.

### Improved Clinch Knot

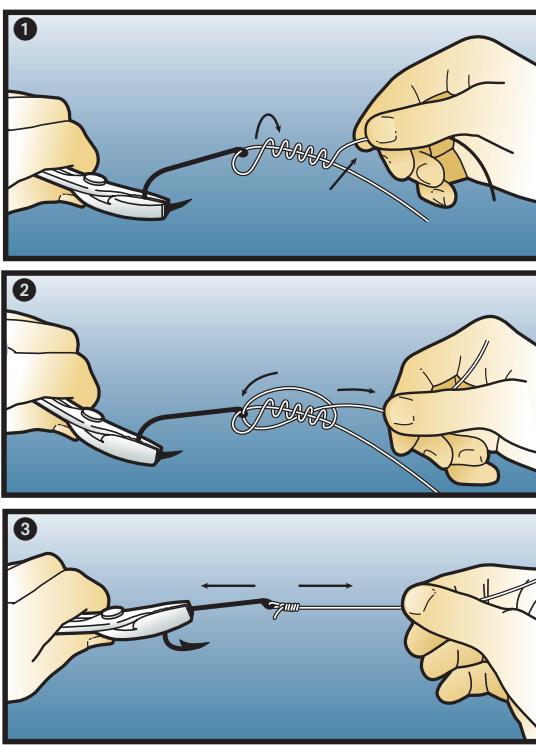
Use the *improved clinch knot* to secure a line directly to a hook or to the eye of a lure:



- ➊ Pass the end of the line (the *running end*) through the eye of the hook or lure. (Holding the hook with needle-nose pliers will shield your hand from possible injury.) Pull through about 8 inches of line. Bend it back away from the lure or hook, and wind it five or six times around the body of the line (the *standing end*).
- ➋ Pass the running end through the loop closest to the eye of the hook or lure, then pass the running end through the newly created large loop.

- ➌ Gently pull the lure or hook in one direction, the standing end and running end of the line in the other. Apply varying pressure to portions of the knot so that it is neatly dressed—that is, all the loops are in place and tightened equally to all other portions of the knot. Moistening the knot as you tighten it can lubricate the line and enable you to pull out the slack more easily.

With a knife blade or fingernail clippers, snip off nearly all of the remaining running end.



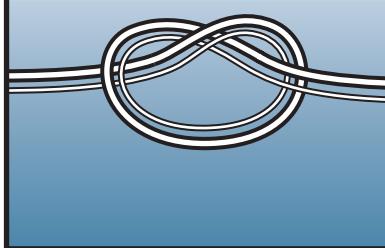
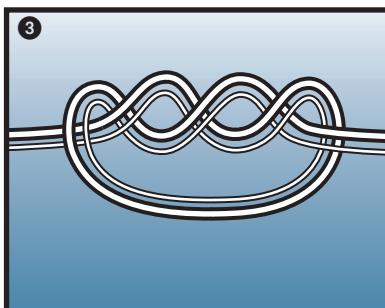
*Improved clinch knot*

**1**

### Surgeon's Knot

To join a leader to a line, rely on the *surgeon's knot*:

- 1** Lay the line and leader side by side, overlapping the ends 6 to 8 inches.
- 2** Lift the line and leader together, form a loop, and tie a loose overhand knot by passing the entire leader and the end of the line through the loop.
- 3** Pass the leader and end of the line through the loop a second time.
- 4** Tighten the knot by gradually pulling slack out of the leader and line. Snip off excess ends of the line and leader.

**2****3****4**

*Surgeon's knot*



## Playing a Fish

You've picked the right lure, cast it in a promising location, and felt the line suddenly jump as a fish strikes. The game of playing a fish has just begun.

A strong fish can snap a light line with a twist of its body. It can dive beneath sunken logs, or tangle your tackle in a bed of weeds. To prevent that from happening, draw the tip of the rod upward and then reel in line as you dip the rod back toward the water. Do what you can with the line to steer the fish away from underwater obstructions, and keep pressure on the line. Don't waste time. The longer it fights, the greater the chance a fish will free itself from the hook, break your line, or become ensnared in obstructions.

