Figures

Photos

Chapter 24. Clearing and Brushing Maintenance

24.1. Clearing

Maintenance “clearing” includes the removal of downed trees, limbs, rocks, chunks of wood, and other miscellaneous debris blocking the trail, creating drainage problems, or otherwise impeding trail users. (See Photo 24.1.) This work is performed on an annual or cyclical basis and often in combination with brushing and structure maintenance.

Photo 24.1 - Downed Trees Across a Trail

Due to variations in weather, geology, vegetation, and visitor use, managers should determine the frequency for clearing on a park by park basis. In most locations, clearing is necessary annually to open and prepare trails for the peak season. On trails with heavy use and in areas with severe environmental conditions, dense forest, or weathered and highly sheared rock formations, more frequent maintenance is necessary to protect resources, reduce visitor safety issues, and maintain public access. The schedule for clearing is also affected by operational protocols to protect rare and endangered wildlife. For example, in an old growth redwood forest, power tools are prohibited during certain months of the year to protect marbled murrelets and spotted owls during their breeding season. To comply with these protocols, focused maintenance is performed in January to reduce the number of large trees that must be removed with labor intensive cross cut saws in the spring. (See Photo 24.2.)

Photo 24.2 - Downed Tree Removal with Crosscut Saw

Clearing requirements are determined by trail classification and design standards. (See Chapter 2, *Trail System Development and Management.*) In addition, resource management protocols can establish clearing limits for certain species of trees. When the trail is located on a hillside, it is cleared from 2 feet beyond the top of the cut bank to 2 feet below the outboard hinge. When the trail is on flat ground, it is cleared 2 feet beyond the prescribed trail bench width. (See Figure 24.1.)

When bucking a downed tree out of the travelway, every effort should be made to remove the cut out section of tree in one piece and place it perpendicular to the trail and parallel to the tree from which it was removed to avoid unsightly log rounds and chunks of wood next to the trail.

When clearing a trail, evaluate its condition and note any maintenance work beyond brushing and clearing that needs to be performed. This work may be accomplished in concert with the brushing and clearing or included in the trail's annual condition assessment so it can be corrected before it becomes a visitor safety or resource protection issue.

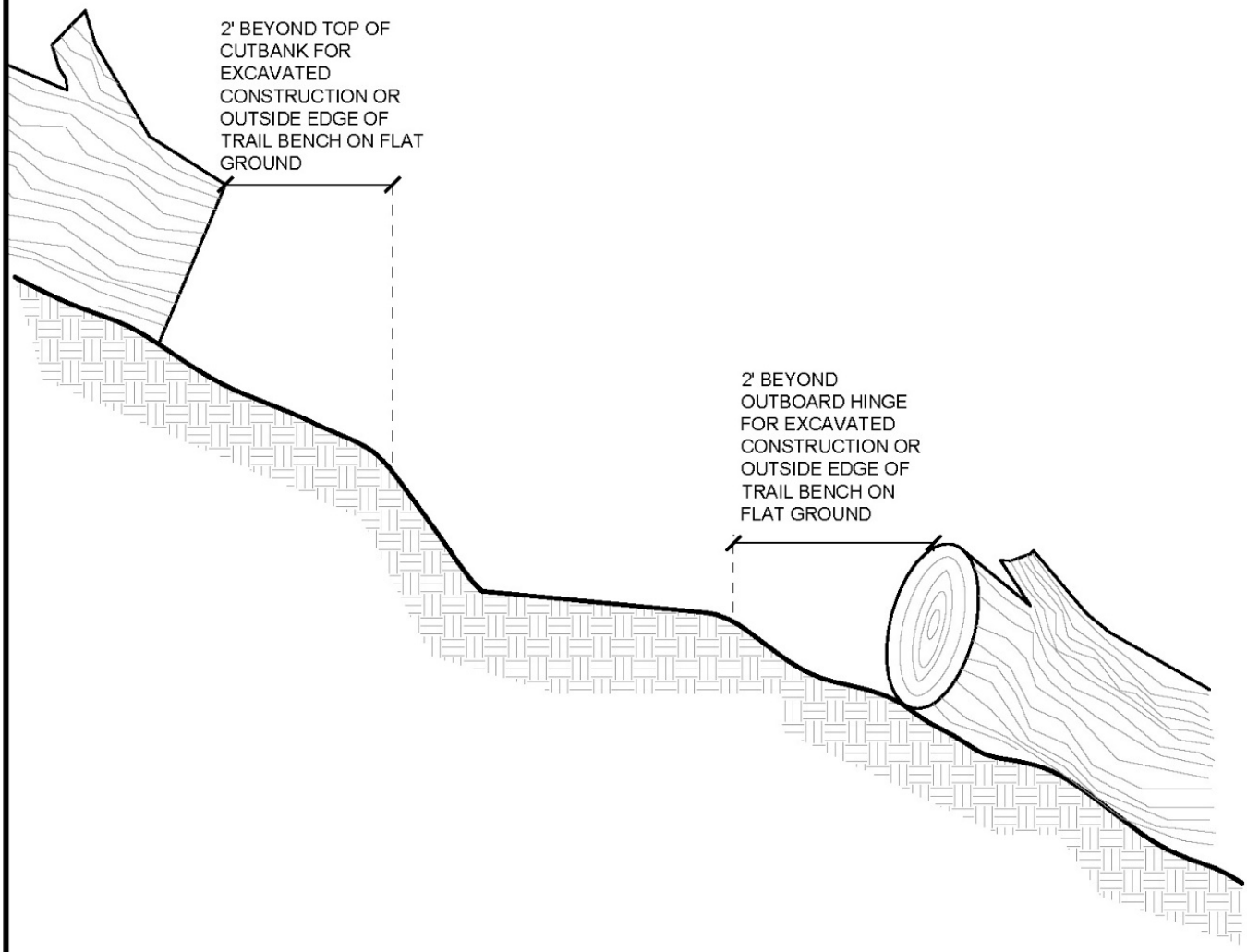

Figure 24.1 - Logging out Maintenance Clearing Limits

LOGGING OUT MAINTENANCE CLEARING LIMITS

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NOT TO SCALE

24.2. Bucking Downed Trees

24.2.1. Evaluating Downed Trees

Before removing a downed tree, determine which direction the cut out section will roll once it is bucked. Based on where the cut out section will roll, finish the cut so that the sawyer and crew are out of harm's way. The sawyer determines if the tree is under stress ("bind") based on its position on the slope or contact with other trees or natural features. Bind occurs when the wood on one side of the tree is compressed. When one side is compressed, the wood on the opposite side of the tree is stretched or pulled apart by tension. (See Figure 24.2.) These conditions are caused by the weight of the tree on those sections suspended above the ground or by lateral compression created when a tree is wedged between other trees or objects. When a tree lies flat and is fully supported by the ground and not wedged against or between other trees, it probably does not have any bind. (See Figure 24.2.) When the ground supports the tree at both ends and the center is suspended, it likely has top bind from compression of the wood cells on the top side of the downed tree. (See Figure 24.2.)

When a tree is supported by the ground on one end and suspended at the other, it likely has bottom bind because the wood cells on the bottom side of the downed tree are compressed. (See Figure 24.3.) However, large limbs that contact the ground can support the tree in a manner that can neutralize this effect and even reverse the bind. Study all tree limbs before making any saw cuts to determine if they are affecting the bind.

If the tree is wedged between three trees with two trees applying force on one side of the downed tree and the third tree (in between the first two trees) applying force on the other side of the downed tree, the downed tree will be bent horizontally. This bend creates a bind on the inside of the bend. (See Figure 24.3.) For a downed tree lying on a steep slope, compression can develop along the axis of the trunk. When bucking this tree, the weight of the tree above the cut pushes against the section of tree below the cut. (See Figure 24.4.)

Some or all of these types of binds and tensions are encountered when bucking downed trees. In addition, other unseen conditions such as a twist in the wood grain, wind check, or a pitch pocket can also cause the saw to bind. If the binds and tensions are not identified and the proper techniques not used, the sawyer could potentially encounter hazards while bucking the tree. Hazards could include getting the saw stuck when the compressed wood closes around the bar or being struck by a portion of the tree when the tension is released.

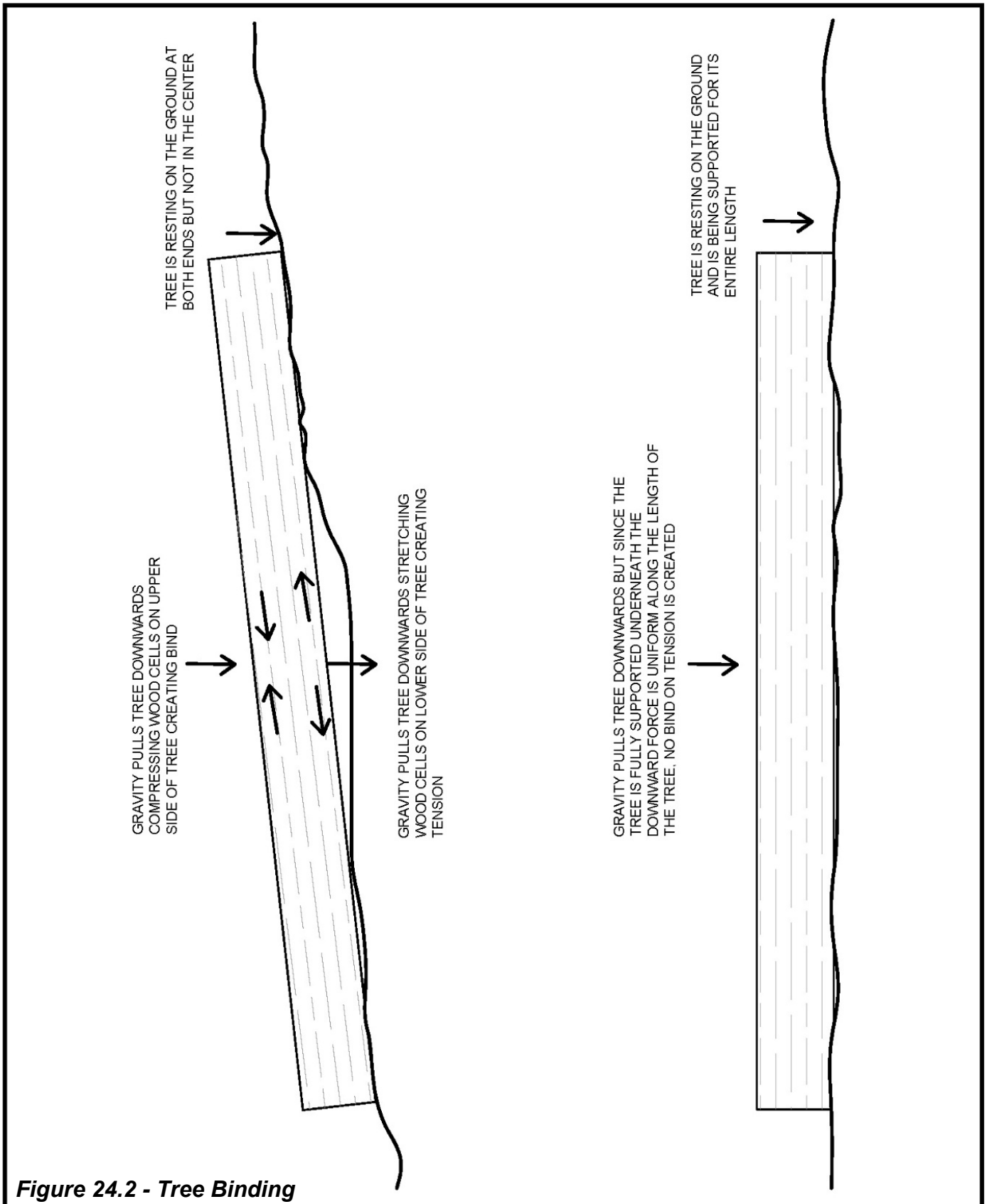

Figure 24.2 - Tree Binding

TREE BINDING

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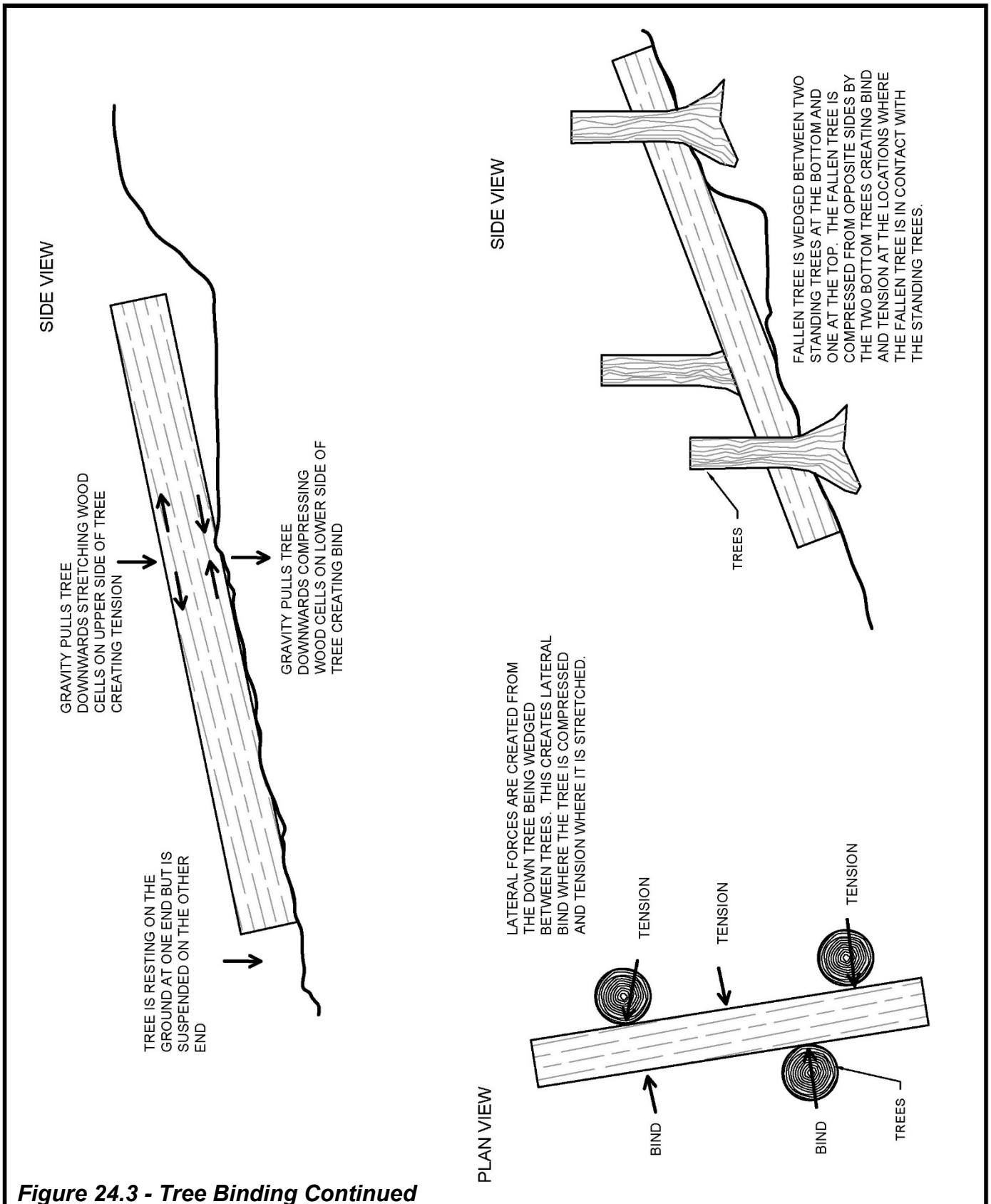

