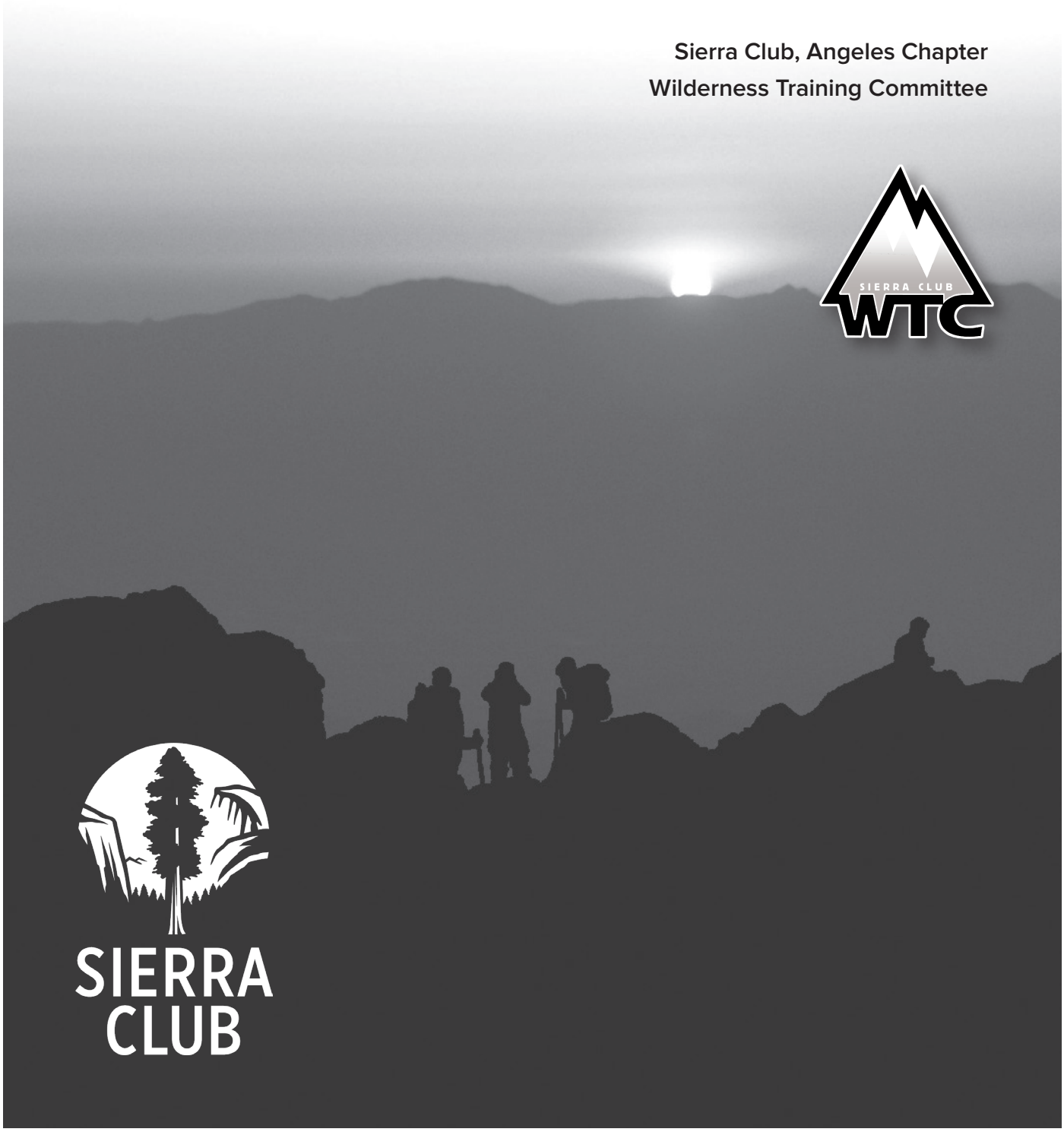
STUDENT HANDBOOK

Wilderness Travel Course 2026

Sierra Club, Angeles Chapter
Wilderness Training Committee



Editors: Regge Bulman (2020–2026), Jane Simpson (2014–2019)

Designer: Helen Qian

Recent Contributors: Ruth Saxson, Robert Myers, Rachel Glegg, Will McWhinney, Shawnté Salabert, Steve Schuster, Sarah Wierszalowski, Tom McDonnell, Daniel Kinzek, Joseph Bell, Neal Robbins, Bob Draney, Ron Campbell, Tina Bowman, Darrick Danta, Bob Myers, Ed Morente, Scott Nelson, Helen Qian, Edd Ruskowitz, Jane Simpson, Tracy Sulkin and staff of WFAC.

Current Curriculum Committee members: Jane Simpson, Dinah Thomas. With notes and assistance from Tom McDonnell and Ann Shields. Special thanks to Shawnté Salabert for the Backpacking Gear List (Chap. 10), Sarah Wieszalowski for the First Aid kit list (Chap. 7) and Will McWhinney for the Gear Maintenance checklist (Chap. 10).

Cover Design: Edd Ruskowitz. Photos by Edd Ruskowitz and Jane Simpson

Knot of the Week illustrations: Regge Bulman

The WTC Student Handbook is the work of multitudes. Over the past 30 years or more, dozens of volunteers have written and rewritten it to better help our students. These contributors include former editors Joe Wankum, John Horton, Ron Campbell and Bob Draney, and writers Randy Bernard, Bob Bradshaw, Walt Bruszewski, Larry Cobb, Nick Clinch, Ed Cunningham, Ron Fine, John Finn, Tom Jeter, Jim and Ann Kominski, Bruce Knudtson, Dennis Lantz, Joe McCosker, Carette McFarlane, Karen Patterson, Frank Riseley, M.D., Bob and Tommie Speik, Howard Stephens, Les Stockton, John Tompkins and Chuck Youngberg.

2026 WTC SCHEDULE

	DATE	ACTIVITY	ASSIGNMENTS
CLASS 1	OC Jan. 6 LBSB Jan. 14 SGV Jan. 20 WLA Jan. 28	6:15 Registration 7:30 Intro, Ten Essentials, boots, conditioning	**Complete assignments before each class.** WTC Student Handbook FOH *Freedom of the Hills*, 10th Edition
	WLA Jan. 31 or Feb 1	**Meet and Greet Hike** (Saturday or Sunday) Check with Group Leader	
CLASS 2	OC Jan. 13 LBSB Jan. 21 SGV Jan. 27 WLA Feb. 4	7:30 Clothing and equipment, compass intro.	**Reading** WTC Intro, Chapters 1, 2 FOH: 16–48, 81–94 **Homework** WTC: 1-6
CLASS 3	OC Jan. 20 LBSB Jan. 28 SGV Feb. 3 WLA Feb. 11	7:30 Navigation	**Reading** WTC: Chapter 3 FOH: 95–129 **Homework** WTC: 2-5
TRIP 1	OC Jan. 24 or 25 LBSB Jan. 31 or Feb 1 SGV Feb. 7 or 8 WLA Feb. 14 or 15	**Full-Day Hike** (Saturday or Sunday) Check with Group Leader	**Reading** WTC: ix, xi–xii **Homework** Trail profile of trip (or later). See WTC: 3-18 & 3-19
CLASS 4	OC Jan. 27 LBSB Feb. 4 SGV Feb. 10 WLA Feb. 18	7:30 Tents, sleeping bags, stoves, navigation	**Reading** WTC: Chapter 4 FOH: 49–60, 64–70, 130–140, 246–268, 581–587 **Homework** WTC: 3-22
CLASS 5	OC Feb. 3 LBSB Feb. 11 SGV Feb. 17 WLA Feb. 25	7:30 Navigation, prep for Trip 2	**Reading** WTC: Chapter 5 FOH: 141–151, 554–560, 571–580 **Homework** WTC: 3-23
TRIP 2	OC Feb. 7–8 LBSB Feb. 14–15 SGV Feb. 21–22 WLA Feb. 28–Mar. 1	**Navigation/Rock Scambling** Buses leave EARLY Saturday, return Sunday evening.	**Reading** WTC: xiii–xiv

OC: Orange County Tuesdays
LBSB: Long Beach-South Bay Wednesdays
SGV: San Gabriel Valley Tuesdays
WLA: West Los Angeles Wednesdays

Important Dates:
Jan. 19 – MLK Day
Feb. 8 – Super Bowl Sunday
Feb. 16 – Presidents' Day
Feb. 17 – Start of Ramadan

2026 WTC SCHEDULE

	DATE	ACTIVITY	ASSIGNMENTS
CLASS 6	OC Feb. 10 LBSB Feb. 18 SGV Feb. 24 WLA Mar. 4	7:30 Snow travel, winter gear, backpacks	**Reading** WTC: Chapter 6 FOH: 61–64, 376–381, 451–474, 561–570 **Homework** WTC: 5-5
CLASS 7	OC Feb. 17 LBSB Feb. 25 SGV Mar. 3 WLA Mar. 11	7:30 Wilderness first aid, first aid kits	**Reading** WTC: Chapter 7 FOH: 510–533
TRIP 3	OC Feb. 21 or 22 LBSB Feb. 28 or Mar 1 SGV Mar. 7 or 8 WLA Mar. 14 or 15	**Snow Travel** (Saturday or Sunday) Check with Group Leader	**Reading** WTC: xv–xvi
CLASS 8	OC Feb. 24 LBSB Mar. 4 SGV Mar 10 WLA Mar. 18	7:30 Nutrition, water filters, trip planning, food storage	**Reading** WTC: Chapter 8, 10-4–10-6 FOH: 70–82, 352–353 **Homework** WTC: 7-10
CLASS 9	OC Mar. 3 LBSB Mar. 11 SGV Mar 17 WLA Mar. 25	7:30 Mountain safety, snow camp, backpacking	**Reading** WTC: Chapter 9 FOH: 490–502, 534–536, 544–551 **Homework** WTC: 8-9
TRIP 4	OC Mar. 6–8 LBSB Mar. 13–15 SGV Mar 20–22 WLA Mar. 27–29	**Snow Camp** A 3-day trip. Buses leave Friday morning, return late Sunday night.	**Reading** WTC: xvii–xviii
CLASS 10	OC Mar. 10 LBSB Mar. 18 SGV Mar 24 WLA Apr. 1	7:30 Course wrap-up, experience trip opportunities, next steps, review final exam	**Reading** WTC: Chapter 10 FOH: 595–608 **Homework** Final Exam Due

OC: Orange County Tuesdays
LBSB: Long Beach-South Bay Wednesdays
SGV: San Gabriel Valley Tuesdays
WLA: West Los Angeles Wednesdays

Important Dates:
Feb. 16 – Presidents' Day
Feb. 17 – Start of Ramadan
Mar. 8 – Daylight Saving Time Begins

WELCOME TO THE WILDERNESS TRAVEL COURSE

WTC Mission Statement

Sierra Club Outdoors reaches across economic lines, cultures and communities to engage everyone to explore and enjoy the natural world. The Sierra Club Angeles Chapter's Wilderness Travel Course (WTC) is committed to creating an inclusive, productive and fun learning environment. WTC expects staff and students to follow behavioral standards ensuring the comfort, interests and safety of all participants

Management

The Sierra Club Angeles Chapter Wilderness Training Committee sponsors WTC. A management committee elected each year from the four geographic areas operates the course. WTC leaders, instructors and staff are all members of the sponsoring committee, many providing instruction and others fulfilling appointed positions or administrative tasks.

Students who have any issues, concerns, or conflicts that arise during the class may contact their group leader, assistant group leader, or any of the management personnel listed below.

WTC Chair: Pamela Sivula	*pamela_hiking@yahoo.com*
WTC Safety Chair: Tom McDonnell	*t.mcdonnell@sbcglobal.net*
Chapter Ombudspersons	*ombudsman@angeles.sierraclub.org*
Orange County (OC)	
OC Area Chair: Jennifer Blackie	*blackiejennifer@gmail.com*
OC Vice Chair: Bryan Fisher	*bryancfisher@gmail.com*
OC Area Representative: Jenny Gardelle	*jgardelle@gmail.com*
Long Beach/South Bay (LBSB)	
LBSB Area Chair: Brian Decker	*scubaairpig@yahoo.com*
LBSB Vice Chair: Krista Muscarella	*krista.muscarella@gmail.com*
LBSB Area Representative: Dominick Garnica	*dfgarnica@gmail.com*
San Gabriel Valley (SGV)	
SGV Area Chair: Homer Tom	*hikerhomie@gmail.com*
SGV Vice Chair: Dawn Burkhardt	*stkastic@gmail.com*
SGV Area Representative: Jason Killian	*towoodi@yahoo.com*
West Los Angeles (WLA)	
WLA Area Chair: Peter Johnston	*popebabylon@gmail.com*
WLA Vice Chair: Drew Baldwin	*drewpbaldwin@gmail.com*
WLA Area Representative: Bob Myers	*rmmyers@ix.netcom.com*
WTC Registrars	
WTC Registrar: Jeremy Netka	*jnetka@gmail.com*
OC Registrar: Anne Justus	*wtcocregistrar@gmail.com*
LBSB Registrar: Joan Rosenburg	*jrrmd@earthlink.net*
SGV Registrar: Justin Bruno	*justinbruno@hotmail.com*
WLA Registrar: Pamela Sivula	*wtcwlaregistrar@gmail.com*

The Course

For many of the thousands of students who have taken WTC, the course is a transformative experience. From new friends, to new skills, to new adventures, WTC aims to deliver everything in a safe and comfortable environment. The course is offered in four geographic areas: Long Beach/South Bay (LBSB), Orange County (OC), San Gabriel Valley (SGV) and West Los Angeles (WLA). Within each area, the course is taught in small groups of approximately 20 students. Each group has a group leader and assistant group leader, plus numerous instructors.

Leaders
All of your leaders, staff and instructors are volunteers with wide and varied skills and experience who share a commitment to creating a safe and fun learning environment. Most instructors have attended a leadership training seminar sponsored by the Chapter's Leadership Training Committee and have attained at least an O rating, with many rated at the higher levels. Learn more about the rating system on page 10-6 of this handbook.

You
As a new student, you may have questions, many of which may be answered in this handbook. Other questions may get answered in class or by your leaders on outings during the course. If you have concerns or unanswered questions, start with your group leaders and instructors. Get to know them and stay in touch with them throughout the course. Continue to stay in touch with them after the course as you head out on your experience trips.

Our behavioral standards include the following:

- Uphold the mission of the Wilderness Travel Course.
- Strive for professionalism and excellence in your role as students or instructors.
- Demonstrate commitment by participating as fully as you are capable.
- Collaborate with each other and help others to succeed.
- Treat everyone with respect; accept and celebrate all levels of experience and interest.
- Contribute to building a productive learning environment in the classroom, on the trail or in the wilderness.
- Accept and uphold all WTC and Angeles Chapter regulations for safe participation on outings.
- Commit to an environment free from discrimination and harassment.

The Rules of Conduct can be found in this Handbook and on the Chapter website.
Examples of behavior that will not be tolerated at any WTC activity or outing:

- Violation of safety guidelines, or engaging in conduct that creates a safety or health hazard for yourself or others
- Theft or destruction of property
- Failure to comply with the instructions of the group leader during outings
- Disrespectful conduct that makes others feel uncomfortable, or creates an intimidating, hostile or unwelcoming team environment
- Sexual harassment, including unwelcome sexual suggestions, physical contact, offensive sexual language or images.

The Sierra Club has established anti-discrimination policies that define prohibited actions and behaviors. Complaints that arise from prohibited conduct are taken very seriously. You may share your thoughts and concerns with your group leaders, instructors, Area Chair or WTC Management without concerns of retribution. Email addresses are provided below.

WTC is a fun, supportive team when we are all participating at our best.
Thank you for your commitment to building the best environment possible!

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CONTENTS

INTRODUCTION

Your friends and relatives have probably asked, "Why?"

Why struggle to reach the summit of a mountain when you could lie on the beach? Why wander around the desert when you could chill in a mall? And why camp in the snow when you could laze in a climate-controlled home?

Thousands of Southern Californians have found satisfying answers to those questions in WTC, the Wilderness Travel Course.

Volunteers in the Angeles Chapter of the Sierra Club have been teaching WTC and a predecessor course for more than 50 years. When we started in 1960, hiking, backpacking and climbing were uncommon pursuits. Few taught the necessary skills. Today some wilderness areas are more popular than the trendiest restaurant, requiring a reservation months in advance. Dozens of classes and hundreds of books, magazines and websites compete to offer the latest information about backpacking and the outdoors.

WTC is not just a backpacking class; it is designed to teach you the skills you will need to travel safely and enjoyably in the wilderness. Each year, more than 100 trained and rated Sierra Club leaders share their knowledge and enthusiasm with a new crop of WTC students. During the class and outings that follow, they provide instruction on a wide range of topics. Along the way, you'll find your own answer to that pesky question, "Why?"

THE SIERRA CLUB

"To explore, enjoy and protect the wild places of the earth;
To practice and promote the responsible use of the earth's ecosystems and resources;
To educate and enlist humanity to protect and restore the quality of the natural and human environment."

The Sierra Club is among the nation's oldest and largest environmental groups. Founded by John Muir in 1892, the Club has grown from a few hundred Californians in Muir's time to more than 700,000 members worldwide today. Its vision also has expanded, from protecting Muir's beloved Sierra Nevada to fighting global environmental threats.

But in one significant way, the Club has not changed. The Club holds true to Muir's belief, that if you show people the natural world they will want to save it. Club volunteers lead tens of thousands of outings every year, often to places that are threatened and sometimes to places that we've already saved.

Volunteers run the Club. A board of directors, elected by the members, directs the Club's national and international activities. The Club acts locally through 63 chapters. WTC's sponsor, The Angeles Chapter, is one of the two largest chapters. Angeles conducts the most outings by far, over 3,000 annually. Learn more about the Sierra Club at:

sierraclub.org

WHAT TO EXPECT

Most students find WTC physically challenging. A few find it too challenging. You owe it to yourself and your fellow students to be in good shape when the course starts and to get in better shape as the class progresses.

The course is also mentally challenging. We teach it in winter when we can make sure that you encounter and learn how to deal with conditions like snow, rain, wind and cold that can take unprepared summer hikers by surprise.

You can enroll in WTC in one of four areas: Long Beach/South Bay, Orange County, San Gabriel Valley or West LA, where you'll attend classes from 7:30 to 10 p.m. on the same night each week for 10 weeks.

At the first class, you'll meet your group leaders and the rest of your assigned group of 15 to 20 students. Groups are the heart of the WTC experience. You will spend the entire course with your group, attending discussions and participating in class outings together. With a student-teacher ratio of 3- or 4-to-1, you're going to get to know your group staff very well.

Most classes will consist of an expert lecture followed by a discussion with your group. See the Schedule for weekly topics.

You will participate in four class outings with your group: a full-day hike, an overnight desert trip with navigation and rock scrambling instruction, a snow travel day in the local mountains and a two-night snow camp in the mountains.

After completing a final exam, you will be ready for the many WTC spring and summer backpacking trips for recent students. To graduate, all you have to do is complete two such trips. Read about this in Chapter 10. A graduation celebration in the desert or mountains is held in October.

WHAT NOT TO EXPECT

WTC teaches basic mountaineering skills, but it is not a true mountaineering course. Because of insurance restrictions, we cannot teach roped rock-climbing, nor can we teach how to use an ice axe. Several private companies and guide services teach these skills. By the time you complete WTC, you'll probably know whether you want to learn technical mountaineering.

ANGELES CHAPTER

angeles.sierraclub.org

The Sierra Club's 40,000 members in Los Angeles and Orange counties belong to the Angeles Chapter. The chapter campaigns on many local environmental issues. It also operates a large and varied outings program.

On any given day, chapter outings volunteers lead beach walks, conditioning hikes, raft trips, skiing expeditions and technical climbs. That's just a small sample of the more than 4,000 trips the chapter sponsors each year.

The outings program is so dynamic partly because there are so many active leaders, more than 600 in all. Another reason is that the chapter contains many geographic and recreational groups, each sponsoring its own unique mix of outings.

If you belong to the Sierra Club, you also belong to the Angeles Chapter and, though you may not know it, to one of the chapter's 16 regional groups such as Palos Verdes-South Bay, Pasadena or Orange County. Many chapter members belong to a recreational section as well. WTC volunteers are active in several of these sections, such as the Hundred Peaks Section, the Desert Peaks Section and the Sierra Peaks Section.

OUTINGS LEADERSHIP

The Angeles Chapter has a rigorous leader training and safety program designed to ensure that volunteer leaders are well-equipped to lead safe and enjoyable trips.

The **Leadership Training Committee** (**LTC**) provides the training, covering basics and advanced topics including navigation and rock and snow techniques. The chapter **Safety Committee** supervises outings and grants leadership skill-level ratings. And the **Outings Management Committee** (**OMC**) oversees the outings program. As a further safeguard, every leader and every participant on a chapter outing must abide by the Rules of Conduct.

WTC's volunteer leaders, for the most part, have attained ratings ranging from O to E. Group leaders have attained at least an I-level rating, with most having an M and a few an E, the highest climbing rating that the chapter grants. You can learn more about ratings on page 10-6 of this handbook.

RULES OF CONDUCT

These rules apply to all persons participating in Angeles Chapter outings activities. Violation of these rules may result in removal of a participant from a particular outing and/or revocation of the privilege to participate in future outings. Below are some key rules. The complete rules can be found at *angeles.sierraclub.org/get_outdoors/policies/rules_of_conduct.*

- **Authority of the Leader:** The outing leader (Group Leader for WTC) is the sole judge of the qualifications of participants. Participants must comply with his/her orders and instructions.
- **Travel Procedures:** Participants are to remain with the group unless the leader gives permission to leave, adhere to routes designated by the leader, refrain from "short cutting" switchbacks on trails and remain behind the leader and ahead of the trail sweep.
- **Compliance with Laws and Regulations:** Sierra Club outings are conducted in compliance with applicable laws and regulations, including requirements for entry permits, campfire restrictions, campsite location restrictions, waste handling rules, parking restrictions, etc.
- **Firearms and Animals:** Firearms are prohibited. Animals (other than guide dogs) are prohibited unless a specific announcement that animals will be allowed is included in the trip write-up. The leader may permit a disabled participant to bring a guide dog as long as the group safety isn't jeopardized or local land agency rules or regulations are not violated.
- **Cell Phones and Sound Listening Devices:** Both leaders and participants are encouraged (but not required) to carry cell phones because they may be useful in an emergency. Their use may be restricted by the leader. In the interest of safety, using your phone or other sound listening device for music may be restricted or prohibited by the leader when on trail or climbing
- **Handheld Transceivers and GPS:** Transceivers such as walkies may be carried but used only if permitted by the leader and subject to further leader restrictions. GPS receivers for navigation are generally permitted, but their use may be restricted by the leader. GPS may be prohibited for navigation checkouts by the event leader and/or evaluator.
- **Qualification to Participate:** All trips (including WTC's) provide a description of the difficulty of an outing. Be sure you are qualified to participate and that you will not handicap the group because the activity is too strenuous for you. Leaders should give good faith consideration to accommodations requested by potential participants who are disabled.
- **Minors:** WTC has special requirements for minors taking the course. Persons less than 18 years old must be accompanied by a parent or guardian or have written permission from same. Special authorization and consent forms will be required for the outings.
- **Sexual Harassment:** Sexual harassment of Club members, volunteers or others who participate in Club-sponsored activities is prohibited. Also not to be tolerated is bullying.
- **Leave No Trace:** The Sierra Club supports leave no trace principles, including minimizing the environmental impact of travel and camping, disposing of waste properly or packing it out, leaving natural objects as you find them, using stoves for cooking, limiting campfires where permitted, respecting wildlife, storing food and garbage securely, and being courteous to other visitors.
- **Liability Waiver:** All participants are required to sign a liability waiver. This is an important legal document that limits your right to sue the Club or its leaders in the event of injury on an outing. Your participation in an outing is a voluntary recreational activity. If you are not willing to sign a waiver, you need to find some other recreational activity.

Only registered students and WTC staff are eligible to participate in WTC course outings.

TRANSPORTATION

WTC provides bus transportation to and from the desert trip and snow camp. For all other trips, including post-class experience trips, you are responsible for arranging your own transportation. We strongly recommend carpooling.

Carpooling for Sierra Club activities is done at the sole risk of the participants, both drivers and passengers. The Sierra Club does not have insurance for carpooling arrangements and assumes no liability for them. Carpooling, ridesharing or anything similar is strictly a private arrangement among the participants. It is expected that drivers using their personal cars, or driving cars belonging to others, will have adequate liability and physical damage (comprehensive and collision) insurance for their own protection in whatever use they make of these vehicles.

Leaders cannot take an active role in making arrangements for participants' transportation. The leader supplies directions to the trailhead, but transportation arrangements, including ridesharing, are the responsibility of the participants. Drivers are responsible for their cars. If drivers are not satisfied with parking at the trailhead (or other meeting location), they should find another suitable location to park or should have someone drop them off. Club insurance does not extend to owners, drivers or passengers of private cars. Riders customarily share expenses with drivers. More information about rideshare and meeting places can be found at the chapter website here:

angeles.sierraclub.org/get_outdoors/know_you_go/rideshare_meeting_places

COURSE COMPLETION REQUIREMENTS

WTC awards a patch and a certificate to each student who completes the course. Here is what you have to do to graduate:

- Attend all 10 classes and complete all reading assignments. The course texts are this handbook and Mountaineering: Freedom of the Hills, 9th edition. The class schedule with reading assignments is in this handbook.
- Participate to the leader's satisfaction in all four course field trips. The trips are described in detail later in this introduction.
- Complete the final exam by Class 10.
- Participate successfully in two post-class experience trips. You'll find more information about selecting and preparing for experience trips in Chapter 10.
- Submit your completed student record card to the WTC registrar in your area. We encourage students to complete all requirements before graduation, which is usually held in October. However, students have a full year after their class graduation to finish. Talk to your group leader and/or area registrar.

FIELD TRIP NO. 1: FULL-DAY HIKE

The "Full-Day Hike" is a hike of significant distance with substantial gain. This hike takes place on a Saturday or Sunday depending on your group and is usually 12–14 miles with 3,000-4,000' of gain.

OBJECTIVES

- To evaluate the student's present physical condition and mental attitude.
- To enjoy a day in the mountains.
- To give students a feeling of accomplishment by climbing a local peak.
- To introduce field use of map and compass.

NAVIGATION HOMEWORK PRIOR TO FULL-DAY HIKE

1. Prepare a trip leg table, identifying route segments, elevation change, distance and estimated time (based on Naismith Rule) for each leg of the route.
2. Draw a trail profile along your proposed route of travel, from the trailhead to the peak and back to the trailhead.
3. On both your topo map and trail profile, highlight or label geographic features like peaks, gullies or trail intersections that will help you keep track of where you are. (Look for these features during the hike.)

STUDENT PREPARATION

- Exercise every day prior to a major hike. Your primary objective is to build physical endurance.
- Break in new boots, but avoid getting blisters.
- Make sure you have the right equipment packed and ready to go. Don't wait until 2 a.m. on the morning of the hike. Use the checklist in Chapter 2. Your daypack should be large enough to hold extra clothing (approximately 2,000 cubic inches or 30 liters).
- Bring the Ten Essentials (Chapter 2). You will not be allowed to go on the hike without them.
- Pack plenty of water. Plan for at least two liters on a cool day and as much as four liters when temperatures are likely to exceed 85° Fahrenheit.
- Review Rules of Conduct (page ix).
- Leaders do not organize or assign a carpool, but ridesharing is recommended.
- Hydrate and get plenty of rest the night before. Most WTC groups meet before dawn and try to start hiking at first light.

SAFETY CONSIDERATIONS

Trips go regardless of weather. However, students' safety is our primary consideration. A group leader may cancel or turn back if he or she judges the situation unsafe.

Everyone on the trip should:

- Be deliberate about footing, especially on eroded trails.
- Pay attention to the group. Watch the time, route, terrain, weather, visibility, trail exposure, rock fall and the group's fatigue level.
- Comply with the group leader's decisions as the Rules of Conduct dictate, but don't simply follow without considering the reasons behind these choices. Learn to evaluate and make up your own mind. If you disagree, find a way to express your concern without disrupting the group.

Note: see Chapter 2 on boots, clothing and gear.

HIKE TRIP AGENDA

Trailhead:

- Sign-in/attendance
- Nametag distribution (up to the group)
- Ten Essentials check
- Introduction of students and leaders
- Introductory trailhead talk

Beginning of the hike:

- The trail "sweep" (leader(s) in the back) counts the number of participants as off go
- Clothing break (after 5 or 10 minutes)
  - Boot laces: snug when going uphill, tighter when going downhill to protect toes

On-going during hike:

- Track location on map
- Follow trail; do not cut switchbacks
- Move off trail to let others pass (small groups/uphill traffic has right-of-way)
- Navigation practice, conservation and Leave No Trace topics
- Carry out your own litter – and that of others if possible (an extra bag helps).
- Conserve sweat, not water – don't dehydrate.

Rest breaks (approximately 5 minutes; may occur every 45 to 60 minutes):

- Snack/drink
- Adjust clothing
- Bathroom (aka "split breaks")
  - Dig a hole approximately six inches deep
  - Stay at least 200 ft. from water
  - In snow, find where ground is exposed near rock or tree. *See Chapter 5*.

Navigation instruction:

- Map orientation
- Take bearings on nearby landform features such as peaks and find your actual location on your trail or route.
- Practice:
  - Intersection of two bearings
  - Intersection of one bearing with trail, gully, etc.
  - Correlation of map with terrain features (gullies, ridges)

Lunch break.

Return to trailhead (remember that most accidents occur on the descent).

Optional post-hike gathering: groups often get together for pizza or dinner after the hike. Bring money and consider bringing a fresh shirt and comfortable shoes.

STUDENT SIGN-OFF CRITERIA

Students must reach the objective designated by the group leader. Any student who fails to do this must have the group leader's permission to continue in the course. The group leader may sign off the student later, if the student demonstrates adequate conditioning.

FIELD TRIP NO. 2: DESERT TRIP

OBJECTIVES

- To introduce the basic skills of cross-country travel including 2nd- and 3rd-class rock climbing (scrambling).
- Instruct students in the fundamentals of navigation using map and compass.
- Gain experience with desert camping.

LOCATION

Typically, Indian Cove or Sheep Pass group camp at Joshua Tree National Park. Because of parking restrictions, students must travel to and from the park by bus. The rock climb and navigation will be within a few miles of camp.

STUDENT PREPARATION

This will be a dry camp with vault (non-flush) toilets. Buses will depart from the LA/Orange County area EARLY Saturday morning (approximately 5 am). Eat breakfast before boarding the bus or bring a sack breakfast to eat on the bus. You won't have time to eat breakfast when you arrive at Joshua Tree.

- Bring at least two gallons of water.
- Bring enough food for one breakfast (Sunday), two lunches and one dinner (and possible items to share).
- Mid-weight hiking boots with good soles are recommended. Ask leaders for advice on boots. (See Chapter 2 for more on boots and clothes.)
- Leave behind or remove jewelry, especially rings and watches, that could be scratched or get caught. Stretchy or loose-fitting pants make climbing easier. Fingerless gloves can be helpful on the rock.
- Carry a daypack on bus, packed and ready for a hike with Ten Essentials, water and lunch. Bring clipboard, paper, pencils, sunscreen. A baseball-style cap can be worn under a helmet.
- Bring or share a tent, camp stove and fuel. Bring a sleeping bag and pad.
- Mark all water containers, duffels and other gear with your name and group number. For camp items such as chairs, coolers, lanterns: coordinate with leaders.
- Review the Rules of Conduct.
- Weather varies tremendously at Joshua Tree. Be prepared for anything from heat to wind to rain or even snow.
- **For rock scrambling day, WTC will supply helmets.**

SAMPLE TRIP SCHEDULE

Saturday:

- Ride bus to desert campground.
- Set up camp
- Practice sessions all day.
- Return to camp by early evening
- Dinner

Sunday:

- Practice sessions start bright and early.
- Return to camp early afternoon.
- Pack equipment and load on bus
- Bus trip back to rideshare lot, arriving early evening.

GETTING HAPPY; BEING WISE

Part of the fun of camping includes getting together for meals. Dinner is often preceded by a communal Happy Hour. What we mean is: your choice of appetizer or other edible treat to share. Wine or other alcoholic beverages are optional. Remember that alcohol and altitude do not mix, nor do hiking and hangovers.

Use moderation if you choose to indulge.

DESERT TRIP SAMPLE AGENDA

What you do each day will depend on your group's schedule. Within each WTC Area, groups do different things on Saturday or Sunday.

NAVIGATION PRACTICE AGENDA

- Written test before trip or at campsite
- Diorama (depends on group – prepare map of designated terrain)
- Map to terrain landform correlation
- Map and compass exercise
- Nav noodle (walk in small groups across desert to find designated locations)
- Dead reckoning (follow compass bearings for specified time to arrive at designated location)
- Micro-navigation (correlate minor changes in contour lines with immediate terrain)
- Locate intermediate and final (designated) sites
- Use all the clues!
- Lunch in the field (as time permits)

ROCK PRACTICE AGENDA

- Basic bouldering (balance, use of hands and feet). See Mountain Travel, Chapter 4, pages 4–7.
- Hike over class 2–3 terrain
- Lunch

STUDENT SIGN-OFF CRITERIA (NAVIGATION)

Students must demonstrate the following:

- An acceptable knowledge of map reading, including recognition of important topographic symbols and an understanding of contour lines.
- The ability to correctly orient the map in the field.
- Some ability to identify on the map prominent features seen in the field.
- The ability to fix location on the map using bearings.

STUDENT SIGN-OFF CRITERIA (ROCK)

Students must demonstrate an ability to hike through rough, boulder-strewn terrain and negotiate class 2–3 rock.

STUDENT SIGN-OFF CRITERIA (DESERT FIELD TRIP)

Students should be able to demonstrate adequate knowledge of following:

- Basic camping skills, including setting up tents and using stoves.
- Knowledge of basic safety procedures in camp.
- Conservation practices appropriate for mountain or desert travel.

FIELD TRIP NO. 3: SNOW TRAVEL

Snow Travel Day takes place in local SoCal mountains at elevations that promise enough snow for our needs. No bus transportation: the group meets at a designated location on Saturday or Sunday.

OBJECTIVES

- To learn the basics of snow travel.
- To gain respect for the hidden dangers of snow and ice.
- To learn how to respond correctly to changing conditions and to mishaps.

STUDENT PREPARATION

Study the equipment checklist in Chapter 2. SoCal mountains can be cool, cold, windy or even hot in sunlight. Hydrate before the trip and be rested. Bring all of the following:

- The Ten Essentials.
- Leather boots, waterproofed and appropriate for snow travel, as approved by your group leader. Trail or running shoes are not acceptable.
- Cotton fabrics are not permitted. Bring warm clothing layers appropriate for the weather and environment. Expect to get wet; have a spare set of clothes to change into when you return to the vehicles.
- Knee-high gaiters.
- Insulating hat and a sun hat.
- Depending on weather and temperature: wool/fleece mittens and/or gloves. Coated nylon or Gore-Tex over-mitts are also recommended.
- Rainproof, breathable pants and jacket of nylon or Gore-Tex. Vinyl plastic is not acceptable.
- Mountaineering goggles or dark sunglasses. Ideally, the sides and bottom should be protected against sunlight.
- Sunscreen lotion. Sunscreen works only when covering the skin, so plan to reapply at intervals. Learn the rating system. High-altitude sunburn can be quick and severe. Use the most protective lotion – don't try for a tan!
- Extra high carbohydrate food and two to three liters of water.
- Daypack large enough to hold all your cold-weather clothing if the day is hot. A backpack may be used, without filling it up with extra weight.
- At your group leader's discretion, you may also be required to carry ski poles or trekking poles (for balance) and snowshoes.
- Snowshoes may be supplied by WTC for this outing, if available. Snowshoes will definitely be supplied for snow camp.

SAFETY CONSIDERATIONS

Snow slopes safe for novices to traverse in the morning may become slippery during a cold afternoon. Hard snow may turn soft, resulting in arduous postholing. Unexpected snowstorms or white-out conditions may obscure the trail and make progress with a novice group difficult.

Hikers and climbers should have a basic understanding of the processes creating rock fall and avalanche conditions, including weather and terrain considerations. Each climber must use good judgment and experience in subordinating the goal at a given time to safety considerations. Leaders must make a particular effort to identify dangers not apparent to the novice.

See Chapters 6 and 9.

SNOW TRAVEL TRIP AGENDA

- Drive or carpool to meeting location.
- Sign-in
- Check for required equipment and Ten Essentials.
- Instruction on trail
  - Pressure breathing ("Whittaker wheeze") and hyperventilation
  - Crossing chutes quickly while being alert for rock fall or avalanche
  - Rest step – move quickly to "locked" leg without hyper-extending the knee
  - Importance of eating and drinking water (dehydration, hypothermia)
  - Regulating body temperature by adjusting clothing and pace
  - Effects of wet clothing – wool and synthetics vs. cotton
- Instruction on slope with safe runout (area chosen by group leader)
  - Kick step
  - Plunge step
  - Traverses
  - Balanced and unbalanced positions
  - Use of trekking poles to control short glissades
  - Proper pace
  - Respect for changing conditions of snow and ice, trail-less terrain
- Navigation instruction
- Return to trailhead
- Optional post-hike gathering.

STUDENT SIGN-OFF CRITERIA

Students must demonstrate that they have adequate equipment for snow travel, that they can move safely on snow, and that they are in condition for snow camp.

FIELD TRIP NO. 4: SNOW CAMP

You will meet your bus on Friday (usually early morning) and be whisked off to the high mountains where the bears will be inactive and the scenery breath-taking. Return home Sunday night.

OBJECTIVES

- To gain backpacking and snow camping experience.
- To put into practice the knowledge gained from the course lectures, outings and classes.
- To test the suitability of your equipment in the high mountains under snow conditions and give you a taste of alpine mountain travel.

STUDENT PREPARATION

Group leaders and instructors will check each student before Snow Camp. Any student who does not have all of the required equipment will not be allowed to go. Your safety depends on this. Review the equipment checklist in Chapter 2 as you pack. Make absolutely sure you bring the following:

- The Ten Essentials. Sunglasses should have side and bottom protection.
- Approved boots – waterproofed.
- Knee-high gaiters.
- Warm clothing such as fleece, synthetic or wool shirt and pants, layers, two sets of wool or synthetic socks, one pair of wool or synthetic mittens, balaclava – as well as sun protection. NO COTTON!
- Waterproof rain jacket and rain or snowpants
- Shelter. Ideally, a sturdy four-season tent. **Tent must be shared.**
- Sleeping bag. Down or synthetic. Two closed cell pads or an inflatable pad with a closed cell pad.
- Stove. Gas or liquid fuel such as kerosene or propane. Stove may be shared.
- Pack. Internal or external frame and an optional daypack (summit pack).
- Trekking poles with snow baskets or ski poles.
- Straps to attach snowshoes and shovels to pack. Do not use bungee cords. **WTC will supply snowshoes as well as snow shovels.**

The Bus Ride. Usually, the same bus drives to the location Friday and back home Sunday. You may leave a duffel with a change of clothes and other items on the bus, but do not leave valuables. Bring cash for a Sunday afternoon dinner.

CONDITIONING

For many of you, this will be your first trip at high altitude. The leader will pace hiking and other activities accordingly. Some altitude sickness may be experienced, especially the first day. Headaches are common; be sure to take fluids, food and rest. It helps to hydrate well before the trip. Non-prescription medications for headache or nausea may be helpful. Avoid alcohol and sleep medications as these may lead to altitude sickness.

AGENDA

Because snow and weather may vary greatly during snow camp, the group leader will exercise considerable discretion over the conduct of the trip. Some groups will move camp each day and some will stay camped in one place. This is up to our permits and the group leader.

SNOW CAMP AGENDA – BY DAY

Winter and spring trips into the high mountains are adventures. Here is a general plan for the weekend. Your group leaders may alter it as conditions indicate.

Friday

Meet at bus. Leaders inspect equipment prior to loading buses. Sign-in; travel to road head and unload bus. Put on backpack; attach snow shovel and snowshoes. Backpack from road head. (Bus departs.)

Set up campsite in snow.

- Learn criteria for choosing campsite: flatness, water availability, no rock or avalanche danger, wind, sun, ease of access, avoidance of tall or dead trees because of falling limbs (widow makers).
- Flatten your tent-site with snowshoes and set up tent.
- Some campsites will have access to existing vault toilets. Otherwise, a honeypot or other type of latrine will be established.
- Build a communal snow table or other snow structures. Prepare and eat dinner.

Throughout the weekend, be aware of:

- Drinking water regularly to avoid altitude sickness and dehydration.
- Adjusting clothing to adapt to changes in wind and temperature.
- Use of rest step; avoid hyperventilation.
- Rock fall/avalanche danger in chutes.
- Traveling on snow. Avoid travel close to large rocks and downed logs. Learn differences between morning and afternoon snow. Differential melting.
- Snow bridge danger and avalanche signs.
- Hypothermia – symptoms and prevention.

Saturday

Move camp and/or day hike.

- Early morning: start with breakfast. Prepare for the day.
- Trailhead lecture on objectives and itinerary for either a dayhike or backpack if moving camp.
- Dayhike in the mountains or backpack to second night's campsite.

Afternoon

- Establish new camp or return to first camp, have lunch or snack, and rest.
- Avalanche or other snow demo.
- Map and compass exercises. Identify surrounding terrain on map. How would you get back to road head in a white-out? How does navigation and travel in this terrain differ from that in the desert? Throughout the weekend, have your map and compass handy and keep track of your location.

Evening

- Prepare dinner, prepare daypack for Sunday hike. Learn pointers on stove use, such as never light a stove in a tent.

More tips on staying warm are in this handbook, in FOH, as well as in the wisdom of your leaders.

Sunday

- Early call for breakfast, with a specific time to start an optional hike in snow to a location within our permitted area of travel.
- Break camp. Packing in snowy conditions can be challenging. Return to roadhead.

Afternoon

- Load bus; stop for lunch/dinner. Return to Los Angeles around 10 p.m.

STUDENT SIGN-OFF CRITERIA

Are you able to keep up with the group and carry your pack? Are you a team-player, willing to pitch in and help your partner as well as your group? Did you bring all the right gear and know how to use it? Successfully complete snow camp and your group leader will be happy to sign your card.

Climbing Santiago Peak | Edd Ruskowitz

CHAPTER 1
CONDITIONING

Mountaineering is a physically demanding sport. For your own safety and enjoyment, you must be in strong physical condition. You need mental strength and confidence in your training too. It all starts with a good strength and conditioning program.

Suppose you're preparing for a day hike to a peak. It's a 15-mile trip with 5,000 feet of gain, some of it over rough terrain. Let's start by looking at the demands that trip will make on your body. Even if it's on trail, you'll be expending about 3,500 calories beyond your basic caloric needs. This represents a lot of work for your body. You will need aerobic conditioning for endurance and muscular strength to haul a backpack all day. You will need strength, power, and endurance to gain elevation. You will need balance, flexibility, and strength to deal with talus or uneven terrain.

Facing long stretches of travel on talus is a mental as well as physical challenge, as is grinding out the miles, and elevation gain and loss. Mental grit will see you through this hard work. Confidence in your skills and conditioning is the other mental aspect of mountaineering, it helps you face the physically tough aspects of wilderness travel with determination and discipline. So how can you develop that mental tenacity and confidence? Several factors will help:

- having a good fitness program that you stick to and that you know will prepare you
- charting your progress so that you see that you are on track to reach your conditioning goals
- setting progressively more challenging goals and meeting them
- gaining experience in wilderness travel so that you know that you are up to the challenges.

FUNCTIONAL FITNESS FOR WILDERNESS TRAVEL

The number one priority for training to hike, climb, or mountaineer is to have a training plan that mimics the movements and actions we do outside of a gym or home program. We can train to deadlift 300 pounds but can still strain our backs throwing a pack on! Functional Fitness has been a consistent "trend" since 2010. The Mayo Clinic defines Functional Fitness as the following:

> *Functional fitness exercises train your muscles to work together and prepare them for daily tasks by simulating common movements you might do at home, at work or in sports. While using various muscles in the upper and lower body at the same time, functional fitness exercises also emphasize core stability.*

Since you may not have a lofty peak in your backyard to train on, you'll probably be doing some cross training. Keep in mind, however, that sport specific training is essential: You need to hike to get in hiking shape and you need to put some weight on your back to get in backpacking shape. Walking and running, lifting weights, stretching – these all help, but you also need to get out in "them thar hills." So what are the aspects of functional fitness you need, and why do you need them?

- Cardiovascular fitness will build endurance, which is the ability to sustain a pace for hours despite the load on your back. When you're aerobically fit, as long as your muscles have a fuel source from good, steady nutrition, you'll be able to continue hiking because your body keeps the muscles

sufficiently supplied with oxygen. As your cardiovascular fitness – aerobic fitness – improves, you'll notice that you can hike longer and faster, and stay in your comfort zone. Anaerobic exercise (that breathless feeling you have when pushing hard), another aspect of cardiovascular fitness, means that you are pushing yourself out of your comfort zone, resulting in you going into oxygen debt; you have to rest and recover the debt before your muscles can push hard again. Anaerobic training pushes your oxygen debt threshold up; in other words, you can hold on longer at that fast pace or go even faster. Cardiovascular fitness gives you a stronger heart, pumping more blood per beat, thus leading to a lower heart rate; better lung power with increased oxygen delivery to the muscles; and greater bone density if you are doing weight-bearing exercise. Both High Intensity Interval Training (HIIT) such as sprints, Tabata work, running, soccer, tennis, etc., and Low Intensity Steady State (LISS) exercises such as walking while keeping a conversation or light intensity cycling, swimming, or rowing can drastically help you stay on the trails longer!

- Strength give you the ability to move loads, such as your body and pack, over big steps on and off the trail, up the mountain and back down. Strength will allow you to pick up the pace when need be. The focus in mountaineering is generally on strength and endurance, but you'll need some explosive power as well for those big steps in a trail, talus fields, and climbing. Although some strength will come from cardiovascular training, you'll need more to lift your pack, step across streams, and pull yourself up rocks. Because the legs and core do a lot of the work in mountaineering, your training focus can be on lower-body strength, but don't totally ignore your upper body; you'll still need to hoist and carry your pack. A strong core helps to protect your back. Arm and shoulder strength will help you as you scramble up rocks.
- Balance will help you cope with uneven terrain, which is made even more problematic by the additional weight on your back. When you cross a talus field, you may be jumping from boulder to boulder, taking off from and landing on surfaces that are rarely smooth and flat. For rock scrambling you also need balance because your hand and foot placements change frequently.
- Flexibility will allow you to make those bigger moves comfortably. Flexible muscles are also less prone to injury.

THE TORTOISE OR THE HARE?

Aside from those few folks who can hike at a fast pace all day and be cheerful about it, you'll find two basic styles of hikers: the tortoises (not particularly fast but relentlessly steady) and the hares (bounding out ahead and then stopping while the tortoises catch up). Tortoise hikers come in various speeds, but they all keep trudging over hill and dale all day long. The hares, on the other hand, zoom up the trail. Their waiting for the tortoises, however, is a cover – they really are trying to catch their breath after that intense bout of hiking.

As the day goes along, the hares take shorter and shorter bounds and longer and longer breaks, eventually being left behind by the tortoises. Hares might not even be all that fast, but they are definitely too fast for their own conditioning. They never quite find the groove or aerobic zone, where their breathing matches their level of exertion and their mind accepts the work of hiking. So be a steady tortoise, get to camp ahead of the hares, and enjoy the entire day because you're in shape.

By the way, it's not a bad thing to be huffing and puffing. If you are climbing a steep hill with a pack, you'd better be breathing hard or you'll never get there! Breathe rhythmically, in sync with your steps. Try to find a pace you can keep all day, speeding up a bit on the level and downhill portions, slowing somewhat as the trail climbs. But keep on going!

TRAINING AT HOME

Before looking at specific ways to train, you need to understand and embrace two concepts: progressive adaptation and recovery. Progressive adaptation means slowly increasing your levels of training so that your body truly has time to adapt: baby steps, not bounding leaps of change. There are two sides to this. If you try to increase your training too fast, you run the risk of injury because your muscles aren't ready for the heavier work load, and you may burn out because your body becomes chronically fatigued – not fun. On the other hand, you must continue to progress to reach new levels of fitness.

Training is a matter of stressing the body so that it adapts to the stress, such as by gaining strength or improving cardiovascular fitness. If you no longer stress your body in exercise, you'll stop progressing. The other fitness concept, recovery, is very important as well. Recovery means refueling the body with good food and water and rest, both enough sleep and enough time between the hard workouts. A hard weight lifting workout, for example, actually breaks down some muscle tissue, which needs time to rebuild. This is part of the training process because the body repairs that muscle tissue and adds more in response to the exercise stress.

One way to monitor your level of fatigue is to check your heart rate in the morning before you get up. If your pulse is elevated compared to your normal morning pulse, you'll know it's a day to ratchet down the intensity or duration of your workout or occasionally take the day off. You probably won't feel very zippy anyway if you haven't fully recovered from a workout; your body is telling you to back off and take it a bit easier. If you keep pushing when you are tired, you also run the risk of illness, and then you'll lose more training time. Proper recovery also is a key in injury prevention. Remember, too, that it takes longer to recover as we age. Don't you just hate that?

Here are some suggestions for training at home.

- Cardiovascular training, aerobic/LISS: If you aren't hiking, you can work on cardiovascular conditioning with activities such as walking briskly, jogging or running, swimming, cycling, or walking stairs; try to make it something you enjoy! Stair climbing meets the demands of mountaineering best because it strengthens the leg muscles more than other aerobic exercises and improves cardiovascular fitness. Any exercise in which you maintain a heart rate about 75% of your predicted maximum heart rate for 20 to 30 minutes four or more times a week can aid aerobic fitness. To find what that heart rate is, subtract your age from 220 to give an approximate maximum heart rate; then figure 75% of that. As you get in better shape, you can increase distance and/or pace. Remember to start conservatively in your program but keep progressing. A gradual warm-up will help you feel better during the main part of your workout and avoid injuries.

- Cardiovascular training, anaerobic: Once you are in good aerobic shape, you can work on the anaerobic aspect now and then. To prepare for mountaineering, try interval training, such as running 400 meters (about a quarter-mile) at a hard pace and then taking a short recovery, two to three minutes, before the next run. You should be breathing hard at the end of the run and not be fully recovered before you start the next one. If you run a shorter distance, pick up the pace and cut down the recovery interval. As with any new physical activity, build into it slowly. Take it relatively easy the first several times you do this type of workout so that your body adapts; then slowly up the ante. Make sure you have done a good warm up with stretching before you start the main part of the workout. The time you can run for the distance should improve over the weeks. You can apply the same training principle to other cardiovascular activities.

- Strength training at a gym: Weight machines at the gym are a great way to get started if you are not sure where to begin! Often the machines will have a picture of the exercise or of the individual muscle it intends to work. This is the simplest way to get started if the weight room floor is intimidating. As you become more confident in your program, begin to add free weights – barbells and dumbbells – for some of the movements. The free weights push you toward movements that you will do outside of a gym and they help to develop all of the very important stabilizer muscles as well as working large muscle groups. Weight machines are fine for certain exercises, but when you have a choice between free weights and a machine, go for the free weights when you feel comfortable with them.

  Some sample exercises include:

  – Machine leg press or squats with barbell/dumbbell/kettlebell
  – Walking lunges with barbell/dumbbell/kettlebell
  – Step-ups/jump-ups and box jumps
  – Hamstring curls/Nordic curls

LOCAL HIKES

You don't have to wait till the weekend to go hiking! In the Sierra Club Angeles Chapter's *Schedule of Activities* you'll find all types of nearby weekday conditioning hikes. You can, for example, hike up Signal Hill or Turtle Rock, walk in Mile Square Park, be nearly overwhelmed with choices at Griffith Park or even walk the beach. The hard part is deciding which hike to go on. You'll make new friends while getting in shape, friends who share your interests.

Want to go longer, farther, higher? A number of local hikes are very popular for conditioning.

- Mt. Wilson – try the Mt. Wilson Trail from the trailhead in Sierra Madre to Orchard Camp (nine miles, 2,000 feet gain round trip). Each week you can go farther, finally topping out at Mt. Wilson, a favorite destination for WTC full-day hikes, at 5,710 feet (15 miles, 4,500 feet gain round trip)
- Mt. Baldy – from Manker Flat a little below the Mt. Baldy ski area, you can hike a trail to Baldy Bowl and the summit of Mt. San Antonio (Mt. Baldy) at 10,064 feet You'll be able to work on some altitude acclimatization as well as conditioning (nine miles round trip, 3,800 feet gain) with this one. Because the upper part of the trail is steep and can be treacherous in winter with icy conditions, use caution and be prepared. You will need an "Adventure Pass" to park at Manker Flat without risking a citation. When this gets too easy, start hiking from Baldy Village for more miles and gain. You'll meet a lot of people who hike Mt. Baldy nearly every week.
- San Gorgonio – the Vivian Creek trail, the shortest but steepest trail up "Old Grayback," will give you a challenge in hiking to the top of Southern California's highest point at 11,499 feet (14 miles round trip, 5,300 feet gain). This is your best local opportunity for altitude adaptation.
- San Jacinto – from the ranger station in Idyllwild you can go to the summit at 10,804 feet and back in 18 miles with 5,000 feet of gain, or go from Humber Park in Idyllwild (15.5 miles round trip, 4,400 feet gain). Another possibility is to take the aerial tramway from Palm Springs and hike to the top from there (11.5 miles round trip, 2,300 feet gain). For a real test of your conditioning, try hiking the trail from Palm Springs to the summit starting on the old Chino Trail, also called the Cactus to Clouds Trail (9 miles and 7,600 feet gain to Long Valley – the tram upper station – or about 15 miles and 10,000 feet gain to the summit and then about 5.5 miles back down to the tram). You can start on this trail at the Palm Springs Desert Museum or the west end of Ramon Road. Arrange a car shuttle or take a taxi back to the trailhead after riding the tram down to save your knees – you deserve it after this one!

  - Machine bicep or tricep exercises plus bicep curls with barbell/dumbbell/kettlebell
  - Machine chin/dip/assist for pullups
  - Cable lat pulldowns plus cable low row
  - Dedicated core work
- Strength training at home: This is a great time for at-home workouts. YouTube can be your best friend, as well as brands such as Peloton, TRX, and more phone applications than you can dream of. Some of these ask you to invest in equipment, but starting with what you can find around the house is appropriate. Look at strength endurance plans and don't forget yoga programs as well.
- Flexibility: Stretching before and after exercise will help prevent muscle injuries – use static, gentle stretches, holding for thirty seconds. Don't stretch so far that you are in pain. Repeat stretches; each time you should be able to stretch a little more than before. Yoga and pilates are also great ways to improve flexibility. Do a lot of work stretching your calves, hamstrings, and quadriceps. Because it takes time to develop greater flexibility, and the incremental changes are hard to measure, be patient. Incorporate stretching as part of your warm up and cool down with other forms of exercise. There are a lot of online options to tap in to.
- Balance: Balance will improve as you strengthen the stabilizer muscles. While standing on one foot with your arms out at your sides, look to the left, then ahead, then right, then back ahead and close your eyes. Can you hold each position for twenty seconds? Also try standing on one foot, holding a ball in front of you and reaching to a spot about a foot off the ground to your left and far enough away that you have to hold your arms out; come back up and repeat in front and to your right.

Keep a training log with information to help you objectively measure your conditioning progress. The simplest way is to create a spreadsheet or keep a training notebook so you can see progress in various ways.

- Distance – record how far you ran, walked, hiked, swam or the number of flights of stairs. The ability to go a longer distance at the same pace shows progress (say three miles rather than two at an eight-minute mile pace)
- Time – record your time over a certain distance. If you are able to do the same distance faster, you've made progress.
- Repetitions and weight lifted – note how many repetitions you can do at a certain weight. When that becomes easy, add more repetitions, another set, or more weight.
- "Level" on a cardio machine – if you like to use an exercycle or stair machine, keep track of the level you use on the machine. As that becomes easier, go to a harder level. You can, of course, also increase the time on the machine.

TRAINING IN THE HILLS AND MOUNTAINS

Training in the hills and mountains continues the work you've done at home. There's nothing like hiking to get you in hiking shape. If you are preparing for a backpacking trip, you need to carry a backpack. You should work on four aspects: distance covered, elevation gained, weight carried and altitude reached. Luckily, in Southern California you can work on these aspects almost all year round. As with other types, training in the mountains should be progressive. Keep a log of your hikes, charting the four aspects listed above so that you can measure that progress. Start with the weekly conditioning hikes or easy day hikes and work up to backpacks.

When you can, hike to higher altitudes to work on that adaptation. Even wearing heavier boots can have a big effect on your conditioning.

Guidebooks, like John Robinson's *Trails of the Angeles* or *San Bernardino Mountain Trails*, give information about the trail, distance for the hike and elevation gained, so you can plan appropriate hikes. Get out there, get fit and have fun!

FURTHER READING

Anatomy of Strength Training. By Pat Mannochia. Thunder Bay Press, California. (2010)

The Outdoor Athlete. By Courtenay Schurman. Human Kinetics, New York (2008).

Conditioning for Outdoor Fitness: Functional Exercise and Nutrition for Everyone, 2nd Edition. By Mark Pierce, A.T.C., David Musnick, M.D. Mountaineering Books, Washington (2005).

Fitness for Dummies. By Suzanne Schlossberg and Liz Neporent. Wiley, New York (2000).

HOMEWORK

1. Why is functional fitness necessary for hiking?
2. Why is strength training needed for mountaineering?
3. How can you see objectively that your fitness is improving?
4. Name some local opportunities for hiking.
5. Explain why a steady hiking pace is better than shifting from bursts of speed to frequent rests.

KNOT OF THE WEEK INTRODUCTION

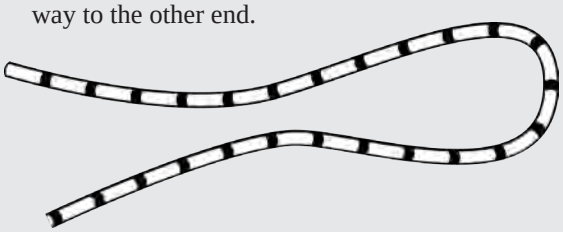
The Knot of the Week section is intended to introduce you to knots and hitches useful during wilderness travel. Some aspect of knot knowledge is presented at the end of each chapter. We encourage you to practice and master the information each week.

GENERAL TERMS

Knots, bends and Hitches. Knots, bends, and hitches serve many purposes. The word "knot" commonly refers to all three, even though they're different from each other. Per *Freedom of the Hills:* "A knot refers to material tied on itself; a bend refers to a joining of material ends; a hitch refers to material tied around a solid object." For this handbook we'll use "knot" to refer to all three ways of tying things.

Bights and Loops. A bight is a section of rope folded back on itself without crossing. See figure below. Note that a bight can be formed in the middle of a rope and doesn't require a free end. A loop is like a bight but the rope crosses itself once.

The Working and Standing ends. The rope is often referred to in two general regions or portions, the Working End and the Standing End. The Working End is generally the shorter side of the rope that is in the hand and is being worked with. The Standing end is the rest of the rope all the way to the other end.



Snow camp, North Lake | Ron Campbell

CHAPTER 2
CLOTHING AND EQUIPMENT

Choosing clothing and gear for wilderness travel is a question of balance: cost vs. weight vs. fit vs. durability vs. suitability. There is no single right answer for everyone. You must evaluate competing needs and find your own balance.

For safety, comfort and enjoyment, we all need proper clothing and equipment. California's deserts and mountains place particular demands on equipment. This chapter will describe what sort of clothing and equipment you will need to complete WTC, based on the experience of WTC leaders and students. For a broader review of the topic, please read Chapters 2 and 3 in *Freedom of the Hills*.

Buy the most personal items (like boots or thermal underwear) first. Rent or wait until later to buy items that are less critical like tents or stoves.

FOOTWEAR

- Boots: A mid-weight leather boot works best for WTC outings. Leather can stand up to repeated water-repellency treatments without damage. A vibram-type sturdy "lug" sole is ideal for traction. The boot should have some flexibility so that the break-in time is not too long. Proper fit is the most important factor in choosing a boot. If your feet hurt, you will not enjoy your hike. A lightweight flexible trail shoe with a good sole may be acceptable for the Full-Day Hike and the desert trip. A boot that can be treated for water repellency is required for the snow outings. Your group leader can evaluate your footwear for the outings.

- Socks: The traditional standard – wearing a thin synthetic liner sock inside a thick sock – still works. Synthetic or wool socks worn as the outer layer provide insulation and padding. A single thick sock layer will work with trail shoes. Individual preference and experience will help you decide what works best for you. Do not use cotton socks. Cotton fibers collapse when wet and take a long time to dry. Wet socks cause blisters.

- Gaiters: Leggings that keep the snow from getting into your boots are required for our snow outings. They should extend from the laces of the boot almost to the knee. Shorter, lighter "scree gaiters" are useful on the desert trip and on summer outings; they keep brush and gravel out of your boots. Practice putting your gaiters on at home.

- Camp booties: Down or synthetic, these booties are optional at snow camp. You'll learn more about this later.

CLOTHING

The wilderness demands a lot from clothing. It must wick moisture from the skin, insulate, protect from wind, rain, and snow, keep biting bugs away, block the sun, and withstand abrasion from rocks and brush. A layering system is the lightest and most versatile way to do all these things.

Wear a lightweight or medium weight thermal top next to the skin to wick sweat away. Polyester, silk or merino wool are suggested. Avoid cotton underwear. In fact, avoid cotton, period.

A middle layer of fleece, synthetic, wool, or down insulation is needed for cold days, when resting or in camp. The fit should allow you to wear all of your layers at once if necessary.

An external shell layer blocks the wind and moisture from the outside. Waterproof/breathable

fabrics like Gore-Tex work well. These waterproof/breathables can still become wet from the inside from your sweat when you are active. A breathable nylon wind shell and pant can be used to deal with sun, bugs and wind.

Rain pants with zippers on the sides can be pulled on easily over boots, snowshoes, or skis; the zippers also provide ventilation. The rain jacket should have a hood and be big enough to fit over your insulation layers.

Recently developed soft-shell fabrics and garments are insulated and water resistant; soft-shells stretch and are more breathable than waterproof/breathables. Current versions are not waterproof in an extended downpour. We recommend that you carry a rain shell if you use a soft-shell.

- Head protection: You need a hat (such as a baseball cap) for protection from the sun. Drape a bandana under the cap for more sun protection for your ears and neck. A wider brimmed hat can provide greater sun protection. For protection from the cold, wear an insulating hat, made of synthetic or wool: put on a balaclava for added coverage for your neck. A thicker insulated fleece or synthetic hat is good for snow camp. When climbing or scrambling on rock, protect your head with a helmet; you'll be provided with a helmet during WTC rock scrambling instruction.
- Hand protection: Hands disperse a lot of heat, so they need protection in cold weather. A thin liner glove lets you work with small items like stoves and cameras. A thicker fleece or wool glove or mitten provides insulation. A glove has individual fingers while a mitten covers all the fingers together in one group. Mittens are warmer because their smaller surface area radiates less heat. A waterproof/breathable overmitt is needed for snow trips. Gloves get wet easily from sweat and external water, so bring an extra pair.

THE TEN ESSENTIALS

The wilderness is not out to get you.

You might think otherwise after reading a lot of ads for outdoor gear, which promise to save you from a hostile environment. The truth is that most outdoor accidents result from overconfidence or inattention. Most gear can't save you from yourself.

The Ten Essentials are an exception. They are useful – sometimes lifesaving – and not easily improvised. You can use them in a variety of ways to get out of a bad situation or make the best of an unplanned night out.

Pack your Ten Essentials in a small sack or fanny pack. That way, you'll be sure to remember them whenever you hit the trail. When putting together your Ten Essentials, consider that you may have to spend a night out, lost or perhaps injured. Each student must have and carry his or her own Ten Essentials on every trip in this course.

There are differing Ten Essentials lists. In WTC we use the Ten Essentials Systems Approach.

Additional Reading on the subject in *Freedom of the Hills* pages 34-40 is highly recommended.

To Find Your Way:

1. Navigation (*map and compass*)
2. Illumination (*flashlight/headlamp*)

For Your Protection:

3. Sun protection(*sunglasses/sunscreen/hat*)
4. Nutrition (*extra food*)
5. Hydration (*extra water*)
6. Insulation (*extra clothing*)

For An Emergency:

7. Fire (*waterproof matches and firestarter*)
8. Emergency shelter
9. Repair kit & tools (*knife, duct tape, etc...*)
10. First-aid kit

EQUIPMENT

- Daypacks: A large daypack is needed for the day hike,desert trip and snow hike. It's also helpful, though optional, for day trips during snow camp. You may be carrying more clothing, food, and water than you are accustomed to. Your pack should be big enough to fit everything inside, leaving nothing to hang off the outside.

- Backpacks: The backpack for snow camp must carry all of your personal gear and your share of group gear like a tent or stove. You may also be carrying a snow shovel and snowshoes. Internal frame packs tend to be more popular than external frames because they help you keep your balance better. It is important that you know how to adjust your pack to keep it comfortable as you hike. Be wary of big, heavy packs. If you buy a big pack, you will probably find a way to fill it up.

- Sleeping bags: A modified mummy shape is the most efficient. For snow camp, we recommend a bag rated at 0 degrees. Down insulation weighs less, packs smaller, lasts longer, and is more expensive. Synthetic fills lose less of their loft when wet. Always make an effort to keep your sleeping bag dry. You can line your pack and stuff sack with garbage bags in wet conditions.

- Sleeping pads: Sleeping bags provide no insulation or padding underneath you. That's where sleeping pads come in. Closed cell foam pads like Ensolite are the lightest, least expensive and most durable, though many find them uncomfortable. Insulating, self-inflating pads, like Thermarest, are more comfortable but can be punctured and may not provide sufficient insulation against cold alone. A Thermarest placed on top of a closed-cell pad is a popular choice for cold weather sleeping. We recommend taking two pads to layer under your sleeping bag when snow camping.

- Tents: During summer in many California mountain areas you need little more than shelter from afternoon thundershowers, dew, and mosquitoes. A simple tarp and mosquito net may be all you need in these conditions. A bivy sack is also a lightweight choice. Three-season tents are intended for spring, summer and fall. They are designed to deal with considerable rain and wind. They have large breathable mesh areas in their inner tent. Four-season tents are built to withstand snow and heavy winds. Four-season tents usually have rain flies that reach all the way to the ground. These tents are often larger because you generally spend more time in them. All tents at snow camp must be staked, so plan to carry snow stakes and extra cord.

- Water: Carry 2 to 4 liters of water on each WTC outing in containers that will not leak. A wide-mouth opening is easier to fill and add drink powders. Plastic sports-drink containers from the grocery store usually are light and strong enough for wilderness travel, yet cost far less than the bottles sold in mountaineering stores.

- Water treatment: Use filters or chemicals such as iodine in the back country. Both methods have disadvantages. Chemicals sometimes leave an aftertaste. Filters are heavy and can break. Study the instructions to know how to properly use whichever method you have.

- Cooking gear: Try to keep your pots and pans simple, light and easy to clean. A single 1- or 2-quart pot and lid will often be enough for 2 hikers. An insulated mug, plastic bowl and spoon will work for most backcountry meals.

- Stoves: Stoves using liquid fuel, like white gas or kerosene, burn hot but the flame cannot be adjusted easily. Canister gas stoves typically are lighter than liquid-fuel stoves, and the flame can be set to a low simmer. Liquid-fuel stoves tend to work better than

gas in cold weather. You must always carry out your empty gas canisters. Whichever model you choose, try it at home so that you don't have to figure it out when it is cold, windy, dark and you are hungry.

- Light: Headlamps leave your hands free – especially important when you are cooking or setting up a tent. LED (light-emitting diode) bulbs last far longer and consume far less energy than conventional flashlights. It's essential to bring extra batteries for conventional flashlights, particularly at snow camp; they lose power quickly in cold weather. Small flashlights or headlamps are adequate for chores around camp. A brighter bulb may be needed for finding your way when traveling at night. AA or AAA batteries are the most common. Lithium batteries are lighter, tolerate cold better than alkaline batteries; however, they cost more. You might consider choosing a headlamp that uses batteries that will also work in other electronic devices that you may carry like a GPS or camera.
- Cameras: You will want to take snapshots of your trips, but you will be too busy on WTC outings for serious photography. A "point and shoot" or simple digital camera works well. A disposable camera takes the worry out of damaging a good camera. We recommend that you leave heavy cameras at home during this course.

PACKING LIGHT

Never forget that you have to carry all this stuff! Your maximum pack weight should be 25-33% of your body weight.

ULTRALIGHT BACKPACKING

In the past few decades, long-distance hikers have pioneered an "ultralight" approach to multi-month journeys on trails like the Pacific Crest Trail and Appalachian Trail. They've learned that they could cover more miles with base pack weights (excluding food and water) of 5 to 15 pounds.

Ultralight backpackers give up some camping luxuries in return for more comfort when moving. The "Packing Light" section of this chapter offers some widely used tactics for reducing weight. If you're ready to move beyond convention (and give up some comforts), here are some ideas for going ultralight.

The biggest savings come from the Big Three: Shelter, Sleeping Bag, and Pack.

- Shelter: A silicon-coated tarp is adequate when properly sited and pitched. Use trekking poles to support the tarp, eliminating the need for tent poles.
- Sleeping bag: Your weight compresses the portion of the sleeping bag underneath you; it does little to keep you warm. Tapered quilts eliminate insulation underneath you to save this weight.
- Pack: If your load is less than 20 pounds, you don't need a sophisticated hip belt and suspension on your pack. Many ultralight packs are little more than stuff sacks with shoulder straps. The sleeping pad gives the pack structure.

Alcohol stoves made at home from soda cans weigh 1 oz. Ultralight clothing is designed to protect you when moving; the designers assume you will get into your sleeping bag if you stop for a long time in cold conditions. Ultralight hiking shoes look more like running shoes than boots.

All of this gear is made with very light material. It will not survive if treated roughly or carelessly. Some of the best ultralight gear is designed and made in small cottage industry businesses. Used properly, ultralight equipment will help you safely cover more miles in more comfort than conventional equipment.

Carry the items we recommend in the checklist at the end of this chapter. Don't carry many extra items "just in case". Only duplicate items beyond those recommended if you have to.

Get a scale and weigh individual items; you can then choose the most efficient item to carry. Use items that have multiple uses. Buy the lightest weight item that will do the job.

Pack your pack and weigh it, then start taking out non-essential items like books, map cases, gadgets, big knives, extra-extra-extra food and clothes. Share items with a camp partner. Be willing to sacrifice a little comfort in camp for greater comfort while hiking. Realize that if it gets really cold you can get into your sleeping bag and tent.

Finally, make it a habit after every trip to review the equipment you brought and didn't use; if it's an essential, like a first aid kit, keep packing it and hope you don't need it. If it isn't essential, leave it behind next time.

FURTHER READING

The Complete Walker IV. By Colin Fletcher and Chip Rawlins. Knopf (2002).

Beyond Backpacking: Ray Jardine's Guide to Lightweight Hiking. By Ray Jardine. Adventurelore Press (1999).

The Outward Bound Staying Warm in the Outdoors Handbook. By Glenn Randall. Globe Pequot Press (2000)

The Backpacker's Handbook (3rd Ed). By Chris Townsend. McGraw Hill Press (2004).

Extreme Alpinism: Climbing Light, Fast and High. By Mark Twight and James Martin. The Mountaineers (1999).

HOMEWORK

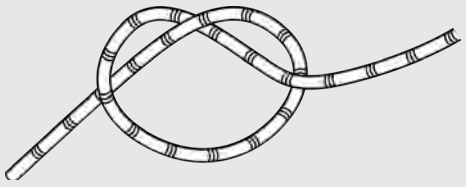
1. Describe how to choose boots for WTC (fit, features, construction, etc).
2. Describe the layering systems of clothing you will bring for the full-day hike and for snow camp. How do they differ?
3. Two items listed on the Equipment Checklist For Fieldtrips, page 2-6, contain the word "extra". Describe why bringing an extra pair of these items is recommended.

KNOT OF THE WEEK
OVERHAND KNOT

The overhand knot is one of the most basic knots. It forms the basis for many other knots.

The overhand is a secure knot but can become jammed. Because of this, it's a good knot to use for something like securing the end of an unraveling rope.

OVERHAND KNOT



TREKKING POLES

More versatile than a single-length walking stick or a ski pole, trekking poles have become very popular among hikers. These adjustable length poles can help in several key ways when hiking and backpacking. They reduce pressure on your knees during descent and improve your balance especially when carrying a load. They are useful for stability when crossing streams or log bridges. They can also be used while snowshoeing as a better alternative to ski poles (see Chapter 6: Snow travel).

Trekking poles are available in several types and brands. Common features are hand grips, wrist straps, collapsible segmented pole sections, metal tips, and a way to attach sand or snow baskets. Differences include grip and shaft material, locking mechanism (twist or lever locking), and whether the pole is rigid or has some method of absorbing shock. These differences contribute to the pole's weight, durability, comfort and cost.

Poles are not always useful or welcome on all outings. In fact, they can be in the way – or potentially dangerous – on a climb that involves boulders. **If you wish to carry poles, learn how to safely use, handle, and store them during the outing. Here are a few tips:**

- Height of the grips should be about even with your elbows bent 90º, with forearms horizontal to the ground and hands optimally positioned below your heart.
- Extend pole length for descents and stream crossings. Shorten when heading uphill.
- On a short section of steep uphill or ascending steps, you can temporarily grasp the pole shaft, below the grip, instead of adjusting the pole height repeatedly.
- On steep down-hill, shift your hands to the top of the grips and use the poles like canes to provide for greater length. Keeping the poles in front of you on the descent helps transfer weight off your knees and onto the poles.
- When side-hilling (traversing), pole heights can be adjusted so that both hands are in the correct position. You can swap poles or grip pole in a different place when you switch direction.
- Pole straps can provide leverage on groomed hiking or snow trails. However, straps can impede your ability to break a fall and should never be used when traveling on lose or slippery terrain.
- Handle poles safely and be aware of other hikers nearby, especially behind you. When hand-carrying (but not using) poles, hold them horizontally by the shaft with the tips pointing forward.
- Never leave your poles dragging in the dirt when not in use.
- Just as careless footwork can damage delicate landscapes, the pointed tips of poles can make a lasting impression. Keep them off the sides of the trail as much as possible and use with care on cross-country terrain.

The use of poles for snow travel activities will be discussed later during the course.

Trekking poles are <u>never</u> a substitute for an ice axe.

****** Consult your group leader on usefulness of carrying poles on WTC outings.******

EQUIPMENT CHECKLIST FOR FIELDTRIPS

	All-Day Hike	Desert Trip	Snow Travel	Snow Camp
CLOTHING				
Sun hat*	✓	✓	✓	✓
Insulating hat or balaclava	W	W	✓	✓
Baselayer shirt, mid- or lightweight	✓	✓	✓	✓
Baselayer bottoms, mid- or lightweight	W	W	✓	✓
Midlayer, insulating jacket or sweater	✓	✓	✓	✓
Puffy jacket (down or synthetic)	W	✓	W	✓
Wind shirt	✓	✓	✓	✓
Long pants	✓	✓	O	O
Insulating pants, synthetic or wool	W	W	✓	✓
Rain jacket*	✓	✓	✓	✓
Rain pants*	✓	✓	✓	✓
Synthetic or wool gloves	W	W	✓	✓
Waterproof overmitts	W	W	✓	✓
Extra gloves or mittens	W	W	✓	✓
Socks and liner socks	✓	✓	✓	✓
Extra socks	✓	✓	✓	✓
Snow gaiters	–	–	✓	✓
Camp booties	–	–	–	O
Hiking shoes or boots	✓	✓	–	–
Waterproof hiking boots	W	W	✓	✓
EQUIPMENT†				
Day pack	✓	✓	✓	O
Backpack	–	–	–	✓
Pack cover or garbage bag	✓	✓	✓	✓
3-season tent	–	✓	–	–
4-season tent	–	–	–	✓
Sleeping bag	–	✓	–	✓
Sleeping pad	–	✓	–	✓

†See chapter 10 for gear maintenance and storage tips.
††You will need straps or bungee cords to attach to your backpack.

	All-Day Hike	Desert Trip	Snow Travel	Snow Camp
EQUIPMENT (continued)				
Extra sleeping pad	–	–	–	✓
Water bottles/bladder*	✓	✓	✓	✓
Stove, fuel, cook pot	–	✓	–	✓
Cup, bowl, spoon	–	✓	–	✓
Plastic bag for trash	✓	✓	✓	✓
Trowel, toilet paper, baggies	✓	✓	✓	✓
Hand sanitizer	✓	✓	✓	✓
Map, compass*	✓	✓	✓	✓
Sit pad	O	O	O	✓
Sunglasses*	✓	✓	✓	✓
Sunscreen, chapstick*	✓	✓	✓	✓
Headlamp*	✓	✓	✓	✓
Meals and snacks*	✓	✓	✓	✓
Fire starting equipment*	✓	✓	✓	✓
First-aid kit*	✓	✓	✓	✓
Repair kit and tools*	✓	✓	✓	✓
Emergency shelter	✓	✓	✓	✓
Trekking poles	O	O	✓	✓
Snow baskets for poles	–	–	✓	✓
Snowshoes††	–	–	P	P
Climbing helmet	–	P	–	–

***The Ten Essentials are required on <u>ALL</u> trips.**

✓ Needed for trip

– Not needed for trip

O Optional; personal preference

W Optional; depending on weather/forecast (*extra clothing is one of the 10 essentials*)

P Provided by WTC

Studying maps, Indian Cove | Homer Tom

CHAPTER 3
NAVIGATION

Navigation – the art of "staying found" – is fundamental to safe, efficient and enjoyable wilderness travel. However, developing into a proficient navigator is no easy matter: New terms and concepts must be learned, and techniques must be practiced over and over before they become second nature.

OBJECTIVES

This chapter presents the basics of wilderness navigation. By reading the material contained here in conjunction with Chapter 5 of *Mountaineering: The Freedom of the Hills*, completing all of the assignments and practicing all the techniques, you will:

- understand the importance of navigation in wilderness travel;
- become familiar with topographic maps, their design, content and interpretation;
- learn about the compass, its components, operation and use;
- discover how a map and compass work together to provide navigational information;
- determine ways to estimate travel time;
- recognize common navigation errors and learn how to avoid them.

REQUIRED EQUIPMENT

Each student should have the following:

1. A topographic map with contour lines (map provided).
2. A compass (mirrored type preferred). See Compass section for details.
3. A pencil, clipboard, ruler (with 1/10 inch scale) and notebook or paper.

WHY LEARN TO NAVIGATE?

You may be asking this question, especially if the most adventurous thing you do is a weekly conditioning hike in Griffith Park. However, there are many situations where a basic knowledge of navigation is important and some where it is critical:

- The ability to read a map is necessary not only to get to the trailhead but to help plan and stay on the correct route.
- The ability to use a compass can help you determine if you are heading in the right direction while on a trail, even if you are in fact on the correct trail. A compass also helps you make the correct choice when a trail forks.
- Skill at using a compass in conjunction with a map allows you to identify features on the landscape.
- The ability to navigate becomes essential whenever you leave the trail and begin cross-country travel. Under these circumstances, you must be able to identify your location at all times, correlate the observed terrain with the map, plot and follow a route and avoid hazards.
- Navigation is also essential in emergencies. If an injury occurs, even on a trail, you must be able to accurately identify the location for rescuers. You might also need to navigate cross-country to notify the authorities.

- Understanding coordinate systems (e.g., latitude and longitude) is essential knowledge for using a GPS device to pinpoint your location.
- Finally, the ability to navigate becomes critical after nightfall, during severe storms, white-outs or when the trail disappears for some reason. Being able to determine where you are and how to quickly and safely get to a destination may mean the difference between a little inconvenience and becoming a statistic.

With navigation skills, you will develop the confidence to leave established trails and go to seldom visited places that are only accessible by cross-country travel.

TYPES OF MAPS

Maps come in all sizes and shapes and are used for a variety of purposes. While web maps and GPS routing applications are used to get from home to the trailhead, more specialized maps usually are needed for wilderness travel.

- Forest Service maps. Produced by the U.S. Department of Agriculture, these maps show national forests. They are useful for giving an overall view of areas, showing the locations of trails, peaks, lakes, campgrounds, ranger stations, private in-holdings and roads with their names and county designations. This last aspect is important, because many forest roads are identified only by their Forest Service designations (such as 5S09X); these designations are not shown on most commercial road maps. Forest Service maps, though, do not provide complete coverage of California, nor do they include topography, so they cannot be used for most cross-country travel.
- 7.5-minute topographic maps. Produced by the USGS, these maps, usually referred to as "topos" or "quads" (from quadrangle, which is part of each map's name), are the standard reference tool for navigation. These maps show a small area in great detail, so subtle features of topography can be identified. Note that most topo maps use miles and feet as the units of measure, but some are in kilometers and meters.
- Commercial Maps. Tom Harrison Maps and Trails Illustrated Maps are readily available in local stores. With numerous titles to choose from, these maps cover the Santa Monica Mountains, local national forests, the Sierra Nevada, and all of California's national parks. The scales of these maps vary, but are generally not as fine as the 1:24,000 USGS topo maps. These maps are plasticized (good for rain resistance) and, unlike most other topo maps, include trail mileage information. They are very helpful in planning trips.
- Online Maps. Most people now use online mapping sites such as CalTopo (www.caltopo.com) for topographic maps. These are often digital versions of the paper maps you can acquire from the USGS.

TOPOGRAPHIC MAPS

Topographic maps are the single most important navigational tool at your disposal. Therefore, learning about all the information they contain is essential.

A topographic map covers an area of 7.5 x 7.5 minutes (.125 x .125 degrees), which is approximately 7 x 9 miles. A total of 64 topo sheets would be needed to cover a 1° x 1° area, which in southern California would be approximately 70 x 58 miles (see Figure 3-1).

Topos are nearly rectangular sheets 27 inches high and around 22 inches wide (width varies with latitude). The first thing to learn about topos is how to handle them. The maps can be rolled for easy transport or storage, but another method must be used in the field. One technique involves folding the maps "accordion" style, similar to how road maps are folded. This

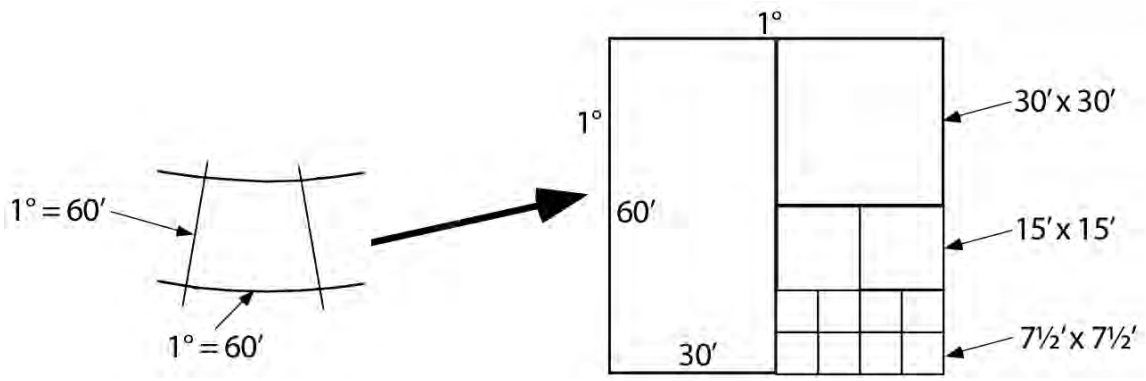


Figure 3-1. Area covered by a 7.5-minute topo sheet.

method, though, still is cumbersome since relevant portions of the map remain obscure. A better technique is to identify the area of the map that will be used, then fold the map so this area is readily visible. Maps can be carried in a pocket or placed inside a plastic bag or special map case for better protection against moisture.

An added problem to the use of topos is that often the area of interest falls at the edge of the map. Therefore, sometimes maps need to be joined together by folding the edge of one map and then taping adjacent maps together (making sure to use writable tape).

Topo sheets contain a great deal of information around their margins. In the lower left corner (Figure 3-2) is a statement concerning the agency producing the map, when the map was produced and which datum was used.

Just to the right of this is information concerning declination (Figure 3-3A), or the difference of magnetic north (MN) from true north (marked on the diagram by a star). GN is grid north, the difference between north on the UTM grid (Universal Transverse Mercator coordinate system discussed below) and true north. Declination will be discussed in more detail later.

Information on scale is provided in the middle of the map (Figure 3-3B). First, the horizontal scale is given as a representative fraction: the "1:24,000" means that one unit on the map equals 24,000 units on the ground. Bar scales are also shown in both metric and English units. Finally, the vertical scale (contour interval) is shown. Each of these topics will be discussed later in this chapter.

Next, the location of the area covered by the topo sheet within California is indicated, along with names of adjoining quadrangle sheets (Figure 3-3C).

Produced by the United States Geological Survey in cooperation with California Department of Water Resources

Derived from imagery dated 1970. Photoinspected using imagery dated 1995; no major culture or drainage changes observed. PLSS and survey control current as of 1972 Boundaries revised 1998

North American Datum of 1927 (NAD 27). Projection and 1000-meter grid: Universal Transverse Mercator, zone 11 10 000-foot ticks: California Coordinate System of 1927 (zones 5 and 6)

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks. The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are obtainable from National Geodetic Survey NADCON software

There may be private inholdings within the boundaries of the National or State reservations shown on this map

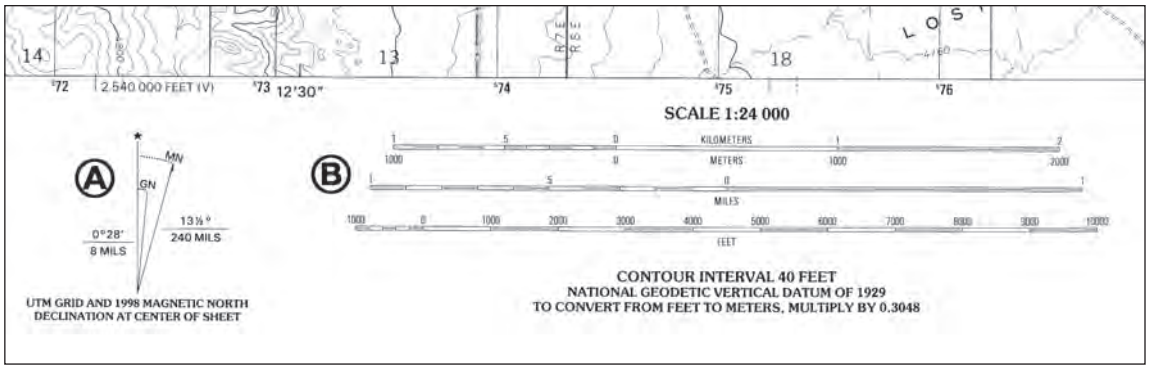
Where omitted, land lines have not been established

Figure 3-2. Map margin – Lower left.

Further to the right appears a description of some of the symbols used on the map (Figure 3-3D). More complete discussion follows.

The date of the map is noted at the bottom right margin of the map. (See reference E in Figure 3-3.) However, the map may be more current than the printed date. For example, although the Indian Cove topo bears a 1995 date, it was updated

Lower middle margin



Lower right corner

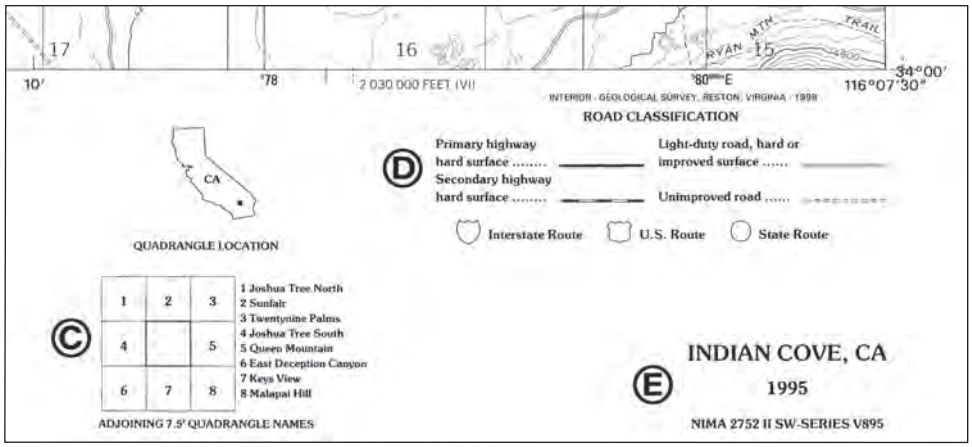


Figure 3-3. Map margins.

in 1998 to show wilderness boundary changes (Figure 3-2) and to show 1998 magnetic declination (Figure 3-3A)

Finally, the name of the topo sheet or quad is indicated in the lower right (Figure 3-3E); it also appears in the upper right corner.

Within the body of topographic maps, information is provided through different colors, line types and symbols. In class, you will be given a sheet showing all of the symbols; these must be learned in detail.

Color is used in the following ways:

- Black is used to show features not part of the natural environment, such as buildings, railroads, minor roads, boundaries, trails and lines of Latitude and Longitude, and UTM.
- Brown is used for contour lines (see the next section).
- Green is used to show vegetation. Solid green means the area is forested; irregular mottled green indicates areas of scrub, while regular mottled green shows groves or orchards.
- Blue is used for water, including streams, lakes, seas, oceans and springs.
- Red shows major roads, built-up areas, survey lines and certain other features, such as picnic areas and campgrounds.
- Purple indicates updates and revisions to the map.

- White, when crossed by brown contours, indicates areas with little or no vegetation (including meadows) or above tree line; when crossed by blue contours, white indicates a glacier or permanent snow field.

Several types of lines appear on topo maps. Continuous lines of various colors can indicate such things as roads, boundaries, contours, transmission lines and pipelines. Different types of roads, railroads and boundaries are indicated by doubling the lines, adding patterns of color or using other symbols. Still more variation is achieved by using long and short dashes and dots in various combinations. Dashed single lines indicate trails.

Distance along a trail can be estimated by counting dashes: 35 usually equal one mile. However, maps often do not show all switchbacks, so estimates using this method could be significantly low.

The location of a trail on the map usually corresponds closely to its location in the field; however, sometimes the trail simply is misplaced, or the map may indicate a former location because the trail was moved and the map has yet to be updated. You have to pay close attention while hiking to make sure the trail's location on the map matches what you're reading from the terrain.

Point symbols of different types are used to indicate many features: rectangles for buildings, circles for tanks, triangles for benchmarks and squares for mines to name a few. Easily recognizable symbols are used to represent locations of schools, picnic areas and mines, while shaded irregular shapes indicate lakes, swamps and sandy areas. Finally, words or abbreviations are used to indicate certain features, while numbers indicate spot elevations.

CONTOURS, SLOPE, AND TRAIL PROFILES

Topographic maps get their name from their portrayal of surface features, or topography. This vertical dimension is shown on maps through the use of contours, lines connecting points of equal elevation. Accurate interpretation of contours – indeed, the ability to "see" landforms on the flat surface of a topo sheet – is essential to navigation. Developing this skill, however, takes some study.

The first time you look at a topo map, the brown contour lines probably will have no more meaning than a bunch of spaghetti noodles placed randomly across a page. Look more closely, though, and some order emerges: Lines are closer in some places, farther apart in others; most are light but some are darker; the lines seem to curve in particular patterns; in places, the lines form closed circles; and they never cross one another. Each of these observations reveals important aspects of contours.

The first thing to understand about contours is that each line represents a certain elevation across the surface of the land. To help visualize this, think of a bathtub with items of different shapes and sizes placed in it. Now, imagine water being added to the tub: first one inch, then another and so forth. If you looked directly down on the scene from above, you'd see that the surface of the water formed patterns around the items and along the edges of the tub at each level. You'd notice that the water moves fast across surfaces that have gentle slopes, more slowly on surfaces that are steeper. As the water rises higher, individual items become isolated, surrounded by unbroken circles of water. If you took the time to trace the water line at each successive level on a piece of paper, you'd have a topo map. Figures 3-4 and 3-5 further illustrate the relationship between topography and contours.

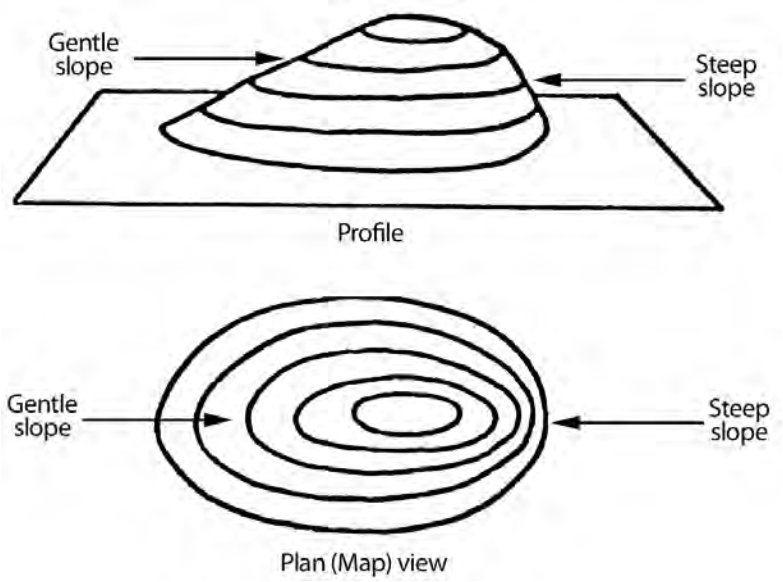


Figure 3-4. Slopes and contours.

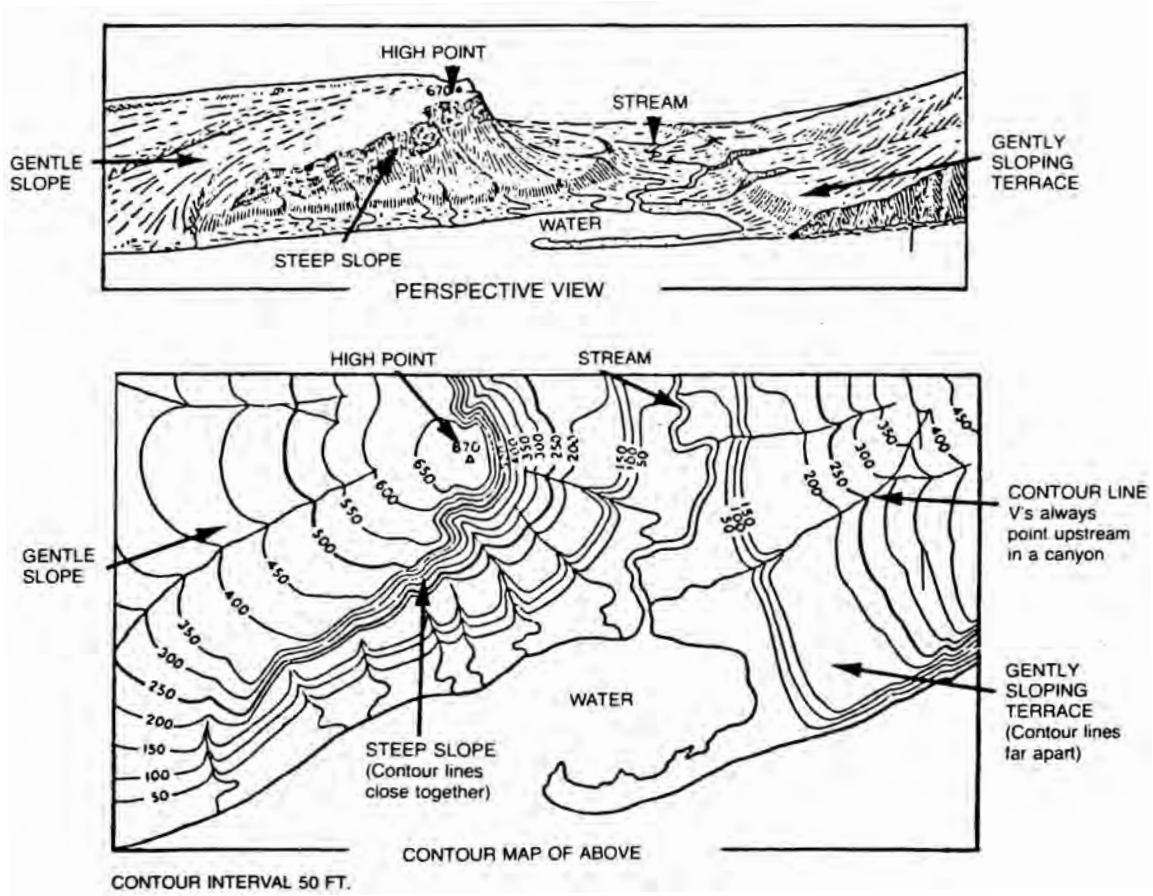


Figure 3-5. Terrain and topo.

Now that some basics have been established, a few specifics can be presented.

- Relatively straight, parallel contours indicate a smoothly sloping surface (Figure 3-6a); irregular contours indicate a complex or broken surface (Figure 3-6b).
- Contours "V" up stream gullies (Figure 3-7a); they "V" down ridges (Figure 3-7b).
- Other topographical features are identified by their characteristic pattern of contours: saddle points (Figure 3-8a); and benches (Figure 3-8b).

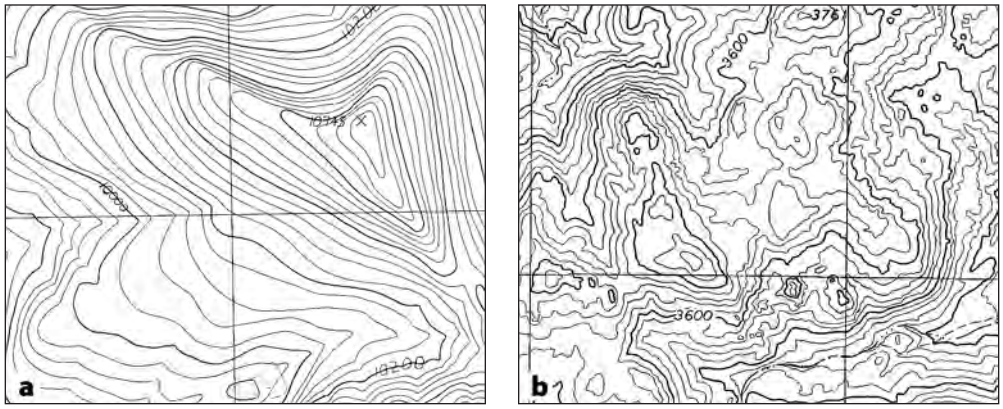


Figure 3-6. Smooth (a) and irregular (b) surfaces.

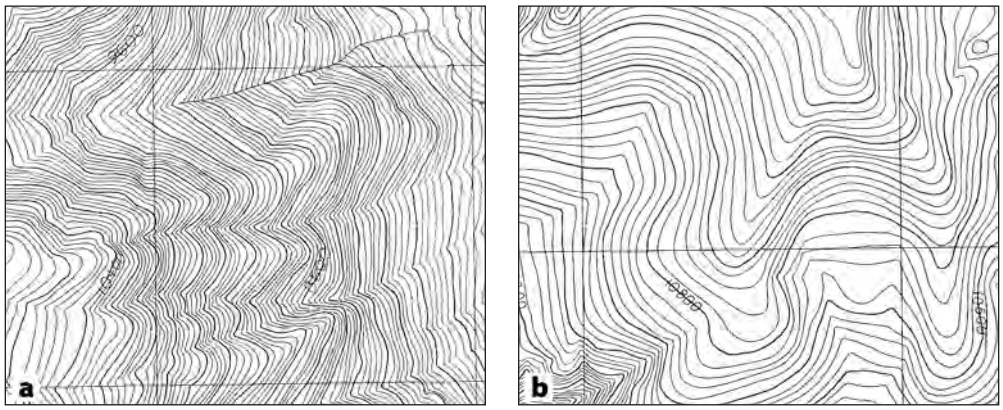


Figure 3-7. How contours indicate stream gullies (a) and ridges (b).

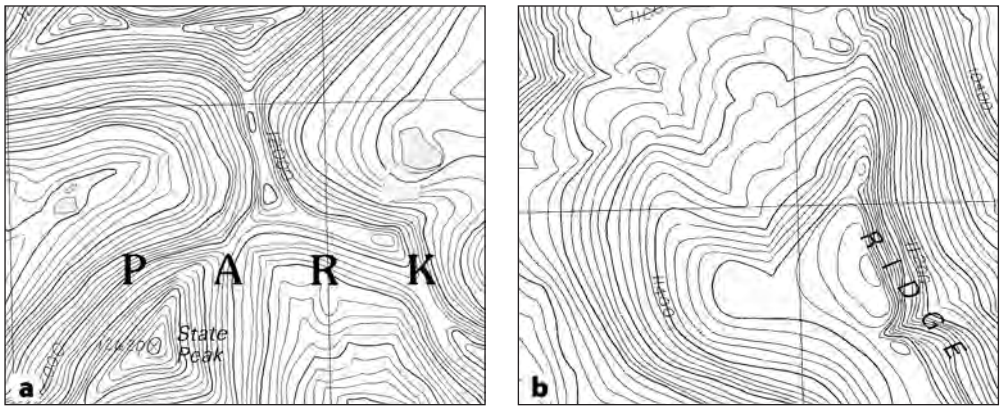


Figure 3-8. Other topographic features: saddle points (a); bench (b).

An important convention on topo maps is the **contour interval:** the difference in elevation between each contour line. On most USGS topo sheets, the contour interval is 40 feet; every fifth contour (called the index contour) appears darker, and its elevation usually is labeled somewhere along the line. To determine the elevation at any point, find an index contour in the vicinity that is labeled, then add or subtract 40 feet for each contour above or below this line. Sometimes, the point will be several contours away from the labeled index contour; in these cases, simply add or subtract 200 feet for each index contour, then 40 feet for each of the additional contours crossed. The exact elevation of the point, though, can only be estimated between adjacent contours. In the case of peaks, all that can be said is that the top is an elevation greater than the last contour, but less than the next one that would appear if the peak were a little taller. Likewise, given that the interval is 40 feet, a feature (such as a pile of rocks or a sharp drop-off) may be as much as 39 feet and not show up on the topo map and a single closed contour can represent a rock pile anywhere from one to 79 feet in height. Topo maps are quite useful and reliable for showing surface features, but they cannot show everything.

In Southern California, some USGS topo sheets use a different contour interval. The San Jacinto Peak topo uses a contour interval of 80 feet. A number of USGS topo sheets for areas in the Santa Monica Mountains have a contour interval of 25 feet and index contour lines of 100 feet are every four contour lines rather than the usual five.

Some USGS topo sheets use metric measures (kilometers and meters). On these maps, the contour interval usually is 20 meters, which equals 61 feet or 52% more than the 40-foot interval of most maps. When viewing these maps, you must keep in mind that the slope will be greater for an equal spacing of contours and that the maps will not show as much topographic detail as those with 40-foot contours.

Another important piece of information that can be gleaned from a topo map is the slope at a given point. **Slope** measures the degree of inclination of a surface and ranges from a flat surface (0°) to a vertical cliff (90°; any angle greater than 90° is an overhang). Obviously, the steeper the slope, the harder it is to climb.

Slope is indicated on topo maps by the spacing of contours: The closer they are together, the steeper the slope (Figure 3-9). Knowing the slope of the terrain you plan to traverse is important for time/effort calculations, route finding in cross-country travel and safety.

In general, slopes up to 5° represent very gently rising topography, up to 10° fairly easy pack trails, up to 15° steep trails, over 20° steep slopes, while over about 45° the slope becomes too steep to walk easily on.

A special value is called the **angle of repose:** the steepest slope that material (sand, scree, talus, etc.) can form. This angle, which usually is given as 34° but can vary from 25° to 45° depending on material, is commonly encountered in mountains as scree slopes and in deserts as alluvial fans.

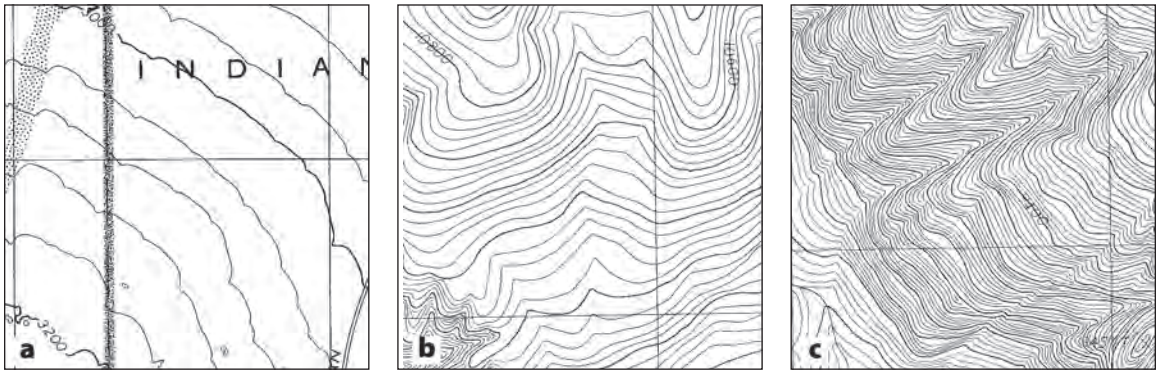


Figure 3-9. Gentle slope, less than 5° (a); moderate slope, 10°-15° (b); steep slope, 40°-50° (c).

COMPASS OPERATION, DECLINATION, AND MAP ORIENTATION

Next to a map, the most important instrument for navigation is a compass. A compass can be used to:

- identify direction;
- orient a map;
- identify features;
- determine location;
- measure slope angles (if a clinometer is built-in);
- follow a course of travel.

A suitable compass for wilderness navigation and for use in this course must have the following features (Figure 3-10):

1. A transparent base with straight sides so that the compass can be used to plot bearings on a map.
2. A rotating central dial (bezel), also with a transparent base, graduated in one- or two-degree increments.
3. The central dial enclosing the pivoting magnetic needle must be liquid filled to dampen oscillations and permit fast, accurate readings. This feature makes it possible to follow an accurate bearing without stopping.
4. The graduations must be clockwise from 0° to 360°.
5. A mirrored cover with sight (preferred).
6. Adjustable declination arrow (preferred).

A compass works because the earth is surrounded by magnetic lines of force, which extend from the Magnetic North Pole in northern Canada to the Magnetic South Pole in Antarctica. These Magnetic Poles are not identical to the Geographic North and South Poles. The magnetic compass needle, when held level and allowed to swivel freely, will align itself parallel to the lines of force at your location; the north end of the needle (red) points toward the Magnetic North Pole.

Maps are based on the Geographic North or South Poles, which are different from the Magnetic Poles. The amount of difference between the Geographic and Magnetic Poles is called the **magnetic declination.** This value, which is identified on all topo maps (refer back to Item A in Figure 3-3), varies from place to place. In the U.S., declination is zero along a line running from Minnesota to Louisiana; places east of this line have "west" declination; places west of this line have "east" declination. In Southern California, compasses need to be adjusted anywhere from 12° to 14° east (to the right).

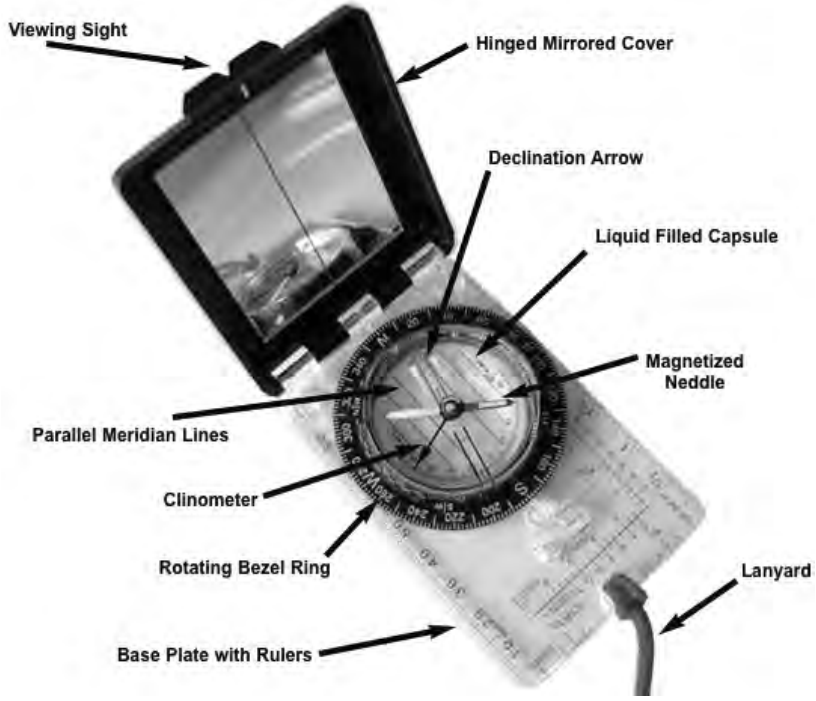


Figure 3-10. Components of a mirrored compass.

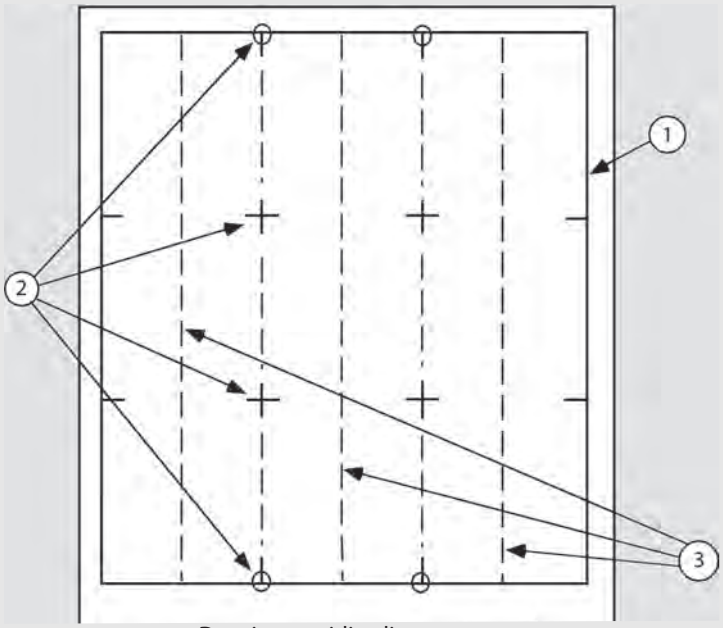
DRAWING MERIDIAN LINES

Before leaving the house, you should draw north-south meridian lines on your topo maps. These lines will help you plot bearings much faster and with greater accuracy.

Here's how to draw meridian lines.

1. The right and left edges of the map are true north-south lines (Meridians of Longitude).
2. Each quadrangle map has two or more Longitude tick marks along both top and bottom edges; they are identified by 1/16 inch long black lines extending from the edge into the mapped area. These tick marks (circled below) can be matched with four 1/4 inch black crosses in the middle of the map. Using the above tick marks, two more highly accurate meridian lines can be drawn.
3. Construct three or more additional meridian lines parallel to the first four. The lines should be between 3/4-inch and 1 inch apart.

Red section lines that appear on many maps may sometimes be used as true north-south meridians, but they often vary from true north. If section lines are inaccurate or don't exist, draw your own meridian lines. UTM gridlines vary off true north from 0° to 2.5° depending on how close the location is to the zone's central meridian. Advanced navigators can use UTM lines in lieu of drawing meridian lines by adjusting the compass declination to take into account the difference between TN and Grid North (GN).



Drawing meridian lines on map

Declination changes over time. In Southern California, up to the latter part of the 20th century, its movement resulted in the magnetic declination decreasing by one degree about every twenty-five years. Since 2000 it accelerated to about 5 minutes per year. This now results in about 1° decrease in declination every 12 years. Future rate of change is not known. Most of the maps that we use have outdated declination information printed on them and current declination should be ascertained using the online calculator at NOAA's National Geophysical Data Center website (see links, end of Chapter 10).

There are two ways to adjust for magnetic declination, depending on the compass. Most mirrored compasses have an adjustment screw on their backs that can be used to rotate the bezel enough to adjust for the declination at any location. The other way to adjust for declination is with a tape arrow.

Here's how to set a tape arrow on compasses that do not have an adjustment screw:

1. Cut a piece of colored tape the same size and shape as the red orienting arrow in the rotating base plate.
2. Set the declination angle on the index (direction of travel arrow) of the compass.
3. Turn the compass over and place the tape arrow on the underside so that it points right at the index (direction of travel arrow).

Nearby magnetic objects can play havoc with your compass – and your navigation. If the magnetic objects (usually containing iron) are small, they must be within inches of the compass to cause errors. Items to watch for include pocketknives, another compass, steel pencil ends, some watches and rings, bracelets, belt buckles and zippers. If the nearby magnetic objects are larger, such as tractors or heavy equipment, you will have to be a number of feet away to avoid deflection.

If the nearby magnetic object is very large (for instance, a mountain of iron ore), your compass may be useless until you get several miles away from it. This situation is not common in California, although it does exist in some isolated areas. If you have any reason to suspect your compass is not giving accurate readings, first check for small nearby magnetic objects.

Before a compass can be used in conjunction with a map in the field, the map must be oriented. This means aligning the map so that its top points north. To do so, set the map on the ground, set the bezel of the compass to north, rotate the compass until it is pointing north, then move the map around until it also points north. Alternatively, you can use the compass to determine north, then mark a north line in the ground to use for orienting the map. See Drawing Meridian Lines for a tool that will help you orient your map.

Another good idea is to draw a line on the map 2.64 inches long (one mile distance), one inch of which is divided into 1/10 inch intervals, to act as a ready ruler for estimating distances. (Figure 3-12) These building blocks of 1/10 inch each equal 200 feet exactly. Place this line in an unused area of the map so as not to interfere with taking bearings.

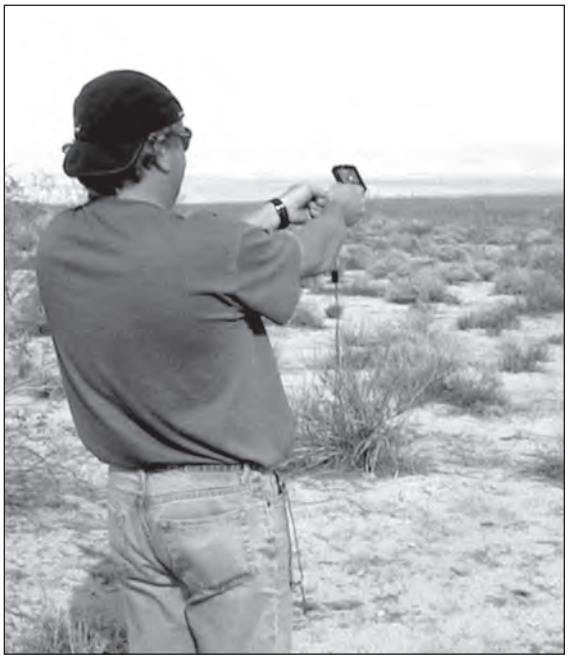


Figure 3-11. Taking a bearing with mirrored compass.

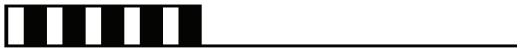


Figure 3-12. Ruler for estimating distances.

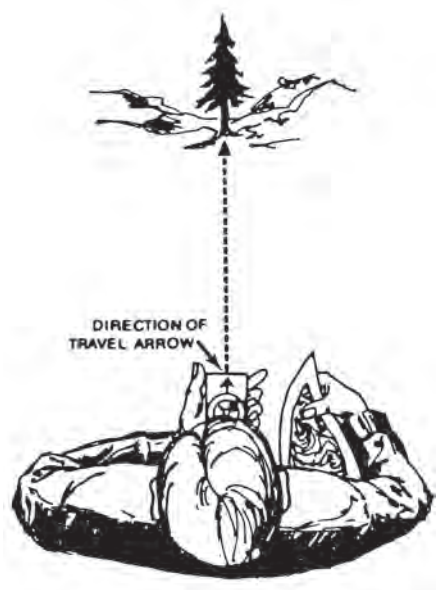


Figure 3-13. Taking a bearing with non-mirrored compass.

USING BEARINGS TO LOCATE YOURSELF AND FEATURES

A bearing (technically, a "full circle bearing," also known as an "azimuth") is simply a direction, usually to a feature. Bearings are measured from north, which is designated 0°, clockwise all the way around back to north (360°); due east is 90°, south 180° and west 270°.

Taking a bearing with a compass requires practice. To take a bearing with a mirror compass, hold the compass at arm's length, level with the ground and pivot the mirror so that the dial is clearly visible (see Figure 3-11). Align the viewing sight with the feature you are taking a bearing to, then rotate the bezel ring until the red declination arrow falls directly over the red portion of the magnetic needle; check the alignment by also seeing if the black part of the declination arrow matches the white part of the magnetic needle. The bearing is read at the point in the middle of the hinge. After taking the bearing once, repeat the process two or three more times and average the result. Even seasoned veterans rarely arrive at the same measure every time they take a bearing.

If a non-mirrored compass is used, bearings are taken by holding the compass at waist level while facing the feature (Figure 3-13). This technique will not yield nearly as accurate a result as can be obtained with a mirror compass.

Accuracy in taking bearings is important. For example, a one-degree error at a distance of one mile equals nearly 100 feet. This means that if you took a bearing to a feature located one mile away and were off by only one degree (which still is a very accurate measure), and then traveled in an exact straight line to the feature you may still miss it by as much as 100 feet to the left or right. The amount of error increases with greater distance and less accurate measures.

Map and compass work together for several important jobs:

- Finding the bearing on the map so you can find the feature in the field. If you know where you are and want to find a feature on the map in the field, place the compass on the map and move it until the edge touches your location and the feature. Then, rotate the bezel until the meridian lines match (Figure 3-14). Once you have found the bearing on the map, hold the compass as though you were taking a bearing, but in this case rotate yourself until the red compass needle lines up with the declination arrow. If you've done everything properly, you should be staring at the feature you are trying to find.
- Identifying features you see in the field by taking a bearing to it and finding it on the map. If you are at a known location (say, at a trailhead or on a trail at an identifiable point), you can easily identify the features you see. To do so, take a bearing to the feature, say one of several mountain peaks. Next, place the compass on the map and line up the meridian lines on the compass with the meridian lines that you drew on the map. Move the compass up or down until the edge of the compass touches your location on the map. Finally, sight along the edge of the compass until you see a feature on the map that matches the one in the field you are trying to identify. Identifying features is easier if you can estimate the distance; that limits the area of the map you have to search. You don't have to orient the map when plotting bearings on the map.
- Identifying your location on a trail. If you are on a trail and can identify a feature on the landscape, such as a peak, you can locate your position. Take a bearing to the feature, place the compass' edge on the map feature is at its edge, then rotate the compass until the meridian lines are parallel. Your location will be where the compass edge intersects the trail. (Figure 3-15).

HOW TO MEASURE A BEARING ON A MAP

Taking a bearing from point A (Camp Rock) to point B (Freimanis Peak) on the map.

- Place compass on map with one long edge of base plate joining two points (A and B). If the points are far apart, use a ruler and draw a line between them with a pencil. Place the long edge of the compass along this pencil line.
- The Index Line points to objective (B).
- Rotate dial to align compass meridian lines with north-south lines on map. N (North) on compass will always point toward the top of the map.
- Read bearing at the index line.
- The bearing from Camp Rock to Freimanis Peak is 38°.

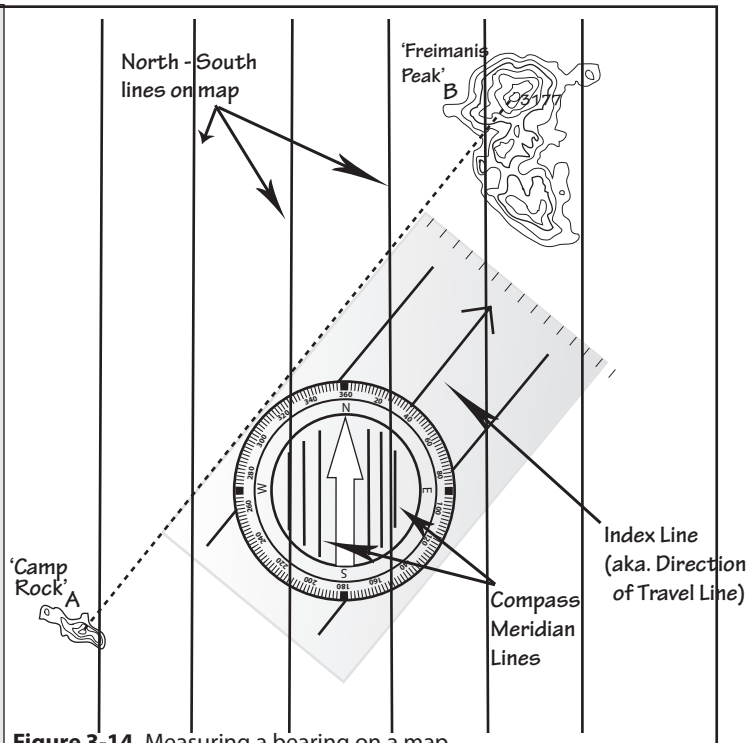


Figure 3-14. Measuring a bearing on a map.

HOW TO PLOT A KNOWN BEARING ON A MAP

While hiking on trail you want to know where you are on the map. You see Freimanis Peak in the distance and take a bearing to it with your compass. The bearing is 132°. Where on the trail are you?

- Set desired bearing of 132° on index line.
- Place compass on map with one long edge of base plate on feature from which you wish to plot bearing (Freimanis Peak).
- Turn entire compass to align its meridian lines with map's north-south lines, with north on compass pointing toward the top of the map. Do not rotate the compass dial; the bearing at the Index Line should continue to read 132°.
- The edge of the base plate is now the bearing line.
- You are at the location where the bearing line intersects the trail.

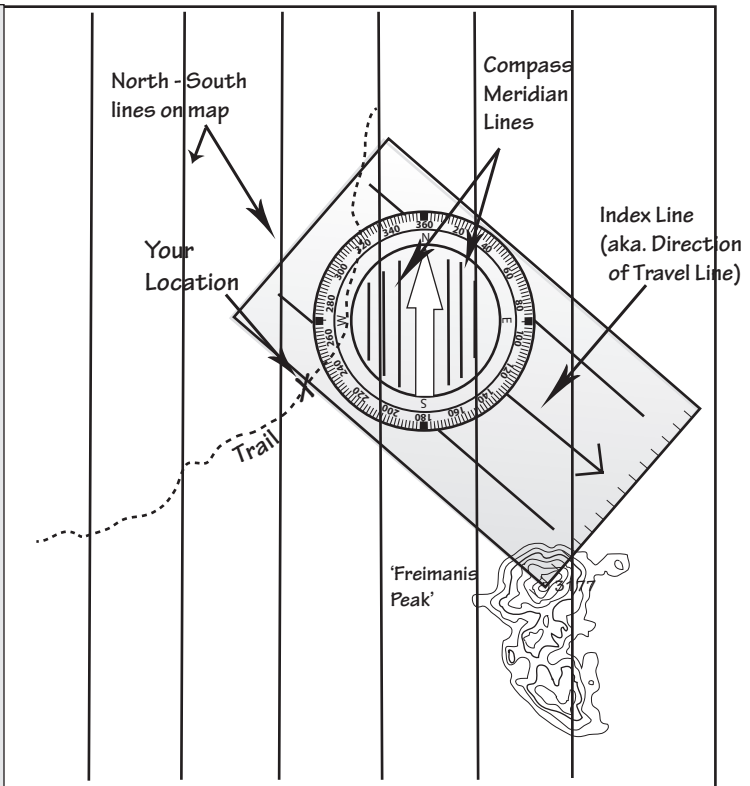


Figure 3-15. Plotting a bearing on a map.

Table 3-1. Distance, speed and time relationships.

Distance		Walking Time		
On Map	On Ground	@ 2 mph (Slow)	@ 3 mph (Quick)	@ 4 mph (Fast)
1/10 inch	200 feet	1 minute	40 seconds	34 seconds
1/4 inch	500 feet = 1/10 mile	3 minutes	2 minutes	1.5 minutes
1/2 inch	1,000 feet = 2/10 mile	6 minutes	4 minutes	3 minutes
1 inch	2,000 feet = 4/10 mile	12 minutes	8 minutes	6 minutes
2.6 inches	1 mile (35 trail dashes)	30 minutes	20 minutes	15 minutes

- Identifying your location off-trail. You'll need to identify two features such as prominent peaks or gullies that are easily recognizable, preferably 90° apart and not more than a couple miles away. Take a bearing to the first feature, then, after placing the compass on the map, aligning with the meridian lines and moving the compass until the edge is on the feature, draw a line along the edge of the compass. Repeat this process for the other feature. Your location is where the lines cross. Note, however, that you may need to extend one or both lines. And remember too that any error you make in your bearings will affect your results. If you need a highly accurate location or if the features are not 90° apart, you may want to use a third or even fourth feature.
- Traveling to a feature. Once you've found the bearing to a feature, you can use the compass to navigate there. Simply hold the compass in front of you as you walk, paying attention to keep the magnetic needle bracketed by the declination arrow. Of course, you can't always travel in a straight line in the wilderness; you'll need to walk around piles of rock, brush or snow to get to your destination.

These skills take a bit of practice to master. You will get plenty of opportunity to do so on the Full-Day Hike and while out at Joshua Tree.

DISTANCE, SPEED, AND TIME ESTIMATION

It's easy to get caught at night in the wilderness, far from car or camp. That's why you need to be able to gauge how long it will take you to travel over varied terrain. Some important relationships of distance, speed, and time are presented in Table 3-1. These values are for a 7.5-minute topo map and assume no elevation gain or loss.

The picture is complicated if you are going uphill. In this case, you estimate time by using the **Naismith Rule**. This rule can be expressed as:

t = 1/3 d + 1/2 h

t = time in hours

d = distance in miles

h = total elevation gain in thousands of feet.

The Naismith Rule assumes a hiking speed of 3 miles per hour and adds 30 minutes for each 1,000 feet of ascent.

The Naismith Rule usually applies to hiking with a daypack. When carrying a full pack, use the **Backpacker's Rule**:

t = 1/2 d + h

The Backpacker's Rule predicts an average speed of 2 miles per hour and adds one hour for each 1,000 feet of ascent.

