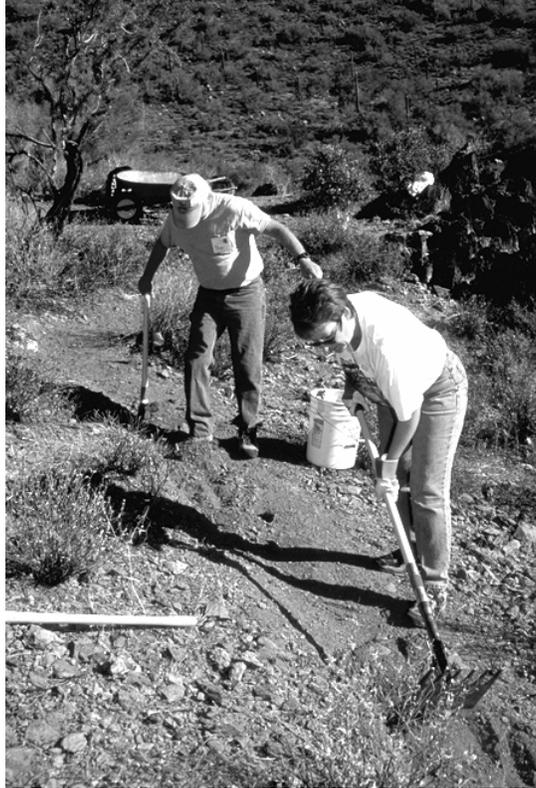


DRAFT...

Crew Leader Manual

Working with volunteers to build quality
non-motorized, multi-use trails



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Foreword

This manual has been written to aid crew leaders working with trail work volunteers. It assumes the following priorities, in order of importance, for every volunteer trail work event:

1. Safety
2. Enjoyment
3. Quality product
4. Productivity

Written and published by Volunteers for Outdoor Arizona (VOAz) with assistance from other trail building groups, this manual may be used by anyone leading volunteer work crews on non-motorized, multi-use trail events in the arid terrain that is characteristic of most of Arizona. An informal coalition of Arizona volunteer trail building groups is seeking to bring greater consistency and quality to the trail work done by volunteers in this state. A training package that may be used by trail building organizations is under development. Any organization that uses this manual will need to identify standards that may be unique to its program or go beyond those stated in this manual and covered in crew leader training based on this manual. Each trail building organization needs to define its own crew leader certification process. It is possible that a uniform crew leader certification program will be established in the future.

This manual is by no means a complete reference or guide to trail work. It incorporates the experience and perceived priorities of its authors as well as ideas found on the web and in other publications. A bibliography of other trail work publications is appended.

Acknowledgements

This draft is based on the draft VOAz crew leader manual that has been in use since early 2000. It draws upon materials contained in all of the trail work documents included in the bibliography at the end of this manual. The manuals published by Volunteers for Outdoor Colorado have been a primary resource from within this group.

Michael Baker is the primary author. Primary editors are: Stephen Wood, Laurie Rubin, and Mark Flint. Others who have contributed to the content and editing of the manual and the training program based on it include: Ed Blanchard, Mary Halfmann, Paul Paonessa, Kevin Lockart, and Mike Snodgrass. Questions and comments about anything in this manual should be directed to Michael Baker at Volunteers for Outdoor Arizona (michaelb@dgcenter.org).

This manual could not have been produced without the generous support of Volunteers for Outdoor Arizona provided by Dorothy Garske Center.

Warning and Disclaimer

The trail building and maintenance work that is the subject of this manual is an inherently dangerous, high-risk activity. The authors and editors of this manual, Volunteers for Outdoor Arizona, Dorothy Garske Center and all other involved organizations page make no representations or warranties whatsoever, and shall not have any liability to any person or entity whomsoever with respect to injury, death, loss, or damage caused or alleged to be caused directly or indirectly by the instructions contained within. *Use this manual with common sense and completely at your own risk.*

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I. Requirements of Crew Leadership

Any program or agency that depends on volunteers will only be successful in recruiting and retaining good volunteers by paying close attention to how they plan work events and manage their volunteers. Volunteers reasonably expect to have an enjoyable and safe experience and, at the end of each volunteer day, feel that their time has been used productively and their work appreciated. One measure of success is this: Do the volunteers come back? It is incumbent upon trail work crew leaders to do their best to make the experience one their crewmembers will want to repeat.

Leading trail work volunteers entails teaching and supervising the technical tasks of a particular project while managing a small team of people who typically bring a wide range of skills, experience, and physical stamina to the crew. Crew leading is not for everyone who simply enjoys trail work. Crew leaders must have a strong commitment to building sustainable trails¹ and get satisfaction out of helping others have a good time while doing good work.

Trail crew leading may be defined in terms of three general skill areas:

- **Trail technical skills** – Crew leaders must command of a core set of technical trail work and safety skills
- **Leadership skills** – Crew leaders must be able to motivate other volunteers to engage in the shared goal of building sustainable trail
- **Management skills** – Crew leaders have to coordinate a series of activities that go into a successful work event

This three-part division is simply a conceptual convenience. All three general skills interact and overlap. For example, a crew leader's credibility as a leader depends on possession of basic technical trail work skills. The stronger those skills, the easier crew leadership becomes.

The technical skills of crew leading are summarized below. Additional details in this area are the subject of sections IV and V. Leadership skills required of crew leading are also discussed later in this section. While volumes have been written about the topic of "leadership," this skill area is perhaps best developed through good training programs and by observing crew leaders with exceptional leadership abilities. Event management skills are the subject of section II of this manual.

Core technical skills for crew leading

It takes a combination of training and a great deal of experience to become a skilled crew leader. The range of circumstances that might be encountered for someone leading crews in different locations is very large. To keep the process of qualifying volunteers to lead crews reasonable, a core set of skills has been identified. This includes skills that are needed for most and, in some cases, every trail work event. The definition also reflects consideration of the amount of time needed to complete a basic crew leader training program.

The core set of skills does not include everything that crew leaders might have a need, or may wish, to master. Building multi-course rock walls, switchbacks, stream crossings, and steps are considered advanced technical skills. Crew leaders may wish to obtain specific training in these areas or have a qualified consultant present if structures are required on a trail work assignment before they are reasonably competent to lead volunteers in their construction.

¹ Sustainable trails have negligible soil loss or movement yet allow the naturally occurring plant systems to inhabit the area, absent required pruning and plant removal over time. Sustainable trails will not adversely affect native fauna. Sustainable trails require little rerouting and minimal maintenance over extended periods of time.

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The core technical skills for crew leader fall under these topical areas:

- Safety and tool technique
- Basic construction for new trail
- Basic trail maintenance
- Quality assurance

The content of these areas is as follows:

- ***Safety and tool technique***
Initial safety evaluation and talk
Tools and work technique
 - Loppers & saws
 - Pulaskis and mattocks
 - McLeods
 - Shovels
 - Rock and pry bars
 - Buckets & brewery blankets
 - Moving large rock
 - Brushing and limbing
 - GrubbingResponding to emergencies
- ***Basic construction of new and realigned trail***
Four stages of new tread construction:
 1. Clear trail corridor
 2. Rough-set trail bench
 3. Finish tread & install special structures
 4. Polish corridor and close old trailSide hill tread construction
Tread on flat and very low-sloped terrain
Installing the most common special structures:
 - Cairns
 - Check dams
 - Crib and single course rock walls
 - Drain dips and reinforced drain dips (replaces waterbars)
 - Guide stones
 - Rip rap
 - Surface drainage crossingsTrail closure
- ***Basic trail maintenance***
Four stages:
 1. Clear corridor
 2. Reset tread (remove slough and berm)
 3. Clean and repair special structures
 4. Polish corridor and close old trail
- ***Quality Assurance***
Working with CL Manual & construction notes
Leave No Trace trail work

Establishing a minimum set of technical skills allows crew leaders to set personal goals for any additional skills they may want to develop *beyond* the core skills. They may then set their own limits with respect to their own time commitment to volunteering as a crew leader.

The “leadership” of crew leading²

Crew leaders are volunteers who self-select into this role. Every crew leader must draw on his or her personal strengths and skills to enable volunteers to have a safe, enjoyable and productive experience.

Effective leadership is comprised of identifiable elements. Attention to these can enhance crew leadership skills and the quality of the crew leadership experience itself. Key components of effective leadership are listed below and followed with a few tips for the field.

- Communication
- Expectations and Goals
- Consistency
- Balance
- Role modeling
- Teaching
- Problem solving
- Constructive criticism
- Praising
- Handling serious rule violations

Communication

The opening safety talk can create a climate for communication by the way crewmembers are greeted and talked to. Establish eye contact and maintain an open body posture. (Thus, stand with arms in an open position-not folded across the chest, sunglasses off and facing the sun-crew members not facing sun, when talking to volunteers.) Listen to what crewmembers say.

Paraphrasing or repeating what someone says back to them is a good way for the listener to make sure the he or she understands what is said and to assure the speaker that he or she is being heard.

Expectations and Goals

Whatever the specific goal of the project, give it some heft. People want to know that what they are working to achieve is important. Try to accommodate the personal goals of crewmembers whenever possible. These may come out during the opening talk, especially if people are encouraged to express them. The amount of work to be done for the day and the work standards to be followed need to be clearly stated. These are the goals and expectations for the crew as a whole.

Consistency

Crews will lose their commitment if the rules change, instructions are contradictory, or work has to be redone. This applies across events as well as to a single event. This is one benefit of adopting written standards within and among trail building organizations. While there may be more than one way to skin a cat, the volunteer experience will be enhanced if all crew leaders within an organization abide by one reasonable way as the norm.

Balance

Balance means building 100 feet of good, sustainable trail rather than 500 feet of poor trail, or 10 feet of beyond-perfect trail. Avoid excess with the work, with the time, with the crew, and with yourself. Do good work but don't go overboard. Safety is always paramount.

² This section is based on the Crew Leader Manual of Volunteers for Outdoor Colorado, Fourth Edition, pp. 13-17.

Teaching

Crew members should come to understand the principles of sustainable, leave-no-trace, trail construction and safe and effective use of tools. For each phase of trail work on a particular section: 1) define the task; 2) demonstrate the skills required to complete the task; 3) monitor and coach as crew members begin the work. How people first do a job largely determines how they will do it in the future. Taking the time to train at the beginning of the day pays off by the end of the day. Show enthusiasm for quality trail work.

On the other hand, teaching can be overdone. Some volunteers may not share the typical crew leader's enthusiasm for learning and quality work. If, for example, someone persists in using a tool in an inefficient though not unsafe way, it is probably best not to persist in attempting to correct the situation. Some will arrive at a project with well established but poor trail work habits. Sometimes it is better to review a completed task, suggest how "you might have done it" and let it go at that rather than asking people to redo some work. After all, current knowledge of what works is far from perfect.

Role modeling

Crewmembers who are new to trail work may learn more by observing what their crew leader does than what he or she says. This extends to all aspects of crew behavior, not just work habits. If the crew leader doesn't take water breaks, crew members are likely not to take them. It is not easy to model hour after hour, but it becomes easier and more natural with experience.

Problem solving

There are two types of work planning problems encountered during an event. One is the global: "How are we going to complete our assigned section of work?" This problem is addressed at the beginning of each day or work section. Crew leaders should walk their crews through the work section and discuss the work to be done. Though crew leaders may have construction notes, staking, and flagging to guide their work, this does not obviate the need for crewmembers to understand the reasons for the plan and how it will be implemented. If this leads to serious questions about the original specifications, contact the event Technical Advisor (TA).

As work proceeds, new, localized problems may develop. Involve the crew in finding a solution following these steps:

1. Define the problem – distinguish facts from assumptions
2. Generate alternatives – identify but don't evaluate
3. Evaluate and select – this requires balancing the pluses and minuses
4. Implement– devise and put into play an action plan of manageable steps

Praising

Never forget that people are giving of their free time to do manual labor, often traveling and walking great distances to get to the work site. Recognition of this fact will give expressions of appreciation the tone of authenticity needed to make them effective. It is easy to get so focused on catching or correcting errors that good efforts are overlooked. Always praise every crew member and as often as it is reasonably justifiable.

During the final review of a completed section of work, note situations that may need to be monitored or that may require additional work, brag a lot and praise the crew for the fine work they have done. But be specific. Point particular features of the completed work out for praise. Avoid generalities—"You are a great trail builder"—that can come across as condescending.

Handling serious rule violations

The two main types of problems crew leaders must manage are serious violations of technical and safety standards and behavior that is disruptive to the crew. The latter is not simply obnoxious

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and annoying behavior (after all, there will always be crew leaders to provide that!), but behavior that is clearly undermining the quality of the experience for other crewmembers. Such problems rarely occur, but when they do, take the involved individual or individuals aside and explain your concerns. If this does not resolve the matter, repeat the discussion and make it clear that, as crew leader, you have the authority to ask a volunteer to leave your crew.

If anyone leaves under these circumstances, their choice or yours, ask them to speak with the Event Manager and the representative of the land manager before leaving the project area. (They may be able to satisfactorily assign them to another crew or task.) The land manager has legal authority over what takes place on the trail site. Rely on this authority in difficult situations.

Physically or verbally aggressive behavior and sexual harassment must be dealt with swiftly and firmly. There should be no tolerance of such behavior.

Any serious crew incidents and anytime someone is dismissed from or walks off a crew should be documented in writing to the sponsoring or host organization. It may be appropriate to identify a witness, with his or her permission.

Common errors of crew leaders

Errors are common and most volunteers are not very critical. It is up to crew leaders and the organizations they volunteer for to take whatever action is needed to maintain a high standard of performance.

Here are some of the most commonly observed crew leader errors:

- Working more than leading (Failing to work at all is equally bad.)
- Inattention to hydration and regular breaks
- Not taking the time at the beginning of the day to orient, involve and train (On the other hand, dragging out the open orientation longer than necessary runs the risk of losing the initial energy of volunteers. Strike and balance).
- Losing track of crew members who are not sufficiently prepared to work without close supervision
- Over-managing and not involving people in problem solving
- Failing to praise good work and thank crews at project's end

Training for Crew Leadership

Mastering the content of this or any manual, while important, will not result in effective crew leadership. Working with a highly qualified crew leader over an extended period of time in a wide variety of circumstances-that is, in an apprenticeship program-is perhaps the best way to become a well-rounded leader of volunteer crews. Unfortunately, this is not practical for most volunteer trail building organizations. Structured training events are a more practical way of enhancing the skills of current and prospective crew leaders in a timely manner.

Every organization has its own standards for certifying and re-certifying crew leaders. The "Crew Leadership for Trail Work" training event can be part of this process. This training program includes an evening class and a full weekend event. Organizations that adopt this manual as their basic standard for trail work and crew leadership may develop their own training program based on the manual (as well as supplements to the manual).

II Trail Work Event Planning and Management

The process used to select, plan, and manage trail work events depends, to some degree, on the mission and structure of the organization. The purpose of this section is to orient crew leaders to principles of successful event management. Some crew leaders may never be responsible for anything beyond the scope of leading a crew of volunteers. Others may have to handle many of the event planning and management responsibilities in addition to leading a crew.

Selecting and planning an event, no matter who is responsible, involves considerations such as:

- appropriateness of the work for volunteers;
- likelihood that a completed, visible product will result (technical feasibility in light of probable crew profile)
- attractiveness of the destinations
- volunteer accommodations
- availability of required tools
- material support that can be provided by the host agency or land manager.

Once a commitment is made to a land manager, all events involve similar basic tasks with respect to event promotion and volunteer support activities. Key roles and responsibilities in trail event planning and management include:

- Project Director (over all event planning, coordination of other team members and land manager communications)
- Event Manager (day-of coordination)
- Support Services Manager. (food services, camping facilities, check-in, emergency services, etc.)
- Technical Advisor, Chief and Assistants (responsible for field planning, flagging, construction notes, and day-of monitoring and technical support)
- Crew Leader Manager. (recruitment, orientation, assignment, and coddling)
- Tools Manager.

The event team must help create a setting that supports the work of crew leaders on the workday. Even when the event “team” consists of one individual, the tasks of the team must be assigned. In such circumstances some tasks, such as food services, may be assigned to volunteers—“Bring your own food and drink.”

In the next part of this section, a trail work event is described from the perspective of the crew leader in terms of a sequence of steps or phases. Event planners should note that there is a “prepare” phase and a “report” phase in this sequence that precede and follow, respectively, the actual time a crew leader is working with the volunteer crew. Event planners have to make time in the schedule for these to occur. If it is not practical for crew leaders to make a visit to the work site before the event, time must be provided for this on the first day of an event. If the distance to the work area makes this impractical, an advance meeting with the TA could be scheduled. In the latter case, photos from the work area would be helpful. Correspondingly, time needs to be allowed at the end of the event for crew leaders to complete those parts of the “report” phase that should be done before leaving the area. This also provides event management staff an opportunity to personally thank every crew leader who participates in an event.

Phases of a successful trail work event

Assuming that the crew leader or others filing the roles identified above have done all the preparatory work to facilitate a successful trail work event, the day-of for a crew leader can be broken into some distinct phases. This sequence is not to be used as a rigid template but as a general guide for successfully managing an event. The short title for each phase is:

1. Prepare (*rehearse, devise a plan of action*)
2. Welcome and Walk-in (*introductions, goals for the day, initial safety items*)
3. Get Ready (*tool safety, storage, and use, walk through work area*)
4. Do It (*work, break, smile, coach, teach, monitor, praise-all repeated through the day*)
5. Wrap Up (*final walk through, more praise*)
6. Exit (*gather and clean tools, evaluations, walk out, final thank you message*)
7. Report (*notes for future events, incident reports, crew leader debrief*)

A summary of each phase follows. Because the number of items to be covered is substantial, crew leaders should carry a cheat-sheet or checklist as a memory aid. Using such aids also communicates the importance of their content. Exhibit II-A shows the information on the q-card. The text in this exhibit can be printed on brochure-sized, double-sided, laminated “q-cards” using 11 point Arial typeface. The cards’ function are to help crew leaders remember key project steps and crew orientation topics.

1. Prepare

Develop a plan for the day. Unless the work is a continuation of work already initiated, a site visit before the event is recommended, if not required. The level of preparation required is a function of the complexity of the work, the logistics involved in getting volunteers to and from the work area and the extent to which the work will be guided by construction notes prepared by the TA.. The characteristics of the crew, if known (Boy Scouts, corporate group, season trail volunteers), should be taken into consideration in devising a preliminary plan of work.

2. Welcome and Walk-in

When the crew is assembled and their readiness for the day is assessed, introductions are made, goals discussed, and initial safety items reviewed. The tool Carrying, Use, Storage, and Safety-CUSS-talk is started. A cheat sheet or q-card should be used from this point forward to make certain all critical items are covered.

3. Get Ready

The tool CUSS talk is completed after arriving at the work area. The closer the discussion of tool handling is to the time when the information will be needed the better. Any remaining safety items are also discussed. During an initial walk through of the work area, give the crew a clear idea of the work to be done and secure buy-in to a work plan. A crew leader’s initial concept of the work plan may well be modified based on crew member abilities, interests and ideas. If strong differences of opinion arise at this or a later point during the day, the TA may be called upon to resolve the matter.

4. Do It

This is the phase when the crew actually gets down to work. The amount of teaching, coaching and monitoring of tool use and work practice required will depend on the skills volunteers bring to the event, how quickly they learn, and how willing they are to take direction. Those with good skills should be identifiable early in this phase and their abilities tapped to help guide the work of less experienced volunteers. (These individuals may be prospective crew leaders.)

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The crew leader must monitor exertion and water consumption. Call for drinks every 20 to 30 minutes, depending on the temperature. Require short breaks every hour. Praise specific good work. Involve the crew in troubleshooting unanticipated problems, while understanding that deviations from construction notes requires TA approval. Written volunteer evaluations are listed as part of phase 5, but this may also be done at an afternoon break. It is best not to wait until the very end of the day for completing evaluations if some people have to leave early.

5. Wrap Up

As a section of work is completed, the crew leader must contact the TA for his or her sign-off on the section. After the TA “releases” a section the crew should be gathered for a walk-through and review of what has been accomplished. Boasting is appropriate as well as honest discussion of disagreements about process and product. If there is less than two hours of work left, have volunteers complete their written evaluations of the event. (After lunch and a mid-afternoon work break are also good times to complete evaluations. If evaluations are web based, this should be announced.) Gather the tools and move to the next work section. Between thirty and sixty minutes before the scheduled end of the work day, examine the remaining work in the current work section and devise a finishing plan. Whether a final walk-through makes sense depends on the amount of work done in the final work section of the day. If clearing a corridor is all that has been done, it may not be of value.

6. Exit

Gather and clean tools. Volunteers should be assembled and thanked either just before and right after the walk out. Make sure all crew members are accounted for. Appoint a sweep and return all tools to the main tool cache and store by type.

7. Report

After the crew leader sends his or her happy volunteers on their merry ways, time should be taken to review evaluations before returning them to the Event Manager. Prepare incident reports (injuries, crew member dismissals or early departures) or make enough notes to be able to accurately prepare them later. There may be a post-event meeting of crew leaders with the TA and the Crew Leader Manager.

Exhibit II-A: Contents of Crew Leader Q-Cards

1. **PREPARE** - Before you meet your crew
 - Review c-notes, review Manual, visit work section & visualize strategy, rehearse safety & orientation talk
 - Help unload tools
 - Secure *undamaged* tool cache, CL kit
2. **WELCOME & WALK-IN** - at assembly point
 - Verify **sign-in** & land manager registration
 - **All ready to go**-clothing, boots, gloves, water, food, sun guard
 - **“Welcome, thank you”**, today’s **goals** (safety/fun/quality/output), goals of **your org.**
 - **Name tags & introductions** –*Interests, Why you volunteered, Prior trail experience, Your goal today*
 - **Tool transport** (gloves, tool at side-not on shoulder, heaviest on downhill side, dangerous face down, safe distance apart)
 - **Walk-in risks** (slowest up front)
 - General safety items**
 - ✓ **Animals** that bite & sting (snakes, scorpions, spiders, bears, squirrels)
 - ✓ **Plant life** that can injure (cacti, cat claw, poison ivy, falling or thrown branches,)
 - ✓ **Children** under adult supervision at all times.
 - ✓ **Pets**, if allowed, leashed or caged
 - ✓ **If you must leave work area.** (Drop pack at side of trail where you leave trail)
 - ✓ **Emergency skills present?**
 - ✓ Explain **first aid support** and **safety net activation** – appoint alternate activator
 - ✓ Significant **medical conditions** (back problems, allergies to plants or insects, medication, diabetes, epilepsy, heart or lung problems)
 - Appoint **lead** and **sweep**
 - Monitor **safe walking distance**
3. **GET READY** - at first **work section**
 - **Tool storage** (in a group, high side of trail, handles toward trail, bars parallel & supported, don’t drop or toss)
 - Critical safety items**
 - ✓ “coming through” and “ rock” alerts
 - ✓ **Dehydration** (drink before thirsty, when asked by crew leader, nearest water station)
 - ✓ Signs of **heat exhaustion** (heavy sweating, cool pale moist skin, nausea, weakness, dizziness) or **hypothermia** (violent shivering; unstable; confusion). Response: lie down feet above head, summon crew leader.
 - ✓ **Over-exertion** (pace yourself, pay attention to your breathing, breaks as needed and when CL directs – sit on high side, facing trail and within corridor)
 - ✓ **Lifting** (bend at knees, ask for help. Handling rock is primary source of injury)
 - **Leave No Trace**
 - ✓ **Minimize impact** on landscape beyond that needed for trail.
 - ✓ **Remove** what you bring to site, including toilet tissue.
 - ✓ Always **walk within tread area** unless this would be unsafe
 - ✓ **Sit** during breaks **where this will not disturb** plants and terrain.
 - Extend **Leave No Trace** to include **trail work**

Exhibit II-A-continued: Contents of Crew Leader Q-Cards

- **Walk through** section and discuss objectives, trail user needs, how you will complete the work section

Complete tool use and safety

- ✓ **Lopper and saw** (don't stress loppers, 3-cut limbing, no hair-cuts or hat racks)
- ✓ **Pulaski & mattock** (grubbing & loosening materials; modest swing; accuracy over power, angle stroke to start, protect axe on Pulaski)
- ✓ **McLeod** (moving ground cover and loose or lightly packed matter; shaping tread and slopes; stroke don't swing)
- ✓ **Shovel** (for moving loose material; not for making tread)
- ✓ **Rock bar** (grubbing, breaking rock, loosening and shifting medium to large rocks; employ fulcrum, employ three on large rocks, assure other workers are clear of fall lines & keep hands clear)
- ✓ **Buckets (½ full) & blankets**

4. **DO IT** - Monitoring during work

- Interact with all crew members, coach, demo, help, **praise**, troubleshoot, **hydration, breaks** and candy treats
- **Contact TA** as needed to resolve technical problems
- Make note of **prospective crew leaders** in your crew

5. **WRAP UP** - at completion of work section

- **Clear with TA**
- **Walk through** and review with crew, more **praise**
- **Gather tools** to move to next section
- At last section of day – Review construction notes and set strategy in light of available time; consult with TA, if possible.

6. **EXIT** - at end of day-

- **Begin shut-down** about 30 minutes before start of walk-out
- **Clean tools**
- **Volunteer evaluations**
- **Thank-yous** and treats
- Talk w/ prospective crew leaders
- Review and note work remaining on construction notes
- Gather tools for walk-out, appoint sweep
- Return tools to main tool cache, group by type, help load
- Read evaluations
- Return c-notes and evaluation in CL kit

7. **Attend post event CL meeting**

Safety plans for trail events

The risk of physical injury or illness is always present in outdoor volunteer work. Avoiding injury is the highest priority. Though project-related injuries and illnesses are extremely rare, their consequences are potentially severe.

Most states have enacted laws to protect citizens who render aid at the scene of an emergency. The Arizona's statutory language is as follows:

ARS ' ' 32-1471. "Health care provider and any other person; emergency aid; nonliability

Any health care provider licensed or certified to practice as such in this state or elsewhere, or a licensed ambulance attendant, driver or pilot as defined in section 41-1831, or any other person who renders emergency care at a public gathering or at the scene of an emergency occurrence gratuitously and in good faith shall not be liable for any civil or other damages as the result of any act or omission by such person rendering the emergency care, or as the result of any act or failure to act to provide or arrange for further medical treatment or care for the injured persons, unless such person, while rendering such emergency care, is guilty of gross negligence."

This law does not protect anyone whose actions might be found negligent. That is, be prudent, use good sense, and don't attempt action for which you are not prepared. Above all, seek qualified medical assistance. Obtaining Basic First Aid and CPR certification is recommended and is required by some trail work organizations.

No one organizing volunteer trail work can ever guarantee safety, but the risks of injury can be minimized. Volunteers must be apprised of the risks as best they can be prudently anticipated. Acceptance of these risks should be acknowledged by each volunteer at the before each event in the form of a signed waiver.

Protecting volunteers and the sponsoring organizations requires a written **safety plan** for every event. The elements of an event safety plan include:

1. Fitness requirements understood by each participant
This is addressed through advance literature about the event. Volunteers should be given some sense of the level of difficulty in reaching the work area and performing the work.
2. Initial crew check-in and assembly
Each crew member must sign an event waiver and land manager volunteer agreement. The latter should extend workers compensation insurance coverage to volunteers.
3. Safety and tool use talk
The crew leader discusses safe behavior and proper tool handling (CUSS your tools: carrying, using, safety, storage).
4. Initial monitoring of tool handling
Crew leader helps crew members follow safety rules as they begin to work.
5. Monitoring by leader: fatigue, water consumption, sunburn
6. First aid & safety net
Crew members must understand how emergencies will be handled
7. Exit strategy
There must always be a plan for quick exit from the work area, and the crew members must be informed of it.

The standard language of the trail safety plan template used by Volunteers for Outdoor Arizona is shown in Exhibit II-B. For a specific event the standard safety language is supplemented by an event specific addendum covering safety net details.

Exhibit II-B: STANDARD SAFETY PLAN

Every VOAz event has a safety plan that documents the measures being taken to minimize the risk of injury and illness to volunteers. For all events there is a core set of measures that apply to all. These are stated below. They are written with trail work in mind in particular. However, trail work safety measures regard safe work practices can be applied in some measure to most non-trail work events.

1. **Fitness requirements understood by each participant**

The advance literature sent to volunteers and posted at the web site explains the physical requirements of the work involved, the amount of walking required to reach and complete work, pre-hydration recommendations, and “what to bring and wear.” A description of the crews may be made available to allow volunteers to identify tasks they believe appropriate to their abilities. Crew leaders have the authority to direct volunteers away from tasks they appear unqualified to perform for either safety or quality control reasons.

2. **Initial crew check-in assembly**

“Admission” to a crew is based on the volunteer signing the project waiver and completing any crew assignment process.

Certain safety items are addressed as crews are assembled for the walk or shuttle to the work area. Smaller events can have a collective initial safety talk; otherwise this responsibility falls to each crew leader. These include making certain volunteers have appropriate clothing, gloves, weather protection, water, and snacks. If tools must be carried, the crew leader will make sure each person is properly handling the tools she or he is transporting.

3. **Safety and tool use talk**

Safety and tool use orientation is completed once the crew has arrived at its work area. The safety talk will include self-monitoring, communication, working distances, and tool handling. Crew leaders use the VOAz Crew leaders Checklist to guide them through this task. Efficient tool use is closely related to safe tool. Both are addressed at the work area. Because volunteers are eager to get to work, crew leaders may break tool use training into stages corresponding to work stages. The more proximate training is to the actual application of the skills to be learned the more effective it is apt to be.

4. **Initial monitoring of tool handling**

Use the first 30 or so minutes of each work session as a *training and orientation period* during the crew leader helps everyone learn the appropriate technique and buy into the project standards. Crew leaders observe and promptly correct tool-handling errors during the first part of each work phase.

5. **Monitoring by leader: fatigue, water consumption, sunburn**

The safety talk will address these issues. In addition, crew leaders must continuously monitor for overexertion, heat exhaustion, dehydration, sunburn, and, under wet and cold conditions, hypothermia.

6. **First aid**

Crew members may well treat their own simple injuries, but this is not to be encouraged. All persons with injuries are directed to the nearest first aid station, if one has been established. If a crew leader determines that this may not be adequate or if the injury is clearly serious, that worker must stop work and the crew leader will secure emergency assistance. The crew leader stays with the injured person and sends two people to the nearest first aid station.

No one who is not certified for first aid is allowed to administer first aid. Qualified first aid and emergency care cannot be readily available for every project. Volunteers are apprised of this fact in advance literature.

Specific instructions from communicating with emergency services are covered in the Event Safety Plan.

7. **Exit strategy**

While not likely, leaving the work area could become necessary should an unforeseen danger arise. A sudden, unseasonable storm or severe lightning and rainstorms are possibilities. If you are directed to evacuate, assemble and count your crew. When all are accounted for, the crew proceeds as a group to the trailhead or as otherwise directed.

Event specific exit instructions covered in the Event Safety Plan.

Food service and camp hygiene

When meals are prepared or assembled at a work event all food handlers are provided and required to use a hand washing station. Such a station is also available to volunteers. If a wash station is not available, sanitary wipes are available.

Events that include camping provide the same hand sanitation services.

Safety Net –responding to emergencies

“Safety Net” is the name used by Volunteers for Outdoor Colorado to describe their response to medical emergencies. Whereas an over all Safety Plan identifies all of the measures that are taken to minimize the risk of injury, the Safety Net portion of the plan addresses what takes place when medical problems occur that require assistance. There are four elements of the Safety Net: communication, medical response, evacuation, and follow-up.

Safety Net: Communication

The Safety Net is activated when a crew leader determines that *an injury or illness requires immediate outside assistance*. The safety net is not activated by a minor scrape that the volunteer seems able and willing to self-treat. It is not activated when a crew leader asks a volunteer, who appears to be getting overheated or exhausted, to sit down in the shade, rest, and take a long slow drink of water.

The first step in activating the safety net is for all work to stop. This is necessary to allow the crew leader to focus solely on resolution of the problem. The crew leader must stay calm so that they can help an ill or injured volunteer and other volunteers remain calm. Act quickly but only based on a well-reasoned plan of action. Other crew members should be called upon to help, as needed. If the situation is such that others may be at risk (rockslides, for example) take action to prevent additional injuries. Notify leaders of adjacent crews.

One or more crew members are sent to the first aid station, if there is one, or to the event manager. This contact point must have radio or phone communication with available local emergency assistance. The messenger or messengers must have exact information about the nature of the problem. To make sure the messengers understand, ask them to repeat the information back before departing. Make sure that messengers also understand that they must relay the information to someone able to contact with the appropriate support and that they are to report back to the crew leader. *The crew leader does not leave the injured or ill person until responsibility is transferred to emergency personnel.*

Do not move ill or injured persons. A crew leader or crew member certified in Basic First Aid and CPR may offer assistance. However, they must first obtain the permission of a conscious victim.

When emergency assistance arrives, answer the questions of the emergency professionals. If others inquire, simply report that there has been an accident. Do not explain how the incident occurred, talk about the cause, assess the consequences, or attempt to fix responsibility.

Injured volunteers should not be allowed to walk off a project site until the crew leader has obtained appropriate assistance or until an additional member of the project team reviews the situation.

Safety Net: Medical Response

Medical response capacity may be on-site or accessed from the nearest community. The crew leader retains control of the situation until responsibility is transferred to a senior member of the event team or EMS personnel.

Safety Net: Evacuations

Advance planning will set the route and mode of removing an ill or injured individual, or if need be, all volunteers on a crew or project. EMS helicopter landing coordinates should be part of the plan. EMS personnel or certified Wilderness First Responders are to be in charge of moving injured volunteers.

If the crew must be evacuated, the crew leader is responsible for making sure everyone is calmly evacuated to a designated point before dispersing from the project. If more than one crew

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is involved, a member of the project team must coordinate the evacuation. The crew leader determines whether it is practical to carry tools.

Safety Net: Follow-up

After the emergency situation has passed the crew leader informs all crew members. The crew leader must complete an incident report. The Project Director or his or her designee will contact the victim within one week of the incident.

III. Trail Design Principles

While crew leading does not involve laying out new trail, understanding the principles of good trail layout contributes significantly to effective crew leadership. This knowledge can help crew leaders understand the placement of a new trail—or stimulate valid alignment questions for the TA. Crew leaders who understand trail design principles can enhance their crew's experience by explaining a new trail's location or why certain maintenance and repair tasks are necessary on an existing trail.

This section provides only an overview of trail design and planning principles. It is not intended as a guide for actual trail planning.

Goals of trail design

Four basic goals in **designing non-motorized recreation trails**, either for completely new trail or for relocating an existing trail, are:

Meet the needs of **prospective users**

Sustainability – trail should require infrequent maintenance

Natural habitat protection – minimize disruption caused by trails and trail users of native flora and fauna

Respect the rights of legitimate non-trail land users

Meeting these goals almost always entails addressing conflicts between them. As nearly all trails are multi-use, meeting user needs in itself entails resolving some conflicting needs and preferences of different types of users.

Meeting the needs of prospective users

All legitimate trail users want to reach their destination in a manner that is safe, reasonably comfortable, and aesthetically rewarding. The definitions of those measures can none the less vary substantially depending both on the mode of trail use (hike, bike, and ride) and the level of challenge expected by projected users.

Hikers need an **obstacle-free** trail so they do not have to concentrate on footing or hazards within the corridor. They need to **expend energy at a more or less constant level** as they walk.

Equestrians require **smooth transitions** with especially **good visibility**. There should be nothing along the trail for an animal to inadvertently encounter and cause surprise. Horses **should not have to jump** forward and load the tread with all their weight. Where this occurs with any frequency, trail becomes unsafe for all users.

Mountain Bikers require trails that are **not hazardous at safe biking speeds**. Most mountain bikers enjoy a **challenging trail**, but neither they nor their equipment should be placed at risk of damage. Because they are smaller and lighter than equestrians, equestrian trail provisions generally meet the needs of bikers for good visibility. Because of the speeds mountain bikes can safely attain attention needs to be given to damping down speed when trails approach blind corners, speed grades or other conditions where speed would be unsafe.

To accommodate **wheel chair users**, grades, tread widths, and surfaces must meet standards promulgated under the Americans with Disabilities Act. This manual does not address this subject.

Additional user requirements may arise due to **local conditions or special user needs**. For example, in bear country, there should always be good approach visibility so that neither bear nor

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human is surprised. Or, if a trail serves skilled mountain bikers, clearing areas along the downhill approaches to climbing turns may need to be larger than normal to allow fast-moving bikes good vision through the turn.

Requirements can also be adjusted based on the level of challenge a trail is expected to provide. Most hikers will object to sustained grades of more than ten percent. Others—extreme hikers, trail runners, mountain bikers, and equestrians—will accept or even seek more challenging trails (steeper grades, narrower and rockier treads). However, the goal of building a more challenging trail or accepting a more challenging trail because of constraints on alignment options easily runs into conflicts with sustainability. Steep trails erode. Narrow and rocky trails push users off the trail.

The land manager determines the user groups served by a particular trail.

Sustainability

The sustainability of a trail depends on
its *placement* on the land,
how it is built, and
the *pattern and intensity of use*.

The single most important determinant of trail sustainability is how well it sheds water. Arizona is mostly characterized by rainfall that arrives infrequently but in concentrated amounts. Erosive soils are common.

Habitat protection

A trail is a scar on the landscape. Trails afford people the opportunity to get close to and disturb wildlife and native plants. Trails can foster the spread of invasive species. This might suggest that, at best, we can minimize the negative consequences of trails for native habitat. While minimizing negative effects is one goal of trail design, trails also have some positive effects on their environments. Building a sustainable trail can effectively control movement through an environment by keeping trail users in a single location. In general, wildlife can better adapt to human activity if it is confined to trails. Trails can be placed to direct humans away from ecologically-sensitive areas. Critical information about habitat issues of a particular area can be more easily disseminated to trail users if there is a well-defined system of trails and trailheads.

Respecting the rights of non-trail users

Many public lands trails are used for purposes other than recreation. These purposes must be identified and addressed in the trail planning process. On federal lands, conflicts with ranchers whose fences must be crossed are often a source of conflict. In urban areas, trails that come close or even within sight of a residential property are often problematic, especially if the trails are planned after the effected residential properties are occupied.

Elements of a trail planning process

The first step in planning a new trail is to identify when to set in motion the requisite processes for ultimately gaining administrative approval for the project. The process of preparing impact statements should anticipate probable effects on native plants and wildlife, archeological sites, and historic sites, or changes in a particular environment such as that brought about through trail building.

Organizations providing volunteer trail work crews rely on land managers to navigate this process. It is best if project planners and trail designers from all stake-holder groups can be

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involved in the initial designation of a trail corridor *before* formal approvals are sought. Trail building organizations don't like to ask volunteers to work on poorly laid-out trails. This is why "route approval" is Item Five in the trail design sequence outlined below. All factors in Items One through Four should receive consideration prior to requesting approval of a trail specific corridor.

Fortunately, environmentally appropriate "trail corridors" on public lands are usually substantially wider than the trail corridor defined in construction specifications. Thus, trail designers will normally have some latitude to adjust the final alignment to meet user needs, sustainability and habitat protection criteria.

The following eight items outline the primary considerations in planning new trail, including significant realignments:

1. Identify trail user groups, traffic volume, and functions of the trail

If trails are not designed in response to an accurate understanding of predictable use (which may vary from the officially expected use), trails may deteriorate more rapidly than expected. On the other hand, resources may be wasted on over-building. Consideration of these factors determines:

Tread width and corridor dimensions (see Summary Table of Standards below)

Acceptable grades (5% to 12%; up to 18% over short distances for hikers and equestrians; grade in excess of 15% highly subject to erosion)

Day use only or accommodation for trail-side camping

2. Identify alignment constraints and opportunities that set control points

End points and junctions

Safety

(talus slopes, cliffs, dead fall zones, etc.)

Desirable/acceptable cross slope

(Optimal cross-slope is greater than 10% and less than 50%)

Cross-slopes less than 10% are apt to accumulate water

70% to 90% cross-slope is likely to require rock walls to stabilize tread

Trail cannot be built on cross-slope that exceeds 90%)

Behavior of users

(Crosscutting, getting to high or vista points and prominent features, avoiding out-and-back, etc.)

Archeological site protection

Wildlife protection

Plant life protection

Serviceability of animal tracks, old roads and social trails

Aesthetics of movement and local features

Vistas (negative and positive)

Comfortable variation

Historic sites (preservation & destination)

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Sounds and smells

3. Follow alignment principles and standards when selecting potential corridor(s)

Maintain proper relationship between trail grade and cross slope

(Trail grade should be less than one fourth of the cross-slope—for example, a 40% cross slope can accommodate up to 10% grade. Ratio can be pushed to one to three in stable soil situations. One to five may be appropriate in areas with highly erosive soils)

Incorporate natural topographic variations to provide appealing changes of grade

Order of preference for negotiating changes of grade:

contouring – follow terrain contours with gentle grade reversals

steps and check dams—where constrained to traversing grades greater than about 10%

Order of preference for negotiating change of direction:

climbing turns – climb or descend in broad arcs when cross slope is less than (preferably) 15%, up to a maximum of 20%

switchbacks – reversing turns where climbing turns are not feasible

Order of preference for moving water off the tread.

straight across, preserving sheet flow or within an established drainage

drainage dips (naturally occurring, where possible)

check dams to removal point

on flat terrain—*it depends*

4. Preliminary route/corridor ribbon flagging

This is where all of the previously assessed factors come together in the field, and more. There is no algorithm for laying out inspired trail. Trail flagging based on a single pass on a single day almost inevitably fails to take full advantage of the opportunities afforded in a given landscape. Obtaining buy-in of land managers, prospective users, and trail stewards/adopters at this stage is also critical.

5. Formal route approval

6. Determination of signing requirements and standards

7. Determination of detailed construction standards

8. Final route flagging

Implications of trail design principles for trail maintenance

While new trail continues to be built, there exist hundreds of miles of trail in Arizona that are poorly maintained. Volunteer trail builders can expect to be called upon to do maintenance on existing trails as often, if not more often, than they are asked to build new trail.

Maintaining well laid out trails is usually a fairly straightforward job of removing slough and berm and cleaning water control structures. Unfortunately a many miles of those poorly maintained existing trails are also poorly laid out. Drawing on the principles presented in the previous section, a diagnosis of the deficiencies of an existing trail may fairly easy. Arriving at a corrective plan that is acceptable to a land manager may be easy or it may not be for a number of reasons.

Diagnosing poorly placed or poorly built trail

Studying erosion patterns is one way to understand what may be going wrong with a trail. Trails that do a poor job of shedding water erode as water is captured on the trail and removes material loosened by trail use. One of the best times to evaluate how water is behaving on a trail is to be there shortly after a significant storm.

Trails tend to widen or “creep” with normal use. Landscape, cross slope, and amount of use all can affect the amount of creep. Plant barriers and guide stones can be used to attempt to contain creep. Sometimes barriers resulting from inadequate maintenance (vegetation that has grown into the trailway, deadfall, low spots that are water traps) causes widening as users take new paths to avoid barriers and difficult segments (actual and perceived).

Inadequate backslope and outslope, poorly built dips, rip rap, rock walls-basically every type structure used to build trail may be present. Distinguishing between poor construction and poor placement of a trail or trail structure is an important part of the assessment process.

Poorly situated or improperly constructed switchbacks may generate off trail short cutting. Poorly maintained trails may themselves cause users to seek easier routes. Trail users will create trails to achieve perceived time and energy savings or to reach interesting places and desirable vistas.

Prescribing maintenance solutions often means arbitrating between conflicting objectives

Planning maintenance work on existing trails clearly requires examination of fine detail-what is happening at this particular point or short section of the trail-and at a macro level-what do all the problems in aggregate say about the current alignment. This is one of the jobs, and skills, of a TA.

When a land manager requests volunteers for trail maintenance work, the first question is: “Is this trail fundamentally sustainable, perhaps with only minor adjustments to the alignment?” If the answer is “yes,” then planning for maintenance and minor repairs may proceed.

When the answer appears to be know “no,” the next question is: “Is it reasonable to consider realignment and closure of the offending portions?” There must be a clearly superior alternative corridor available that provides whatever benefits the exiting trail provides. The old trail needs to be successfully obliterated and the land rehabilitated. If this is not possible, is it still worth having two scars rather than just one?

Land managers may not be keen on expending volunteer time in a laborious job of building a new trail if they are confronted with a large maintenance deficit. Arguments that this will save resources over time, not to mention enhance the users’ trail experience, may not be persuasive. Few land managers are accountable for the life-costs of a trail.

Crew leaders with an organization that relies on volunteers have concerns that a land manager may be insensitive to. What is the best or a reasonable use of a volunteer’s time? This manual takes the position that volunteer trail work thrives only when the goals of quality and sustainability take precedence over quantity.

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It may be easier to do a quick-and-dirty job. There may be short-term satisfaction from such an approach because more feet of trail may be “fixed” than is possible if higher standards are pursued. But, such an orientation will not build the corps of dedicated and competent trail workers. It also may undermine the argument for the using volunteers and for providing volunteer trail work organizations appropriate financial support because they deliver a consistent, quality product.

Volunteers will be disappointed if their brushing work is overgrown after one season because a trail is improperly placed on the margins of a drainage; or, if the cleaned waterbars and dips quickly clog because the trail grade and soil conditions are beyond that which can be managed by any feasible water control structures; or, if off trail traffic resumes because the trail forces a seemingly unnatural or uncomfortable line of movement on users. Project selection and planning needs to reflect sensitivity to such dampers of volunteer enthusiasm.

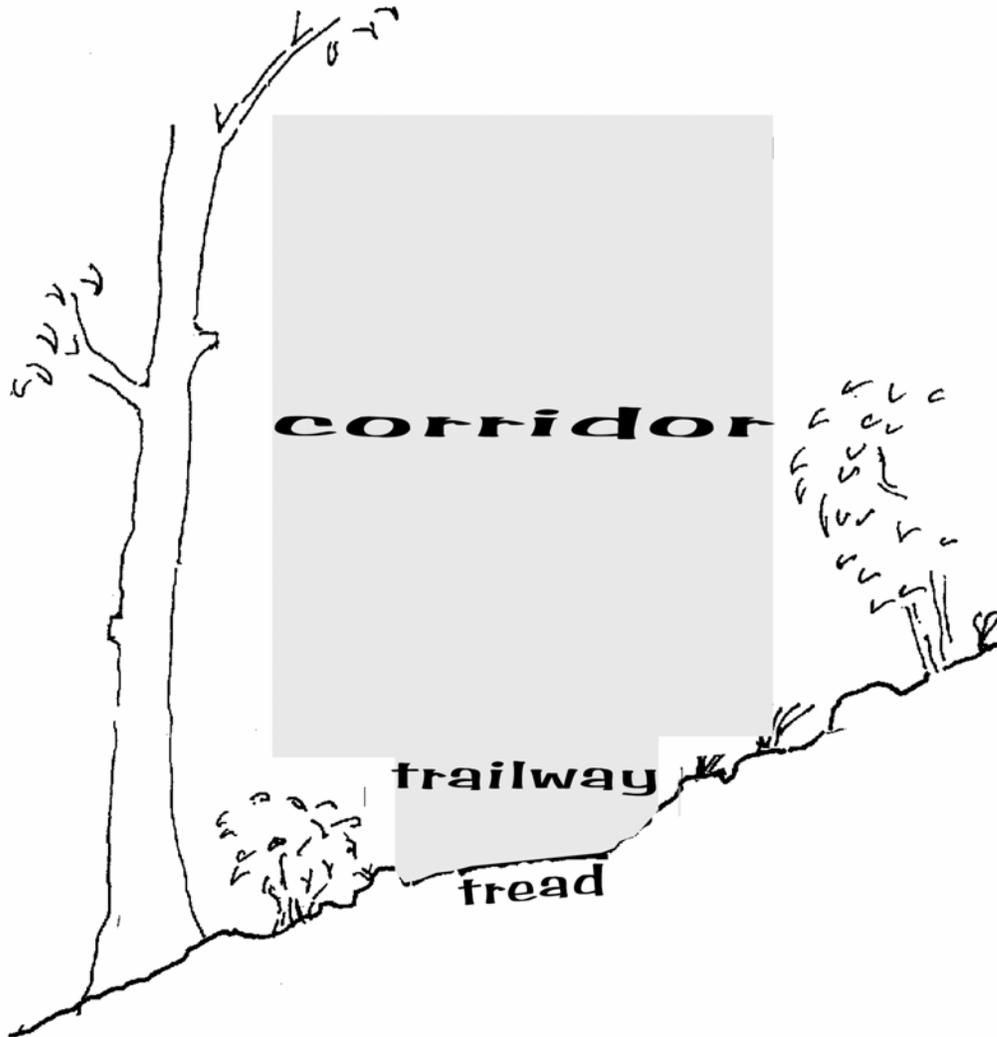
On the other hand, volunteers usually understand and become enthusiastic about replacing an unsustainable length of trail with one that is user friendly and easy to maintain. This can only happen if they can complete the project or, if this is not possible, they are convinced that it will be completed.

Nonetheless, there are situations where a poorly laid out trail must stay where it is and frequent maintenance work is unavoidable. It may be possible to justify use of volunteer time on in these situations, but the case must be made. If the case cannot be readily made, trail organizations may do real harm to the cause of mobilizing trail volunteers by accepting such projects. Maintaining unsustainable trail for no logical reason may be better left to the paid crews of land managers.

IV. Trail Construction and Maintenance

Leading trail work volunteers requires knowledge of the care and use of trail work tools and how to build and maintain tread and trail structures that minimize damage *to* trails from use and natural forces and *by* trails on their proximate environment. Section V. of this manual addresses these issues. This section provides an overview of trail standards and models of the trail construction and maintenance processes. Crew leaders may use this information to plan and organize the work of volunteers and to orient volunteers to these processes. The final topic of this section addresses the implications of the Leave No Trace concepts for trail work.

Whoever fulfills the TA function will base construction notes on trail standards or trail specifications specifies by the land manager. The core of these standards are the dimensions of the *trail corridor*, *trailway*, and *tread* illustrated on this page. Exhibit IV-A presents some common standards for trails. In addition to defining the three aforementioned trail elements, the exhibit may also be helpful for trail building with organizations, such as land trusts, that may not have established trail standards.



**Exhibit IV-Common Non-motorized
Trail Terms and Trail Construction and Work Standards**

<i>Tread, Trailway, & Corridor have a common centerline</i>	Tread Travel surface for trail users	Trailway Area cleared to grade through which tread passes	Corridor Area cleared of obstructions to accommodate trail users	Beyond corridor
Width	18” - wilderness 24” - back country, multi-use >30” - urban	4 ft. or 6” to 12” beyond tread width	4 ft. – pedestrian only 6 to 8 ft – multi-use	N/A
Height	N/A	7 ft.- pedestrian only 8 to 10 ft – multi-use		
Trees	Removed		Removed or cut to grade	Limb only for aesthetic or fell serious leaners
Tree branches	Remove all intrusions into corridor. Cut to near trunk or strong, live collar, irrespective of corridor width			
Understory	Grub out	Grub out	Prune intrusions & growth over 18” high	Prune only to enhance natural look
Roots	Grub out. Retain transverse roots if removal will destabilize tread	Grub out	Grub only if needed to set backslope	N/A
Ground cover	Remove in areas of direct sunlight	Remove only as required to set tread and backslope		
Boulders	Remove obstructing	Remove as required to set backslope		
Soil	Remove as needed to set tread, backslope, clean waterbars & dips, etc.			

Trail construction sequence and trail maintenance sequence

There are any number of different ways to efficiently organize the work of a given trail event. The sequences described here provide crew leaders with a way to orient volunteers who have minimal prior trail work experience. Use the information below as guidelines. In the field, it may not make sense to try to complete one phase for an entire section of work before the next phase is initiated. The crew should understand the plan for work before work commences.

An advance team of experienced volunteers or the land manager should perform tasks such as felling or winching out trees and rough-clearing of heavily vegetated corridor to facilitate access. Advance construction of samples that illustrate the desired end result can help in orienting volunteers.

The trail work tasks and structures printed in *bold italics* below are described in detail in section V of this manual.

New trail construction phases A. through D. and typical tasks of each

A. Clear Corridor

Brushing, grubbing, limbing

Transplant endangered/sensitive species

Store debris that might be used for blocking and closing old trail and disperse the remainder out of view

B. Rough Set Bench

Cut full bench and backslope (*tread construction – side hill* or *tread construction-flat/low slope*) to approximate final width and to 80 % of outslope

Construct *climbing turns, switchbacks*

C. Finish Tread and Install Special Structures

Build *drain dips, rip rap, surface drainage crossings, rock walls, steps*, and other more specialized structures (turnpikes, culverts, etc.)

Finish tread and backslope

Add *guide stones* and *cairns*, if needed

Add signage, where needed.

D Polish Corridor & Close Old Trail

Verify rolled critical edge of tread

Check for haircuts and hat racks in brushes and trees

Remove flagging

Block short cuts and potential/actual social trails

Disperse excess debris outside corridor

Trail closure work

Trail maintenance phases A. through D. and typical tasks of each

A. Clear Corridor

Brushing, grubbing, limbing

Store debris that might be used for blocking and disperse the remainder

B. Reset Tread

Slough and berm removal

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C. Reset/add Special Structures

Clean and repair *drain dips, rip rap, surface drainage crossings, waterbars* and *rock walls*, etc.

Reset *guide stones* and *cairns*

Repair signage

D Polish Corridor & Close Old Trail

Verify rolled critical edge of tread

Block short cuts and potential/actual social trails

Disperse excess debris outside corridor

Leave No Trace in trail work

“Leave No Trace” principles have been expanded from their original focus on low-impact camping to a more comprehensive ethic of trail user behavior. Leave No Trace principles can also be applied to trail construction and maintenance activities.

In one sense, the expression “Leave No Trace trail work” is an oxymoron. Scarring the landscape with a trail removes the possibility that human presence will not be evident. Trail building, in fact, makes the point of leaving a well-defined “trace.” The intent is to discourage traffic from going off a designated track.

Trails themselves support “Leave No Trace” to the extent that they contain and minimize the effects of trail activity on the land. *Trail work* supports “Leave No Trace” if the alignment and structures have as “natural” an appearance as possible and if the physical impact of the work itself is minimized and effectively masked. This is achieved by:

- Confining movement to the tread as much as possible during construction and minimizing the destruction of habitat outside the trailway
- Placing cut plant material to obscure its fate
- Placing disturbed exposed rock with varnished and encrusted faces visible
- Gathering materials removed to set a tread and backslope within the tread or at temporary depots until used or finally dispersed
- Thinly dispersing excess materials (duff and soil) outside of corridor
- Using fine duff and materials that naturally appear at grade to dress disturbed off-trail areas
- And, if you are really into it, removing tool marks from tread and back slope with a wisk broom and then dusting with dry soil and fine gravel.

Perhaps the most common violation of Leave No Trace principles in trail building is the tendency to stand on the downhill side of the tread while cutting and shaping new tread or removing sough and berm from existing tread. In addition to trashing the area adjacent to the trail, this practice obliterates the outside edge (*critical edge*). The resulting pile of debris not only looks bad. It does not provide trail users with a clear indication of where the lower tread edge is.

This practice sometimes results in poor drainage of the tread because a berm of debris is created.

The problem for volunteers is that it is generally easier to stand below the tread and use a pick or McLeod to pull debris toward them. The crew leader has to convince his or her crew that it is worth the extra effort to gather loose material on the tread and then disperse it outside the corridor when it is clear that it is not needed. The best way to do this may be to first gain buy-in to the general concept of Leave No Trace trail work.

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When to let nature carry more of the land-healing burden

Energy expended masking trail work scars will take away from the total number of lineal feet of trail work that is accomplished on a project. When working on remote, low-traffic trails it may be practical to allow nature to do more of the masking.