Figure 24.3 - Tree Binding Continued

TREE BINDING CONTINUED

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NOT TO SCALE

WHEN A DOWN TREE IS LYING ON A STEEP HILLSLOPE, GRAVITATIONAL FORCES WILL COMPRESS THE WOOD CELLS. THIS RESULTS IN THE SAW KERF CLOSING UP AS THE TREE IS BEING BUCKED. WEDGES ARE INSERTED INTO THE KERF TO KEEP THE KERF FROM CLOSING AND PINCHING THE BAR

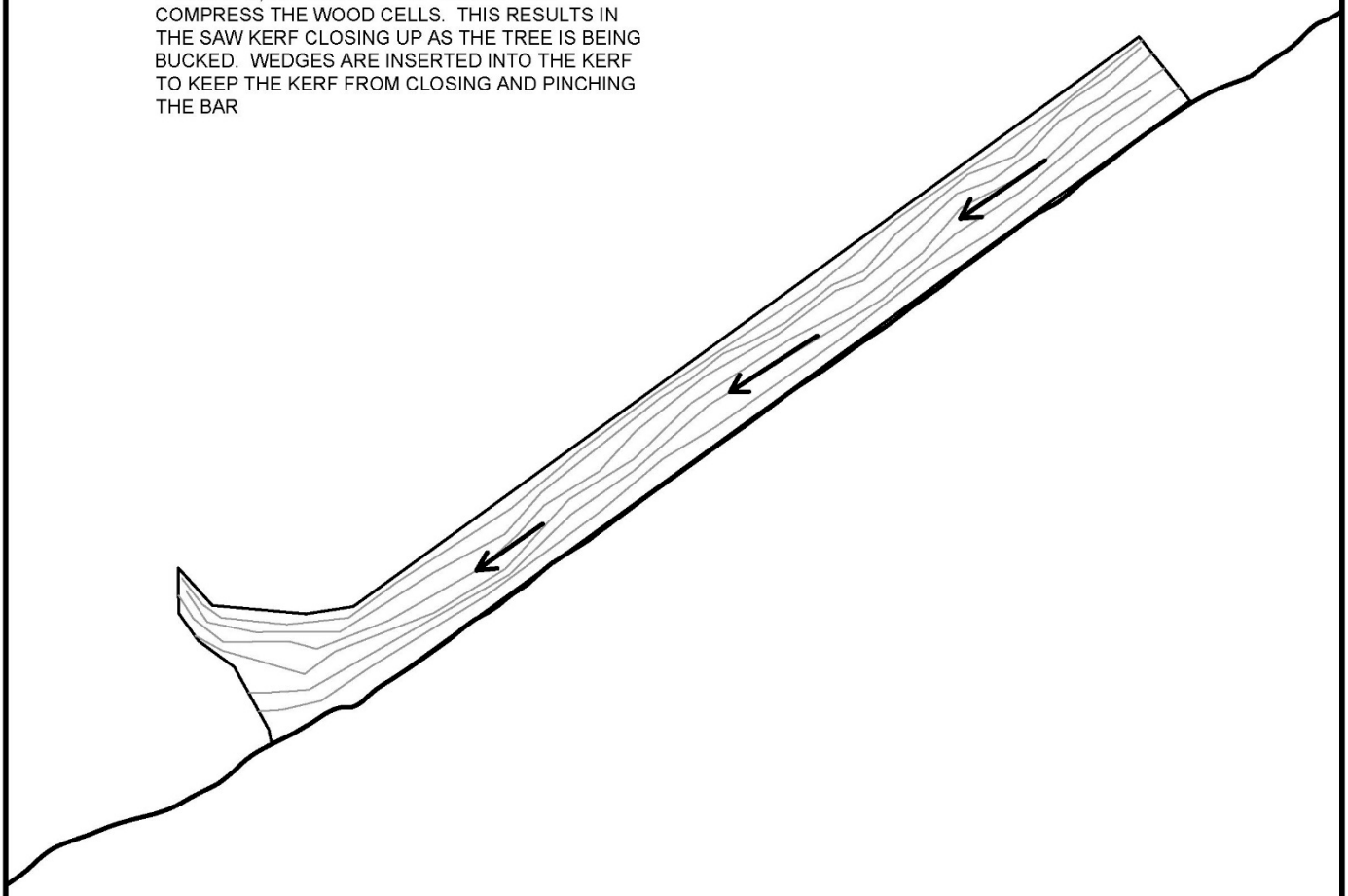

Figure 24.4 - Tree Compression Steep Slope

TREE COMPRESSION STEEP SLOPE

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NOT TO SCALE

When a downed tree is lying across the trail on flat ground without any bind, it is simple to buck and remove it. First, identify the downhill side of the tree where the bucked section will roll easiest. Next, remove any rocks, impact berm, or vegetation that might inhibit the tree from rolling in the desired direction once it is bucked. On steep slopes it may be necessary to secure the tree with rigging prior to bucking to keep it from rolling downhill uncontrollably when it is released. A temporary trail closure or use of a "spotter" who can watch for trail users may be required to ensure public safety. Also, be sure there are a couple of inches of clear space under the tree where the cuts are performed. Avoid dulling the chain through contact with the ground by watching the color of the wood chips as you near the bottom of the tree. Darker bark chips indicate the edge of the tree.

Using a Pulaski, remove any soil or rocks embedded in the tree bark where the saw cuts will be made. Soil and rocks are often splashed on the tree when it hits the ground. If they are not removed and the saw makes contact with them, it will become dull in an instant. For downed trees with thick bark, the bark should be cut away with an ax where the saw cuts will be made. Removing the bark will eliminate the possibility of cutting soil and rocks embedded in it and reduce the diameter of the tree, providing a better surface for the "dogs" (a plate with toothed spikes mounted on the power head) to penetrate and plastic wedges to be inserted. Filing a dull saw chain on a 6-foot bar in the field takes a long time, so measures to keep the chain sharp are worth the effort. When cutting a downed tree with a substantial amount of soil and small rocks embedded in the bark, the use of carbide saw chain is a good option. This hardened saw chain is more resistant to the dulling effects of soil and small rocks; however, it cannot be sharpened in the field. Sharpening requires a bench-mounted electric chain sharpener and a diamond wheel. The saw chain also can be taken to a chainsaw repair vendor for sharpening.

If the section of tree to be removed can be rolled out of the cut with the use of a peeler or rock bar, begin the bucking cuts. If additional force will be required to help roll the bucked section (which is common with large diameter trees), rigging should be used to roll it out of the cuts. If rigging is required, a wire rope choker should be inserted under the tree before it is bucked. A choker roll set should be applied to provide additional mechanical advantage. (See Figure 24.5.)

24.2.1. Bucking Small Downed Trees

Simple bucking techniques can be used to buck small trees (i.e., less than 3 feet in diameter). If the chainsaw bar is longer than the diameter of the tree the bucking should be simple. The majority of downed trees encountered on a trail will fit into this category. Note, if it will be difficult to roll out the finished saw cuts from a tree being bucked, the cuts should be made with compound angles that leave the bucked ends of the tree wider on the "off side" (front) and at the top. The backside and bottom of the bucked section are narrower than the front side and top of the downed tree, allowing the bucked section to be rolled out toward the off side without binding. (See Figure 24.10.)

CHOKER ROLL

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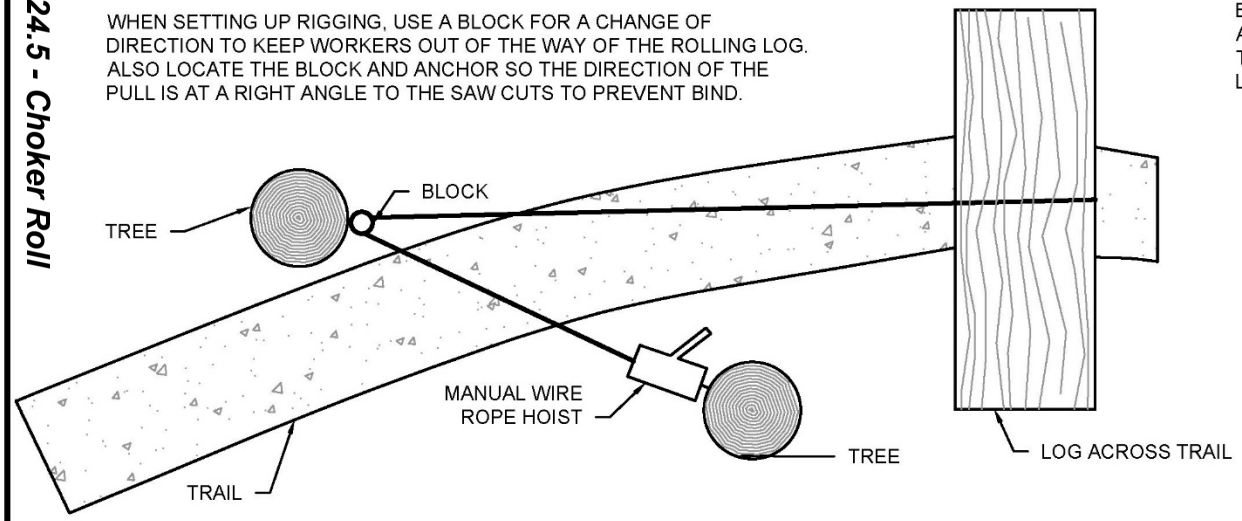
NOT TO SCALE

Figure 24.5 - Choker Roll

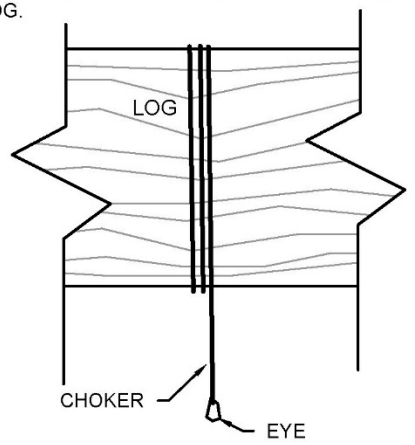
PLAN VIEW

WHEN SETTING UP RIGGING, USE A BLOCK FOR A CHANGE OF DIRECTION TO KEEP WORKERS OUT OF THE WAY OF THE ROLLING LOG. ALSO LOCATE THE BLOCK AND ANCHOR SO THE DIRECTION OF THE PULL IS AT A RIGHT ANGLE TO THE SAW CUTS TO PREVENT BIND.

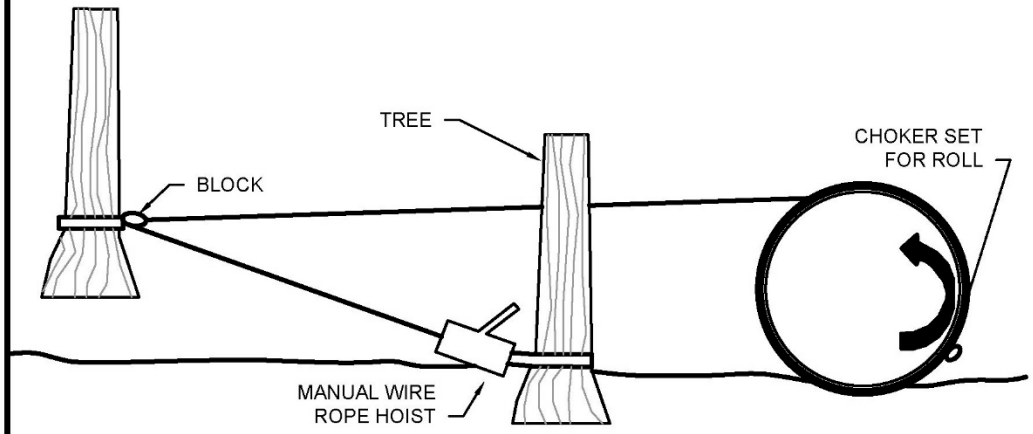


PLAN VIEW DETAIL

FOR ADDITIONAL ROLL ADD ANOTHER WRAP BY TAKING THE EYE END OF THE CHOKER AND WRAPING IT UNDER THE LOG, AROUND THE BACKSIDE AND OVER THE TOP OF THE LOG.

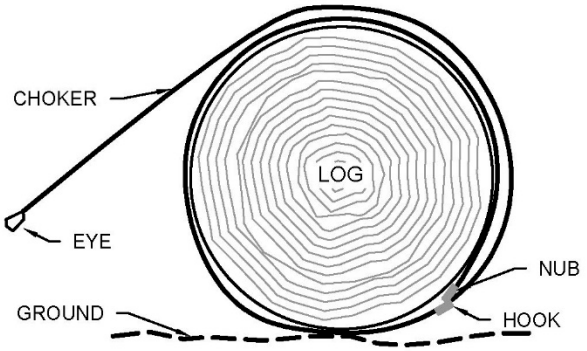


SIDE VIEW



SIDE VIEW DETAIL

TAKE THE NUB END OF THE CHOKER AND WRAP IT OVER THE TOP OF THE TREE TO BE LOGGED OUT. WRAP THE NUB END UNDER THE LOG AND ALL THE WAY AROUND THE LOG TO THE BOTTOM BACKSIDE OF THE LOG. SLIDE THE CHOKER HOOK TO THE LOCATION OF THE NUB AND SLIP THE NUB INTO THE HOOK.



24.2.1.1. Trees with No Bind

If the tree is lying fully supported on relatively flat ground with no bind, begin the bucking cut on the uphill side of the tree. Place the chainsaw on top of the downed tree with the dogs firmly imbedded into the bark or cambium. Saw downward until the depth of the cut is sufficient so that a plastic wedge can be driven into the kerf without making contact with the saw chain. The wedge ensures that the kerf will not close as the sawyer completes the cut through the tree. While cutting through the tree, periodically drive the wedge further into the kerf to keep it open. When nearing the bottom of the tree, watch the saw chips for a change in color (indicating the bark) and do not cut past the bark. It is better to leave a little bark than saw all the way through it and make contact with the ground. (See Figure 24.6.)

24.2.1.2. Trees with Top Bind

On the uphill side of a downed tree, set the dogs of the chainsaw into the tree and then cut downward toward the center of the tree until the kerf begins to close. Pull the power head of the saw back toward your body while cutting down. Pull the saw out of the kerf and perform a second cut parallel to the first but at an angle so a small wedge is cut away from the top of the tree. On the uphill side of the downed tree, set the chainsaw against the bottom of the tree directly in line with the first cut, then cut upward toward the top of the tree. The kerf will open wider as the saw nears the wedge cut. Pull the powerhead back toward your body while cutting upward to minimize the amount of chainsaw bar in the kerf. Keep feet and body away from the tree before it releases. (See Figure 24.7.)

24.2.1.3. Trees with Bottom Bind

On the uphill side of the downed tree, set the chainsaw against the bottom of the tree, then cut upward toward the top of the tree until the kerf begins to close. Pull the power head of the saw back toward your body while cutting. Pull the saw out of the kerf and perform a second cut parallel to the first but at an angle so a small wedge is removed from the bottom of the tree. On the uphill side of the downed tree, set the chainsaw on top of the tree and directly in line with the first cut, then cut downward toward the bottom of the tree. The kerf will open wider as the saw nears the wedge cut. Pull the powerhead back toward your body while cutting to minimize the amount of chainsaw bar in the kerf. Keep feet and body away from the tree before it releases. (See Figure 24.8.)

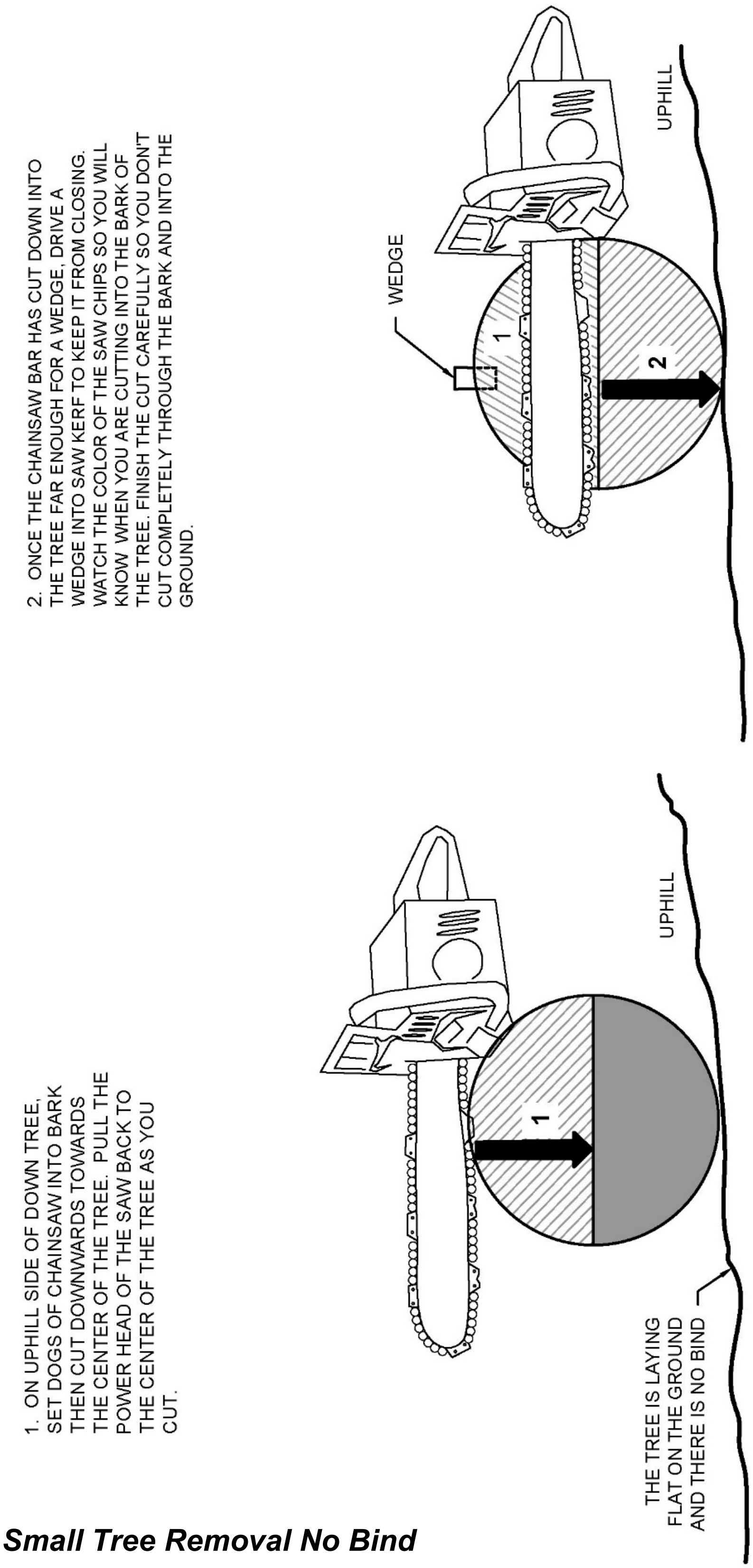


Figure 24.6 - Small Tree Removal No Bind

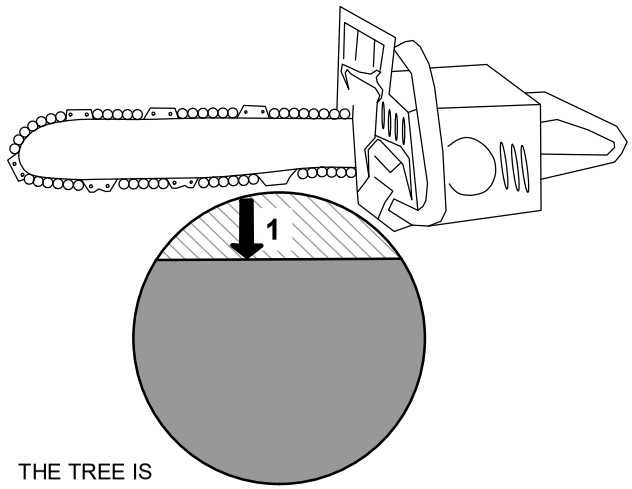
SMALL TREE REMOVAL NO BIND

CALIFORNIA STATE PARKS

NOT TO SCALE

Figure 24.7 - Small Tree Removal Top Bind

1. ON UPHILL SIDE OF DOWN TREE, SET DOGS OF CHAINSAW INTO BARK THEN CUT DOWNWARDS TOWARDS THE CENTER OF THE TREE UNTIL THE KERF BEGINS TO CLOSE. PULL THE POWER HEAD OF THE SAW BACK AS YOU CUT.



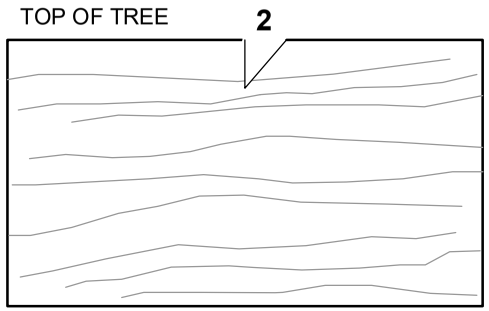
END VIEW

THE TREE IS SUSPENDED OFF THE GROUND AND HAS TOP BIND

UPHILL

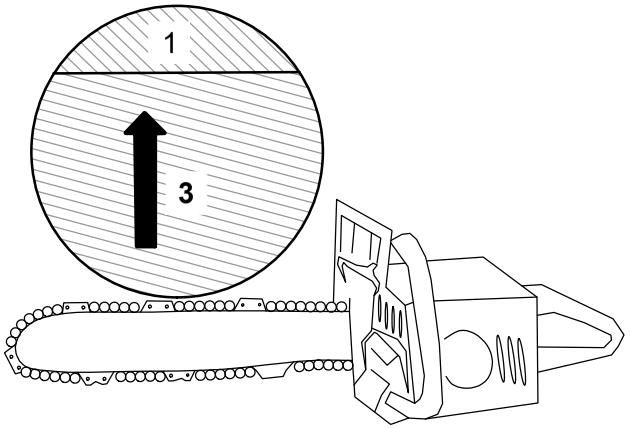
2. PULL THE SAW OUT OF THE KERF AND PERFORM A SECOND CUT PARALLEL TO THE FIRST BUT AT AN ANGLE TO THE FIRST CUT SO A SMALL WEDGE IS REMOVED FROM THE TOP OF THE TREE.

SIDE VIEW



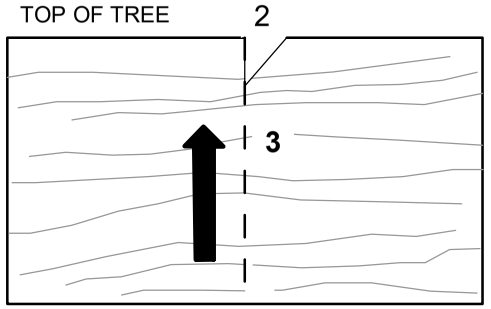
3. ON UPHILL SIDE OF DOWN TREE, SET THE CHAINSAW BELOW THE TREE DIRECTLY IN LINE WITH THE FIRST SAW CUT THEN CUT UPWARDS TOWARDS THE TOP OF THE TREE. THE KERF WILL OPEN WIDER AS THE SAW NEARS THE WEDGE CUT. PULL THE POWERHEAD BACK AS YOU CUT UPWARD TO MINIMIZE THE AMOUNT OF CHAINSAW BAR IN THE KERF. KEEP YOUR FEET AND BODY AWAY FROM THE TREE BEFORE IT RELEASES.

END VIEW



UPHILL

SIDE VIEW



SMALL TREE REMOVAL TOP BIND

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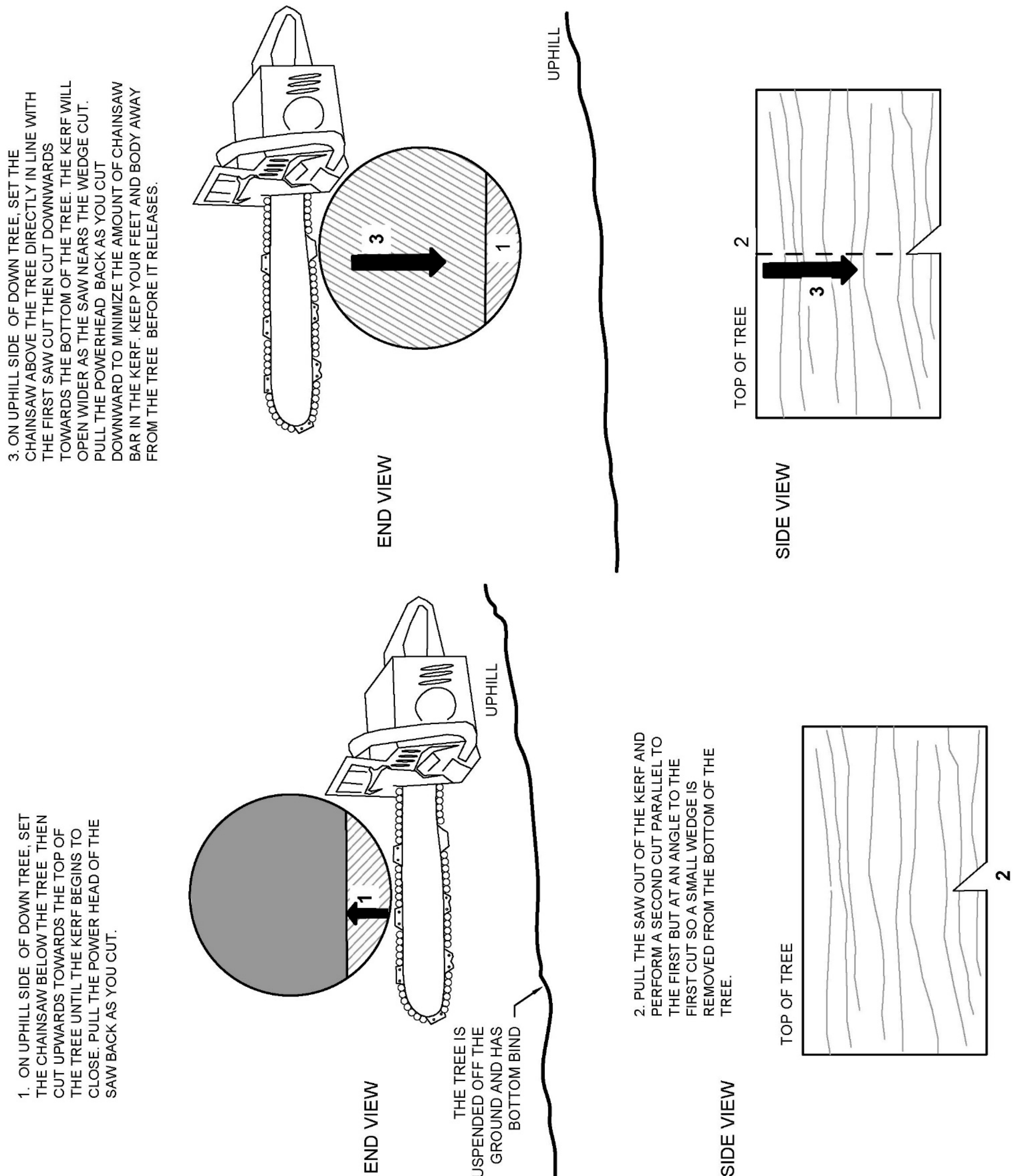

Figure 24.8 - Small Tree Removal Bottom Bind

SMALL TREE REMOVAL BOTTOM BIND

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NOT TO SCALE

24.2.2. Bucking Large Downed Trees

Removing a large tree that has fallen across the trail requires use of specialized bucking techniques and rigging to safely and efficiently move the cut out section of tree off the trail. A large tree is one that is 3 feet or greater in diameter. It is very common to remove redwood, Douglas fir, and even Sitka spruce trees between 3 and 12 feet in diameter in many state parks on the Northern and Central California coast. Removing a tree of this size without following the proper procedures and techniques is dangerous and inefficient. Only skilled workers should perform removal of large trees. (See Photo 24.3.)

The procedures for removing a large tree can also be used to remove smaller trees, and trail workers are encouraged to use these techniques to hone their bucking and rigging skills. The tree bucking techniques in this section show how to remove large trees across a trail with chainsaws too small to cut all the way through the tree. Due to the complexities that exist when a tree is under tension, sawyers must watch the behavior of the tree as they cut it. They must be prepared to adjust bucking cuts as the tree reveals its hidden stresses.

When preparing to remove a large downed tree across a trail, it should be carefully evaluated first. Determine the tree's diameter and weight to ensure that you have the right equipment. For chainsaws, the bar length should be a least half the diameter of the tree, and a longer bar is preferable. It is not necessary to have a bar that is longer than the tree diameter. Most standard chainsaws are not available with a bar longer than 6 feet. Bucking a 10-foot diameter tree is difficult, inefficient, and unsafe when proper bucking techniques are not followed (e.g., a sawyer cutting from the wrong side of the tree; finishing the cut on top of the tree; performing an undercut with a chainsaw weighing more than 40 pounds; or cutting the tree out in small chunks because they don't know how to remove it with two cuts.) Using the techniques described below allows the sawyer to carry a much smaller saw, which reduces fatigue and increases control of the saw. Other necessary tools include a peeler or rock bar, felling ax, Pulaski, plastic wedges, and assorted rigging equipment, such as a manual wire rope hoist, nylon straps, chokers, wire rope slings, blocks, and shackles.

The first saw cut is on the downhill side of the tree, known as the "off side." To ensure that the bucked section of the tree will roll freely and not get bound against the cut ends, a compound angle cut is made. Standing on top of the tree on the off side, the sawyer places the chainsaw so the power head is slightly flared out from the tip of the bar. This flare makes the off side of the cut wider than the back (uphill) side of the tree. At the same time, the bar is slightly tilted inward at the bottom to make the top of the cut wider than the bottom. When finished, the compound angle cut leaves the bucked ends of the tree wider in the off side (front) and at the top. (See Figure 24.9.) The backside and the bottom of the bucked tree are narrower, and when the bucked tree is rolled out of the cuts toward the off side, the opening between the two cut ends is wider to allow the bucked tree to be removed without binding on the cut ends.

Photo 24.3 - Bucking a Large Diameter Tree

24.2.2.1. Trees with No Bind

On a large diameter tree, the initial cut begins on the top of the tree on the off side. This cut should be as deep as the bar can penetrate, but not more than two thirds of the diameter of the tree. Again, the sawyer should be using short bars to reduce fatigue and improve control. Once the bar has penetrated deep enough to provide room, plastic wedges are inserted at the top of the cut. Remove the bar from the first saw cut, then, from the off side standing on the ground, insert the bar into the kerf of the first cut and saw down to the bottom of the tree. Watch the saw chips for a change in color indicating you have reached the bark on the bottom of the tree and do not cut further. It is better to leave a little bark than saw all the way through and make contact with the ground. (See Figure 24.10.) Once the off side is cut all the way to the bottom of the tree, the sawyer climbs on top of the tree and inserts the bar into the completed off side saw kerf. It is important to re-occupy the previous saw kerf so that the saw cut is continuous. Using the kerf as a guide, the sawyer cuts the full depth of the bar across the top of the tree until the power head approaches the backside of the tree and there is no place to stand. Again, plastic wedges are inserted into the kerf when the bar has penetrated deep enough to provide the necessary room. (See Figure 24.11.) The sawyer stands on the ground on the backside of the tree and completes the cut by inserting the bar into the saw kerf and cutting down to the bottom of the tree. (See Figure 24.11.) This same cut is repeated on the other end of the bucked out section, and the remaining tree is rolled out with bars or rigging. If the section can be used as building material for a trail structure, it is bucked to the appropriate length then split or milled on-site. If not, it is rolled off the trail and placed parallel to the downed tree.

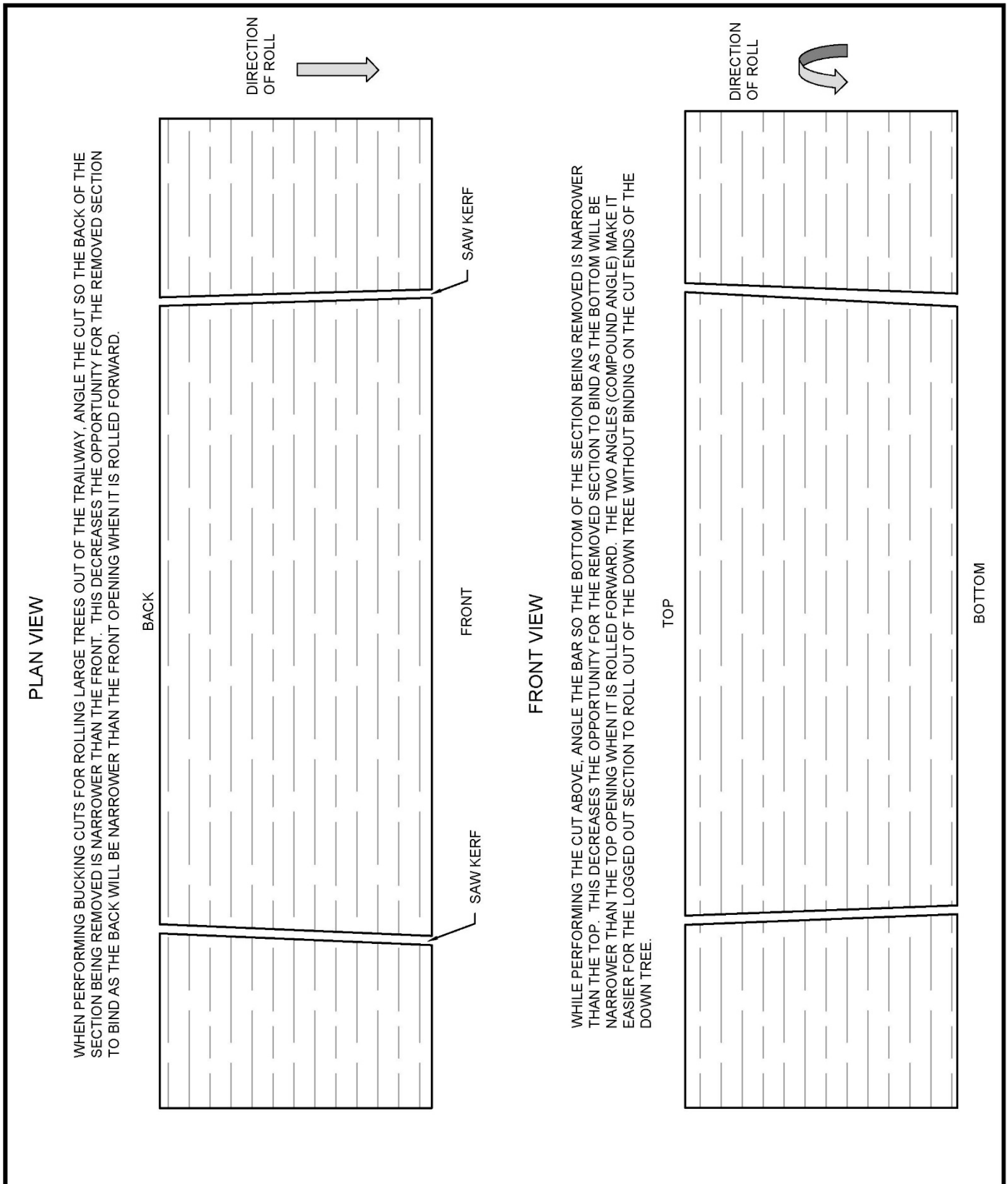

Figure 24.9 - Compound Angle Cuts

COMPOUND ANGLE CUTS

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NOT TO SCALE

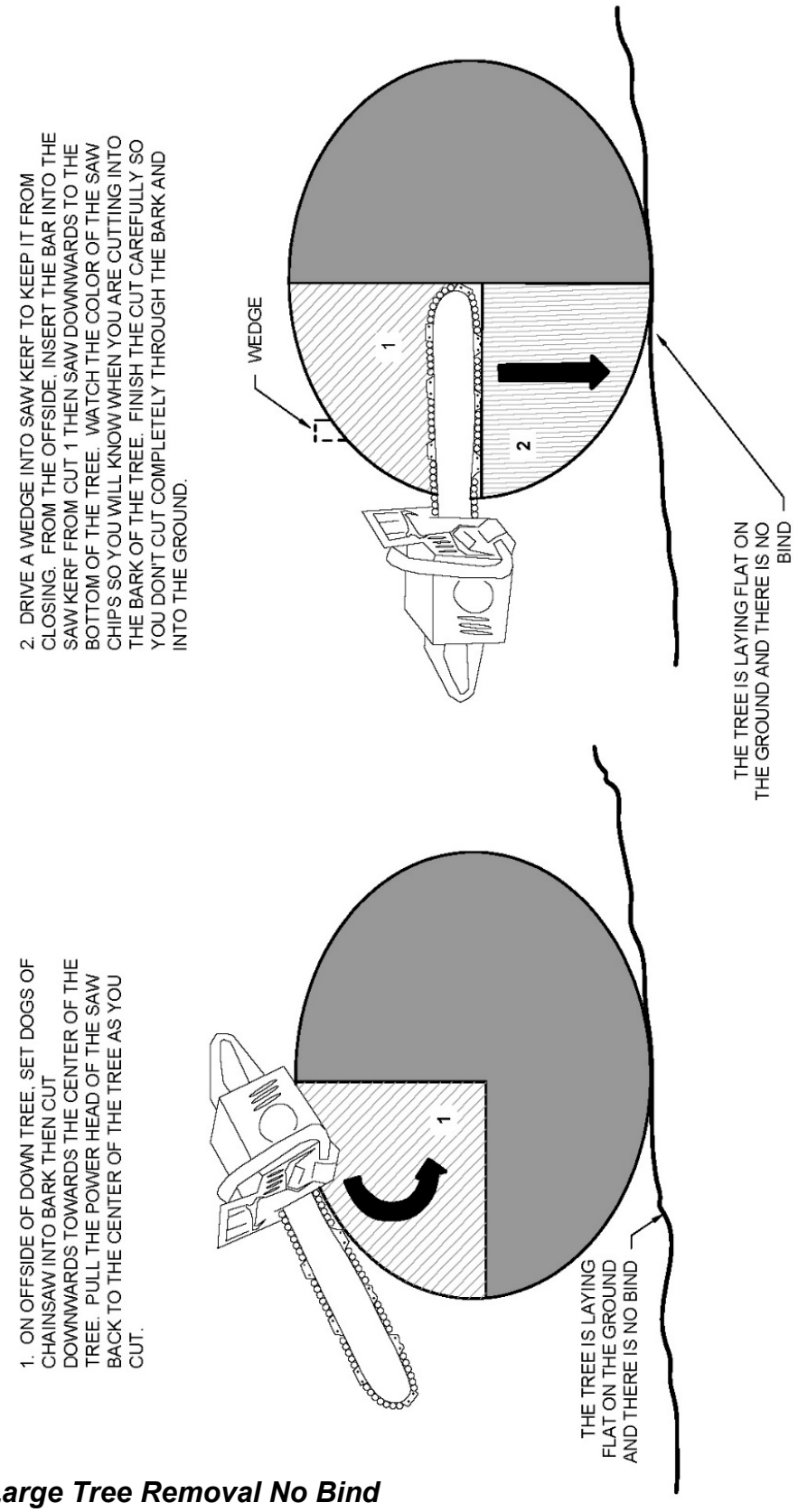

Figure 24.10 - Large Tree Removal No Bind

LARGE TREE REMOVAL NO BIND

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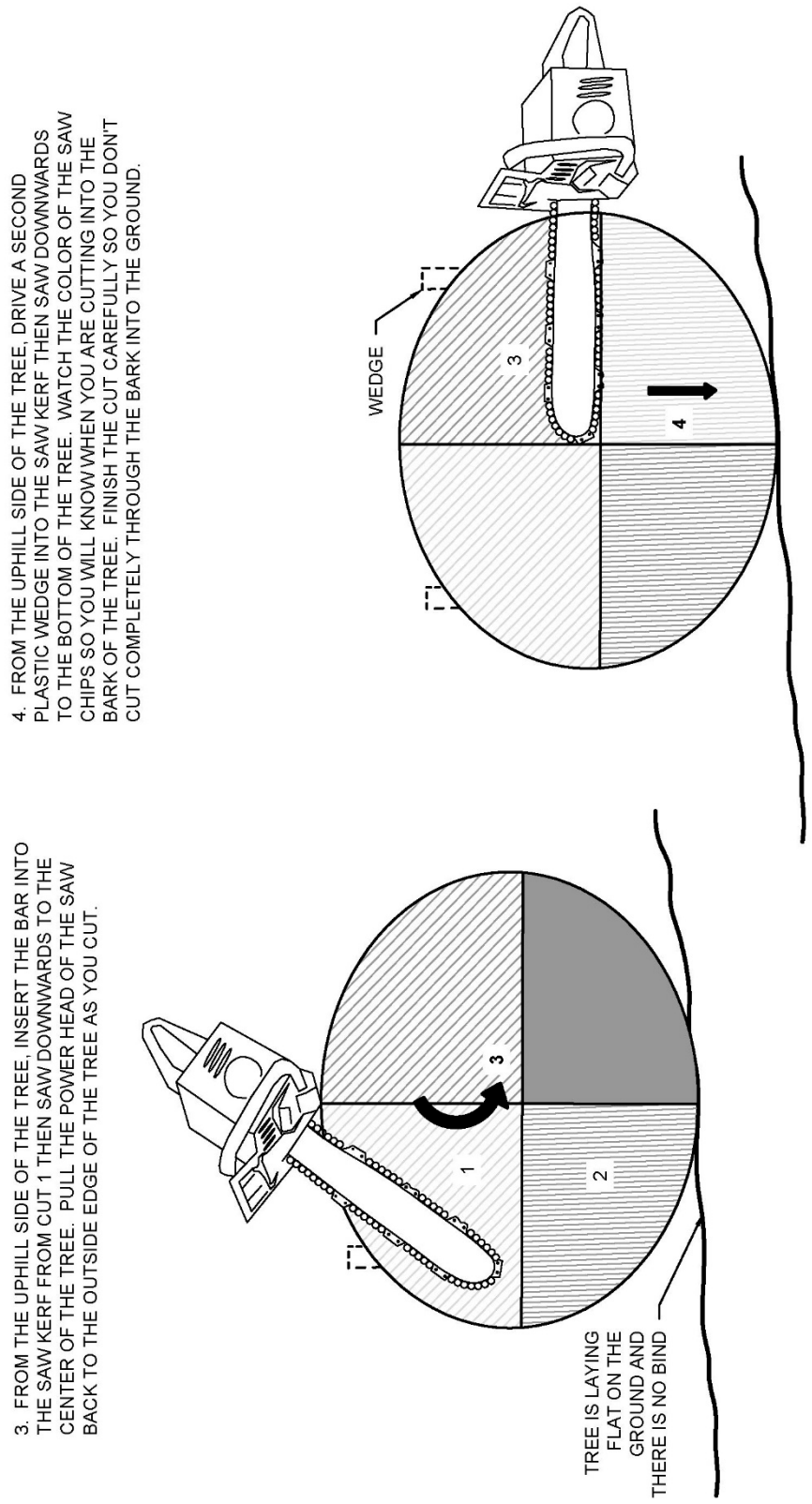


Figure 24.11 – Large Tree Removal No Bind Continued

LARGE TREE REMOVAL NO BIND CONTINUED

CALIFORNIA STATE PARKS

NOT TO SCALE

Bucking a tree when the tree is lying on a steep slope and is being compressed along the trunk's axis is performed as described above, except that additional wedges are inserted into the saw kerf to keep it from closing. In addition, it may be necessary to secure the portion of the tree above the cut with rigging to ensure that it does not slide or roll down the hillslope once released.

24.2.2.2. Trees with Top Bind

When the tree has top bind, an off side cut is repeated as described above. The wedges are set deeper into the saw kerf as the cut continues into the tree. (See Figure 24.12.) The cut across the top of the tree is performed in the same way, except it is very shallow (one-fifth or less of the tree's diameter). The depth depends on the amount of compression, and can be determined by the sawyer by observing the width of the saw kerf and watching for it to close or feeling the kerf pinch the bar as it closes. Once the top cut is complete, move to the backside of the tree and insert the bar into the saw kerf. Finish the top cut to a depth of one-fifth or less of the tree, and insert a plastic wedge or two into the kerf at the top of the tree. (See Figure 24.13.) Pull the bar out of the cut until it is only penetrating a quarter of the tree's diameter. Cut halfway down the backside of the tree. At this point, lower the power head so only the bottom portion of bar tip is making contact with wood to reduce kickback as you shove the tip of the bar forward and bore into the tree. Once the tip of the bar is bored into the wood, raise the power head of the saw to level it. Continue boring into the tree until the saw kerf is met on the off side of the tree. Cut down through the tree until the bottom is reached. (See Figure 24.14.) The bar does not become pinched, because the bottom section opens as it is cut. Next, insert the bar into the kerf below the uncut holding wood section, and cut upward until the tree is cut through or breaks and releases. The kerf will open below the bar and the wedges at the top of the tree will prevent the tree from pinching the bar from above. The bar can now be easily removed from the tree. (See Figure 24.15.)

24.2.2.3. Trees with Bottom Bind

If the tree has bottom bind, the off side cut is performed in the same manner as described above, except plastic wedges are inserted into the kerf about two-thirds of the way down the diameter of the tree or when the sawyer feels the bar being pinched. (See Figure 24.16.) Once the off side cut is complete, the sawyer moves to the top of the tree, inserts the bar into the kerf, and finishes cutting from the top to a depth of one-half the diameter of the tree. (See Figure 24.17.) Once this cut is complete, the bar is pulled from the cut until it is only into the tree a quarter of its diameter. Then, cut down through two-thirds of the backside of the tree. (See Figure 24.17.) At this point, lower the power head so only the bottom portion of the bar tip is making contact with wood, shove the tip of the bar forward, and bore into the tree. Then, raise the power head of the saw to level it. Continue boring into the tree until the kerf is met on the off side of the tree. (See Figure 24.18.) Next, cut down through the tree until the bottom is reached. The bar should not become pinched because there is still an uncut

section of holding wood keeping the tree together. Insert the bar into the kerf above the uncut section of wood and cut downward until the tree is cut through or breaks and releases. At this point, the kerf will open above the bar and the bar can easily be removed from the tree. (See Figure 24.19.)

24.2.2.4. Trees with Side Bind and No Top or Bottom Bind

If the tree has side bind and no top or bottom bind, the compressed side of the tree is cut first. The depth of the cut depends on the amount of compression as judged by the sawyer but should not exceed one-fifth of the diameter of the tree. Because of the shallow depth and ease of cutting when using dogs on the power head, this cut is performed from the top of the tree. If the bar cannot reach the bottom of the tree, the cut is finished from the ground. Once the compressed side is cut, plastic wedges are inserted into the bottom half of the kerf (lower half of the tree to keep the kerf open). (See Figure 24.20.) Standing on top of the tree, insert the tip of the bar into the compression side kerf above the plastic wedges, and cut across and down the top of the tree for approximately half the diameter of the tree. Once the bar is clear, plastic wedges are inserted into the upper half of the compression cut to keep the kerf open. Standing on the ground on the tension side of the tree, insert the bar into the kerf approximately half of the tree's diameter and cut downward through the bottom, leaving a block of holding wood in the lower corner of the compression side of the tree. (See Figure 24.21.)

Next, move to the compressed side of the tree and remove the plastic wedges in the kerf on the lower half of the tree. Insert the bar into the kerf and cut down through the remaining wood at a 45-degree angle leading with the tip of the bar. Then, cut downward and toward the compression side of the tree at the same time. Cutting from the back to the front allows the tree to open on the tension side and reduces the chance of the bar being pinched as you cut into the compression side. Plastic wedges are placed into the kerf as this cut is made to keep the kerf open. The wedges inserted along the front of the compression cut keep the kerf from closing and the bar from being pinched. They are driven deeper into the kerf as the cut is made by the person assisting the sawyer to ensure the kerf stays open. Keep your body away from the tree near the completion of the cut as it may suddenly spring open on the tension side of the tree. (See Figure 24.21.)

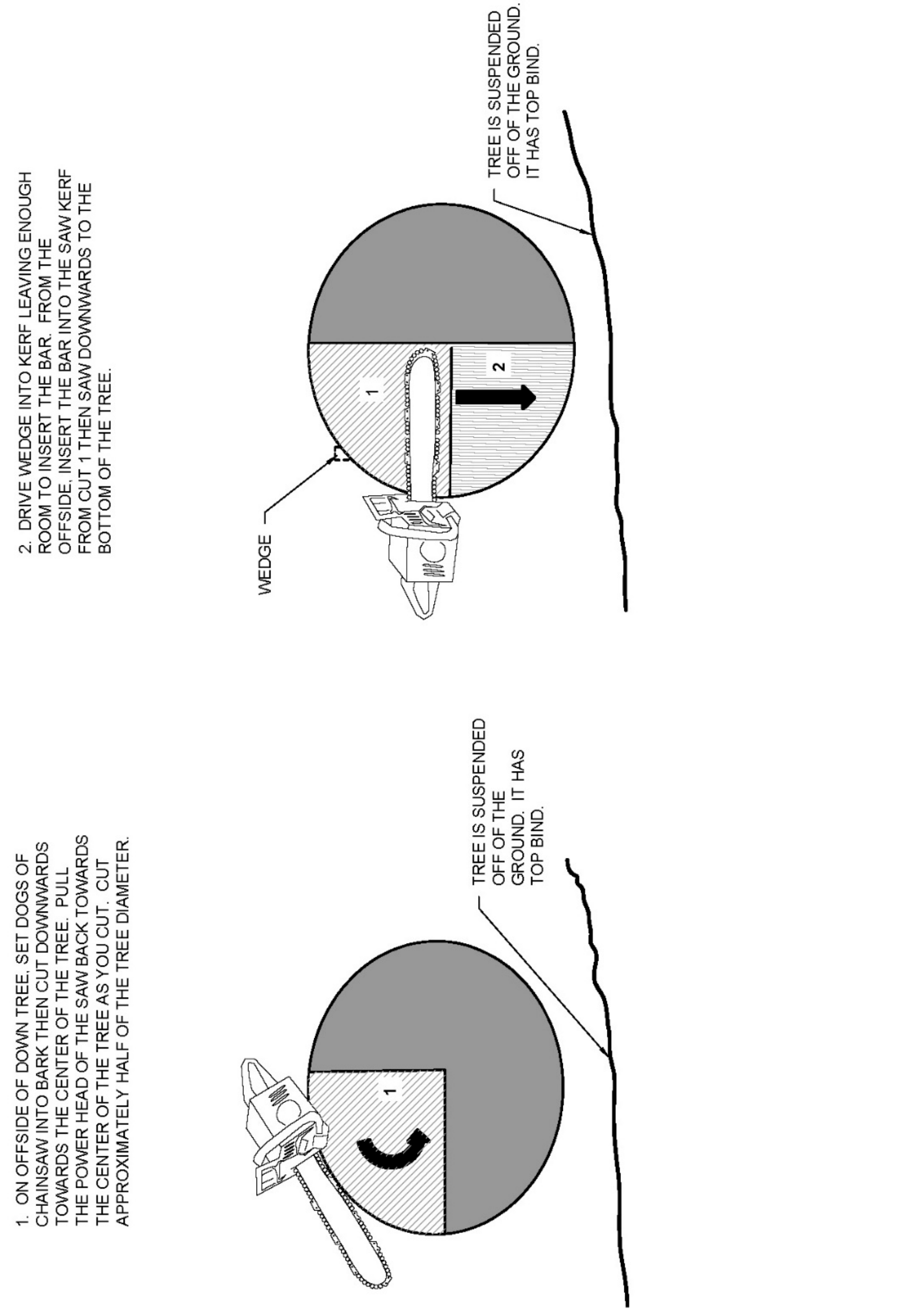


Figure 24.12 - Bore Cut Top Bind

BORE CUT TOP BIND

CALIFORNIA STATE PARKS

NOT TO SCALE

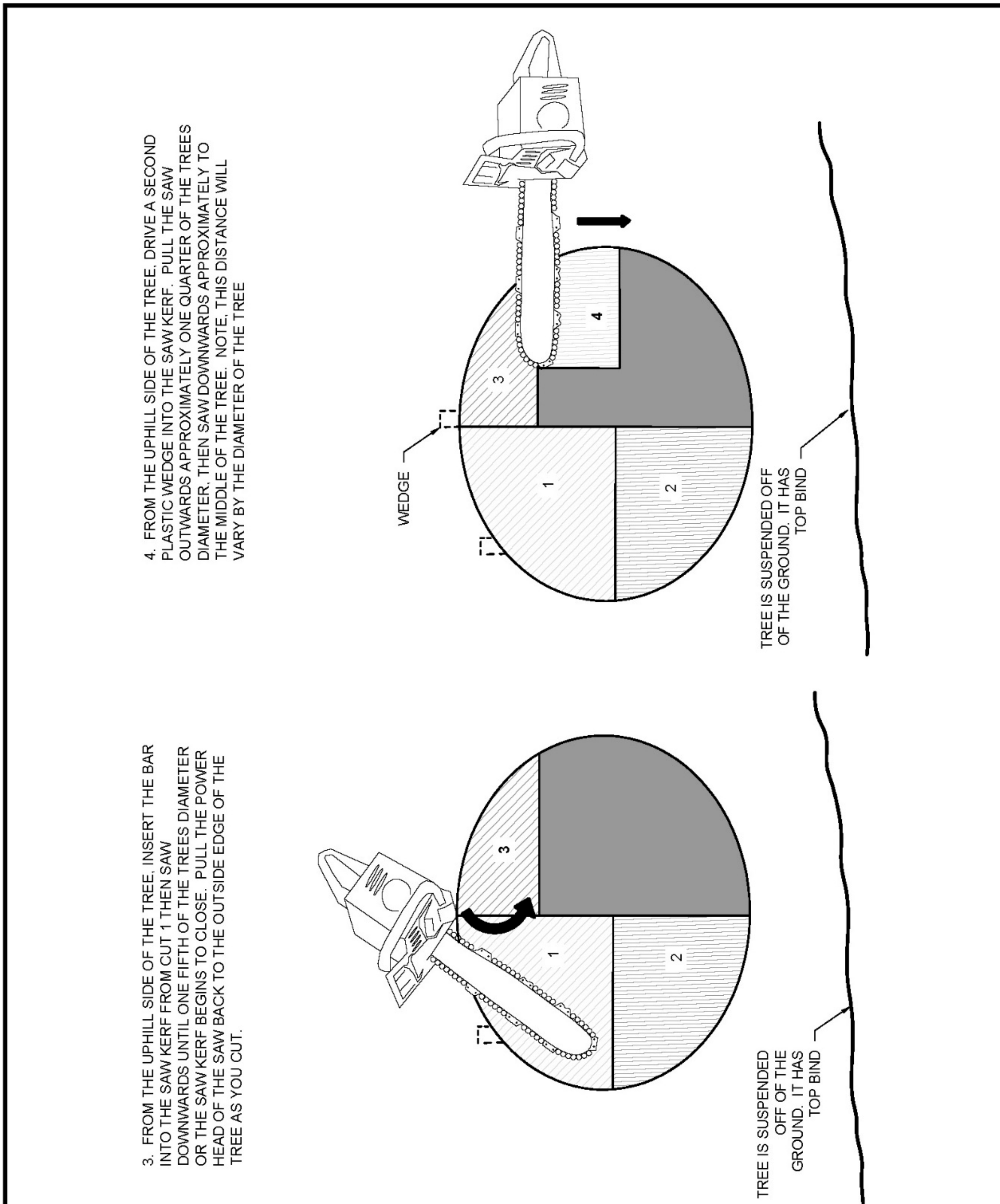


Figure 24.13 - Bore Cut Top Bind Continued 1

BORE CUT TOP BIND CONTINUED 1

CALIFORNIA STATE PARKS

NOT TO SCALE

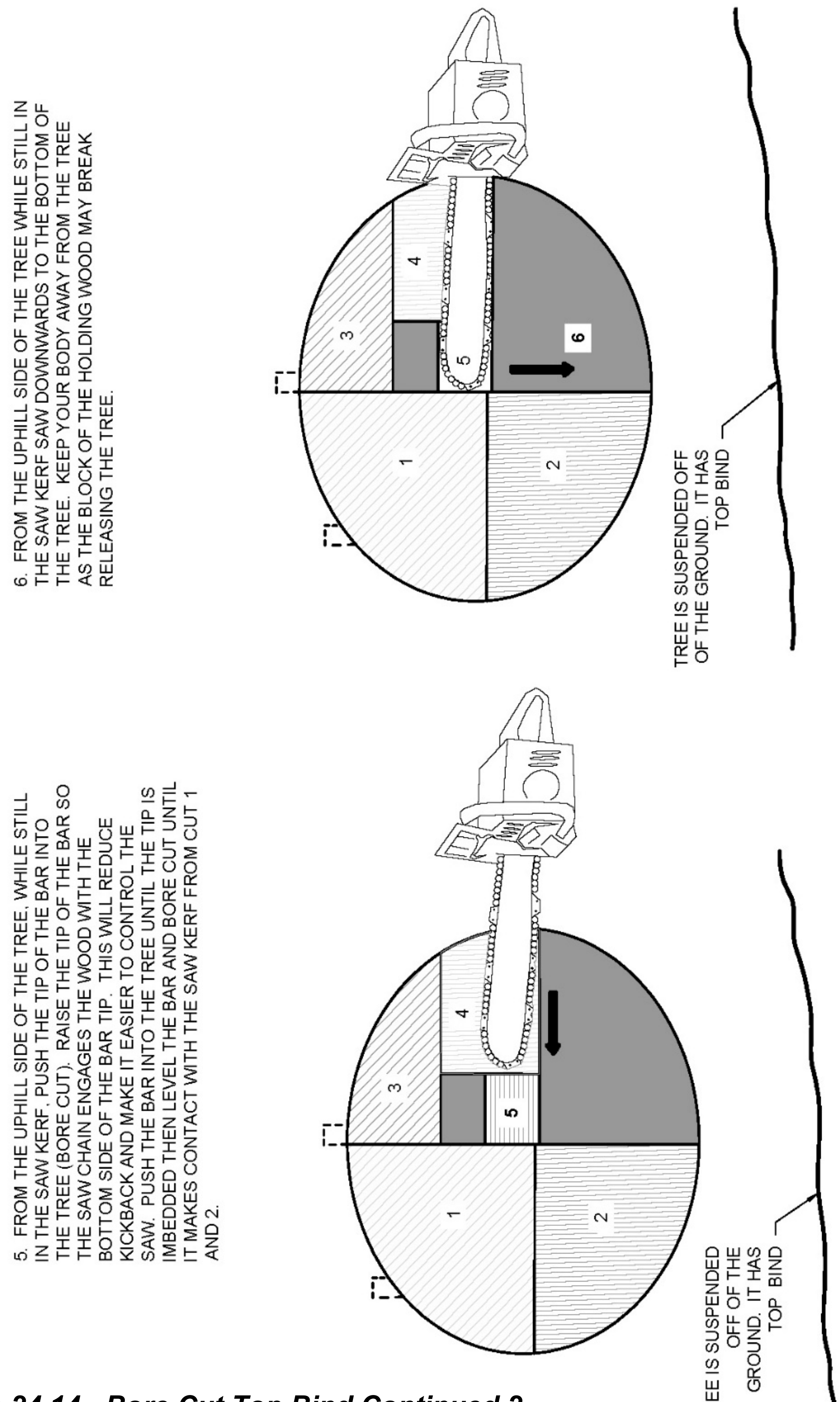
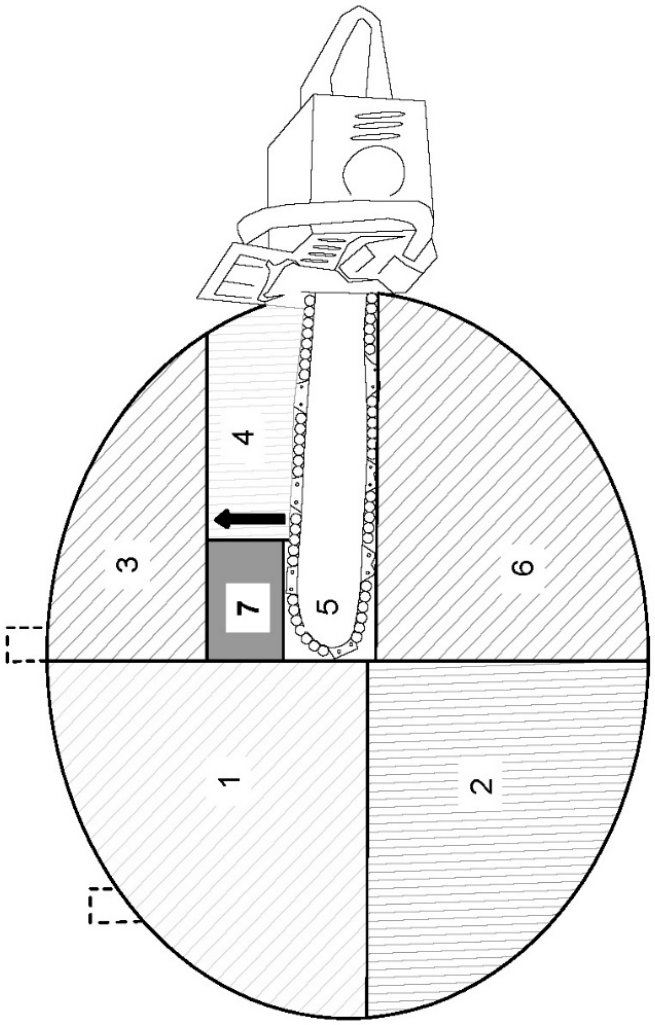


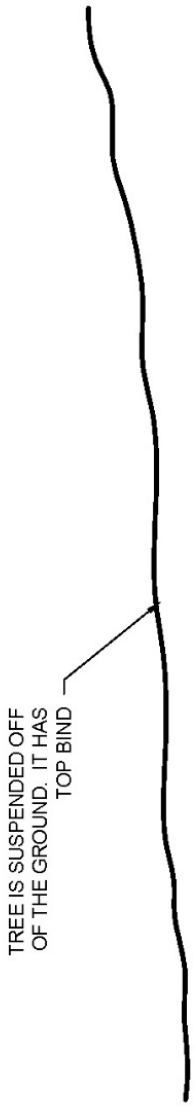
Figure 24.14 - Bore Cut Top Bind Continued 2

BORE CUT TOP BIND CONTINUED 2

CALIFORNIA STATE PARKS

NOT TO SCALE





7. IF THE TREE DID NOT RELEASE AFTER FINISHING CUT 6, KEEP THE SAW IN THE KERF AND CUT UPWARDS AGAINST THE REMAINING HOLDING WOOD. ONCE THE REMAINING HOLDING WOOD IS COMPROMISED IT WILL BREAK AND THE TREE WILL RELEASE. KEEP YOUR BODY AWAY FROM THE TREE AS THE BLOCK OF HOLDING WOOD BREAKS THE TREE WILL FALL TO THE GROUND.

Figure 24.15 - Bore Cut Top Bind Continued 3

BORE CUT TOP BIND CONTINUED 3

CALIFORNIA STATE PARKS

NOT TO SCALE

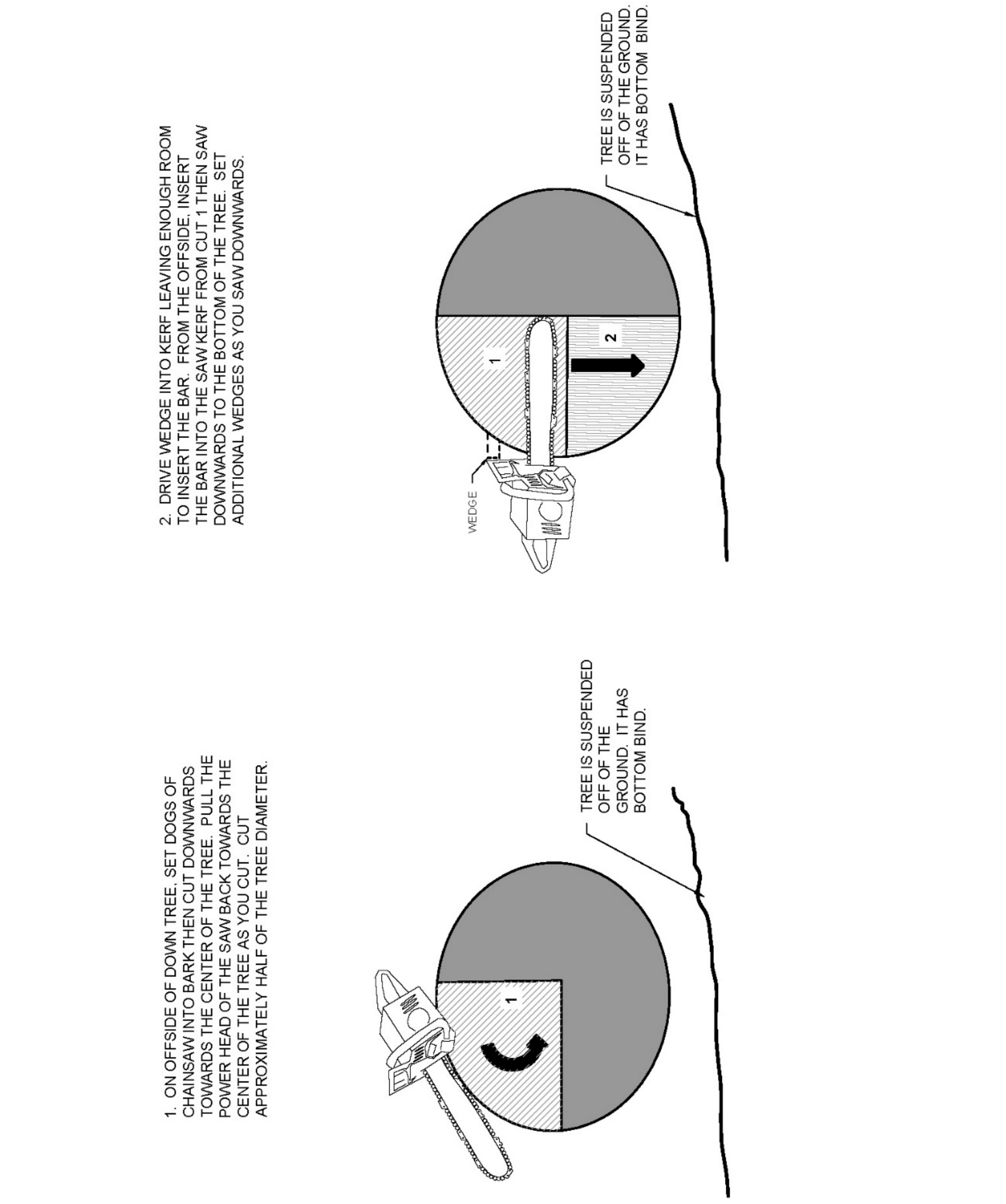


Figure 24.16 - Bore Cut Bottom Bind

BORE CUT BOTTOM BIND

CALIFORNIA STATE PARKS

NOT TO SCALE

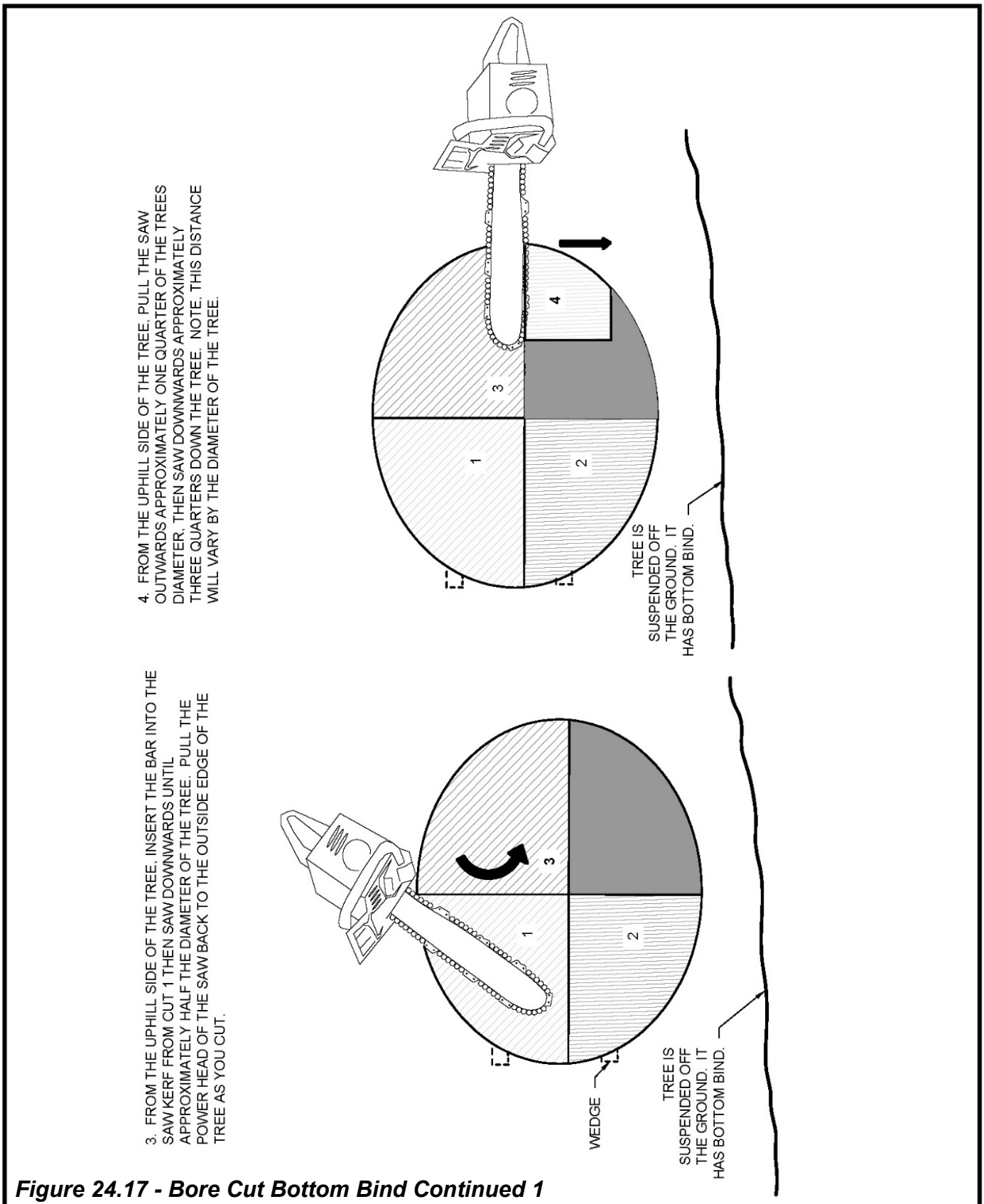


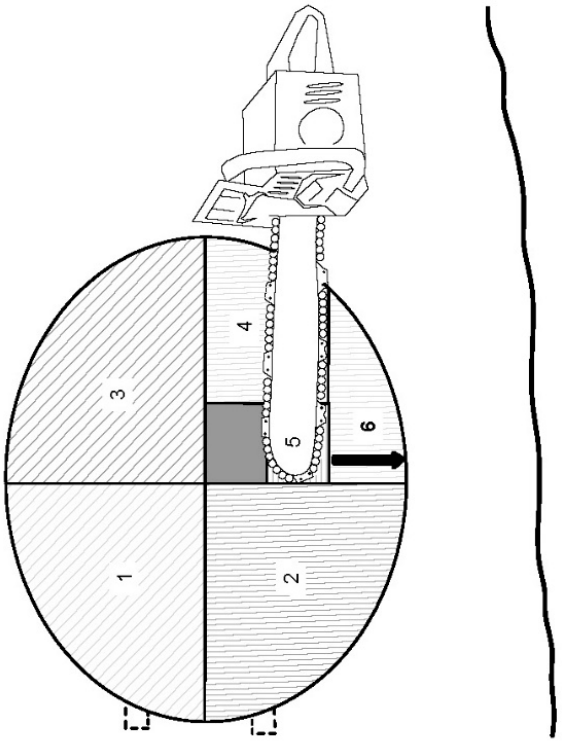
Figure 24.17 - Bore Cut Bottom Bind Continued 1

BORE CUT BOTTOM BIND CONTINUED 1

CALIFORNIA STATE PARKS

NOT TO SCALE

6. FROM THE UPHILL SIDE OF THE TREE WHILE STILL IN THE SAW KERF SAW DOWNWARDS TO THE BOTTOM OF THE TREE. KEEP YOUR BODY AWAY FROM THE TREE AS THE BLOCK OF THE HOLDING WOOD MAY BREAK RELEASING THE TREE.



5. FROM THE UPHILL SIDE OF THE TREE, WHILE STILL IN THE SAW KERF, PUSH THE TIP OF THE BAR INTO THE TREE (BORE CUT). RAISE THE TIP OF THE BAR SO THE SAW CHAIN ENGAGES THE WOOD WITH THE BOTTOM SIDE OF THE BAR TIP. THIS WILL REDUCE KICKBACK AND MAKE IT EASIER TO CONTROL THE SAW. PUSH THE BAR INTO THE TREE UNTIL THE TIP IS IMBEDDED THEN LEVEL THE BAR AND BORE CUT UNTIL IT MAKES CONTACT WITH THE SAW KERF FROM CUT 2.

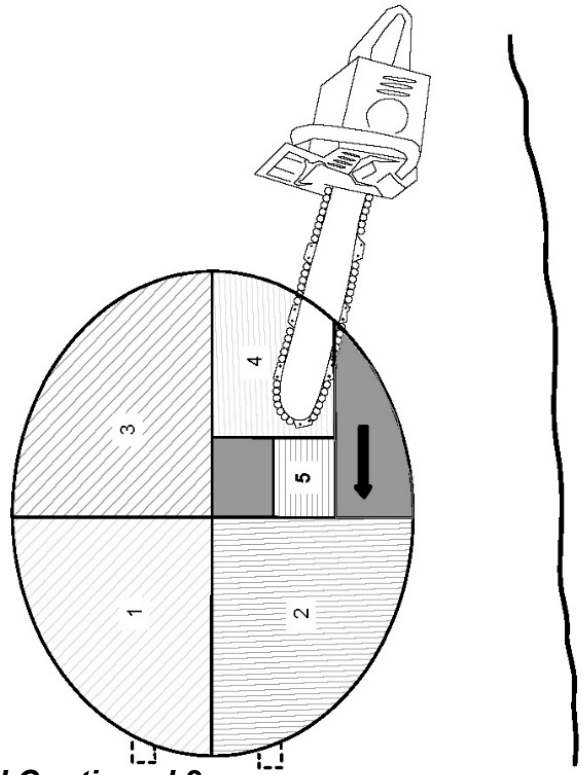
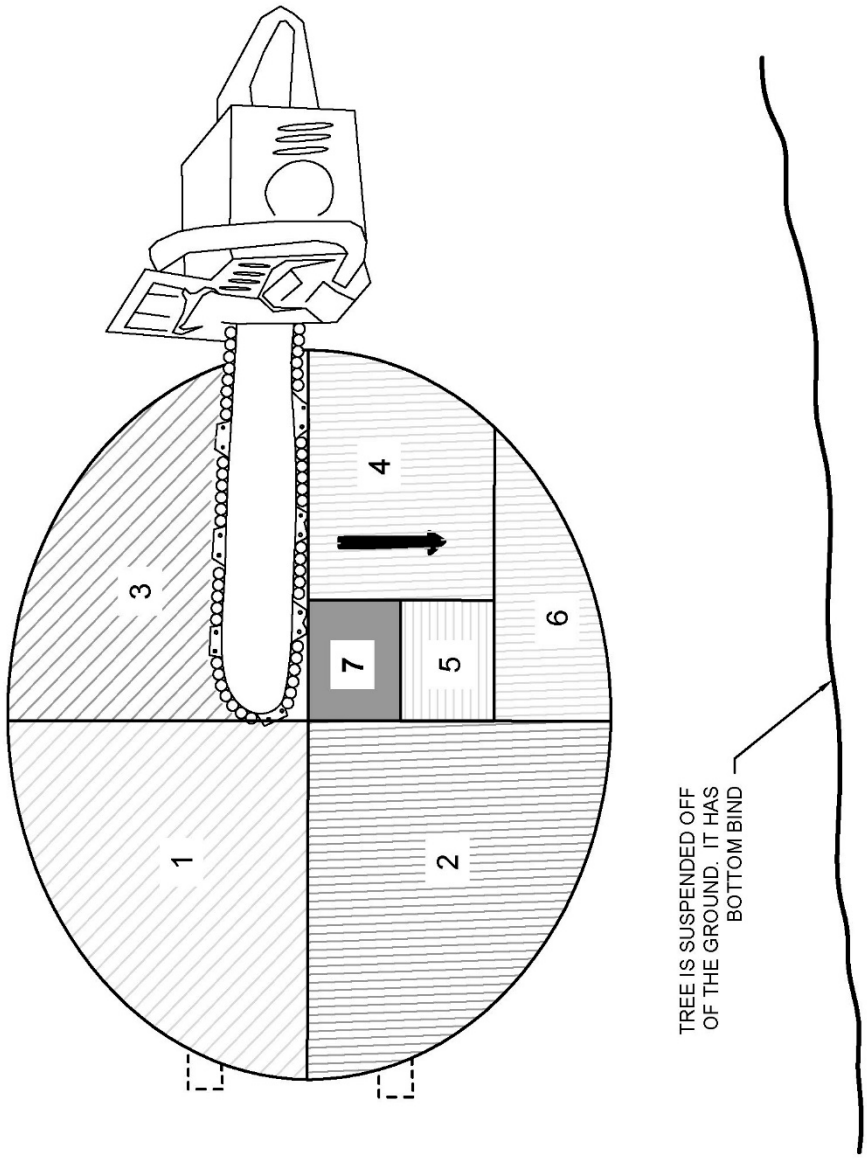


Figure 24.18 - Bore Cut Bottom Bind Continued 2

BORE CUT BOTTOM BIND CONTINUED 2

CALIFORNIA STATE PARKS

NOT TO SCALE



7. IF THE TREE DID NOT RELEASE AFTER FINISHING CUT 6, INSERT THE SAW INTO THE KERF ABOVE THE HOLDING WOOD AND CUT DOWNWARDS. ONCE THE REMAINING HOLDING WOOD IS COMPROMISED IT WILL BREAK AND THE TREE WILL RELEASE. KEEP YOUR BODY AWAY FROM THE TREE AS THE BLOCK OF HOLDING WOOD BREAKS THE TREE WILL FALL TO THE GROUND.

Figure 24.19 - Bore Cut Lower Bottom Continued 3

BORE CUT BOTTOM BIND CONTINUED 3

CALIFORNIA STATE PARKS

NOT TO SCALE

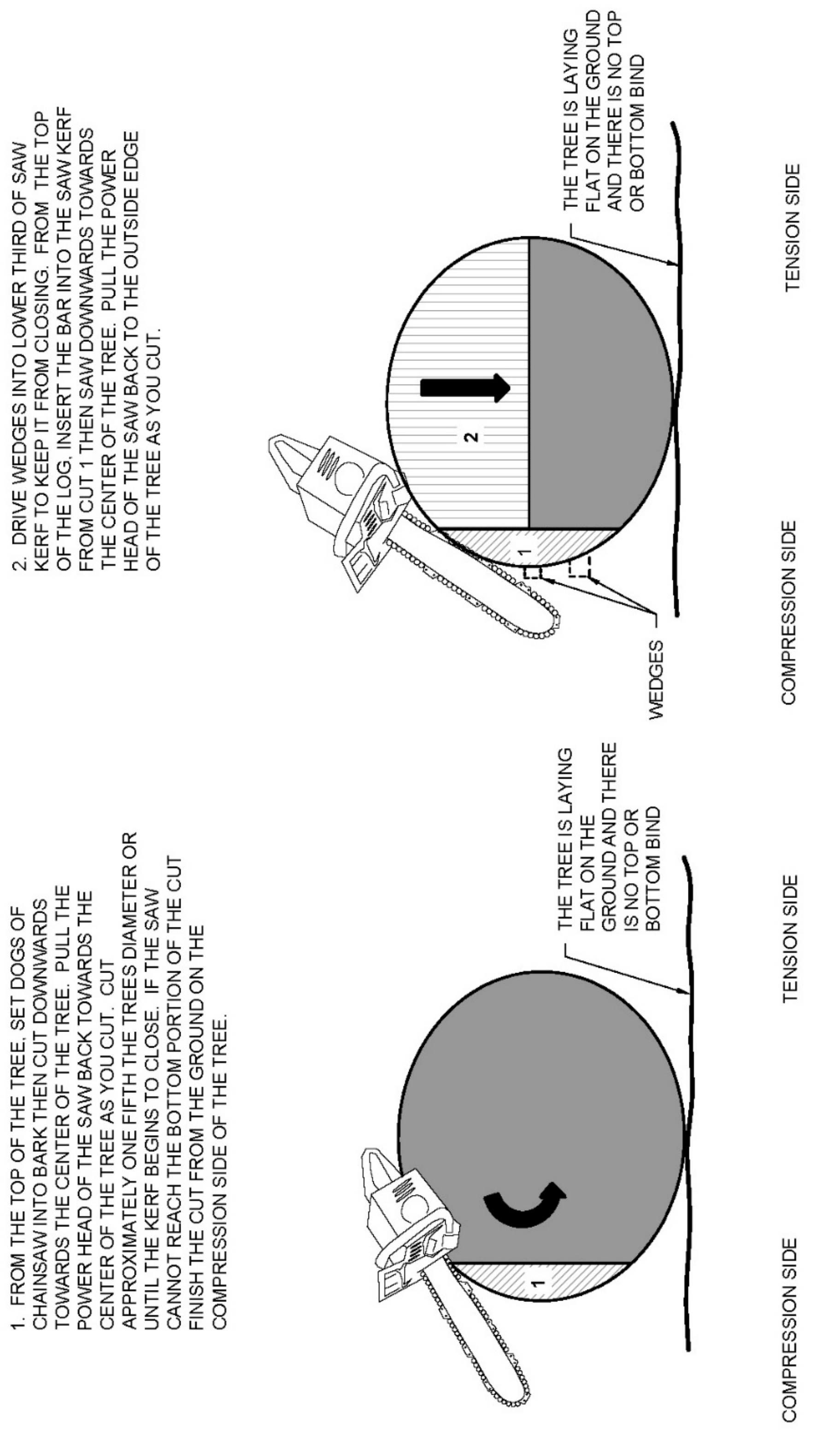


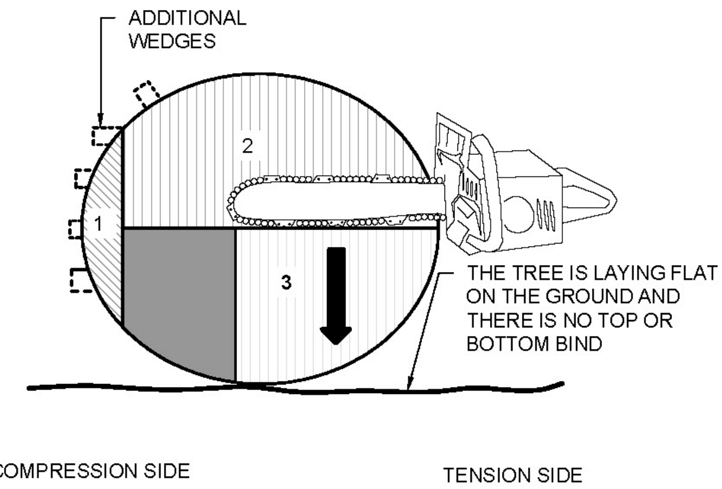
Figure 24.20 - Tree Removal Side Bind and No Top or Bottom Bind

TREE REMOVAL SIDE BIND AND NO TOP OR BOTTOM BIND

CALIFORNIA STATE PARKS

NOT TO SCALE

3. INSERT ADDITIONAL WEDGES INTO THE COMPRESSION CUT TO KEEP THE KERF OPEN. FROM THE GROUND ON THE TENSION SIDE OF THE TREE, INSERT THE BAR INTO THE SAW KERF THEN SAW DOWNWARDS TO THE BOTTOM OF THE TREE. WATCH THE COLOR OF THE SAW CHIPS SO YOU WILL KNOW WHEN YOU ARE CUTTING INTO THE BARK OF THE TREE. FINISH THE CUT CAREFULLY SO YOU DON'T CUT COMPLETELY THROUGH THE BARK AND INTO THE GROUND. NOTE, IF YOU HAVE A BAR THAT CAN REACH MORE THAN HALF WAY ACROSS THE TREES DIAMETER CUT TWO THIRDS OF THE WAY THROUGH THE TREE, LEAVING A SMALLER BLOCK OF HOLDING WOOD.



4. REMOVE WEDGES FROM THE COMPRESSION CUT TO ALLOW BAR TO BE INSERTED INTO THE KERF. INSERT A WEDGE ON THE LOWER THIRD OF THE TENSION SIDE. FROM THE GROUND ON THE COMPRESSION SIDE OF THE TREE, INSERT THE BAR INTO THE SAW KERF THEN SAW DOWNWARDS AT A 45 DEGREE ANGLE TO THE BOTTOM OF THE TREE LEADING WITH THE TIP OF THE BAR AND SAWING BACK TOWARDS THE COMPRESSION SIDE. DRIVE ADDTIONAL WEDGES INTO THE SAW KERF AS YOU CUT DOWNWARDS TO KEEP THE KERF OPEN. REMOVE ANY WEDGES INTERFERING WITH SAW CUT. WATCH THE COLOR OF THE SAW CHIPS SO YOU WILL KNOW WHEN YOU ARE CUTTING INTO THE BARK OF THE TREE. FINISH THE CUT CAREFULLY SO YOU DON'T CUT COMPLETELY THROUGH THE BARK AND INTO THE GROUND. KEEP BODY AWAY FROM TREE NEAR END OF CUT AS THE TREE MAY SUDDENLY SPRING OPEN ON THE TENSION SIDE OF THE TREE.

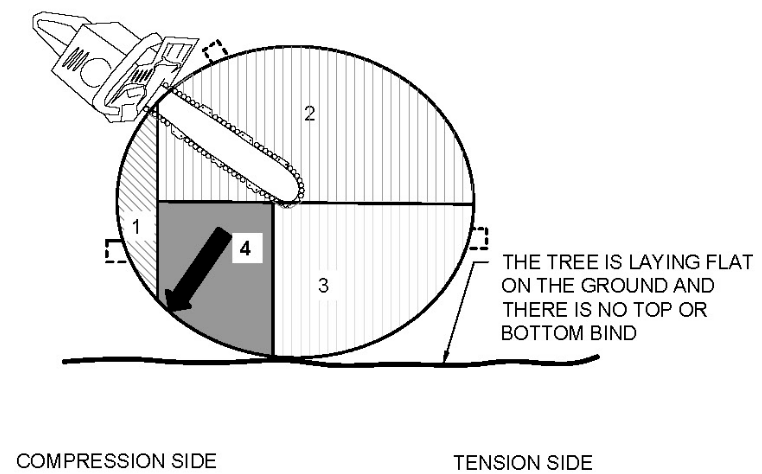


Figure 24.21 - Tree Removal Side Bind and No Top or Bottom Bind Continued

TREE REMOVAL SIDE BIND AND NO TOP OR BOTTOM BIND CONTINUED

CALIFORNIA STATE PARKS

NOT TO SCALE

24.3. Brushing

Maintenance “brushing” is the removal of vegetation from the travelway that interferes with use of the trail or is otherwise out of compliance with brushing standards.

The frequency of brushing is dependent on a number of variables. In dense redwood forest, trails are brushed at least once a year because vegetative growth will readily obscure the trail. Whereas in the Sierra Nevada Mountains, it may be necessary to brush a trail only every two to three years, since vegetation grows more slowly there. Brushing frequency is even less in arid, desert climates. (See Photo 24.4.)

Like clearing, maintenance brushing limits are based on the classification and design standards of the trail. (See Chapter 2, *Trail System Development and Management.*) Maintenance brushing limits are narrower than clearing limits because only the vegetative growth blocking user passage is removed. Maintenance brushing limits extend 1.5 feet beyond the inboard and outboard hinges or 1.5 feet beyond the trail edges on flat ground. (See Figure 24.22.) The trail should maintain a natural appearance and not be brushed beyond these limits. **The exception to these brushing limits is brushing that occurs during trio maintenance in which the trail is brushed back to its original construction standards. (See Chapter 25, *Trail Tread Maintenance.*)**

Photo 24.4 - Trail in Need of Cyclical Brushing

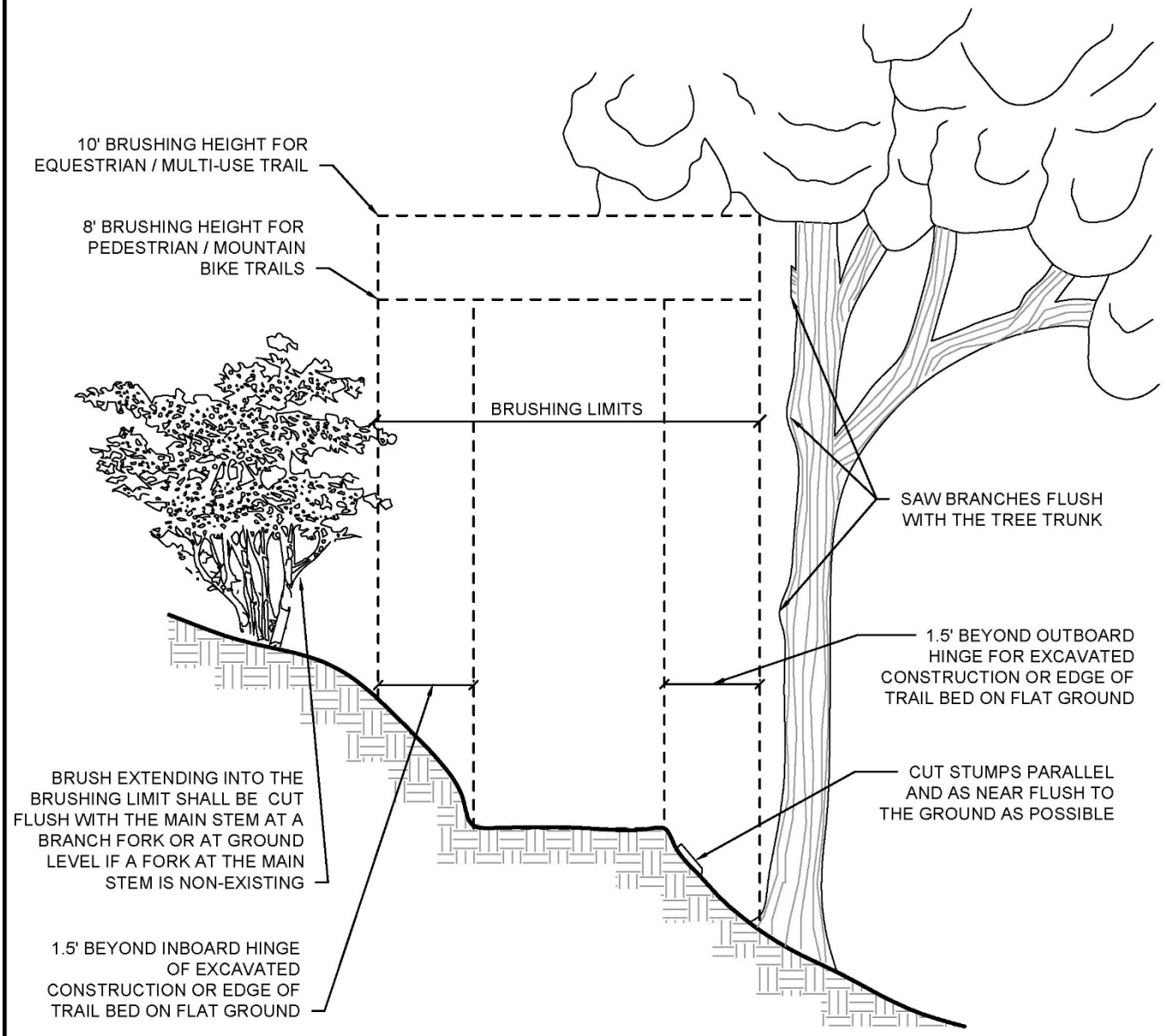


Figure 24.22 - Brushing Maintenance

BRUSHING MAINTENANCE

CALIFORNIA STATE PARKS

NOT TO SCALE

24.4. Resource and Trail Protection

Regularly scheduled brushing maintains public access and prevents users from deviating from the trail bed and damaging sensitive resources adjacent to the trail. When trails become overgrown, trail users hike or ride where there is the least amount of vegetative resistance. Use off the designated trail can create soil erosion and result in the development of volunteer trails outside the established travelway, which can damage sensitive natural and cultural resources.

When brushing a trail, extra care is given to important plants, such as oaks and redwoods or any other large tree or shrub identified as special or unique, including rhododendrons, azaleas, and Western redbuds. These plants are pruned rather than brushed to preserve their overall shape and beauty when flowering. (See Photo 24.5.) If the vegetation is part of a historic landscape, such as a historic farm or homestead, care should be taken to prune and maintain these plants according to their historic style or design intent. Resources staff can provide guidance on the appropriate methods for treatment of historic vegetation

Photo 24.5 - Pruning Sensitive Vegetation

Areas with an abundance of seasonal wildflowers should be brushed when flowers are not in bloom. (See Photos 24.6 and 24.7.) Native wild flowers are allowed to grow, flower, and produce seeds to perpetuate their numbers.

Photo 24.6 - Wildflowers Along a Trail

Photo 24.7 - Wildflowers Along a Trail

24.5. Brushing and Clearing on Accessible Trails

When performing clearing and brushing on an accessible trail, the brushing limits may need to be modified. One technique in accessible design is to use native vegetation as trail edge protection. Woody plants such as manzanita and chemise can be used to replace safety railings because they are almost impenetrable and prevent trail users in

mobility assistive devices from leaving the trail. When used for this purpose, the plants are left growing along the outside edge of the trail. (See Photo 24.8.) In addition, trail users with a visual impairment like to touch and smell the vegetation through which the trail traverses. If the trail is brushed beyond their reach, they miss out on this experience.

Photo 24.8 - Vegetation Providing Edge Protection

24.6. Brushing of Scenic Overlooks

A scenic overlook is often designed into a trail alignment as a trail destination with views of the surrounding landscape, as well as unique or outstanding points of interest. Every effort is made to maintain the view from such overlooks, as they are an integral part of the trail experience. (See Photo 24.9.)

Brushing a scenic overlook requires balancing maintenance of the viewshed with preservation of the vegetation. Remove only the vegetation blocking the view and only to the extent necessary to maintain the view. Aggressive vegetation removal creates a visual impact that detracts from the user's experience. Excessive brushing also tempts trail users to venture beyond the perimeter of the overlook, which can lead to the development of volunteer, resource damage, and visual scars on the landscape.

Photo 24.9 – Scenic Overlook Requiring Brushing

24.7. Brushing Procedures

To be efficient, brushing is implemented with the hook-line technique. (See Chapter 11, *Principles of Trail Construction.*) When each person performs a portion of the task, work is streamlined and greater production is achieved.

Brushing can be a stand-alone project or done in conjunction with clearing. Both clearing and brushing can be accomplished with power or hand tools. Regulations or operational protocols in some parks limit or prohibit the use of power tools during certain months of the year. In this situation, use only hand tools, such as brush axes, brush hooks, loppers, handsaws, McLeods, machetes, weed whips, and pitchforks. If the vegetation is not too dense, these tools are very efficient. However, it is best to use a combination of power tools, such as brush cutters and chain saws, with hand tools, such as loppers, brush axes, McLeods, and pitchforks.

As with trail construction, large trail crews in a hook-line formation are more effective than small crews. The brushing operation begins with two people operating power brush cutters in the front of the line. One person cuts the brush on the right side of the trail and the other on the left. These workers are staggered 30 to 50 feet apart, so they do not interfere with or send flying debris towards each other. In heavy vegetation, the cutters are equipped with brush blades, and in light vegetation, such as grasses, with nylon line. In heavy, woody brush, a chainsaw with a brush bar can be substituted for a brush cutter or added to the line. The brush encroaching onto the trail is cut back to the designed width and height. Additional brush cutters or chainsaws are added to keep the line moving and to balance the workload when vegetation is exceptionally heavy.

As the cutters move forward, two workers, staggered on opposite sides of the trail for safety, follow with loppers or brush axes. They clean up the work performed by the power tools, cut vegetation that was missed, and remove any stobs or splintered ends protruding into the brushing limits. All limbs are cut back to the plant's main stem. (See Figure 24.22.) The workers also carry a pole saw to cut limbs that are out of reach of the brush cutters and chainsaws. Next in line are two workers using McLeods or brush rakes to pull the cut brush into piles in the center of the trail. Again, they work opposite sides of the trail. Next in line are the brush stashers. They gather the piles of brush and stash them off the trail and out of sight. Sometimes it is more efficient to form a human chain and pass the brush from worker to worker to where it will be stashed. This method also reduces resource damage caused by trail workers climbing the cut bank and hillslope.

Workers carry an assortment of tools, including McLeods and pitchforks, for gathering the brush piles and cleaning the trail, as well as extra brush cutting tools to augment the line when necessary. Similarly to trail construction, the brushing line is dynamic, and tools and worker assignments are altered as conditions change. The crew leader must plan ahead, observe the line operation, and adjust accordingly.

If a small trail crew is used, the brushing work is performed in manageable segments. For example, if the crew consists of six people, the crew cuts the brush and rakes it into piles for a certain distance, such as 1,500 feet. Then, they go back to the beginning to stash the debris. Once they finish the first 1,500 feet, they start the process all over again. This process repeats itself for as many cycles as it takes to brush the entire trail.

When clearing and brushing are performed together and the trail crew is large enough, a small removal team of two to three people is placed at the front of the line to buck out trees ahead of the brushers. Depending on the amount of trees to be removed, the crew and equipment are assigned to balance the workload between clearing and brushing. With a small trail crew, it may be necessary to perform the clearing work with the whole crew for a certain distance, and then go back through the same segment for brushing. Tools and equipment are moved forward, to the extent possible. Often times equipment and tools need to be stashed overnight off the trail. In some locations, theft and vandalism problems preclude this practice, but in most locations it is acceptable and efficient.