Both these rules assume you're traveling on a trail. To calculate travel time while going cross-country, use the Naismith or Backpacker's Rule and add a "squiggle factor": a multiple to account for a slower travel time. Squiggle factors

are arbitrary and based to a considerable degree on experience. Here are some commonly used squiggle factors:

- For trails with many switchbacks, in desert or rocky terrain or in light brush, multiply your Naismith or Backpacker's Rule time by 10 to 40% (multiply by 1.1 to 1.4).
- For moderate or steep slopes, thick brush, talus and slippery rocks, multiply Rule time by 50 to 200% (multiply by 1.5 to 2.0).
- For steep scree slopes, chock points or third-class rock, multiply Rule time by 200 to 500% (multiply by 2 to 5).
- When traveling with a group, add 1 percent to your travel time for each participant. For example, if Rule time tells you a trip will take four hours, plan an extra 48 minutes if 20 people are joining the hike.

In general, travel in the wilderness usually takes longer than expected.

TRIP LEG TABLES AND TRAIL PROFILES

A very useful trip planning tool is to create a trail profile and trip leg table. A trail profile will give you a very good idea of the total distance and the total elevation gain (and loss) of your trip. In addition, the profile will tell you at a glance which legs of the proposed trip will be hard and which easy. By combining this information with the time-distance formulas presented earlier, you can calculate the time required to do the trip for a certain condition level. All of this information comes together in the trip leg table.

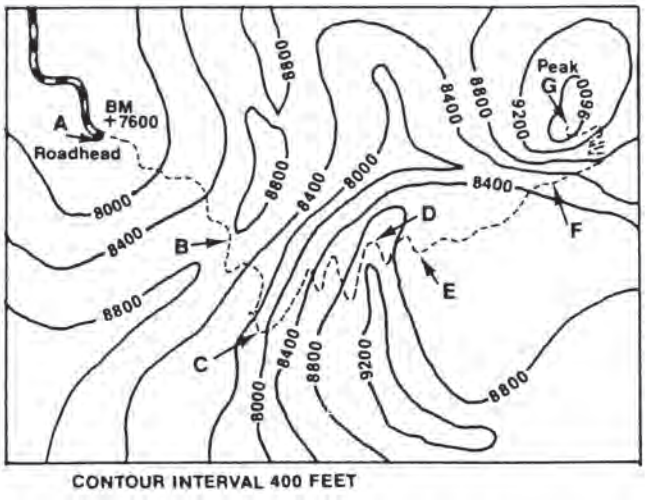


Figure 3-16. Trail profile map.

Trail profiles are constructed as follows.

- Mark starting and ending points on the topo, along with the intermediate points along the proposed line of travel (e.g., where the slope changes from ascending to descending or vice-versa, stream crossings, rest stops, etc.; refer to Figure 3-16, points A-G).
- Measure the horizontal distance along the route of travel between the selected points with the edge of a piece of paper, and prepare a Trip Leg Table. Table 3-2 shows a simple Trip Leg Table. You can add additional columns to fit your particular needs.

Table 3-2. Trip Leg Table

Point	Location	Miles		Elev.	Elevation Gain			*Time (Minutes)	
		Leg	Total	(feet)	Leg	Total	(ft/mi)	Leg	Total
A	Roadhead		0	7600					
B	Saddle	1.2	1.2	8700	1100	1100	917	57	0:57
C	Valley	0.8	2.0	7950	-750	1100	-938	16	1:13
D	Ridge	1.7	3.7	9000	1050	2150	618	66	2:19
E	Change of slope	0.5	4.2	8600	-400	2150	-800	10	2:29
F	Valley	1.0	5.2	8350	-250	2150	-250	20	2:49
G	Peak	1.1	6.3	9600	1250	3400	1136	57	3:46

***Time Estimates based upon Naismith Day Hiker rule.**

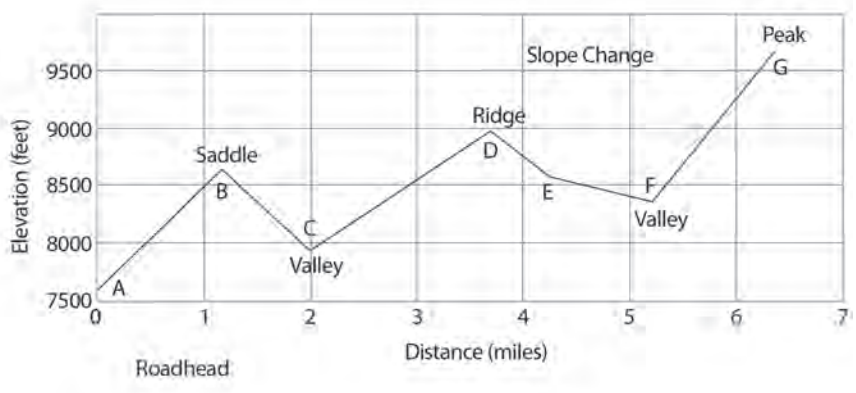


Figure 3-17. Trail profile.

- Plot these points on graph paper or on your computer using Excel or some other program. To do so, select a convenient scale to represent horizontal distance; make sure that the total distance fits along the bottom of the graph. Next, select a vertical scale, one which spans the range of elevations encountered. Since the amount of vertical gain and loss is but a fraction of the distance covered, the vertical scale needs to be much smaller than the horizontal; if not, you will end up with a flat line rather than a meaningful profile (Figure 3-17).
- Finally, connect the dots. Typically, this is done using straight lines though curved lines better reflect the actual topography.

LOCATING POINTS: LATITUDE-LONGITUDE

An important step in navigation is learning how to accurately identify locations using coordinate systems. In cities, places are located by reference to a number (an address) on a street. To get to a particular address, one follows the street grid so many blocks over, then up or down so many blocks. Locations on the earth's surface also are specified using numbers and a grid; the main difference is that two numbers are used to locate a point.

The oldest and still most widely used system of locating points is Latitude-Longitude, also called the Geographic Grid. Latitude (Lat) measures the angle in degrees north or south of the Equator; values range from 0° at the Equator to 90° N and S at the two Poles. Lines of equal Latitude are called Parallels. Longitude (Long) measures the angle in degrees east or west; values range from 0° at the Prime Meridian, which passes near London, to 180° at the International Date Line, which is found in the middle of the Pacific Ocean. Lines of equal Longitude are called Meridians. Points north of the Equator are designated N Lat; west of the Prime Meridian as W Long. The point identified in Figure 3-18 is 30° N Lat 20° W Long; Los Angeles is located a little further north and a lot further west, at 34° N Lat 118° W Long.

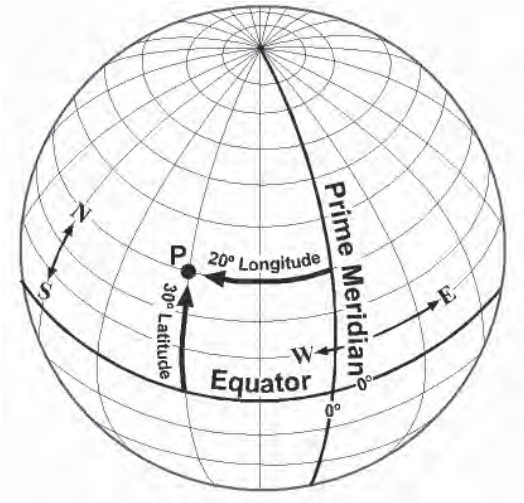


Figure 3-18. The Geographic Grid. The lines represent Parallels of Latitude and Meridians of Longitude.

To attain greater accuracy, degrees are divided into minutes (designated ′ ; 60′ = 1°), which in turn are divided into seconds (designated ″; 60″ = 1′). Minutes and seconds in this case refer to measures of angle, not time.

Latitude-Longitude remains the system of choice among geographers, surveyors, pilots and, importantly, rescuers. The system works best when locating relatively large features not too precisely or when referring to broad zones on the earth. But Lat-Long does not easily identify the small points (like peaks and trail junctions) that are commonly used in wilderness navigation.

Lat-Long is difficult to measure because a minute of longitude is a different distance than a minute of latitude. The Indian Cove quad represents an area of 7.5 minutes of latitude by 7.5 minutes of longitude; if the minutes measured the same distance the map would be square. The distance represented by a minute of longitude decreases as you go north. Although not readily noticeable on your map, it is measurable – the width at the top of the Indian Cove map is 1/8th inch less than the width on the bottom.

LOCATING POINTS: UTM

The UTM (for Universal Transverse Mercator, the map projection used) coordinate system uses 1000 meter (1 kilometer or .62 mile) square grids so East-West units of measure are the same as North-South units. It is based on units of ten, which makes finding locations much easier than using Lat-Long. The coordinates translate directly to distances on the ground. It is easy to estimate distance because the distance between each gridline is the same.

The UTM system divides the globe into 60 longitude zones, each 6° wide. The numbering begins with zone 1 at 180° W Long and proceeds eastward. The contiguous U.S. is covered by 10 UTM zones; Southern California lies in zone 11. Likewise, there are 20 Latitudinal zones, designated by letters, stretching from Lat. 80° south to 84° north; Southern California lies in zone S. (The polar regions are covered by a separate Universal Polar Stereographic projection.)

The meridian (center) of each UTM zone is assigned the value $^{5}00^{000m}$E. Eastings within each zone will range from $^{1}66^{640m}$E in western area of the zone to $^{8}33^{360m}$E in the eastern area of the zone. For locations north of the equator, values range from $^{00}00^{000m}$N to $^{93}34^{080m}$N. A northing value of $^{37}75^{000m}$N means that the point lies 3,775,000 meters north of the equator. Locations south of the equator use different values.

The UTM grid is shown on newer topo maps by fine black lines; on older maps blue tick marks appear along the edge. UTM lines are identified by a three- or four-digit number. More precise locations are given by adding more digits.

When specifying UTM coordinates, care must be taken to identify the map datum (or survey) upon which the measures are based. Many different datums are in use, but the two most commonly used in the United States are the North American Datum of 1927 (NAD 27) and North American Datum of 1983 (NAD 83). NAD 83 is virtually identical to World Geodetic System of 1984 (WGS 84). The difference between NAD 27 and NAD 83 amounts to about 210 meters, so you need to know which is in use. Topo sheets will identify which datum was used to produce the map (most use NAD 27), and GPS units must be set to the correct datum (most default to WGS 84). When giving coordinates, the datum should be specified.

Figure 3-19 is the northwest corner of the Indian Cove 7.5 minute quadrangle. The map is printed with UTM gridlines. Latitude-Longitude is shown in the upper left corner (34°07′30″116°15′). The three-digit numbers along the top of the map (and bottom) are called eastings, which provide an east-west position. The four-digit numbers on the left side of the map (and the right side) are called northings. They give you a north-south position.

Location in the UTM system is defined by the coordinates of the point, giving the easting first and then the northing. To specify a point in UTM coordinates, or to find a coordinate on a map, the first set of numbers moves you from left to right across the map; the second set from bottom to top. The convention of east (right) first, then north (up) can be remembered by the mnemonic "read right up."

The form of a complete UTM coordinate is map datum, zone, easting and northing. The complete UTM coordinate for Peak 3454 in Figure 3-19 is:

NAD27 Zone 11S $^{5}71^{497m}$E $^{37}74^{184m}$N.

This gives the UTM coordinate to within a one meter square area. There are a number of ways to abbreviate this coordinate by dropping the datum, zone number, and subscripts:

Six Digits (accurate to within 100 meters square): 714 741

Eight Digits (accurate to within 10 meters square): 7149 7418

Ten Digits (accurate to within 1 meter square): 71497 74184

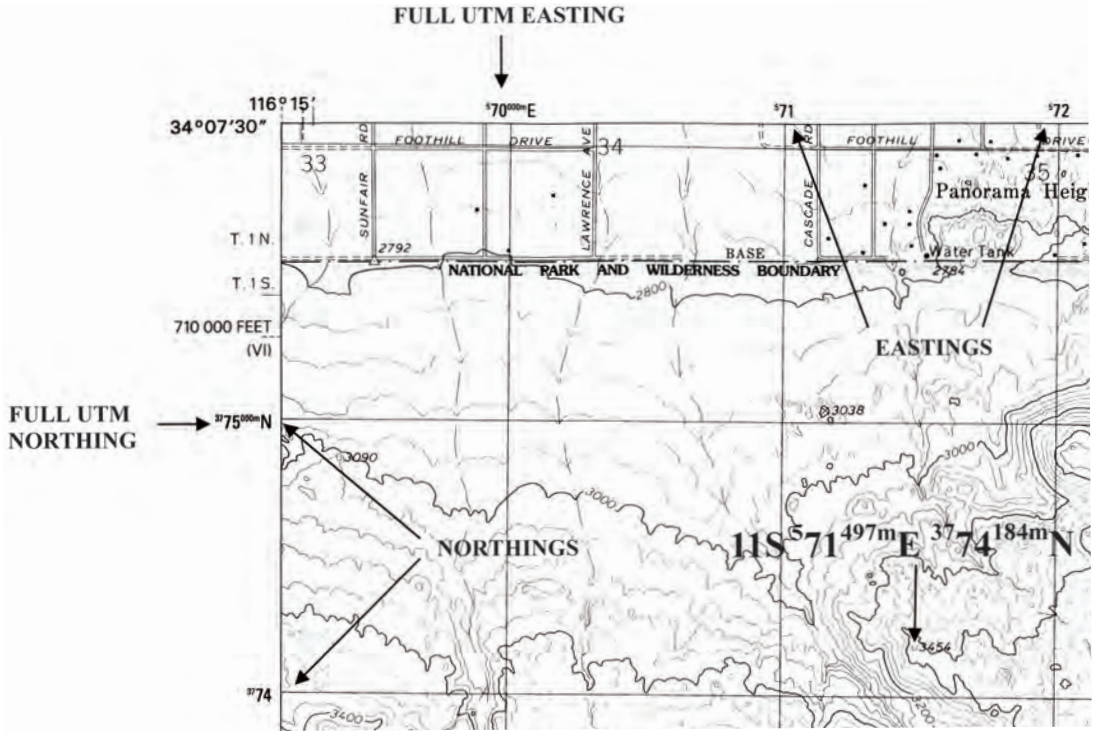


Figure 3-19. UTM Coordinates

There are several ways to find UTM coordinates:

Visually: You can obtain an accurate coordinate to within about 100 meters simply by using your eyes. On Figure 3-20, Peak 3543 (A) looks about six-tenths of the way between eastings $^{5}71$ and $^{5}72$ and about halfway between northings $^{37}73$ and $^{37}74$. Therefore, the coordinate of 11S $^{5}71^{600m}$E $^{37}73^{500m}$N would be accurate to within 100 meters.

With a Map Ruler: The map ruler used in Figure 3-20, gives 50 meter increments and accuracy will be between 25-50 meters. Peak 3510 (B) is 350 meters east of easting $^{5}72$. Using the ruler (not illustrated), the peak is 850 meters north of northing $^{37}74$. Therefore, the coordinate of 11S $^{5}72^{350m}$E $^{37}74^{850m}$N would be accurate to within 50 meters.

With a UTM Ruler: The corner of the UTM ruler is placed on the target location (C). The horizontal scale measures the easting; it is found by where the scale intersects the easting gridline. The vertical scale measures the northing; it is found where the scale intersects the northing gridline. The UTM Ruler used in Figure 3-20 is in 20 meter increments and can produce accuracy to within 10-20 meters. Point C is where an intermittent stream crosses the 3000 foot index contour line. It is 260 meters east of easting $^{5}70$ and 720 meters north of northing $^{37}74$ resulting in coordinate of 11S $^{5}70^{260m}$E $^{37}74^{720m}$N.

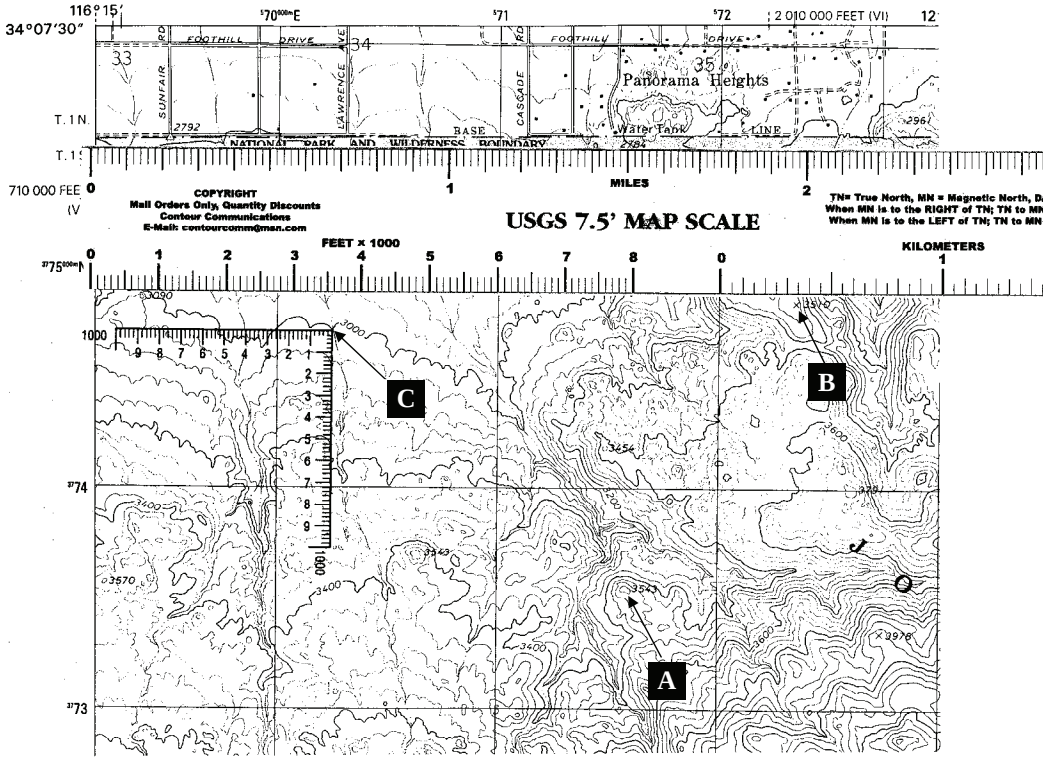


Figure 3-20. Map & UTM Rulers.

COMMON NAVIGATION ERRORS

Anyone who claims not to have made an error while navigating probably hasn't done much of it. Here are some common errors and clues for avoiding them:

- Descending the wrong side of the mountain. Many mountains are topped by a rocky outcrop (called the summit block), which can be difficult to climb. It's good practice to scout around the base of this block to find the safest route up. However, while circling the summit block you might become disoriented and forget which direction you came up the mountain. A quick check of the compass will steer you in the right heading for the descent.

- Taking the wrong gully down. Many mountain and desert peaks are climbed by following a gully or chute up to a ridge, then following the ridge to the summit. Going up is easy: You generally can see the peak, so navigating is not an issue. Going down is a very different matter, since all the gullies and chutes look the same; descending the wrong one may take you to the top of a cliff. When going up, note carefully which gully or chute you took; you may even want to mark it with a pile of rocks (known as a "duck"), but be sure to remove it on the way down.

- Getting lost. When traveling cross-country, you must continually count gullies, take bearings, check time and match terrain with the map to stay found. If at some point you are not 100% certain of your location, return to the closest point where you were 100% certain and proceed from there. This advice is difficult to follow, especially if the sun is setting and everyone is tired; however, pressing on will only make things worse. Turn back, and get found.

- Missing cars on the return. On many trips, participants park cars on a dirt road, then hike cross-country into the mountains. The problem comes on the return trip: Often the cars aren't visible; if they were visible in daylight, that wouldn't help if you're returning after sunset. Even if you walk far enough to find the road, you probably won't know which way to turn on the road to find the cars. The answer is to intentionally "offset" your return to one side, so that when you get to the road you will know which way to walk to get back to the cars (Figure 3-21). You can use the same technique to find a road or trail that ends. In these cases, do not try to hit the end point exactly; shift your course a bit to one side to prevent walking right past.

WHAT'S NEXT

Navigation proficiency requires constant practice. Once the course ends, you should consider participating in one of the many navigation outings offered by the Angeles Chapter's Leadership Training Committee.

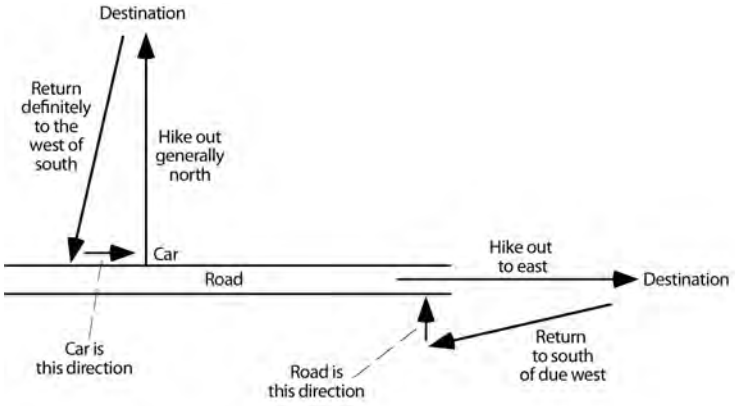


Figure 3-21. Using offsets to return to cars or road.

BEYOND THE COMPASS AND PAPER MAPS: GPS, ONLINE MAPS AND MOBILE NAVIGATION APPS

Everyone venturing into the wilderness needs to carry, and know how to use, a map and compass. However, modern GPS devices, whether a dedicated GPS unit or a phone app, have desirable features that account for their commonplace use on the trail today:

- They are extremely accurate; if properly calibrated, they can fix your location in forests and featureless terrain where you can't triangulate with your compass.
- They can point the direction and distance to places (waypoints). This is important, for example, when trying to decide whether to turn back from a peak attempt or when trying to find your car in the dark.
- They measure how fast you are moving, which is useful for estimating travel time.
- They can download maps and imagery, which will show your location among the terrain, trails, streams, peaks, etc.

As good as they are, using electronic GPS devices does have drawbacks:

- The devices rely on batteries, which need to be recharged or replaced.
- The devices can break and the electronics can fail, leaving you with only your map and compass.
- The device and batteries add additional weight.
- In narrow canyons and thick forests the GPS signal can be lost.
- They require additional training: If you don't know the software and interface, the device will not be much help and if you calibrate the device to the wrong datum, it'll give you the wrong location.

All told, a GPS device is not a substitute for navigation skills, but instead a powerful additional tool. Although accurate and convenient, you should never rely on a GPS device as your only source of navigation information.

ONLINE MAPS

Numerous online resources exist for trip planning, custom route creation and printing topo maps for hiking.

CalTopo (caltopo.com) is a useful and popular mapping site. Originally created for California search and rescue work, the CalTopo platform now covers the entire U.S. Its free-version has most needed features, but several paid levels add even more capabilities and data storage.

GPS ON YOUR PHONE

Though many experienced hikers still use a dedicated GPS handheld device (Garmin being the most common), many hikers have begun to use ever-improving phone-based apps. Today, a cellphone with a backcountry navigation app (and a knowledgeable user), can rival the best dedicated GPS unit.

When selecting a navigation app, the competition and their various features seem to be ever-changing. **Gaia GPS** (gaiagps.com) is a popular and full featured platform. It has both an online and mobile versions available, and like CalTopo, it has various pricing structures – from a free basic version to a full-featured paid version. To download and use maps offline with Gaia, the paid version is needed.

Available layered maps and imagery add another valuable feature to GPS navigation in the field. By downloading both topo maps and satellite imagery, the user can toggle between layers while in the field and can literally see the features around them on both the topo map and satellite image.

All these GPS features and capabilities are incredibly useful. Including GPS as part of your navigation toolkit is rapidly becoming standard for the backcountry user.

ALTIMETERS

Altimeters are instruments that measure elevation above mean sea level. They can be used to help:

- Determine location. If you know approximately where you are on a trail, ridge or gully, knowing the elevation will pinpoint your location on a topo map. Elevation also helps determine location more precisely when triangulating.
- Estimating speed of ascent or descent. Periodically checking an altimeter while going up or down a mountain can aid in time estimates.
- Plan breaks. If you've been climbing steadily for an hour and still have 500 feet to reach the summit, you should take a break. However, if you've only got 100 feet, press on!

Several types of altimeters exist, including mechanical devices and electronic ones incorporated into wrist watches and weather instruments. Altimeters work by measuring the weight (barometric pressure) of air, which decreases at a predictable rate with gain in elevation. Altimeters are thus barometers calibrated to measure elevation above mean sea level. But since they rely on values of atmospheric pressure, altimeters are subject to the same variations that cause fluctuations in a stationary barometer: the "highs" and "lows" of passing weather systems and changes in temperature. Because of these variables, altimeters need to be adjusted frequently at known elevation sites.

Of course, a GPS device also can fix your elevation. However, measures of elevation usually are less accurate than measures of position, since more satellites are needed to fix altitude. These days most WTC instructors use some type of altimeter, most typically a wristwatch, when hiking.

FURTHER READING

Wilderness Navigation: Finding Your Way Using Map, Compass, Altimeter & GPS. By Bob Burns and Mike Burns. The Mountaineers Books, Seattle, Wash. (3rd edition 2015).

Land Navigation Handbook: The Sierra Club Guide to Map, Compass & GPS. By W.S. Kals and Clyde Soles. Sierra Club Books, San Francisco, Ca. (2nd edition 2005).

Staying Found: The Complete Map and Compass Handbook. By June Fleming. The Mountaineers Books, Seattle, Wash. (2001).

The Essential Wilderness Navigator: How to Find Your Way In the Great Outdoors. By David Seidman with Paul Cleveland. Ragged Mountain Press, Camden, Maine (2nd edition 2001).

NOLS Wilderness Navigation. By Gene Trantham and Darren Wells. Stackpole Books, Lanham, Md. (2019).

NOLS Wilderness Navigation. By Darren Wells. Stackpole Books, Mechanicsburg, Pa. (2005).

HOMEWORK A (TO BE COMPLETED BEFORE CLASS 4)

GENERAL: The following homework problems will help you get a head start on the Map & Compass exercises at Joshua Tree. To do these problems, you will need an Indian Cove 7.5-minute quadrangle map with N-S lines drawn, recommended type of compass and a pencil.

MAP BASICS

1. What is the UTM coordinate for Peak 5405 near Quail Mountain in the SW quadrant of the map?

2. The UTM coordinate for Peak 4377 (unmarked on the map) is NAD27 Zone 11 $^{5}75^{770}$E $^{37}72^{400}$N. Mark the peak on your map.

3. Draw the symbols for the following features: county boundary, school, orchard, bridge on a trail, mine entrance, railroad line, unimproved road.

4. In Figure 3-7a on page 3-7, draw in the gullies. Draw the ridges in Figure 3-7b.

5. How long will it take to hike 7 miles with 2,000 feet total gain
   (a) with a daypack and (b) with a backpack?

FINDING YOUR LOCATION BY INTERSECTION OF ONE COMPASS BEARING WITH A KNOWN LINE OF TRAVEL

Draw the bearing on your map to find your location.

6. You are hiking on the trail from Section 32 at the north edge of the map, to elevation 4142 near the middle of the map. Draw these bearings to locate your position on the trail along the way:
   (a) 270° is your bearing to Hill 3237.
   (b) 219° is your bearing to Hill 4627, Section 23.
   (c) 44° is your bearing to Hill 4544, above the word TREE in the middle of the map.

7. You are walking a straight line following a bearing across the desert from Test Well 4176 in Section 8 to Desert Queen well in Section 3.
   (a) What is the bearing you are following? Draw it on your map and label its bearing.
   (b) While on this course of travel you take a bearing on Hill 4952, to your south, which turns out to be 169°. Where are you? Indicate the point on the map.

ROUTE FINDING

8. You are at spot elevation 3334 at the road's end in Indian Cove Campground. You want to hike to Peak 4377 (Q.2 above), which is about 0.7 mile SW of your location.
   (a) Study the map carefully, and decide on the route you propose to take. Draw in the route on the map, then write a description. Pay particular attention to justifying each segment of the route.
   (b) Prepare a trip leg table. Estimate time to complete the trip, based on the Naismith Rule; you can add in break times and squiggle factors if you choose.

HOMEWORK B (TO BE COMPLETED BEFORE CLASS 5)

FINDING YOUR LOCATION BY THE INTERSECTION OF TWO COMPASS BEARINGS

Draw the bearings on your map to determine your location.

1. 238° is your bearing to Test Well 4176 in Section 8.
   298° is your bearing to permanent horizontal control marker Cinch in Section 8.

2. 184° is your bearing to the windmill in Section 7.
   99° is your bearing to vertical control tablet mark 4106 in Section 6.

3. 170° is your bearing to recoverable mark 4469 in Section 1.
   263° is your bearing to the section corner bench mark 3788 in the SE corner of Section 27.

SITUATIONS WHERE A COMPASS CAN BE USEFUL

4. You have just come out of Johnny Lang Canyon (SW corner of map) and you are now standing on Road Elevation 3812. You've misjudged your time, and it's now dark. What course of travel bearing should you follow to get back to your camels, browsing next to BM 3922, Section 25?

5. Leaving from Section 34 at the north edge of the map, you want to follow the canyon west of the word BASE and east of Lawrence Ave. to the SE to Peak 4314. At an altimeter reading of 3,400 feet, you take a bearing up the canyon and it turns out to be 89°.
   (a) Are you still in the right canyon?
   (b) If not, which one are you in?
   (c) What is the bearing upslope of the canyon you want to be in?
   (d) What are you going to do now? Why?

LANDMARK VERIFICATION

6. You have just parked your Jeep at the intersection of the trail and dirt road just NW of Hill 4602, located west of the "Wonderland of Rocks." You think you have identified Hill 4483 (Keys), north of U and A in JOSHUA, but you want to make sure. You take a bearing on this landform which turns out to be 319°.
   (a) Have you correctly identified the landform?
   (b) You change your mind and decide the landform you took the bearing on is actually Hill 4389. Are you right?

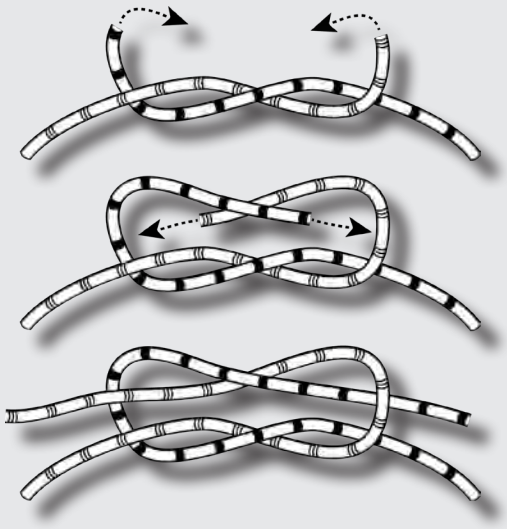
7. You're traveling east on Quail Springs Road from the west edge of the map. You take some bearings to Hill 4695 in Section 35 to track your progress.
   (a)Your bearing is 151°. Where are you?
   (b) Your bearing is 211°. Where are you?
   (c) Your bearing is 249°. Where are you?

KNOT OF THE WEEK
SQUARE KNOT

The Square Knot is a simple bend that is easy to untie. However, it can capsize if an end is pulled either on purpose, which makes it easy to untie, or accidentally, which makes it unsuitable for critical loads.

A Square Knot is formed by tying a left-handed overhand knot and then a right-handed overhand knot, or vice versa. A common mnemonic for this procedure is “right over left; left over right”, which is often followed with “...makes a knot both tidy and tight”. The ends, or “tails,” of the Square Knot must emerge both at the top or both at the bottom. The tails should also lie parallel to the standing ends. If they stick out perpendicular to the standing ends then the knot is the inferior “granny knot.”

SQUARE KNOT



Rock scrambling, Indian Cove | Homer Tom

CHAPTER 4
MOUNTAIN TRAVEL

Mountain climbing is the classic form of wilderness travel. It requires overcoming obstacles safely and efficiently, allowing you to follow your schedule without wasted effort. Many of the techniques apply to other destinations in the wilderness, but this chapter will look at mountain climbing – whether in the Sierra or the desert – as the representative goal.

First you have to get there...

DRIVING

Wilderness trailheads are usually reached by driving over remote, winding and sometimes unpaved roads. Road conditions may require special gear, like snow chains or even 4WD vehicles. Emergency equipment, including a blanket, first aid kit, shovel, tools, extra water and clothes should be carried routinely. Vehicles should be properly maintained, with fluids full. Departure time should be early enough to be able to deal with delays. Carpooling and caravanning provide support to drivers and vehicles so that everyone arrives safely at the trailhead at the intended time.

Ice and snow on roads are special hazards. "Black ice" is a transparent layer of ice over pavement that can be hard to see. Drivers who encounter ice should avoid sudden changes in speed or direction. If the car begins to skid, steer into the skid before gradually bringing the wheel back to the intended direction.

Desert trips can involve unmarked, rarely maintained roads. It may be hard to distinguish the intended route from side roads or washes. If deep sand is encountered, the driver should maintain speed to get across.

Drivers must also be alert for hazards such as rockfall, washouts or animal crossings.

- Stay with your vehicle if you become stranded unless you know how to reach help.
- During sustained descents, shift the transmission, whether manual or automatic, into low gear to prevent the brakes from overheating.

TRAILHEAD

Parking lots and trailheads are sometimes the least accurate places on a map. To avoid delays at the start of a trip, scout the trailhead, or talk to someone who has been there recently. Some trailheads are so popular or remote that cars have to be parked a distance away. Secure the car key, and give a spare to another member of your group, if possible.

Before leaving the trailhead, locate yourself on the map and note the time. Set your GPS and altimeter, if carried. Junctions around trailheads can be complicated, so it is important to look back frequently during the first stretch of the hike. A photograph taken of the junction or soon after can help to remind you on the return.

See Ch. 10 for more information on parking at trailheads in bear and marmot country.

GROUP TRAVEL

Group travel is the safest and easiest mode of wilderness travel, with the advantage of shared gear along with safety in numbers. Travelling with a group also brings individual responsibilities. Members of a group should not wander off without telling others. They should

keep up with the group pace, look back to make sure the group stays together, and help other members when needed.

Groups generally have at least one designated leader whose guidance should be respected unless there is consensus otherwise. Everyone should have a clear idea of the group's plan and agree with the group's goal. Clear communication is always important, especially when changing a plan. Every group should have a "sweep," a designated person at the back who keeps the group together.

If you need to stop suddenly, try to pull off the trail, or at least raise a hand to warn anyone following closely behind you. If you need to answer "nature's call" behind a bush or boulder, also known as a "split break", leave your pack on the trail to alert others to your absence.

- One slow hiker can cause the whole group to miss the goal. Make every effort to keep up with your group. There may be some problem, like excess weight or badly fitted equipment that you can fix.
- If you find yourself struggling to keep up then make sure you are ready to hike as soon as breaks are over and even start at the front of the line so you can fall back as you go.
- If it is still too difficult, then a decision may have to be made whether to continue, turn back, or wait in place until the group returns.

SOLO TRAVEL

Solo travel is far more dangerous than group travel. Solo travellers must be vigilant at all times. There is no group to fall back on if equipment fails or is forgotten, no companion to challenge navigational mistakes or look back to see approaching storm clouds. In case of accident, rescue may be difficult or impossible unless a detailed itinerary has been left with a responsible person. Despite the dangers, solo travel is popular due to its convenience, sense of solitude, and feeling of accomplishment. The standard advice is that no one should ever hike or climb alone.

PACE, BREATHING AND BREAKS

Mountain climbers have to balance their energy output with their schedules. A gradual start will help warm up muscles without the anaerobic exertion that leads to premature exhaustion. Relevant discussions can be found in Ch. 1 (Conditioning), Ch. 8 (Food and Nutrition) and Ch. 9 (Mountain Safety).

Stride, the distance between steps, can be varied depending on the slope.

- On flat ground: take long strides to cover ground quickly.
- Uphill: shorten your stride, sometimes significantly, to make the best use of your legs without overexertion.
- Downhill: you can go faster if you lean forward.

For use of trekking poles, see Ch. 2, page 2-6.

Breathing: Exertion and high altitude can leave hikers breathless. Avoiding unnecessary chatter is one way to conserve breath. Panting is the least efficient way to breathe. Make a conscious effort to breathe deeply. One way is to coordinate breaths with steps (e.g. inhale and exhale for two steps each). Another is the "**Whittaker wheeze"** also called "alpine breathing", which is done by breathing in deeply then exhaling slowly through pursed lips.

In extreme situations, climbers may use the **rest step**, a technique that is performed while either traversing or directly climbing a steep slope. The climber stops in the balanced position (downhill leg locked and uphill leg forward and bent), and rests on the locked leg. The rest may last for a single inhalation or for several breaths.

Breaks are an important part of climbing. Deciding on the right place and time for a break is typically one of the leader's responsibilities. At least five minutes is a good duration for a common stop. Longer breaks make it harder to get started again. Make good use of the time by resting, drinking, eating, adjusting boots and clothing, and navigating. Be ready to hike when the break is over to avoid splitting or delaying the group. Always look back to make sure that you are not leaving anything – or anyone – behind.

MOUNTAIN TERRAIN

Scree, talus, and boulders are all forms of loose rock.

Scree is comparable to gravel, including everything larger than sand particles and smaller than baseballs. Scree slopes can be very tiring to climb. Take steady steps instead of thrashing through it. Sand and scree covering smooth rocks can be like ballbearings underfoot – take care and lean forward to keep your feet from sliding out from under you.

Talus is rock that is larger than a baseball but smaller than a boulder. Talus can form small precariously balanced piles that can move unpredictably. Disturbing one rock can release a cascade. Step on the uphill side of rocks where possible.

Boulders are loose rocks as large as a footstool or as big as a house. In some cases they are delicately balanced and will start moving with a mere touch. Boulder hopping should be done smoothly without unnecessary drops or climbs. Trekking poles are useful with scree and talus but they may be dangerous distractions while boulder hopping because it can be hard to find proper placements.

Additional considerations

Snow may be encountered as soft or as hard and can occur on trail as well as off trail. Depending on the year, snow may occur early in the fall and may persist well into summer. Generally, snow on low angle terrain can be managed without specialized equipment and training. Although, hard, icy snow on low angle terrain can be difficult to cross. Snow on terrain that is not low angle should be carefully assessed before ascending or descending through it. Snow consistency often changes day to day and hour to hour. Traveling on snow is discussed in Ch. 6.

Streams of all sizes can present obstacles and hazards, some of which are discussed in Ch.9. Researching stream conditions and crossings before you leave can save time on the trip

CLIMB RATINGS

In the 1930s, the Sierra Club created a system to rate the difficulty of an outing based on the hardest part of the trip, the so-called "crux," rather than on distance and altitude gain. This system became the basis of the "Yosemite Decimal System," (YDS) that is used in rock climbing today.

Class 1 – Walking: usually a trail or easy cross-country. Hands are not needed for balance.

Class 2 – Easy scrambling: occasional use of the hands, mostly for balance. Rough terrain, frequently steep.

Class 3 – Easy climbing, scrambling: many moves require use of hands, although a fall will probably not be fatal. A rope should be available in case of an emergency.

Class 4 – Moderate climbing: exposed, with a rope essential for safety. Unprotected falls are probably fatal. Moves are usually not difficult, but consequences of an error are bad.

Class 5 – Difficult climbing, on rock: very exposed, most often using ropes and anchors to protect the climber. Decimals are generally added to indicate the degree of physical/technical difficulty with the easiest as 5.0, ranging upward, e.g. 5.6, 5.7, etc.

Class 6 – Artificial aid required: the climber stands in slings fastened to small hooks, or pitons, etc. Also classified as "A" (for aid).

TRAVELING IN MOUNTAIN TERRAIN

Class 1 – Traveling on Trail

The approach to a peak will usually begin on trail. Use this part to hike efficiently, saving energy for the more difficult stretches ahead. Stay on the trail. Don't create side-trails or cut switchbacks. Avoid weakening water barriers in the trail, which are built to divert running water off the trail – step over them.

Pack teams (mules and horses) and uphill hikers have the right of way. Step to the side at the first opportunity. Trails used frequently by pack animals can be so dusty that hikers may want to bring some protection. This is where your WTC bandanna may come in handy!

Class 2 - Off -Trail Travel

Class 2 encompasses various types of terrain with many possible obstacles including vegetation and rocks. Boulder hopping and hiking on steeper granite slabs are Class 2, whereas climbing boulders may be Class 3. Learn the distinction so that you are prepared and can avoid getting into an uncomfortable siuation. This takes route-finding skills that come with practice.

Brush, especially chaparral, can be very difficult to hike through and is best avoided by detouring around it. Meadows and thinly covered areas deserve special care to avoid trampling delicate or rare plants. Groups should spread out to avoid creating unintended trails.

Desert plains are sometimes covered in a thin crust known as "*Cryptobiotic soil*" which reduces evaporation loss. It takes decades to develop and so you should make every effort to avoid breaking it. Washes, without delicate vegetation or soil, can make good routes. Avoid them when there is any chance that rain is falling in the drainage as they can be subject to flash flooding.

Many plants have chemical irritants or thorns. Poison Oak is common in shady or damp areas. Noxious Poodledog Bush grows on recently burned mountainsides. In the desert, varieties of cactus require care when hiking nearby. Tweezers can remove individual cactus spines. Clumps of cholla are best removed with a comb, fork, or pliers.

Streams of all sizes can present obstacles and hazards, some of which are discussed in Ch.9. Researching stream conditions and crossings before you leave can save time on the trip.

Class 3 - Rock Scrambling

Class 3 is the highest level of terrain we cover in WTC.

Many climbs involve scrambling on steep rocky terrain or outcrops where hands may be needed. Scrambling employs many of the techniques used on more difficult terrain, but it does not include routes with exposure to severe falls. It does not require ropes except in emergencies. Rock scrambling is a fun activity if the climber can overcome a fear of heights.

"Climb with your eyes" is a climber's axiom, meaning: plan your moves before making them and try not to grope for holds. Test each hold before committing to it; even solid-looking rock can crumble. If the hold is questionable, then it is safer to push down rather than pull on it.

Maintain three points of contact by moving only one hand or foot at a time while keeping the others secure. Use your legs for lifting and your arms for balance. Keep your weight centered over your feet. Many footholds are not secure until you commit to them. Try to make each placement precise so you don't have to slide or twist your foot. When climbing onto a ledge do not use your knees as points of contact because you can become trapped.

Downclimbing can be much harder than climbing up. Do not climb up anything you cannot climb down. On the way up, look back to memorize the route and note any holds that

may be hard to spot on the way down. Climbs with higher ratings than Class 3 require the use of ropes and other special equipment due to the greater danger of fatal falls.

It is vital that you learn to recognize the distinction between 3rd and 4th Class or higher. "Exposure" refers to the presence of a sheer drop below you. If it looks like you could fall a significant distance then you may be on 4th class or higher terrain and you should move back onto lower angle rock immediately and carefully.

CLOTHING AND GEAR

Footwear: ordinary boots are usually sufficient, though some may be too stiff or too soft for certain moves. They should fit snugly enough so that your feet do not move around inside them. Check with your instructor to make sure your boots will be appropriate for Joshua Tree outing.

Fingerless gloves (optional) provide protection from cold or sharp rocks while still allowing you to grip the rock with your fingertips.

Helmets will be supplied by WTC for the Joshua tree rock scrambling day. They offer protection, especially if there is risk of rockfall.

Pants should be sufficiently loose in the knees and seat to allow you to make very high steps.

CLIMBING RULES – QUICK LIST

- **Test each hold** before trusting it.
- Maintain **three points of contact.**
- **"Climb with your eyes."** Plan the holds and the route.
- **Be smooth and deliberate**, and you will not strain holds or yourself.
- Don't get on your knees (on a ledge, you could be trapped).
- If you dislodge a rock (water bottle or camera, etc.), yell **"ROCK!"** for those below.

Gear: stow your trekking poles and make sure that nothing is dangling off of your pack. Remove any jewelry, which could get caught or scratched. Remember: always carry your 10 Essentials.

SUMMITS

Historical note: most California summit registers have been placed by Sierra Club climbing sections.

The summit is the climax of the climb. Some summits form a sharp point that may be the most technically difficult part of a climb. Reaching a summit is often celebrated with a long break. In addition to resting, climbers may eat, dry their socks, identify landmarks, and sign the register.

Mountains in California often have summit registers tucked inside small waterproof containers. Their original position and placement should be noted so they can be returned properly. Signing a register makes the successful climb seem official, and reading old entries can be fun and informative. It is customary for the leaders to sign first. Most entries indicate the group name, if any, the date, and the names of the climbers, and sometimes their hometowns. Fill up each page before starting a fresh one. Comments on the conditions or route are appropriate. Anything unrelated to the peak or the climb should be kept very brief. After everyone has signed, the container should be sealed and secured.

DESCENTS

A bit of old mountaineering wisdom:

"Most accidents occur on the descent."

The descent from a peak has special hazards of its own. Take extra care to avoid dislodging rocks, trampling plants or torqueing your feet. Tighten your bootlaces to give better traction and minimize blister formation. Take breaks even while descending, too. You still need to eat and drink, to adjust boots, and to navigate.

When descending 3rd class rock you may have a choice of facing in, which is most secure but slowest; facing out, which is fastest; or facing sideways, which offers reasonable security and speed. Because of the difficulty in seeing footholds, climbers below you should try to provide guidance for those above, known as "beta," for others coming down. While descending slabs, lean forward and walk with bent knees. Use special care on any surface that could be slick.

When not on rock, you may want to use your trekking poles. You may lengthen the poles and keep them in front of you to give you stability and ease the strain on your knees when descending steep terrain.

NIGHT HIKING

It is occasionally necessary or desirable to travel at night. It may be a conscious decision, or the result of a climb that took longer than expected.

Beginning a climb before dawn makes full use of the daylight. The so-called **"Alpine Start"** is commonly used when there is a threat of afternoon thunderstorms or to avoid the dangers of warming snow. See Ch. 6 for more on Alpine Starts.

Cross-country travel and navigation can be difficult after dark. A good practice is to try to get back on trail before twilight. When traveling in the dark, it is especially important to avoid errors in navigation. Mistakes are easier to make and harder to correct.

"Night vision" refers to the ability of the eyes to adapt to lower light levels. Full adaptation takes about one hour, with much of the benefit coming in the first ten minutes. Rods, the optical receptors most sensitive to low light, are not present at the center of focus. For that and other reasons, it is best to keep the eyes moving around the point of interest rather than staring directly at it. Night vision is harmed by smoking and by vitamin A deficiency.

Night vision can be temporarily lost when your eyes are exposed to unshielded lights. For that reason, try not to shine a light at anyone's face. Look away or close one eye if you see anyone about to point a light at you. Colored lights, such as red or green, can help protect your night vision. A light can be aimed down in front of you or held in your hand with only slits of light visible through your fingers.

Trails can sometimes be easier to follow without a light than with one. Flashlights create tunnel vision limited to a few dozen yards at most, while using night vision can provide a wider and deeper picture. It is possible to travel in open country by starlight alone. A full or nearly full moon can provide significant light.

On clear nights the shadows cast may appear extremely dark and so a light should still be available. Clouds can help reflect or diffuse moonlight into shadows, making night travel easier. As you hike, lift your feet more than usual to prevent tripping. Nocturnal wildlife will be active at night and should be avoided.

Some form of lighting is one of the 10 Essentials. Headlamps are popular because they leave the hands free. A major disadvantage is that placing the light near eye level minimizes the shadows which give depth perception that shows the terrain. Holding the light in the hand at waist level makes it much easier to see obstacles.

Darkness, weather or injury can force an unexpected stay in the wilderness, known as a **"bivouac,"** a temporary shelter. Stop and wait for daylight or rescue whenever you cannot navigate or travel. The bare minimum equipment required to survive a night in the open should be carried as part of the 10 Essentials. This is when "extra clothing" comes in handy, as does the pack itself. Fear of a bivouac should not lead a hiker or climber to carry excessive equipment as the weight could slow the group. There is an adage, *"If you prepare for a bivouac then you'll never need one."*

RETURNING HOME

The drive home can be the most dangerous part of a trip. If you are tired, consider napping or getting coffee, and if you are a passenger help the driver stay alert.

Once home, remove perishable food from your pack and spread out any equipment that could have gotten even slightly damp. Nothing is worse than a mildewy, smelly tent. Brush off any mud from your boots to prevent it from drying out the leather. Preserve your gear for the next adventure.

Finally, share your photos and GPS tracks. Consider posting trip reports to aid future climbers.

See next page for Basic Rick Scrambling Techniques

ADDITIONAL TRAINING

WTC provides only an introduction to the intricate world of rock climbing. A student should never go climbing on his or her own with only this basic level of knowledge. There are several alternatives for additional practice with competent instructors and leaders:

- Commercial – Numerous, including Yosemite Mountaineering School, Outward Bound, National Outdoor Leadership School (NOLS), Vertical Adventures, etc.
- Volunteer – Southern California Mountaineering Association (SCMA) rock climbing class. Sierra Club Angeles Chapter opportunities: Sierra Peaks Section (SPS) practice climbs, Leadership Training Committee (LTC) checkouts – November through April (prior experience required). Advanced Mountaineering (AMP) course sponsored by LTC and WTC, offered twice a year.

Ask your group leaders for more information.

BASIC ROCK SCRAMBLING TECHNIQUES

Legs can hold much more weight than the arms, and for longer, too. Learn how to stand straight over footholds for better grip and to rest when you can. Note that the side of the foot is less tiring to stand on than the toe.

The techniques used for 3rd Class rock scrambling are a subset of those used for 5th Class rock climbing. The holds are easier to see and easier to use. The use of handholds is the boundary between walking or boulder hopping and scrambling.

Here is a selection of holds and moves:

FOOT HOLDS

Edging is performed with the side of the foot, usually the inside edge at the ball. Keep your weight balanced over the hold. Lowering your heel will save energy. Edging is easiest with stiff-soled boots.

Smearing requires pressing the toe onto a hold to force as much contact between rock and rubber as possible. It can also be done on slabs where there are no obvious holds. Avoid leaning in to the rock, as that will tend to make your feet slide out from under you. Smearing is best done with soft-soled footwear.

Jamming is a form of crack climbing where the foot is placed into a crack so that a secure hold is created when you put your weight on it. Avoid putting your foot too deeply into a crack, as it may be hard to get it free again.

SELECTED HANDHOLDS

Open grip is used for large holds. Place your entire hand on the hold, maximizing contact.

Cling grip uses mostly the fingertips for smaller holds

Hook grip is used when the hand is curved into a hook to go over a rock edge

MOVES

Mantling (or mantelling) involves bringing your feet up to a ledge where your hands are. Lay your hands flat on the ledge, push yourself up, and then bend a knee enough to bring a foot onto the ledge. Try not to rest on your knees, as they can become injured and because you can get stuck in a clumsy position.

Counterforce moves create secure positions through opposing forces.

Undercling holds use downward pointing rock edges. Grip them as if to lift the rock – security is created by the force between your feet and hands.

Laybacking (or liebacking) is a strenuous technique in which your hands grasp a rock edge while your feet press against the rock. The position is more secure the closer your feet are to your hands. You move by shuffling your hands and feet.

Stemming (or bridging) is done with your feet and or hands pushing against rock surfaces that face each other.

Chimneying techniques vary with the width of the gap. Wide chimneys are climbed with your back pressed against one wall while your feet press against the opposite wall. Use your hands placed Flat against the rock near your back for stability. Place one foot below your butt and use it to raise your torso, then switch feet on the opposing wall before repeating. Keep your pack out of the way by carrying it over your chest, by suspending it below you, or by lifting it separately by rope. Exiting a chimney can be tricky; you may need to push off the rock at your back to reach for a hold above your feet.

FURTHER READING

Mountaincraft and Leadership. By Eric Langmuir, published jointly by Mountain Leadership Training, England and Mountain Leadership Training Scotland.

(This is the British equivalent of Mountaineering: Freedom of the Hills, a comprehensive guide to mountain travel. While focused on conditions in the British Isles, most of its contents are generally applicable.)

How to Rock Climb! By John Long. Falcon. A classic book to help further your interest in climbing.

The High Sierra, Peaks, Passes, and Trails. By Secor, R. J. Mountaineers Books. (May 1999).

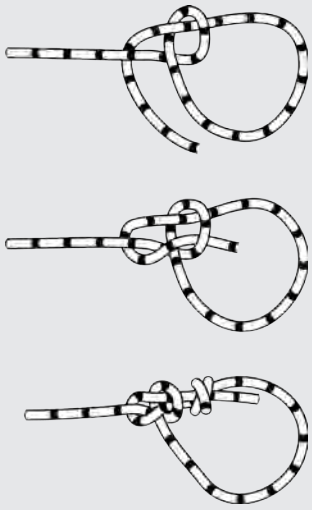
Close Ups of the High Sierra. By Norman Clyde.

KNOT OF THE WEEK
THE BOWLINE

The Bowline is another useful knot for securing a rope around an object such as a tree. It is easy to untie and therefore should always be completed with a 'finishing knot' as shown.

The Bowline is often taught using the famous 'rabbit' story. Make a small loop (the 'hole') in the rope with enough of the working end past it to form the main loop and the rest of the knot. The standing end of the rope is the 'tree'. The 'rabbit' (working end of the rope) comes out of the hole, goes around the tree, and comes back down into the hole. Cinch the knot tight and tie a finishing knot.

THE BOWLINE



Campsite, Long Lake | Edd Ruskowitz

CHAPTER 5
WILDERNESS ETHICS

How often do students visit the wilderness during the ten-week WTC course? It might surprise you to learn the answer is perhaps once, during Snow Camp, or not at all. You'll see why in this chapter.

WHAT IS WILDERNESS?

"Wilderness" means different things to different people. Early settlers regarded the wilderness as a threatening, inhuman place. This fear of wild places, along with the pioneers' drive to tame and civilize the land, led to a dramatic reduction of wilderness areas in North America over the centuries that followed. Today, just 2.7% of the contiguous United States is protected as wilderness, an area about the size of Minnesota.

As wilderness grew scarcer, appreciation for the beauty and ecological diversity of wild areas gradually became more widespread, thanks in part to early conservationists and writers, Sierra Club founder John Muir among them. Wilderness also came to be seen as a place where the human spirit could be renewed, a place to step outside the web of responsibilities, regulations and technology we experience in our everyday lives

For many people, "wilderness" means a place that is undeveloped and unspoiled, where the impact of humans on nature is little or none ("untrammelled by man"). For others, the wilderness is a place where they can experience freedom, go where they want to go and do what they want to do.

There's potential for conflict here. How can we visit the wilderness and enjoy the freedom it offers without harming the very thing we came to experience? This question lies at the heart of wilderness ethics, or the standards, principles and best practices of traveling in the wilderness.

GROUP SIZE, PERMITS, CROWDS

The chance to "get away from other people," is a great part of the appeal of visiting the wilderness. Most visitors to the wilderness prefer to travel in small groups, and to see relatively few people during their trip. Human beings are social creatures, however. Like the stranger who sits next to you in an otherwise empty movie theater, tents tend to cluster together near the shore of a wilderness lake.

The National Forest Service, National Park Service and other land managers commonly require hikers to obtain permits for overnight trips into the backcountry and day hikes on especially popular trails, as well as activities with specific costs or risks, such as building a campfire. Wilderness permits typically limit group size to a maximum of anywhere from 8 to 12 people (one reason why WTC class outings typically don't enter the wilderness.) Many trailheads also have a quota in force, limiting the total number of people who can enter a wilderness area on a given day.

It's hard not to have a love-hate relationship with permits and quotas. On the one hand, they limit how many people you'll encounter during a trip. It would be difficult to have an authentic wilderness experience if an unlimited number of people were able to hike on the same trail, and camp in the same valley, at the same time. On the other hand, permits force you to commit to dates for your trip – often paying a fee – long before you know what conditions will be like on those dates. And there's always the possibility

you won't be able to secure a permit at all. The number of people applying for permits to hike the Mount Whitney Trail or Half Dome is so great permits are given out through a lottery system. See more on summer trips in Chapter 10.

One trick for avoiding the crowds – and perhaps also permits and quotas – is to visit in the shoulder season or off-season. A destination that receives thousands of visitors each day in the summer may be all but deserted in winter. Another strategy is to be creative in your goals and trip planning. Hiking the Mount Whitney Trail is a goal for many WTC students, along with 20,000 other people each year. But there are other routes up Whitney, and other magnificent 14,000ft Sierra peaks to climb, which see a much smaller number of visitors. The more skilled and confident you become in wilderness travel, the greater your ability to enjoy the wilderness during the off-season, or to step safely off the crowded trail into an unspoiled backcountry few visitors get to experience.

PLANNING AND PREPARATION

Successfully minimizing your impact on the wilderness is yet another part of wilderness travel that begins with proper planning and preparation at home.

Repackaging food before a trip not only lightens your pack; it also minimizes the chances packaging scraps will be left behind as litter. Choosing to carry a stove means building a campfire – whether it's convenient to do so at your campsite or not – isn't necessary for cooking. Taking an odor-proof, re-sealable plastic bag lets you pack out used toilet paper. When traveling in particularly sensitive areas, a "wag bag" or "poop tube" allows you to pack out human waste as well.

Buying clothing, tents and other gear in natural colors, as opposed to the eye-catching and thus obtrusive palette of many outdoor products, allows you to blend into the landscape and avoid alerting other groups to your presence from miles away. A brightly colored shell jacket for alpine climbing or travel in remote areas could help to draw the eye of a rescue party. For routine hiking in the local mountains, however, a neutral color is more appropriate.

Planning an appropriate route is equally important. Overestimating your group's stamina can leave people too tired to reach a designated campsite, forcing the group to camp on more fragile terrain. As exhaustion or even fear set in, backcountry travelers are less able and less inclined to care about protecting the wilderness, for example becoming more prone to cutting switchbacks or trample plants in their efforts to conserve what energy they have left. One of the most damaging things that you can do to the wilderness is to be rescued from it, with all the people, equipment and procedures involved in an emergency situation.

ON TRAIL AND OFF TRAIL

When traveling on trail and camping in developed campsites, a basic goal is to concentrate impact in areas that have already been impacted. If you encounter a muddy puddle in the middle of a narrow trail, for example, the least impactful approach is to walk through the puddle, rather than skirting around it and eroding and widening the sides of the trail. Robust footwear certainly helps.

When traveling cross-country, on the other hand, the goal is to minimize impact on largely pristine areas. A group of hikers should spread out as they travel, so as to minimize their impact on any one spot. (WTC groups often use this technique travelling off-trail during their weekend in Joshua Tree National Park.) Especially fragile areas, such as stream banks, may be damaged by the passing of just a few people, e.g. a small group tramping vegetation as they collect water from the same spot during an overnight stay.

SPECIAL CONSIDERATIONS FOR DESERT ENVIRONMENTS

In arid desert climates, vegetation grows slowly, and recovers slowly from impact. Water is especially precious here, both to other hikers and desert creatures. Even if there seems to be no fragile vegetation next to water in the desert, camp at a distance of at least 200 feet to avoid scaring away wildlife relying on that water source, and to avoid contaminating the water with food scraps and human waste.

When disposing of human waste, burial in a cat hole is considered the best method. Desert soil contains few microorganisms and has little aeration, however, so digging a cat hole more than a few inches deep actually preserves solid waste. The sun is the primary driver of decomposition here, and can eventually sterilize feces buried a few inches beneath the surface – deep enough not to be uncovered easily, but not so deep as to be out of reach of the sun's heat. Try to choose a location with plenty of sun exposure, such as south-facing slopes or ridge tops.

When traveling off-trail, spread out to minimize the impact the group's footsteps have in the terrain. A particularly fragile aspect of desert ecology is cryptobiotic soil crust, a mat of microorganisms on the surface that can withstand the harsh conditions, but may take more than a century to recover from the damage caused by a hiker's boot. Bare sand, slickrock and the bottom of dry washes are durable surfaces on which to camp and cook. (Avoid washes if there is any risk of flash flooding, though.)

The deserts of the Southwest harbor ancient rock art and ruins, tragically prone to theft, vandalism or simply mishandling by curious visitors. If you stumble across a site, don't assume it's been documented or catalogued by archaeologists. Explore with extreme care to avoid depriving later visitors of important information about the site, and avoid touching rock art as the oils on your skin can hasten wear on the pigment can strain or wear away the designs.

SPECIAL CONSIDERATIONS FOR SNOW CAMPING

Minimizing your impact also applies in a winter setting. Wildlife may be stressed by adverse environmental conditions and hunger, so camp away from their sources of food and water if possible. Don't give in to the temptation to feed hungry-looking wildlife, as this may alter their behavior patterns and expose them to other dangers.

Snow is a wonderfully durable surface on which to travel and camp, but vegetation under a thin or thawing layer of snow is especially vulnerable, as are snow-free soils saturated with melt water. Tread especially carefully when transitioning from snow to snow-free ground.

Cold conditions and weak sunlight slow the breakdown of human waste, and packing it out is the best option (fortunately, frozen feces is relatively odorless). If you must bury it, choose a site away from drainages, and cover unsightly yellow stains with fresh snow. Tree wells may provide the easiest access to soil. If you are melting snow for water, mark an area of clean snow on the perimeter of camp to avoid accidentally contaminating snow that will be used to make water.

While signs of a snow camp will eventually melt away, be sure to destroy or cover any temporary structures – snow tables, trenches, igloos, avalanche pits – that could be a source of danger or visual blight for other visitors who may follow.

LEAVE NO TRACE (LNT)

The **Leave No Trace Center for Outdoor Ethics** is dedicated to teaching people about good stewardship of the environment and has established the "Seven Principles of Leave No Trace." The LNT Center and the Sierra Club advocate for these best practices that allow us to explore and enjoy the outdoors while we take care to protect the environment. Whenever you head outdoors, use and apply these principles. Be aware of your own impact. See the next page and learn more at *LNT.org*.

THE SEVEN PRINCIPLES OF LEAVE NO TRACE

Plan Ahead and Prepare

- Know the regulations and special concerns for the area you'll visit.
- Prepare for extreme weather, hazards, and emergencies.
- Schedule your trip to avoid times of high use.
- Visit in small groups when possible. Consider splitting larger groups into smaller groups.
- Repackage food to minimize waste.
- Use a map and compass to eliminate the use of marking paint, rock cairns or flagging.

Travel and Camp on Durable Surfaces

- Durable surfaces include established trails and campsites, rock, gravel, dry grasses or snow.
- Protect riparian areas by camping at least 200 feet from lakes and streams.
- Good campsites are found, not made. Altering a site is not necessary.

  In popular areas:
  - ◊ Concentrate use on existing trails and campsites.
  - ◊ Walk single file in the middle of the trail, even when wet or muddy.
  - ◊ Keep campsites small. Focus activity in areas where vegetation is absent.

  In pristine areas:
  - ◊ Disperse use to prevent the creation of campsites and trails.
  - ◊ Avoid places where impacts are just beginning.

Dispose of Waste Properly

- Pack it in, pack it out. Inspect your campsite and rest areas for trash or spilled foods.
- Deposit solid human waste in catholes dug 6 to 8 inches deep, at least 200 feet from water, camp and trails. Cover and disguise the cathole when finished.
- Pack out toilet paper and hygiene products.
- To wash yourself or your dishes, carry water 200 feet away from streams or lakes and use small amounts of biodegradable soap. Scatter strained dishwater.

Leave What You Find

- Preserve the past: examine, but do not touch cultural or historic structures and artifacts.
- Leave rocks, plants and other natural objects as you find them.
- Avoid introducing or transporting non-native species.
- Do not build structures, furniture, or dig trenches.

Minimize Campfire Impacts

- Campfires can cause lasting impacts to the backcountry. Use a lightweight stove for cooking.
- Where fires are permitted, use established fire rings, fire pans, or mound fires.
- Keep fires small. Only use sticks from the ground that can be broken by hand.
- Burn all wood and coals to ash, put out campfires completely, then scatter cool ashes.

Respect Wildlife

- Observe wildlife from a distance. Do not follow or approach them.
- Never feed animals. Feeding wildlife damages their health, alters natural behaviors, and exposes them to predators and other dangers.
- Protect wildlife and your food by storing rations and trash securely.
- Control pets at all times, or leave them at home.
- Avoid wildlife during sensitive times: mating, nesting, raising young, or winter.

Be Considerate of Other Visitors

- Respect other visitors and protect the quality of their experience.
- Be courteous. Yield to other users on the trail.
- Step to the downhill side of the trail when encountering pack stock.
- Take breaks and camp away from trails and other visitors.
- Let nature's sounds prevail. Avoid loud voices and noises.

FURTHER READING

Leave No Trace Center for Outdoor Ethics website: *lnt.org*

Rich Brame and David Cole. NOLS *Soft Paths (4th Edition)*

Laura and Guy Waterman. *Wilderness Ethics: Preserving the Spirit of the Wilderness.*

Roderick Frazier Nash. *Wilderness and the American Mind (5th Edition)*

HOMEWORK

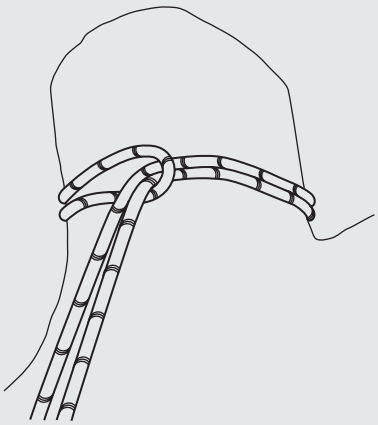
1. List at least two things that hikers do on-trail that cause erosion.
2. When selecting a campsite, what is the standard distance you should be away from water, trails, and other campsites?
3. Rate these campsite options from best (1) to worst (4), based on Leave No Trace principles:
   - Sand, dirt or flat gravel
   - Grass covered meadow
   - Snow
   - A rock slab surface
4. What are two things you can do before a trip to reduce your impact during the trip?
5. Is it acceptable to bury or burn used toilet paper? Why or why not?
6. List three ways that building campfires in the back country can harm the environment.

KNOT OF THE WEEK
GIRTH HITCH

The Girth Hitch is simple to tie and has many practical uses. Use it in snow to extend a tent's stake loop with cord tso the tent anchor stake can be buried deeply in the snow or use it to fabricate a lanyard to a zipper to use as a zipper pull.

To tie: 1) take a bight of rope, pass it around or through the attachment point, 2) bring the remaining rope though the bight, and 3) cinch up the bight against the attachment point.

GIRTH HITCH



Snow travel, Mount Waterman | Edd Ruskowitz

CHAPTER 6
SNOW TRAVEL

Winter can be a beautiful and rewarding season in the mountains for well-prepared backcountry travelers. Popular destinations that are crowded in the summer may be all but deserted in the winter months. Winter conditions tend to be more gear intensive than summer, however, and not being properly equipped can have serious consequences.

DRESSING FOR WINTER TRAVEL

Modern clothing technology has changed the way climbers layer for strenuous exercise in very cold conditions. Insulating layers used to be worn underneath the outer shell, as protection from the elements. Today, climbers shed insulation on the approach as well as while climbing, wearing breathable shell garments that provide a good range of movement and allow moisture to escape. Hardcore alpinist Mark Twight dubbed this their **action suit.**

When they stop to rest, weather-resistant insulating layers are put on over the top of the action suit, preserving body heat generated during exercise. This approach is designed to minimize sweating inside of your clothing. Sweat-soaked clothes can quickly become cold and uncomfortable – even a hazard – in winter conditions.

Depending on the weather and snow conditions, you'll want to wear, or at least carry, water resistant outer layers for snow travel.

Here are two options for your outer shell:

Hard Shell	Soft Shell
"Hard shell fabrics provide full weather protection"	"Soft shell fabrics are breathable, and stretch to allow maximum movement"
"Tightly woven fabric resists abrasion wear"	"A soft shell's inner face is comfortable next to skin and provides mid-layer warmth"
Waterproof	Water repellent
Windproof	Air permeable
Somewhat breathable (vents moisture) Full storm protection	More breathable (vents moisture) Stretches for greater flexibility

For mountaineering and hiking in very cold conditions you also have a choice when it comes to boots:

Single Boot	Double Boot
Lighter weight	Heavier
Rigid or semi-rigid	Rigid
No built-in gaitor	May have a built-in gaitor
No removable liner boot	Removable liner boot
Moderately warm. Suitable for three season use in the Lower 48 (Spring, Summer, Fall) and cold daytrips	Very warm. Suitable for Alaska, the Greater Ranges, winter in Colorado, and extended trips in cold areas

WTC students are <u>not</u> expected to wear double boots.

Wear the boots that your group leader has approved for snow travel day and snow camp. Single boots are suitable for most trips in the Sierra in all but the coldest of conditions, although extra insulation for your feet is desirable for snow camping.

The ideal boot will keep your feet dry in snow by resisting moisture in the environment outside the boot (waterproofing), while releasing moisture generated by your feet inside the boot (breathability).

To keep wet snow out of your boots**, gaiters** will do the job. If the snow is deep as well as soft, crossing snowfields becomes slow and exhausting. Completing your route early in the day is the best way to avoid an overly-grueling hike if daytime temperatures are expected to rise much above freezing.

WATERPROOFING YOUR BOOTS

Many new boots come from the factory with a coating of **Durable Water Repellent (DWR)** applied to the outside of the boot. This coating prevents the outer layer of the material from becoming saturated with water ("wetting out") and losing its breathability. DWR wears off with use. This is true of waterproof clothing too. Abrasion from rocks and trail particles will strip away this coating from hiking boots much more quickly than from a jacket.

WTC recommends reapplying DWR to your boots before Snow Camp. Some DWR products (Nikwax, Granger's, etc.) come in the form of a spray, or a liquid applied with a sponge. Read the instructions carefully. The surface of the boot may need to be moist in order to properly absorb the DWR coating into the outer layers. WTC instructors can demonstrate this and other waterproofing products.

Tip: A good way to test waterproofing before you set out is to put on your gear at home and stand under a cold shower!

THE "ALPINE START"

During the day, the sun can turn firm snow to mush or it may melt and then refreeze the snow's surface so that it becomes icy. Seracs and cornices become even less stable as the day wears on. Avalanche activity may increase, depending on the conditions (see Chapter 9: Mountain Safety for further information on avalanches.) If snowmelt is in progress, run-off can cause streams and rivers to rise in the afternoon.

These factors are why many climbers favor a so-called "alpine start," sometimes as early as midnight when climbing a big, snowy peak such as Mount Rainier. They aim to summit in the morning, perhaps even at sunrise, and be safely off the mountain's more rugged terrain before the heat of the midday sun destabilizes the snow.

SUN PROTECTION ON SNOW

Cold, snowy conditions have great potential for sun exposure and sunburn. Snow acts like a mirror, bouncing harsh sunlight up at climbers from all sides. Sunburn and snow blindness are serious hazards.

- Put sunscreen on the underside of your chin and nose and even ears if exposed. Consider wearing a nose guard.
- Sunglasses known as "glacier glasses" come with side shields that cut out glare from sunlight bouncing off snow below and to the sides. You can also make your own shields for your glasses.

HANDLING HYDRATION IN COLD CONDITIONS

Staying hydrated is of special concern in freezing conditions. If there's no running water, you'll need to use a stove to melt snow for water, and every drop is precious.

It's a mistake to think that you don't need to drink as much to stay hydrated when the air is cold and you're surrounded by snow. The critical factors are how hard you're exercising, and how little moisture is in the air. The lungs moisten

cold, dry air each time you breathe, which can contribute to dehydration.

Freezing conditions are not the best place for water bladders (such as Camelbacks), as the bare hose may freeze even if the bladder stays warm in your pack. An insulated hose will be an improvement. If you do use a bladder, also carry a Nalgene – inside a handy water bottle parka if it's really cold. A Nalgene bottle makes hydrating in cold conditions easy. Nalgene plastic has some flex, so that it will not crack if the water inside freezes. Wide-mouth bottles work best so that you can top off your water with snow during the day (but it's wise not to over-fill it).

TEMPERATURE REGULATION

Remember, the goal isn't really "to stay warm" or "not get cold" as you exercise in cold conditions – it's to regulate your body temperature inside your clothing system:

- Take off the outer insulating layer just before departure. This will feel a little cold until exercise-generated body heat kicks in. Avoid becoming sweat-soaked inside your clothing at all costs!
- Open up armpit ('pit') and upper leg zippers to ventilate moisture generated by the body.
- Pull on extra layers of insulation again when you stop to rest or negotiate difficult terrain.

TRAVELING ON SNOW

Low-angle snow that is firm (but not icy) allows you to travel at a good pace. **Trekking poles** can provide valuable support here, helping you keep your balance and giving you a way to probe the firmness of the snow up ahead.

In warmer winter conditions, snow that is firm first thing in the morning may become soft

FOUR MECHANISMS OF HEAT LOSS

Radiation
Warm bodies radiate heat to colder objects, such as your clothing – and from clothing to other nearby objects. Radiation is usually the single biggest cause of heat loss, and current clothing technology does little to reduce it. Carrying an aluminum emergency blanket can help if you must bivouac. Fortunately, your body can compensate for radiant heat loss in all but the most extreme cold – provided the other mechanisms for heat loss (below) are adequately controlled.

Evaporation
Water on the skin turns to vapor - evaporates - into the air, taking heat along with it. This cooling effect is welcome on a hot summer day, but not at a snow camp when the higher altitude and cold climate conspire to rob your body of heat and your lungs of moisture. At high altitudes, dry cold air aggravates heat loss as you breathe more deeply and work to humidify inhaled air.

Conduction
If you touch a cold object, heat is transferred from you to the colder object. Don't sit directly on snow. Use insulation such as a foam pad or your pack. Your boots may not protect you from cold feet when standing on snow. Moving helps, as do foot warmers, insulation and down booties for snow camping.

Convection
Moving air and water, drawing heat from the body, can both accellerate heat loss. It doesn't have to be a strong wind to remove the thin layer of radiant heat from exposed skin, resulting in "wind chill." To avoid convective cooling, protect yourself with your shell and keep your clothing dry as possible. The insulating properties of most clothing is drastically reduced when wet.

and slushy after a couple of hours in the sun. Snowshoes allow you to travel comfortably across softer snow by spreading your weight over a larger surface area than just the soles of our boots. Again, trekking poles are an invaluable aid to balance. As the day wears on, snow may become soft enough to leave you floundering with every step even with snowshoes. The opposite can happen if a cold wind comes up amd previously soft snow becomes hard and icy.

A slope covered in firm (but not icy) snow can be ascended by **kick stepping** up the slope, a technique in which the toe of the boot is used to punch a foothold into the snow. The leader will set the distance between steps and should take into account the smallest stride length among group members. Climbers following the leader should place their feet carefully into the steps made by the leader, to reinforce rather than destroy the footholds. Kicking steps can be quite tiring, and it may be necessary to "rotate the lead" so each climber takes a turn at the front of the group.

For descending snow, **plunge stepping** is a fast but controlled technique in which climbers plunge the heel of their boots into the snow as they move down the slope. With practice, it becomes quite easy to keep one's balance while traveling rapidly downward. Care should be taken to avoid patches of ice or signs of covered boulders. Should your foot become stuck while plunge stepping, it is important to fall backwards rather than forwards to avoid hyperextending the knee.

Steeper snow-covered slopes should be approached with extreme caution. Patches of ice can lurk just below the snow surface, ready to send an unwary winter hiker careening uncontrollably down the slope.

ASSESSING TRAVEL ON SNOW

Whether as part of trip planning at home or as part of an en-route decision, the changeable nature of snow and the potential injuries sustained at the end of an uncontrolled slide must be considered. The snow consistency may changed during a day making travel across a snow field a second time much less safe or preferred. Under any circumstances, potential injuries following a fall must be carefully assessed. For more difficult snow travel, specialized training and equipment should be used.

Particular hazards from avalanche and snow bridges are discussed further in Chapter 9.

ARRIVING AT CAMP

Plant your snowshoes and trekking poles standing up in the snow. If snow falls, they should be easy to find. If you leave poles with snow baskets out overnight, stick them into the ground upside down with the handles in the snow. This prevents the baskets from freezing into the snow overnight.

Once you stop moving, it's time to put on extra layers of insulation to stay warm. You may find that your feet get cold standing around on snow (particularly in single boots.) Standing on a compact, inexpensive foam pad provides a layer of insulation under your feet. Walking around can also generate bit of heat for cold feet.

TENT SET-UP ON SNOW

Create a level tent platform on the snow using your boots and snowshoes to stamp down the snow and shovels to firm it and to build up a wall of snow blocks if you expect really harsh conditions. Use tent stakes designed for snow (snow stakes), and don't bury them so deeply they'll be impossible to remove. Dig out a step in the vestibule to make getting in and out of the tent a little easier. Always keep one hand on the tent during set-up, or secure a corner using a snow stake. Having your tent blow away in winter conditions can be really inconvenient!

- Place collapsed tent poles on the tent during assembly, not in the snow. Getting the rod connectors wet can lead to them freezing and being hard to break down.
- Keep sharps – shovel blades, snowshoes

with teeth etc. – away from the tent to avoid tearing it.

- Once the tent is assembled, stake down the back of the tent first, and then stretch it out towards the front to ensure you get maximum floor area inside.
- Two people should tension opposite corners of the tent simultaneously, pulling on diagonally opposed straps at the same time.
- Ventilate the tent to avoid condensation build-up inside the tent overnight. Leave doors and vents cracked open at the very least. A shower of ice from the roof of your tent when you get up in the morning is no fun!

SLEEPING ON SNOW

A primary concern is how to stay warm enough and how to keep yourself – and your gear – dry. A good approach to insulating yourself from snow while in your sleeping bag is to use two sleeping pads stacked on top of each other. WTC recommends using a closed cell foam pad next to the ground (bulky, but no danger it will get punctured and stop working) with an inflatable sleeping pad on top of it.

Certain items survive a cold night much better in your sleeping bag with you than they do out in the cold. This is where extra room inside a long sleeping bag comes in handy.

- Placing your boot or boots liners inside your sleeping bag prevents them from freezing solid overnight. (Put them inside a plastic bag if needed.)
- Water in bottles will freeze solid overnight in cold conditions unless they are kept warm. At night, place the bottle upside down, and/or warm in a protective sleeve in your bag. Water freezes from the top.
- If you're using fuel canisters rather than liquid fuel (not recommended in very cold conditions), the stove will light more easily in the morning if the canister is kept warm – which means insulated in your tent, near you.
- Batteries and electronics vary in their tolerance to cold; most will last longer and perform better in the morning if you don't let them get too cold. Keep them near you inside the bag. And, note that if you breathe on a cold camera lens you will wind up with frost on the glass.
- Your body heat can be used to dry clothing such as liner boots and gloves. If you have too much damp or wet gear to put it all inside your sleeping bag with you, try sandwiching some of it in between your bag and sleeping pads. Sandwich very wet items between the two sleeping pads.

See next page for tips on staying warm and dry

FURTHER READING

Alpine Climbing: Techniques to Take You Higher. By Mark Houston and Kathy Cosley. The Mountaineers Books (2004).

Hypothermia, Frostbite and Other Cold Injuries, 2nd ed. By Gordon Giesbrecht and James Wilkerson. The Mountaineers Books (2006).

Winter Hiking & Camping: Managing Cold for Comfort and Safety. By Michael Lanza. The Mountaineers Books (2003).

STAYING WARM AND DRY

Here are a few tried and true tips that can warm your spirits (and body) at Snow Camp.

Eat and drink frequently. Food and water are the fuels for your internal furnace. Stoke the furnace by eating well and keeping up the hydration. If you get cold late at night, add more fuel by eating an energy bar, candy or nuts, raisins or other snack food.

Use a hot water bottle. Before going to bed, fill a leak-proof water bottle with very warm water. Be careful. Seal it tight. Wrap it in a sock to prevent scalding, then put it inside your sleeping bag. You can do this while finishing up dinner. Your sleeping bag will be nice and cozy when you get in.

When nature calls, answer it. Holding your bladder is not only painful, it saps your energy. You can get up, get dressed and be done in under 10 minutes, or you can lie awake for hours. A pee bottle can minimize (or eliminate) your time outside the sleeping bag.

Mind your mittens. Bring several pairs and weights of gloves, and consider mittens and waterproof over-mitts your friends. Wear gloves when traveling in snow even if it's hot. If you slip and slide on snow or ice, it's virtually impossible to stop yourself with bare hands. Dry out the gloves along with your socks at night.

Garbage bags are not just for salad. Line the inside of your pack with a strong garbage bag, so that it can be set down in wet snow without the contents becoming damp. Use this tip for a day hike or backpack. (This is a good alternative to fancy – and expensive – waterproof backpacks.) Bags are also useful for setting out your gear, or covering your pack overnight.

KNOT OF THE WEEK
FIGURE 8 FOLLOW THROUGH

Figure 8 Follow Through – The Figure 8 Follow Through is useful in securing a rope around an object such as tree. To prevent the knot from untying, you should have about one-fist worth of rope sticking out at the end of the knot

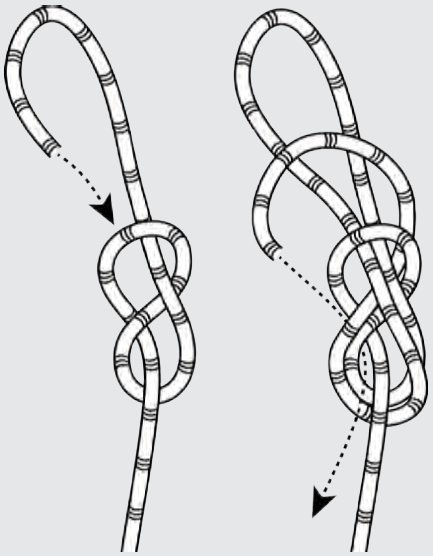


FIGURE 8 FOLLOW THROUGH

CHAPTER 7
WILDERNESS FIRST AID

"What if I fell right here and broke my leg?"

Has that thought ever crossed your mind as you crossed a steep talus slope in the Sierra? Maybe you've had a close call, or even witnessed a real wilderness accident. You don't have to be in a terribly remote wilderness to get into trouble. A couple of miles up the trail to Mt. Baldy puts you more than an hour away from definitive medical care.

Preparation for any outing should include an awareness of possible accidents, illnesses and reactions to the environment that can happen whether you are traveling in local mountains or venturing deeper into the Wilderness. Many of these same events can occur in your home, your neighborhood or work. The difference in your ability to treat or handle such events is found in your proximity to emergency medical care, as well as your level of first aid training.

In this chapter, we will look at the signs, symptoms and treatments for some common (and not so common) injuries (shock, sprains, strains, blisters, etc) and illnesses and reactions to the environment (hypo and hyperthermia, altitude illnesses, snake bite and ticks). But first, let's understand why basic first aid training is just that – basic.

Urban (Basic) First Aid assumes *rapid entry* – within minutes – into the Emergency Medical System (EMS). Basic First Aid is of limited use in the wilderness for a number of reasons:

1. The care that is required may be *beyond the scope* of basic first aid.
2. The standard of care acceptable in urban medical care may change in a wilderness setting, due to *lack of specific medical equipment* and *trained medical personnel*. This requires the rescuers to *improvise equipment and technique or just do without.*
3. Illnesses and injuries may be *unique to the outdoor/wilderness environment*. Examples are snakebite and acute mountain sickness.
4. Definitive medical care is likely to be *delayed*, due to remoteness, lack of communication, and transportation. The delay may be in terms of *hours, days* or more.
5. *Contact* with the patient will be *prolonged*, for hours or days, and around the clock. This circumstance requires training in longer-term care.
6. The outdoor environment itself can present a challenge and a hazard to the *patients and the rescuers*. Both patient and rescuer may be exposed to harsh temperatures, weather, altitude and terrain.
7. Familiarity with rescue techniques and operations is necessary to make the *appropriate evacuation decisions*.
8. *Outcomes* of treatment given in a wilderness setting may be less favorable than treatment obtained by rapid entry into the EMS and a modern medical facility.

This chapter will not make you a trained wilderness first-aider, but it will give you some guidance on what to do in a wilderness emergency. *Find out about Wilderness First Aid training later in this chapter and review the WFA Checklist, p. 7-11.*

RESPONSE TO A WILDERNESS EMERGENCY

The key to an effective response to a wilderness emergency is to keep the larger picture in mind. Address the patient's chief complaint ("My wrist is painful and is swelling") in the context of the wilderness environment (Is the group exposed to rockfall in this area?) and the patient's medical status (Does the patient have any less obvious but more serious injuries or illnesses?) and the needs of the group.

