GORE CREEK
Restoring an Icon

AN OVERVIEW OF THE STRATEGIC PLAN TO RESTORE THE GORE

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Love VAIL
GORE CREEK

THE BACKGROUND

The high quality of life in Vail is inextricably tied to the health and beauty of its streams and rivers. Wildlife depend on these rivers for habitat, utilities need high-quality supplies to provide tap water and treat waste, and many downstream communities count on the water that flows through Vail for agricultural, municipal and other needs. And of course, we rely on the natural beauty of the valley to draw visitors.

THE GREATER WATERSHED

The Gore Creek watershed drains approximately 102 square miles of land that ranges in elevation from 7,700 to 13,200 feet above sea level. Gore Creek, the largest and best-known stream in the watershed, flows west from its headwaters in the Gore Range 19 miles through a narrow mountain valley. It is fed by numerous tributary streams until its confluence with the Eagle River. Because of its high elevation and significant winter snowpack, the watershed is the headwaters for a high density of creeks and rivers that flow through Colorado and beyond.

Approximately 63% of the watershed is forested, 14% is covered by shrub or brush, 14% consists of exposed rock or tundra, and 8% is occupied by urban development and transportation corridors. Even though urban development occupies a relatively small percentage of the watershed as a whole, it often occurs right next to Gore Creek and other streams, which means it has an outsize effect on water quality.

THE HISTORICAL CONTEXT

In 1962, a pair of ski enthusiasts who met at Camp Hale, a World War II training center for ski troopers, founded Vail Mountain, laying the groundwork for what would become one of the premiere mountain destinations in the world. A bloom of development beginning in the 1970s and 1980s, and the completion of Interstate 70, has resulted in a fragile balance between high alpine ecosystems and an urban resort environment.

Vail Ski Resort is now one of the largest developed ski areas in the country, covering about 5,000 acres of land and attracting more than a million skiers each year. The Town of Vail itself, populated by 5,000 full-time and 5,000 part-time residents, is nearing complete build-out and is now as densely settled as many larger towns and cities.

Though Vail is largely known for its exceptional skiing, the market for summer tourism is growing quickly and the Town is actively encouraging the development of even more recreational opportunities, such as golf, mountain biking, fishing and rafting. The quality of water in Gore Creek and its tributaries is critical to the Town's ability to continue to attract visitors throughout the seasons, and meet the needs of residents and downstream communities.

In 2011, even before the creek was listed, a group of local stakeholders, including the Town of Vail, Eagle River Water and Sanitation District, Colorado Department of Transportation, Eagle County, Vail Resorts, Vail Recreation District, the Town of Avon, Climax Molybdenum, and the Eagle River Watershed Council initiated a study to identify the causes of the poor aquatic health on Gore Creek, informed by years of testing from the U.S. Geologic Survey and the US Forest Service. The result was the 2013 publication of the Gore Creek Water Quality Improvement Plan, which recommends strategies to improve water quality in the greater area.

WHAT AFFECTS WATER QUALITY?

Urbanization in the valley has a large impact on water quality. Effluent inflows from the Vail Wastewater Treatment Plant and fertilizers used on lawns and gardens increase the concentrations of nutrients, such as nitrate and phosphorous, in the creek. Highway traction sand, de-icers and cinders increase dissolved solids, chloride and conductivity in streams. (In spring months, the process of melting snow carries sediment from the surrounding watershed into

the stream.) Cleaning agents, motor oil, and grease also frequently wash from roads into waterways. In addition, construction and landscaping activities often remove the streamside vegetation that naturally filters runoff. This, in turn, exacerbates the pollution problem, leads to higher water temperatures, and cuts down on the organic matter that is essential for the creatures that live in the stream.

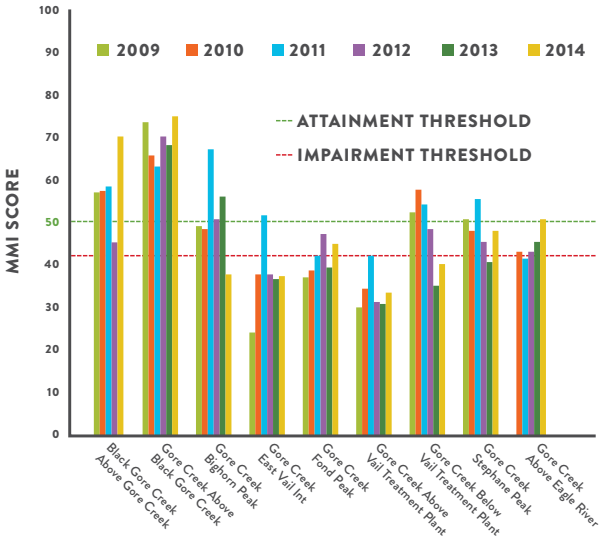
Because the pollution comes from many different sources, improving water quality will require changing the practices of a broad spectrum of community members, from landscapers, builders, and window-washers to residents picking up pet waste and town staff washing vehicles and maintaining facilities, among many others.

HOW IS WATER QUALITY DETERMINED?

Biological monitoring of Gore Creek involves observing the creek's various plants, aquatic insects, fish, and animal species. Bottom-dwelling, or benthic, macroinvertebrates are small aquatic animals without backbones, such as mollusks or insects, that can be seen by the naked eye. Macroinvertebrates are used to assess the impacts of pollution on water quality because they have limited movement, specific adaptations to their environments, high reproductive rates, relatively short lifespans, and varying sensitivity to pollution.

Unfortunately, the results proved that macroinvertebrate populations in Gore Creek are far below the levels found in healthy ecosystems. In fact, recent research shows that the health of aquatic life in Gore Creek generally parallels the patterns and density of urban development. In polluted areas, pollution-tolerant species like certain midges and worms consistently replace pollution-sensitive species, such as mayflies, stoneflies, and caddisflies as indicated by the multimetric index (MMI).

GORE CREEK MMI SCORES: FALL 2009 – FALL 2014



Conditions in the creek are impacted due to the level of urbanization through Vail's core commercial district, and receive the worst scores in developed areas. Conditions improve somewhat below the Wastewater Treatment Plant before declining again towards Gore Creek's confluence with the Eagle River, but largely, scores are still failing.

THE CONSEQUENCES OF POOR WATER QUALITY

In 2012, after numerous assessments of the health of the macroinvertebrate community, the Colorado Department of Public Health and Environment (CDPHE) Water Quality Control Commission (WQCC) listed Gore Creek on the Clean Water Act's Section 303(d) List of Impaired Waters.

During the listing process, WQCC assigned a "provisional" status to Gore Creek, which means that there was no single identified pollutant by CDPHE, rather there are multiple causes.

THE CHALLENGE

The Town of Vail is committed to restoring the quality of the water in Gore Creek to ensure it is permanently removed from the list of impaired waterways. Numerous factors, including climate, geology, soils, land-use activities, drainage patterns, and vegetation, contribute to the quality of the water, but the Town of Vail can exert direct control over only three, which are the focus of this Plan.

The Gore Creek Strategic Plan pursues two themes for improving and protecting water quality in Gore Creek and its tributaries: **reducing pollutants** and **interrupting the transport pathways** that carry pollutants into streams.

POLLUTANTS FROM URBAN RUNOFF

Construction activity, fine metal dust from passing cars, highway de-icing products, cleaning detergents, solvents, herbicides, insecticides and fertilizers all contribute to pollution in Gore Creek. In particular, many pesticides are highly toxic to fish and aquatic insects.

DRAINAGE FROM PAVEMENT AND OTHER IMPERVIOUS SURFACES

Increases in the amount of hard, impervious surfaces such as roofs, roads, parking lots, and pedestrian walkways are one of the most visible impacts of urbanization. These hard surfaces speed the movement of water across the land and through the town's stormwater drainage structures, carrying pollutants directly into streams rather than allowing them to be absorbed through the natural filtration systems in vegetated areas.

LOSS OF VEGETATION NEAR GORE CREEK AND ITS TRIBUTARIES

Vegetated areas slow the speed of runoff as it moves across the landscape. This, in turn, increases infiltration to the soil and helps capture and transform chemicals and sediments that would otherwise find their way to the stream. Healthy riparian areas also stabilize stream banks and reduce the damaging effects of floods. Once vegetated buffers are removed or altered, sediment, nutrients, pesticides, and fertilizers can more easily reach the stream. As a result, aquatic food sources, shade, and complexity of the habitat all diminish, potentially sending ripple effects through the ecosystem.

THE SOLUTIONS

The Town of Vail recognizes that it has a significant impact on and responsibility to the health of Gore Creek. Starting in 2011, the town took action to improve water quality by launching a public-education campaign, enforcing public stream tract property violations, developing stormwater control projects, and modifying the Town's pesticide use, among other efforts.

Following on the heels of its progress, the town and a wide array of community members must collaborate to make a lasting change in water quality. As noted in The Challenge previously, restoring Gore Creek in 2016 and beyond requires preventing pollution and, where that can't be achieved, disrupting pollution's pathways.
The following recommendations use five different strategic approaches to achieve those ends.
For a complete list of actions, please see the full Gore Creek Strategic Plan (available at lovevail.org).

EDUCATION AND OUTREACH

The Town of Vail and its partners already conduct outreach to inform the public about environmental issues and how they can do their part. Vail runs a recycling program and maintains trash containers and pet bag dispensers in public parks, which prevent waste from washing directly into streams. Every year, the Town of Vail partners with the Eagle River Watershed Council to organize river clean-up days, when hundreds of volunteers pick up trash along highways and watercourses. The Eagle River Watershed Council also offers school programs about aquatic and riparian ecology and the importance of water quality.

Despite these efforts, few residents understand what a serious challenge Gore Creek is facing, so public education is critical. Large periodic influxes of visitors and second homeowners make it even more challenging to shift individual behaviors at the scale necessary to effect change. But detrimental activities, from the overuse of pesticides to the improper disposal of snow, could be changed through a well-designed campaign with consistent and attractive branding.

Water-Quality Literacy

We all need to know the causes and consequences of low water quality in order to understand how and why to restore it. Here are a few ideas that are part of the plan:

- Conduct field trips where town staff and others could discuss key areas in need of revegetation or better structural stormwater controls, such as man-made ponds, drains, or vaults that capture sand.

- Partner with nonprofit organizations to run trash clean-ups, volunteer revegetation projects, and other activities that educate citizens on the importance of riparian areas and how wise landscaping can support the health of the ecosystem and prevent property loss to the stream.

Municipal Maintenance and Management

Town of Vail facilities should serve as a positive example of superior stormwater management. The plan recommends the town:

- Mark all storm drains in Vail with a message warning that the structure drains to Gore Creek.

- Post a service phone number on trash, recycling, and pet waste containers in public parks to encourage people to reach out when they need to be serviced.

VAIL, COLORADO

GORE CREEK

102 SQ. MILES DRAINED

13,200 PEAK ELEVATION

19 MILES LONG

7,700 BASE ELEVATION

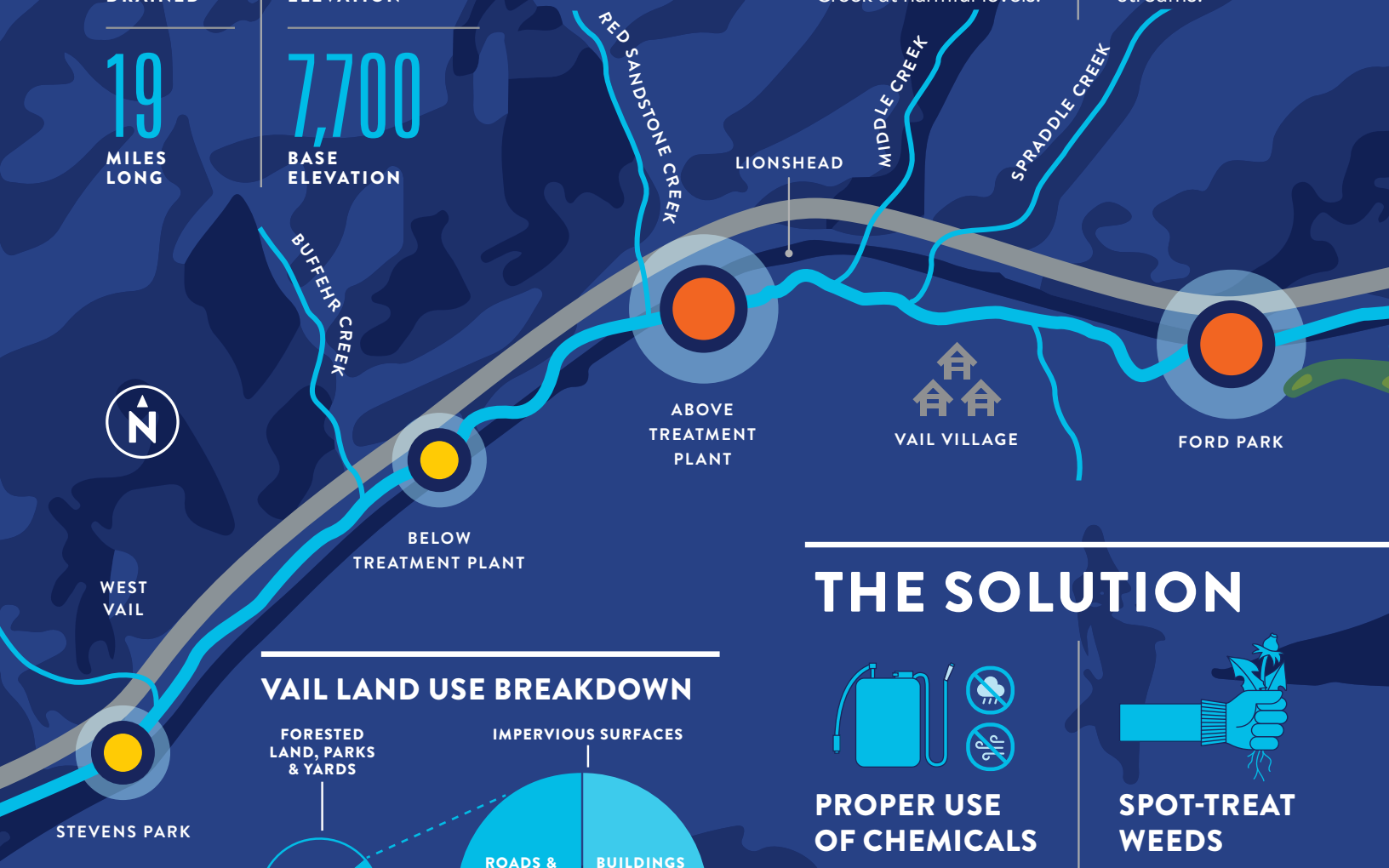
THE CHALLENGE

IMPROPER USE OF CHEMICALS

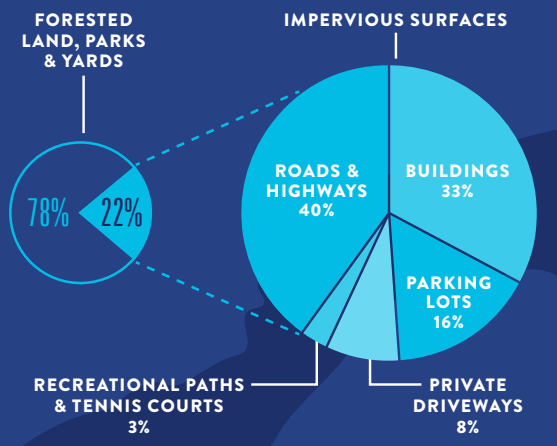
When pesticides or fertilizers are applied incorrectly, on windy days, or before a storm, they can make their way into the Creek at harmful levels.

WINTER MAINTENANCE

Traction sand, de-icers and cinders used to treat icy roads increase dissolved solids, chloride and conductivity in streams.



VAIL LAND USE BREAKDOWN



THE SOLUTION

PROPER USE OF CHEMICALS

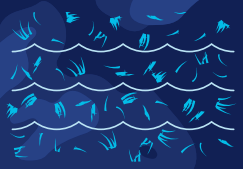
Avoid the use of pesticides or fertilizer under windy conditions or when rain is forecast. Remember: The Label is the Law.

SPOT-TREAT WEEDS

Reduce the use of chemicals by removing weeds by hand and spot-treating critical areas.

PAVED SURFACES

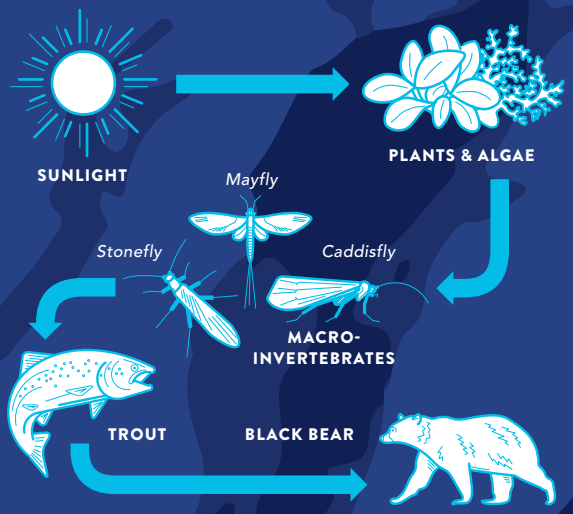
Parking lots, driveways, sidewalks, and other "impervious surfaces" speed the flow of water—and pollutants—to streams.



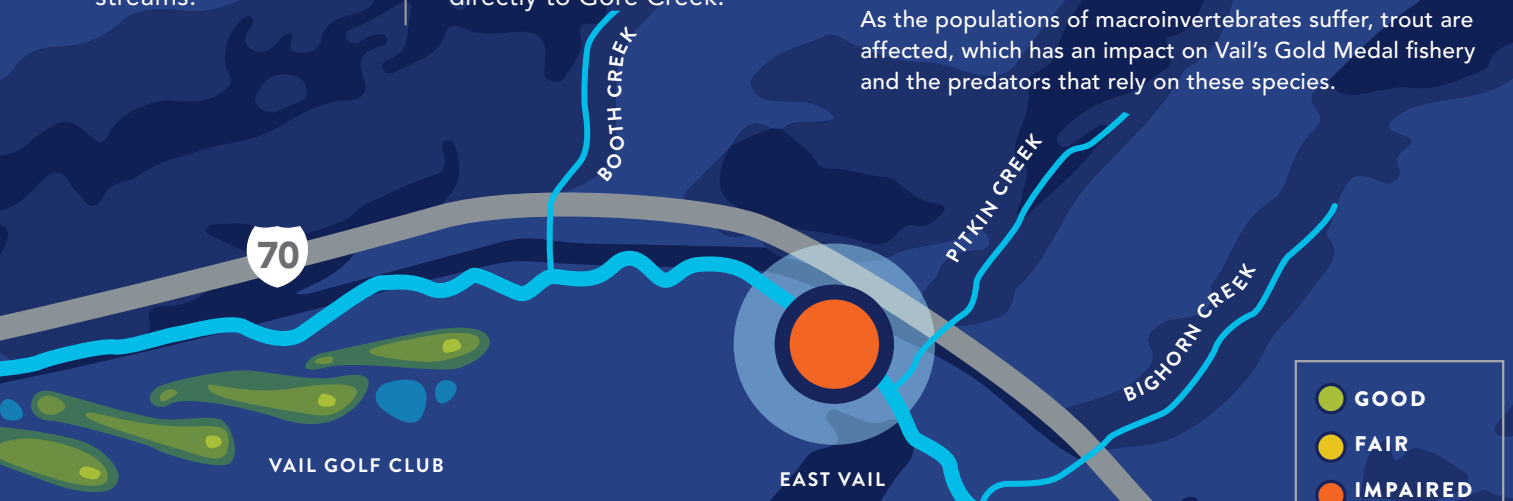
TREATED GRASS CLIPPINGS

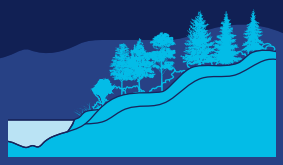
When residents or business mow their lawns and sweep or spray grass clippings onto paved areas, rainfall carries fertilizer and pesticides directly to Gore Creek.

ECOSYSTEM DISRUPTION



As the populations of macroinvertebrates suffer, trout are affected, which has an impact on Vail's Gold Medal fishery and the predators that rely on these species.





MORE NATIVE PLANTS

Add trees and shrubs to your yard to capture and hold rainwater before it can reach the creek.

PROPER DISPOSAL

Dispose of garden chemicals correctly by taking unused products to your local household hazardous waste site.

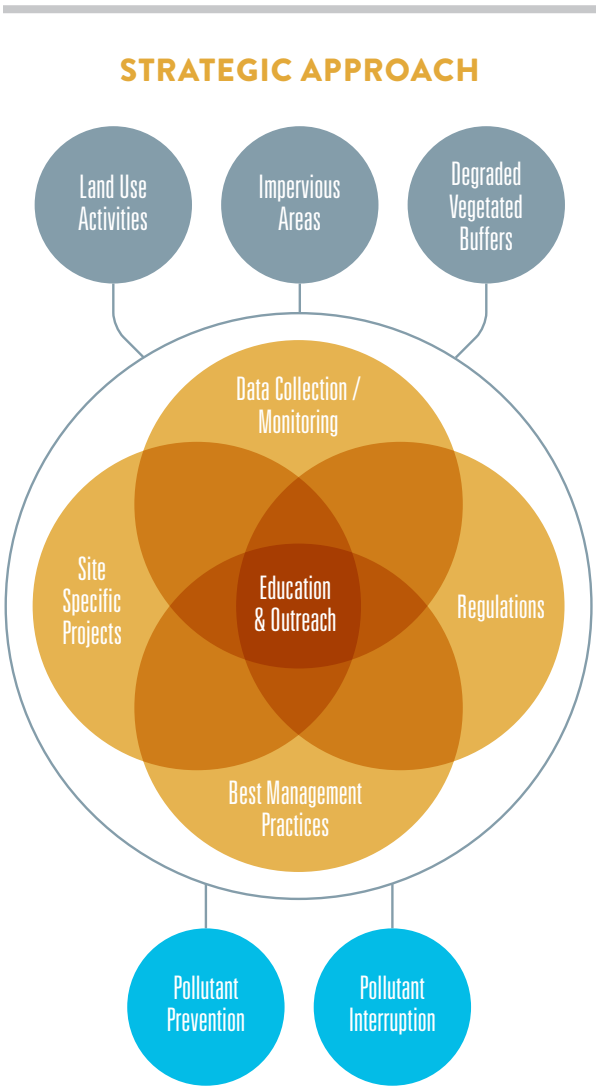
HOW IS WATER QUALITY DETERMINED?

Macroinvertebrates are used to assess water quality because they have limited movement, high reproductive rates, and varying sensitivity to pollution. Data shows that macroinvertebrate populations in Gore Creek are well below healthy levels, paralleling the density of urban development.

Management of Creekside Landscapes

Changes in the management of creekside landscapes throughout Vail could slow the runoff that carries pollution into Gore Creek. To support this, the plan recommends the town:

- Offer classes and seminars on ecologically managing yards, gardens, and other creekside areas for homeowners, contractors, homeowners' associations, landscaping companies, and commercial businesses.



- Develop Project Re-Wild, a public assistance program designed to help improve vegetative buffers on private property.

- Develop an annual "Creek Friendly Lawn" competition that recognizes properties with vegetative buffers that are both beautiful and effective at controlling urban runoff. The town will use the competition results as a marketing tool to promote Project Re-Wild.

Commercial Activities

The Town of Vail is informing and educating business owners and managers of how to prevent pollution associated with their field by:

- Reach out directly to landscaping companies and other professionals who apply pesticides to make sure they know how to reduce the impacts of spraying and mowing in riparian areas.

- Organize free or low-cost Erosion and Sediment Control training courses for Town of Vail staff and local contractors and builders.

Online Information and Resources

The LoveVail.org website is always being updated to include new program information, including the Gore Creek Strategic Plan, stormwater basics, pollution prevention, regulations and policies, opportunities to get involved, and detailed resources for specific audiences, including residents, businesses, construction companies, teachers, property managers, homeowners' associations, and municipal staff.

BEST MANAGEMENT PRACTICES

The Town of Vail has adopted a number of procedures and permitting processes that protect the water quality in Gore Creek, but additional policies improve practices and ensure they're followed even as seasonal employees leave and new employees are hired. The town has also invited partner agencies that work in and around Vail, such as CDOT, Vail Resorts, Eagle County, Eagle River Water and Sanitation District and utility companies, to adopt similar practices.

Reduce Runoff and Erosion

Design development codes that increase pervious areas, such as green spaces, native areas and gardens; minimize connections between hard surface areas; and keep as much sediment on site as possible during and after construction. The plan recommends the town:

- Develop an Erosion and Sediment Control plan on municipal sites that are near bodies of water or that have disturbed areas greater than 500 square feet.
- Establish an Erosion and Sediment Control certification program for contractors and require certified inspectors for all town projects.
- Develop a Town of Vail-specific Erosion and Sediment Control manual that addresses Vail's unique biological and development conditions.

Prevent the Transport of Pollutants

Town staff frequently clean vehicles and do maintenance tasks that could result in a spill of hazardous materials. They already use good housekeeping practices, such as isolating dirty wash water, minimizing waste generated by car maintenance, and preventing the discharge of fuels into stormwater drains. The town is adopting even more practices that contribute to creek health, for instance:

- Label storm drains at key municipal facilities so staff don't wash vehicles in areas that drain to Gore Creek.
- Use non-hazardous cleaners and solvents and steam cleaning or pressure washing when possible.
- Move snow storage areas that are currently located near unprotected bodies of water or storm drains and research alternatives to cinders.

Minimize Pollution

The most effective approach for controlling nonpoint source pollution is, generally, reducing pollutants at their many sources, for instance:

- Use the least harmful pest-control practices possible, such as hand-removing invasive thistle.
- Treat unused pesticides, herbicides and insecticides as hazardous chemicals and dispose of them and their containers properly.
- Postpone pesticide and fertilizer applications on windy days or immediately before a big storm.

Reduce Road Runoff, Operations, Repair and Management Impacts

The town is reducing pollution by asking crews to restore vegetation after soil is disturbed, appropriately disposing of construction waste, and judiciously using pesticides, herbicides, fertilizers, de-icing salts, and other chemicals.

Develop and Maintain Stormwater Controls

At its most basic, an effective stormwater control program involves regularly inspecting and repairing stormwater infrastructure and monitoring all maintenance activities. The Strategic Plan includes developing standards and checklists for inspection and maintenance and establishing a database to track stormwater infrastructure maintenance.

Maintain Vegetated Buffers

In Vail, historically, building patterns and unfettered public access to the stream have damaged or killed large vegetated areas, disrupting important habitat and compromising water quality. The town is working to revegetate streamside zones on town property and to develop a monitoring, management and maintenance program for all publicly owned streamside areas.

RULES AND REGULATIONS

The town already requires contractors to control pollution and erosion at construction sites, secure stormwater quality permits, and develop stormwater management plans for projects a half acre in size or bigger. The town has also established design requirements that encourage new development to preserve existing vegetation and be sensitive to natural features like wetlands. The town is also improving its land use and development code to better align with EPA standards in several ways:

- Maintain site hydrology so that the average runoff on a site matches the natural state before development and requiring stormwater management plans for development on properties near bodies of water or areas that have greater influence on water quality, such as wetlands.

- Protect areas that are important to the health of local waterways or susceptible to erosion to limit risks to water quality, by mapping wetlands, stream corridors, and important vegetated buffer areas in town and prohibiting the development of aesthetic or chemically treated water features, such as pools, hot tubs, and artificial ponds, in riparian zones and wetlands.

- Reduce pollutants by requiring professionals who plow snow, apply pesticides, and landscape to participate in formal training in water quality best management practices, require hazardous substances to be stored at least 150 feet from any body of water, and adopt a comprehensive program to systematically find and eliminate sources of pollution that are washing into storm drains.

- Enhance streamside vegetation by restricting the activities allowed in and near streams and require that the areas where businesses and residents are encroaching on town property around Gore Creek are cleaned up and restored.

- Reduce impervious areas and implement runoff controls by encouraging more low-impact development techniques, such as curbless roads, pervious pavement materials, and bioretention areas; which are areas with grass, shrubs, and trees that help filter runoff.

DATA COLLECTION AND RESEARCH

Decades of research informed the development of this plan, and more research will be needed to judge its success and make informed decisions in the future. The town is collecting more data while developing new efforts that fill important gaps, for instance:

- Continue to support research done by USGS, Colorado Parks and Wildlife's River Water program, and Black Gore Creek traction sand monitoring and coordinate with the Eagle River Water and Sanitation District to collect and analyze macro-invertebrate samples and commission aerial photographs to make maps of impervious surfaces at least every 10 years.

- Use satellite images from Eagle County to create maps of the drainage basin and make models that simulate how water moves across the land so the town can more effectively and inexpensively place stormwater-control structures in the future.

- Create a model of the water and pollutants moving through the watershed to better understand their effects on the macroinvertebrate community.

SITE-SPECIFIC PROJECTS

Many of Vail's structures, parking lots, public paths, and roadways have been developed close to the stream banks and are often designed to funnel water away from buildings as quickly as possible. Landscaping often butts right up to the stream edges, making it easier for pollutants to find their way into the streams. Constructing stormwater control structures, including mechanical filters, sediment traps, swales, pervious pavement, and sand + oil separators, and restoring vegetation in stream corridors play critical roles in interrupting the pathways that transport pollutants into streams. The town has already reduced its use of herbicides and pesticides throughout the town, stabilized the stream bank near the library, eliminated turf areas along the Gore Valley Trail, and reseeded the hillside along Ford Park, putting significant momentum behind this broader initiative.

This plan represents an investment of $9 million in program development, capital projects and regulatory changes, and another $285,000 in recurring maintenance, program support and personnel costs.

THE CONCLUSION

The challenges facing Gore Creek did not arise overnight, and they certainly won't be solved overnight. To address the complex matrix of pollutant sources, increases in impervious surfaces, and a lack of vegetation, we all need to do our part. Thankfully, a little wild goes a long way.

The town's efforts through the Strategic Plan should go a long way toward reviving the aquatic life in Gore Creek. But the causes of the decline are numerous and widespread, so the town cannot succeed on its own. Whether your yard abuts the creek or you live high on a hill overlooking the valley, we want you to know: A little wild goes a long way. Restoring native vegetation helps filter pollutants and provides habitat for the wildlife that inhabited the valley long before the resort and the town blossomed. Replacing part of a turf lawn or paved surface with native Colorado shrubs grasses, and wildflowers will help keep pollution out of Gore Creek. If you're a year 'round resident or a "local for a day;" join the Town of Vail in putting the wild back in Gore Creek.

For more information and
to see the full report go to
lovevail.org

ACKNOWLEDGEMENTS

The Town of Vail would like to thank the following people for their enormous contributions in recognizing the challenges facing Gore Creek, discussing possible approaches, and ranking solutions in terms of impact and feasibility.

CONTRIBUTORS

- Colorado Department of Transportation
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- Land Planning Collaborative
- Watershed Environmental Consultants, Inc.
- Eagle River Watershed Council
- Walking Mountains Science Center
- Eagle River Water and Sanitation District
- Vail Resorts
- Alpine Engineering, Inc.
- Vermilion Design + Digital
- SGM
- Timberline Aquatics

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