Crew Leader Training for Post-fire Restoration
2013

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WILDLANDS RESTORATION VOLUNTEERS

HIGH PARK RESTORATION COALITION

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OSI Guide to Crew Leadership for Ecological Restoration

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ORIGINAL CURRICULUM COMMITTEE MEMBERS

Project Leader: Ed Self, Wildlands Restoration Volunteers
2006 Edition:
Larry Nygaard, Wildlands Restoration Volunteers
Terry Gimbel, Retired, Colorado State Parks
Pam Packer, Outdoor Stewardship Institute
2008 Edition: John Giordanego, Wildlands Restoration Volunteers
Terry Gimbel, Retired, Colorado State Parks
2011 Edition: Sue Anderson, Fletcher Jacobs, Volunteers for Outdoor Colorado's Outdoor Stewardship Institute

Claire DeLeo, Boulder County Parks and Open Space
Henry Gibb, Independent
Sarah Gorecki, Colorado Fourteeners Initiative
Jon Halverson, US Forest Service
David Hirt, Boulder County Parks and Open Space
John Giordanego, Wildlands Restoration Volunteers
Kimberley Horn, Continental Divide Trail Alliance
Danielle Hosler, Colorado Division of Wildlife
Steve Johnson, Wildlands Restoration Volunteers
Jennifer Kesler, Boulder County Parks and Open Space
Chris Pasko, Wildlands Restoration Volunteers
Scott Rudd, Independent
Nancy Matchett, Colorado State Parks
Mike Smith, Colorado Division of Wildlife
Ray Sperger, South Suburban Park
Mick Syzek, Wildlands Restoration Volunteers
Lisa Tasker, E.M. Ecological

REVIEWERS

Tom Acre, City of Commerce City
Jennifer Freeman, Colorado Youth Corps Association
Steve Austin, Volunteers for Outdoor Colorado
Tim Beaty, USFS-National Headquarters
Doug Blankinship, Bureau of Land Management
Patricia Brennan, Larimer County Parks & Open Lands
Jane Clodfelter, Bureau of Land Management
Alicia Day, Colorado Fourteeners Initiative
Hugh Duffy, National Park Service
Randy Engle, Colorado State Parks
Avrom Feinberg, Rocky Mountain Youth Corps
Bob Finch, Colorado State Parks
Kim Frederick, Jefferson County Open Space
Linda Fuller, Girl Scouts-Mile High Council
Tim Gaines, Volunteers for Outdoor Colorado
Henry Gibb, Jefferson County Schools
David Hamilton, Roaring Fork Outdoor Volunteers
Jerry Helmke, Colorado Mountain Club
Becky Hubbarth, Volunteers for Outdoor Colorado
John Hunt, Buffalo Peaks Back Country Horsemen
Ryan Jackson, Jefferson County Open Space
Brooke Lachman, City of Steamboat Springs Open Space, Parks and Recreational Services Department
Ben Lawhon, Leave No Trace
Tom Ledgerwood, Volunteers for Outdoor Colorado
Jeff Leisy, USFS-Pike-San Isabel National Forest
Clay Malcolm, Jefferson County Open Space
Faye McNabb, Teller County Parks, Trails and Open Space
Jay Neimoth, Jefferson County Open Space
Peter Newman, Colorado State University
Jim Reeder, City of Boulder Open Space and Mountain Parks
Nadeen Reinecke, Girl Scouts-Mile High Council
Craig Simmons, Colorado Fourteeners Initiative
Mike Smith, Colorado Division of Wildlife
David Smith, Jefferson County Open Space
Gary Tennenbaum, Pitkin County Open Space and Trails Land Steward
Patti Turecek, USFS-Arapaho-Roosevelt National Forest
Eric Vogelsberg, Independent
Ken Waugh, USFS-White River National Forest
Steve West, Volunteers for Outdoor Colorado
Ron West, Colorado Natural Areas Program
Judy Wolfe, Lafayette Parks & Recreation
Kristy Wumkes, USFS-Arapaho-Roosevelt National Forest

CONTRIBUTOR CREDITS:

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About OSI Guide to Crew Leadership for Ecological Restoration

PURPOSE

This training course was developed to teach restoration ecology crew leadership consistently throughout the state. Local, state and federal land management agencies will benefit because all participants will gain basic skills that are uniform across Colorado. Land managers will know what to expect when groups trained with these materials work on projects.

Local groups and organizations will benefit because they can insert the standardized training into their programming. The standardized materials may strengthen the base of their training program which may shape relationships with land managers.

Another benefit is that all groups that use the standardized training materials will have a common point of reference when discussing basic planting, seeding, erosion control, safety, tool use and crew leadership.

As a result of the training, Crew Leader Trainees will learn the fundamentals of restoration, basic planting, seeding and erosion control. Instructors will teach Trainees about tools and tool safety – including tool identification, carrying, use and storage. Crew Leaders learn how to assess risks to avoid injury.

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Crew Leader Trainees will learn individual learning styles, listening skills as well as conflict and dispute management. A successful Crew Leader will be able to assess the individuals that make up the crew, understand motivational types and be able to effectively acknowledge efforts of individuals and the team.

By the time the course concludes, Crew Leader Trainees will know how to motivate individuals to produce the desired end result in a safe manner while utilizing the varied skills offered by Ecological Restoration Crew Members.

Crew Leadership for Ecological Restoration is a basic course for crew leadership. Time limitations and the amount of material covered in the course do not allow Crew Leader Trainees the opportunity to practice being a Crew Leader. OSI recommends that in addition to this course, Crew Leaders work under an experienced Crew Leader or arrange for mentoring to gain confidence prior to leading a crew. In addition, many organizations and agencies have established protocols and programs for their Crew Leaders. Trainees need to check with these entities to get any additional training that is specific to that group.

Summary of OSI Training Program

PURPOSE

OSI Guide to Crew Leadership for Ecological Restoration was developed for any organization or land management agency that is interested in crew leadership training. This *Guide* has been designed to teach basic planting, seeding, erosion control, safety, tool use and crew leadership principles. The intent of OSI is to offer training resources that can be inserted into existing programming.

HISTORY

The content of the *OSI Instructor's Guide to Teaching Crew Leadership for Ecological Resources* is a direct reflection on survey results and focus group feedback. Prior to the development of the materials, a comprehensive statewide survey in 2002 titled: *The Blueprint for Outdoor Stewardship* confirmed the need for consistent, standardized crew leadership training. Training content was specified at statewide focus group meetings with organization and agency representatives. Multi-organizational committees collected curricula to match the focus group specifications. A statewide curricula content review period, followed by testing the materials at pilot workshops completed the development process. The *Guide* has since been refined every year using feedback from workshop participants and instructors who taught the materials.

BENEFITS

OSI Guide to Crew Leadership for Ecological Restoration will offer a standardized training package to agencies and organizations. Local, state and federal land management agencies will benefit because all participants will gain basic skills that are uniform across Colorado. Land managers will know what to expect when groups trained with these materials work on projects.

Local groups and organizations will benefit because they can insert the standardized training into their programming. The standardized materials may strengthen the base of their training program which may shape relationships with land managers.

Another benefit is that all groups that use the standardized training materials will have a common point of reference when discussing ecological restoration, safety, tool use and crew leadership.

SPONSORSHIP

Crew Leadership for Ecological Restoration is sponsored by Outdoor Stewardship Institute (OSI) whichi s program of Volunteers for Outdoor Colorado and Wildlands Restoration Volunteers (WRV) and funded in part by Great Outdoors Colorado (GOCO) through the Colorado State Parks Trails Program. Information about OSI's other leadership and stewardship training opportunities can be found at www.voc.org.

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Course Objectives

By the time the course concludes, Crew Leader Trainees will:

- Know how to lead individuals to produce the desired end result in a safe manner.
- Understand basic planting, seeding and erosion control practices.
- Know about tools and tool safety – including tool identification, carrying, use and storage.
- Know how to assess risks to avoid injury.
- Understand individual learning styles, listening skills as well as conflict and dispute management.
- Experience a mix of in- and out-of-the-classroom discussions and activities that facilitate learning.

Ecological Restoration Overview

By the end of this course, Crew Leader Trainees will:

- be able to dentify the basic concepts of ecological restoration.
- be familiar with a wide diversity of restoration practices.
- be inspired by the growing, field of ecological restoration.

What is a Crew Leader?

Crew Leaders play a number of different roles with their teams and they may be responsible for their team members for a day, a weekend, a week or a full season. Crew leaders may work for public agencies or nonprofit stewardship organizations or they may be volunteers willing to take on a leadership role.

Some roles crew leaders may play include:

1. Manager of safety and risk assessment
2. Teacher of technical information and skills for the project
3. Connector to the larger project plan, other teams and the agency or organization
4. Delegator of project assignments
5. Team builder and leader
6. Motivator for crew members
7. Booster of morale and cheerleader
8. Decisionmaker, especially in critical situations
9. Resolver of conflicts
10. Teacher of stewardship information
11. Ambassador for volunteer organization or land agency

Leadership: Getting Started with Your Crew

Your crew is made of a group of individuals that have joined together to complete a project. It's important that you get to know your crew as people and understand how they can work together. This means finding ways to learn a bit about them so that you, as the group leader, can connect and so they can connect with each other. It's also important to understand some basics of group dynamics and how to build a strong team as these will be key to a successful project AND a positive experience.

When working with any group on outdoorstewardship project, it's important to not only do good work, but also to ensure that the group has a positive and rewarding experience. The leadership role of a crew leader is as much about managing the people as it is understanding the technical aspects of working on ecological restoration.

Icebreaker Activities

Icebreakers are generally used first thing to help a crew get to know each other's names and a little about each person. They might be used at other times as well for team-building purposes especialy with crews that will be working together for a while.
Icebreakers 1-4 typically are much quicker exercises that give participants a little information about their teammates. Icebreakers 5-8 are a little more in-depth and may be more suitable for longer term teams.

Simple and quick icebreakers:
1. Have team members pair up and do a one minute interview of each other; each person introduces their partner to the rest of the group.
2. Team members give their name, where they live and favorite outdoor place in the world and why – less than one minute
3. Have the group line up by month and day of birthdays and then give their name and birthday when the exercise is complete.
4. Trainees line up on a n-s-e-w grid by direction of residence from worksite.

In-depth icebreakers – more appropriate for long-term crews:
5. Pick a year and season and have everyone introduce themselves and say what they were doing in that year and season – may be not be as interesting or useful if there is uniformity of age in the group.
6. Trainees introduce themselves and say one thing that's true and one that's not – group has to guess which is which.
7. Trainees introduce themselves by their first names spelling it out and coming up with a personal descriptors for each letter of their names. E.g. for Bill: B - brave, I – Iceland, L – Lesley College, L – lazy. Bill would describe himself as brave and liking lazy afternoons. He attended Lesley College and traveled to Iceland.
8. Make up cards with things on it such as "likes broccoli" or "has hiked at least 10 of the 14'ers" and have people mingle for 5 minutes, introduce themselves and get others to initial their card; sort of a variation of bingo. Whoever gets them all initialed first or the most initials after 5 minutes "wins."

Tuckman's Model of Group Dynamics

Tuckman's theory of group dynamics and key crew leader roles:

1. **Forming**:
The group comes together and gets to initially know one other and form as a group.

Crew Leader strategy: facilitates group introductions, is identified as the leader, sets a tone for group ground rules and interactions, emphasizes importance of working together and being safe.

2. **Storming**:
A chaotic vying for understanding of roles, leadership and trying out group processes

Crew Leader strategy: reviews group goals for the project, makes assignments to members and establishes work flows.

3. **Norming**:
Eventually agreement is reached on how the group operates (norming). Everyone understands who is doing what, what the group's purpose is and what their role is.

Crew Leader strategy: checks in with members, reviews members' understanding of what their work is, makes course corrections as necessary.

4. **Performing**:
The group practices its craft and becomes effective in meeting its objectives. Group is working together well.

Crew Leader strategy: acknowledges and recognizes each of the members and the group effort; reviews what is left to be done, ensures that work continues to go smoothly. Morale and motivation boosting as necessary.

5. **Adjourning:**
The process of "unforming" the group, that is, letting go of the group structure and moving on.

Crew Leader strategy: helps to provide closure at the end of the project period – whether just for the day or a section of project or after a longer period of time. Continues to recognize the work and achievement, leadership to the group as they close the work activity.

G-R-E-A-T Team Building Model

To make your team function effectively, one useful model to consider is: G-R-E-A-T.
- G - Goals
- R - Roles/ Results
- E - Expectations / Performance
- A - Accountabilities / Abilities
- T - Timing

This model outlines what people must know so that they can work together effectively.

Goals
- What are the goals of the project?
- What is the goal of each individual activity?
- Why are we doing this?

Roles
- What is my job as an individual team member?
- What do I do?
- What is the contribution I am expected to make?
- What expertise do I bring to the situation?
- What is everyone else's role and everyone else's expected contribution?

Expectations
- How good is "good enough"?
- What is the level of performance that is desired?
- What level of performance is not desired?
- Why are the expectations set at this level as opposed to another?

Accountabilities/Abilities
- Who is accountable for each phase of the work, especially on jobs that cut across functional lines or involve several people?
- What abilities do we possess that have a bearing on the individual job assignments?

Timing
- When must this be done?
- At what pace am I to work?
- How does the timing of one piece of the work affect other pieces?

Teaching to Different Learning Styles

Leading a crew to accomplish a goal is one of the most challenging aspects of being a Crew Leader. Crew Leaders are challenged with creating a safe, positive work environment while addressing a wide variety of learning needs. Each Crew Member will interpret directions in a different way. Misunderstandings can lead to poor outcomes, an unsafe work environment, and frustration for all involved. The key to effective teaching lies in understanding different learning style preferences. Effective instructors can teach different ways to do one task. The Learning Styles handout defines examples of different learning styles and how to teach to each style. These learning styles are a simplification and are meant to be used to illustrate a point.

There are numerous models and ways to define learning styles and this is just one of many. Additionally many crew members will be adults or older youth, so understanding strategies for adult teaching is included as well. There are several pages relevant specifically to working with youth in the appendix as well.

Learning Styles	Characteristics	Teaching/ Learning Strategies
Visual Learners	process new information best when it is visually illustrated or demonstrated	• graphics, illustrations, pictures • images • demonstrations • taking notes
Auditory Learners	process new information best when it is spoken	• lectures • discussions • talking things through
Kinesthetic Learners	process new information best when it can be touched or manipulated	• participation in activities • written assignments, taking notes • examination of objects

Teaching to Adults

Most crew leader trainees will be adults of all ages or older youth and will bring with them experiences of their own. Adult learners are different from younger learners in several ways. Malcolm Knowles, a pioneer in the study of adult learning, observed that adults learn best when:

1. They understand why something is important to know or do.
2. They have the freedom to learn in their own way.
3. Learning is experiential.
4. The time is right for them to learn.
5. The process is positive and encouraging.

Assessing Your Crew

Crew Leaders are expected to manage projects, people and safety. It is a Crew Leader's job to ensure a positive experience for all parties regardless of the background of their crew members. Crew assessment is a tool that can be very helpful. Every Crew Leader needs to know about the people working on the project and be one step ahead. It is much more important for a Crew Leader to be proactive than reactive. A skilled Crew Leader is able to anticipate, to see things before they happen and institute a preventative measure.

There are five elements for a Crew Leader to be mindful of while leading a crew. The five elements are expectation, skill, personality, performance and safety.

The first element is **expectation**. Every member on the crew has a different reason for being there. The more expectations a Crew Leader can fulfill the better the experience each member will have. It is important to find out the member's reason or motivation for being there. If the member feels satisfied in their experience they tend to be more productive. Meeting member's expectations will also help increase retention levels. Clear expectations in the beginning will lead to fewer problems down the road.

Crew members at a most basic level expect to be treated with respect for who they are as a person regardless of their skill or experience with the task at hand. It is important for crew leaders to respect and appreciate the diversity of their crew and recognize that people will come from backgrounds that may vary based on lots of factors: profession, racial or ethnic background, gender, politics, sexual orientation, religion or class. *That diversity should be a plus to any crew and should not get in the way of successful completion of projects.*

NOTE: We have opted to not attempt to cover diversity training in the context of Crew Leader training given the time limitations and that working with diversity could easily be a two day training by itself. We do ask that Crew Leaders think about their understanding of diversity, their own biases and their

comfort level working with people from different backgrounds. At a minimum, we expect Crew Leaders to foster a sense of respect among the crew and to follow whatever non-discrimination policies are in place for the organization with which they are working.

Next, it is important to measure the team's **skill level**. By knowing the individual skill sets of members on the crew, the team can tackle projects more efficiently. Some members may have medical expertise, equipment certification or project experience, which can make the work go a lot smoother and safer. This information helps when pairing people together, deciding who will do which tasks, determining which member will need more assistance and/or training and ensures better quality of work.

Personalities play a big role in project management. Not everyone will be a leader, an analytical thinker, a supporter, and a cheerleader or show exceptional determination. But the combination of these personalities is what makes a team successful. Identifying the roles people play and strategically placing them will help the team be more efficient and productive.

Performance assessments need to be done on a continuous basis. It is easy to get off track when supervising multiple people. It is easier to correct mistakes as they happen than to correct them when a task has been finished. Trying to motivate a crew to redo a task because their leader was negligent is not easy.

Lastly and probably most important is assessing your crew's **safety**. Safety is a Crew Leader's first priority. A person's well-being can be measured in three different ways:

- **Personal safety** is the first consideration for a crew. Crew Leaders need to be sure their crew is healthy in order to take

on the physical demands specific to their projects. Crew Members need to drink plenty of water, eat nourishing food, take enough breaks, stay warm (or cool as the case may be) and dry, and stretch their muscles throughout the day. It is the Crew Leader's job to provide a method that maintains each of these physical needs.

- **Mental well-being** must also be evaluated. Members need to be attentive and focused to help maintain their own safety. Members need to continue to learn and be challenged in order to grow and remain attentive and focused. When boredom and monotony set in, members lose their motivation and determination. The same may be true if they are experiencing interpersonal conflict. This will cause a loss in productivity and may create an unsafe environment.

- **People want to fit in, accomplish goals and feel good about themselves.** Stress, feeling overwhelmed, and lack of support will keep a person from achieving their fullest potential. A Crew Leader needs to watch for external signals and be ready to offer additional support when needed.

Conflict and Dispute Management

Conflict is inevitable in any group that is together for any length of time. People are unique and therefore will have differing viewpoints, ideas and opinions. Conflict occurs when there is no internal harmony within a person or whenever there is disagreement or a dispute between, or among, individuals. In other words, conflict may be intra-personal, interpersonal or intra-group.

There are many sources of conflict:

- Different values and beliefs
- Role pressure or clarification
- Perception differences
- Diverse goals or objectives
- Race, ethnicity, or gender differences
- Personality clash or conflict
- Competition for limited resources
- Disagreement on how things should be done
- Personal, self or group interest
- Tension and stress
- Power and influence

People generally may think of conflict in negative terms because conflicting issues that are avoided or handled poorly may divert attention from important issues, damage morale,

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cause polarization and reinforce differences in values. Outcomes may also include irresponsible and regrettable behaviors.

Conflict handled well can result in positive outcomes. It may promote change, increase cohesiveness, become a forum for problems to be heard, and provide a means for people to work together. Knowing how you handle conflict will help you to better interact with others who approach conflict in a different way. Keep in mind that not all conflict can be successfully resolved.

Remember, when managing conflicts:

- Real issues driving many conflicts are rarely obvious.
- Separate the people involved in the conflict from the rest of the group for privacy unless it is a group issue.
- Clarify issues and find common ground.
- You are in charge of how you respond.
- Avoid pre-formed judgments.
- Solutions lie in building trust and open dialogue.
- A vision of success is required.

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Praise, Recognition and Feedback

Crew Leaders represent the front line of any organization/ agency and they are key for the retention of individual Crew Members. A Crew Leader's interaction with each Crew Member will play a large role in the quality of a project experience. Effective crew recognition requires an understanding of why people participate and a little knowledge of who they are. With this information, you can provide an environment that meets the needs of individual Crew Members.

This activity will focus on effective recognition strategies. It will provide the opportunity to practice developing and delivering verbal recognition and feedback. Appreciating the work of your crew is important in every crew, especially with volunteers.

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Recognition Tips

Recognition:

- Give it frequently
- Give it using different methods
- Give it honestly
- Give it to the person, not to the work
- Give it to the achievement
- Give it consistently
- Give it on a timely basis
- Be as specific as possible

Day-to-Day Recognition

- Say “thank you”
- Tell them that they did a good job
- Ask for their opinions
- Greet them by name
- Show interest in their personal interests
- Smile when you see them
- Brag about them to others in their presence
- Say something positive about their personal qualities
- Provide food, snacks to acknowledge
- Demonstrate that you care about them and their well being
- Provide social opportunities on a project for a reward
- Provide educational opportunities
- Involve Crew Members in decisions
- Ask about the Crew Member’s outside life (family, other work, interests, etc.)
- Make sure that Crew Members receive treatment equal to that given to staff
- Send a note of appreciation to the Crew Member or the Crew Member’s family
- Recommend the Crew Member for promotion or a more responsible job
- Celebrate goals achieved, small triumphs

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Feedback

Feedback is the process of presenting to individuals your observations and understanding of what they have done, how they did it and what they achieved in order to improve their performance.

There are three main types of feedback:

Positive: applies to situations where a person did a good job; may consist of a simple praise, but even more powerfully reinforcing if you specifically highlight why or how that person did a good job.

Constructive: highlights how a person could do better next time; needs to be delivered sensitively. Focus on observable facts, not assumed traits. This kind of feedback may be different depending on whether the crew member is an employee or is a volunteer.

Negative: describes a perceived negative behavior, without proposing a resolution - is essentially destructive and is only used, usually by accident, to terminate relationships. Crew Leaders should do their best to avoid negative feedback.

Constructive Feedback Should Be.....

- specific rather than general (based on first-hand data, actions, and behavior, not on the person or speculation about his or her intentions) and validated through agreement from other observers when possible.
- presented as a method of improvement rather than as a punitive step and used as a method of building up the recipient and strengthening the relationship.
- given at an appropriate time, in an amount the receiver can use, and checked for clarity of communication.
- provided in terms of previously-outlined expectations.
- descriptive rather than judgmental/evaluative
- Demonstrate a correct procedure rather than letting crew members stumble along without guidance.
- Be supportive when giving feedback; sandwich areas for improvement between positives at the beginning and end of the session.
- Rely on personal observations rather than on other people's complaints; use such complaints to focus your observations.

Tools

Tools can make a crew leading experience either enjoyable or miserable, depending on whether the right tool is available at the right time and whether crew members know how to use tools safely. The information provided gives the basics for hand tools in a project setting. Only basic hand tools used on a project will be covered in this training.

There are many specialized tools available for work projects including rockwork tools, power tools, and motorized equipment. All of these specialized tools require training before using in the field and will not be covered in this component. It is essential to know what tools your agency or organization will allow on a work project.

TOOL TALK

The tools to be used during the day should be introduced in a logical order to allow an effective discussion of their use and safety with the crew. The order of tool presentation is up to the Crew Leader. However, certain subjects regarding tools must be covered. These subjects will be referred to as “CUSS”:

- **C**arrying tools
- **U**sing tools
- **S**toring tools
- **S**afety with tools

“C” – Carrying Tools

There are basic safety requirements for carrying tools to and from the work site. Be alert and make sure the safety guidelines are enforced throughout the day:

- Always wear gloves while carrying tools.
- Safety sheaths should be properly in place on the tool.
- Pick up a tool and feel for the balance point. The balance point is the place where there is equal weight in front of and behind your hand. Carrying a tool at the balance point results in less strain on wrist and arms. Carrying a tool vertically requires tensing the wrist and provides minimal control over movement of the tool. The best possible control over motion of the tool is obtained when it is gripped at the balance point.
- Always carry tools in hands with arms at sides. The blade or most dangerous part of the tool should point downward.
- Never carry tools propped on your shoulder.
- Tools should be carried on the downhill side of a trail or route. This is so that the tool can be thrown clear in case of a stumble or fall.
- When it is necessary to carry tools in both hands, carry the heaviest or most dangerous tool on the downhill side.
- Maintain a safe distance between people when walking to the work site. Everyone should be an arm and a tool-length from the next person while walking. Crew

Members need to be responsible for maintaining the correct distance from the person immediately preceding them if they are walking in a single file line.

- Watch where tools are pointed at all times.

- Let the slowest Crew Member set the pace for the group.

- Announce “Coming through” or “Bumping by” when approaching other crews working. Stop and wait for the Crew Members to cease work. The person who is working has the right of way and will cease work and yield when comfortable for them to do so. “Coming through” or “bumping by” is always a request for passage and never a demand.

“U” – Using Tools

Each tool has its proper and improper methods for use. Here are some of the general considerations when using tools:

- Before using any tool, make sure you know what it is used for and how to use it safely.

- Before using any tool, check to make sure the handle is not loose or split. Tag all damaged tools for repair. Any tool with flagging on the handle is not safe to use.

- Adopt the proper stance for using the tool. This will save strain on your back and make the tool more effective to use.

- Establish secure footing before using tools. Be especially careful when working in wet, slippery conditions.

- Maintain a safe working distance between Crew Members at all times. Be sure someone else's space is not compromised while using a tool. Do not bunch up or crowd one another. Some organizations will maintain at least a 10-foot distance between workers as a safe operating distance when using tools.

- Full "roundhouse" swings with tools are not generally acceptable unless a Crew Member has extensive experience with this technique. Using a tool this way can be dangerous and may cause the user to quickly tire.

- In the rare occasion a roundhouse swing is necessary, check to make sure the work site is safe and advise those people nearby that you will be swinging. Before starting to work, clear away any brush or limbs that might unexpectedly catch a swinging tool. Yell "Swinging!" before lifting the tool to work.

- Use all tools in a motion parallel to the body rather than towards the body.

- Demonstrate to the crew how to lift with the legs instead of the back. "Head up, butt down" is the order of the day.

"S" – Storing Tools at the Worksite

Tools are dangerous when not stored properly at the worksite; any tool is a potential risk. Here are some things to remember about tool storage:

- Concentrate all tools not currently in use in one area if possible.

- Tool sheaths, due to their small size, are easily lost and should be gathered by the Crew Leader.

- Store all tools on the uphill side of the work section or trail so they are not a hazard, but can be reached easily. Store them with the handles pointed down towards the trail or work section, and the sharp or business end furthest uphill.

- Store shovels with the sharp edge towards the ground.

- Never sink axes, Pulaskis, picks, or similar edged tools into the ground or in stumps where they become dangerous obstacles, i.e., impalement and tripping hazards.

- The storage of rock bars requires special attention. Rock bars are heavy and have pointed tips that can severely injure someone if they slide or roll down a hillside. To store rock bars, place the tool on the ground, parallel with the contour, and preferably centered behind a tree or rock for security. They should never be stored in such a way that they can escape downslope and create a javelin-like hazard.

"S" – Safety With Tools

Carrying, using, and storing tools present different safety issues. It is important for Crew Leaders to emphasize tool safety at all times. Remember these tool safety tips:

- Dis-CUSS tools in the morning and re-emphasize "CUSS" all day long.

- Be careful how you carry, use, and store tools at all times. Set a good example for your crew by always being "tool safe".

- Always use proper personal protective equipment like hardhats, gloves, and safety glasses when using tools.

- Use the right tool, the right way, for the job at hand.
- Avoid “roundhouse” swings. You could injure someone else and you increase the likelihood of a miss-stroke and hitting yourself. Roundhouse swings are very tiring and unsustainable over extended time periods.
- Tools come in a variety of sizes, shapes, and intended uses. They are all dangerous if not treated with respect.
- Misused tools can break and are a danger to future users. They also cost time and money to repair.
- Remove all broken tools from use immediately, and tag for repair before you forget and the tool is used again.
- Stay alert when others are using tools nearby.
- Do not set a tool down “just for a minute” in the wrong place. It will become a hazard.
- Safety with rock bars is very important; they are a hazard especially when stored improperly.
- Trade off on tools occasionally for relief from repetitive stresses. Repetitive stress may cause more injuries particularly towards the end of the day.
- Always “CUSS” your tools, even if you have a crew of veteran members. The refresher is helpful for everyone.
- Be thinking about the consequences of every move. When working with a rock or log, think ahead so as not to be standing in the wrong place when it moves. Be ready to toss the tool aside and jump free. Avoid cutting

toward any part of your body, and watch out for your coworkers. Use skill, not brute force.

- Everyone has different levels of coordination. Some members of your crew may need to use a given tool several times before they are able to overcome their awkwardness. For others, new tools may come as second nature. Spend an appropriate amount of time training each individual to ensure safe and efficient work habits.

Tool & Safety Talk

Crew Leaders are responsible for the safety of their assigned crew and for anyone who passes through their work section. Project safety begins as soon as the Crew Leader meets their crew.

The Safety and Tool Talk will establish safety guidelines for the crew at the start of the day. The Safety presentation informs volunteers of safety issues such as dehydration, sunburn, over exertion, poison ivy, and other site-specific hazards. The Tool Talk establishes safe ways to carry, use, and store tools during the project. Wearing appropriate clothing at all times (boots, gloves, etc) sets a good example for the crew.

If An Accident Occurs...

- The Crew Leader should stay with the accident victim.

- Only the Crew Leader (or his/her designee) should be in verbal communication with the next level in the chain of communication.

- Make sure you can give clear directions about your location to staff or medical personnel. Be prepared to send Crew Members to strategic locations as a flag, or to notify the appropriate staff or medical personnel as per the established chain of communication appropriate to the Project Safety Net.

- Do not talk to the media. Refer them to agency personnel.

- Do not attempt anything medically that you or your crew has not been trained to do.

Crew Leader Safety Talk Checklist

___ Have Crew Members completed a liability waiver if required?

___ Make sure your crew has appropriate footwear, clothing, eye protection, and gloves.

___ Do Crew Members have lunch and enough water?

___ Do Crew Members have sun protection (hat, sunscreen, sunglasses, and lip balm?)

___ Discuss the project goals, specifications, and context (refer to Know Your Agency and Organization Protocols).

___ Specify the length of hike and type of work.

___ Explain any site- or project-specific hazards.

___ Ask that persons with specific health concerns notify you about them in private. Some items you should know about include: back problems, allergies (insect, plant, and medication), diabetes, heart and lung problems, epilepsy, and other serious physical conditions.

___ Ask if any of your crew are certified Emergency Medical Services personnel (EMS) or other health care professionals. Ask if anyone is certified in CPR or Wilderness First Aid. Establish primary and secondary medical chain of command within crew.

___ Explain to your crew the Project Safety Net and the chain of communication for the project. (Refer to Know Your Agency and Organization Protocols). Select someone on you crew to act as an alternate leader to start the safety net process should you become incapacitated.

___ Explain “Coming Through!” or “Bumping By” and practice it at all times.

___ Demonstrate why safe working distances are important. Be sure that people working near a hazard (chipping stone, lumber cutting, etc) stay at a safe distance and are wearing eye and/or ear protection.

___ Hardhats should always be worn if there is any risk of head injury (on steep slopes or areas where rock or other materials may come down from above) or if required by the agency.

___ Demonstrate how to lift with the legs and not with the back. Get help and/or tools to move heavy objects.

___ Reiterate through the day the crew’s need to drink water, even when they may not be thirsty (drink water at least every 15 minutes). Remind them that by the time they feel thirsty, they are already dehydrated. Enforce water breaks by taking them as a crew throughout the day.

___ Stress the need to wear sunscreen. Watch for sunburn throughout the day.

___ In areas where West Nile Virus may be a concern, stress the need to wear insect repellent.

___ Lead the Safety Warm Up and stretching exercises at some point before starting the work. Use the opportunity to provide further information on additional safety issues.

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Safety Warm-Up

This unit is designed to teach Crew Leader Trainees how to lead a simple warm-up stretching exercise in the field with a crew, while emphasizing safety concerns simultaneously.

The Safety Warm-up Exercise is an easy way to prepare a crew for project work, and a great way for a Crew Leader to facilitate leadership of a group in a fun, interactive way at the beginning of a day. Because stretching is more effective after 15 minutes of exercise, this exercise may be more productive after hiking to the work site.

This exercise can also be utilized as an “ice breaker” to introduce Crew Members to each other.

Safety is the most important component of a trail project, therefore Crew Leaders must stress that Safety is the Number One Priority. A successful project is a safe project – getting the work done is secondary!

Examples of appropriate stretches:

- Arms over head and bend side to side
- Low back arch (numerous times)
- Bend forward to stretch back-touch toes (numerous times)
- Forward lunge-keep back leg straight and foot flat on ground
- Arch back and pull shoulder blades together

Basic Risk Assessment

The Crew Leader is responsible for the safety of a crew and therefore needs to understand the basics of risk assessment. Crew Leaders will perform risk assessments constantly throughout the workday. Crew Leaders need to assess potential hazards while hiking to the work site, while working at the work site, and even during lunch!

The term “risk” includes three concepts: the hazard, the possible outcomes, and the likelihood. A hazard is a situation that can cause harm to a person. An outcome is the resulting injury due to a hazard. The likelihood describes the level of probability of the outcome.

For example, one of the possible risks of standing in front of the group to teach this course is that the instructor could step on a loose rock (hazard) and sprain his or her ankle. The instructor may experience pain, need to go to the doctor, and could even miss a paid work day (outcomes). However, the likelihood is low.

Once we understand the risks of any particular activity, we can think about how to mitigate, or lessen the likelihood of each. If the severity of the outcome and the likelihood are both low, we may choose to do nothing to mitigate the risk. But if the severity is high (even if the likelihood is low), we will probably choose to take some mitigation action. For example, when operating a vehicle on icy winter roads, an accident could cause death for the driver. Although the likelihood is relatively low, the severity is high: we will both adhere to safety standards already in place (following the rules of the road, wearing our seatbelts) and implement some new ones ourselves (driving slowly and cautiously.)

Hazard-a-Guess Scenario

Potential Hazard	Potential Injury / Outcome	Likelihood (high/ med/low)	Need to mitigate? Y/N	What measures are already in place?	What should be done?

Seedbed Preparation and Seeding

Seeding with native seeds is an economical and easy ways to restore a disturbed ecosystem. While the selection of native species for a seed mix requires a bit of technical knowledge, seeding is fairly easy to master. The success of a wildland seeding project depends a lot on the weather. Successful seeding is dependent on a period of adequate moisture and specific soil temperatures that create optimum conditions for seed germination and seedling establishment. Also, native plants, unlike horticultural plants, have seed dormancies that prevent the seeds from germinating until environmental conditions are ideal. While predicting the weather is difficult, seeding at the right times of the year will take advantage of the most ideal moisture and temperature conditions. Many seed dormancies can also be broken naturally when planted at certain optimum times of the year.

Seed Selection

When creating a native seed mix, a restoration professional will 1) consider the goals for the restoration project, 2) have an understanding of how well the disturbed area can heal on it's

own, and 3) select species based on the following factors:

- Native vegetation that was historically on the site. Usually, there are remnant patches of native vegetation near or within the disturbed area. These species can be recorded, and then selected based on the factors below.

- Native species that are typically found in similar ecosystems, considering important factors such as soil type, elevation, slope aspect, and slope steepness. Sometimes, there are no native species left on a disturbed site. In this case, a reference ecosystem can be used to create a species list. Some publications have lists of species for specific ecosystems. For example, the Natural Resources Conservation Service has lists of native species for soil types and ecosystems in Colorado, called “Ecological Site Descriptions”.

- Availability of seed, either commercially or wild collected. Purchased commercial seed is convenient. However, not all native species are available commercially. Also, one native species from your local area may not be the same genetically as the same native species from another state. These are called ecotypes. An ecotype is a native plant that has adapted to the local environmental conditions. For example, the Colorado’s Front Range big bluestem grass that is adapted to drier conditions is an ecotype different from the big bluestem from the wetter Mid-West Region. Local ecotypes are rarely available commercially.

  Wild collected seed can also be used. Availability of wild collected seed is dependent on environmental conditions that favor seed production. Native plants typically do not set viable seed year after year. Seed collection is a great activity for volunteers, though it is hard to collect enough viable seed for all but the smallest projects.

- Affordability of the seed available.
  Native seed prices vary from year to year, depending upon the previous season's harvest. Demand also influences seed prices. A species that costs $3 per pound is much more affordable compared to a species that costs $80 per pound.

- Quality of the seed available.
  When buying commercial seed, the seed companies test for the viability of the seed and how much contaminants are in the seed, like chaff and weed seed. For wild collected seed, it's best to use the seed soon after collecting it. As seed ages, it looses its viability.

- Diversity of species, including grasses, wildflowers, and shrubs.
  Native ecosystems naturally have a diversity of plant shapes, sizes, and species. Diversity is important because it ensures that some of your seeded species will survive and thrive. Some species grow at different times of the year (see discussion below on cool and warm season grasses), and therefore, provide coverage and competition from weed invasions. A diversity of plants also provides greater habitat for a range of wildlife.

- Native species that germinate relatively easily from seed.
  Species can be selected by how easily the seed dormancy is broken under natural conditions. If extra efforts are required to break seed dormancy, then those species are best established through transplants or cuttings.

- Balance of cool season and warm season grasses.
  Grasses are often divided into cool and warm season types based on their growth pattern. Cool season grasses do much of their growth in the fall or spring when the weather is cooler, and produce seed by mid-summer. Cool season grasses usually dominate seed mixes for higher elevations. Warm season grasses start their growth when the weather warms up in late spring or early summer, and produce seed by late summer or fall. A balance of these two grasses can increase species diversity and plant coverage throughout the year to prevent weed invasion. It also provides some insurance from unpredictable weather. For example, a dry spring may cause cool season grasses to not germinate, but a wet summer could still work to germinate the warm season grasses and vice versa.

- Species that grow rapidly, to cover bare ground or steep slopes quickly.
  For quick erosion control, choose native species that grow quickly and have vigorous root systems. Sometimes, land managers will use a sterile reclamation grass product such as ReGreen® or Pioneer®, as an addition to a seed mix. These sterile grasses establish a quick cover initially while slower growing natives get established. Being sterile, these ground covers should not reseed or will only persist for a few years at most. By this time, the native plants should be firmly established.

- Competition with weeds.
  To compete with fast growing weeds, native species must establish quickly and have vigorous root systems. These may be the same species chosen for erosion control. Higher seeding rates may be also used to prevent weed establishment.

Seedbed Preparation

A seedbed requires preparation before any seeding can take place. The concept is similar to preparing the soil in a garden bed or agricultural field, but native seeds do not have the same requirements as crop plants. The ideal seedbed meets these two conditions:

- Loose enough for water and the seed's roots to penetrate the soil.

- Firm enough so the seed will be in contact with the soil, and not easily washed or blown away.

A well-prepared seedbed provides sprouting roots an easier time of growing down into the soil. If the soil is compacted from vehicle use or trampling, it will need to be broken up. Breaking up soil compaction allows water to infiltrate into the soil rather than running over the surface. On the other hand, if the soil is too loose, water and wind can wash or blow away the soil, taking the seeds with it.

In a backcountry setting, using machinery to loosen compaction is usually not an option, so soil compaction can be loosened manually with a pick mattock or other tool. Not only can soil compaction be broken up, but larger clods of soil can also be broken down into smaller pieces. This activity alone is one of the key aspects to a successful seeding project.

Proper seedbed preparation also includes weed removal. As with a garden, removing weeds prior to seeding ensures weed roots and seed do not sprout and compete with native seedlings.

Finally, some seedbed preparation may include adding some type of amendment to improve the fertility, water holding capacity, or other important aspect of the soil. This can be determined through soil testing and the interpretation of a trained professional. Fertilizers used in wildland settings may be different than those used for a garden since native plants typically have much lower nutrient requirements than garden crops. Other amendments may be used to encourage or introduce soil microorganisms. Soil is basically a living organism, containing worms, insects, microbes, fungi, and plant roots. Many native plants have developed associations with certain soil microorganisms to survive and thrive. It is important to try to recreate these natural soil conditions as much as possible in a restoration project to ensure the success of a native seeding. The addition of soil amendments will be different for each project, and details can be included in a project's technical and/or crew leader instruction notes.

Time of Seeding

Since most native seedings are not irrigated, seeding usually takes place at times of the year that take advantage of natural moisture. For cool season species, seeding between the late fall and early spring is best. Warm season species can be seeded along with the cool season species, although they will not sprout until temperatures have warmed up sufficiently to support their germination, typically in late spring to early summer. Many seeds need to be exposed to a period of cold weather to break their seed coat dormancy, as discussed earlier. Warm season species can also be seeded separately in the late spring or early summer to take advantage of warmer temperatures and summer thundershowers. In the higher

elevations where summer rains are more predictable, seeding can take place later into the summer, especially before our late summer monsoons.

Seeding Methods

The two primary methods of seeding are 1) drilling with machinery and 2) broadcasting by hand. Drill seeding is an effective method of seeding that is used on larger acreages accessible to equipment. Special seed drills have been developed for native seed and are designed to be pulled behind a tractor. The advantage of seed drills is that they place the seed in the ground at reliable rates and depths. Seed drills cannot be used on extremely rocky soil, steep slopes, or in wilderness areas.

Spreading seed: Broadcast seeding by hand or using hand held seed dispensers is the best seeding method for volunteers. This application is best for small areas or areas that are inaccessible to machinery. Broadcasting favors both small and large seeded species equally, and results in a more natural appearing stand of plants. Broadcast seed needs to be raked into the soil. It is important that the seeds are buried in the soil, even if just slightly, to keep the seeds from drying out and ensuring successful germination. Invariably with raking broadcasted seed, some of the seeds will be buried at the proper depth while others will be too deep or left on the surface. Seeding rates are higher for broadcast seeding compared to drill seeding to take into account these inefficiencies.

The seeding rate or application will be different for each project, and can be indicated in a project's technical and/or crew leader instruction. Seeds are usually applied immediately and uniformly spread after the soil bed is prepared. Knowing how much to seed over an area takes a little time to learn by eye. Seed can be spread as if one is "feeding the chickens". When in doubt,

be conservative initially as applying too much seed from the start may mean that you run out before covering the specified area. For large areas, it may be beneficial to divide the space and the amount of seed for each space ahead of time.

Raking in seed: After the seeds have been distributed, the seed is raked into the soil with a quick back and forth motion. When raking on a slope, rake parallel to the contour (which is perpendicular to the fall line or slope). Raking up and down the slope causes the seed to roll downhill with gravity, and it can all end up at the bottom. It is acceptable if some of the seeds are visible on the surface of the soil. Trying to cover all the seed may cause some seeds to be buried too deep. Again, the higher seeding rates used with broadcast seeding take into account the inaccuracies of soil depth placement with this method.

Tamping the soil: After seeding, it is very beneficial to lightly tamp the soil. The flat end of a McLeod or walking on the soil works well for this. Better soil contact provides a more reliable water supply to the seeds. Many seed companies recommend using a roller or packer over the seed to press the seed into the soil. In most wildland situations, tamping can be used as an alternative.

Seeding and Wind

On windy days, seeding by hand can be a futile effort. Even light winds can carry the seeds outside of the work area. If seeding MUST happen, apply the seed about 6-12 inches off the ground, and use the wind to help with distribution. If the seed is still being dispersed too far, wait until things calm down. Native seed can be expensive, and seeding the wrong area can result in an unsuccessful project.

Seeding in Rocky Areas

Seeding on rocky ground may be difficult, but can be successful with the properly selected seed species. A rocky area may not be conducive to raking after seeding. In this case, broadcast the seed among the rocks. Some of the seed will find its way into the spaces and hollows between and around the rocks, where wind and rain may deposit some soil and provide good germinating conditions.

ON SITE ACTIVITY

Seedbed Preparation

1. Using pick mattock, Pulaski, or other appropriate tool, break up soil compaction to depth of at least 4 inches. If possible, break up the compaction to 6 inches or deeper, but this can be challenging on large areas.

2. Break up any larger clods of soil with a McLeod, rake, shovel, or other appropriate tool.

3. If available, spread soil amendments over the area and work into the soil using the appropriate tools. The type and amount of soil amendments are specific to each project. Details will not be provided here, but a demonstration could be worked into this practicum if desired.

4. Use a rake or McLeod to smooth out the area you are working in. The area does not need to be completely smooth or flat as these imperfections create microclimates for germinating seed. Rocks do not need to be removed, unless erosion control matting will be installed. Pay attention to water flow patterns so that water will drain correctly. Seek assistance from an agency representative or restoration professional if needed to determine water flow patterns.

Seeding

Note: Seeding rates used in this activity are for demonstration purposes only. Seeding rates will vary from project to project, and can be provided to the Crew Leader by an agency representative or restoration professional. A crew leader should always ask an agency representative about seeding rates if they have not been informed or are unsure.

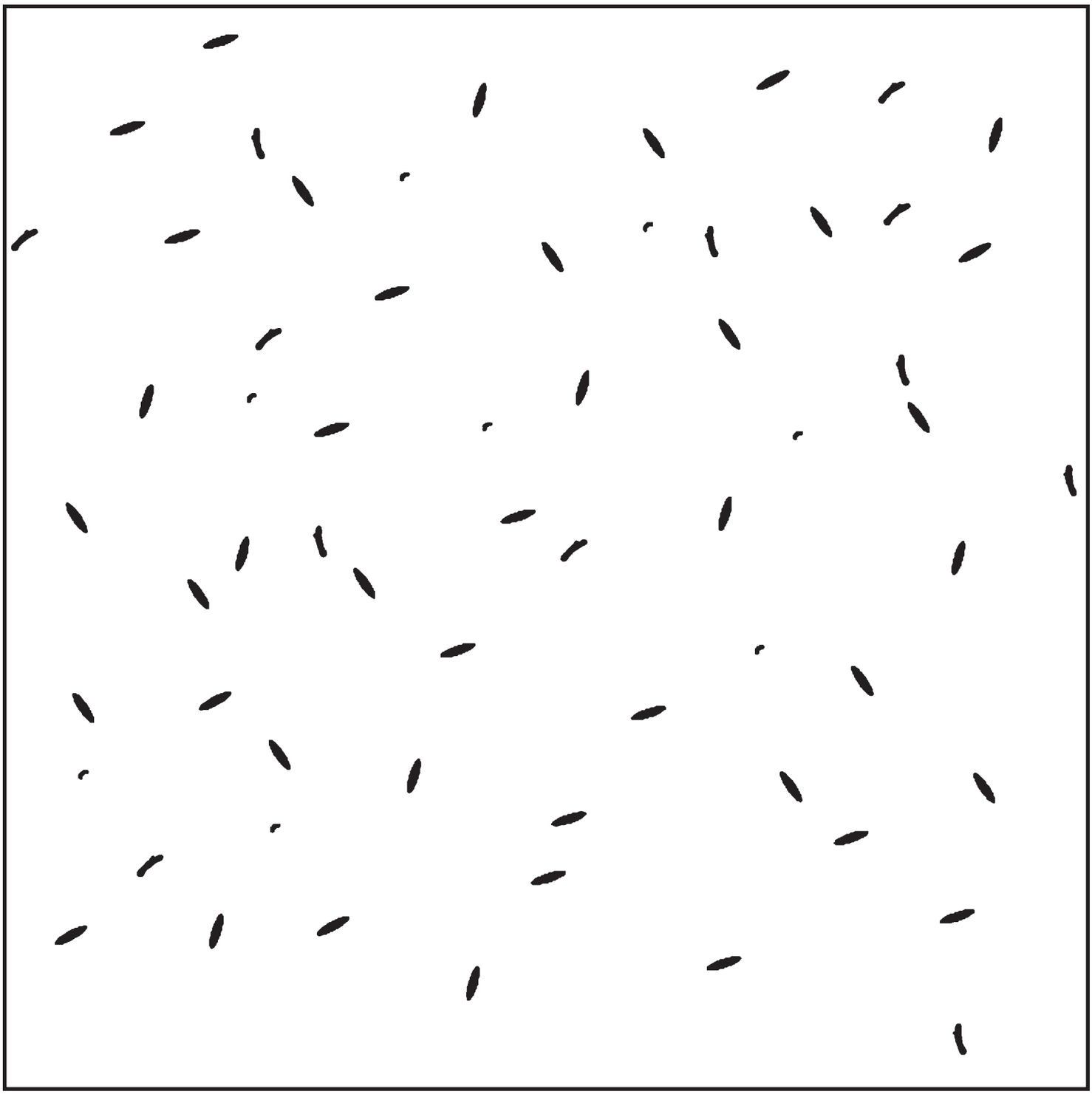
1. To demonstrate seeding:
   Using the hand method, spread the seed as if “feeding the chickens”. When using a seed spreader cranked by hand, adjust the rate the seeder feeds out seed until the rate is satisfactory. Different hand seeders have different adjustments. Have participants practice spreading seed in a small area. Optionally pick a rate that corresponds to the seed density “Calibrate Your Eyes” reference sheet (60 or 120 seeds per square foot) and compare results on the ground with the graphic on the reference page. Is the seed being spread too heavy? Too lightly? Practice and adjust as necessary.

Seeding Tip: When first learning how to spread seed, it is recommended to go light at first. The area can always be reseeded if any seed is left over. Many native species have small, fluffy seeds that may not be clearly visible on the ground. If too much seed is used initially, the seed may be used up before the area is finished.

2. Rake the seed into the soil with a quick back and forth motion. It is recommended that most of the seed be covered with soil, but it is okay if some seed is visible on the soil surface. Do not take the time to try to get all the seed covered, as this will bury other seeds too deep. Remember to rake parallel to the contour of the hillside and not vertically up and down slopes, where possible.

3. Lightly tamp the soil by using the flat end of a McLeod or by walking over the seeded area.

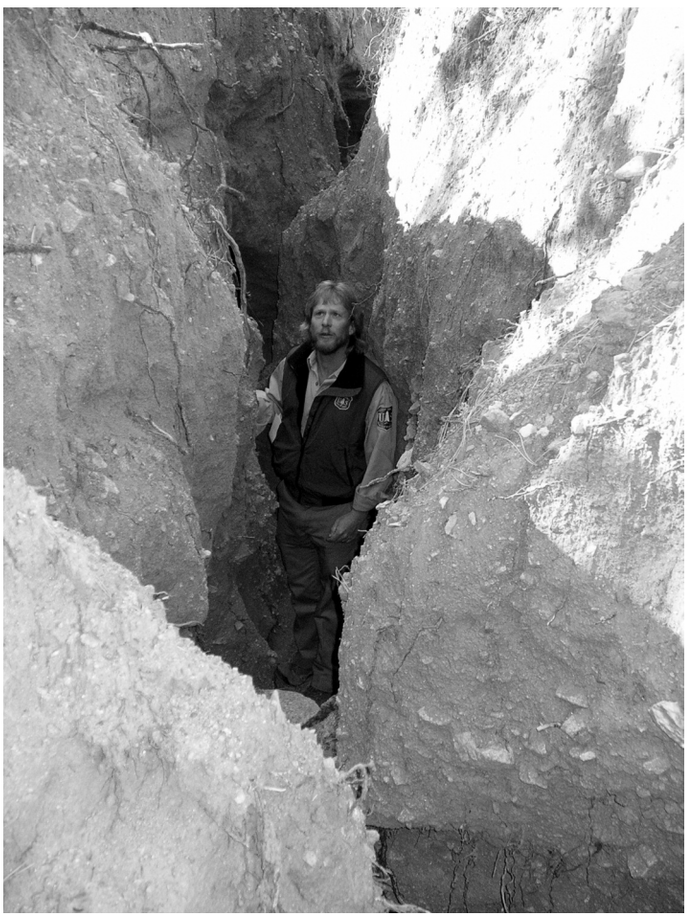
Calibrate Your Eyes



This 8x8 inch square represents a seeding rate of 80 seeds per square foot. Use it to "calibrate your eyes" to recognize this seeding rate. Actual seed mixes contain varying amounts of chaff and other impurities in addition to pure live seed (PLS). As a result, there may be significantly more specks per square foot when a seeding rate of 80 PLS per square foot is achieved with an actual seed mix. Examine your mix to estimate PLS to impurities ratio.

Erosion Control Practices

The erosive force of rain and wind can wash or blow away soil and seeds, and expose roots on new transplants. Water erosion can particularly be a problem on old road and trail closure projects. Often, old roads and trails are being closed because of poor design. Old roads and trails are typically entrenched because of severe water erosion, and this can contribute to habitat destruction. Soil that erodes off these areas is often deposited in watersheds downhill and downstream, and can bury vegetation, destroy aquatic habitat, spread noxious weeds, and contribute to poor water quality.



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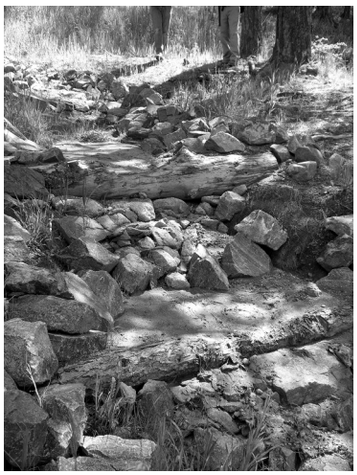
Understanding Slopes

Different types of slopes will require different types of protection from erosion. The land's slope is measured in percents, degrees, or described by a ratio of run:rise. For example, a rise in slope of one foot per ten feet of horizontal distance is described as a 10% slope (rise [1] divided by run [10] x 100 = 10%). Expressed as a ratio it is 10:1. The degree of a slope is the angle of the slope. A 90º slope would be a vertical cliff face, 0º slope would be flat ground, and a 45º slope is in between the two. As the percent or degree increases, the slope gets steeper. As the slope gets steeper, the ratio decreases. For example, a 4:1 slope (=25% or 14º) is typically a gentle slope, compared to a 2:1 slope (=50% or 25º) that is fairly steep. Generally, a slope equal to or steeper than 3:1 (33% or 18º) will require some type of mulch or erosion control on it. Also, areas that concentrate the flow of water during rainstorms or snow runoff, such as gullies or streambanks, may require extra reinforcement through the use of check dams, drainage control structures, and materials called erosion control blankets. The placement of erosion control will be determined by an agency representative or restoration professional. The typical types of erosion control installed by Crew Leaders and Crew Members are described below.

Drainage Structures

To alleviate the impacts of water erosion, drainage structures are typically used in trail construction to prevent water from running down a trail and thereby destroying it. Modifications of these structures are also useful in restoring old roads and trails for the same purpose; to keep water from washing away bare soil before vegetation has established. Volunteers for Outdoor Colorado (VOC) has a chapter in their *Crew Leader Manual* 5th edition, that describes in detail how to build drainage dips. This information is also available in the *OSI Crew Leadership for Trails* manual.

Some commonly used drainage structures include drainage dips and waterbars. A drainage dip uses a reversal in grade to divert water off a gully, trail, or old road where water tends to collect and run down. A drainage dip can be constructed in an area where there is a natural dip. A waterbar is a reinforced berm made of soil, rock, logs, or other material constructed across a gully, eroded trail or old road at a 45° to 60° degree angle to divert running water that is eroding these areas. The process to construct a drainage dip or waterbar is beyond the scope of this introductory manual, but the references provided at the end of this Section provide detailed construction guidelines. On some projects, an equipment operator may dig the trench of the drainage structure. In this scenario, the Crew Leader and Crew Members will finish the drainage structure by creating the proper ramp, angle of the outflow, and the back-ramp of the structure.

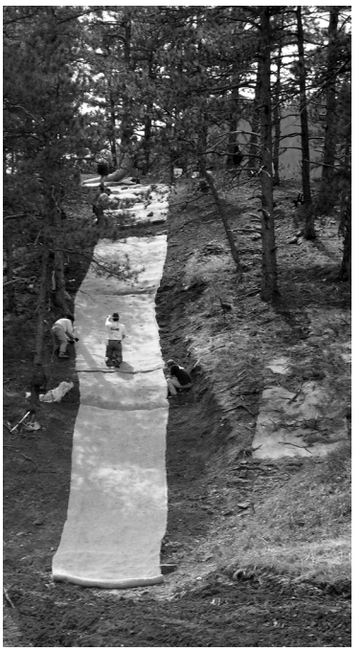


Check Dams

Check dams are structures designed to span gullies and slow the erosive force of water. As the water slows down at the check dam, sediment will be deposited behind the dam, hence building up a terrace of soil behind the structure. In this way, gullies can be filled up, instead of continually deepening with each new rainstorm or snowmelt. At the same time, check dams allow water to seep into the soil instead of flowing over the land.

The materials and methods used to construct check dams will vary depending on access to the site and the availability of local materials. Structures can be made of locally collected rock or logs, or from purchased materials such as straw bales or straw wattles. Check dams are particularly useful for closing old eroded roads and trails, or on severely eroding hillsides.

The spacing between check dams is determined by the steepness of grade. In general, the steeper the slope, the closer together the check dams. An agency representative or restoration professional will usually determine check dam placement and spacing.



Erosion Control Blankets or Matting

Erosion control blankets are used on slopes and streambanks, or other areas of concentrated runoff, to provide a protective cover for the soil from rain and runoff. Mats or blankets are usually composed of straw, coconut fiber, aspen shavings, jute, or combinations of such fibrous material. These biodegradable materials are either attached or sandwiched between netting, or woven as in the case of certain types of open weave mats made out of jute and coconut fiber. The netting material can be photodegradable or biodegradable. Whenever possible, the biodegradable nets should be used. The photodegradable netting is composed of polypropylene, which is essentially plastic. Typically, photodegradable netting breaks down into smaller pieces of plastic, but does not completely degrade. This plastic netting can be a hazard to wildlife. All the blankets come in varying widths and lengths, but they are typically 4 feet or 8 feet wide.

The different materials used for erosion control blankets have different protective qualities. Straw will break down the quickest, so a 100% straw blanket would be used on relatively gentle slopes with no gullies, such as a 4:1 or 3:1 slope. A heavier duty blanket made of woven coconut fiber would typically be used in areas where erosion potential is very high, including streambanks, gullies, and other areas where water velocity is concentrated and constant. The fiber types will also act as a mulch, holding moisture and shading germinating seeds. Erosion control blankets can also be used to visually

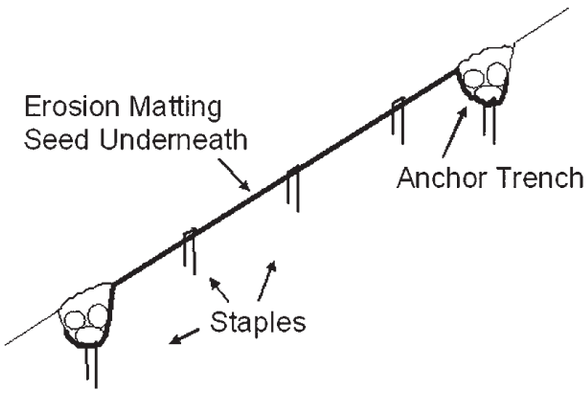
delineate to the public areas closed for restoration.
Erosion control matting works best when it has close contact with the ground. If part of the blanket does not touch the ground, water can potentially run underneath the blanket and erode away soil unseen, instead of flowing over the blanket, thereby protecting the soil. Removing large rocks and branches before laying the blanket on the slope will help with proper blanket installation.

Mulching

Various materials can be used as mulch where needed to provide shading to the soil or to blend a restoration area into the surrounding landscape. Locally collected materials, such as pine needles and leaves can be easily gathered in a brewery blanket or tarp, and scattered over the restoration area needing mulch. Care should be taken to avoid weeds and weed seed when collecting local, native materials for mulch. Straw is also another common mulch used, and only weed-free straw is recommended for restoration projects. In Colorado, certified weed-free straw bales are identified by one blue and orange striped twine on the bale.

ON-SITE ACTIVITY

1. At the site, decide as a group when and where to install the erosion matting and check dams. If an area requires matting and a check dam, install the matting first, and place the check dam on top of it. If using a log check dam, follow steps 1 through 6 in that section BEFORE installing the erosion matting.



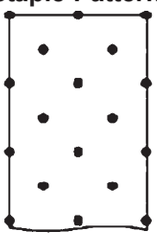
Installation of erosion blanket or matting:

Note: Installation guidelines may change slightly with the brand of erosion control blanket. Check manufacturers guidelines for their products through their websites.

1. Make sure the ground is free of large rocks, branches, and other debris.

2. Soil bed preparation and seeding should precede installation of the erosion control blanket.

Staple Pattern



8' wide
3:1,
33% Slope
Closer if steeper

3. Dig a 6 inch deep trench across the top of the slope where the mat will start and place the excavated soil upslope of the trench.

4. Fold over the edge of the matting, and place into the trench.

5. Fasten the matting with landscape staples (typically 8-inch x 1-inch) about every two feet. On rocky terrain, it may be difficult to pound staples into the ground. In this case, rocks can be used to hold the blanket down.

6. Backfill the trench and tamp the soil.

7. Once secure, unroll the matting down the slope, adjusting the blanket to remove any folds or kinks before stapling.

8. Position and pin the edges of the matting with staples every three feet in staggered rows.

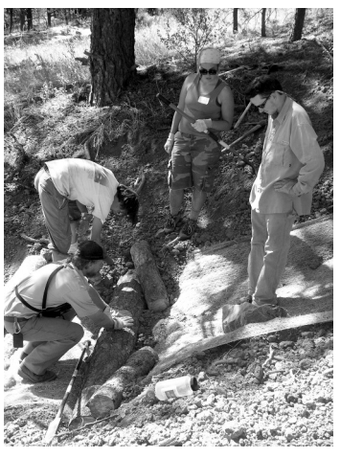
9. At the lower edge of the mat, dig another 6 inch deep trench and secure the matting the same way as the top edge.

10. Place some rocks and branches on top of the blanket to help secure it.

11. Where two blankets meet on the edges, overlap edges by 6 to 12 inches and pin every 2 feet.

12. Where two blankets meet end on end, anchor meeting ends of the blankets in a trench.

EDGES & ENDS
A roll of matting is much longer than wide. Two common dimensions are 68 feet long by 8 feet wide or 200 feet long by 4 feet wide. The “edges” are the long dimension and the “ends” are the short dimension. If you join two 68 x 6 blankets on edges, they are side by side, with two 68 feet edges meeting. If they meet on ends, then one is higher on the slope and the other is below it on the slope and they overlap on the 8 foot wide end.



Installation of a log check dam:
Before you begin:

1. Obtain a log that is roughly 18 to 24 inches longer than the area that needs a check dam. It may be necessary to either cut a log to the proper length or have it cut ahead of time. The diameter could vary from 6 inches to over 12 inches. Use larger diameter logs for areas with deeper gullies or steeper terrain, and smaller diameter logs for shallow gullies.

2. Check dams should be installed as level as possible, perpendicular to the fall line. Otherwise, water will just flow to the low end of the check dam, reducing effectiveness

and eroding the upslope edge along the check dam. Water bottles are handy for estimating level in situations where the terrain might fool the eye. When in doubt, ask an agency representative or restoration professional for help in placing a check dam.

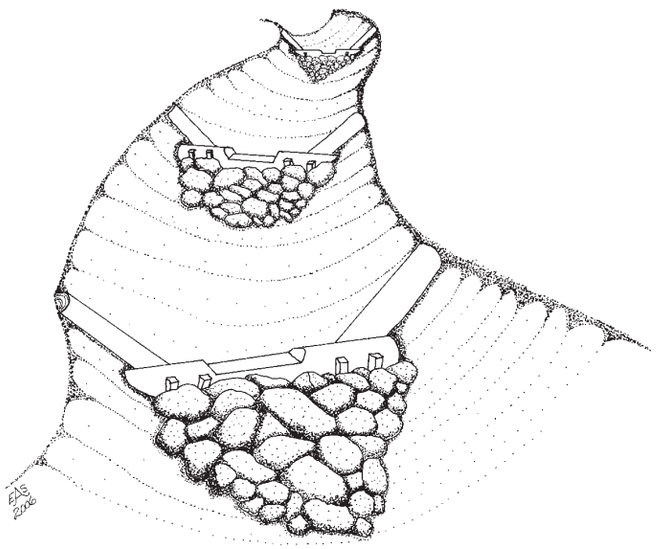
Installing the log check dam:

1. Dig a trench and gauge the depth based on the lowest point in the gully. Gullies tend to be deeper in the middle, rather than flat across the bottom.

2. Extend the trench 9 inches to 12 inches into each bank of the gully.

3. Dig out the ends of the trench to match the depth of the middle of the gully. Be conservative when digging initially, and remember that it is better to dig more later than to try to fill it back in later.

4. When digging the trench, dig slightly shallower and narrower than the length of the log. If the trench is too big, then water can easily flow around the ends, making the check dam useless, or possibly even accelerating erosion. If the trench is too deep, then you will lose above-ground height of the



check dam.

5. Place the log tightly in the trench.

6. Secure the log check dam with small rocks wedged in on the downhill side.

7. On the uphill side of the log, backfill and tamp with loose dirt one quarter of the way up the log. Take care not to fill the entire uphill side of the log, as this is where sediment will be trapped in future rainstorms or snow runoff.

Installing a log check dam in combination with erosion matting:

8. If the check dam is being installed over the top of erosion matting (e.g. in a road closure/reveg situation), follow steps 1-4 from Installing a log Check dam.

9. Install the erosion matting over the trench area according to directions. When rolling out the matting, stop the matting just below the trench until the log check dam is properly placed. Adjustments to the trench can still be made.

10. Place the log in the trench on top of the matting. If the log does not properly fit, make the necessary adjustments in the trench. Repeat the process of adjusting the trench and testing the check dam until the log tightly fits in the trench

11. Secure the log check dam with small rocks wedged in on the downhill side.

12. On the uphill side of the log, backfill and tamp with loose dirt one quarter of the way up the log. Take care not to fill

the entire uphill side of the log, as this is where sediment will be trapped in future rainstorms or snow runoff.

13. Follow the directions to install and secure the matting below the check dam.

Special considerations for log check dams:

- For large diameter logs in wide gullies: notch the log at the center of the gully. This will direct water through the center of the check dam instead of around it and possibly cutting into the gully walls. For larger check dams, also build an apron of rock around the outflow of the notch. This will prevent a plunge pool from forming at the outflow of the check dam. Without this, the check dam could be undermined. In addition, reinforce the gully banks at the sides of the log check dam to keep the water from eroding around the check dam. Logs or rocks can be used for this.

- For extra stability: use 1/2-inch rebar cut to a length that is 6 to 12 inches longer than the diameter of the check dams. This requires pre-drilling of the logs and soil conditions that are not excessively rocky.

- For high water flow situations, add reinforcing logs on either side of gully, upstream of the check dam to prevent flow from cutting around check dam.

Putting It All Together

The Daily Reminder summarizes all of the basic components from the training workshop and presents the information in a simple format that can be utilized in the field. Following the basic reminders will promote a better crew leading experience. Visit OSI's website at www.voc.org to find out about additional training and volunteer opportunities.

A Crew Leader's Daily Reminder

Start of Project

GREET crew members as they arrive
- Supply name tags for everyone (if you decide to use them)
- Ensure waivers are signed (if required)

INTRODUCE yourself and crew members

DISCUSS project expectations, work objectives and work site specifics
- How far/difficult is hike/travel to site
- What type of work will be done

DEMONSTRATE/PROVIDE Safety/Tool Talk
- Discuss safety and first aid
  - Find out crew members health needs
  - Make sure everyone has water, food, clothing, boots, and gloves for the day
  - Ask if anyone has medical/first aid training
  - Explain your level of first aid training and where a first aid kit is located
  - Explain the safety net for the project
  - Explain the environmental and safety hazards for the project
- (CUSS) Carry, use, storage and safety of tools being used that day

LEAD Safety Stretch Exercise (may be done upon arrival at the worksite)

HIKE/TRAVEL to the work site at a pace everyone can handle
- Put your slowest hikers/travelers in front
- Check tool carry and safety on the way to the site

Upon Arrival at the Worksite

EXPLORE work area and discuss with crew members
- Find out what talents, experience or expertise crew members have
- Utilize project notes (if provided) to explain tasks and standards for project

DEMONSTRATE the techniques that the crew will need to be using on the project

- Provide a short talk on ecological restoration in general and why you are doing the kinds of things that you are doing.

DELEGATE tasks to crew members accounting for individual preference, ability and skill

Ongoing/Throughout Project

PROMOTE a safe work environment

- Take breaks as needed
- CUSS for tools
- Encourage crew members to work at a comfortable pace.
- Continually assess for risks

PROVIDE a positive work environment through:

- Demonstration of appropriate leadership styles
- Praise and recognition of crew members
- Utilizing active listening techniques, giving appropriate feedback, and demonstrating tact and diplomacy in negotiations and confrontations with others
- Understanding reasons for participation
- Understanding learning styles and using effective teaching techniques
- On-going assessment of crew members (expectations, skill level, personality, performance, and safety)
- Identifying problems in the field, creating a plan of action to resolve problems, communicating the plan to crew members, and motivating them to implement solution
- Using a group approach to solve problems
- Modeling appropriate behavior
- Having fun!

End of Project

WALK work site at end of project with crew members to assess work accomplished

- Gather tools, packs, clothing, trash, etc. so that nothing is left behind
- Give thanks to crew members for a job well done and encourage them to volunteer/work again
- Check tool carry and safety on the way out

ENCOURAGE crew members to provide feedback on project

- Fill out evaluation form if provided

NRCS
Natural Resources
Conservation Service

Log Erosion Barriers (LEBs)

Denver Federal Center
Building 56, Room 2604
PO Box 25426
Denver, Co 80225-0426

720-544-2810 - office
www.co.nrcs.usda.gov

What are log erosion barriers?

Log Erosion Barriers (LEBs) are logs placed in a shallow trench on the contour to intercept water running down a slope and trap sediment. This treatment may also be known as contour log felling, log terraces or terracettes.

When are log erosion barriers used?

Log erosion barriers are used on moderate or severely burned slopes ranging between 20% to 60%, with erosive soils. LEBs are used where erosion rates have increased significantly because of the fire and there are high values at risk downstream. The site must have enough trees of adequate size to meet treatment objectives (at least 60 trees per acre). Soils can be shallow, but not less than about 8 inches. LEBs increase infiltration, adds roughness, reduce erosion, and help retain small amounts of eroded soil on site. LEBs should be effective for a period of one to two years, providing short term protection on slopes where permanent vegetation will re-establish and provides long term erosion control.

What materials are needed?

- 6-12 inch diameter logs, 10-30 feet long
- An expert sawyer and labor crew with hand tools
- Machines may be used for moving logs or trenching them in on 30% or flatter slopes

How are log erosion barriers installed?

A contour line is marked on the slope to identify the approximate cross slope alignment. Trees along this line are felled on the upstream side of the contour line as much as possible. Stumps are left about 12" high to brace the tree. The logs are cut to a length that permits safe handling and placement for the crew, generally 10 to 30 feet. Tree limbs are removed to the extent necessary for the log to lie flat on the ground. A shallow trench (about 4 to 6 inches deep) is dug along the contour. The log is placed in the trench and seated with tamped backfill such that water flowing down the slope will not run under it. For this practice to be effective, enough trees must be felled along the contour line to create a semi continuous barrier to the movement of water down the slope, as shown in Figure 1 & 2.

How many log erosion barriers are required?

Depending on characteristics of the slope, somewhere between 60 and 152 trees per acre are needed for use of LEBs to be effective. Figure 1 depicts the pattern of LEBs on the slope, and Table 1 shows recommended spacing.

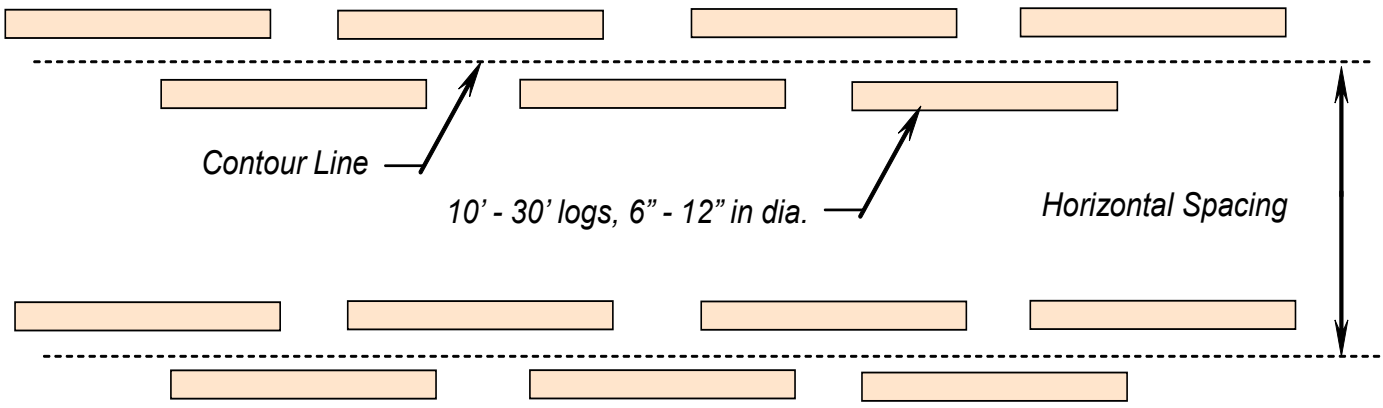


FIGURE 1 - Theoretical log terracing pattern

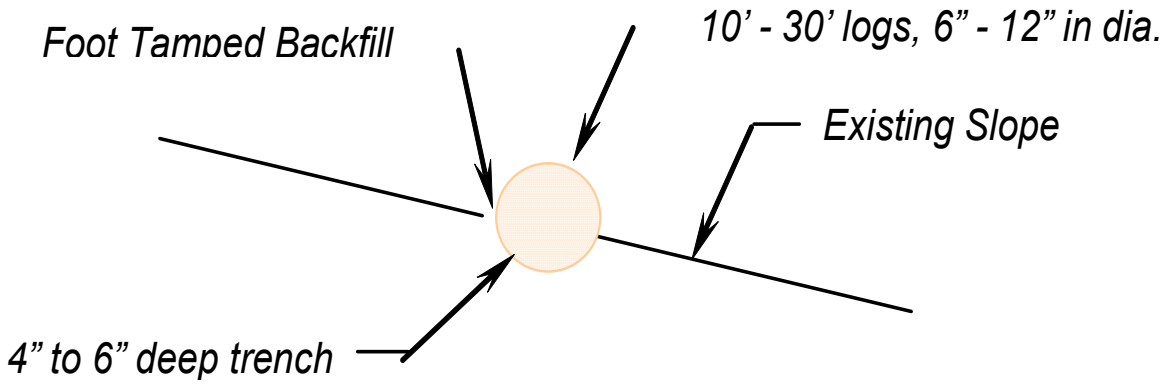


FIGURE 1 - Typical log & bedding detail

Slope steepness (percent)	Burn Intensity	
	Moderate	Severe
	Spacing (feet)	
10 - 20%	60	40
20 - 50 %	30	20
> 50%	15	10

TABLE - Recommended spacing for contour slope treatments

NOTE: After a fire many trees are weakened from burning around the base of the trunk. The trees can fall over or blow down without warning. Shallow rooted trees can also fall. Therefore be extremely alert when around burned trees.

NRCS
Natural Resources
Conservation Service

Contour Wattles

Denver Federal Center
Building 56, Room 2604
PO Box 25426
Denver, Co 80225-0426

720-544-2810 - office
www.co.nrcs.usda.gov

What are contour wattles?

Straw Wattles, also known as fiber rolls, bio-logs, or straw tubes are man made cylinders of compressed, weed free straw (wheat or rice), 8 to 12 inches in diameter and 20 to 25 feet long. They may also be filled with other types of weed free fibers. They are encased in jute, nylon, or other photo degradable materials, and have an average weight of 35 pounds. They are installed in a shallow trench forming a continuous barrier along the contour (across the slope) to intercept water running down a slope.

When are contour wattles used?

Straw Wattles are used on burned slopes that have less than 30% of the original ground cover remaining and are at risk for increased erosion. They can be installed on slopes up to 50 percent. Soils can be shallow, but not less than about 8 inches. Straw Wattles increase infiltration, add roughness, reduce erosion, and help retain eroded soil on the slope. Straw Wattles should be effective for a period of one to two years, providing short term protection on slopes where permanent vegetation will be established to provide long term erosion control. Contour Straw Wattles accomplish the same treatment as Log Terraces, but require less skilled labor to install and can be placed on the slope more effectively. Straw wattles should not be placed across drainage swales and channels with more than 2 acres of contributing drainage area because they are not sturdy enough to resist the forces of concentrated flows.

What materials are needed?

- 9 -12 inch diameter tubes, 10-30 feet long.
- 5 - 1x2 or 2x2 wooden stakes, 18 - 24 inches long per wattle.
- Hand tools -shovels, polaskis, & stake hammer.
- Small machines for plowing trenches on 30% or flatter slopes.

How are contour wattles installed?

- Layout a contour line on the slope with a hand level and wire flags.
- Dig a shallow depression (about 3 to 5 inches deep) and lay the wattle into it.
- Drive a 1x2 or 2x2 wooden stake through the center of the wattle at least 6 inches into the ground, stopping about two inches above the wattle.
- Put 5 stakes in each wattle, installing them end to end in the trench.
- Seat the wattle with foot tamped backfill on the upstream side such that water flowing down the slope will not run under it.

How many wattles are required?

The horizontal spacing of wattles on the slope is based on normal rainfall intensity, slope steepness, soil characteristics, and the extent of surface cover remaining after the fire. Figure 1 depicts the placement straw wattles on the slope. Table 1 shows recommended wattle spacing.

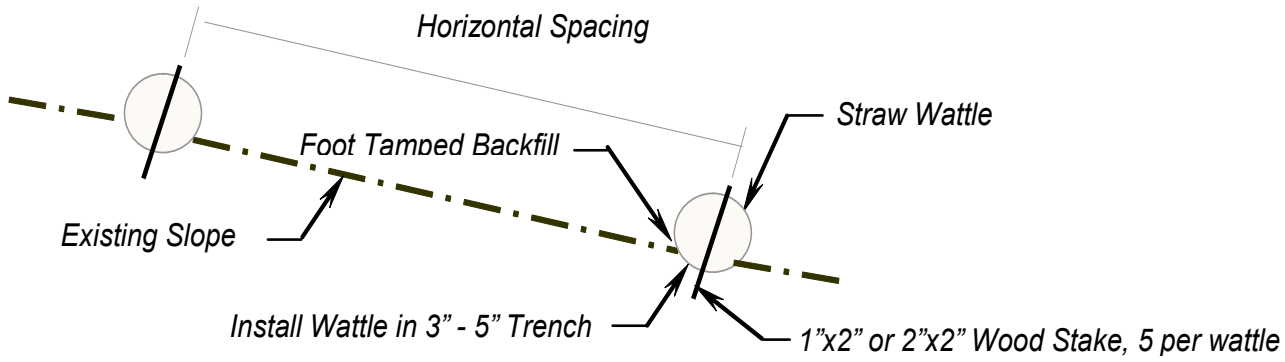


FIGURE 1 - Typical straw wattle installation

Burn severity	Low Intensity		Moderate Intensity		Severe Intensity	
land slope (percent)	Spacing (feet)	# Wattles (feet/acre)	Spacing (feet)	#Wattles (feet/acre)	Spacing (feet)	#Wattle (feet/acres)
5 - 10%	200	218	120	363	90	484
10 - 20%	120	363	60	726	40	1089
20 - 50%	60	726	30	1452	20	2178
> 50%	40	1089	20	2178	20	2178

TABLE 1 - Recommended spacing for contour wattles

NOTE: After a fire many trees are weakened from bunring around the ase of the trunk. The trees can fall over or blow down without warning. Shallow rooted trees can also fall. Therefore b extremely aler when around burned trees.

USDA NRCS Natural Resources Conservation Service FACT SHEET

WHAT ARE HYDROPHOBIC SOILS?

DEFINITION: Wildfires burn dead and living vegetation that accumulates on the surface of the soil. This burning produces volatile hydrophobic substances which can penetrate the soil up to a depth of six inches. When these substances penetrate the cool soil, they condense and coat the soil particles making the soil hydrophobic (water repellent).

PROBLEM: Soils that water repellent exhibit a decreased water infiltration rate and an increased water runoff rate, creating extreme soil erosion potentials. Initially, rain and irrigation water will run off hydrophobic soils instead of infiltrating and promoting germination of seed and growth of roots. This makes it difficult to establish a stand of vegetation on a hydrophobic soil for erosion control purposes.

Water repellency will be the worst where the fuel and burn temperatures were extreme, especially around buildings which burned to the ground.

TEST: Field checking for water repellent soil conditions can be done by digging a shallow trench with a vertical wall and applying water droplets from the surface down in centimeter increments. If water sits as a ball on the soil for 10 to 40 seconds, it is moderately hydrophobic. If more than 40 seconds, it is strongly hydrophobic.

TREATMENT: On gentle slopes, home owners may hoe the soil a few inches deep to break up the hydrophobic layer. This will allow rain or light irrigation waters to penetrate the soil surface for seed germination and root growth.

On steeper slopes, lightly spray the soil surface with a soil wetting product (surfactant.) This will break up the hydrophobic substances coating soil particles the way dishwashing detergent breaks up grease. Then rain and irrigation water can penetrate the soil readily. Soil wetting products can be purchased at a lawn and garden store or a golf course supply store.

Seed Recommendation	**High Park Fire**					
		1	**2**	**3**	**4**	**5**
Species	**Variety**	**Required PLS rates Per acre (100%)**	**% of Species in mixture**	**PLS Seeding Rate per species/Ac**	**Planned Acres**	**Total PLS Lbs/Species planned (3) x (4)**
Slender wheatgrass	San Luis	22	25	5.5		
Mountain bromegrass	Garnet	38	20	7.6		
Western wheatgrass	Rosana	32	15	4.8		
Regreen or Quickguard		40	25	10		
Sandberg bluegrass	VNS	3	15	0.45		
The following grass species can be added to the mix at their PLS rate or substituted for any of the species listed:						
Thickspike wheatgrass	Critana	22				
Streambank wheatgrass	Sodar	22				
Green needlegrass	Lodorm	20				
This is a native mix of species that should be found within the fire effected areas. You can either use this native mix or the sterile cover. Only one of these mixes should be used, NOT both.						

USDA Natural Resources Conservation Service
2150 Centre Ave Bldg A-Ste 116
Fort Collins Colorado 80526
O:970-295-5655
F: 970-295-5668