WOUNDS, STRAINS, SPRAINS AND FRACTURES

Active Bleeding

1. Wash your hands with soap and water if the severity of the bleeding permits.
2. Put on protective gloves or cover your hands with a baggie.
3. Ask the patient to sit or lie down.
4. Expose the wound.
5. Place a bulky dressing or clean cloth directly over the wound and press evenly for up to 15 minutes.
6. If bleeding persists after maintaining pressure on the wound for five to 10 minutes, remove the dressing, then more accurately locate the source of the bleeding and resume direct pressure.
7. Apply a pressure dressing. Cover the wound with a thick layer of gauze and tightly wrap a bandage over the dressing. Leave in place for several hours.

OPEN WOUNDS: Dressing and Treating

Wounds That Have Not Bled Heavily

1. Wash the wound with large amounts of the cleanest water you have available (e.g., filtered if possible).
2. Remove or cut away clothing near the wound, and remove superficial foreign matter.
3. Flush the wound with water; wash with mild soap if you have it.
4. Blot dry with sterile 4x4's.
5. Apply a sterile dressing, over-the counter topical antibiotic (ask the patient about allergies) and bandage in place.

Wounds That Have Bled Heavily

1. Do not wash the wound.
2. Apply a thick layer of gauze or a sanitary napkin and bandage with moderate pressure using roller gauze or a cravat.
3. If dressings become blood-soaked, add additional dressings on top of the old ones.
4. Check distal (downstream) circulation by pinching the nailbed. The color should return to pink within two seconds, unless the limb is very cold.

Wounds Requiring Special Treatment

Avulsion (skin and tissue torn loose or left hanging). Avulsed tissue that is torn free should be wrapped in sterile gauze, placed in a plastic bag, and kept cool but not allowed to freeze.

Impaled Foreign Object:

1. Apply pressure around, but not directly on the object to control bleeding.
2. Do not move or remove the object.
3. Surround the object with bulky dressings to stabilize it.
4. Transport the patient promptly to the emergency room with the object still in place.

CONTUSIONS (BRUISES)

Contusions are injuries caused by a blunt object striking the body with sufficient force to crush tissue beneath the skin.

Contusions to Extremities

1. Apply cold (e.g., snow in a baggie) for 15 minutes on and 15 minutes off as long as patient comfort and practicality permit. Put a layer of clothing between the baggie and the injury so that you do not freeze the skin.
2. If the application of cold is impractical, apply mild compression directly over the injury. Use something compressible such as foam from a sleeping pad or a wad of facial tissue. Bandage this in place tightly with a cravat, roller, or an Ace bandage. Check distal circulation (downstream from the injury) periodically.

BLISTERS

A blister is a collection of fluid beneath the skin caused by excessive friction.

Prevention and Treatment

1. Cover a "hot spot" or unbroken blister with tape, duct tape, moleskin or Spenco Second Skin. Cover an area larger than the blister to avoid peeling of the dressing.
2. Use several layers of moleskin or molefoam cut in the shape of a donut that fits around the blister to relieve pressure.

Painful Unbroken Blisters

Clean with soap and water or disinfectant. Puncture several times around its lower edge with a needle sterilized over a flame. Gently press out the fluid. Do not remove the "roof" of the blister, but cover it with a non-stick dressing, Spenco Second Skin, or tape.

Broken Blisters

Clean surrounding skin with soap and water. Wash the broken surface to remove sand and dirt even if painful. Cover the open wound with a non-stick pad, then apply tape or molefoam. It is often more comfortable to "unroof" broken blisters and apply Second Skin directly to the wet surface. Do this if dirt or sand is seen under the skin; clean before applying dressing.

BONE, JOINT, AND MUSCLE INJURIES

This group of injuries includes fractures, dislocations, sprains, strains.

- Fractures: A fracture is a break or crack in a bone. Important distinctions are whether a fracture is deformed or not, and whether it is closed or open (has a wound creating a pathway for infection).
- Dislocations: A dislocation occurs when the bone ends at a joint are separated and out of alignment, creating a deformity.
- Strains: A strain is a tearing injury of muscle. It occurs when muscle is stretched beyond its normal limit.
- Sprains: A sprain occurs when a ligament (the tough tissue that holds bones together) is stretched beyond its limit, causing a minor pull or major tear.

Assessment of Bone/Joint/Muscle Injuries

In the wilderness, the most pressing issue is not to label a bone/joint/muscle injury as a "fracture" or a "sprain". The most pressing issue is to decide if the patient can continue to use the limb to reach camp or the trailhead, or if the injury must be splinted and not used for locomotion. The following are some guidelines for making that decision:

- Did the accident involve sufficient force to break a bone?
- When the injured body part is compared with the opposite side of the body, is there any deformity (more than just a little swelling)?
- Did the patient hear a "snap" or feel a "pop"?
- If a rescuer presses on opposite sides of the injured limb with hands offset along the length of the limb, does the patient experience substantial pain?
- Can the patrient exert much more force with the uninjured limb than with the good limb? On a scale of one to 10, is the level of pain on attempted use six or above?
- Does the patient refuse to use the injured limb in a normal fashion?

The above assessments are a good indicator of whether the injury is serious enough to require a splint. Splinting is appropriate for fractures, dislocations and serious sprains. Have one of the rescuers support above and below the injured location until the splint is applied or the decision not to splint is made. When in doubt, apply a splint. If a splint is not needed, treat as a sprain/strain (see below).

Splinting an Injured Limb

1. Control any bleeding.
2. Expose the injury by removing clothing; cut it away if necessary.
3. Check damage to blood vessels and nerves.
   - Check distal (downstream) circulation.
   - Assess sensation. Pinch the big or little toe (or finger) where the patient cannot see it, and ask the patient to tell you which toe (or finger) is being squeezed.
   - Assess movement. Ask the patient to wiggle fingers and toes.
4. Realign deformities. Correct angles and deformities of the bones if circulation is impaired. Do this by pulling gently along the axis of the limb. Maintain the pull until the splint is secured. Do not realign dislocations or joint injuries.
5. Splint the fracture or dislocation to stabilize it. Recheck distal circulation.

Treatment of Sprains and Strains

Just remember: **RICE**.

1. **Rest** – To the extent that is practical, do not use the injured joint until swelling begins to go down (probably about 24 to 48 hours). In a wilderness setting, this rule frequently must be weighed against the desire to get back to the camp or to trailhead. An improvised crutch can reduce the load on an injured ankle or knee.
2. **Ice** – If ice or snow is available, put some in a baggie and apply it to the site of the greatest pain and swelling. Put something thin like a layer or two of gauze between the baggie of snow and the skin to prevent frostbite. Apply the cold for 10 to 15 minutes or until the area begins to go numb or becomes painful. Remove the cold for approximately 10 minutes; then apply the cold again.
3. **Compression** – If ice or snow is unavailable, use compression to control internal bleeding and hold down swelling. Take a wad of something compressible, like facial tissue or open cell foam, and place it over the site of greatest pain and swelling. Take roller gauze or an Ace bandage and wrap it tightly around the joint, compressing the tissue or foam. Secure the end of the wrapping.
4. **Elevation** – Elevating the limb helps to hold down swelling. For leg injuries, this goes well with Rest (item #1), since it is difficult to elevate the leg of someone who insists on hiking out. For wrist injuries, this is as simple as putting the injured arm in a sling and making sure the hand is above the level of the elbow, rather than letting the arm hang at the patient's side.

Check to see whether or not you have the wrapping (#3) on too tight by checking distal circulation. If the nailbed takes much longer than two seconds to return to its original pink color, loosen the wrapping a little.

SHOCK

Shock occurs when blood flow is inadequate to maintain the supply of oxygen due to volume (blood) loss, decrease in the ability of the heart to pump, or vessel dilation. Loss of one to 1.5 pints of blood in an adult may cause the first stages of shock. Low blood volume can result from:

- Internal or external blood loss.
- Severe dehydration due to diarrhea, vomiting or sweating, especially if combined with a lack of fluid intake.
- Low blood pressure due to the inability of the heart to pump blood, as after a heart attack.
- Dilation of the blood vessels, as in anaphylaxis (severe allergic shock) or with spinal cord damage. Small blood vessels dilate and the blood volume is insufficient to fill the space, causing blood pressure to fall.

> Signs and Symptoms

- Rapid, weak pulse; this is the most consistent sign of shock.
- Rapid breathing.
- Pale or bluish skin, nail beds and lips.
- Damp, clammy skin.
- Nausea and vomiting.

Treatment of Shock

1. Check ABCs (Airway, Breathing, Circulation as in basic first aid) and examine the patient for bleeding. If external bleeding seems insufficient to cause shock, consider internal bleeding.
2. To the extent possible, address whatever injury or condition seems to be causing the shock.
3. Lay the patient on their back with feet elevated 8 to 12 inches if possible.
4. Keep the patient sheltered and warm.
5. Give clear liquids if the patient can swallow and if the shock is due to fluid loss. Do not give food.
6. If shock does not resolve itself quickly (i.e., signs and symptoms lessen or disappear), evacuate the patient to professional medical attention ASAP.

HEAT ILLNESSES (HYPERTHERMIA)

This discussion will be limited to heat cramps, heat exhaustion and heat stroke. **Heat cramps** is a local salt deficiency resulting in muscle cramps. **Heat exhaustion** is a mild form of shock due to loss of fluids and pooling of blood in the extremities. **Heat stroke** is a life- threatening emergency resulting from the body's temperature regulating mechanism failing to shed sufficient heat. Although given separate names, these conditions exist as a continuum and two or more may be present at the same time.

Heat Cramps

Heat cramps can be experienced by people who exercise in hot weather if they are not replacing salt and other electrolytes lost through sweating. Active muscles of the abdomen and lower extremities are most affected. The best prevention is to drink liquids that contain electrolytes at regular intervals during exercise.

> Signs and Symptoms

- Severe muscle cramps.
- Normal body temperature.

Treatment of Heat Cramps

1. Move patient to cool environment.
2. If patient is able to swallow and is alert, give a sports drink or similar substitute, such as 1/2 teaspoon of salt in a quart of water.
3. Try stretching out the muscles. Massage affected muscles if this does not cause more pain.

Heat Exhaustion

Heat exhaustion is caused by dehydration and a disproportionate fraction of the blood being routed to the extremities for cooling. Heat exhaustion is a diagnosis of exclusion, since many of the symptoms are similar to those from having recently had the flu or having eaten something that is "off". The primary mechanism at work is the same as in shock – volume loss (water) or pooling of blood in surface vessels leading to a reduction in circulating volume.

It is important to remember that a person can show signs of heat cramps and heat exhaustion simultaneously. If you treat the heat exhaustion effectively, the cramps will also subside.

> Signs and Symptoms

- Exhaustion, nausea, dizziness and headache.
- Body temperature, pulse and respiration may be normal or somewhat elevated.
- Skin can be either wet or dry depending on level of hydration.

Treatment of Heat Exhaustion

1. Move the patient to a cool environment and keep him lying down until he improves.
2. Remove unneeded clothing. Cool by fanning and wetting down clothing.
3. If the patient is able to swallow and is alert, give a sports drink or a substitute, such as 1/2 teaspoon of salt in a quart of water
4. Patients who recover in half an hour or less may resume the hike; those who do not need to be escorted back to civilization and an ER.

Heat Stroke

Heat stroke is caused by a combination of a hot environment and the inability of the body to shed heat fast enough. The body temperature continues to climb above 105° F. Excessive clothing, improper layering, or lack of conditioning may hinder heat dissipation. Heat stroke is a true medical emergency. Excessive heat can cause permanent damage to internal organs and the brain.

Suspect heat stroke in anyone who exhibits reduced level of consciousness, confusion or change in personality in a hot environment.

> Signs and Symptoms

- The skin is hot and red.
- Patient exhibits a reduced level of consciousness or change in personality.
- Patient may still be sweating, or sweating may have stopped.
- Pulse changes from rapid and strong to weak.
- Patient may be irritable or combative.

Treatment of Heat Stroke

1. Recognize the problem early and act decisively. How aggressively you intervene will determine the extent of long-term damage suffered by the patient.
2. Get the patient out of the sun.
3. Immediately cool the patient using snow or cool water.
4. Remove unneeded clothing. Wet the patient's clothing and fan them. Continue cooling the patient during evacuation and transport.
5. If the patient is fully conscious, give cool liquids and monitor vital signs (heart rate and respiration).
6. Evacuate patient to professional medical care ASAP.

HYPOTHERMIA

Hypothermia is a lowering of the body and core temperature (below 95° F). Hypothermia occurs when heat loss exceeds heat production long enough for the body's core temperature to drop below 95° F. Hypothermia occurs most often in wet and/or windy weather when the temperature is between 30° and 50° F.

Mild Hypothermia

The core temperature of the body will range from 91° F to 95° F. Mild hypothermia is generally manageable in the field through rewarming procedures in which the patient can actively participate.

> Signs and Symptoms

Mild hypothermia must be recognized early so that treatment can begin early. If treatment is delayed, the condition can rapidly develop into profound hypothermia.

- Shivering, later becoming uncontrollable.
- Patient feels cold.
- Apathy, confused and sluggish thinking, poor judgment, poor decision-making.
- The "umbles": the patient fumbles, mumbles, grumbles and stumbles.
- Cold, pale skin.

Treatment of Mild Hypothermia

1. No standing or walking for 30 minutes; thereafter increase exercise gradually.
2. Find shelter out of the wind.
3. Light a fire or stove, change patient's wet clothes, add insulation, give food and a hot, sweet drink.
4. If patient is shivering, allow shivering to continue inside a sleeping bag on a foam pad.
5. Do not delay treatment, and do not leave a hypothermic patient alone.

Severe (Profound) Hypothermia

In severe hypothermia, the body's core temperature falls below 90° F. Treatment is directed at avoiding further cooling and preventing unnecessary movement of the patient. This is a medical emergency demanding immediate, intensive care.

> Signs and Symptoms

Reduced level of consciousness or change in personality.

- No shivering. Stiff muscles.
- Weak, slow, irregular pulse.
- Slow breathing.

Treatment of Severe Hypothermia

Handle a severely hypothermic patient gently; avoid any rough movement. A severely hypothermic patient cannot be rewarmed in the field. Concentrate your efforts on reducing further heat loss.

1. Shelter everyone from wind, rain, and snow. Do not endanger other members of the party.
2. Stop further heat loss by putting the patient in a sleeping bag on a foam pad.
3. Remove wet clothing and replace with dry.
4. Handle the patient gently. Do not manipulate or rub limbs.
5. Cover the patient's head with a hat.
6. Add heat by putting water bottles full of hot water in the sleeping bag with the patient.
7. Provide insulation between the heat source and the patient to prevent burns.
8. Body-to-body rewarmning can be used but is less effective.

Leave at least one person to care for the patient. Send the strongest, most competent party members for help. Provide location and condition of the patient in a written message.

ALTITUDE ILLNESSES

Acute Mountain Sickness (AMS)

Acute mountain sickness is caused by diminished oxygen in the blood (hypoxia) due to decreased oxygen pressure in the air, usually at altitudes above 8,000 feet. It is more likely to occur in those who ascend too high too fast and those who have not acclimatized to high altitude. In this section, we will look at two of the illnesses: Acute Mountain Sickness and High Altitude Pulmonary Edema (HAPE).

Avoidance of AMS

Conditioning prior to a trip at altitude, along with adequate time to acclimatize at the trailhead or at similar elevation, are among the ways to avoid or lessen the efffects of AMS. As the body continues to acclimatize during the ascent, pay attention to signs and symptoms as you climb — and stay hydrated.

> Signs and Symptoms

- Generalized headache.
- Unusual tiredness out of proportion to the activity.
- Appetite loss and nausea.
- Restless sleep with irregular breathing.
- Shortness of breath with exertion.
- Swelling of the face or fingers.

Treatment of Acute Mountain Sickness

1. Rest and do not go any higher.
2. Wait and see. If headache or shortness of breath increase despite taking aspirin or acetaminophen and resting, descend 1,000 to 3,000 feet or until the patient feels better.
3. Travelers who have already experienced altitude symptoms should consider appropriate prescription drugs before going to altitude again.

High Altitude Pulmonary Edema (HAPE)

In HAPE, fluid builds up in the alveoli (lung sacs), hindering the passage of oxygen into the blood. Patients can drown in their own fluid. HAPE usually starts above 10,000 feet but can occur at lower altitudes; it begins 36 to 72 hours after arriving at altitude and is cured by descent.

> Signs and Symptoms

A patient will have one or more of the signs and symptoms of Acute Mountain Sickness plus:

- Shortness of breath that occurs with slight exertion and is present even at rest. The patient needs to sit up to breathe comfortably.
- Cough, dry at first, then producing frothy pink sputum.
- Rattling or crackling, moist breathing and coughing.
- Cyanosis (bluish tinge to lips, face and fingernails). Compare patient's color to your own in natural light.
- Rapid pulse: more than 100 beats per minute and rapid breathing, more than 20 breaths per minute, after 30 minutes at rest.

Treatment of HAPE

1. Descend immediately 2,000 to 3,000 feet, or until patient feels better.
2. Patient needs to return to the trailhead and see a doctor as soon as possible.

SNAKEBITE

In the U.S. there are an average of 45,000 reported snakebites per year, but only 8,000 of them are venomous. The average death rate is only about 9 to 15 persons per year. Venomous snakes of the U.S. are the pit vipers and coral snakes. Pit vipers account for 98% of all bites (65% from rattlesnakes), and 2% are caused by coral snakes.

Prevention of Snakebite

- Be able to recognize venomous snakes. Pit vipers have a triangular flat head wider than the neck and vertical elliptical pupils. The coral snake is small, with a series of red, yellow and black bands all the way around its body.
- Avoid snake habitats such as rocky ledges, rock piles, and dense brushy areas.
- Look where you put your hands and feet, and where you sit.
- Stay away from a snake when passing; they can strike to about half their length.
- If you hear rattling, stop until you can see the snake. Once it moves away or relaxes its defensive posture. you can back away.
- Never handle a poisonous snake, even a dead one. A dead snake can strike and envenomate due to reflex action.

> Signs and Symptoms

- Severe burning at the bite site.
- Two small puncture wounds approximately 1/4 to $1^{1/2}$ inches apart. Some bites may have only one fang mark, or several sets.
- Swelling, starting within five minutes and progressing up the extremity in the next hour.
- Discoloration and blood-filled blisters developing in 6 to 48 hours.

Treatment of Snakebite

- Get the patient away from the snake. Do not attempt to capture or kill the snake.

- Remove any jewelry on an extremity.
- Clean and dress the bite like a wound.
- If the bite is on an extremity, immobilize it below heart level.
- Get the patient to the hospital ASAP. The decision to have the patient walk out or be evacuated by SAR will depend on the patient's condition and the geography of the trip.

TICKS

Tick bites are painless, and a tick can remain attached for days without the patient being aware of its presence. Some ticks can transmit serious diseases such as Lyme disease, but most tick bites are harmless.

Prevention of a Tick Bite

- Use a repellent containing DEET on your skin and permethrin on your clothing.
- Wear light-colored, long-sleeved long-legged clothes, preferably with elastic wrist and ankle bands.
- Examine yourself nightly, paying particular attention to scalp, armpits, anal and genital areas. It takes ticks 24 to 36 hours to transmit Lyme disease.

Ticks: What Not To Do

- Do not put petroleum jelly or nail polish on the tick or touch a hot match to it. These methods are ineffective.
- Do not grab the rear of the tick. This may rupture it and squeeze the contents into the wound.
- Do not twist or jerk the tick. This may break it in half**.**

Treatment of a Tick Bite

- Remove the tick using either tweezers or your fingers. If using your fingers, protect them with paper or gloves.
- Grasp the tick close to the skin surface and pull steadily; or lift the tick slightly upward, then pull parallel to the skin until the tick detaches. If the head is still embedded in the skin, remove it with a needle as if it were a splinter.
- Wash the bite with soap and water.
- Watch for signs of local infection or unexplained symptoms of tick-borne diseases (severe headache, fever, or rash) appearing three to 30 days after discovery of the tick. If symptoms appear, seek professional medical attention immediately.

ADDITIONAL TRAINING

Like other wilderness skills, competence in wilderness first aid requires mastery of both theory and practical skills. The material in this chapter is only a start. You are urged to enroll in a recognized WFA course such as these:

- **Wilderness First Aid Course** (*http://wildernessfirstaidcourse.org*) Satisfies Angeles Chapter leadership requirement for I,M,E ratings; see website for details.
- **Wilderness Medical Associates** (*http://www.wildmed.com* or *http://adventureriskmanagement.com)* Wilderness Advanced First Aid (WAFA), Wilderness First Responder (WFR) and Wilderness EMT courses satisfy Angeles Chapter leadership requirement for I, M and E ratings.

FURTHER READING

Wilderness First Aid Course Notes, G. Brimmer, M. D. Hryshchyshyn, Schuster and S. Sexton, Wilderness First Aid Course Inc., November 2007.

Wilderness First Aid – Emergency Care for Remote Locations, H. Backer, W. B. Patton, P. Steele and A. Thygerson, National Safety Council and Wilderness Medical Society, 1998.

HOMEWORK

1. You are leading a group at 11,000 feet in the Sierra on the second day of a backpacking trip when a 27-year-old woman trips over a rock and strikes her right knee. It is beginning to discolor and is swelling rapidly. After 30 minutes of resting, she is weak and short of breath; her pulse is rapid. She has a persistent dry cough that began about an hour ago. You notice that her fingers are swollen. Other than the obvious knee injury, what first aid problem do you suspect here?

2. On the WFA Checklist, under Response to Wilderness Accidents, Emergency Move and/or Reposition the Patient, item #1 reads "Decide whether patient condition or environment requires moving or repositioning the patient." Give two examples of first aid problems listed in this chapter that might require moving or repositioning the patient and explain why.

3. Which heat illness most resembles shock? Why?

4. You are a member of a group doing a day hike on Mt. Baldy. A 43-year-old man has just fallen and struck his right lower leg. It is deformed, and he refuses to move it. He says he heard something pop. He has a fast weak pulse, his breathing is shallow and rapid, his skin is pale and sweaty, and he complains of an upset stomach. Other than the obvious leg injury, what first aid problem do you suspect here?

KNOT OF THE WEEK
CLOVE HITCH

A Clove Hitch is an extremely useful hitch as it secures well, but is easily adjusted after being secured. Use the clove hitch to secure tent guy lines to stakes, so they can be more easily adjusted for snow loads or wind later on.

To fashion a clove hitch:

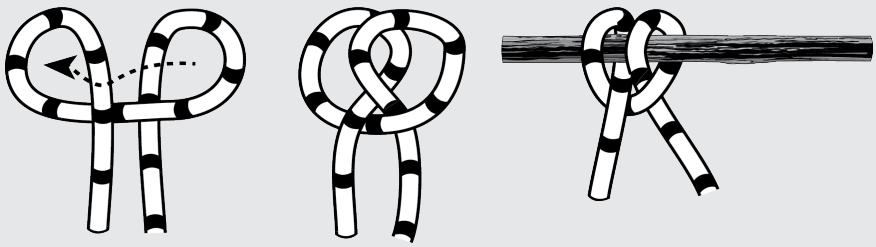
1) Form two "P's" with a bight of rope, one forward 'P', one backward 'P'. Notice the rope forming each of the "P's" is on the opposite side of the bight from the other.

2) Take the right hand loop of the 'P', bend it toward you slightly and stack it on top of the left loop of the 'P'.

3) Place both loops over the object to wish to secure the rope to.

4) Adjust the rope on the load side to a bit beyond the desired tightness, then pull the running side tight against the object to secure the hitch. Adjust the hitch as needed.

Note: The Clove can also be formed by passing the end of the rope around an object as shown in the finished hitch below on the right.



WILDERNESS FIRST AID CHECKLIST

The order of these actions varies with the circumstances of the emergency. Use the checklist only as a supplement to training in a wilderness first aid course.

SURVEY THE SCENE

- Notice your first impression.
- Identify unsafe conditions.
- Count patients.
- Determine the cause of the accident.

CONDUCT THE PRIMARY SURVEY

- Isolate yourself from body substances.
- Check the patient's level of responsiveness.
- ***Check the ABCs:***
  - Establish and maintain an **Airway.**
  - Check for breathing; give rescue **Breathing** if needed.
  - Check for a pulse (**Circulation**); do cardiac compression if needed.
  - Control serious bleeding. In the case of trauma or unwitnessed unconsciousness, check for bleeding under the edges of the body.
- Recognize and deal promptly with life-threatening or disabling injuries.
- Establish a relationship and get consent.
  - Introduce yourself and state your qualifications.
  - Ask the patient's permission to help.
  - Ask the patient's name and age.

ASSESS AND TREAT SPINAL INJURIES

- Manually immobilize c-spine if:
  - The accident was unwitnessed, or
  - There are signs or symptoms of head, neck or back injury, or
  - Mechanism of injury indicating head, neck or back injury is present.

EMERGENCY MOVE AND/OR REPOSITION THE PATIENT

- Moving the patient
  - Decide whether patient condition or environment requires moving or repositioning the patient.
  - Plan the move, then move the patient to the desired new location and position.
- Adjusting the patient's position
  - On patient's side for drainage
  - Head slightly uphill for a head injury
  - Legs elevated or head slightly downhill for shock
  - Flat (and level) on patient's back otherwise
- Maintaining thermal balance
  - Protect the patient from heat and cold.

BEGIN GATHERING INFORMATION ABOUT THE PATIENT

- Begin recording patient information.
- Ask "What happened?" and "What hurts?"

SECONDARY SURVEY – EXAMINE THE PATIENT

- Examine and address the patient's chief complaint.
- Take vital signs; check the patient's:
  - Level of consciousness
  - Pulse (rate and quality)
  - Breathing (rate and quality)
  - Skin vitals (color, temperature, moisture)
  - Pupils, if appropriate (equal size, roundness, reaction to light)
- Perform a head-to-toe exam.
- Record the patient's medical history ***(SAMPLE)***:
  - Note and record patient's **S**igns and symptoms.
  - Does the patient have any **A**llergies?
  - Is the patient on any **M**edications? Has the patient taken any recreational drugs or alcohol in the last 72 hours?
  - Is there significant **P**ast medical history?
  - When and what was the patient's **L**ast meal? When did he last drink something and what was it?
  - What were the **E**vents leading up to the injury or illness?
- Conduct a focused spinal injury assessment:
  - Is the patient alert, oriented, and without distracting pain?
  - Does the patient have normal sensation and motion in all of his extremities?
  - Palpate the spine in the neck and back while asking "Does this hurt?"

TREAT INJURIES

- Check distal circulation, sensation and movement before and after treatment.
- Improvise splints.
- Wrap wounds.
- Recheck vitals and look for trends.

EXTRICATE THE PATIENT (WHEN NECESSARY)

- Immobilize the c-spine.
- Move the patient, if needed.
- Straighten the arms and legs; untwist the torso.

A FIRST AID KIT: *One of Your 10 Essentials*

How many items you include for a trip may be a matter of weight and usefulness. Many items that are needed in an urgent medical situation may be improvised — but some cannot.

For your own kit, start from scratch or add to a ready-made medical kit. Above all, know what to do with what you have. Consider what you might need for some of the injuries and conditions listed in this chapter. The longer you are away from urban medical care, the more you may want to carry. Some trips may call for additional items based on the nature of the trip. While no quantities are listed here, you may have more than one person requiring your care at any given time. Look over your kit before each trip; replenish any used items and replace any expired medications. If you are unfamiliar with a medication, carry a card that covers over-the-counter dosing, indications and side effects.

	Day Hiking / Backpacking	Optional but Useful
WOUND MANAGEMENT		
Adhesive bandages ex. band aids	+	
Gauze pads and gauze roll	+	
ACE bandage	+	
Triangular bandage aka cravat for slings	+	
Adhesive wound closure strips ex. steri strips/ butterfly bandage	+	
Adhesive tape 1-inch roll	+	
Blister care of choice- ex. mole skin/ 2nd Skin/ gel bandages	+	
Cotton swabs ex. Q tip	+	
10ml syringe for irrigation	+	
Liquid all-purpose soap (handwashing and cleansing wounds)	+	
Non-adhering bandage ex. telfa		+
Heavy compress dressing/ sanitary pad (for heavily bleeding wounds)		+
MEDICATIONS		
Antibiotic ointment	+	
Ibuprofen	+	
Acetaminophen	+	
Antihistamine ex. Benadryl	+	
Personal medications (pack more days than needed when backpacking)	+	
Emergency electrolytes ex. Gatorade powder	+	
Iodine/ chlorine water treatment	+	
Antidiarrheal		+
Hydrocortisone cream		+
MISCELLANEOUS		
Exam gloves (at least two sets)	+	
Medical report form and pencil	+	
Additional baggie: e.g. a zip lock for making a cold compress with snow or to use for irrigation (puncture a corner)	+	
Waterproof case (zip lock bags works fine)	+	
CPR face mask	+	
Sanitizer	+	
Scissors (small, may be found on a Swiss Army knife)/ trauma shears	+	
Safety pins	+	
Splinting materials ex. SAM splint (can be improvised from items carried)		+
Tweezers		+
Hand warmers		+
Thermometer		+

Back-country happy hour | Ron Campbell

CHAPTER 8
NUTRITION

Thriving in the wilderness requires skill. But it also requires a well-conditioned body and the food to keep you going. Good conditioning will get you started up the mountain. Good nutrition will get you to the top and back to camp.

THE AMAZING MACHINE

It is sometimes useful to think of your body as a machine. Kept in proper working order (see Chapter 1), it can do wonderful things. But like any machine, your body requires fuel. So the first rule of wilderness nutrition is also the most important: Don't stint on the fuel; give your body the food it needs to perform.

THE CHALLENGE

Backpacking and mountaineering demand an extraordinary amount of energy. There is, of course, only one way for your body to generate that energy – through consuming and digesting calories from food.

Now we come to one of the essential differences between your body and a machine. Engineers can accurately predict the fuel demands of a machine under varying conditions. No one can predict exactly how much food is needed for wilderness travel. People differ too much. You'll have to figure out your own needs.

Start with some rough guidelines. Larger men or women burn more calories than smaller individuals hiking the same distance. Cold weather forces the body to burn more calories to keep the internal furnace at a constant temperature. Hot weather or high altitude strips away moisture in the form of sweat or exhaled water vapor; nature exacts a price in the form of an increased demand for water.

Some scientifically inclined mountaineers have embraced the "Energetics" formula. It resembles the Naismith Rule for estimating travel time. (See Chapter 3.) Here it is:

$$E = 100(10 + R + 2C + 4H)$$

E is energy in calories. R is distance in miles on trail. C is distance in miles cross-country. H is altitude gained in thousands of feet.

The formula offers a way to compare the physical demands of trips. For a 12-mile on-trail trip with 1,500 feet gain compared to a 10-mile cross-country bushwhack with 1,000 ft. gain, the formula tells you that the shorter, lower cross-country trip will burn almost 20 percent more calories.

But the formula does not take altitude or cold weather into account. Experience suggests, and medical research confirms, that altitude and cold tax the body, demanding more calories to do the same amount of work.

No formula can explain all the variables. **Table 8-1** offers a very rough estimate. The critical aspect is not the calorie range for each type of trip (your mileage may vary); it's the comparison among types of trips.

BUILDING BLOCKS

Most diets, and all weight-loss diets, require some adjustment in one or more of four essential nutrients: carbohydrates, protein, fats and water. Wilderness nutrition is no exception. But while the weight-loss gurus offer warring prescriptions – eat protein and avoid carbs; eat carbs and avoid protein; shun all fats; drink a glass of water every waking hour – the people who study wilderness nutrition agree: eat more and drink more than you do at home.

TABLE 8-1. Comparative energy demands for outings.

Trip	Description	Calories/day
Home to work and back	Minimal walking	1,500 to 2,500
Mt. Lowe day hike	13 miles, 3,800 feet gain, mild weather	2,500 to 3,000
WTC Snow Camp	5 miles, 1,500 feet gain, cold weather	3,500 to 4,500
Summer peak-bag	12 miles, 4,000 feet gain, warm days, cool nights	3,000 to 3,500
Climb Denali	Multi-week trek, below-zero temperatures and extreme high altitude	4,500 to 6,000

Let carbs comprise at least half your caloric intake. Eat at least as many calories from fat as from protein.

For a snapshot of nutrients, see **Table 8-2**.

CARBOHYDRATES

Carbs provide your body quick energy in the form of easily digestible calories. That quality makes them the core of the mountaineer's diet. They should comprise 50 percent to 70 percent of the your daily intake of calories. Low-carb diets make sense only if you are living a sedentary lifestyle or on a paleo diet.

Carbs come in two types: *simple* and *complex*.

Simple carbs are the speed demons of the nutrition world. They digest quickly, providing a swift boost in energy. Examples include fruit, dried fruit, candy, honey and sugar. It's easy to grow bored of one type of candy after a day or two on the trail; if you buy a variety of dried fruits, you'll never get bored.

Complex carbs take longer to digest but also provide longer-term energy. Pasta, brown rice, potatoes and grains are almost pure carbohydrates. When picking carb sources, look for whole grains; nutrients are lost during processing.

FATS

Fat is a prodigious source of energy. A single gram of fat releases more than twice as much energy as a gram of carbohydrates or protein. That makes it critical to the climber's diet. Plan to take at least 20 percent of your daily calories in the form of fat – and up to 40 percent on cold weather trips such as Snow Camp.

You're probably thinking right now that you're already carrying enough fat on your body and don't need to carry any in your pack. Well, you may be right about your body, but you can't burn stored fat fast enough to help you climb a mountain.

Look for foods high in unsaturated fats such as fish, oils, cheese and butter. They may not taste as good (or as fatty) as potato chips, but these foods will provide you with the fats you need for climbing. Perhaps the best of all backpacking foods is peanut butter, which combines fats, carbs and proteins in a ratio of about 2:1:1.

TABLE 8-2. Basic nutrients at a glance.

Type	Calories by weight	Examples
Simple carbohydrates	4 cal/g, 112 cal/oz.	Fruits, vegetables, candy, sugar
Complex carbohydrates	4 cal/g, 112 cal/oz.	Pasta, bread, grains
Protein	4 cal/g, 112 cal/oz.	Meat, dairy products, beans, nuts
Fat	9 cal/g, 252 cal/oz.	Olive oil, butter, nuts

Remember in your meal planning that fat takes longer to digest than carbs do and thus is more appropriate as a long-term source of energy.

PROTEINS

Protein builds and repairs muscle and is also a small source of energy. As important as that is, you don't need a lot of protein to do the job. Protein should make up 10-15 percent of your daily calories while climbing.

Good protein sources include meat, fish, eggs, cheese, beans, peas, lentils, peanuts or almonds and soybeans. Four ounces of soybeans contain 41 grams of protein, close to the daily requirement for a 150-lb. hiker. It's available in many forms, including soy milk, edamame (sweet green soybeans), tofu, miso (the base for a wonderful Japanese soup), tempeh (soybean cake) and textured vegetable protein, or TVP.

Proteins are the source for nine essential amino acids. It's easy to get all nine if you eat meat. If you're a vegetarian, and in particular if you're a vegan who avoids all animal products including dairy, you have to work a little harder to get those vital nutrients. Only one vegetable – the soybean – has all nine. If you're a vegetarian you could plan the protein portion of your diet around complimentary pairs – rice and beans, cereal and milk, pasta and cheese. Each pair combines all nine amino acids in one meal.

WATER

Water provides no calories, no vitamins and no minerals. It is merely essential to life. Water carries nutrients to your cells, carries away waste and regulates your body temperature. Not bad for a simple molecule.

In the wilderness, you need to stay hydrated. You can easily lose a lot of water through sweat, respiration – and digesting all that extra food you're supposed to eat.

Dehydration occurs when you lose more water than you absorb. Even a 1 percent loss in body weight due to sweating – and many athletes lose 2 percent to 6 percent during prolonged exercise in the heat – can cause your body temperature to rise. The consequences include nausea, loss of appetite, Acute Mountain Sickness (AMS) and sometimes heat illness (see Chapter 7). After a time, the symptoms of dehydration form a vicious cycle; the thought of drinking more than sip or two of water makes you sick, and the lack of water makes you sicker. The vicious cycle is broken only when the body finds a new equilibrium – typically after a miserable day.

The old hiker's answer was to drink constantly and to treat thirst as an enemy. The old rule boiled down to the acronym CCU, short for "clear and copious urination," and the advice, "Pee clear." That requires a lot of water. Recent medical research suggests the old rule may go too far. (See **"Too Much of a Good Thing?"**)

A better answer is to hydrate adequately before starting your hike and drink consistently while you are hiking. Drink more water than usual the day or two before your trip begins and at the trailhead. Bring at least two to four liters of water on the trail – more when the weather is hot or the trip strenuous – and drink close to a half-liter per hour. On longer, hotter days, you can balance electrolyte loss with a sport drink or with salty snacks.

Beware of coffee and tea. Both are diuretics; you'll urinate more water than you gain. Alcohol in all its many forms is a potent dehydrator; it also increases heat loss through the skin, a potential danger during cold-weather trips. This is not a screed against the simple pleasures of a cup of coffee in the morning or a taste of wine at dinner. Drink your 2-4 daily liters of water, and on top of that, drink a cup of water to replace each cup of coffee and glass of wine.

MENU PLANNING

Menu-planning for wilderness travel poses a three-part challenge: food must contain enough calories to fuel the trip; it must be easy to prepare under primitive conditions; and it must be tasty enough that you will eat... and eat.

TOO MUCH OF A GOOD THING?

A hiker collapses and dies in the Grand Canyon. A runner collapses and dies in the Boston Marathon.

The surprising medical verdict: too much water. The hiker and the marathoner literally drank themselves to death.

The medical name for this condition is **hyponatremia** (water intoxication). It occurs when the level of sodium in the bloodstream drops below a critical level. That typically happens when someone is sweating – losing water and salt – while ingesting a lot of water. The sodium that remains in the blood is diluted by water.

A 2005 study in the New England Journal of Medicine showed that hyponatremia affected 13 percent of the runners in the 2002 Boston Marathon. One woman died of hyponatremia during the race.

The condition appears to occur mostly in extreme conditions: in the legendary heat of the Canyon and in the stress of a long race.

What should you do on a typical backpack? The American College of Sports Medicine's advice is to drink enough fluids on the trip to replace what you lose through sweating. You can get a clue to your fluid loss by weighing yourself before and after a conditioning hike.

Loading enough calories into the menu is pretty easy. You can roughly judge the required calories by using Table 8-1. Nutrition labels on packaged foods will help you decide which foods deserve a place in your backpack. **Table 8-3** summarizes the calories delivered by several foods that are commonly carried on backpacks. You can easily pack calories into even the simplest meals by adding ingredients. See the next table for ways to add calories to meals.

As a general rule, plan to take 1-1/2 to 2 lbs. of food per person per day. This is the prepared weight; dried pasta, for example, more than doubles in weight as it absorbs water during cooking.

The basics of wilderness cooking are easily mastered. (See **"Advice for the Wilderness Chef"**). The KISS Rule (Keep It Simple, Stupid) is a good guideline; the ever-changing environment forces simplicity and shortcuts, even when one is cooking something complex. Several wilderness cookbooks, sold at mountaineering stores, provide excellent recipes.

Which brings us to taste. Many climbers do quite well on Spartan diets. Others flock to gourmet backpacks, complete with vintage wines (in plastic containers) and elaborate sauces. Make the food tasty enough so that you will want to eat the required number of calories. Know whether you are the type of person who can happily eat plain rice or if you need something more tempting to keep you chewing.

You should also be mindful of time. You will need high-energy foods in the morning and afternoon, the times when you most likely are hiking and backpacking. You should reserve most of your protein and fat intake for dinner. Fat is particularly important in winter, when its slow-burning quality provides excellent protection against cold nights.

BREAKFAST

Timing is everything at breakfast. On the morning of a peak climb, the leader may call for an "alpine" start; typically you will have less than an hour to get dressed, eat, gather your gear and start hiking. On layover days you may have hours to devote to the morning meal.

Organization is the key to getting a good breakfast on climbing days. If water is a concern, treat all the water you'll need for breakfast and the hike the night before; that will free up at least 10 minutes in the morning for eating. Stash breakfast items at the top of your bear canister where you can reach them quickly.

Above all, resist the urge to skip breakfast. You can get away with that at home, but in the wil-

derness a light breakfast or no breakfast at all can ruin your whole day. Build your breakfast around complex carbs to provide long-lasting energy. You'll discover over time how much breakfast you need to perform well. Try to eat a quarter of your daily calories at breakfast.

Here are some breakfast ideas:

- Cooked grains such as oatmeal or Cream of Wheat. Add raisins or other dried fruit, brown sugar, milk and butter for extra calories.
- Cocoa. Boost the calories and the flavor with some dried milk.
- Cold cereal: granola, with dried milk and fruit
- Breads. If you carry bread from home, bring a dense bread that cannot be easily crushed.
- Bagels
- Pancakes. Only if you have time to clean up afterward
- Fresh fruit for first day; but you have to pack out the peel or pit.

LUNCH

Lunch in the mountains is a movable feast. Step-chew-step; repeat frequently. Many climbers start eating lunch right after leaving camp or the trailhead, and they don't stop eating until it's time to cook dinner. If you wait for a sit-down lunch, you may wait a long time for a very short meal break. You're constantly burning calories while hiking, and slow but constant eating ensures you never run short of fuel.

It's very easy to eat too little lunch because you're constantly moving. If you feel rundown by mid-afternoon, hunger may well be the culprit. Part of the solution is to carry food in your

TABLE 8-3. Typical items in a backpacker's pantry.

Item	Serving size (before cooking)	Calories
Breakfast		
Oatmeal	1.5 oz.	160
Dry cereal (granola)	1/2 cup	200
Bagel	2 oz.	130
Cocoa	1 oz.	120
Lunch/snacks		
Banana chips	1/2 cup	150
Raisins	1 box (1.5 oz.)	130
Peanut (nut) butter	1 T	100
Snicker bar	2oz.	280
Hard candy	3 pieces	70
Salami	1 oz.	120
Jerky: beef or other	1 oz.	80
Cheddar cheese	1 oz.	110
Peanuts or almonds	1/4 cup	160
Sunflower seeds	1/4 cup	160
Granola bar	1 bar (1.3 oz.)	130
Clif Bar	1 bar (2.4 oz.)	250
PowerBar	1 bar (2.3 oz.)	230
Dinner		
Instant vegetable soup	1.4 oz.	30
Pasta (dry)	4 oz.	420
Pasta (deli case)	3 oz.	230
Instant rice	1/2 cup	160
Olive oil	1 T	120
Sun-dried tomatoes	1/2 oz.	40
Freeze-dried tuna	2 oz.	60
Freeze-dried dinner (range)	3 to 6.5 oz.	200 to 400

Note: 1 tablespoon (T) = 3 teaspoons; 16 T = 1 cup; 1 cup = 8 oz.

pockets where you can easily reach it; don't stash everything in your pack. Train yourself to eat something every 15 to 30 minutes. Try to consume half your calories from lunch and snacks.

