

JOB HAZARD ANALYSIS	1. JOB TITLE: Trail Reconstruction	2. DATE:	<input checked="" type="checkbox"/> NEW <input type="checkbox"/> REVISED
3. TITLE OF WORKER(S): Maintenance Worker Leader, Maintenance Workers, Laborers.	4. NAME OF ORGANIZATION: Rocky Mountain National Park	5. LOCATION: RNMP all Trails	ANALYSIS BY:
6. DEPARTMENT: Maintenance--Trails	10. SUPERVISOR:	APPROVED BY:	REVIEWED BY:

11: REQUIRED AND/OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT: Hard hat, eye protection, ear protection, respirator long sleeves, gloves, long pants, good boots.

7. SEQUENCE OF BASIC JOB STEPS	8. POTENTIAL HAZARDS	9. RECOMMENDED ACTION OR PROCEDURE
Trail reconstruction: general, preparing for work.	Injuries or property damage resulting from lack of knowledge, communication, equipment, or training.	<p>-Our most important achievement is for every employee to conclude each and every day without personal injury or damage to property.</p> <p>-Employees are provided adequate orientation, equipment and training as per their duties and responsibilities.</p> <p>-Employees participate in and support an environment where all valid safety concerns can be raised and addressed, without judgement or reprisal.</p>
	Injuries or property damage resulting from lack of PPE and/or training.	-Crew leaders and supervisors are responsible for providing crewmembers with adequate PPE and related training. Refer to block 11.
	Injuries or property damage resulting from lack of knowledge, communication, equipment, or training.	<p>-Crew leaders and supervisors will conduct and document weekly safety meetings to discuss safety issues, projects, and other work related topics.</p> <p>-Crew leaders will also conduct, whenever appropriate, 'tailgate' safety meetings with crews to provide project orientation, assign work, and avoid miscommunication.</p>
Trail reconstruction: general.	Injuries or property damage resulting from lack of communication.	<p>-Good communication between crewmembers should reinforce individual awareness of real and potential hazards.</p> <p>-Communication methods or jargon should be discussed and agreed upon prior to performing work.</p> <p>-The plan of attack should be discussed <i>before</i> beginning work.</p> <p>-Instructions should come from one person when working in teams of two or more.</p>
	Injuries or property damage resulting from lack of knowledge, communication, equipment, or training.	<p>-Each crewmember should receive training on basic radio procedures, emergency response plans, and SAR operations (see trails handbook).</p> <p>-Trail workers need to stay aware of their surroundings, the location of other crewmembers and other trail users while performing all aspects of trail work.</p> <p>-Crewmembers often warn each other of the presence of hikers with an audible, "trail," or, "traffic."</p>
		<p>-Each crew will be provided at least one first-aid kit and water-filter.</p> <p>-Crewmembers should be familiar with its location and contents at all times.</p> <p>-Basic first aid/CPR training will be available for all crewmembers.</p>

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	Injuries or property damage resulting from work site hazards such as weather.	-Trail workers should be continually aware of, and prepared for, dynamic and extreme weather. Refer to the trail's handbook for more.
	Injuries or property damage resulting from lack of project management and control.	-Good project management should include consideration and implementation of any of the following: scheduling, logistics, season, trail closures, signage, reroutes, temporary trails/detours, flaggers, guards, lookouts, communications, relays, visibility, signals/hand signs, fatigue, location, elevation, visitor traffic patterns/volume, and other factors.
Trail reconstruction: general.	Injuries or property damage resulting from work site hazards such as loose/unstable ground, snags, brush, insects, poisonous/hazardous plants and animals, swift water, cliffs/heights, edges,	- Safety is everyone's primary responsibility , and all employees should take an active role in hazard identification, analysis, and mitigation. - If at any point, a job is deemed unsafe, workers should feel entitled to stop until the appropriate PPE, engineering controls, equipment or conditions are available to make the job safe.
Performing trail reconstruction work: lifting, bending, pulling, pushing, dragging, using hand and power tools, etc.	Injuries from improper body mechanics, body positioning, etc.	-Each employee should be provided training on the safe and proper use of the most important, primary tool—their bodies (Strong, Alert, Focused, Energetic, or SAFE training). Proper techniques of stretching, lifting, bending, moving, rolling rocks, tool use, securing good footing, the importance of good nutrition and hydration, etc., should be addressed.
	Muscle strains, pulls, and repetitive motion injuries.	-Each employee will be given time on the job to properly stretch and warm-up before and during physical activity for a period of time deemed appropriate by the crew leader, or on-site supervisor. -Employees will be encouraged to switch hands often, and vary the types of activities performed to limit exposure to repetitive motion injuries. -Logic dictates that if proper body mechanics are employed while using any tool, proper tool use should follow.
	Excessive strain, lack of personnel.	-The appropriate number of workers should be used to move materials or accomplish work. This decision may vary between individuals
Performing trail reconstruction work: tool management.	Injuries from tools or equipment: general.	-Employees will be provided training on proper re-handling, sharpening and maintenance techniques of tools and equipment used in trail work. -The right tool for the job should always be used to decrease the chances of injury to an employee, or damage to a tool through improper use. -All tools should be inspected regularly to ensure their safe condition. -Any unsafe, defective, or ill-maintained tools should be fixed, red-flagged, tagged, rotated out of service, or discarded.
		-Wood handles should be free of cracks or splinters, fit tightly, with no wiggle or play, and be replaced when they are loose or damaged. -Metal heads: burrs, mushrooms, etc., should be filled or ground down. -Edges should be sharp and covered when not in use.
	Injuries from tools or equipment: housekeeping.	-Tools and equipment, when not in use, should be kept in an orderly manner a safe distance away from the work area or the public. -Tools should never be leaned against trees or rocks, always laid down flat, and in such a way to minimize exposure to sharp edges. -All protective covers, scabbards, and shields should be in place whenever such tools are not actively being used.

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	Injuries from tools or equipment: safe use, management, and transportation.	<ul style="list-style-type: none"> -When carrying tools, keep the working end close to your body and under control at all times to avoid accidental injury to others. -Sharp edges should be positioned in such a way to minimize exposure to self and others.
	Injuries from tools or equipment: transporting/packing tools.	<ul style="list-style-type: none"> -Efforts should be made to avoid carrying tools above waist. Tools need to be carried securely, but also readily separable in case of a slip or fall. -Tools should be securely lashed to backpacks in such a way as to not pose an injury, tripping or safety hazard to the person carrying the tool(s), or anyone else on the trail. -Several lighter trips are better than struggling with one. -When loading tools on packs, all protective scabbards and covers should be in place. -Tools and supplies will be packed on NPS stock, under the direction of a packer or crew leader.
Performing trail reconstruction: rock work.	Injuries from rock bars.	<ul style="list-style-type: none"> -Workers should never straddle, sit or stand on rock bars. -Exercise caution when crisscrossing rock bars. -Be prepared for sudden or unexpected loss of bite or slippage—use chocks. -Experience shows that as the angle between the ground and the rock bar approach’s 90 degrees, the less secure becomes the bite.
	Foot injuries.	<ul style="list-style-type: none"> -Workers need to maintain constant awareness of their feet in relation to objects being moved and avoid placing them under materials.
	Finger and/or hand injuries.	<ul style="list-style-type: none"> -It is recommended that workers use either rock bars or hand lifting techniques to minimize the potential for injuries to hands. -If hands are absolutely necessary in the presence of rock bars, extreme caution and 100% communication with other workers should follow.
	Injuries caused by shaping or splitting rock.	<ul style="list-style-type: none"> -Chisels and wedges should be frequently ground or filed so that no “mushroom” or burrs develop. -All personnel in close proximity to shaping or splitting operations need to be in full PPE. -In case of a partial miss or deflection, workers need to give a 5 to 10 foot safety circle around anyone driving wedges or shaping rock. -Consider use of the special driver bit in jackhammer mode to reduce potential hazards when driving wedges.
	Cuts or scrapes, from rock and freshly cut edges.	<ul style="list-style-type: none"> -Freshly cut stone is extremely sharp, and workers need to exercise caution while handling or moving this material. -Clear work area often to reduce the chance of tripping or falling.
Performing trail reconstruction: drilling operations.	Hazardous material (respirable silica, CCA, etc.)	<ul style="list-style-type: none"> -Poinjar operators are required to participate in the Park’s respiratory protection program (ideally, 2 to 3 people per crew). -Participants will be assigned an appropriate respirator, and it will be the individual’s responsibility to maintain, clean and care for their respirator. -Anyone working very close or up wind of Poinjar operations should also protect their airways. -Participation in the Volunteer Respirator Protection Program is open to all.

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		crewmembers, and everyone should have access to a disposable, P-100 air-mask
	Injuries caused by rock drills.	Be aware of casings or components that may build up heat, move, or attract loose articles of hair or clothing (such as mufflers, shanks, and flywheels).
Performing trail reconstruction: drilling operations.	Injuries caused by drilling operations.	<ul style="list-style-type: none"> -Operators need to find the safest, most effective position for themselves and the machine. -If possible, consider moving materials so that drills can be operated from such a position to allow the driller to maintain good footing and posture. -Drill operators should maintain a relaxed grip on the handles, reducing the conduction of vibrations and impacts to hands, wrists, arms and elbows. -Allow the weight of the drill to drive the bit, while guiding the shank in the middle of the hole, with minimal pressure from the drill operator. -If necessary, a spotter, or an additional operator can help support the machine or guide the bit. -Poinjar operators should take frequent breaks of appropriate length, and stretch often.
	Injuries caused by transporting/packing drills.	<ul style="list-style-type: none"> -Frame packs and backboards are available for transporting drills by foot. -Anyone carrying a drill should be extra careful of rough or loose footing, and get assistance while loading and unloading. -Packers or other trained staff must lash drills tight and secure to pack stock. -Poinjars should be purged whenever being transported or not in use.
	Frozen bit, sudden stop, or fatigue/frustration.	<ul style="list-style-type: none"> -Drillers need to be attentive to the behavior of the drill and conscious of the type of rock they are drilling. -Micro-fractures and unforeseen seeps can jamb a bit, causing a sudden reaction with the drill. -Drillers should monitor the following: <i>Changing tones</i>-often signal a bit is about to break completely through a rock. <i>Fast and slow drilling</i>-often indicates different layers and hardness of rock. <i>Color of the drill fines</i>-a good indicator of the type of rock below. -When all else fails, take a step back and a big, deep breath, maybe stretch a little, and try again or try something different.
Performing trail reconstruction: chainsaw use.	Injuries or property damage from improper chainsaw use.	<ul style="list-style-type: none"> -Only authorized personnel may operate power saws, under the approval and direction of supervisors, crew leaders or on-site (project) supervisors. -Chainsaws can be operated only when two or more workers are present.
		-Power saw operators will follow standard operating procedures and guidelines found in S-212 (Wildfire Power Saws), or Missoula Technology & Development Center (MTDC) Chainsaw and Crosscut Saw Training Course.
	Injuries or property damage from lack of preparation, proper tools, or poorly maintained equipment.	<ul style="list-style-type: none"> -The chain brake should be functional, and tested prior to each use. -Chains should be sharp, and spares should be readily available. -Air filters should be thoroughly cleaned at least once per use or once a day, and have a spare along.

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	Injuries or property damage from improper chainsaw use—general.	<ul style="list-style-type: none"> -Always thoroughly size-up each and every tree, before any cuts are made. -Constantly assess and reassess as you go—things can change! -Never attempt to cut any tree that is unsafe, that you are uncomfortable with, or that is beyond your skill level. -Never attempt to cut any tree when conditions aren't right or too hazardous-e.g., high winds, deep snow, etc.
Performing trail reconstruction: chainsaw use.	Injuries or property damage from improper chainsaw use—general.	<ul style="list-style-type: none"> -Always have at least one escape route and safety zone cleared prior to making any cuts. -Always post guards or lookouts when clearing trails, preferably in the line of sight of the chainsaw operator. -Always yell-out, “front-cut! Back-cut!” and, “falling!” when falling trees. -Try to accomplish work with as few cuts as possible to reduce visual impacts, but keep it safe and within reason!
	Injuries or property damage from improper felling, bucking, or limbing.	<ul style="list-style-type: none"> -As a general rule, always release the stump shot from stump first, then limb your way out to the top and buck your way back to the stump. -Anticipate where the tree is being pinched, where it's under tension (pulled apart) and where it's under compression (pushed together/compressed). -Watch the kerf—it is a good indicator of tension and compression—if the cut opens, it's under tension: if it closes, it's under compression. -But don't forget to look up, down and all around—don't focus in on one thing and neglect to watch for other hazards. -Anticipate 'spring-back' from 'spring poles', saplings or pinched trees. -Always work from the uphill side unless the situation dictates otherwise. -Always try to cut limbs on the opposite side of the tree in relation to where the operator is standing, as terrain, tension, and the situation allows. -Flush cut stumps, and scarify/checkerboard to encourage decomposition. -Use wedges, especially on larger diameter material. -Be extremely careful when setting and taping wedges! If possible, stop the chain and engage the chain brake while setting and driving wedges. -Analyze stumps to assess the operation.
	Injuries from materials: logs.	<ul style="list-style-type: none"> -Rotten or wind-blown trees should be considered unsafe until thoroughly sized up and inspected. -Be especially careful rolling logs and rounds on loose or steep slopes. -Clear a path, and post guards to minimize potential for injuries. -Use an adequate number of bodies when moving logs by hand (tongs).
Cutting/working with pressure treated wood.	Hazardous materials.	<ul style="list-style-type: none"> - Employees cutting or working with pressure treated wood should minimize their exposure to direct skin contact and wash hands before eating, and consider wearing a dust mask or respirator. -Saw dust and scraps from ACQ treated wood are considered non-native material and must be packed out and properly disposed of. -Consider placing temporary booms over water, and/or perform as much cutting as possible away from water sources.

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Performing trail reconstruction: moving materials/griphoist and highlines.	Injuries or property damage resulting from misused or overloaded equipment.	<ul style="list-style-type: none"> -Employees using griphoist and highline systems must be familiar with the safe working load limits and safety features of all components in the system. -It is recommended that a load calculation be done before every new or major lift, to ensure loads are within safe working limits.
	Injuries from equipment: chains and chain baskets.	<ul style="list-style-type: none"> -Employees working with chains and chain baskets need to be familiar with their safe working load limits and basic chaining techniques. -Inspect chains and baskets prior to use and/or periodically during use. -Be prepared for sudden or unexpected shifting or settling of loads when tension is introduced, especially when using chains and chain baskets.
Performing trail reconstruction: griphoist and highlines.	Injuries from equipment.	<ul style="list-style-type: none"> -Workers should never: <ul style="list-style-type: none"> -step, sit, or stand on the cable. -straddle the cable, -enter or occupy the ‘dead man zone’. -needlessly touch a cable under tension -When moving materials or applying tension, workers need to remain aware of direct and potential hazards, and position themselves in such a way to minimize their exposure. -All personnel in close proximity to highline operations need to be in PPE.
	Injuries or property damage resulting from poor planning, route selection, or lack of project management.	<ul style="list-style-type: none"> -Explore options, fill holes, and build temporary structures to maximize safety and efficiency in moving materials, especially on steep or loose slopes. -Clear the route of hazards and debris before moving materials. -Consider using chocks, skids or logs to ease moving materials.
	Injuries or property damage resulting from misused or overloaded equipment: highlines.	<ul style="list-style-type: none"> -Questions to ask when setting up and using a highline system: <ul style="list-style-type: none"> -Where is the most useful location for the system? -Are there any conflicts/safety issues with trails or the public. -Where is the direction of pull? -What type of anchors are there? -Are they sound? Are there more than one? -Are the anchors/spar trees in the same plane? -What’s the angle between anchors? Between anchors and spar trees? -Are the anchors equalized and/or independent? -What will happen if an anchor fails? -Are spar trees of questionable size? Can they be anchored? -Will anchor straps damage trees? Adjust under slack and/or pad. -Will the loads clear high spots/natural obstacles? -Do loads need to be belayed? -How heavy are the loads? -How much tension is required to lift loads? -What is the heaviest load this system can safely handle? -What is the weakest link in the system? -Where is the greatest strain placed on the system? -What is the worst case scenario? How can it be prevented/mitigated? -Is there anyway to retain safety and function, yet reduce the system to fewer components?

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	Injuries from equipment: anchor straps.	<ul style="list-style-type: none"> -Employees working with anchor straps need to be familiar with their safe working load limits and basic wrapping techniques. -Inspect anchor straps prior to use and/or periodically during use. -Note that there are anchor-only and drag-only straps in the cache. -If anchor straps will damage trees, adjust under slack and pad. -Slip hooks should be equipped with operational gates.
	Injuries from equipment: shackles and misc.	<ul style="list-style-type: none"> -Employees working with shackles and other system components need to be familiar with their safe working load limits and basic techniques. -Inspect shackles prior to use and/or periodically during use.
Performing trail reconstruction: moving materials/griphoist and highlines.	Injuries from equipment: shackles and misc.	<ul style="list-style-type: none"> -When in doubt, tape or cable-tie shackle pin to ensure it will not back out. -When belaying loads from a shackle, make sure the vibration or friction from the rope will not back the pin out. -Slip hooks should be equipped with operational gates.
	Injuries from equipment: modular spar towers.	<ul style="list-style-type: none"> -Employees working with towers and their components need to be familiar with their safe working load limits and basic set up and operation. -Inspect towers and components prior to use and/or periodically during use. -Note that each tower is unique and each piece is labeled to indicate which parts go together. -Direction of pull should strike through the center of each tower. -Ensure each leg is securely planted. Be extra careful on exceptionally hard (slick rock) or soft ground, as legs can slip or become buried under tension. -Make sure weight is evenly distributed between each leg. -When in doubt, anchor tower and/or secure legs.
	Injuries or property damage resulting from misused or overloaded equipment: multi-part-pulls.	<ul style="list-style-type: none"> -Employees working with blocks need to be familiar with their safe working loads, angle limits, and basic techniques. -Note that there are two sizes of blocks; <ul style="list-style-type: none"> -small (silver) blocks for angles between 0 and 90 degrees, -large (orange) blocks for angles between 0 and 180 degrees. -Inspect blocks prior to use and/or periodically during use. -When in doubt, tape or cable-tie block locking mechanism to ensure it will not back out or loosen. -Blocks should be equipped with operational gates. -When using multi-part pulls, make sure the additional mechanical advantage does not exceed the safe working load limits of anchors, shackles, or other system components.
Performing trail reconstruction work: equipment use.	Personal injury or property damage.	<ul style="list-style-type: none"> -Only authorized personnel may operate power buggies, bobcats, loaders, stake side, dump trucks, and other heavy equipment.
		<ul style="list-style-type: none"> -Operators are responsible for the knowing and obeying all applicable traffic laws and for the safe and proper use of all equipment under their control. -Operators are responsible for performing a pre and post-trip inspection. -Note any mechanical or safety issues in the operation log, and report any problems immediately to the auto shop, a crew leader or trail supervisors.

JSA Instructions

The JSA shall identify the location of the work project or activity, the name of employee(s) writing the JSA, the date(s) of development, and the name of the appropriate line officer approving it. The supervisor acknowledges that employees have read and understand the contents, have received the required training, and are qualified to perform the work project or activity.

Blocks 1, 2, 3, 4, 5, and 6: Self-explanatory

Block 7: Identify all tasks and procedures associated with the work project or activity that have potential to cause injury or illness to personnel and damage to property or material. Include emergency evacuation procedures (EEP).

Block 8: Identify all known or suspect hazards associated with each respective task/procedure listed in block 7. For example:

- a. Research past accidents/incidents.
- b. Research the Health and Safety Code or other appropriate literature.
- c. Discuss the work project/activity with participants
- d. Observe the work project/activity
- e. A combination of the above

Block 9: Identify appropriate actions to reduce or eliminate the hazards identified in block 8. Abatement measures listed below are in the order of the preferred abatement method:

- a. Engineering Controls (the most desirable method of abatement). For example, ergonomically designed tools, equipment and furniture.
- b. Substitution. For example, switching to high flash point, non-toxic solvents.
- c. Administrative Controls. For example, limiting exposure by reducing the work schedule.
- d. PPE (least desirable method of abatement). For example, using hearing protection when working with or close to portable machines (chain saws, rock drills, portable water pumps)
- e. A combination of the above.

Block 10: The JSA must be reviewed and approved by a supervisor.

Block 11: List all recommended and required PPE relevant for job/activity.

Emergency Evacuation Instructions

Work supervisors and crew members are responsible for developing and discussing field emergency evacuation procedures (EEP) and alternatives in the event a person(s) becomes seriously ill or injured at the work site.

Be prepared to provide the following information:

- a. Nature of the accident or injury (avoid using victim's name).
- b. Type of assistance needed, if any (ground, air or water evacuation).
- c. Location of accident or injury, best access route into the work site (road name/number), identifiable ground/air landmarks.
- d. Radio frequency(s).
- e. Contact person.
- f. Local hazards to ground vehicles or aviation.
- g. Weather conditions (wind speed & direction, visibility, temp).
- h. Topography.
- i. Number of person(s) to be transported
- j. Estimated weight of passengers for air/water evacuation.

The items listed above serve only as guidelines for the development of emergency evacuation procedures.

JSA and Emergency Evacuation Procedures Acknowledgement

As supervisor I acknowledge that the following employees have participated in the development of this JSA, accompanying evacuation procedures and have also been briefed on the provisions thereof:

Supervisor's Signature:
