Jack Monschke

How To Heal The Land

BY JACK MONSCHKE

I HAVE CONSCIOUSLY SHIED AWAY from writing about doing restoration work for years for two apparently contradictory reasons. First, it all seems so simple and obvious to me: water flows downhill. The other side of this coin is that each erosion problem and the resulting attempt at restoration is totally unique and site-specific. It's not clear-cut. I depend, not on a scientific formula, but on getting the feel of a situation. How can I write about that?

I am hoping here to set out a way for you to get a feel for the land, a way of looking at a situation so that you really see it, and some general guidelines that will lead you to discovering for yourself how to lessen our human impact on the land in general and how to heal damaged land. When I am beginning a project, I spend a lot of time just walking the land and quieting myself. Then I begin to take notes, and the ideas just come. I have incredible respect for the power of nature and how little control I

Every piece of land is different. This perception has even entered our language in the term "site-specific." Every restoration project is unique as well. The principles behind the work remain the same — careful observation, timely intervention, willingness to experiment and to stick around for the long haul.

The land in this article is 290 steep, logged-over acres near the headwaters of Salmon Creek, a tributary of the Eel River, on California's north coast. Jack Monschke, 45, has been restoring it for 18 years. He is currently a consultant for a timber company, dealing with logging practices and long-range watershed management. Jack's wife Jonelle provided the illustrations.

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—Richard Nilsen

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(Far left) Jack and nine-year-old Kasara stand in exactly the same place they stood eight years ago (center), when the same section of the creek had just undergone heavy-equipment work. Today the creek bed is restored, and planted trees prevent erosion. In 1981, before any work was done on it, the creek bed was filled with debris (upper right).

have over it. Yet, I was recently inspired by this statement in a SEVA newsletter: "The worst mistake is to do nothing because you can only do a little." —Edmund Burke.

The great thing about doing restoration work is that you get to work with the incredible healing potential of Mother Nature. When you recognize this natural process, problems that seemed hopeless can be solved and you can accomplish amazing things. The first step in healing is to get to know the land, walking and observing it through all seasons, learning to understand the process that *is* healing, and then carefully and respectfully nurturing this natural process.

A specific way to get to know the land is in terms of watershed. When a drop of water hits the peak of your roof, it goes down one way or the other, and runs down to the valleys where it is concentrated. Just as the valleys in your roof drain the slopes of your roof, so the valleys in nature drain the slopes from the ridgetop on one side to the ridgetop on the other. The entire area that is drained *is* the watershed.

So the first thing you can do is identify the watersheds on your land, and I'm talking about really small watercourses here because that's how this all begins. Begin by following running water upstream (often in small drainages water will be flowing only when it's raining). By following the watercourses upstream you will eventually be led to the divide between watersheds. This can be almost flat, or jagged and steep (think of the Continental Divide). If you watch the water carefully, you will eventually find the place where it runs one way on one side and the other way on the other side. Identifying and understanding these watersheds large and small is a way to see what's happening on your land and a key to learning how to make changes where changes need to be made.

Erosion of the soil takes place where the binding and protective qualities of the earth are insufficient to stand against the energy of moving water. Much current erosion is the result of man artificially altering the watersheds, either by changing the vegetation, increasing the volume of water, or changing the gradient, all of which are interdependent. Water has great energy, and this energy increases when it is concentrated and when it drops fast. You can see when erosion is happening by noticing whether water is running clear or muddy. Muddy water means that active cutting is happening somewhere in that watershed. In the very simplest terms you can alleviate erosion by dissipating the energy of water at the point where it meets the soil.

If you build a new house that doesn't have rain gutters, the water drops off your eaves and begins cutting into the bare soil below. Things have been altered by your building: the gradient has been changed because the slope of your roof is different from the slope of the land that it covers, and the vegetation has been eliminated. The energy of the water has been changed, and the protective covering of the earth has been removed. You can mitigate this erosion in several ways. You can plant something below the

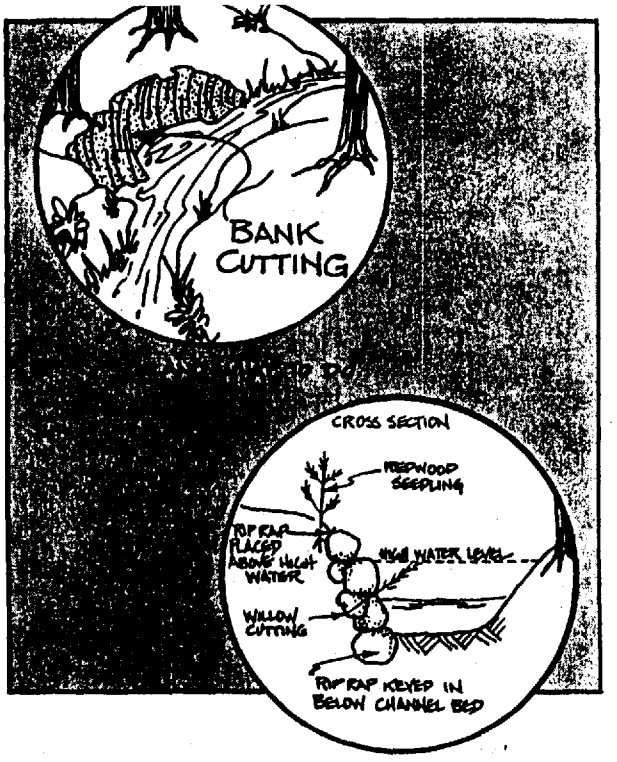
eaves that will break the impact and hold the soil *or* you can physically protect the soil by covering it with a deck or gravel path *or* you can eliminate the water by placing a gutter. However, if you do put in a gutter, you are further concentrating the water and must therefore intensify your protection at the point where you bring that water down.

Say you are out in the rain following your watersheds around, and you see a rivulet or stream that's muddy. Follow it upstream. If you come to a fork, you might see a clear stream and a muddy stream running into each other. Keep on the trail of the muddy one. Sooner or later you'll come to the place where the erosion is actually occurring. If you're lucky, there will be a single, easily identifiable source: your dog just dug up a gopher hole, or a small bank is caving in because a branch diverted water against it, or a muddy rivulet is running off a poorly drained dirt road. Sometimes, though, there will be a number of problems, some of which are less easy to identify, and it's the accumulation of many conditions — the cumulative impact — that is turning the water muddy.

Splash (or sheet) erosion is caused by raindrops hitting bare mineral soil. Soil should always have a protective cover, either living or dead, i.e., plants or mulch and preferably both. The method I use most often to protect bare soil is to seed and mulch.

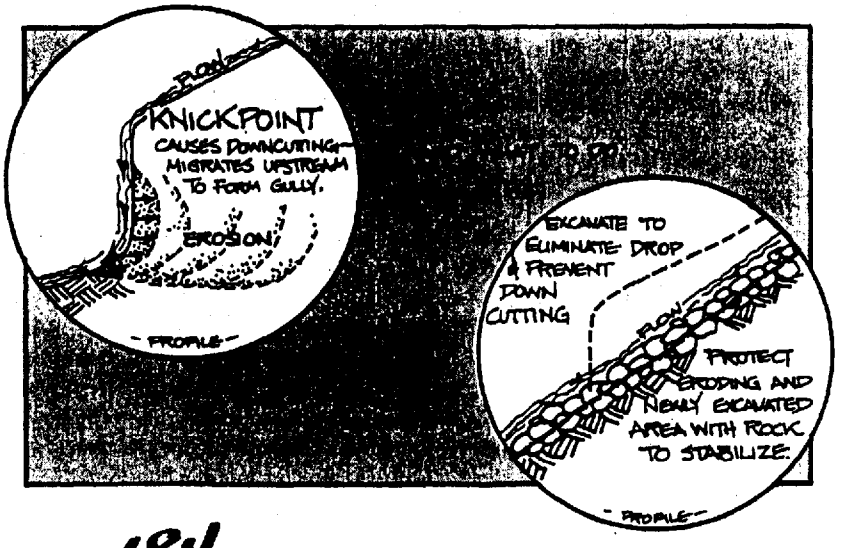
I use different seed mixes depending on the site (steepness, soil type, soil moisture, etc.) and its use (pasture, future forest, front yard, etc.). A mix that I have found adaptable for many different conditions is 3/4 annual rye and 1/4 perennial rye. I often add clovers and/or other legumes. (A good source for more information for your specific area is your local nursery, an agricultural extension office, or Federal Soil Stabilization office.) I then cover the seed with a layer of straw. Approximately 4,000 lbs. per acre, or 10 lbs. per 100 square feet, works out well because it allows the seed to come through while still providing physical protection from splash erosion. There is a delicate balance between the protection of a mulch and the growth of a living ground cover, and the choice of the correct combination is very site-specific. The mulch doesn't have to be straw; any sort of organic debris, like branches or leaves, will do. For a road, use gravel or pavement. The bottom line is that bare earth needs protection or it will erode. If it's an emergency situation, even plastic can be used to cover the soil. The ideal time to seed and mulch in the Pacific Northwest is in the fall just before the onset of the winter rains.

Another way erosion commonly occurs is through bank cutting — when the force of the water flowing in a channel cuts into the side(s) of the channel because of a physical diversion (small slide, uprooted tree, etc.), or because of changes in the gradient,



the volume of water flowing the channel, or the vegetation on the banks. My first choice for protecting an eroding bank is to line it with rock; this is called riprap. You can also use wood, sod, or plantings of heavy-rooted plants that don't mind having wet feet. Even though rock riprap provides the best immediate protection for the bank, I always try to include plantings within the riprap for stability, appearance, and the long-term benefits to the ecosystem. There are certain trees that thrive along streams. They don't mind having their roots under water or having a few feet of silt dumped on them, and if they fall over, they have the ability to resprout. In our area redwood, alder, and willow have these characteristics, and I use them a lot.

Erosion also occurs from downcutting. This is where a gully is forming and getting deeper; think of the Grand



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Canyon! If this is happening, you need to look for the knickpoint, which is the point where there is a dramatic change in the gradient of the watercourse. There are many different reasons why a knickpoint develops. It can be caused by something quite small like a rock or a branch on a small watercourse. Because of the nature of kinetic energy, the cutting power of the water increases geometrically with the increased drop and eventually creates a gully, which migrates upstream. First, you want to stop the downcutting at the knickpoint by eliminating the drop. Rock is best to use here because it not only holds firm, but also because it dissipates the force of the water.

Think of a waterfall. The cutting force of that water as it drops is incredibly strong. But in a cascade, where the water flows along from boulder to boulder with lots of aerated whitewater, the force of the water has been broken up. Wherever you see white foamy water, you know that its cutting force has been reduced. By changing the knickpoint from a fall to a cascade, you greatly reduce the cutting energy, and if rock is placed correctly, the gully will stop its migration upslope. If the bottom of a gully has no protection, it can be actively eroding even without a specific knickpoint. Rock, woody debris, heavily rooted grasses can all help stop active downcutting when placed in the bottom of a gully.

If you put something in the bottom of a freshly cut V-shaped gully, however, it serves to transfer the force of the water away from the bottom of the gully to the sides,

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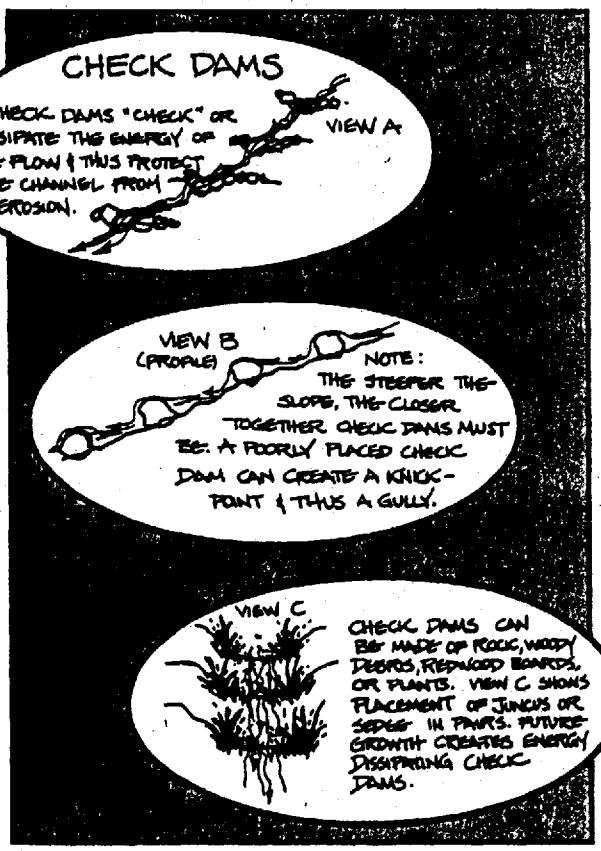
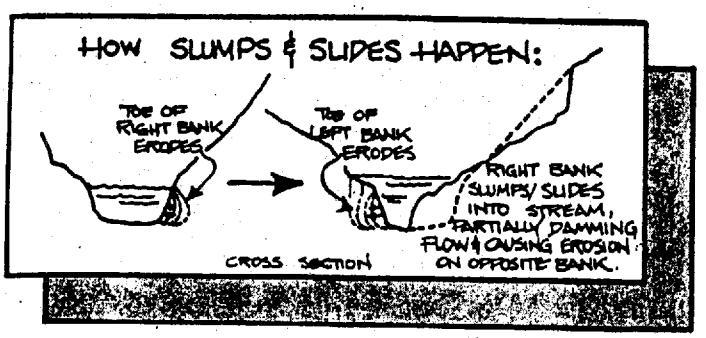
Redwood-slab check dams dissipate the force of the water, creating a graceful, gentle fall.



and then you might have bank-cutting. So you often need to protect the sides as well, by lining the channel in such a way that both the bottom and the sides are protected. If material and money are limited, you can build a series of check dams, which means you don't try to line the whole channel with rock, but do it intermittently. Check dams can accumulate sediment and dissipate the force of the water effectively if they are constructed properly. But check dams can be tricky to build, are site-specific, and are never as trustworthy as lining the entire channel. If experimenting with check dams is appealing to you, start slowly on a small, non-critical drainage and then watch your results carefully. This way you will get the feel of how they work in your specific situation.

I've found that juncus planting works as effectively on meadow gullies as living check dams. (Juncus is a heavy rush natural to this area, and it is very tolerant of wet soils.) As the years pass, the juncus grows, traps sediment, and turns the V-gully into a U-gully and finally into a swale. In fact, you can throw juncus and sedge roots into the bottom of a gully before placing rock or woody de-



bris, and they will often re-sprout through the rock the next winter.

When you have bank cutting occurring along a stream, at some point the cutting may become so great that the toe of the sloped bank is removed and the undercut bank slumps into the stream. This brings us to what I call slumps and slides. This action can set up a chain reaction. The slide creates a temporary dam which leads to bank cutting on the other side of the watercourse, which creates a slide, and so on. Protect the bank, and especially the toe of that bank, with something — rock, if possible. Try to keep the water off the toe. With some slumps and slides, the water which is supersaturating the soil and contributing to its instability is actually subsurface. Then you need to put in drainage facilities to release that water to the surface. You might also find that water is running onto that sliding toe from above, and in that case you want to use waterbars or diversions to keep the water off that unstable section of the bank. Sometimes, in a very difficult situation — and I have this exact situation on my road — all three of these conditions are present.

If you have a situation where big slumps and/or slides are happening, first spend some time just watching it and try to get a feeling for what's going on. Then call for help. Finding experts in this field can be difficult depending on where you live and what your problem is, but for starters find the most experienced and skilled heavy-equipment operator in your area and then determine whether that person has experience dealing with similar problems. Seeking help from professional experts — engineers, geologists, hydrologists, etc. — can be cost-prohibitive for the small landowner, and it's often possible to get very sound advice from the person who will actually be doing the work.

When I first started creek restoration work, I tried to do it all by hand. I quickly learned that it wasn't practical to go in and remove a few hundred yards of fill by hand. Heavy equipment is often necessary, although after the

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(Before)
Section of creek where bank cutting was causing a slide. The bank was an unhealed wound constantly being eroded by high flows. The shallow creek bed was a poor habitat for fish.

(After)
Tree planting and rock protection on the eroding bank have stopped all active erosion. The pool here is approximately 30' in diameter, an excellent fish habitat.

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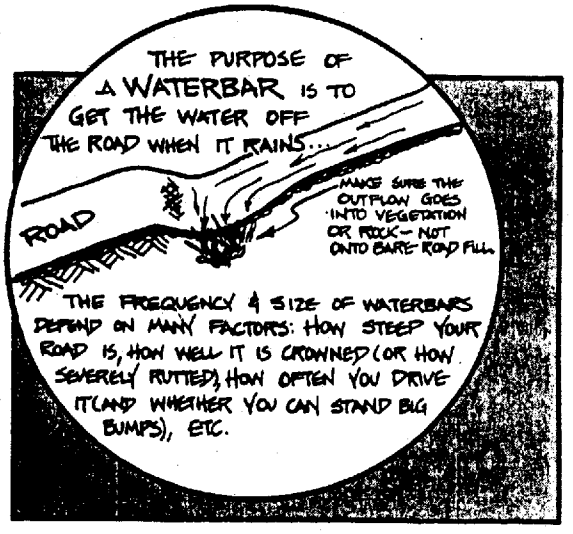
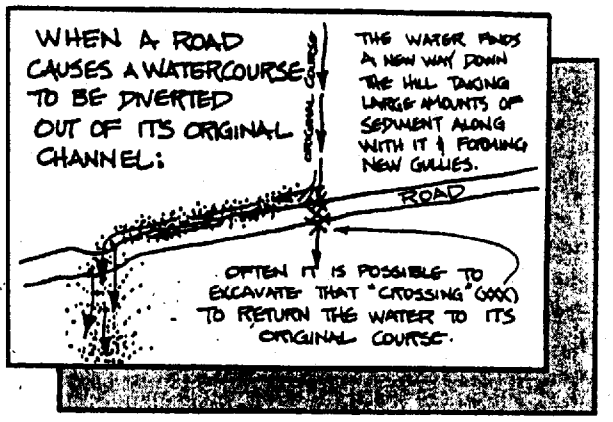
heavy equipment work is done, I almost always go back in and touch up the work by hand, placing small rock, etc. I am very lucky in that I work with a highly skilled heavy-equipment operator. We can go into a creek, and he will not damage any vegetation we have chosen to keep. But your average random cat skinner is not this skilled or sensitive, so you need to be selective when choosing one.

Sometimes watercourses are diverted totally out of their natural channels. In the Pacific Northwest on the vast acres of logged-over lands, these diverted watercourses are often the single most common source of stream sediments. When the loggers arrived in the old days, they cut roads wherever they wanted, and often when they were done they left the roads in place without putting



in any drainage facilities (culverts, bridges, waterbars, etc.). So many, many watercourses were diverted completely out of their natural drainages and forced to find new ways. This is a common problem, but it is often relatively easy to resolve: look for the original drainage and return the stream to its old home where it belongs. In some situations, however, the water has flowed in its newly formed gully for so long that to change it back may cause more erosion than it stops. This is a site-specific situation, and I advise careful observation over time. When the water is returned to its original channel, the newly formed gully still exists and may need to be treated.

Around here most of us live on land that was roaded with very little thought given to erosion, and roads are the main cause of most of the active erosion that's going on today. If you have the opportunity to build your own road, the most important thing to look for is natural watershed patterns. Identify these and then change them as little as possible. The best roads are built on ridges (those divides between watersheds) and are crowned so the water can run off both sides. A ridgetop road is the safest and most stable because when you build this way, you are not changing the gradient or the volume of water flowing in the drainages. You are only changing the vegetation, and



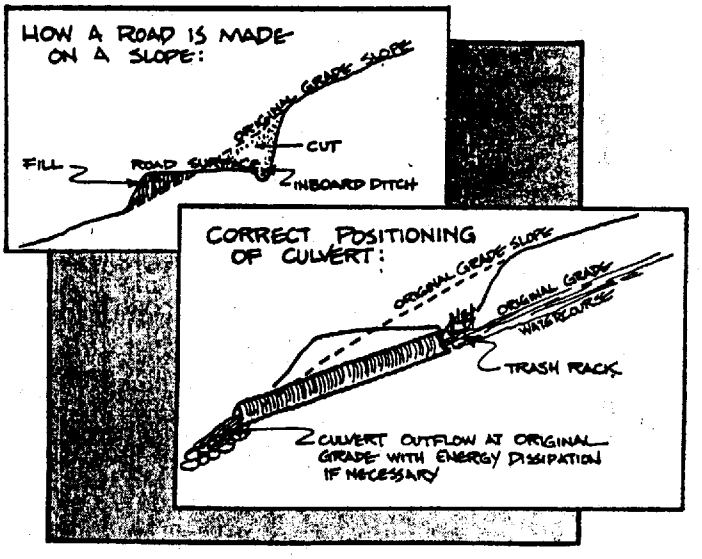
building narrow roads and leaving as many trees as possible will even minimize that.

A road on a hillside is constructed by cutting and filling. To lessen the impact, outslope the road gently (it doesn't even need to be noticeable) so that the water that comes off the slope and the water that falls on the road itself will flow across the road and down the hillside. Outsloping the road can be a safety problem if you live in an area with snow and ice because if you go into a skid, the tendency will be to slide to the outside of the road and over the bank. If outsloping isn't practical, an inboard ditch and cross-road drains must be installed.

Plant and mulch both the cut and fill, the upslope and downslope, to minimize the overall change to the vegetation and eliminate or minimize splash (sheet) erosion.

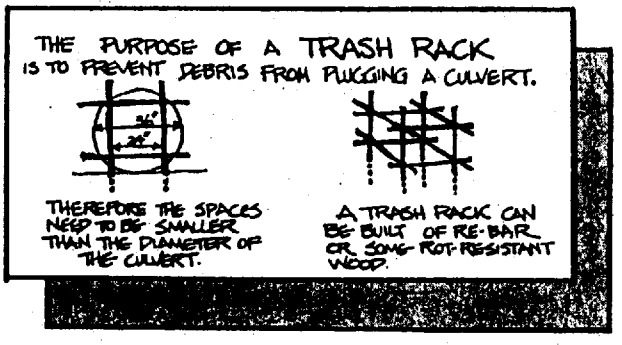
Keep all watercourses that the road crosses in their natural drainages. This is done by proper position and placement of culverts, a major subject in itself.

Steel culverts are expensive, and what happened around here was that the people who put in the roads tried to save money by putting in as few culverts as possible, with inboard ditches along the road. The idea was that the water from a little watershed would hit the road and flow



into and along an inboard ditch until it came to a culvert, at which point the water would flow under the road and get dumped out on the downhill side of the road. This doesn't work because the volume of water dumped out at a given spot gets greatly increased, the gradients are drastically changed, and the vegetation has been changed by cutting and filling to build the road in the first place. The results of this method are road failures, and bank failures both above and below the road, plus lots of eroding soil.

The right solution is to put in a culvert at every place where the road crosses a watercourse. They may be small culverts, but they are necessary so that volume and gradient of the runoff is altered as little as possible. The money spent on culverts when building a road right will save you a great deal of money on maintenance cost and also eliminate anxiety and eroding soil in the future. Culverts generally need to be placed by a backhoe or excavator, and it's important to check around in your area for a good heavy equipment operator, one with sensitivity to the land and water and the way they work together. A good backhoe operator will place your culverts correctly at the original grade and at the exact location of the watercourses it is draining.



Make sure that as the water flows into the culvert on the inboard side, it does not flow under the culvert or erode the fill on the sides of the culvert because this will eat away little caves under your road surface. Sometimes you have to protect this point with rock or sandbag riprap. In order to decrease the possibility of a culvert plugging during winter storms, I recommend placing a trash rack made of steel re-bar at the inlet. A properly designed trash rack will keep culverts clear of obstructions without causing other drainage problems. Make sure that where the water flows out of the culvert, it returns exactly to that drainage where it was flowing before the road and culvert were there. This drainage has spent centuries adapting itself to carry that stream. If it is impossible to place the outflow of the culvert exactly at the original grade and the water must fall some distance onto unprotected soil, dissipate the energy of that water and lessen the impact of the gradient change you have created. This can be done by using a culvert downchute with a rock pile below to dissipate the water's energy.

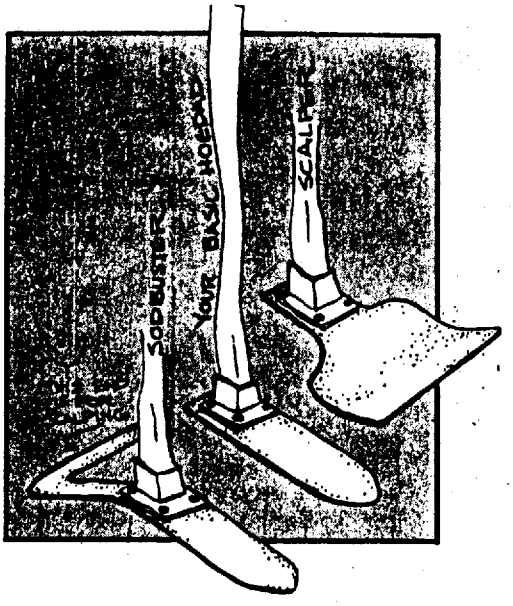
Winter road maintenance is crucial. I walk my roads during the first good rain, checking all trash racks and/or culvert inlets to make sure there are no obstructions. I also check all ditches, both inboard and cross-road, to make sure they are capable of carrying the runoff of a heavy storm. The small ditches that drain the surface water off the road usually have to be redone every year, because summer driving wears them down. During a rain the water in these ditches should run fast enough so that it doesn't deposit sediment and plug, but slow enough to keep from downcutting. This is another case where close observation and fine-tuning is critical.

I also walk my roads during the first very heavy storm, removing debris if necessary and checking all culvert outlets to be sure there isn't any downcutting. Always walk your roads during any heavy flooding storm and follow the above procedures. Winter maintenance can save you thousands of dollars. It's preventive maintenance at its best.

The same rules that apply to siting a road also apply to siting a house and garden. Put your home and garden where they change the natural watershed as little as possible. Don't just bulldoze in a big flat and then have it slump away. Fill is very unstable. Unless you're willing to terrace it, a garden should not be on a grade of more than 10 percent. A garden is in constant disturbance, and in terms of erosion it never has a chance to heal. I think the most important thing in planning where to build and garden is to take the time to really get to know your land before making any changes.

One of the most beneficial things people can do for any land is to plant trees, which help prevent erosion in many ways. First, the impact of rain is broken up by the canopy; second, the roots and humus absorb much more water than bare soil; and finally, roots provide structural binding strength to soil. Although grass does this work also, it is less effective than trees. The water that has been absorbed by the ground is released slowly over time. In a healthy forest a lot of the water absorbed during the winter rains is released over the whole summer. I recommend planting trees along all roads and streams, and anywhere trees have grown in the past and have not reestablished themselves naturally. If you have a lot of non-forested land, and it used to support trees (stumps are the obvious indicator here), the land will support trees again. You might have to give the seedlings a little shade and water for a year or two, but getting the root structure back and the canopy overhead is one of the simplest, most effective and most rewarding things you can do to heal the land.

It's important to choose the right planting stock. The Agricultural Extension office and State Nursery office can help you get the proper stock for your area. I have had a much higher survival rate planting bare-root stock than containerized stock on harsher sites, and for that reason, I prefer to plant bare-root, although the planting takes more skill and patience. It was really hard for me to accept this, but trees like to be planted in bare, mineral soil. Bare-root trees don't like humus, and young trees are hurt



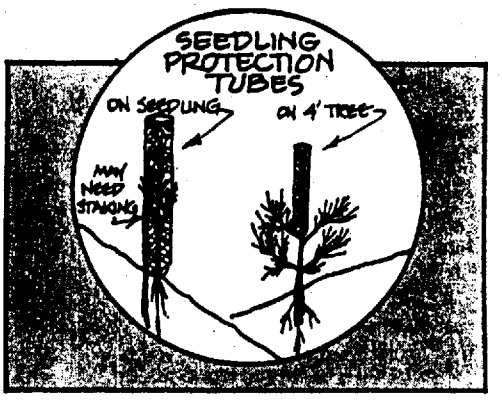
by competition with grasses. To prepare the ground, scrape off all the existing grass and debris down to the bare soil. This is called scalping. If you're working by hand, scrape off a 30" square and plant in the middle of it. There is a great tool made now for scalping called, of course, a scalper. The tool for planting bare-root seedlings is called a hoe-dad. Both functions of scalping and planting are combined in one tool called a sodbuster, which is perfect for the smaller landowner who doesn't have large acreage to prepare for planting.

If you're planting a large area, have a Caterpillar do what is called mechanical site preparation. When I do this, I get the best tree seedling survival rate by clearing 10- to 12-foot swaths with the Cat's blade tipped so that all the grass and debris is pushed to the downside to make a berm. Then I leave a 10-foot section on either side of that swath untouched to act as a filter strip. It's important that these are made on the contour of the slope so that they act as terraces breaking up the energy and dispersing the concentration of runoff.

In California you can buy 1,000 one- or two-year-old tree seedlings for about $150 from the state nursery. If you plant them right, they will cover approximately three acres. There are government programs to help you reforest your land. Some people are suspicious of government programs, but I've had a very positive working relationship with government cost-sharing programs for 18 years. They've made it possible for me and my clients to do a lot of conservation work that otherwise would have been impossible because of cost constraints. Even though the programs are there to encourage forest products for future harvest, there's nothing in the programs that says you have to harvest.

There are times when the microclimate and the soil conditions have been changed so much that the natural vegetation won't survive. When I can't get a native species to work, I will introduce a non-native one, but I will check it out to see that it's not something that will dominate the native species. For example, I've never used Argentine pampas grass, although its root binding is great for erosion control, because it can take over a clearcut or other disturbed area, and then the native species can't get started. Sometimes I'll plant a non-native species as a nursery crop to slightly alter the micro climate and thus enable a native species to survive in the future.

If deer browsing is a problem, I have found that 3" x 24" seedling protection tubes have been very effective on young fir trees to get them above browse height. These tubes are stiff plastic mesh and protect the leaders of the little trees as they grow. You have to move them up just before new growth each spring. On fast-growing trees the tubes will allow the trees to get above browse height in 2-3 years, compared to trees I have watched that were stunted for 10-20 years without any browse protection.



In my stream work, after years of working for total protection of the banks, I've been working more lately for the fish. The most stable channel in terms of erosion control is not the most ideal condition for fish. They need pools and diversity in the stream channel. I've started leaving certain structures in the channels, carefully placed, to cause downcutting, thus creating little pools that loosen up the gravel so the fish can spawn, and also creating nice living places (rearing habitats). I also put in woody debris, which I originally considered an erosion threat and unsightly, to provide food and hiding places for the fish. The riparian, or streamside, vegetative cover is important for the stream and for the fish. I plant redwoods, alders, and willows below the flood high water level because these trees can thrive with wet feet and being knocked over and covered with silt.

When I moved to our land 18 years ago, our stream was totally trashed. The loggers used the stream bed as a haul road to take out logs because in those days there were no forest practice rules. The stream then ran underground a lot, under yards of fill and tons of debris. We moved the debris out and placed it above the high water level, removed fill and defined the channel where necessary by placement of rock. We planted exposed banks with grass and trees (alder, redwood, and fir), and protected existing trees with tubes. It is amazing how fast it came back. Now our creek is a beautiful little stream with mossy banks and trees and pools, and it can support fish. ■

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