A speedy retrieval is especially important when you intend to release a fish. Its chances of recovery will be higher than if it had been played to the point of exhaustion.

## Releasing a Fish

Try to leave a fish in the water if you are planning to set it loose. You might be able to release it simply by running your hand down the line to the lure and twisting the hook free. If you must lift the fish, wet your hands first to protect the mucus on the fish's skin. Continue to support the fish when you have returned it to the water. Position it with its head upstream so that water will flow through its gills until it seems to have regained its energy and can swim away on its own.

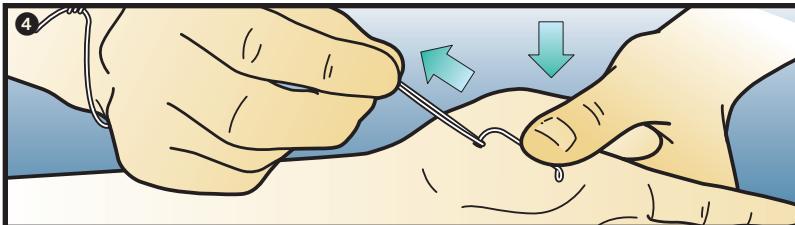
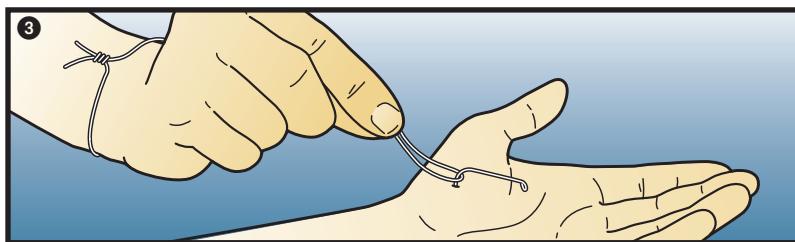
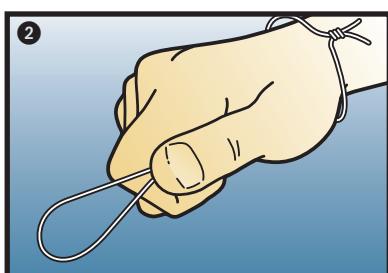
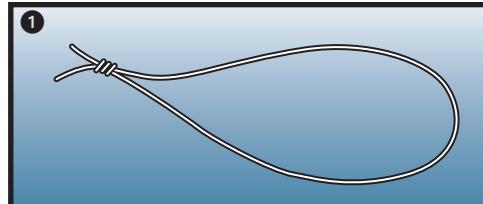
## Releasing a Hooked Angler

If you fish long enough, there will come a time when you put a hook in yourself rather than in a fish. Catch-and-release takes on new meaning when it is you (or one of your companions) in need of being released. If possible, let a physician or medic remove the hook from the flesh. On a long fishing trip, you might have to do the job yourself.

When the hook is embedded in flesh where the barb cannot be pushed through, a quick way to extract the hook is to use a length of fishing line.

- ❶ Tie the ends of a piece of sturdy fishing line together to form a loop.
- ❷ Place the loop around your wrist and grip the line between your thumb and index finger.
- ❸ Slip the loop over the hook.
- ❹ Press the hook's eye against the skin, then remove the hook with a quick jerk of the loop.

Thoroughly wash the wound and treat it with antibiotic ointment. Bandage the wound to help prevent it from getting dirty.

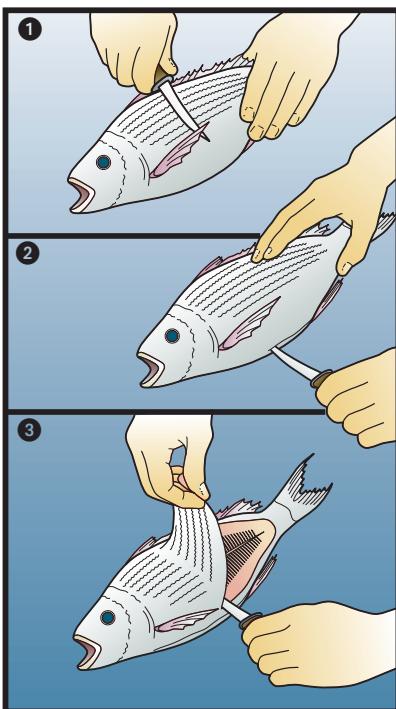




## Cleaning Your Catch

Trout and some other species of fish have scales so small they don't need to be removed before cooking; nor do catfish and similar species that can be skinned. For other fish, begin preparing them for the kitchen by scaling.

- ① Remove the scales by scraping the skin from tail to head with a knife blade or fish scaler.
- ② Gut the fish by making a slit from vent to throat. Strip the entrails from the body cavity with your fingers, then thoroughly wash the fish inside and out.
- ③ You can fillet a fish by slicing along each side close to the spine. The result should be two boneless pieces of fish.

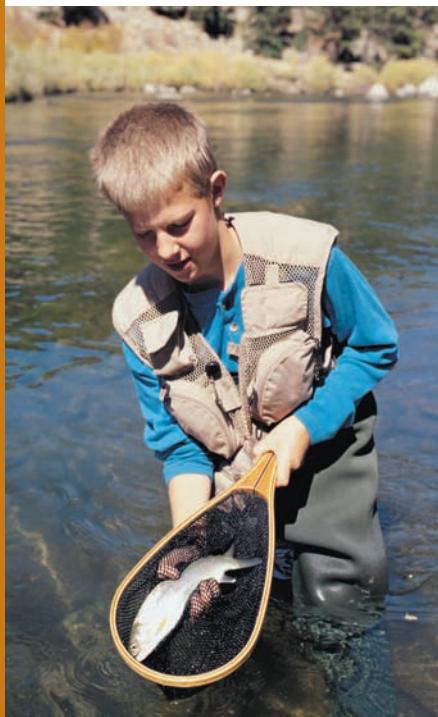




## Fishing Tips

Every angler has a creel full of tricks for making fishing easier and more fun. Here are a few:

- Sunglasses with polarized lenses can enable you to see beneath the surface of the water even when the sun is bright.



- Fish swimming in a swift stream usually face into the current. They aren't as likely to see you if you approach from downstream. Cast over them and let your lures drift toward them.
- Reeling in a lure very slowly might bring it through submerged vegetation without snagging.
- Make short casts first, then cast farther out into the water. That way, fish farther away will still be around after you've given those closer in a chance to attach themselves to your lure.
- Fish early in the day and at dusk when fish are more likely to be feeding. Overcast days also can be good.
- For beginning anglers, it's hard to beat worms, grasshoppers, grubs, and other live bait collected near a fishing spot.

## The Why of Fishing

This chapter has explored the *how* of fishing—how to prepare a bait or lure, how to rig a rod and reel, how to approach a body of water where fish are likely to lurk. As to the *why* of fishing, well, that's going to be answered every time you take your tackle and make your way to the edge of a pond, a lake, a stream, or the pounding surf. You know that fish are there, and that nothing stands between you and them but your skill, cunning, and luck.

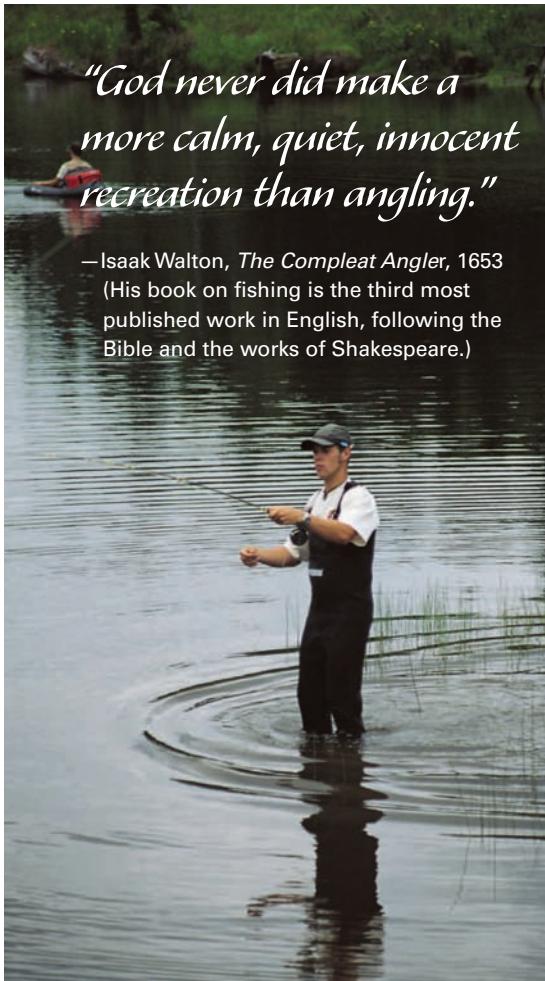
The adventure of fishing is also a terrific way to appreciate the environment. Your awareness of your surroundings is heightened by an eagerness to understand the habits and habitat of the fish you want to catch. You have a wonderful excuse to slow down, to spend plenty of time in one spot, and to notice everything going on around you. If you do catch a fish, that's a bonus to an otherwise fine day, but if not, the experience is never wasted.

Fishing is as varied and interesting an outdoor activity as you can find. Every kind of fish, every body of water, every sort of tackle, and each season of the year brings its own variety and challenge for anglers. Sometimes you'll have terrific luck; other days the fish will win. The bottom line, though, is that any time you spend with a fishing rod in your hand is quality time—time for having fun, time for making memories, and time simply to realize how great it is to be alive.

*"God never did make a more calm, quiet, innocent recreation than angling."*

—Isaak Walton, *The Compleat Angler*, 1653

(His book on fishing is the third most published work in English, following the Bible and the works of Shakespeare.)





# CHAPTER 26



## Search and Rescue

*"The people who I see performing best in a crisis are people who are honest and forthright. They don't hide their personalities or their weaknesses. They're genuine."*

—Sharon Wood, the first North American woman to summit Mount Everest



A mountain climber rushes down a trail to report that a companion on a snowy peak has fallen and broken an ankle. Children wander away from a picnic area and their parents are frantic. A group of hikers is overdue as night settles upon a wet, chilly forest. In each case, search-and-rescue teams are mobilized and, following well-practiced procedures, set out to meet the challenge. Before long the children are reunited with their families. By midnight the overdue hikers have been located, warmed, fed, and brought out of the woods. A rescue team has flown by helicopter to the top of the peak and rappelled down to the fallen climber. They treat his injuries and monitor his condition through the night while more rescuers approach on foot to carry the victim to the trailhead the next morning.

The happy endings to many potential wilderness tragedies are due to the dedication and efforts of search-and-rescue teams. In the frontcountry, people seldom are far from a road. Reacting to a medical emergency is often as simple as summoning assistance and then performing first aid for a few minutes while waiting for an ambulance to arrive. The rules change as you get farther from a road, though—rescuers often have to *find* the person in distress before beginning a treatment plan. Once victims of injury or illness have been located, transporting them immediately might not be practical or even possible. Weather, location, nightfall, and other variables might

make it necessary for an aid team to stabilize patients and maintain their safety for a period of hours or even a full day or more until an evacuation can be undertaken.

This chapter is an introduction to some of the main concepts and techniques of search-and-rescue (SAR) teams. It is not intended to teach all you need to know in order to take part in searches, but it might spark your interest in finding a SAR organization that can train you and then draw on your strengths and dedication in emergency situations.

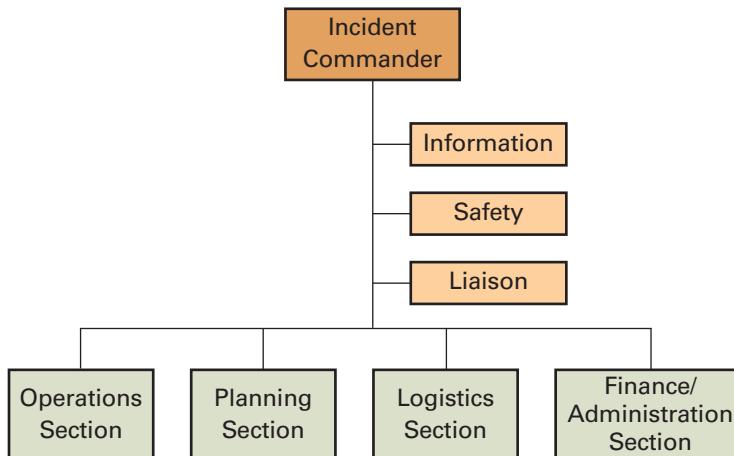
### ***Incident Command System***

The *incident command system (ICS)* is a flexible management protocol often mandated by law to be used when conducting search-and-rescue activities. The ICS is particularly effective when two or more agencies involved in an effort (especially those with differing legal, geographic, and functional responsibilities) must coordinate their responses.

## **Organizational Plan for Search and Rescue**

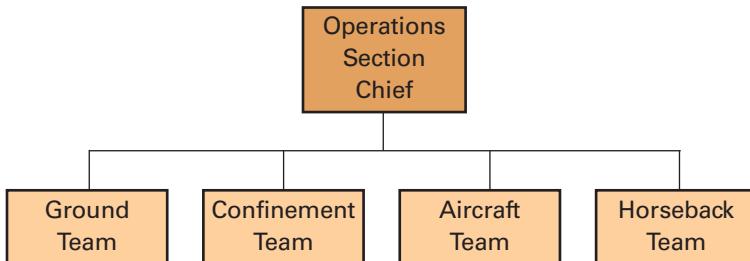
The organizational plan for a search-and-rescue effort depends upon the needs of official state and local agencies, the kinds of operations the unit will be expected to handle, and the existence of other SAR organizations with whom efforts can be coordinated. A typical search-and-rescue organizational chart looks like this:

### **ICS Sections**



It might surprise you to learn that a search-and-rescue operation involves the participation of so many people. The expanses of territory to be searched and the effort required to bring injured persons to safety can require a large number of personnel. In addition, teams in the field must be backed by an extensive support staff responsible for everything from supplying warm blankets and dry clothing to organizing transportation home for everyone after a rescue has been completed. If there are enough people, one team member can be assigned to each position; however, each team member might be assigned to handle several jobs on a search-and-rescue organizational chart.

## Resources for SAR Operations



### SAR Unit

A *search-and-rescue (SAR) unit* is a highly organized group of people who understand the serious nature of their responsibilities. Long before an emergency arises, leaders of any SAR group must meet with agency officials to clarify the exact nature of their relationship and to sort out lines of authority. Embarking on unauthorized search-and-rescue efforts is poor manners at best, and at worst can create problems. SAR units—aware of the limits within which they must operate—attempt only those rescues that are within the scope of their abilities.

Called out to respond to an incident, members of a SAR unit might be divided up to serve on several teams—as individuals helping with the confinement of an area, for example, or as participants on search teams. Depending on the nature of an evolving event, incident commanders can add teams to address the needs of the search-and-rescue effort.

Teamwork is the glue that holds together every search-and-rescue effort. The food service volunteers making sandwiches and soup at a base of operations are every bit as important as the searchers following footprints in the snow. A search-and-rescue operation is no place for glory seekers unless, of course, they see the glory of serving in quiet roles that are essential to the success of the overall effort.

## Personal Equipment

The personal gear that SAR team members carry in the field will vary according to the season of the year and the environment in which they expect to operate. A *24-hour pack* contains everything a searcher will need for a full day in the field—the outdoor essentials plus additional food, water, first-aid supplies, and emergency communications equipment. A *48-hour pack* adds a sleeping bag, shelter, stove, and more provisions. In either case, searchers carry more than they expect to need; they might be out longer than intended, and they might need to share their food and equipment with the subjects of their search.



## Call-Out

Officials of each of the 50 states have determined who will be responsible for planning and managing search-and-rescue operations within the boundaries of their state. Those duties often fall within the authority of local sheriffs, state or local emergency management offices, or a state natural resources department. Using this means to coordinate the efforts of search-and-rescue personnel, most search efforts are resolved within 24 hours.

When asked to help by an agency legally authorized to request assistance, a search-and-rescue unit must mobilize quickly. SAR team members often are equipped with pagers that a unit leader can use to alert them to emergency situations. Another option is a telephone tree, with various team members responsible for calling others.

## Search Tactics

A SAR team deployed to help find missing persons will have been trained to use a variety of search tactics, each intended to be effective for a wide range of situations. The three search methods that have proven the most successful are *investigation*, *hasty search*, and *confinement*.

### Investigation

Good information is vital to the quick success of a search-and-rescue operation. Team members can be assigned to individually interview people who might have recently seen the subject of the search or who might know about the subject's current appearance, habits, health, or other factors that can help SAR teams narrow the range of their efforts. The team may expand their investigative opportunities by leaving notes on vehicles in the area with the subject's description and contact information to be used by anyone with information that might be of assistance.

### Confinement

*Confinement* is the effort made by a SAR team to prevent lost persons from wandering beyond a search area. Since the unconfined area in which a person could be lost grows in size with each passing moment, confinement must be achieved as quickly and thoroughly as the availability of resources will allow. Methods include assigning team members to monitor trailheads, roads, and other points where a lost person could leave the primary search area. Barriers such as rivers or mountain ridges can aid confinement by acting as natural barricades.

### Hasty Search

In the early stages of a search, there often are several areas that team leaders and the incident commander pinpoint as probable locations of the lost person. A child who has wandered away from a campground, for instance, might have gone up a trail, across a meadow, or down to a beach. SAR team members can split up and go immediately to each of those areas to conduct hasty, informal searches.

### Critical Separation

*Critical separation*—the distance maintained between SAR team members as they make their way through a search area—allows the incident commander to balance the need for covering an area quickly with the importance of being thorough. The technique takes into account local terrain, foliage, and weather.

To determine the distance of critical separation for a particular search, SAR team leaders select a location that is typical of the area their team has been assigned to search. They lay a backpack (or something of equal size) on the ground and, if they have it, cover the pack with clothing similar to that last seen on the missing person. Three team members walk away in different directions until each loses sight of the object. Next, they walk directly back to the object, counting their steps as they return. Team leaders average those step counts and double the result to come up with

the distance of critical separation—that is, the number of steps from one another that searchers should maintain as they sweep through an area, knowing as they go that they will have a high probability of seeing the subject of their search.

### Probability of Area

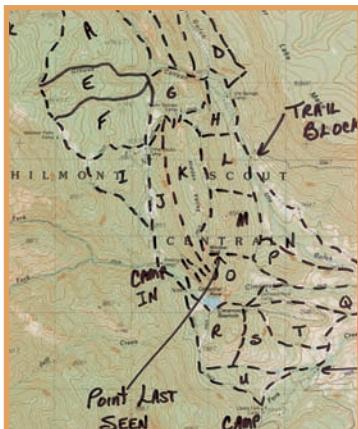
A means found effective by many teams to limit the initial area of a search draws upon the input of five experienced team members who are knowledgeable of the terrain, studying a map overlaid with a grid. Using all they know about the terrain, climatic conditions, time of day, the subject of the search, and details of the subject's disappearance, each of the team members independently rates the likelihood that the subject will be found in each section of the map grid. When these *probability of area (POA)* predictions are tallied, the team will have a consensus on the order in which areas should be searched to achieve a high possibility of early success.

Seasoned team members might also draw upon their expertise to estimate the *probability of detection (POD)* of clues and search subjects in a particular area. As with POA considerations, they take into account all the variables of a search situation, then predict their expected success rate. For example, if experts predict there are likely to be 10 useful clues in a grid section on the map but time and personnel are limited, the incident commander might order that the segment be searched with sufficient care to locate half the clues—a POD of 50 percent.

### Clue Finding

Despite the emphasis on Leave No Trace methods of travel, no one can move about without leaving some signs of passing, especially if the traveler is making no effort to hide. While it takes considerable skill to recognize many of these clues, some signs are obvious even to untrained observers, provided they are looking for them. Footprints on a damp shoreline or in patches of snow are easily seen, and a candy wrapper in the brush had to be left by someone. Finding and evaluating even a few clues can substantially reduce the potential area of search.

Two critical factors in clue finding are preserving the clues and evaluating them effectively. Searchers must take care not to disturb areas where footprints are likely or where other subtle signs might exist. Team members also should document all they can about clues—where they were found, in what condition, etc.—so that SAR leaders and the incident commander can effectively consider and use the information presented to them.





## Advanced Search Methods

Some search methods require advanced expertise or equipment. Among them are the following:

### Trailing Dogs

Certain breeds of dogs, notably bloodhounds, have such keen senses of smell that after being allowed to smell an article of a lost person's clothing, they can follow the scent trail left by that person. Success is dependent upon many factors including the training of the dogs, air temperature and humidity, and presence or absence of wind.

### Air-Scenting Dogs

Unlike trailing dogs, air-scenting dogs will follow to its source any human scent they find in a search area. As a result, they might locate the subject of the search, though they are just as likely to follow the scent of a SAR team member or a passerby. Air-scenting dogs (frequently German shepherds) have the greatest success when there have been few persons in the area they are to search.

### Tracking

A trained and talented tracker may be able to follow the trail left by a lost person. It is very important to prevent other people from entering the search area if a tracker is to be successful.

## Vehicle Search

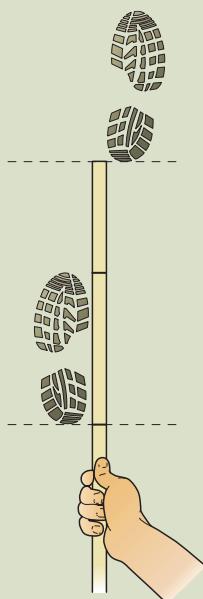
Using four-wheel-drive vehicles, team members can travel backroads to gather information about the terrain and to set up roadblocks to prevent lost travelers from wandering away from a search area.

## Aircraft Search

Searches from the air can be very effective, but they are highly dependent upon weather and the density of ground cover. Most searches from fixed-wing aircraft are conducted by the Civil Air Patrol. Helicopters might be supplied by the military, or by municipalities and corporations. The efforts of airborne searches can be greatly enhanced by SAR incident commanders drawing upon the resources of satellites, emergency location transmitters (ELTs), and the Air Force Rescue Coordination Center (AFRCC).

Airplanes are equipped with emergency location transmitters (ELTs), devices that are activated by significant impact. If an airplane goes down, the ELT on board sends out a signal that can lead rescuers to the crash site.

### Tracking Stick



Searchers engaged in tracking can increase the likelihood of success by using a *tracking stick*—a rod about 4 feet long. (A straight branch with notches cut for measurements will work nicely, too.) When trackers find two footprints in a row, they can measure the distance from the heel of one print to the heel of the next and mark that distance on the stick with a rubber band. Then, by measuring the same distance ahead and slightly to the side of the forward print, they'll know approximately where the next track should be. At night, a lantern or flashlight held near the ground will produce shadows that make tracks more visible.



## First Aid

Search-and-rescue teams must number among their members persons trained to provide first-aid treatment to victims of accident or illness. The challenges facing first-aiders can be heightened because of weather conditions, location of a victim, distance from a road or aircraft landing zone, and the need to render aid using only the supplies and equipment the team has carried with them. Advanced first-aid training with an emphasis on wilderness emergencies prepares team members with the medical skills they need and a methodology for addressing emergencies in remote settings.

Upon finding an injured or ill person, a SAR team's routine generally will follow the same protocol as for incidents in the frontcountry:

### Take Charge

Team members will focus their attention on the job of making people safe. Their training and experience will nearly always infuse their efforts with an air of authority.

### Approach With Care

Rescuers must be aware of falling rocks, slippery footing, steep slopes, and other hazards as they come to the aid of ill or injured persons. Becoming injured themselves or causing further injury to the subject can dramatically compound the seriousness of an emergency situation.

### Provide Urgent Treatment

The first rescuers on the scene will make a quick assessment of the victim's situation and address any conditions that could be life-threatening; this includes checking and treating for shock if necessary.