CREEK CARE GUIDE

For Landowners Along Garden Creek

Preface

Garden Creek is one of the last free flowing streams coming down the face of Caper Mountain. In spring and fall the water tumbles down Garden Creek Falls adding a spectacular natural feature to the landscape. The Creek meanders along the base of the mountain, through the urbanized areas of Natrona County and the City of Casper, all the way to the North Platte River.

Property owners along the Creek, individuals and families who frequent the neighborhood parks and playgrounds it flows through, area residents, and visitors appreciate the natural characteristics of Garden Creek. Over time citizens have commented, and much has been written, about the degradation of Garden Creek and its riparian corridor. While many have expressed concern about the condition of the Creek, few have had the resources to organize and implement a large-scale restoration effort.

This Creek Care Guide is a educational component of the Garden Creek Stream Restoration Demonstration Project, funded by the City of Casper with a grant from the Wyoming Department of Environmental Quality/U.S. Environmental Protection Agency. The objective of the Project was to restore and stabilize 2,000 feet of Garden Creek through Nancy English Park.

The restoration project was designed to reduce creek bank erosion and excess sediment in this portion of Garden Creek, restore the riparian corridor to increase natural habitat for birds and wildlife, and to serve as a dynamic demonstration platform for good creek care stewardship. This companion Creek Care Guide was developed to encourage and support ongoing stewardship of all waterways in the Casper Mountain Watershed.

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What is a watershed

A watershed is the landscape that water from rain or melted snow flows across on its way to a creek, drainage way, river, or ocean. Water travels down hills, across farm and ranch land, suburban lawns, and city streets on its way to the lowest point in the watershed.

Rain and snow that falls on Casper Mountain makes its way to the North Platte River through the many creeks, drainage ways, and draws that mark the local landscape. Whether the water flows year-round or seasonally these creeks and drainage ways provide a valuable surface water source for landowners and residents, and recharge groundwater and aquifers, as the water moves through the watershed. The creek, drainage and draw ecosystems serve as conduits for floodwaters, form wildlife habitat, and create interesting ever-changing landscape characteristics.

WE ALL LIVE DOWNSTREAM

We all live in a watershed, sometimes more than one! Watersheds vary in size and are as unique as individuals. Some have mountains and hills, others are nearly flat. Natrona County contains a portion of twelve (12) unique watersheds all draining directly or indirectly to the lowest point, the North Platte River. All of the watersheds on the continent are inter-related basins; therefore, what happens in one watershed effects a larger watershed downstream.

The health of the creeks and streams in any watershed is directly related to both naturally occurring events and human influences. A healthy watershed has clean creeks, productive riparian corridors, and stable well-vegetated creek banks. These components help keep water quality high, provide fish and wildlife habitat, control erosion, reduce flash flooding, and encourage dry season creek flows.

Downstream areas such as the North Platte River, are influenced by what happens upstream. A septic system that is not functioning properly on Casper Mountain, motor oil allowed to leak onto city streets, over-fertilizing a crop on a farm near Alcova, all have negative impacts on the North Platte River and connected downstream waterways all the way to the Mississippi River and beyond.

Water runoff from irrigation and rain washes motor oil, paint products, and fertilizers off streets, yards, and parking lots into gutters and storm drains. Unlike sanitary sewers, storm drains are not connected to wastewater treatment facilities. Storm drains carry runoff, ***untreated***, directly into creeks, drainages, and the river.

Caring for the Creek You Share

A creek flowing through property in a developed or urban area is a valuable amenity. Creeks and drainage ways on farms and ranches may be essential to support the desired land use.

All creek-side property owners share the responsibility for keeping their creek and its corridor healthy for those living and working downstream, to ensure water flow is adequate for desired uses and to support the wildlife that depend upon these fragile creek ecosystems. Property along a healthy creek has many benefits. A degraded creek causes problems for all its neighbors. Through proper stewardship of creek banks and riparian areas landowners can enhance the creek and their property, prevent creek bank erosion, reduce flooding, and improve or preserve water quality.

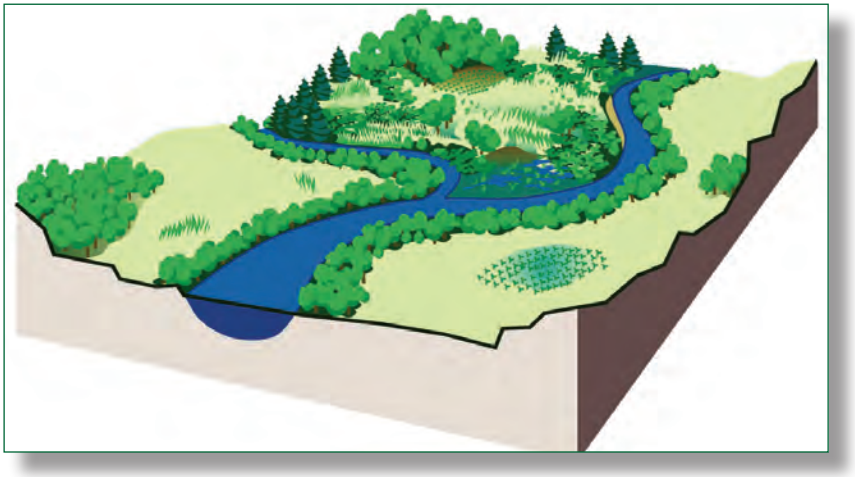
The characteristics of creek banks, creek channel, and vegetation vary naturally along the length of any waterway. To create and maintain a healthy creek, the best approach is not to change the natural watercourse unless absolutely necessary to resolve a severe bank erosion problem.

Sediment transported through a natural stream channel is dramatically effected when dams or diversions are constructed, and can reduce year-round or seasonal water flow. Low water flow, or no water flow, cause creek banks to become unstable and sediment to accumulate in the creek bed, particularly during dry seasons and drought cycles.

A thriving creek ecosystem is naturally diverse and dynamic; best when human interference is kept to a minimum. Careful consideration should be given before making even slight modifications to creek banks, creek beds, riparian zones, or bank vegetation. Simple alterations to the creek on your property may create significant impacts to your neighbors or creek-side landowners further downstream.

Getting to Know Your Creek

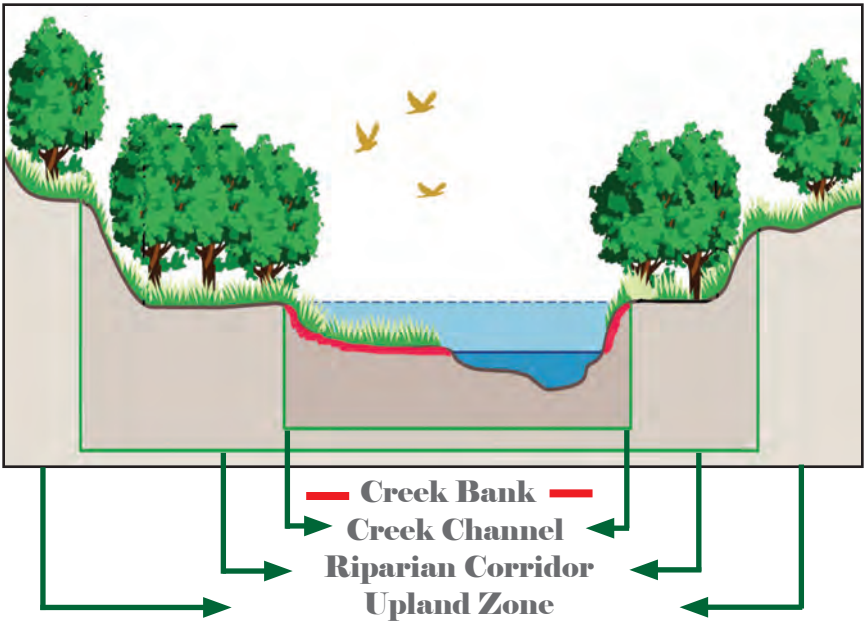
Looking out over the landscape of a watershed, it is easy to identify the viable creeks and streams by the presence of natural, lush vegetated corridors that line the banks of the waterway from the headwaters all the way to the point where it discharges into another waterway. This vegetated area, along with the associated waterway, is know as a *Riparian Corridor*. Healthy riparian corridors include an intact floodplain and well established, year-round vegetation.



While each creek, stream, and river has unique characteristics, all healthy waterways have the same fundamental components. In addition to a riparian corridor, there is a defined creek channel; the area of the riparian corridor that periodically or continually contains flowing water. The creek bed, or bottom, is composed of a mixture of gravel and sand with a limited amount of silt and sediment. The riparian area is free of trash and debris.

The sloping area between the water's edge and level ground is referred to as the creek bank or stream bank. Roots and spill-over vegetation from the riparian corridor help to stabilize the stream banks, filter sediment, and is critical in reducing soil erosion during seasonal runoff and high water events.

Components Of A Waterway



Small soil particles either in the creek bed or suspended in the water, are called sediment. Some sediment is needed to bring nutrients and mineral materials to aquatic ecosystems, but too much sediment can be harmful. Water with a high sediment load looks muddy or cloudy. Heavy spring runoff and flash flood conditions often cause high sediment loads. Sediment can accumulate and fill a creek bed, reducing the creek's ability to carry high runoff and flood water causing water to overflow the creek banks. A heavy sediment load fills natural pools eliminating shelter and spawning habitat, and diminishes food supplies for fish and aquatic insects.

Homes and other structures should be built in the Upland Zone safely away from the damp Riparian Corridor, the creek banks, and floodplain. Vegetation in the Upland Zone often includes naturally occurring native plants, shrubs, and trees that are more drought tolerant than the vegetation found in the Riparian Corridor.

Value of Riparian Corridors

Although riparian corridors cover only a small portion of the land within a watershed, these ecosystems are important to the plants, animals, and humans that depend on their unique functions.

- Riparian vegetation prevents the sediments and nutrients in surface runoff from entering a waterway. Roots and surface mulch in a riparian zone remove nitrogen and other pollutants dissolved in surface and ground water before it reaches the creek, improving and protecting water quality. The dense roots of this vegetation helps to stabilize the creek banks and minimize soil erosion.

- Riparian corridors and floodplains act as a sponge by absorbing floodwaters. The water is then slowly released over a period of time, keeping creeks flowing into the late summer months. Trees and shrubs in the riparian corridor and along creek banks help reduce erosion during high water and flood events.

- Healthy riparian corridors are among the most productive wildlife habitats, providing dense vegetation and a high diversity of plant species. Long, connected riparian corridors allow wildlife to travel safely between habitats, reduce the potential for over-grazing and excessive concentrations of single species populations. The riparian corridor trees and shrubs provide a canopy that shades and cools the water. Lower water temperatures encourage a diversity of aquatic life and decrease the potential for algae to form in the creek.

THE HEALTH OF YOUR CREEK

Many creeks in urban areas have been altered, channeled, or piped underground rather than left in their natural condition. Other urban waterways suffer from sedimentation, sewage, debris, and reduced water flow. Preservation of even small drainage ways is important as they carry water and nutrients into larger waterways. Healthy, intact creek ecosystems continue to thrive in many remote areas of Wyoming. Only a few creeks in urbanized areas have survived in a healthy, natural condition.

A creek's health reflects what is happening upstream and on the surrounding land. As ranch and farm land is developed and urbanized, waterways crossing the land will be influenced whether they flow year-round, seasonally, or only during storm events.

SIGNS OF A HEALTHY CREEK

Water Quality & Flow

- Cool, clear water free of pollutants, excess algae, and sediment
- Varied flow cycles

Creek Beds & Banks

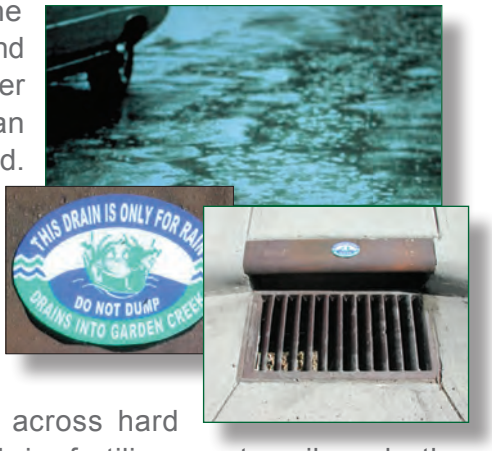
- Stable vegetated banks
- Presence of slow pools and fast running water over shallow, rocky stretches
- Abundant rock and various size clean gravel

Plants & Wildlife

- Native riparian tree canopy to stabilize banks, provide wildlife habitat, and keep water temperature cool
- Abundant native riparian vegetation which absorbs and stores runoff during storm or flood events
- Leaves, small branches, fallen logs, and other natural vegetation debris in the stream bed and along banks

THE HEALTH OF YOUR CREEK

In urban areas, as the natural landscape and open land is paved and developed, water from rain and snow melt can not percolate into the ground. The water flows from roof tops, across streets, and lawns as runoff into a storm drain system or directly into a creek, drainage way, or river.



As the runoff moves across hard surfaces it picks up dirt, debris, fertilizer, motor oil, and other pollutants. Urban storm drain systems transport the runoff, along with the debris and pollutants, untreated to creeks and rivers.

SIGNS OF AN AILING CREEK

Water Quality & Flow

- Excessive algae, suspended sediments, contamination from animal waste or sewage, presence of metals or other toxins
- High water temperature
- Reduced water flow

Creek Beds & Banks

- Loss of natural creek channel
- Excessive bank erosion, or deeply incised stream bed, large amounts of sediment impeding stream flow
- Still water, absence of pools, riffles, and clean gravel
- Litter, yard clippings, trash and other dumped debris

Plants & Wildlife

- Lack of diversity in flora and fauna
- Barren creek banks
- Invasive non-native plants compete with native species in the riparian corridor
- Diminished fish, amphibian, and aquatic insect populations
- Little or no shade from overhanging vegetation

Creek Care Stewardship

A landowner may have little control over the entire watershed, however diligence and cooperation with other creek-side landowners can reduce and prevent direct harmful activities on their property and downstream. Creek ecosystems are complex dynamic systems influenced by a wide variety of factors, and most often function best when human influences are kept to a minimum.

Learn what household, gardening, or commonly used products become pollutants when they enter a storm drain or creek. If proper use or disposal of any of these products is inconvenient, consider using an alternative product. Read labels carefully for proper use, storage, and disposable

Fecal coliform is a major pollutant in all waterways in the Casper Mountain Watershed, therefore it is essential to control pet and livestock access to creeks and riparian areas. Dog and cat feces add excessive nutrients and bacterial pollution to water, decreasing water quality causing unpleasant orders and health problems for humans. Pick-up pet waste in your yard and when walking your pet. Dispose of the waste in the garbage.

Horse and livestock manure is also harmful to water quality in creeks and streams. Action should be taken to avoid contamination of storm water and irrigation runoff. To minimize runoff from pasture land into a creek, keep the area between the pasture and creek well vegetated and limit or control grazing within the riparian corridor.

Creek Friendly Landscaping

In a developed area, a creek flowing through private property is a desired feature; creeks on farms and ranches may be essential elements to support the desired use of the land. Preserving and enhancing a creek's ecosystem can ensure the beneficial attributes of creek-side property ownership and support the desired land use, long-term.

A healthy urban creek ecosystem is complex. Rain fall, groundwater, surface runoff, structure placement, and creek-side landscaping are all important considerations. The impact of development can be minimized when structures and landscaping occur in the upland zone, preserving the natural riparian corridor, creek banks, and creek bed. Healthy riparian corridors, whether in urban or natural environments, are essential to healthy creeks.

In urban areas where riparian corridors have been eliminated, surface runoff carries gardening chemicals, fertilizer, sediment, and debris into the creek bed and erodes creek banks. Where riparian corridors are maintained, the natural vegetation filters surface runoff and shallow groundwater before it enters the creek.

The vegetation provides creek bank stability, shades and cools creek water flow, and provides wildlife and aquatic habitat.

LANDSCAPING TIPS

- Limit the use of gardening chemicals. Pesticides, herbicides, and fertilizers can be carried by surface runoff or groundwater into the creek. Fertilizers add excess nutrients, contribute to algae bloom, bad odors, and are extremely harmful to wildlife and potentially harmful to humans.

- Consider using compost and organic soil amendments instead of chemical fertilizers. Pull weeds before they flower to reduce the need for herbicides. Introduce natural predators such as toads, spiders, garter snakes, and ladybugs into your garden to reduce insect pests.

- Compost yard and lawn clippings away from the creek. Never dispose of lawn, shrub, or tree clippings in a creek, river, or storm drain. Soil and lawn clippings disposed in creeks become unsightly, destroy aquatic habitat and may worsen flooding problems. While clippings are biodegradable, the decomposing organic waste consumes the oxygen in the water that fish, aquatic insects, and native plants need to survive.

- Avoid hosing down paved surfaces. Don't rake, sweep, or blow leaves and lawn clippings into the street, creek, or storm drain. Place the leaves in a compost pile, away from the creek and storm drain, and use as fertilizer and mulch. If composting is not possible, bag the leaves and clippings and take the bags to the City of Casper Balefill Facility's composting area for others to use.

- Practice water conservation. Use a meter or timer to control water use. Over-watering (and over-spray) increases runoff to the creek and often contributes to creek bank erosion.

- Keep all non-native materials, such as trash, tires, metal, concrete rubble and other debris out of the creek channel. This debris contaminates the water, reduces channel capacity, and attracts nasty pests.

Landscaping with Native Plants

Native plants offer an attractive landscaping alternative to traditional turf grass and ornamental plants. They are naturalized to the local growing conditions: climate, altitude, and precipitation. Native plants generally require less water once established, less fertilizer and other soil amendments, and are more resilient to insects and diseases than non-native plants. Native plants can be incorporated into an existing riparian area to add variety and interest. They can also be used to create a new riparian zone to reduce bank erosion, filter runoff, and improve overall creek viability.

Replace turf grass in the upland zone with low maintenance ground covers, buffalo or blue grama grasses, open paths, or mulch to reduce irrigation water use and surface runoff. Where the neat trimmed look of grass is desired, native grasses or thyme lawns work well. Native grasses require less soil preparation when planting, require only occasional mowing, and are nearly maintenance free.

For creek-side landowners an important element of a landscape plan is to preserve and maintain the riparian buffer along the creek for bank stabilization and runoff filtration. Use water, yard and gardening chemicals sparingly in the upland zone to reduce runoff contamination. Routinely remove trash and debris from the creek and the riparian buffer. Refrain from diverting, damming, or redirecting the water flow. The health of a creek is improved by year-round water flow to reduce sediment and maintain a functioning riparian corridor.

RIPARIAN CORRIDOR NATIVE PLANTS

Lower Terrace to Water's Edge

Reed Grass	*Calamagrostis canadensis*
Water Sedge	*Carex aquatilis*
Nebraska Sedge	*Carex nebraskensis*
Beaked Sedge	*Carex utriculata*
Tufted Hairgrass	*Deschampsia cespitosa*
Small Fruit Bullrush	*Scirpus microcarpus*
Baltic Rush	*Juncus balticus*

Mid - Terrace *To* Top Of Bank

Shrubs

Sandbar Willow	*Salix exigua*
Planeleaf Willow	*Salix planifolia*
Peachleaf Willow	*Salix amygdaloides*
Bebb Willow	*Salix bebbiana*
Scouler Willow	*Salix scouleriana*
Red Osier Dogwood	*Cornus stolonifera*
Buffaloberry	*Sheperia argentia* - *Attractive to Birds*
Choke Cherry	*Prunus virginiana* - *Plant for Birds & Flowers*
Shrubby Cinquefoil	*Potntilla fruitcosa* - *Attractive Flowers*
Currants	*Ribes spp* - *Plant for Birds & Flowers*

Trees

Mountain Mohagany	*Cercocarpus montanus*
Hawthorne	*Crataegus phaenopyrum*
Water Birch	*Betula occidentalis*
Alder	*Alnus tenuifolia*
Boxelder	*Acer negundo*

The above partial list of riparian plant species was developed by the Wyoming Department of Game and Fish. The plant choices are extensive for riparian corridors in Wyoming. Consult an expert for help in choosing the most suitable plants for your creek, local climate, altitude, and specific creek conditions.

Living with your creek

Residents living next to a creek have additional reasons to be concerned with creek health. A healthy creek can increase property value, provide flood protection, provide an aesthetic and calming landscape, and prevent property loss due to erosion.

Soil erosion is a natural and necessary process adding important nutrients and mineral materials to aquatic ecosystems. Excessive erosion, whether caused by human, livestock, wildlife, or natural processes can result in excessive sediment in a creek, filling the creek bed, and reducing its capacity to carry runoff and flood waters.

When flowing water meets unprotected soil, erosion almost always results. Barren land and slopes, not just creek banks, can lead to creek sedimentation. Natural vegetation is the best defense against topsoil erosion from water and wind. Replant barren slopes or disturbed soils as quickly as possible. Native plants growing within the riparian corridor help to stabilize creek banks. A well-vegetated creek bank may be a property's best flood protection.

Check for creek bank erosion and excessive debris regularly. Correct any problems carefully and promptly. Re-vegetate creek banks with native plants and shrubs. Limit the use of gardening chemicals and fertilizers on creek bank, creek side, and riparian vegetation.

Stabilizing Creek Banks

Creeks are complex systems. They are constantly reshaping their channels through natural processes, scouring out side curves and depositing sediment inside bends as they meander along. A stream's natural tendency to meander can be aggravated by human activities. Increased volumes of storm water runoff into creeks, removal of natural vegetation, and upstream alteration of the creek channel may lead to erosion problems on banks that were once stable.

Stabilizing banks requires knowledge, expertise, and information relative to the history of the site. When considering repairs check the creek regularly, especially during storm events, and learn to spot problems. Some sediment and foam is natural. Excessive sediment, colored or oily foam indicate problems such as erosion or pollution upstream. If the problem occurs upstream, restoration efforts may be defeated unless the upstream problem is also addressed.

Always consider the least invasive bank stabilization options first; creeks are resilient and may not need extensive (or expensive) bank stabilization techniques. Techniques that use living materials, such as willows and native vegetation are often the most effective. Hard structures, such as rock and concrete-lined channels, tend to increase the water flow speed and therefore may create increased bank instability downstream.

Creek bank erosion that is extremely active should be monitored. Bare, vertical, and actively eroding banks are likely to need repair. Less severe problems may not require immediate attention, but treating a problem early may prevent costly fixes later. Consult an stream bank erosion expert, as some actions taken to protect creek banks in one area may have unforeseen consequences downstream.

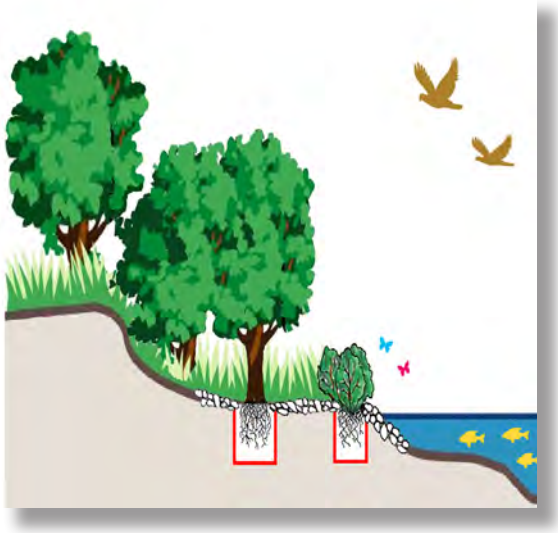
BANK STABILIZATION TECHNIQUES

Before starting a bank stabilization project remember to seek professional advice before taking any action. An expert may be able to identify simple, low-cost, and low-tech solutions for erosion control or riparian corridor enhancements.

If the native riparian vegetation has been depleted or removed but severe bank erosion has not yet occurred, it may be possible to re-establish or augment the remaining vegetation. Research what types of native vegetation to use for the particular site, how to plant and care for it.

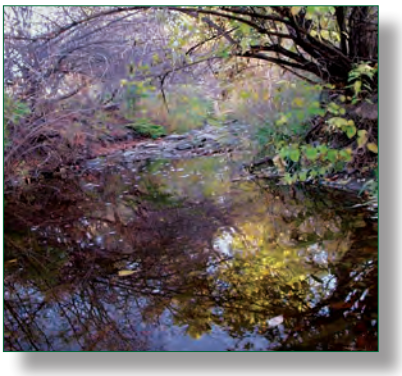
Modify steep banks to shallow or moderate slopes and re-vegetate with native riparian species. Live cuttings of willow or cottonwood driven into the bank, or bundles of live cuttings secured to the bank can be effective stabilization techniques. Cuttings should be harvested after dormancy in the fall and before bud break in the spring. They will remain dormant if stored in a cool dry place until planting season. Harvest willow cuttings long enough to extend at least 8 inches into the water table and 8-12 inches above the ground when planted.

Where existing bank vegetation is threatened or needs to be reinforced to effectively stabilize a creek bank, consider retrofitting existing small trees and shrubs with planting collars. Planting collars can be designed from a variety of materials including wooden beams and concrete boxes. Collars can be tailored to each site based on the unique needs and condition. Planting collars are often used to incorporate new trees and shrubs into existing vegetation or to add vegetation to hardscape areas. The collar provides a barrier between the plants and the hardscape without compromising long-term bank stability.



For severely sloping and eroding creek banks the most effective stabilization technique may be to terrace the bank and plant with native species. This is a relatively complicated process and should not be attempted without first consulting an expert, such as the Natural Resources Conservation Service (NRCS) and Wyoming Game & Fish for information and guidance.

Managing Woody Debris



Large woody material in a creek such as, fallen logs, stumps, root wads, and large branches are essential to a healthy waterway. The material dissipates stream energy, stores and distributes sediment, and creates channel features such as pools, riffles, and waterfalls. A moderate amount of such material can also provide natural protection for stream banks.

Fallen trees can deflect the water current away from highly unstable stream banks and dissipate stream energy that would otherwise potentially cause erosion to the banks of the creek. This naturally occurring debris also provides valuable habitat for fish, aquatic insects, and wildlife. Avoid removing natural debris from your creek or stream unless it is creating a serious flooding or bank erosion problem. If removal is necessary, seek expert guidance to carefully remove only the debris that pose a threat. Careful attention should be given to the possibility that debris removal may create a more serious threat downstream. When woody material is removed, streams tend to become more simple. They will cut off meanders, have long uniform riffles, begin to down-cut or erode laterally, and will lose much of their biodiversity.

Brush, weeds, grass clippings, or other small material should not be thrown into a creek or dumped on creek banks where it can be washed away. This small material could create a debris jam or block a culvert, causing flooding and erosion.

Nancy English Park Project

Garden Creek is the last free flowing stream coming down the face of Casper Mountain. Its headwaters flow through fractured limestone, sandstone, and granite until it tumbles over Garden Creek Falls creating a unique and spectacular natural mountain feature. Although identified as a Class 2AB trout stream by the Wyoming Department of Environmental Quality, ten years of ongoing water quality sampling indicates that the health of Garden Creek is rapidly deteriorating.

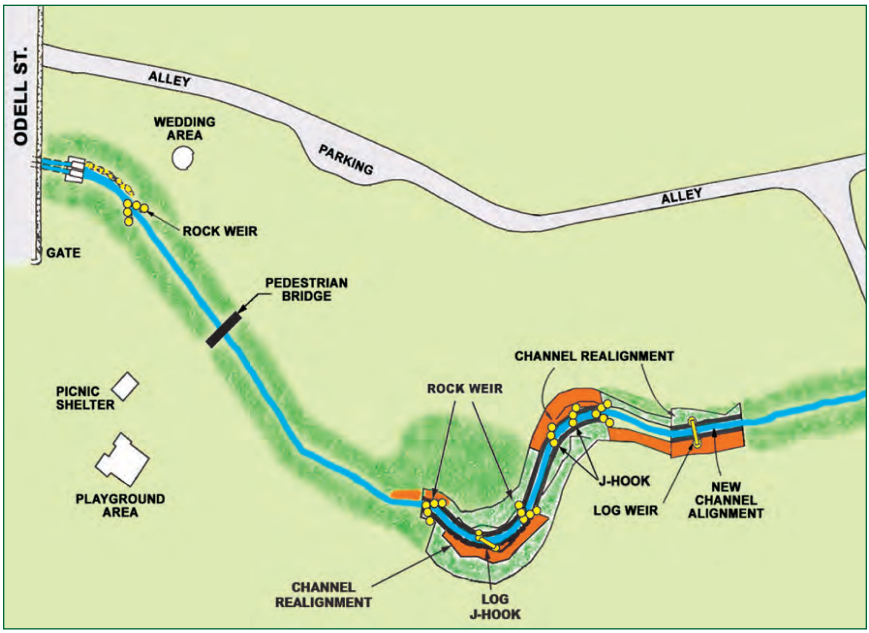
Garden Creek through Nancy English Park typifies the degradation that has taken place along the entire stream corridor. The portion of the creek that flows through the Park is the only portion of the creek, from headwaters to the North Platte River, that is not on private property. This City owned park provides a unique setting for a stream restoration project to address stream bank erosion, sediment control, improved riparian buffer and natural habitat along 2,000 feet of the creek.

The Garden Creek Stream Restoration Project is funded by the City of Casper with a 319 Grant from the Wyoming Department of Environmental Quality/U.S. Environmental Protection Agency.

Nancy English Park Project

Stream restoration requires technical evaluation, analysis, and planning. It is not an exact science. The characteristics of each stream (waterway) are unique, influenced by its natural environment, human impacts, and time. Restoration requires a holistic approach to ensure that slight modifications or corrective changes made in one area do not create harmful impacts upstream or downstream.

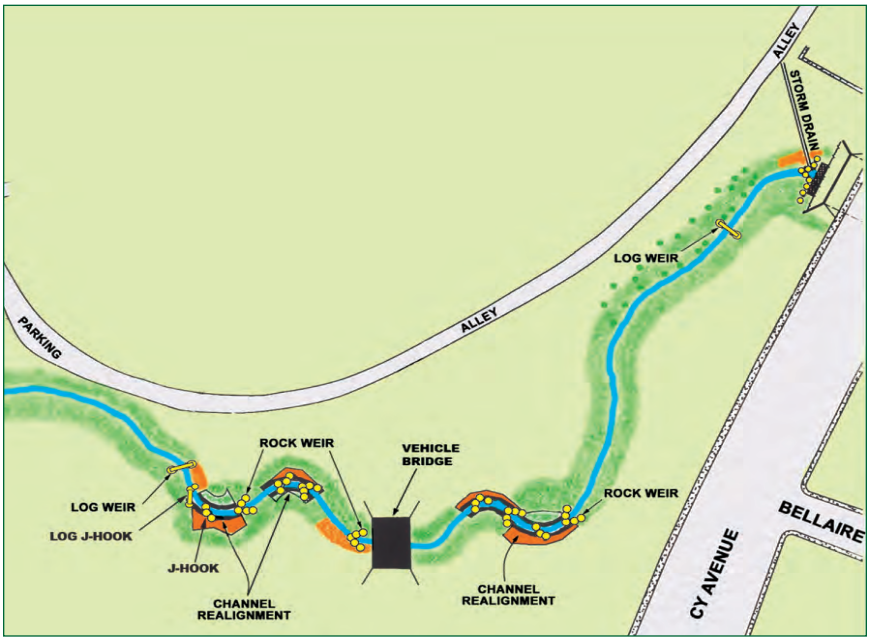
Prior to restoration, Garden Creek through Nancy English Park was characterized by many of the signs of a stressed or unhealthy waterway. Severe bank erosion and under-cuts increased sediment in the water and creek bed. The riparian buffer was thin, dominated by non-native vegetation and nonexistent vegetation. Trash and debris in the creek bed and along the creek banks was common. Throughout most of the year water temperatures were high due to reduced, shallow water flow. Ongoing water sampling indicated persistent high levels of pollutants such as fecal coliform.



Nancy English Park Project

The restoration design team, headed by Chuck Schmitt, Assistant State Conservation Engineer, Natural Resources Conservation Service, working in coordination with the City of Casper and Wyoming Department of Environmental Quality, developed the Project Design Plan. Construction of the plan hardscape elements was performed in the winter when the water level was low and the bank vegetation was dormant exposing the creek banks, the proposed riparian and buffer zones.

The creek banks were sloped back in open areas and a landscaping (no-mow) buffer zone was created and defined. Debris, non-salvageable and invasive vegetation were removed. The creek channel was realigned at specific points where severe erosion had influenced the direction of the water flow. Rocks and logs were carefully placed to reinforce the creek banks, redirect the water flow to reduce future bank erosion, and to create faster moving riffles and quiet pools.

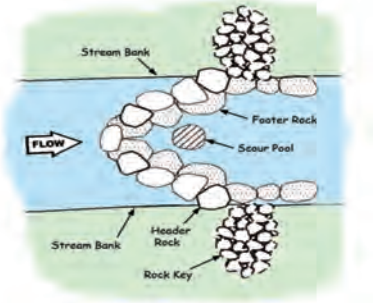


Nancy English Park Project

The Garden Creek Stream Restoration Project demonstrates the effective use of stream engineering structures, carefully designed and placed to reduce bank erosion and stream flow sedimentation. The type and placement of these structures requires a high level of expertise. The NRCS is available to assist landowners to assess and analyze the benefit of introducing similar structures into the creek running through their property.

Rock & Log Weirs

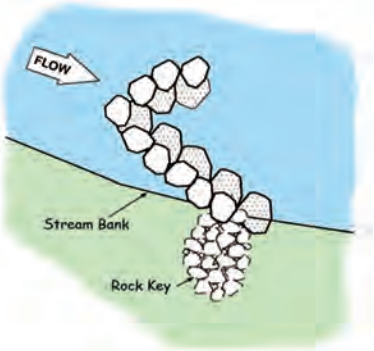
Rock weirs are structures which span the stream channel and redirect stream flow to the center of the channel to reduce bank erosion and undercutting. Rock weirs are often used immediately upstream from a bridge or other crossing structure where bank stabilization is especially critical.



Log weirs are similar in design to rock weirs and are a useful and natural appearing stream engineering structure. Rock and log weirs redirect the stream flow away from banks to reduce erosion and stream flow sedimentation until the natural vegetation becomes established to reinforce bank stabilize. Over the long term, log weirs will naturally decompose and may be replaced.

Nancy English Park Project

J-Hook Vanes



The J-hook vane is designed to reduce accelerated stream bank erosion on the outside bank of a bend along the stream channel. The vane is pointing upstream and anchored into the bank slightly upstream opposite the eroding or undercut bank. The water flows over the J-hook perpendicular to the "leg" of the vane, redirecting the faster moving water towards the center of the stream channel and the slower moving water to the outside of the stream channel bend.

Pools & Riffles

The stream engineering structures incorporated into the Garden Creek Stream Restoration Project Design Plan create areas of fast and slower moving water, small pools and riffles, and a healthy riparian buffer zone. All are necessary elements of a healthy, viable waterway. It will be the responsibility of all who use the Park, access Garden Creek upstream from the Park, and creek-side landowners to ensure the long term health of Garden Creek through the Park.

Nancy English Park Project

The Garden Creek Stream Restoration Landscape Plan was developed through a series of Neighborhood Meetings. Landowners adjacent to the Park and creek-side landowners offered native plant preferences and recalled native plants that historically dominated Garden Creek's riparian area. Working in collaboration with landscape consultant Larry Harms, beneficial and favored flowers, shrubs, and trees were selected to supplement the Park's native willows.

Non-native and invasive vegetation was removed during the construction phase of the project. Willows were utilized for creek bank stabilization adjacent to rock and log weirs. Additional willows were planted in selected areas of the buffer zone to reinforce potentially threatened creek banks. Large boulders, logs, mulch, and nearly 3,500 trees, shrubs, and plants were incorporated into the buffer zone to create a natural creek bank environment.

Buffer Zone Trees & Shrubs

Hawthorne

Mountain Mohagany

Late & Common Lilac

Gooseberry

Chokecherry

Nancy English Park Project

Silver Buffaloberry

Skunkbush

Rabbit Bush

Big Sagebrush

Woods Rose

Buffer Zone Flowering Plants & Vines

Rugosa Rose

Leadplant

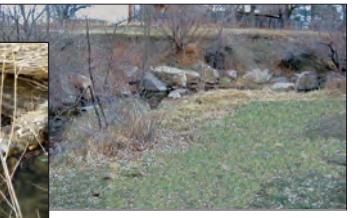
Virginia Creeper

Yucca

Blanket Flower

Project Photo Gallery















Project Contributors

The Garden Creek Stream Restoration Project through Nancy English Park was a four year project requiring the skills, expertise, resources, and commitment of numerous individuals and organizations.

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Casper College
Casper Rotary Club
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Friends of Garden Creek
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Keepers of the Creek
Our Lady Of Fatima Catholic Church
McMurry Ready Mix
Natrona County Commissioners
Natrona County Conservation District
Natrona County Road & Bridge
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Wyoming State Forestry
Wyoming Department of Environmental Quality
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West Wind Gallery

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Garden Creek Restoration Project

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