MPWMD Carmel River restoration work 1983-2001

Seven miles of river bank replanted with vegetation

53,112 willow and cottonwood cuttings planted along river banks

611,880 feet of irrigation systems installed to establish plantings and maintain vegetation

More than 135,000 cubic yards of river material moved to create stable channels

31 fish pools excavated to provide steelhead habitat

114,295 steelhead rescued

1,050 tires removed and recycled

855 cubic yards of trash removed

Contact the Monterey Peninsula Water Management District before making streambank alterations to ensure that you are taking the most effective action to protect yourself, your neighbors and the river—we're here to help!

Each year, MPWMD clears the river bottom of debris that can cause erosion and degrade riverbank and water quality.

Services for river-front residents

Here are just some of the services that MPWMD staff biologists, hydrologists, engineers and maintenance workers provide to landowners near the Carmel River:

- Analyze the condition of your riverbank and that of your neighbors'.
- Evaluate your property's flooding and erosion potential, and suggest preventive measures.
- Use historic photographs and flood elevation models to predict future problems.
- Provide information on safely pruning vegetation to create view windows.
- Design neighborhood river restoration projects.
- Help you obtain permits from different agencies.
- Advise you on the addition of riparian plants and irrigation systems.
- Supply free willow and cottonwood cuttings.
- Advise you on how to safely remove non-native vegetation.
- Provide "how-to" guides on streambank planting and water-wise landscaping.
- Help you find information in our library of public documents and reports pertaining to the river.
- Remove flood debris and other flow obstructions.
- Maintain the "Erosion Potential Hotline" with updates on streamflow: 658-5678.

For assistance, please call the Carmel Valley Field Office at 659-2543.

Monterey Peninsula Water Management District

Main Office: 658-5600
5 Harris Court, Bldg. G, Monterey, CA 93940

For river-related questions call
Carmel Valley Field Office: 659-2543
Talbott Building, Carmel Valley Village

For updates on streamflow conditions call
Erosion Potential Hotline: 658-5678

For flood or erosion emergencies call
Monterey County Office of Emergency Services: 755-5010

Visit the District website at
www.mpwmd.dst.ca.us

River Myth #4: fact & fiction

Clearing the riverbed would prevent floods. It is impossible to "vacuum" the riverbed of all obstructions. Removing all organic debris would remove nutrient sources, destroy aquatic habitat, and could actually cause erosion by altering stream flow. Each year, MPWMD removes non-organic material from the river, such as car tires, metal and plastic debris.

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How to protect & enhance the Carmel River and your property

Monterey Peninsula Water Management District

Why Does Property Erode & Flood?

As a river-front resident, you live in the middle of a ***riparian ecosystem,*** *amidst the very forces that form our natural landscape.*

Riparian ecosystem*: The natural associations of soil, plants and animals existing within the floodplain of a stream, and dependent for their survival on high water tables and river flow.*

"The first and most important aspect of a natural channel is that it is self-formed and self-maintained. The flowing water carves the groove in which it flows. The water fashions the depth, the cross-section, the areal configuration and longitudinal profile."
—Luna B. Leopold
Professor of Hydrology, University of California, Berkeley

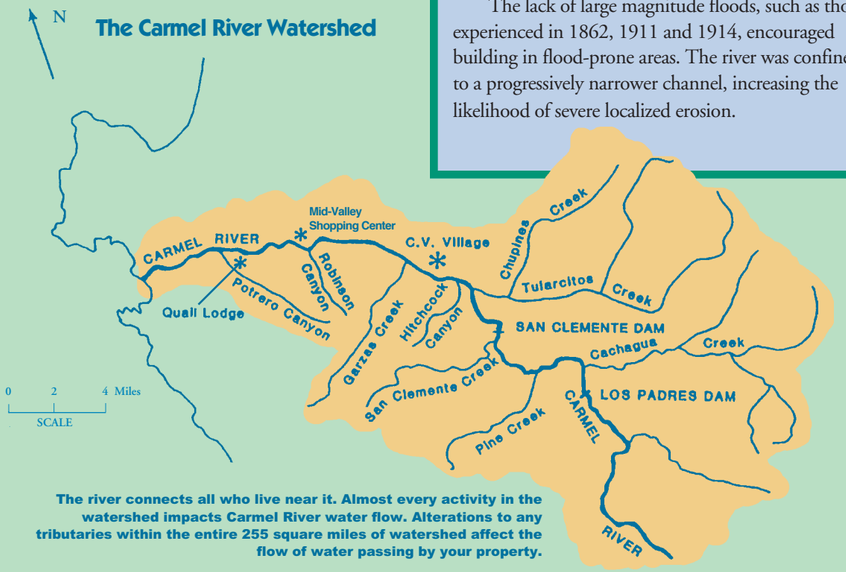
Rivers are ever-changing entities. Whether in a sudden rush of water during a few days or a persistent slow flow over decades, water has always been the dominant architect of the earth's surface. Periodic bank overflow is the pulse of the river, as natural and inevitable as the drifting of sand dunes, the ebb and flow of the tides or the cycles of the moon.

As a healthy river carves and reshapes the landscape, it acts as a corridor of life, laying down rich sediments and supporting a wide variety of plants and animals. A high river flow is only called a "flood" or "disaster" when people and property are in its path.

Before human settlement, the Carmel River was a wide, shallow stream with meandering threads which separated and joined on their way to the

continued, far right column

The Carmel River Watershed



The river connects all who live near it. Almost every activity in the watershed impacts Carmel River water flow. Alterations to any tributaries within the entire 255 square miles of watershed affect the flow of water passing by your property.

Carmel River Timeline

Human alterations have severely degraded the Carmel River riparian corridor, causing increased erosion and flooding over the last 80 years. Problems along the river are the cumulative result of many changes along the river and throughout the watershed.

1921 San Clemente Dam constructed
The dam traps the sediment that naturally would travel down the river to settle out in the Valley, where it is crucial in building river banks and nourishing streamside vegetation. By year 2001, this trapped sediment had reduced the San Clemente Reservoir's original storage capacity of 1,425 acre-feet by 90 percent.

1948 Los Padres Dam constructed
Currently, over one-third of the 3,030 acre-foot Los Padres Reservoir is filled with trapped sediment.

1959 Large-scale municipal pumping of aquifer begins
Decades of pumping from the Carmel Valley aquifer have reduced the water supply to native trees and vegetation. Lowering of ground water levels causes the river to run dry, especially during rainless summer and fall months. This weakens and kills plant roots which stabilize banks.

1960 Intensive development of floodplain begins
The lack of large magnitude floods, such as those experienced in 1862, 1911 and 1914, encouraged building in flood-prone areas. The river was confined to a progressively narrower channel, increasing the likelihood of severe localized erosion.

1976/77 Severe drought prompts overpumping, which increases die-off of streamside vegetation
Groundwater was pumped to a new low to satisfy community water demands. The level remained below the root zone for long periods of time, stressing trees and plants that held banks together.

1978/1986 Wet winters increased stream flow, which washed away unvegetated property
Even though flows were moderate, erosion was severe on degraded banks. An estimated 100 acres of land eroded during this eight-year period alone.

1983 Carmel River Management Plan adopted
Monterey Peninsula Water Management District adopted a plan to protect and restore the Carmel River and its riparian corridor. Numerous projects have prevented property loss, reduced flood hazards, protected streambanks and restored the river.

1995/1998 Significantly high river flows cause property damage and erosion
High river flows in January 1995 (9,800 cubic feet per second) and March 1995 (16,000 cubic feet per second) eroded unprotected banks and flooded hundreds of structures. Although larger floods have occurred, the building of homes in flood-prone areas turned this natural phenomenon into a catastrophe.

Three years later, some areas along the Carmel River flooded again in February 1998 with a peak flow of 12,000 cubic feet per second. Many steep banks along the river failed and erosion in the watershed was widespread.

ocean. But as people developed the floodplain, they began confining the river into a narrower and narrower channel. Today, due to dams, levees, roads, bridges, homes and other barriers, the Carmel River is a single, deeply-incised channel. This narrowing has intensified the velocity of water flow against riverbanks and increased the potential for erosion.

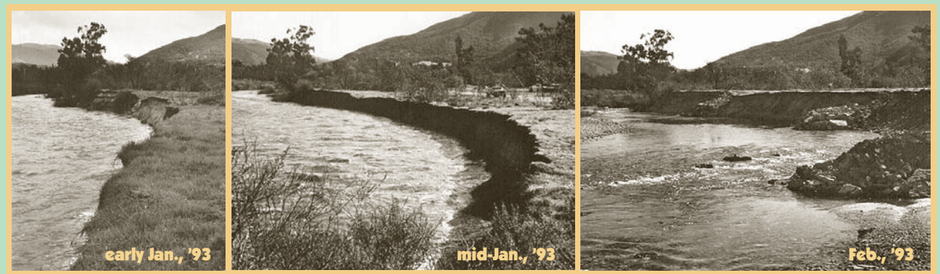
River Myth #1: fact & fiction

Confining the river effectively would make flooding obsolete.
Levees, dams and other confinements cannot always prevent flooding. At best, these alterations can only make floods less frequent. Levees often increase local flooding when they fail. A floodplain is bound to get wet at some point—it's a matter of time.

This problem is compounded when property owners cut native, streamside vegetation, or when too much groundwater is pumped, leaving plants to wither and die. Without the extensive, intertwining root systems of riparian trees and plants, there is nothing to stabilize the riverbank and hold the sandy soil together.

High velocity river flow against these denuded riverbanks has the same effect as a fire hose pointed at a pile of dry sand. Even though the Carmel River is usually peaceful and scenic, erosion can be dramatic when the increased flow of the confined river moves against unprotected banks.

The key to minimizing the effects of erosion and flooding lies in understanding river dynamics. Nobody has ever won a fight with a major force of nature, but by working together *with* the river and not against it, you can achieve a degree of control and peace of mind. Read on . . .



These successive photos of the same riverbank in mid-Carmel Valley show how even moderate flows can severely erode banks that are unprotected by native vegetation.

Steinbeck on the Carmel River:

"The Carmel is a lovely little river . . . in its course it has everything a river should have. It rises in the mountains, and...spills into pools where trout live...In the winter it becomes a torrent, a mean little fierce river, and in the summer it is a place for children to wade in and for fishermen to wander in. Deer and foxes come to drink from it...and now and then a mountain lion crouched flat laps its waters...it's everything a river should be."
—John Steinbeck, from *"Cannery Row,"* 1945

Protect the River & You Protect Yourself

The same factors that erode banks, worsen flooding and destroy property also hurt the river, habitat and wildlife. Keeping the river healthy protects your home and property.

Keep it clean
Remove trash, yard waste and other debris to help native plants flourish. Never dump grass clippings, pet waste, yard debris or anything else into the river or on the banks. Debris does not "wash away"; it settles on someone else's property, smothers young plants, distributes unwanted seeds, clogs the river bed, degrades water quality and depletes oxygen. In the event of flooding, debris on your property may end up in your neighbor's yard or living room.

Use care when you trim native streamside vegetation
Even minor pruning can kill a stressed tree. Months down the road you or your neighbors' property could be severely eroded as a result. Call MPWMD if you'd like to create a viewing "window" or need to alter vegetation for special reasons—they can help you minimize any negative impacts.

Irrigate native streamside vegetation when needed
In a typical year, groundwater pumping drops the water-table in the Carmel Valley aquifer from between 10 to 50 feet. That's why streamside plants may need irrigation to survive, especially in summer and fall. For example, heavy municipal pumping during drought years would kill much of the protective corridor of trees between the Carmel River Lagoon and Robinson Canyon Bridge, but it is kept alive by the MPWMD irrigation program.

Keep non-native plants out of the riparian corridor
Species not native to the riparian community such as ivy, broom, acacia, eucalyptus and pine trees, compete with native plants and do not prevent erosion. The riparian corridor is a natural area—not a garden—and should be left undisturbed. Call MPWMD for advice on removing non-natives or replanting native riparian vegetation.

Keep vehicles out of the riverbed
Vehicle use near the riverbed is illegal without special permits from the California Department of Fish and Game and MPWMD. Even a horse trail can cause severe erosion if it's too close to the river.

Do not dump tires, concrete, asphalt or any foreign material in or near the river
Altering the streambank in this manner does not provide lasting protection against erosion, but it can cause erosion on your neighbor's property by altering flow downstream. Besides being unsightly, rubble often contains toxic materials.

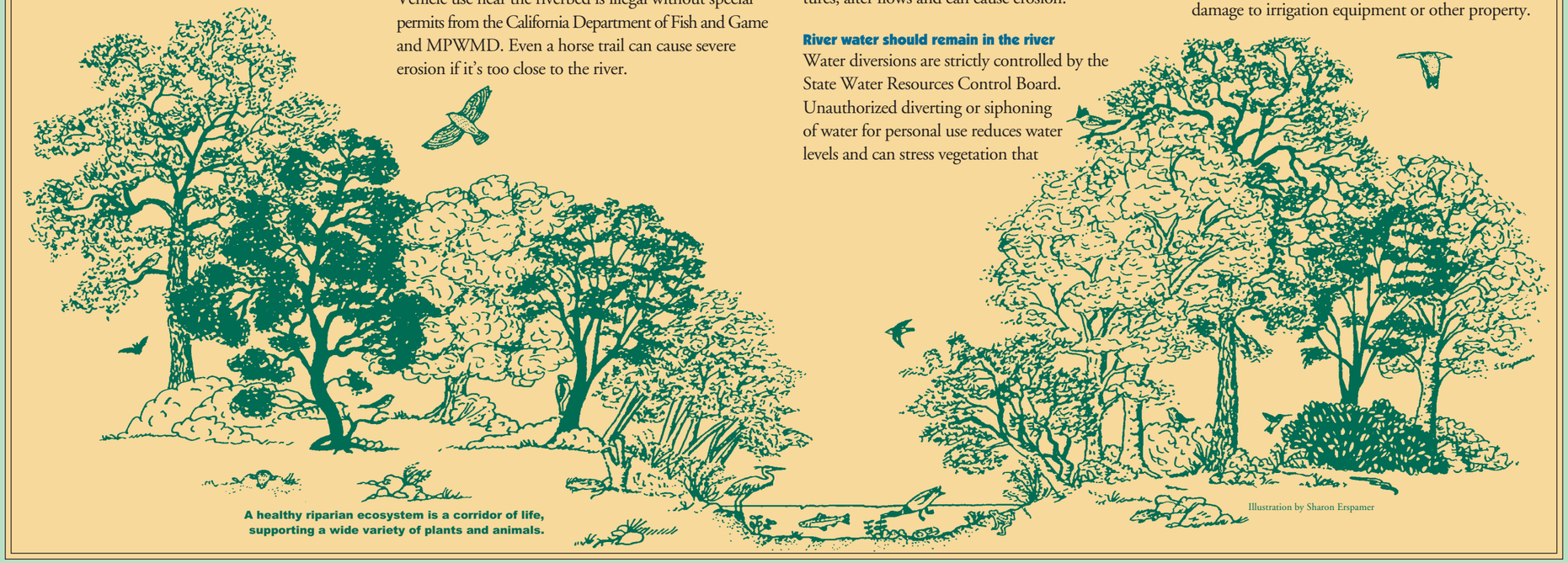
Never allow poisons to enter the river or floodplain
Herbicides, bug sprays, common yard chemicals, oil products, detergents, wash water, pool or spa water—all are poisons that kill plants and animals. Even "biodegradable" soaps can be harmful to wildlife, as well as fertilizers which cause algae blooms and deplete oxygen. If you live in the floodplain, using poisons in your yard is the same as dumping them in the river—that is where they will end up. Be sure containers are well-sealed and can't be carried off in the event of flood.

Do not construct cobble (rock) dams or diversions
These illegal obstructions in the river inhibit steelhead migration, reduce habitat value, raise water temperatures, alter flows and can cause erosion.

River water should remain in the river
Water diversions are strictly controlled by the State Water Resources Control Board. Unauthorized diverting or siphoning of water for personal use reduces water levels and can stress vegetation that protects your banks and those of your neighbors. Less water means less aquatic habitat.

Work with your neighbors
Vegetation is most effective in preventing erosion when it occurs continuously along the banks. Whether you consider the river an amenity or a problem, neighbors must work together to minimize property loss. Participate in MPWMD river restoration projects in your area, or contact us to help plan a neighborhood restoration.

Become a "river watcher"
When streamside landowners act irresponsibly, it is their neighbors who end up paying the most. That's why all the destructive practices described here are either illegal or require a permit—to protect you, your neighbors and the river. Help keep the river healthy by educating your neighbors and alerting MPWMD to hazardous conditions, degraded areas, and damage to irrigation equipment or other property.



A healthy riparian ecosystem is a corridor of life, supporting a wide variety of plants and animals.

Illustration by Sharon Erspamer

Which of these is part of the earth's hydrological system which supports all life on the planet?

A) The Rio Grande River
B) The "Mighty Mississippi"
C) The Carmel River
D) All of the above

Answer: **"D," of course. The Carmel River is part of an intricate hydrological system that each year removes 80,000 cubic miles of water from the world's oceans and recycles it over the face of the earth. Rivers are the "arteries" of the planet; they sustain our most important food chains as they distribute nutrients, carry off waste and create habitat. Yet it's easy to forget that the "overgrown creek" behind the shopping center is as vital to the health of our planet as a tropical rain forest or the ozone layer. Of the 121 million acres of U.S. land within the 100-year floodplains of rivers, only 19 percent are in their natural or semi-natural conditions today.**

River Myth #3: fact & fiction

"Straightening the river would prevent floods and erosion."
Even if it were possible to engineer the "straightening" of the river, a straighter channel alignment would increase water velocity and erosion, while destroying habitat. To avoid increased velocity, the channel would have to be so wide it would engulf many nearby homes and properties.

Why save the river?

Saving threatened species
Steelhead fish and the California red-legged frog live within the watershed and have been listed as threatened under the Federal Endangered Species Act. Vegetation removal, streambank alteration and other activities around the Carmel River are regulated by federal law.

Natural looking streams increase property value
A recent analysis of property values of homes located on natural and channelized branches of the Portage River in Wood County, Ohio, indicates that *"homes constructed on the natural stream [above the flood plain] are assessed to be worth 331% more than homes built on the channelized stream."*
—K. Schurr, R. Schurr, and P. Barker. "How a Natural River Can Increase the Community's Tax Base," *American Rivers* 14, no. 2 (1986): 4.

How to Safeguard Your Home & Property

When you plant and maintain native riparian vegetation, you help to minimize erosion and maximize the likelihood that your property will remain intact during a flood.

While property loss during the 1995 and 1998 flooding was sudden and dramatic, it's important to know that if your banks are unprotected, you are losing your land to erosion *every day*, even during relatively low flows.

It's easy to conclude that high river flow causes erosion, but the true causes are usually lack of protective bank vegetation or instability upstream. Banks with healthy native vegetation often remain unchanged even when deeply flooded.

Our native streamside plants, especially willow trees, are your first line of defense against property loss. The branching roots and fibers that make up riparian root systems hold soil together at streamside and extend far back from the banks to provide natural protection. During floods, the leaves and branches of plants slow the velocity of stream flow and reduce the erosive force of the river against the banks.

Quick-growing native trees provide an amazingly high level of protection even as young saplings. Planting is also the cheapest, quickest way to protect yourself—it requires no permits, and free cuttings and planting guides are available from the Monterey Peninsula Water Management District.

Streamside vegetation also provides wildlife habitat and deep, shady pools for fish, while at the same time enhancing views and property values.

River Myth #2: fact & fiction

Streamside vegetation "chokes the channel" and increases flooding.

The benefits of streamside plants far outweigh the insignificant flood elevations they may cause. The river will flood whether vegetation is present or not, but banks with healthy growth are much more likely to remain intact and resist erosion during a flood. Plants also help absorb rainfall and runoff.

Benefits of native streamside vegetation:

- Protects property
- Relatively inexpensive
- Easy to install
- Requires no permits
- Prevents erosion
- Stabilizes banks and slopes
- Reduces stream flow velocity
- Provides habitat for wildlife
- Enhances property values
- Improves aesthetics
- Supplies nutrients
- Improves water quality
- Shades and cools water
- Provides fish habitat

This photo shows a willow sapling and the curve of the unprotected, eroded bank upstream from the tree. Even though the willow is only a couple of years old, it has already saved a large area of bank from erosion.

A word of caution about rock rip rap

Severely eroded, extremely unstable banks may warrant using large rock or other acceptable material along with vegetation—a technique which requires permits and heavy equipment. Merely dumping rip rap over the bank will usually create more erosion problems instead of solving them.

To be effective, a bank stabilization project must be carefully designed and built. Results can vary greatly depending on rip rap size, type and placement; bank preparation; degree of stabilization; use of filtering materials; conditions up and downstream, etc.

Improperly installed, rip rap can do more harm than good. And even if your project is sound there are no guarantees. Any bank can be compromised if sufficient erosion occurs upstream to alter the natural flow of the river. If your neighbors' streambanks fail, stream flows can erode your banks and eventually undermine your rip rap from beneath or behind.

To save time and expense, call [the experts at] MPWMD for advice before you invest. A bank stabilization technique other than rip rap may be more cost-effective for your unique situation.

Native red willow

Native black cottonwood

Neighbors must cooperate to create a continuum of bank protection. This bank restoration project shows newly planted willow cuttings taking root. With irrigation during dry periods, these fast-growing native trees will provide a high level of bank protection in just a few years, while at the same time increasing aesthetics, wildlife habitat, water quality and property value.

Stabilization will only prevent erosion if the correct technique is chosen, and then properly installed.

Whatever stabilization technique you use, it should always be installed along with native trees. Vegetation covers rock rip rap and other structures quickly to increase bank protection and provide the aesthetics, improved water quality and wildlife habitat that exposed rock cannot contribute.

Photo credits: cover photo, MPWMD staff; pages 2-3—wildlife photos, Anne Muraski; river photos, MPWMD staff; pages 4-5—river and wildlife photos, Anne Muraski; page 6-7—steelhead photo, MPWMD staff; frog, courtesy U.S. Fish and Wildlife Service; page 8—owl, Anne Muraski; river cleanup photo, MPWMD staff

Flood Checklist: preparing your home

- Store valuables on high shelves.
- Create a list of the most important portable items you'll want to take with you in case of evacuation (photos, keepsakes, documents, keys, home inventory, medicines, jewelry etc.). Store them near each other for easy collection.
- Keep a home inventory at another location.
- Elevate or secure large equipment such as washing machines, water heaters, furnaces, television, etc.
- Evaluate each room to see how quickly you could move belongings out of harm's way. You may want to add high shelving, store collections in one moveable box, or install casters on hard-to-move furniture.
- Inspect your home for ease of cleanup. Use area rugs over tile or linoleum instead of wall-to-wall carpeting. Smooth wall surfaces are easier to clean and disinfect than textured ones.
- Have a family evacuation plan: where to meet, quickest escape routes, etc.
- Keep carriers, leashes and food for your pets in a handy location.
- Maintain an emergency kit: flashlight, radios, fire extinguisher, drinking water, food supply, first aid kit, tools, all-weather gear.
- Consider installing gates in fences so flow and debris can pass through during flooding.
- Keep important items on hand:
  - First aid and survival guide
  - Instructions on how to turn off utilities
  - Emergency phone numbers
  - Emergency broadcast frequencies
  - Sandbags (available at fire stations)

The river joins all who live along it: how the cycle of erosion works

Whenever you alter the riverbank, you set forces in motion that also alter your neighbor's banks—for better or worse.

Improperly stabilizing your bank or deflecting flows away from your property even slightly can change river hydraulics and increase flow velocity and erosion downstream.

When the river deposits eroded material in gravel bars downstream these obstructions deflect water flow into your neighbor's banks, causing more erosion and gravel bars as the cycle continually works its way downstream.

Contact MPWMD before altering your streambank to make sure you're not transferring your problem to someone else.