Look for foods that are both high in carbs and extremely easy to prepare and eat. The ultimate in mountain convenience is "Gorp" – short for "Good Old Raisins and Peanuts," though modern Gorp recipes frequently include a wide (and wild) variety of fruits, vegetables and nuts. Gorp is commonly eaten from a bag, often while walking at a brisk pace. Dried fruits and hard candy provide abundant carbs.

Other lunch or snack ideas:

- Hard candy
- Snickers or similar bars
- Cookies. Hard, small ones without chocolate. unless you really like eating sticky crumbs
- Kiwis. The furry fruit packs a lot of energy in a remarkably durable container.
- Jerky (beef, or other)
- Salami. A traditional favorite, though far too greasy for some
- Cheese. Pick a hard cheese like Cheddar. String cheese is better on a cooler day.
- Crackers. Pick hard crackers.
- Tuna and crackers packets
- PBJ: make a peanut (or almond) butter and jelly sandwich ahead of, or during, the trip.

TABLE 8-4. Calorie-loading your breakfast.

Item	Calories	Cumulative calories
Instant oatmeal (1.5 oz.)	160	160
Instant dry milk (2 T)	30	190
Brown sugar (1 T)	45	235
Raisins (0.5 oz.)	45	280
Cocoa	120	120
Instant milk (2 T)	30	150
Peanut butter (1 T)	100	250

DINNER

Dinner is by far the most leisurely meal of the climber's day and usually the most calorie-laden. The big logistical challenge is nightfall. You should assume when you plan your meals and when you buy your equipment that you may be preparing, eating or cleaning up your dinner after dark. Headlamps are necessary.

Dinner on Sierra Club trips often begins with a potluck happy hour or "garbage bag" salad. You may start with soup, then a main course and sometimes dessert. This is a good time to eat fats; they take longer to digest than carbs do and will help keep your body warm at night. You can easily add fats like olive oil to a variety of carb-rich foods such as pasta and rice.

Here are some dinner basics:

- Packaged soups. Avoid bouillon cubes as they contain only 5 to 10 calories; you can do much better. Miso packets are a handy choice.
- Pasta or rice. Fine carbs which are easily flavored with spices and sauces.
- Rice noodles / Ramen
- Mashed Potatoes: Idaho brand dried. Just add butter.

Sauces:

- Olive oil (plus garlic)
- Pesto. This concoction of basil leaves, olive oil, cheese, garlic and pine nuts is very rich.
- Freeze-dried tuna, salmon or chicken. A great way to add proteins to your meal.
- Asian sauces and condiments

- Indian curries
- Chilis, Mexican flavors... and more.

FREEZE DRIED FOODS

Freeze dried foods are dehydrated in a special way that retains color and texture better than conventional methods. Typically, they're sold as complete dishes that only require boiling water to prepare. Try them at home before taking on trips as some hikers have found certain meals unpalatable. Many packages have two servings, which may be too much for one person. Consider dividing them up for two meals or splitting them with another hiker. They can be repackaged as they remain good for about a week after opening.

- Read the instructions. Thoroughly mix contents with boiling water to avoid crunchy bits in the corners.
- Putting the meal pouch inside a cozy or your jacket can keep it warm while it rehydrates. At altitude, this may take as long as 20 minutes.
- For long rehydrations, consider starting with half of the required water then adding the remaining boiling water partway through. Or, simply cook in a pot.
- If you add too much water, you can use instant mashed potato powder to absorb the excess.
- A long spoon makes eating from the pouch easier and neater.

DESIGNER FOODS

Energy supplements such as Clif Bar, PowerBar, and GU Energy Gel promise a quick burst of carbohydrates in a very small package. However they may sacrifice taste for all that energy.

Before you stow several of these in your pack, buy one and taste it; energy bars do no good if they're uneaten in your pack. Sports drinks add flavor and, more important, carbohydrates and minerals to water. When the weather turns hot and the climbing becomes strenuous, sports drinks earn their place in your backpack.

FOOD STORAGE

Most popular backcountry areas require bear canisters for food and scented item storage during months when bears are active. Even when not required, bear cans are highly recommended. (The counter-balance method of hanging food sacks is not included in this handbook.) The following information pertains to food storage in black bear habitat during prime camping seasons. Food storage techniques differ in grizzly bear habitat (e.g. Alaska, NW US and Canada).

A bear canister is an effective method of protecting scented items from bears and keeping out intruders such as marmots and squirrels. They work because bears are generally unable to get to the contents. They can smell what's inside, bat cans around and attempt to pry off lids, but in most cases, they can't get into the canister.

Anything that has a scent goes into a bear canister. Food, toiletries, trash, first aid supplies, gels, creams, candies, cleaning supplies, even scented dental floss all need to be stored when not in use, on your back or in your pocket. Careful preparation is required to fit everything inside. Consider these guidelines:

1. Choose food and scented items that are compact and that won't squish.
2. Repackage and pre-measure meals.
3. Choose non-bulky or flat items such as tortillas or pita bread instead of bread or bagels.
4. Choose small packaged toiletries or place them in small, refillable containers. Only take as much as you'll need.
5. Pack strategically with the last day's meals and seldom used products at the bottom.
6. Take advantage of every square inch of space. You may have to force or squish items into the can in order to make everything fit.

7. Make sure everything fits before leaving home. If not, either eliminate items or consider carrying an additional bear can.

8. Carry the first day's meals outside the canister. Make sure to leave room for the trash in the canister.

During the day, scented items in your pack or pockets while hiking are fine. Items out of the canister should be within arm's reach at all times. If you leave your pack for any length of time, place all scented items in the canister.

At night, place all scented items in the canister. Make sure the canister is closed and 'locked." Place it at least 50 feet from your cooking and sleeping areas. Place it on the ground in the open, not where it can get lodged or wedged by rocks or trees which can provide the bear extra leverage. For obvious reasons, don't place it on the edge of a cliff.

Backpacker's Cache ("Garcia") can. Most ranger stations rent this one. Easy to open. A bit heavier. Good stool to sit on.

BEAR CANISTERS: Two Examples

Bear Vault; 2 sizes. Smaller size is great for shorter trips. Can be tricky to open especially if dirt or sand gets on rim.

In places (or seasons) where large animal scavengers are not a problem, softer containers (sacks) may be acceptable. Hanging sacks in trees can work if done properly (e.g. by counter-balance method), but not as a subsitute for cans when required.

ADVICE FOR THE WILDERNESS CHEF

Things happen in your wilderness kitchen that simply could never happen at home. When the lights go out, they really go out. Even the worst plumbing problem at home can't compare with a Sierra thunderstorm. One of the keys to eating well outdoors is to adjust to the circumstances.

First, remember to **clean your hands** before you prepare or eat food. This is critical. You can't wash your hands by rubbing soap on them in the nearest stream (see Chapter 5 if you've forgotten why not). Instead use biodegradable soap and water from your bottle, keeping at least 200 feet away from running water; or else use a hand sanitizer or packaged antibacterial wipe. Proper hygiene is a big deal: Illnesses can easily spread from your dirty hands to food to your mouth and to others' mouths.

Second, **know your stove**. Practice assembling and lighting it at home. If it's a self-igniting model, bring matches, just in case the ignition fails. As you gain experience, note how many minutes or hours a given quantity of fuel will last; this will help you avoid running out of fuel on future trips.

Third, the boiling point of water drops – and cooking time rises – with altitude. The general rule of thumb is that a 10°F drop in boiling temperature will double cooking time. The boiling point drops by 10°F from sea level to 6,000 feet and another 10°F, to about 192°F, at 11,000 feet. Something that takes 5 minutes to cook in boiling water at home will take 20 minutes at 11,000 feet elevation.

Fourth, while at home clearly write out labels and recipes for your food. After a long day in the wilderness, you may not be able to tell the difference between brown sugar and brown rice.

Finally, remember that food is more than a necessity. It is one of life's pleasures. People bring big appetites and small expectations into the wilderness. If you bring enough food, you'll keep yourself and your companions happy. If you bring even a modest flair to the cooking, people will remember it like a 5-star restaurant meal.

FURTHER READING

Backpacker's Field Manual, The. 2nd Edition. By Rick Curtis. Three Rivers Press, New York (2005).

Eat, Drink and Be Merry. By Dr. Dean Edell with David Schrieberg. Harper Collins Publishers, New York (1999).

Food for Fitness: Eat Right to Train Right. By Chris Carmichael with Jim Rutberg and Kathy Zawadzki. G.P. Putnam's Sons, New York (2004).

NOLS Cookery. 6th Edition. Edited by Claudia Pearson, National Outdoor Leadership School. Stackpole Books, Mechanicsburg, Penn. (2012). Available many places and at NOLS sitore: https://store.nols.edu/products/nols-cookery

Wilderness Cuisine. By Carole Latimer. Wilderness Press, Berkeley (1991) wildernesspress.com.

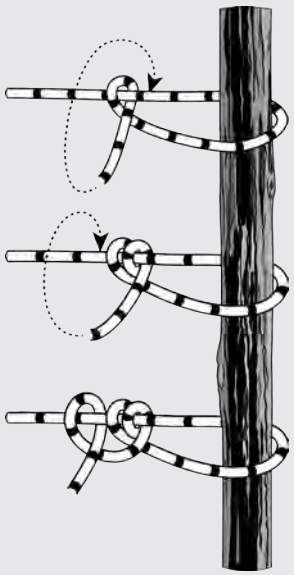
HOMEWORK

1. Prepare a meal plan, including water, for an all-day peak climb in the local mountains.
2. Prepare a meal plan for a typical summer backpack, starting after breakfast Saturday and concluding late Sunday afternoon. Assume a 2,000-feet peak climb on Sunday.
3. How would your meal plan for Saturday night at Snow Camp differ from your answer to Question 2? What special challenges does Snow Camp pose for meal preparation?

KNOT OF THE WEEK
TAUT-LINE HITCH

The Taut-Line Hitch forms an adjustable loop for use on lines under tension. It is easily adjusted and there a great choice for tent guy-lines or similar situations where periodic re-adjustment of tension may be needed.

Wrap the rope around the anchor object forming a loop. Make two half-hitches around the rope on the inside of the loop and a third half hitch on the outside. Rigorously tighten all the half hitches.



Approaching summit, Bloody Mountain | Patrick McKusky

CHAPTER 9
MOUNTAIN SAFETY

Many hikers and climbers enjoy a lifelong passion for being in the mountains without accident or injury. Others become victims in need of rescue, or, worse still, statistics. While bad luck can play a role, poor planning and poor judgment are often the primary causes of accidents.

WHY ACCIDENTS HAPPEN

Accidents rarely have a single cause. Rather, they tend to be the result of a chain of events. This chain can begin long before reaching the trailhead. A decision to bring along a less experienced group member, or to leave behind a certain piece of equipment that proves critical later on, can sometimes have unfortunate consequences.

Anticipating possible issues while planning a trip is an important safety skill. So is being flexible with respect to your plans once the trip is underway. Imagine setting out for a day hike, and discovering you have forgotten your headlamp. As the day wears on, you realize the hike is taking longer than expected. You can still reach the peak and get back to your car before sunset, but there won't be much daylight to spare. Should you turn around now, or continue? Without a headlamp, the risks of being caught out after dark if something unexpected happens may change your answer.

THE HUMAN FACTOR

Mountain hazards can be divided into two broad categories, objective and subjective:

- Objective hazards are potentially dangerous aspects of the mountain environment, such as rivers, rock fall and avalanches.
- Subjective hazards are the 'human factor' – how wilderness travelers relate to, and behave in, the mountain environment.

Some form of human error plays a role in almost every mountaineering accident. It's important to realize that having training and experience doesn't automatically reduce this risk. Three quarters of the people killed in avalanches in the US between 1981 and 2007 had some level of avalanche training. Of 41 such fatalities that occurred during the 1990s, human factors were identified as the primary cause of 34 of them, namely:

1. Overconfidence (15)
2. Attitude (12)
3. Group Management (8)
4. Complacency (6)
5. Poor communication (6)

(From Dale Atkins, Human Factors in Fatal Accidents, 1990–2000, *International Snow Science Workshop, 2000, pp. 46–51,* cited in Tremper, 2008*.)*

Being alone in the wilderness has an allure for many hikers. But deciding to go solo drastically reduces your options in the event of an accident, particularly in a remote spot where help may be a long time coming (if it comes at all). It's always prudent to travel with others when visiting the wilderness.

Group dynamics bring their own issues. Less experienced group members may follow more experienced climbers into trouble, perhaps lacking the confidence to voice legitimate concerns. Just because the person in front was able to traverse a slippery ledge doesn't mean it is safe to do so. Never hesitate to speak up if you feel a questionable decision is being made, or are faced with doing something that makes you feel uncomfortable.

If you have a group – keep it together. A group that can't stay together is often indicative of other problems such as a sick or out-of-shape member. Group members that are lagging behind often benefit from group support and may need specific assistance. When it appears that the group is not staying together. the trip plan should be reassessed. The original plan may no longer be feasible given the current group conditions.

AVALANCHES

Staying safe in avalanche terrain is not about knowing what to do if an avalanche occurs – it's about understanding how to avoid avalanches altogether. Most avalanches that result in accidents are triggered by human activity, often by the victim themselves. The weight of a person causes a weak layer in the snowpack to break from the neighboring layer. A large slide can start if stress fractures between layers of snow spread across an unstable, snow-covered slope.

Avalanches tend to occur on slopes angled between 30 to 50 degrees, with 35-45 degrees being the 'sweet spot' where snow is barely able to cling to the slope. The majority of avalanches happens within 24 hours after a big weather event. It is wise to stay off the slopes immediately after a storm even if the weather is good.

Look up and around you as you travel through snow-covered terrain, checking for slopes with the potential to avalanche. You may see signs of previous avalanches: fresh debris from recent slides, or avalanche paths devoid of vegetation visable on a forested hillside.

Avalanche forecasts are available for many popular skiing and winter mountaineering areas, including the Eastern Sierra. Check the avalanche advisory at www.esavalanche.org before your trip. If you plan to venture into the mountains in winter, taking a three-day / 24 hour AIARE Level 1 course is highly recommended.

FALLING ROCK AND ICE

Falling rock, ice, and other objects are the third leading cause of mountaineering accidents (behind the climber falling on rock, or falling on snow.) While rock fall can be triggered by ice and snow melting in the afternoon sun, other climbers are often the cause. If you dislodge something on the hillside, or see something fall, yell "rock!" regardless of whether the object is a piece of rock, wood or a water bottle. Climbers below you appreciate a quick, unambiguous signal more than an accurate description of the object that may be about to hit them.

If you hear somebody immediately above you shout "rock," do not look up! Press yourself close to the rock wall, or duck behind an object that offers some protection. If you hear someone yell "rock" from a distance above you, you may have time to look up and locate the object in order to dodge it.

When following each other up a steep, loose slope, keep the group close together so that any dislodged rocks do not have time to pick up speed before reaching other group members. If possible, spread out across the slope so that nobody is immediately below other group members. Pay careful attention if a switchback forces some group members to cross above others. It may be necessary to move through short sections one person at a time, with group members below safely out of the way.

Helmets should be worn in steep, loose terrain. A properly fastened helmet is secured tightly enough that it will not be pushed back by a hit, exposing the forehead to a second impact. Keep in mind that the protection provided by helmets is limited.

STREAM CROSSINGS

Crossing a stream or river is one of the most dangerous aspects of wilderness travel. Spring

snowmelt or an abundance of rain can turn placid streams into raging torrents. For a shallow stream crossing, you may use lengthened trekking poles to stabilize yourself, but care should be taken to avoid getting them stuck between rocks.

Standing up in a stream or river that is deeper than knee height is more difficult, especially if the current is strong. Ropes should not be used as safety tethers for a wet crossing without specialized training. It is easy to become entangled in the rope, at which point a strong current may drag you underwater.

Scout upstream and downstream, searching for a slow, shallow stretch of river to cross. Avoid crossing with trees or rocks in the water downstream of the crossing point, as these can act as 'strainers' against which the force of the water can pin a floating log or hiker swept downstream by the current.

Wear hiking boots or other study footwear for any wet crossing. You may want to remove socks, insoles and even pants to keep those dry, but sturdy footwear is essential. Before entering the water, release the belt buckle and sternum strap of your backpack, and loosen the shoulder straps, making it easier to escape your pack if you fall in the river. Take this same precaution when crossing on a log above deep water. If you cannot avoid a wet crossing, face upstream with your legs wide, and use a sturdy stick or pole to create a tripod. (A trekking pole may be too weak for this purpose.) Move slowly across the current, using the stick to maintain two points of contact with the riverbed at all times. Group crossing techniques use similar principles: group members hold onto each other as they enter the water, taking turns to move in small steps.

In deeper water, getting a foot stuck between rocks on the streambed ('foot entrapment') can allow the current to drag you under the surface, leaving your companions very little time to attempt a rescue. If you are swept off your feet in a river, do not try to put your feet down on the river bottom. Rather, swim to shallower water while keeping your feet near the surface. Stand up only where the water is knee height or shallower.

Generally, never cross a stream unless you can do so safely.

For more on stream crossings, see *Freedom of the Hills*, 9th ed., Ch. 6, p. 136-137.

Snow bridges pose a special hazard in the winter and especially the spring. Drifting snow can form a 'bridge' over a creek, giving the appearance of an unbroken ground surface when in fact a rushing torrent of cold water lurks beneath. Stay alert for the sound of running water under the snow, and use trekking poles to probe ahead of you to see if the snow is solid.

WEATHER AND LIGHTNING

Big mountains create their own weather. Moist air moving in from the ocean is forced up and over a mountain range, causing the moisture to condense into clouds and rain. In the Sierra Nevada, this typically means watching out for storm clouds gathering from the Pacific Ocean to the west. During the summer monsoon season, southern California mountains can expect clouds from the south, generated by waters off the coast of Baja California.

Thunderclouds bring with them the potential for lightning. During the summer, thunderclouds form over the peaks of the High Sierra in the mid-to-late afternoon. Just as an early start in winter aims to get you down from the peak before the heat of the sun destabilizes the snow, an early start in summer gives you the best chance of avoiding afternoon thunderstorms. For this reason, mountaineers aim to summit by noon, and leave the summit before 2 p.m.

Lightning strikes higher elevations more frequently than lower elevations. Summits and ridges are extremely unsafe places to be

in a thunderstorm. If you see or hear a storm approaching, seek out safer terrain immediately!

Ground current can travel 50 yards from the point where lightning strikes the ground. Sheltering just below an exposed, rocky outcrop or in a shallow cave does not offer the best protection. Trees do not provide protection either, because they can act as lightning rods. A lightning strike can send wood or rock chips flying like shrapnel.

If the terrain prevents you from moving to somewhere less exposed, spread the group out as much as possible, and kneel or sit on the ground on top of any sort of insulation available (a foam pad or backpack, for example). Never swim or wade during a thunderstorm.

Extremes of heat and cold encountered in the mountains also pose a hazard. Staying properly hydrated is critical both in very hot and very cold conditions. See Chapter 7: Wilderness First Aid for a discussion of how to identify and treat temperature-related injuries.

WILDLIFE

Attacks by wildlife tend to loom larger in the imagination than in fact. In North America, you are about 50 times more likely to be killed by a lightning strike than from being bitten by a venomous snake. Of 2,800 snakebites reported in 2003, only one was fatal. And while bear attacks receive a lot of coverage in the media, unprovoked predatory attacks on humans are extremely rare.

California's state flag honors a species of brown bear, the grizzly *Ursus californicus* that has been extinct for almost 100 years. Today, California's bears are of the omnivorous Black Bear variety, although they actually range in color from black-brown to blonde. Less formidable than the "grizzly" or brown bear roaming the Northwest, Montana and Alaska, they nonetheless deserve respect – especially when they are protecting their young or dining on trash in your back yard.

Wildlife isn't "out to get you." Don't make wildlife feel that you are "out to get it." Avoid approaching, and especially feeding, wild animals, whether deer, mountain lion or bear.

Other than during winter hibernation, bears require quite a bit of personal space. If you get too close, a bear will either fight, or flee. Two hundred yards is generally considered a safe distance. Avoid startling bears, especially in forests and thickets. Talking loudly to your companions can be effective, or shout "Ho! Bear!" every so often to announce your presence.

If a black bear approaches, stand your ground. Do not run or try to climb a tree, as this will elicit a chase response from the bear -- and she can run faster than you. Bears recognize that standing your ground suggests you are not intimidated, whereas backing away too quickly suggests that you are afraid. At camp, bang pots and pans, shout, and throw small rocks towards (but not at) the bear.

See Ch. 5: Wilderness Ethics for details of proper food storage in bear country.

Staying safe in the mountains is a broad topic. The best way to ensure your safety is to be prepared — which is what taking WTC is all about. Refer to previous chapters in this handbook and Freedom of the Hills for reminders about first aid, gear, snow travel, camping, navigation and much more.

FURTHER READING

Avalanche Essentials. By Bruce Tremper. The Mountaineers Books (2013).

NOLS Wilderness Mountaineering, 3rd ed. By Phil Powers. Stackpole Books (2009).

Backcountry Bear Basics, 2nd ed. By Dave Smith. The Mountaineers Books (2006).

Accidents In North American Mountaineering. Published annually by the American Alpine Club.

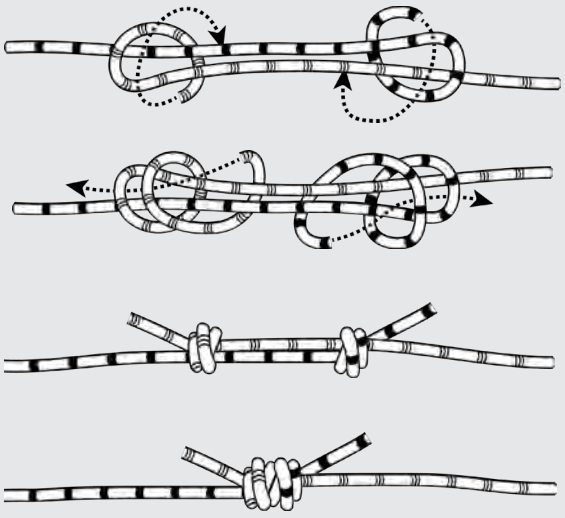
KNOT OF THE WEEK
DOUBLE FISHERMAN'S KNOT

The Double Fisherman's Knot 'is a simple and effective way to join two ropes securely even if they are of different diameters. Is is also easy to recognize if it's tied correctly. The downside of the Double Fisherman's Knot is that it can be very difficult to untie once weighted.

Tie a Double Overhand Knot with one rope around the other. Then repeat this with the other rope.

Each Double Overhand Knot forms a stopper knot that won't slide through the other.

DOUBLE FISHERMAN'S KNOT



Climbers atop North Maggie Mountain | Richard Boardman/Bob Beach

CHAPTER 10
THE TRAIL FROM HERE

For the past 10 weeks, WTC instructors have taught you the basics of wilderness travel. Now it's your turn to take the lead on the trail to graduation.

FINAL EXAM

Only two items are needed to take the final exam: a pen or pencil and a compass. The exam will be collected during Class 10. If you have paid attention, there should be no surprises. During class, instructors will review any missed questions with you, answer any questions you may have about wilderness travel and talk about the trail ahead.

AFTER SNOW CAMP... NOW WHAT?

Get out there; hike, climb, backpack. In particular, focus on the two experience trips required for graduation. Whether you choose Sierra Club trips or private outings, hiking, backpacking and climbing are the best ways to build on lessons learned during the course. While you'll most likely not construct an igloo in summer, virtually everything you did at snow camp applies in every other season of the year. For your next adventures, you can expect new wrinkles: permits and quotas, variable weather conditions; critters such as bears, rodents, snakes and mosquitos; gear items from bear canisters to water filters. And you won't be alone. You'll be sharing the Sierra with a lot more people – and pack animals – especially during the popular summer months. Consider these topics as you plan your outings.

Desert vs. Mountain Trips

During WTC, you were able to experience both types of terrain in winter. Where you decide to go next may be a matter of taste in scenery or convenience. Deserts and SoCal mountains are scenic and close. Spring and late fall are particularly worthy. However, during much of the year a desert trip will present complications

WTC GRADUATION REQUIREMENTS

If you:

- Attended all 10 classroom sessions*, and
- Attended all four course outings*, and
- Passed the Final Exam.

*Note: If you missed a class session or outing, group leaders can help suggest activities or opportunities to make-up the experiential learning.

Now you only need to:

- Complete two post-course experience trips,
- Send your completed Student Record Card to your area registrar, and
- Attend Graduation which is optional

About Experience Trips:

- Both trips must be overnight backpacks with substantial cross-country travel. One must aim for the summit of a mountain.
- The trips can be scheduled Sierra Club trips or non-scheduled trips of your own. Any Sierra Club trip sponsored by Angeles Chapter must be rated "I," "M" or "E."
- A trip that turns back without reaching the summit, due to weather or other safety-related reason, may count as an experience trip provided most of the route was completed and substantial off-trail or class 2 (or above) terrain was encountered.
- Note: If you have not yet completed all graduation requirements, you have up to one year to make them up and graduate. Hold on to your Student Record Card as this is your record of what you have completed. Experience trips need only be entered on your Student Card and turned in to your area registrar. Your group leader can approve any class or outing make-up activities.

such as heat, carrying enough water and staying hydrated. By summer, local mountains will pose the same challenges. For trips to the Sierra Nevada, add altitude to the mix, along with weather, streams and bears. But the glorious scenic photo ops, the attainment of a goal and bragging rights are definitely worth it.

Factors to Consider

Heat: Obviously, heat is a major consideration for a desert trip in any season but winter, but it is also a factor in the mountains in summer. Review the signs of heat-related illnesses.

Sun: It goes without saying, sun protection is essential in desert or mountain terrain.

Water and nourishment: No matter where you go, stay hydrated and nourished. Consider the amount of water needed, its weight, balanced with how much else you need to carry.

Altitude: Whether or not you experienced altitude trouble at snow camp, plan acclimatizing hikes before you attempt any mountain backpacks in the Sierra or similar elevation.

Streams: After the snow starts melting, mountain streams rise and creeks can become rivers. Stream crossings need to be approached with caution. (See Chap. 9)

Bugs: Where there's a lush green meadow bursting with wildflowers, there will be bugs. Mosquitoes, no see-ums are out to make you miserable. Break out the headnets, the sprays and carry on.

Weather: Often a product of monsoonal moisture, afternoon thunderstorms can suddenly appear and chase you off high ridges, or even deliver snow in late summer.

Wildlife: Marmots are cute but they want your stuff. Above all, Be Bear Aware: in most mountain areas, bears are such a problem that no food or scented items – even chewing gum – can be left inside a car. Many trailheads have bearboxes for backpackers' storage. Label stored items with your name and exit date.

Gear: Lightening up

You can travel lighter during the summer, especially if the weather is going to be hot. But going lighter does not mean leaving out proper gear. The "ultra-light backpacking" philosophy only works when you have enough self-knowledge and experience. You will need to become familiar with your own needs in the wilderness. What can you do without? Do you really need that extra sleep pad? Slippers? A chair? Your sleeping bag will probably be a 20-40 degree bag, lighter than the 0 degree bag you took to snow camp. Your comfort level depends on what you are willing to do without, or can replace with lighter weight items. Remember that you can share some items, but you will always need protection from sun, wind, and unexpected cold and rain.

Packing for summer trips

The key factors for packing are similar to snow camp: plan ahead and test any new or unfamiliar gear. A bear canister is best carried inside an internal frame backpack, so be sure it fits. We recommend packing the heaviest items close to your back, but individuals can vary in how they handle heavy loads. Consider whether you are sharing gear and food with someone else. Pack ahead of time and arrange to share the heaviest items.

Know Yourself and Your Limitations

WTC provides you with a starting point. With each trip that you do, you will learn more about how you personally handle what the outdoors has to offer. Staying in shape is key. Hiking, backpacking and mountain climbing are more fun when you are in good condition. Take note of the gear that you actually use, and the food you eat. Learn from others on your trips, from leaders and participants alike. Learn what works for you and what doesn't. Learn what kind of trip suits you and when to back off. Wherever you go, always remember the Leave No Trace principles, carry the 10 Essentials, and use common sense.

THE CLIMBING SECTIONS

The Angeles Chapter sponsors thousands of outings every year. But the most challenging climbs tend to be sponsored by four groups:

- **Wilderness Training Committee (WTC).** In addition to the class, WTC leads dozens of outings every spring, summer and fall. All but of a few of these outings fulfill WTC graduation requirements. Many of these trips are cosponsored with other climbing sections as a way of introducing students to those sections. WTC leads a handful of "restricted" outings – trips that are restricted to Sierra Club members with mountaineering experience; in general these trips are not appropriate for recent students. Visit: *http://wildernesstravelcourse.org*.
- **Sierra Peaks Section (SPS).** A typical SPS trip starts with a long, fast backpack in, one or more peak climbs (sometimes technical) and a long backpack out. The norm is to drive up Friday night and drive home late Sunday. Most SPS trips will qualify as a WTC experience trip, but be sure you are properly equipped, in *good condition* and capable. SPS sponsors a number of intro trips each summer, often in partnership with WTC. Unless you are exceptionally strong and experienced, stick with intro trips until you are ready for more challenging trips. For more information visit *https://sierraclub.org/angeles/sierra-peaks*
- **Desert Peaks Section (DPS).** Specializes in desert peak ascents. During the winter, deep snow makes Sierra peaks difficult and hazardous. In the desert, meanwhile, winter makes for near-perfect climbing weather. Desert peaks offer a special variety of climbing problems. No wonder that many climbers divide their time between the Sierra in summer and the desert in winter. DPS trips are an excellent place for WTC students to gain additional experience. For more information go to *http://desertpeaks.org.*
- **Hundred Peaks Section (HPS).** Specializes in peak ascents in the local mountains reaching as far north as the southern Sierra. HPS leads challenging outings lasting a day or a weekend. Challenge yourself as you gain experience and wisdom from HPS leaders; build that resume as you improve your conditioning in local mountains before you go into the Sierra or beyond. For more information, visit *http://www.hundredpeaks.org.*

OTHER ACTIVITY SECTIONS

The Chapter also hosts entities that sponsor a range of activities from bus trips, travel adventures, trail maintenance, conditioning hikes, to themed trips, laking adventures and more. Below is a sample. Visit: *http://angeles.sierraclub.org/about_us/whats_your_passion/activity_sections_committees*

- **Wilderness Adventures (WAS).** Peaks, lakes, car camps and NPS treks. *http://www.wildernessadventuresla.org*
- **Santa Monica Mountains Task Force** and **Forest Committee**
- **Backpacking Committee.** Exactly what it says. *http://angeles.sierraclub.org/backpacking*
- **20s & 30s Section.** Car camps, hikes and more. *http://www.sc2030singles.org*
- **Orange County Sierrans Section**. Conditioning, local hikes, ski trips and international travel adventures: *http://angeles.sierraclub.org/ocss/*
- **Natural Science Section.** Geology, Botany and more. Learn while you earn environmental awareness credits: *http://www.sierraclub.org/angeles/natural-science*
- **Gay and Lesbian Sierrans Section.** *http://www.sierraclub.org/angeles/gay-lesbian-sierrans*
- **Mule Pack Section.** When you just want to travel light. *http://www.sierramulepacks.org*

Regional Groups also offer hikes, events and more. Find your regional group here: *http://angeles.sierraclub.org/about_us/regional_groups*

SELECTING A SIERRA CLUB TRIP

The first place to look for outings that qualify as WTC experience trips is on the WTC website. The WTC Newsletter is another source. The Spring edition, usually available near the end of the course, will have the biggest selection of trips. Your group leader may let you know when new trips are posted on the website, so be sure to stay in touch.

Other Sierra Club groups and sections offer a variety of outings, from backpacks to mountain climbs to social hikes. Some outings meet graduation requirements and others are outings just to enjoy. If you plan to use a trip to fulfill graduation requirements, make sure that the trip fills all the graduation prerequisites.

Read the trip write-ups. Note the equipment needed, technical difficulty (such as comfort on Class 2 or above), physical difficulty (length of backpack, altitude gain, number of days) and special requirements such as your experience, Sierra Club membership or other restrictions.

You may want to consult with your group leaders regarding whether a trip is right for you.

Signing up for a trip

Once you have found an outing you are interested in, contact the outing leader. Leaders and participants typically communicate by e-mail. Feel free to ask questions or share any concerns you may have about the outing. Be aware that Sierra Club leaders are volunteers so use common courtesy and be patient for a reply.

It is common for outings to fill up and prospective participants be put on a waitlist. Resist the temptation to sign up for a different trip that may be outside your comfort level because you were waitlisted for a trip suited to your ability. If you join a trip that is not an appropriate match with your skills and interests, it's less likely to be an enjoyable experience for you and could compromise the trip objective for the entire group.

If your availability changes after you request to join a trip (even if you are on the waitlist), be proactive and notify the leader right away.

The trip leader will have obtained any necessary Wilderness Permits and you may be asked to share in the expense of the permit ahead of the trip.

Hiking/Climbing Resume

Leaders want to know about your experience and conditioning to help them determine whether the outing is suitable for your experience level. The more challenging the outing, the more critical this information becomes.

The preferred method to convey this information is with a simple hiking resume (see example on page A-13 at the end of this handbook). List your recent hikes, backpacks, or climbs and include the date, distance, elevation gain, etc. Also include your CURRENT conditioning routine. It is also helpful to include any relevant or specialized experience you may have along with any noteable outings you may have done in the past.

Contacting a leader by email

- Include your contact information, WTC area/group, and hiking resume.
- Be sure to put the name of the trip, with dates, in the subject line of your email. "Your Trip" is too vague for leaders that lead multiple trips.
- The trip write-up frequently asks for information that the leader finds relevant to the outing. Be sure and include all requested info.

SELECTING A PRIVATE TRIP

Private trips can count towards graduation, provided they meet the requirements. You can ask the organizer of the trip, or look at the plan to see if it qualifies. Often there is no formal leader on these trips; everyone helps plan and lead. Although these trips can be more spontaneous than scheduled Sierra Club trips, they still require careful planning.

If you feel confident in your skills, you can organize your own private trip that can count toward graduation if it meets the requirements. See the Trip Planning section in this chapter and the *Non-scheduled Experience Trip Record Form* at the end of the Appendix. Your group leaders are great resources for reviewing a private trip plan. Consider asking for their opinion as you plan the trip to be sure it qualifies.

A TYPICAL EXPERIENCE TRIP

Backpacking outings usually begin with a long drive. For a 2-day weekend trip, participants often carpool after work on Friday, unless they are able to leave earlier in the day. When carpooling, every participant should be clear on meeting points, dinner expectations, equipment and cost sharing. **Remember: carpooling is not part of the actual Sierra Club outing**.

At many trailheads, backpackers may be able to sleep in their vehicles or in their sleeping bags on the pavement. Or, there could be a nearby campground site available; you will probably need to arrange this ahead of time. The trip leader can offer some suggestions on where to catch some sleep before the morning start. At the appointed meeting time – typically 7 or 8 a.m. Saturday – every participant must be fully packed, with boots tied and cars locked.

Participants on Sierra Club trips are expected to follow the Rules of Conduct, including signing the liability waiver for the trip. (See Introduction in this Handbook.)

In addition, participants are expected to be ready on time, properly equipped, and in adequate physical condition. A cheerful attitude is optional, but appreciated.

During a trip that includes a peak climb, the group backpacks to a base camp and sets up tents. The group may immediately go for the peak or wait until the next morning.

Tip: Remember the basic precepts of efficient hiking: keep a steady stride and regulate your breathing, fix any boot or clothing problems at the first opportunity, stay hydrated and fed. The goal is to stay comfortable and safe.

In the evening, the group usually eats together, sometimes supplemented by a happy hour potluck or a "garbage bag" salad. Early the next day the peak is climbed, if it hasn't already been done, or a second peak or lake destination may be attempted. Then the group packs up and heads out. After getting back to the trailhead, some or all of the group may reunite for a meal together in town. This is a good time to ask the leader to sign your WTC Student Card.

After a long day, the drive home may be the real crux. Make sure that you are adequately rested before driving home. Pull over to a safe place and take a nap, or let someone else drive if you find you are getting sleepy. When you get home, dry out and clean your gear before putting it away. See Gear Maintenance at the end of this chapter.

After all other requirements are complete, send your completed Student Record Card to your area registrar. You may be able to scan and send your card via email and ask for a response. Keep a copy of the card for your records.

If any of the experience trips were private, make sure to include the Non-Scheduled Experience Trip Record Form in the Appendix and send the completed form to the area registrar along with your Student Record Card.

GRADUATION – AND AFTER

Congratulations! You did it!

The culmination of all the hard work is rewarded by the WTC graduation. It's a fun gathering of your new friends, where you can swap stories and share photos. Each area conducts its graduation gathering at a local spot in the fall. Make sure to get your student record card completed and shared with your area registrar in time to get your completion certificate.

You are welcome to attend graduation even if you did not complete the course.

TAKING THE LEAD

The Angeles Chapter welcomes new leaders along with the skills and ideas they bring. The chapter's Leadership Training Committee offers a one-day seminar for leader candidates every April and October. LTC also sponsors several "checkoffs" year-round where leaders can practice and be tested in navigation, rock and snow. Visit *http://angeles.sierraclub.org/ltc_become_a_leader*.

The Chapter Safety Committee certifies leaders at the following levels:

- **O-1 and O-2** leaders go on trail; O-1 for day hikes, O-2 for overnight backpacks. Requirements for both ratings include the seminar, first aid and CPR classes. Read about requirements on the website and in the Leaders Reference Book (LRB, see link below). A candidate must lead one provisional outing at the desired rating level, assisted by an experienced leader rated at that level or higher.
- **I** leaders go cross-country. Requirements include the seminar, wilderness first aid, CPR, two days of environmental awareness training and successful completion of the navigation checkoff. A candidate must lead two provisional outings, one of them a backpack and both assisted by an experienced leader rated I or higher.
- **M-Rock, M-Snow and M** leaders can go on third-class rock (M-Rock), or in snow where an ice axe is necessary (M-Snow), or both on the same outing (M). Requirements mirror that of an I leader plus, successful completion of a written exam. A rock and/or snow checkoff is also required. A candidate must lead two provisional outings.
- **E-Rock, E-Snow and E** leaders go on fourth-class rock and/or steep snow requiring ice axe and crampons. Requirements include E-level technical checkoffs (navigation, rock and snow) plus an E level written exam. A candidate must lead three provisional outings.

Students who graduate WTC already have most of the basics needed to be O- or even I-rated leaders. Many have participated in challenging cross-country trips, already acquiring rock and snow skills to aim higher. Most of the people who pursue advanced ratings in the Chapter are past WTC students and/or current WTC leaders. Maybe you'll be next.

LTP seminar, more on ratings and link to LRB: *http://angeles.sierraclub.org/ltc_leadership_seminar*

After Graduation

- Keep hiking. You have done more than you might have thought possible ten weeks ago. Keep up with your conditioning. Plan trips. Share your pictures and your enthusiasm with your family, friends, and coworkers.
- Join the Sierra Club if you're not already a member. There's sure to be a group or section in the Angeles Chapter that's right for you. Try different outings to find a group that fits your style and interests. WTC graduates have a reputation for being prepared and in shape. That makes you welcome on most trips.
- Become a Sierra Club outings leader.
- Inquire about becoming a WTC instructor.
- Stay in touch with your group leader and instructors.

TRIP PLANNING

Whether you're planning an experience trip with fellow WTC students or a private weekend in the Sierra with family and friends, a few simple steps make the difference between a great time and a disaster:

- Pick an area you want to visit
- Research the route using topographic maps, guidebooks and trip reports
- Pick a date, and be sure you're ready for the worst that season can deliver – whether it's heat, deep snow, or swift water.
- Decide what type of trip you're prepared to organize: overnight or multi-day, short or long, how much distance cross-country, how many participants, fast- or slow-paced. You can lead an epic trek – or do a weekend pleasure jaunt – without leaving California
- Get the necessary wilderness permits. Apply early, since many areas fill up fast especially in quota season. If you can't get a reservation, you might take a chance on a

last-minute opening for a small group. Most ranger stations hold a limited number of walk-in permits

- Prepare a trip leg and trail profile. See Ch. 3 for details. Be sure to remember "squiggle factors" for the number of participants and the cross-country distance
- Factor in any special requirements such as water for a desert trip, or bear canisters for a Sierra or SoCal mountain trip
- Determine start and end time for each day Give yourself a couple of extra hours of daylight each day, just in case you encounter something unexpected
- Be sure that someone back home knows where you are going and when you expect to return. Carry emergency contact information for each participant
- Establish a "turn-around time" for any climb or extended hike. Getting down safely is part of the trip, so respect and obey your turn-around time
- Identify good campsites in advance. Select a site that is environmentally appropriate, near water and safe from landslides or other physical dangers
- Be aware of changing weather conditions.
- Practice Leave No Trace principles on any trip that you lead or participate in
- Finally, if you're traveling in a group, appoint a leader and a sweep. Never leave someone behind.

MAPS AND PERMITS

A majority of the most popular hiking areas in California and the Southwest are controlled by one of three federal agencies: the U.S. Forest Service, the National Park Service or the U.S. Bureau of Land Management.

Permits: The Forest Service and National Park Service routinely require wilderness permits for overnight backcountry visits.

Once you've decided where to go and reserved permits, you'll need maps.

AAA or similar type roadmaps are great for everything from freeways to country roads. If you expect to be driving any distance on park or forest roads, you'll need land agency maps. Forest Service maps are particularly valuable because they show even the most obscure dirt roads with their county designations as well as private in-holdings. You can get these maps at ranger stations or park offices.

Waterproof Tom Harrison brand maps provide convenient overviews of well-traveled areas such as the Mount Whitney region, Yosemite, and local mountain areas such as the San Gabriels.

The gold standard for topographic maps is still the 7.5-minute series published by the **U.S. Geological Survey** (the ones we use for the course and for navigation events). The most likely place to get a 7.5-minute series topo map is the USGS online store where you can search by zip code, address, or by navigating an interactive map that helps you isolate needed quadrangles. The map locator provides the option to order printed maps or download a scanned map image in PDF format (current or historical). See Trip Planning Resources at the end of this chapter for more information.

Mapping resources like **Caltopo** let you survey the equivalent of several hundred 7.5-minute maps, zoom into the one or two areas that interest you, profile several potential routes and print a full-color map.

Dozens of guidebooks offer exhaustive information on favorite hiking areas. One of the best is *The High Sierra: Peaks, Passes and Trails* by longtime Angeles Chapter climber R.J. Secor.

The next pages contain a few resources: A Trip Planning Resources page, a Backpacker's Gear List and tips on maintaining and storing your gear.

TRIP PLANNING RESOURCES

There are tons of additional resources on the web for planning and information. Here are a few of our favorites.

Trip Planning and Permits

- Angeles National Forest - *www.fs.fed.us/r5/angeles*
- San Bernardino NF - *www.fs.fed.us/r5/sanbernardino*
- San Gorgonio permits - *www.sgwa.org/permit.htm*
- San Jacinto State Park - *www.parks.ca.gov/?page_id=636*
- San Jacinto permits - *www.fsva.org/pdf/Wilderness%20Permit%20App%20MSJW.pdf*
- Los Padres National Forest - *www.fs.fed.us/r5/lospadres*
- Santa Monica Mountains - *www.nps.gov/samo*
- Inyo National Forest - *www.fs.fed.us/r5/inyo*
- Sequoia Kings Canyon National Park - *www.nps.gov/seki*
- Yosemite National Park - *www.nps.gov/yose*
- Mojave National Preserve - *www.nps.gov/moja*
- Joshua Tree National Park - *www.nps.gov/jotr*

Sierra Club Info, General Info and Trip Reports

- Sierra Club Angeles Chapter Outings Sections - *http://angeles.sierraclub.org/about_us/whats_your_passion/activity_sections_committees*
- Sierra Club Angeles Chapter Regional Groups - *http://angeles.sierraclub.org/about_us/regional_groups*
- Summit Post - *www.SummitPost.org*
- Climber.Org - *www.climber.org/TripReports*
- Sierra Info - *www.sierrawild.gov*

Map, Compass and Navigation Tools

- CalTopo - *http://www.caltopo.com*
- Google Earth - *http://earth.google.com*
- Declination - *https://www.ngdc.noaa.gov/geomag-web/#declination*
  - Mobile version available at *ngdc.noaa.gov*
- USGS maps (click the Map Locator button): *https://store.usgs.gov*
- National Geographic free printable maps: *http://www.natgeomaps.com/trail-maps/pdf-quads*
- New generation (USTopo) and related information: *https://nationalmap.gov/ustopo/index.html*
  - Mobile apps such as AllTrails, Topo Maps, etc.
- BLM, USFS Geocommunicator - *http://www.geocommunicator.gov*

Weather, Current Conditions and Hazards

- National Weather Service / NOAA - *www.weather.gov/*
  Mobile apps are also available: weatherunderground, etc.
- Eastern Sierra Avalanche Center - *www.esavalanche.org*

A BACKPACKING GEAR LIST

Packing for a trip can quickly become overwhelming if you're not organized. One solution is to create a gear list that covers nearly everything you might take backpacking, depending on weather, location, and activities. This example is meant for inspiration – use it as a guideline for creating your own checklist.

CAMP BASICS		KITCHEN		HYGIENE / CARE	
Tent, fly, footprint, stakes		Bear canister / Ursack		Toothbrush	
Sleeping pad(s)		Stove		Toothpaste	
Sleeping bag or quilt		Fuel		Soap / wipes	
Pillow		Pot / pan + lid & handle		Washcloth / towel	
Sleeping bag liner		Utensil(s)		Comb / brush	
Camp chair		Cup / mug		Deodorant	
Sit pad		Plate / bowl		Prescription eyeglasses	
Lantern		Bag for garbage		Personal medication	
Tarp		Dish soap, sponge, scraper		Tampons / pads / cup	
Snow stakes		Paper towel, napkins		Sunscreen	
		Extra baggies		Bug spray	
PACK / ESSENTIALS		Food + extra		Chapstick	
Backpack		Water + extra		Earplugs	
Summit pack		Cooking oil		Tissues	
Pack cover / liner		Condiments / spices		Toilet paper / pee rag	
Trekking poles		Drink mixes		Trowel	
Hydration reservoir		Electrolyte mixes		Hand sanitizer	
Water bottle(s)				Baggies for used TP	
Water filter				WAG bag (if required)	
Knife / multi-tool		**CLOTHING**			
Headlamp & batteries		Sunglasses			
Matches / firestarter		Sun hat		**MOUNTAINEERING**	
Whistle		Hiking boots / shoes		Approach shoes	
Emergency blanket		Camp / watercrossing shoes		Climbing shoes / boots	
First aid kit		Down booties		Helmet	
Duct tape / repair kit		Warm hat / balaclava		Harness	
Map & compass		Vest		Climbing gear	
GPS		Gloves / mittens		Rope	
SPOT / InReach / PLB		Gaiters		Crampons	
		Jacket - puffy		Ice axe	
		Jacket - shell		Snowshoes	
PERSONAL ITEMS		Jacket - rain		Shovel	
Wallet / cash / cards / ID		Rain pants		Avalanche probe & beacon	
Permits (incl. campfire)		Fleece		Belay gloves	
Passes (parking, NPS, etc)		Base layers: top & bottom			
Phone / charger		Hiking shirt			
Battery pack / solar panel		Hiking pants / shorts / skirt		**OTHER**	
Camera + accessories		Snow pants		Fishing gear	
iPod/earphones		Sports bra		Sun or rain umbrella	
Journal / notepad		Underwear		Bug net	
Pen / pencil		Hiking socks, liner socks		Hand / foot warmers	
Book / e-reader		Sleep socks		Cards / portable games	
Watch / altimeter		Swimsuit		Map case	
Leader: forms, contacts		Change of clothes		Paints & sketchbook	

GEAR MAINTENANCE: CARE, REPAIR AND STORAGE

We expose our outdoor equipment and clothing to harsh conditions. The consequences of their failure can be severe. With proper use, maintenance, and storage, backpacking gear should last many years. This list covers basic topics, including ways to prevent gear – or trips – from being ruined. The most important advice is to care for your gear before and after each trip.

ALL EQUIPMENT

Before every trip

- Check that devices work, including stoves, pumps, and anything electrical.
- Make sure that complicated gear, like tents, have all their parts.
- Inspect any gear you borrowed or have loaned out.

After every trip

- Empty debris, trash and old food from pockets, packs and containers.
- Dry everything.
- Clean according to directions.
- Repair damage.

Fabric items (including clothes, tents, sleeping bags and packs

- Carefully follow cleaning instructions. Modern technical fabrics have exacting, sometimes unusual requirements. Bleach, fabric softeners, and high heat can ruin them.
- Special repair tape, such as Tenacious Tape, works much better than duct tape, which doesn't last and leaves a residue. A dab of Shoe Goo, a rubber cement, can repair small tears before they grow.
- Nylon, used in ropes, fabrics, and other textiles, is weakened by ultraviolet (UV) light, chlorine bleach, and acid fumes. Store nylon gear out of direct sunlight and away from chemicals. Nylon gear burns at a low temperature, so keep clothing, sleeping bags, and tents away from flames or sparks.
- Gore-tex and other waterproof/breathable garments lose their breathability unless their water repellency is renewed occasionally. If water doesn't form beads on the fabric anymore then it's time to use spray or wash-in products, according to their instructions.
- Socks should be washed gently, or at least rinsed, after every use, and air dried. Wash thick socks inside out.
- Shoe repair shops have the special sewing machines for repairing packs and other bulky fabric items with heavy thread.
- Elastic deteriorates quickly.

Boots

- Never heat wet leather. The fastest, safest way to dry boots is to lightly stuff them with crumpled newspaper, changing the paper when it gets damp.
- Mud weakens boots as it dries so rinse or brush it off as soon as possible.
- Renew waterproofing treatments regularly.
- Remove orthotics. Rinse the inside of the boot with clear cool water occasionally to remove accumulated sweat residue.
- Good boots can often be resoled or repaired.

Sleeping bags and down jackets

- Remove from stuff sacks as soon as possible.
- Allow to dry before storage.
- Store uncompressed on a hanger, in an oversized cotton bag, or billowing in a closet corner.
- Spot clean dirt by wiping with a damp cloth – avoid cleaning too much.
- Do not wash a sleeping bag in a vertical axis washing machine with a post.
- Dry with a clean tennis ball or dryer ball to break up clumps of down.

Sleeping pads

- Self-inflated pads should be stored with their valves open, laid out flat.
- Always carry a patching kit with an inflatable pad.
- At home, you may submerge an inflated pad in tub of soapy water to find any holes.

Tents:

- Mildew is difficult to remove once it has set in.
- Tents can get damp from ground moisture, dew, and internal condensation. Always air-out tents after each use before putting them away, even if they already seem dry.
- Shake or sweep out any loose dirt (or forgotten equipment) from the interior.
- Check that all the parts are together before storing.

Stoves

- Rubber seals and O-rings crack with age. They're easy and cheap to replace but obtaining parts can take time.

Trekking poles

- Friction pads inside twist-lock poles segments can get covered in a film of fine dust over time, which makes them hard to lock. Take the pole segments apart to scrub the pads and rinse out the tubes.

Water bottles and bladders

- Use separate bottles for plain water and flavored waters.
- Clean bottles, bladders, and hoses promptly, and add a drop of bleach to the rinse water.
- Hard-to-dry hydration systems can be stored empty in the freezer.
- Check fittings and valves for leaks, especially before major trips.

Water filters

- Test filters and other mechanical water treatments before each trip.
- Most filters require some kind of regular back-flushing or filter cleaning. Doing it at home is easier than in the field, over a sink instead of over a stream.
- Check the o-rings.
- Some filters crack if they freeze while wet and may require special care in the cold.

First Aid Kits

- Replace used items.
- Check for expiration dates on medications.
- Replace unused latex gloves occasionally.

Electronics, optics, and batteries

- Don't bring cold electronics or optics into warm, damp environments (indoors or in-pockets) where moisture will condense inside them. Leave them outside or warm them slowly in a sealed bag. However batteries, etc., can be inactivated or permanently damaged by severe cold or heat.
- Remove alkaline batteries from headlamps, etc, before storage to prevent corrosion or accidental discharge. Alkaline batteries lose capacity if discharged when cold, so keep them warm during use in freezing weather.
- Lithium-ion batteries, whether removable or built-in, should not be discharged fully before recharging. Store them with about 40% charge and add to that charge every six to 12 months to compensate for self-discharge. Keep them in a cool place and charge fully just before using.

Maps and compasses

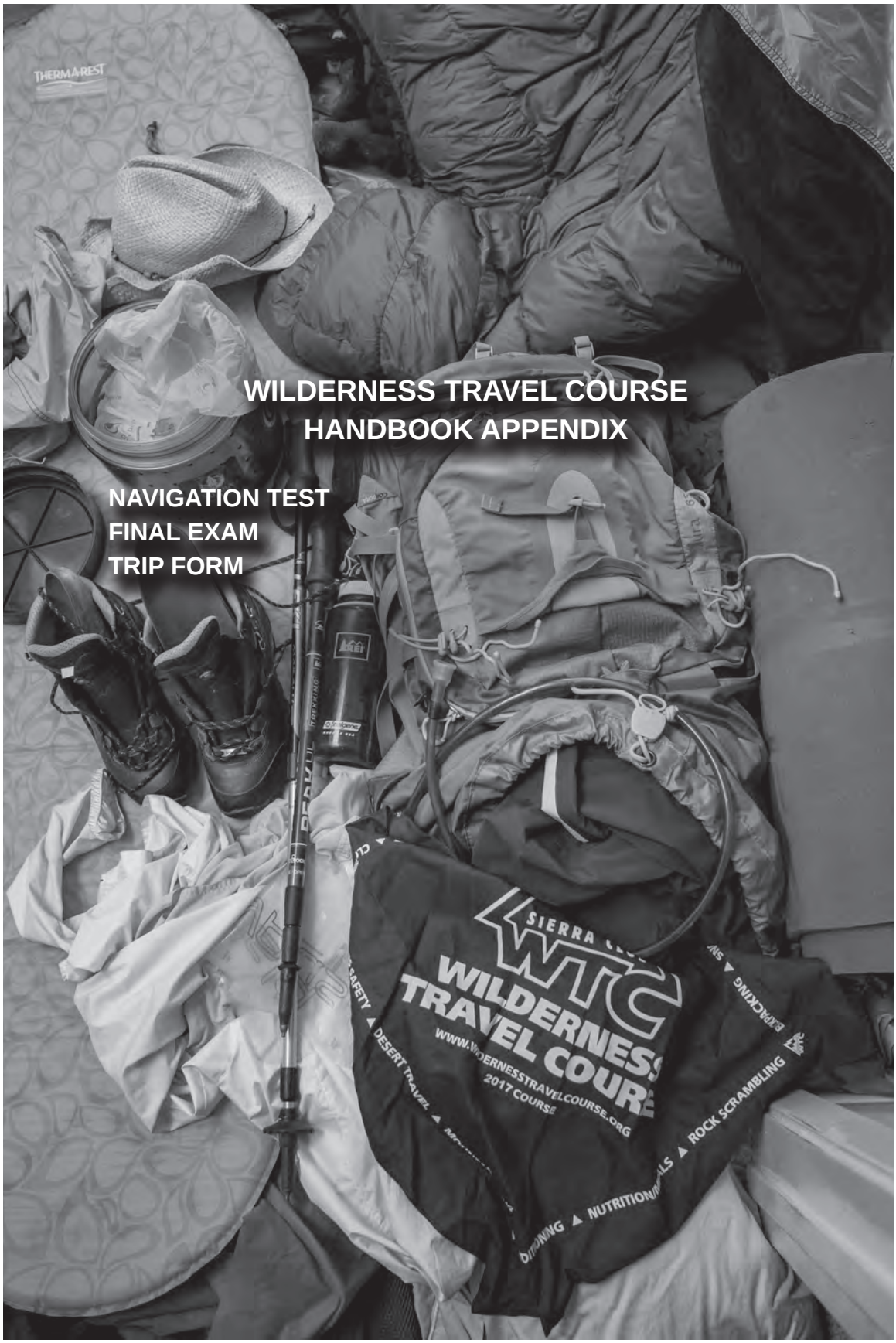
- Store your maps folded and filed, or rolled.
- Don’t store compasses in hot environments (such as in your car on hot days).

Repair items - carry

- Tools (knife, multi-tool)
- Spare parts such as: O-rings and seals for stove Pole sleeves for tent Batteries for headlamp Emergency spoon
- Duct tape / repair tape (Tenacious Tape)
- Safety pins, paper clips, & baling wire

Repair items – home

- Rubber cement (Shoe Goo)
- O-rings and seals for water bottles and filters



WILDERNESS TRAVEL COURSE
HANDBOOK APPENDIX

NAVIGATION TEST
FINAL EXAM
TRIP FORM

Gear : After a Trip – Before Storing it Carefully | J Simpson

WILDERNESS TRAVEL COURSE
NAVIGATION TEST

There are four pages. Enter your answers directly on sheets and add your name on each.

Name: _____ **Score:** _____

Section 1: [8 points]

1. Which term means the angle of difference between true (geographic) north and magnetic north?
   A. Magnetic Inclination
   B. Magnetic Declination
   C. Magnetic Destination
   D. Magnetic Deviation _____

2. In order to take a bearing in the field you:
   A. Align the magnetic needle with the declination arrow.
   B. Align the compass bezel with the map.
   C. Align the magnetic needle with north on the compass bezel .
   D. Align the compass bezel with the declination arrow. _____

3. On 7.5-minute series maps, which have a scale of 1:24,000, one mile in the field is represented by about what distance on the map?
   A. 1 mile
   B 2.4 feet
   C 1 inch
   D 2-1/2 inches _____

4 Contour lines are:
   A Lines of magnetic deviation
   B. Lines of constant elevation
   C Lines of true bearing
   D. Lines of contoured trail _____

5 When contour lines form V's pointing downhill, this indicates a:
   A. Ridge
   B. Intermittent stream
   C. Watershed
   D. Gully _____

6 Contour lines are what color?
   A. Red B. Green C. Brown D. Purple _____

7 On USGS 7.5 minute topo maps, how long would it take to hike a distance represented by 1/4 (0.25) inch on the map, using the unadjusted Naismith Rule and assuming the ground is flat?
   A. 2 minutes
   B. 5 minutes
   C. 7 minutes
   D. 10 minutes _____

8 How is shrub represented?
   A. Solid green shading
   B. Green dots
   C. Solid brown shading
   D. Brown dots _____

WILDERNESS TRAVEL COURSE NAVIGATION TEST

Section II: [6 points] Referring to your Indian Cove/Queen Mt combined 7.5-minute maps:

9. What is the magnetic declination (amount, direction, and year)?

_____

10. What is the Grid Zone Designation? _____

11. What is the horizontal scale (inches on the map per inches on the ground)? _____

12. What is the contour interval? _____

13. What is the name of the quadrangle to the southeast of the Indian Cove map?

_____

14. What is the six-digit UTM coordinate for the picnic symbol southeast of Indian Cove Campground? _____

SECTION III: [17 points] Referring to the map on the last page:

15. List the names of the 5 numbered symbols on the map. (You can refer to your Map Symbol Sheet)

① _____
② _____
③ _____
④ _____
⑤ _____

16. The contour interval is

A. 40 feet
B. 50 feet
C. 80 feet
D. 100 feet

_____

17. If you were hiking north on the trail at point Ⓐ, you would be hiking where?

A. Uphill on a ridge
B. Downhill on a ridge.
C. Uphill in a gully.
D. Downhill in a gully.

_____

18. If you were hiking southeast on the trail at point Ⓑ, you would be hiking where?

A. Uphill on the side of a ridge.
B. On a flat trail between hills.
C. Downhill on the side of a ridge.
D. Downhill on a switchback.

_____

19. The elevation change from point Ⓒ to point Ⓑ is closest to:

A. 200 feet gain
B. 250 feet gain
C. 350 feet gain
D. 400 feet loss

_____

WILDERNESS TRAVEL COURSE NAVIGATION TEST

Name: _____

20. The distance along the trail from point Ⓐ to point Ⓑ is closest to:
    A. 3 miles
    B. 5 miles
    C. 7 miles
    D. 9 miles
    _____

21. The time to get from point A to point B, based on the Naismith Rule with no "squiggle factors", is approximately:
    A. 1 hour
    B. 2 hours
    C. 2-1/2 hours
    D. 3 hours
    _____

22. While on the trail, your bearing to the church (use middle of the black square for bearing) is 130 degrees. What is your elevation?
    A. 4625 feet
    B. 4675 feet
    C. 4725 feet
    D. 4825 feet
    _____

23. The bearing from the middle of the depression to the spring is:
    A. 10°
    B. 170°
    C. 280°
    D. 350°
    _____

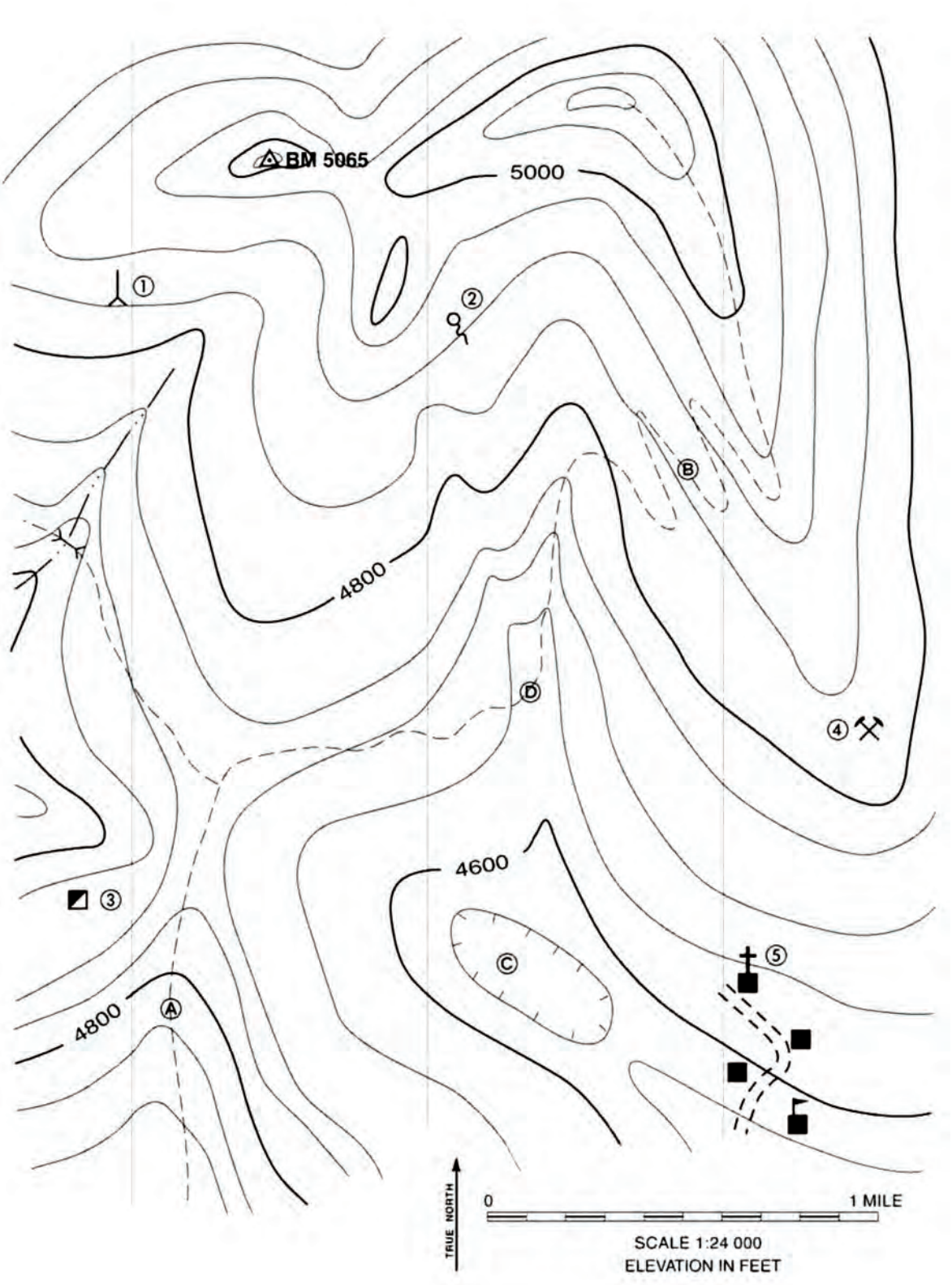
24. If you took a field bearing of 110° to the church and a bearing of 330° to the footbridge, you would be standing at the:
    A. mine tunnel
    B. spring
    C. trail junction
    D. bench mark
    E. sink
    _____

25. What is the elevation of the highest point on the map?
    A. 5050 feet
    B. 5065 feet
    C. 5120 feet
    D. 5750 feet
    E. 1280 meters
    F. 2130 meters
    _____

26. (1) Is the spring visible from the mine tunnel? (yes/no) _____

    (2) Explain why _____

WILDERNESS TRAVEL COURSE NAVIGATION TEST



WILDERNESS TRAVEL COURSE
FINAL EXAM

Begins on next page

WILDERNESS TRAVEL COURSE
FINAL EXAM

Write all answers except #50 on provided answer sheet.

Class 1: Conditioning

1. Complete the list of 10 Essentials (1 point).

2. What is the best reason for bringing the 10 Essentials on every hike or backpack?
   A. Your WTC instructors recommend them.
   B. They are lightweight.
   C. They have many uses.
   D. They are life-saving tools that cannot be improvised.

3. What is the best way to train for a one-day climb of Mount Whitney (6,000 ft. gain, 22-mile round trip)?
   A. Run 3 times a week and hike Mount Baldy (10,064 ft.) every weekend.
   B. Hike local mountains on weekends when you have the time.
   C. Hike San Gorgonio Mountain (11,499 ft.) the weekend before.
   D. Don't train. Just do the peak.

4. What is the best form of conditioning at home for mountaineering?
   A. Power-walking
   B. Sprinting
   C. Mountain climbing
   D. Stair-climbing

Class 2: Clothing and Equipment

5. The layering system for outdoor clothing consists of these three layers:
   A. Wicking (next to skin), insulating and shell layers.
   B. Inner nylon, waterproof membrane and outer nylon layers.
   C. Capilene, cotton and nylon layers.
   D. Upper body layer, lower body layer, boots

6. Which material will keep you warm even when wet?
   A. Cotton
   B. Wool
   C. Down

7. When selecting boots for hiking and backpacking, what feature should you never compromise on?
   A. Price.
   B. Leather uppers.
   C. Compatibility with crampons.
   D. Fit.

8. All of the following are normally features of a 4-season tent except:
   A. Greater strength to withstand winter storms.
   B. Large nylon mesh windows.
   C. Openings have zippered solid fabric coverings.
   D. Rainfly goes down nearly to the ground.

9. When loading a pack, stow heavier items:
   A. Close to your back at the bottom of the pack.
   B. As far as possible from your back in the pack's bottom.
   C. Close to your back in the center of the pack.
   D. At the top of the pack.

Class 3: Navigation

10. When contour lines form parallel V's pointing uphill, they indicate a:
    A. Gully or canyon.
    B. Ridge.
    C. Cirque or bowl.
    D. Gentle slope.

11. Declination is:
    A. The angle between true north and grid north.
    B. The angle between true north and magnetic north.
    C. The angle between grid north and magnetic north.
    D. The angle measured by a compass.

12. When using an old topographic map in the field, which representations on the map are most likely to still be accurate?
    A. Benchmarks.
    B. Trail routes.
    C. Man-made features such as power lines or streets.
    D. Landforms such as peaks, gullies and ridges.

13. You're somewhere on a trail. Which visible feature would provide the best cross-bearing to establish where you are?
    A. A prominent gully in line with the trail.
    B. A prominent peak many miles away.
    C. A cabin.
    D. A prominent landform feature, relatively close whose bearing intersects the trail at or near a 90 degree angle.

14. Which of the following is correct:
    A. The declination information printed at the bottom of the map is current regardless of when the map was printed.
    B. Declination information on the map may be out of date because the amount of declination changes over time.

For questions 15-19, refer to map on back of answer sheet. Each time you draw a bearing on the map, be sure to label it correctly (e.g., 15°).

15. Starting from the trail junction in the lower left-hand portion of the map, use Naismith's Rule to estimate time to reach the apparent summit via the trail forking to the east. The closest estimate is:
    A. 1 hour
    B. 1 hour and 30 minutes
    C. 2 hours and 15 minutes
    D. 2 hours and 45 minutes

16. The landform about 0.8 miles west-northwest of Point C (depression) is a:
    A. Bridge
    B. Saddle
    C. Cirque
    D. Stream

17. Starting from point A near the center of the map and walking a short distance north on the trail, you are:
    A. Proceeding up a canyon.
    B. Proceeding down a ridge.
    C. Contouring around a ridge.
    D. Switchbacking toward a summit.

18. You are on a trail. Your bearing to the church is 120°, and your bearing to the spring is 15°. Draw the bearings on the map and circle the point where the bearings intersect. Label that point #18.

19. You are off-trail. Your bearing to the trail junction (see 15 above) is 265°. Your bearing to the school is 190°. Draw the bearings on the map and circle the point where they intersect. Label that point #19.

Class 4: Mountain Travel

20. Which of the following is <u>not</u> a way to balance your energy output with your goal?
    A. Start off at a brisk pace to warm up quickly.
    B. Shorten your strides while going uphill.
    C. Breathe deeply.
    D. Lean forward when going downhill.

21. What should you not do when climbing on loose talus slopes?
    A. Yell "ROCK!" repeatedly and loudly if a rock is falling.
    B. Tread lightly. Try not to knock any rocks down.
    C. Wear a helmet.
    D. Climb directly under another climber.

22. As you leave the trailhead and begin your hike, it is important to do the following, except:
    A. Locate yourself on the map.
    B. Check the time.
    C. Take a selfie and post to Instagram.
    D. Look behind you repeatedly during the first stretch of the trip.

23. While rock scrambling, you should do the following, except:
    A. Maintain three points of contact.
    B. Keep your weight over your feet.
    C. Climb with your eyes.
    D. Use your knees as one point of contact.

Class 5: Wilderness Ethics/Leave no Trace

24. What is the minimum distance for placing your campsite away from water?
    A. 50 feet
    B. 100 feet
    C. 200 feet
    D. 500 feet

25. What is the best practice for disposing of soiled toilet paper?
    A. Carry it out.
    B. Burn it.
    C. Bury it in dirt.
    D. Bury it in snow.

26. Which is not an appropriate place to make camp?
    A. On barren ground.
    B. On snow.
    C. On rock.
    D. On a grassy meadow.

27. What is the best way to take care of dirty pots and dishes on a multi-day trip?
    A. Clean them when you get home.
    B. Wash them far away from any water source, using biodegradable soap.
    C. Wash them in the fastest part of a stream, using sand or gravel.
    D. Wash them in camp using regular dish soap.

28. What should you do with cooked food that you cannot finish eating?
    A. Bury it at least 6 inches deep in mineral soil, well away from water.
    B. Scatter it on the ground, well away from camp or water.
    C. Pack it out.
    D. Burn it.

Class 6: Snow Travel

29. Most avalanches occur on slopes:
    A. Of 75° or more.
    B. Between 55° and 70°,
    C. Between 30° and 45°.
    D. Of 25° or less.

30. In what circumstance is kick-stepping most appropriate?
    A. While climbing firm snow.
    B. On flat, soft snow.
    C. While climbing an icy slope.
    D. While descending an icy slope.

31. The key to staying warm in snow is:
    A. Wearing an insulated hat at all times.
    B. Wearing several layers of warm clothes at all times.
    C. Drinking a moderate amount of alcohol before bed.
    D. Keeping dry.

32. Which type of clothing is <u>least</u> appropriate for snow travel?
    A. Pile or down insulating layer.
    B. Cotton underwear.
    C. Nylon or Gore-Tex shell layer.
    D. Thin liner gloves.

33. To minimize heat loss to the ground while snow camping, the best option would be:
    A. An uninsulated air mattress.
    B. A combination of two low R-value sleeping pads.
    C. A combination of a closed foam pad and a high R-value sleeping pad.
    D. An open-cell foam pad.

Class 7: Wilderness First Aid

34. If a wound on an extremity is bleeding heavily and direct pressure does not control or stop the bleeding, what else could be done in an emergency?
    A. Elevate the extremity
    B. Press hard on the vein supplying blood to the extremity
    C. Apply a tourniquet
    D. Give the patient two aspirin

35. In the wilderness. the best way to clean a wound that has not bled heavily is:
    A. Wash with Betadine (iodine compound) or hydrogen peroxide
    B. Irrigate with water under pressure, or wash with soap and water
    C. Let it bleed for two to three minutes
    D. Do not clean a wound in the wilderness

36. First aid treatment of sprains and strains in the wilderness includes:
    A. Realignment, splinting, and a check of distal circulation
    B. Rest, hot packs, and moving the limb to keep it from "freezing up"
    C. Alternating hot and cold packs
    D. Rest, ice, compression and elevation

37. A key indicator that a victim of heat illness is in heat stroke is:
    A. Profuse sweating
    B. Altered level of consciousness
    C. Shortness of breath
    D. Pulse between 50 and 60 beats per minute

38. Signs and symptoms that indicate that a victim of altitude illness has High Altitude Pulmonary Edema include:
    A. Dry cough and shortness of breath at rest
    B. Swelling of the face or fingers
    C. Dilation of the pupils
    D. Hallucinations

Class 8: Nutrition

39. How should you store food in a wilderness camp during most seasons?
    A. Inside your tent, at the bottom of your sleeping bag.
    B. Atop a boulder or in a tree at least 50 feet from camp.
    C. In a bear canister.
    D. Hidden in small batches under rocks.

40 Which is not appropriate when planning food for a backpack?
    A. Plan to bring 1-1/2 to 2 lbs. of food per person per day.
    B. Plan to eat 1.3 to 2 times as many calories as usual.
    C. Repackage all prepared foods to reduce weight and trash.
    D. Plan to eat what you normally eat at home.

41. The best reason for including fats in your mountain diet is:
    A. Fats taste good.
    B. Fats have twice as many calories, ounce for ounce, as other foods.
    C. Fats are essential for repairing muscle tissue.
    D. Your body digests fats easily.

Write all answers except #50 on provided answer sheet.

42. What is the best way to maintain your energy level during a long climb?
    A. Eat a large dinner the night before.
    B. Eat a large breakfast the morning before.
    C. Eat calorie-rich snacks frequently during the climb.
    D. Don't eat immediately before or during the climb; your body will burn storedcalories.

43. Which is the best way to prevent food-borne illnesses?
    A. Wash your hands with soap before handling food.
    B. Eat only foods that have been boiled for at least 10 minutes.
    C. Take prescription anti-diarrhea drugs on your trip.
    D. Ignore it; if you purify your water you don't have to worry about food illnesses.

Class 9: Mountain Safety

44. Serious accidents usually happen:
    A. Whenever participants are poorly prepared.
    B. Whenever leaders or participants make mistakes.
    C. Whenever the weather is bad.
    D. Because of a combination of human and natural conditions.

45. When fording a stream it is best to cross where the stream is:
    A. Slow, wide and shallow.
    B. Fast, narrow and deep.
    C. Fast, wide and deep.
    D. Fast but with several boulders above water.

46. The safest footgear for crossing a stream is:
    A. Boots with socks and insoles removed.
    B. Sandals.
    C. Going barefoot.
    D. Socks without boots.

47. If you get lost, which is <u>not</u> a good solution?
    A. Keep moving until you get found.
    B. Find a sheltered spot and wait for searchers.
    C. Retrace your steps to the last place where you knew your location.
    D. Use your map and compass.

48. What's the best way to make sure someone look for you if you get lost?
    A. Yell as loudly as you can for as long as you can.
    B. Make sure someone knows your plans and expected return date.
    C. File a wilderness permit before you leave.
    D. Don't worry; if you're an experienced hiker you won't get lost.

49 What's the purpose of a "turn-around time" on a climb?

A. To ensure enough time for a safe return.
To ensure a fast pace.
To meet Forest Service regulations.
To limit the climb to a reasonable number of hours.

Class 10: The Trail From Here

50. Prepare your personal hiking resume similar to the sample shown below. Turn your resume in with your answer sheet—you'll get it back. Create it on your computer and continue to expand on it as you gain experience. List recent hikes, any Sierra Club hiking experience, and any significant hikes or relevant experience. Use it when applying for WTC experience trips or Sierra Club outings.

Pat Student
3250 Wilshire Blvd.
Los Angeles, CA 90010
C: 213-555-1212, W: 213-555-3434
pat-student@gmail.com

Experience
I have been hiking regularly for five years and took WTC in 2022 with SGV Group 9, Lisa Leadsalot was our group leader.

3/25/22	WTC: Snow Camp, Rock Creek Lake	3-day backpack @ 9600'
3/12/22	WTC: Snow Day, Mt Pinos (8847')	4.0 mi RT, 700' gain
2/26/22	WTC: Peak 4377' (3rd class)	2.9 mi RT, 1050' gain
2/12/22	WTC: Full Day Hike: Muir Pk (4682')	11 mi RT, 2800' gain
11/27/21	Strawberry Peak (6165') via Red Box	7 mi RT, 1800' gain
10/30/21	Mt Wilson (5713') via Chantry Flats	13 mi RT, 4200' gain
9/25/21	HPS: Mt Baldy (10,064') via Ski Hut Trail	8.8 mi RT, 3900' gain
7/17/21	Mt Baden-Powell (9384')	8 mi RT, 2800' gain
4/10/21	Owens Peak (8445')	6.2 mi RT, 2900' gain
Nov '19	1-day rock climbing class in Joshua Tree	
Jun '19	2-night backpack in Pfeiffer Big Sur State Park	16 mi, 3200' gain

Conditioning
Jog 2-3x per week, 8-12 miles total. Yoga 2x per week.
Local 5-10 mile conditioning hikes 2x a month on average.
Feb 2022 Surf City Half Marathon; finished in 2:15

Rideshare
Have 4WD SUV, can drive or carpool.

WILDERNESS TRAVEL COURSE
FINAL EXAM

Use this page for your personal hiking resume, or create on your computer. Turn in your hiking resume with final exam answer sheet.

WILDERNESS TRAVEL COURSE
FINAL EXAM ANSWER SHEET

Name _____ **Score** _____

Passing Grade 35 of 50

Class 1: 10 Essentials/Conditioning

1. Complete list of 10 Essentials (1 point).

1) Navigation	6)
2)	7) Fire
3) Sun Protection	8)
4) Nutrition	9) Repair Kit and tools
5) Hydration	10)

2. _____

3. _____

4. _____

Class 2: Clothing and Equipment

5. _____

6. _____

7. _____

8. _____

9. _____

Class 3: Navigation

10. _____

11. _____

12. _____

13. _____

14. _____

15. _____

16. _____

17. _____

18. See Map

19. See Map

Class 4: Mountain Travel

20. _____

21. _____

22. _____

23. _____

Class 5: Wilderness Ethics/Leave No Trace

24. _____

25. _____

26. _____

27. _____

28. _____

Class 6: Snow Travel

29. _____

30. _____

31. _____

32. _____

33. _____

Class 7: Wilderness First Aid

34. _____

35. _____

36. _____

37. _____

38. _____

Class 8: Nutrition

39. _____

40. _____

41. _____

42. _____

43. _____

Class 9: Mountain Safety

44. _____

45. _____

46. _____

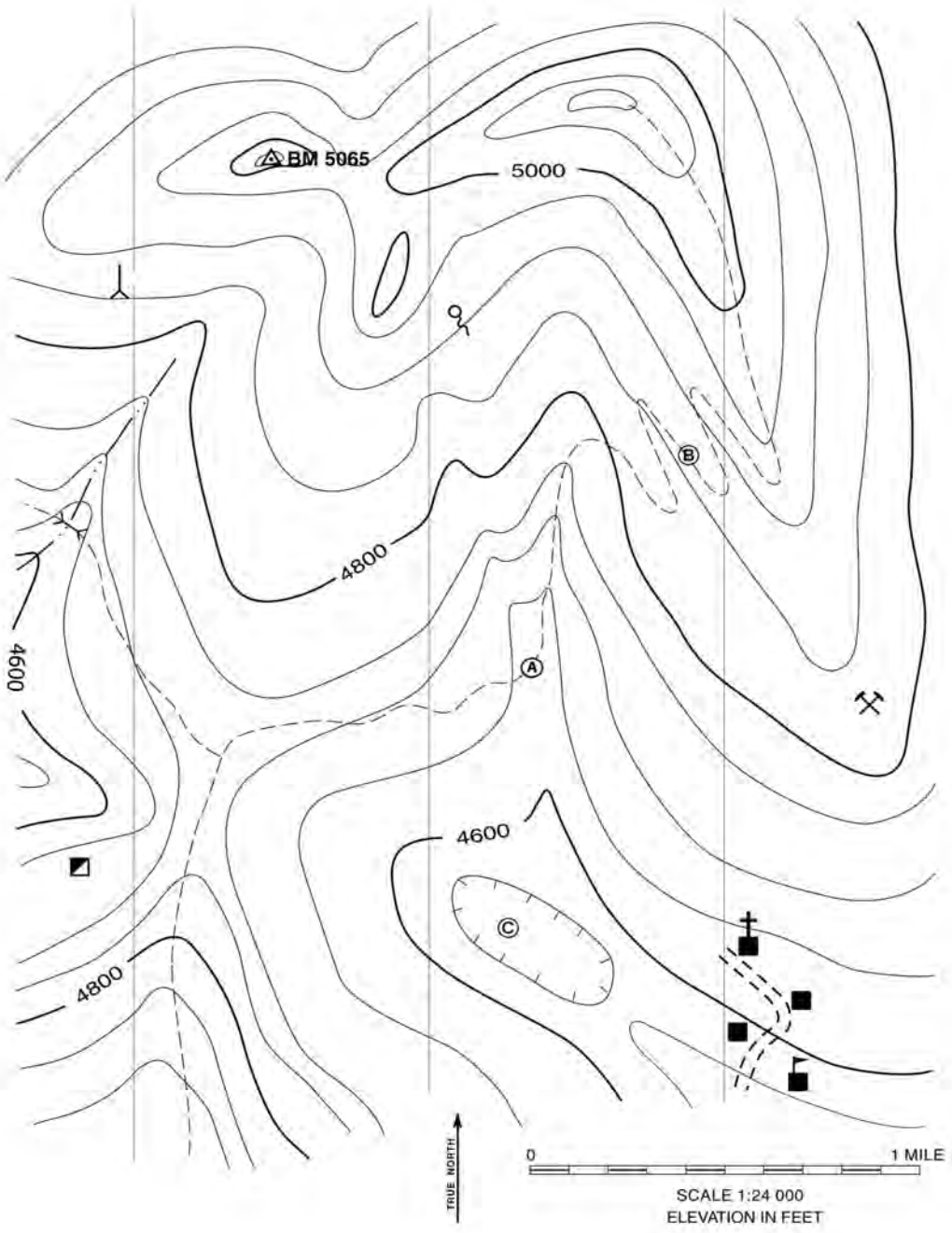
47. _____

48. _____

49. _____

50. See Page A-14 of Exam

WILDERNESS TRAVEL COURSE
FINAL EXAM ANSWER SHEET



WILDERNESS TRAVEL COURSE

AFTER THE COURSE:

TRIP FORM FOR PRIVATE EXPERIENCE TRIP

NON-SCHEDULED EXPERIENCE TRIP RECORD FORM

DO NOT USE THIS FORM FOR SCHEDULED SIERRA CLUB TRIPS

Student Name					Area	Student #
Address					City	Zip
Dates of Trip					No. of Days	No. of Nights
Trip Location (e.g., Sierra Nevada, San Gabriel Mountains)						No. in Party
Trip Distance (number of miles roundtrip)					Elevation Gain (feet)	
Trip Started From						
	Distance Traveled (miles)	Distance Off Trail (miles)	Elevation Gain (feet)	Elevation Loss (feet)	Peak Climbed (if applicable)	Camped At
Day 1						
Day 2						
Day 3						
Day 4						
Day 5						
Day 6						
Day 7						
Trip Finished At						

Notes: