The Place We Cross the Water:
Whychus Creek

PRODUCED BY

THE UPPER DESCHUTES WATERSHED COUNCIL

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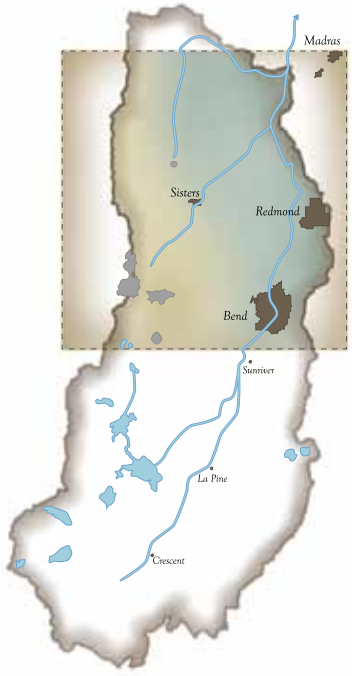
The Place

WE CROSS THE WATER

WHYCHUS CREEK

Whychus Creek is the place we cross the water. As a community, it is up to us to choose how we affect the water in our crossings.



UPPER DESCHUTES SUBBASIN

An Illustrated Map of

WHYCHUS CREEK

Whychus Creek flows out of ancient glaciers in the Three Sisters Wilderness to carve through steep boulder canyons. Downstream, Whychus sidles past pine forests and the community of Sisters to stretch through arid farmland and high desert rimrock. After a journey of 41 miles, Whychus winds around alders and sagebrush to converge with the Deschutes River.

Ways of Seeing:

The Place We Cross the Water

"To walk along Whychus Creek is like walking on a rainbow."
Cassie Huber AGE 16

This is a story about a watershed. Told through many voices and with images created by many different hands, *The Place We Cross the Water* tells the story about the health of the Whychus Creek watershed. Relatively speaking, the Whychus Creek watershed is healthy. It has been spared from the large scale insults and violations that many watersheds throughout the country have suffered. It does not have streams that are toxic or polluted beyond repair, it has not been completely deforested, and its creeks have not been cemented over by high rises or subdivisions. However, the watershed is not without its problems.

PHOTO **NATALIE WEIGAND**

The purpose of this booklet is to explore the health of Whychus Creek, including the good and the bad, in creative and thoughtful ways. The spirit of this publication dwells within the passionate words and artwork of local community members and students who have connected to the creek in their own ways. We hope that floating somewhere among the confluence of local inspiration and watershed information, you too will find a personal connection to Whychus Creek.

Sisters High School student Cassie Huber expressed, "To walk along Whychus Creek is like walking on a rainbow." With journal writing and students' sketches penciled streamside, through the brushstrokes of a painting born on a New Year's Day hike, punctuated by the vibrant images of the multi-faceted watershed itself, and woven with the stories of the restoration work of many, this booklet reveals what happens when a creek meanders through history as a creek, then a canal, and then a creek again.

We all connect to special places in unique and personal ways, and *The Place We Cross the Water* invites multiple ways of learning about Whychus Creek and its watershed. The main body of the booklet offers an inspiring overview of this Central Oregon watershed. The accompanying ecological supplement provides a more focused examination of the watershed indicators used to communicate about stream health. It is our hope that, whether read together or separately, these two resources create inspired and informed ways of knowing *The Place We Cross the Water.*

PHOTO **BRIAN HUDSPETH**

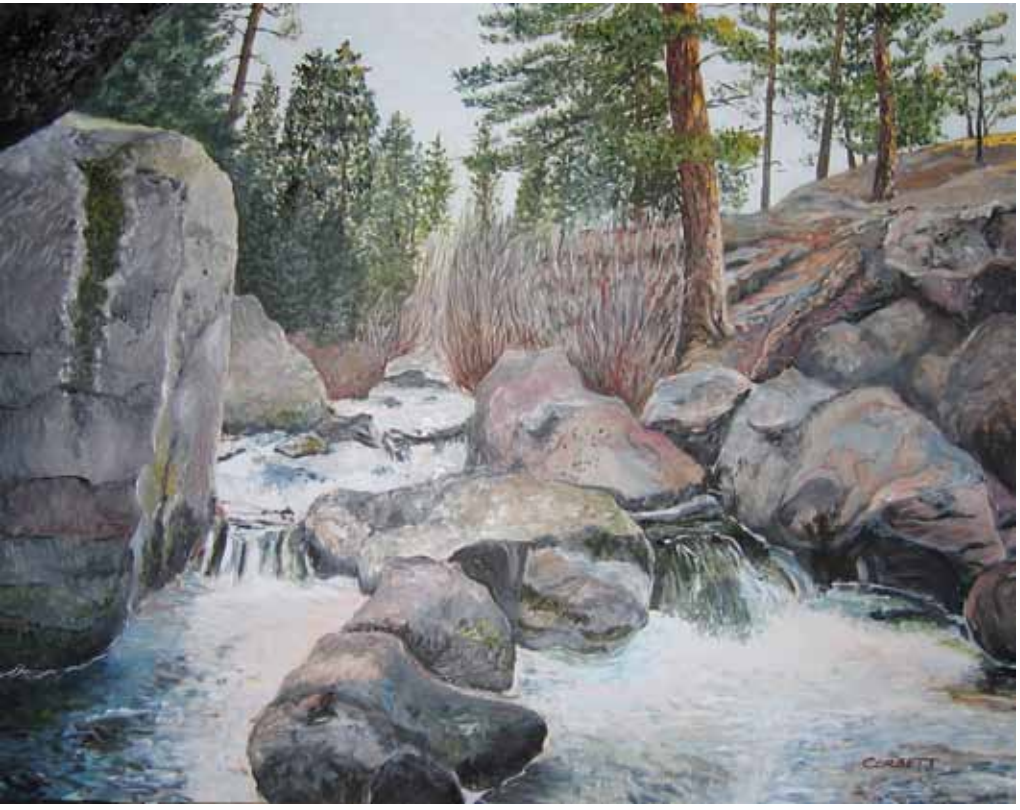
A series of glaciers in the Three Sisters Mountains provide the source of waters for Whychus Creek.

Who I Am

I am Whychus Creek and I want my story to be heard. I begin in the icy glaciers of Middle Sister. Every year the snow melts and my energy is back. I provide habitat for fish and irrigation for my town of Sisters and I keep the riparian zone around my banks healthy and thriving. I am pure because my water comes from a pure and beautiful place. Once, a few decades ago, people came with bulldozers and straightened my body. They took away my meandering curves and changed the fish habitat. Now, the steelhead who used to thrive in my waters are gone, only a memory. I used to be called Squaw Creek but with the generations, my name has changed.

To the other creeks, I send a message: no matter how much people take from you and damage you, just keep flowing because soon people realize that they need you.

Mackenzie Williams AGE 16



WhyChus...creeks
of mountain snow melt

North Sister Middle Sister South Sister Broken Top
braided creeks joining
to rush over basalt
and pool drop
singing to
winds thrumming
through fir, pine and alder

and yet it brings a quiet peace
a place to rest the beating heart
WhyChus

Glen Corbett NEW YEAR'S DAY 2005

PHOTO **GREG LIEF**

Creek to Canal to Creek:

Abandonment and Embrace

New life for an old creek

Once a creek, then effectively a canal, and now slowly emerging as a creek again, the 41 miles of Whychus Creek have evolved through a perceptual and literal history of abandonment and embrace. Just as Whychus Creek's name has been changed and changed back, the path and personality of the creek has been altered too. Referred to as Squaw Creek for over a hundred years, records from the 1855 Pacific Railroad Reports indicate that Whychus was its historic name. Derived from the Sahaptin language, Whychus means: *the place we cross the water.*[1]

Whychus Creek has been referred to with different names as it has meandered through different eras, embodying shifts in perceptions about the value of the creek. As the creek has been named and renamed, it has been subsequently repressed and embraced. Born in Sisters in 1918, local homesteader Jesse Edgington once referred to this evolving perception of Whychus Creek: "As far as taking any care of Squaw Creek or anything like that, that was just somebody else's concern. I think that there is a vast amount of caring now. People that are here see the potential of a stream going through town, a steady stream, not an off and on one."[2]

This creek to canal to creek story of Whychus Creek has been woven through its history. When Whychus was initially referred to as *Whychus*, it was a true creek that flowed and ran wild. Not long after the name was changed to Squaw Creek in the late 1800's, the creek became used as a canal and its water was spread across farmland. Diversions for irrigation began in 1871 and by 1912, sections of Whychus Creek were parched, and hot, and dry.[3]

For almost 100 years, Whychus Creek was a virtual canal and it was treated as such. As local historian and author Martin Winch proclaims in *The Biography of a Place*, "The fishery notwithstanding, most persons had the attitude that stream water running past your land in its usual and accustomed way was simply going to waste."[4] However, by 2005, the same year when the final approval was given to change the name of the creek from the derogatory word Squaw back to it historical name, Whychus, local organizations, community members, and landowners were working hard to return Whychus Creek its waters.

PHOTO **LESLEY JONES**

Emerging out of the rimrock canyon walls, cold groundwater recharges the waters of Whychus Creek.

The actual path of the water of Whychus Creek from source to mouth also tells the story of a creek that becomes a canal that becomes a creek. Just below its headwaters in the icy glaciers of the Three Sisters, Whychus Creek rushes as a dynamic and cold mountain stream around 180 cubic feet per second.[5] After it drops dramatically through steep boulder canyons surrounded by lush firs, the steepness of the stream channel decreases and Whychus winds through warm ponderosa pine forests. The majority of the waters of Whychus Creek are diverted out of the stream above the City of Sisters and, during the hot summer months, the streambed trickles with barely more than 10% of its water. As it continues to hesitantly meander through meadows and rimrock canyons 20 miles downstream from the City of Sisters, Whychus Creek then becomes a cool flowing creek again as it is recharged and refreshed by Alder Springs. At its mouth where it meets the Deschutes River, Whychus Creek summer flows can reach about 60% of their dynamic upstream counterparts. [5]

The perception of Whychus as once a creek, then a canal, and, slowly a creek again, is an outgrowth of the community that surrounds the creek and either chooses to abandon or embrace it. Both the historical and on-the-ground abandonment of Whychus Creek reflect the perception of its community at the time. The evolution of Whychus Creek from a creek to a canal to a creek exemplifies a shift in cultural perspectives and values. The health, the mere existence, of Whychus Creek and its surrounding watershed, depends upon the perception and vision of those who cross the water and tell its story.

When the majority of the water is diverted out of the creek during the hot summer months, the temperature in Whychus Creek becomes too hot for native fish.

PHOTO **JIM YUSKAVITCH**

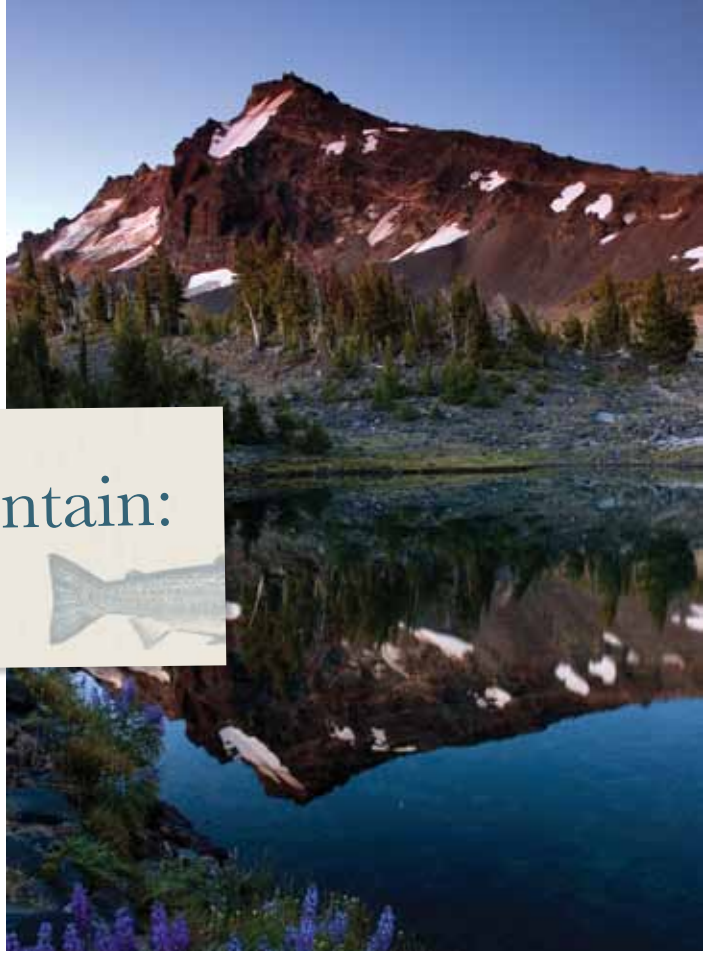


PHOTO **BRIAN HUDSPETH**

The Way to the Mountain:

The Historic Path of Whychus

Glacial Beginnings

The namesake and the largest stream in the watershed, Whychus Creek, begins in the glaciers of the Three Sisters Mountains. Appearing as the Three Sisters on 1856 maps, the peaks are also known as Faith, Hope, Charity. Other streams in the watershed include Soap Creek, the North and South Forks of Whychus Creek, Park Creek, Pole Creek, Indian Ford Creek, Three Creek, and Snow Creek. Known for its old-growth ponderosa pine stands, ancient archaeological sites, and quiet corners of beauty, the uppermost 15 miles of Whychus Creek have been designated as Wild and Scenic under the Oregon Wild and Scenic Rivers Act of 1988.[1]

The landscape surrounding the headwaters of Whychus Creek has been created by a series of diverse glacial and volcanic events in the Three Sisters Wilderness. Resting above Whychus Creek, seven glaciers—Bend, Prouty, Carver, Diller, Hayden, Thayer, and Villard—quietly sit as reminders of the last ice age 18,000 years ago. At the present day confluence of Whychus Creek and the North Fork of Whychus Creek, a magnificently thick glacier once stretched two miles wide to reach within six miles of present-day Sisters. Meandering downstream from the headwaters, flows from the melting glacier carved intricate webs of stream channels and ridges. When the glacier receded, the present-day Whychus

Creek channel emerged from the deepest, longest, and most complex of them all. The path of the upper portions of Whychus Creek now drops down waterfalls to carve steep bedrock canyons, spread across broad alluvial valleys, explore water-carved caves, and wash across polished andesitic rock.[1]

The Wild and Scenic river corridor of Whychus and the entire Sisters Ranger District of the Deschutes National Forest are ceded lands of the Confederated Tribes of Warm Springs protected by treaty rights. Elders from the Tribes have referred to the creek as *the way to the mountain* because people traveled along the creek as a route to higher elevations to pick berries, gather herbs, hunt deer, and pick pine nuts.[1] According to an oral interview with Jesse Edgington, Native Americans from the Warm Springs Reservation passed through his family's ranch in 1936. "This family came, they were going up to Santiam, to the Big Lake area for berries. . . The Indians have told us that the ranch was part of their heritage, that the meadow there . . . should have been part of the reservation."[2]

PHOTO **U.S. FOREST SERVICE**

Just below the beautifully wild and most certainly scenic 15 miles of upper Whychus Creek, there are a number of factors that make Whychus decidedly less wild. A number of unscreened irrigation diversions and multiple fish passage barriers conspicuously fetter Whychus Creek just a few miles upstream from the City of Sisters. However, a decade of partnership-building among local conservation organizations, private landowners, Deschutes National Forest, and the Three Sisters Irrigation District has created a collaborative climate in which the process to remove barriers for migratory fish and restore prime fish habitat conditions has begun. Soon, spawning fish will be able to swim freely up the creek on their own way to the mountain.

PHOTO **NATALIE WEIGAND**

Pine needles blanket the forest that envelops Whychus Creek.

The Ebb and Flow of It:

Flashy and Wild

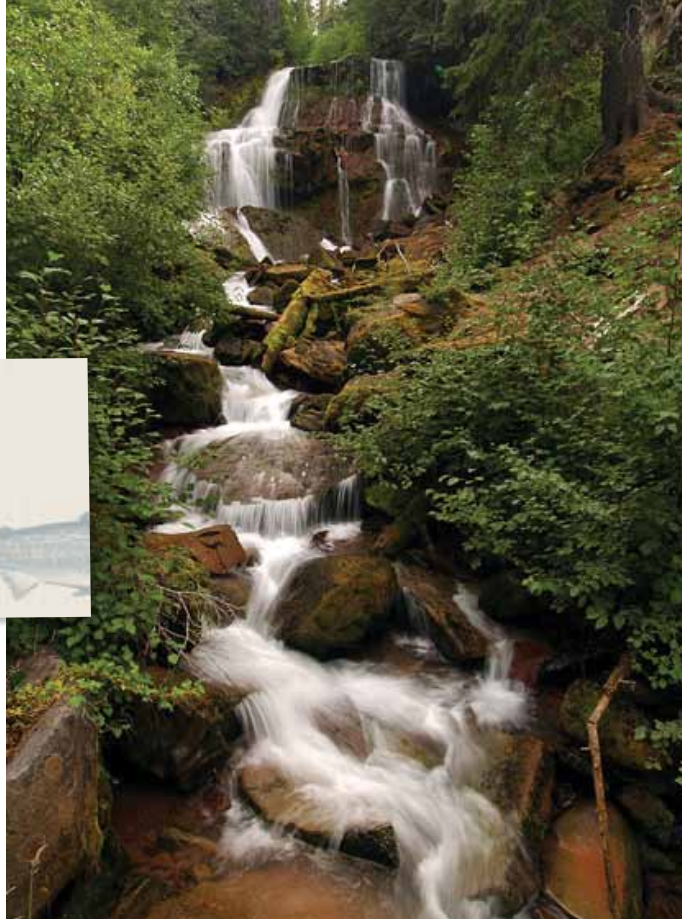


PHOTO **GREG LIEF**

"There's one thing about the creek I'd like to mention. You said you'd like to know about the ebb and flow of it. Soap Creek used to have a beautiful fall where it comes into Squaw Creek... Later, something come along and undermined it and let Soap Creek wash out that material that had closed it. That was another color of the water—soapy. Soap Creek was soapy. And Squaw Creek was muddy and Park Creek was muddy depending on time of year and what they were running through up there."

Jesse Edgington BORN IN SISTERS IN 1918

Inherently, Whychus Creek is flashy and wild. The soil near the headwaters allows the snowmelt and rainfall to run off quickly, bringing very high streamflows and dramatic floods. The amount of snow or rain that refreshes the arid Whychus Creek watershed varies dramatically depending upon location. Over 11 feet of precipitation can fall on the Three Sisters Mountains each year, while only 14 inches may hit the ground in the town of Sisters.[1]

When pregnant with snowmelt waters, Whychus Creek has flooded its banks many times. The 100-year flood event of 1964 is infamous among Sisters residents and characterizes the dramatic and wild nature of Whychus Creek. On December 18, 1964, warm rain began to pour over the upper Whychus Creek watershed. Temperatures soared from zero into the 50s in one week and over 20 inches of rain fell on a deep snowpack in the mountains, creating a flash flood on Whychus Creek. Magnificent in size and speed, floodwaters completed the filling of Lake Billy Chinook months ahead of schedule.[4] According to Jesse Edgington, "After we moved from the ranch, the bridge we crossed on was 12 feet above the creek and four to five feet above

the bank. That year the ice jammed some place and it came down the creek, picking it up as it came. It piled up against that bridge till it was clear up over the top of a car on top of that bridge."[2] Whychus again flashed its wild waters only 16 years later when it crested at 2000 cubic feet per second—the highest flow recorded—on December 25, 1980.[4]

The 1964 flood was a bit too dynamic for some. In an effort to restrain and control the energy of Whychus Creek, local landowners and the Army Corps of Engineers straightened and deepened approximately 18 miles of Whychus Creek stretching from upstream of Sisters down to the Jefferson County line at Rimrock Ranch.[4]

In their effort to subdue Whychus, logs and trees that had been carried in by the floodwaters were cut up and removed. The Corps worked with landowners to remove gravel bars and push the cobble up into berms along the banks to control the creek. In Camp Polk, the creek was moved and straightened, or effectively *canalized*, in an attempt to make it behave. The meadow became more open and dry than it had ever been, "more like a savannah with a stream running beside it."[4] The combination of the flood and the bulldozers turned the creek into a virtual canal. Removing the natural curves from the creek, stripping downed trees and logs from its banks, and scraping gravels and cobbles from its bed, the work sought to subdue Whychus Creek.

PHOTO **KYLE GORMAN**

After channelization, Whychus Creek flows beside Camp Polk Meadow.

The channelization, or canalization, of Whychus Creek that transpired on the ground exemplified the perception that the creek was better utilized as a canal than left to flow wild. The cultural ecology, or the relationship between the community and Whychus, led the community to rearrange and reassemble the creek to better match the form and function of a canal. Although the subjugation of a creek as a canal was in line with perspectives and social values of the time, the channelization of Whychus Creek directly contrasted Aldo Leopold's well known land ethic, "A thing is right when it tends to preserve the integrity, stability, and beauty of the biotic community. It is wrong when it tends otherwise." [6]

PHOTO **U.S. FOREST SERVICE**

Whychus Creek flooded its banks in November 2007, flowing into its floodplain and beyond.

PHOTO **NATALIE WEIGAND**

Whychus Creek,

The place I can picture from halfway around the world,

A creek that defines my sense of home.

I know its path.

I have uncovered places only I know exist.

This place,

I hold inside me

From halfway around the world.

Audrey Tehan AGE 19

PHOTO **RYAN HOUSTON**

Whychus Creek becomes parched and dry when its waters are diverted.

In the Water:

The Evolution of a Creek

Keeping the creek cool

The irrigation diversions that began in Whychus Creek in 1871 exposed and dewatered sections of the creek less than 50 years later. The removal of most of the streamflow had devastating effects on water quality, fish, and aquatic habitat conditions. For almost a century, Whychus Creek watered canals and farmland while its creekbed sat hot and dry. In 1904, The Oregonian newspaper noted, "the water from the mountain streams that has heretofore flowed through canyons and gulches and over barren rocks is being diverted to the fertile soil in the rich valleys and on the level plains." [4]

When the waters of Whychus Creek, Indian Ford Creek, or Pole Creek are reduced to thin rivulets in the summer, the hot sun takes its toll. The less water that remains in the creekbed, the more rapidly that water heats up and becomes inhospitable for native coldwater fish. Information gathered by local organizations over the last 10 years shows that, in some sections, the waters of

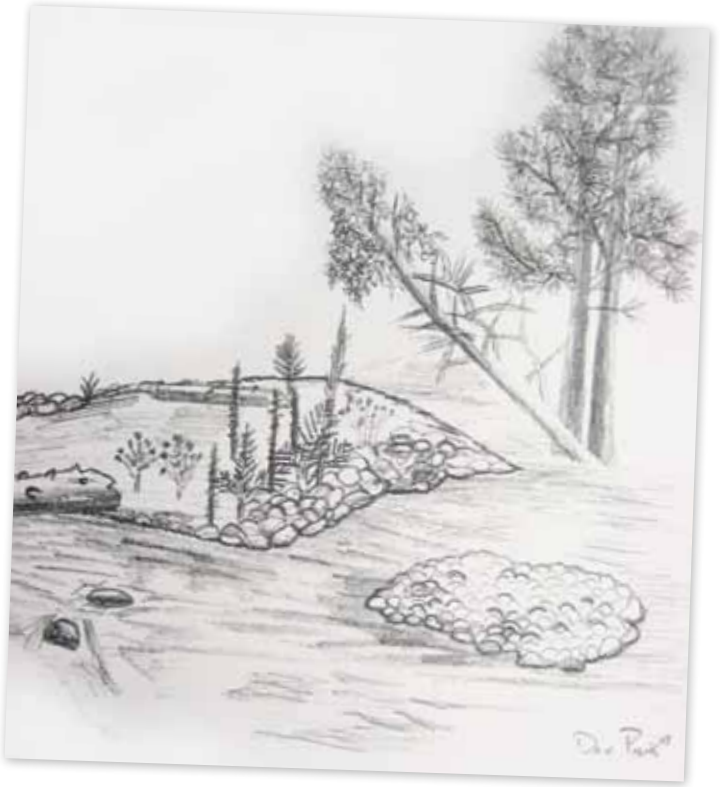
Whychus Creek are too hot for native fish for up to two months out of the year.[7]

Water temperature is one of the most pressing water quality concerns throughout the Whychus Creek watershed. It is self evident that fish need water but the fish that are native to Whychus Creek and its tributaries, redband and steelhead trout, also need cold water. In order to stay cool during the critical summer months, Whychus Creek needs more water than it has seen for the past 100 years.[8] While there are other factors that affect water quality and stream health, the unnaturally low stream flows in Whychus Creek greatly compromise stream conditions for native fish and other aquatic species.

Beginning in 1996, local conservation groups began to work with private landowners and irrigation districts to create new ways to return water to Whychus Creek. Although the vast majority of the water in Whychus Creek continues to be diverted out of the creek during the hot summer months, collaborative work between conservation organizations, farmers, private landowners, and the irrigation district has resulted in the permanent protection of 10 cubic feet per second in the creek as of 2008. Through water leasing, an additional 10 cubic feet per second has been temporarily protected instream in 2008. With shifting perceptions, many voices are rising together to express a vast amount of caring for Whychus Creek and the return of its waters.

But, the evolution of a creek to a canal to a creek is not over.

Keeping Whychus Creek cool enough for native fish throughout its entire length will require more water than amounts restored so far. A permanent and lasting shift toward re-embracing the creek and restoring holistic watershed health will emerge as our connection to the creek deepens. In addition to ongoing community collaboration on flow restoration projects, individual voices and stewardship actions will play a critical role in the story of this creek and its watershed.



SKETCHBOOK ENTRY **DAN PURVIS**

By participating in watershed restoration and education, Sisters High School students connect to their home creek in meaningful and relevant ways.

Returning to the Creek:

Native Fish Come Home

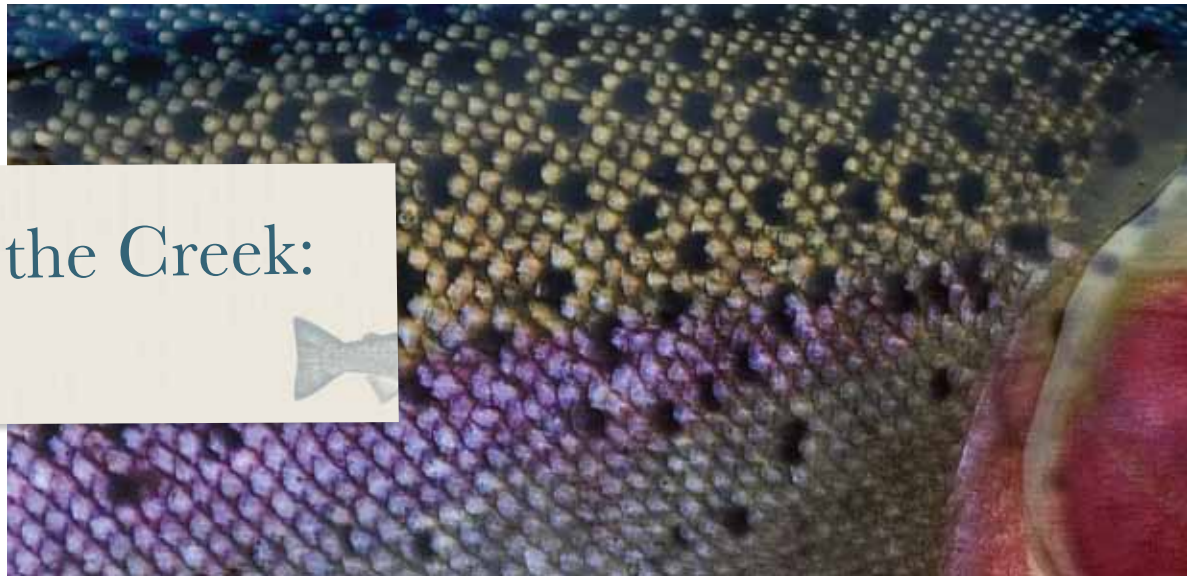


PHOTO **BRIAN HUDSPETH**

"Until between 1890 and 1900, Whychus Creek had been the primary steelhead spawning and rearing stream in the upper Deschutes Basin, with a capacity estimated at 9,000 adults. Thereafter, its excellent spawning gravels often went unused because there was too little water left in the stream bed after irrigation withdrawals and the remaining water became too warm for fish."

Martin Winch LOCAL HISTORIAN & AUTHOR

Before it was poked and prodded, Whychus Creek provided prime spawning and rearing habitat for wild migratory steelhead and spring chinook salmon as well as for resident redband trout. Whychus Creek currently contains a native strain of Interior Columbia Basin redband trout that is on the United States Forest Service Sensitive species list. Highly significant and rare for the Interior Columbia Basin, Whychus Creek has never had hatchery rainbow trout planted into it.[1]

Whychus, historically, had stream conditions that included a valuable mix of cobble, gravels, and sand, thus providing an incredibly healthy habitat for native fish. Cool temperatures, shaded pools, and side channels provided an excellent home for coldwater redband trout and wild steelhead. Throughout the upper Deschutes Basin, it is estimated that Whychus Creek historically provided 42% of the total steelhead spawning habitat.[1]

When relegated to a canal, Whychus proved to be much less hospitable to fish.

Now, as water is being returned to wet and cool the streambed of Whychus, migratory steelhead may return to populate the creek once more. Listed as Threatened under the Endangered Species Act, steelhead spend a large portion of their lives in rivers and streams and are particularly affected by human-induced changes to stream habitat. Steelhead require specific stream conditions in order to survive through their long journey downstream, out to the ocean, and back upstream hundreds of miles to spawn in their home waters. Throughout their life cycle, steelhead need downed trees, deep pools, abundant gravel, and good sources of food.

First proposed by Portland General Electric in 1949, the Pelton Round Butte dams sit on the Deschutes River and have blocked fish passage for migratory steelhead between Whychus Creek and the ocean since 1964. Some optimistic estimates claim that, prior to the construction and operation of the Pelton Round Butte dam complex, there were up to 9,000 spawning steelhead in Whychus Creek.[3] Between 1965 and 2006, there were none.

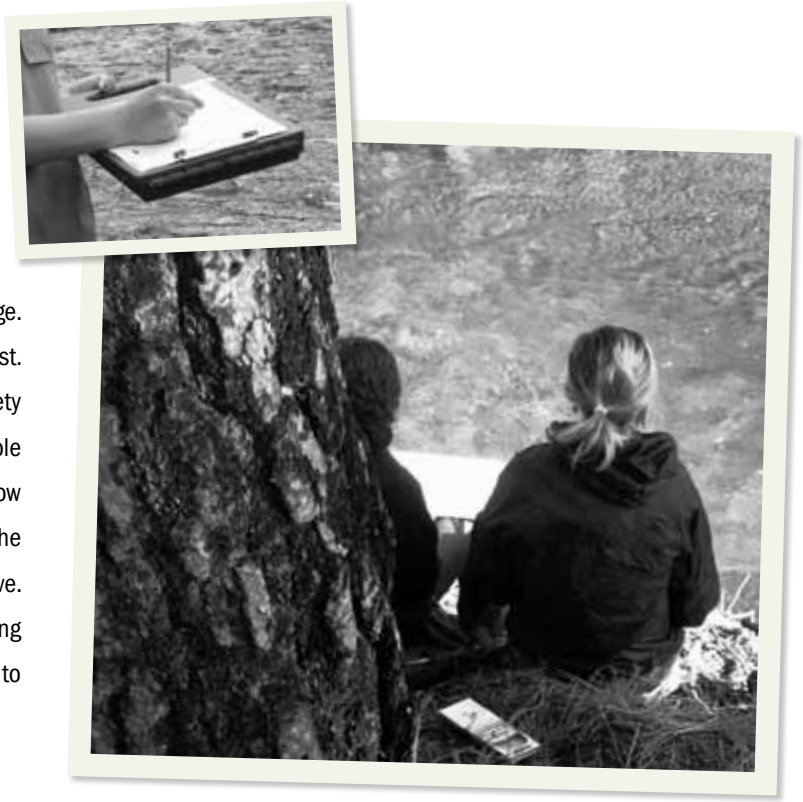
In the spring of 2007, almost 200,000 steelhead fry were released into Whychus Creek and many more will be released in the coming years. As a part of their federal relicensing agreement, Portland General Electric and the Confederated Tribes of Warm Springs worked with many local partners to provide fish passage and return native migratory steelhead back to Whychus Creek. The return of hundreds of thousands of steelhead to Whychus in 2007 and 2008 is just the beginning of a decade's long movement to return wildness to the place we cross the water. Through time, we have crossed the water in many ways and now, with buckets and backpacks full of fish, we cross the water to bring back native fish. While it is still unknown if or how many of these fish will make a successful journey to return to spawn in Whychus Creek, many hands and a vast amount of caring has been dedicated to ushering their safe return.

PHOTO **JIM YUSKAVITCH**

Community members volunteered to assist with the reintroduction of almost 200,000 steelhead fry into Whychus Creek in 2007.

A Sense of Place:

Connecting to Whychus



PHOTOS **KOLLEEN YAKE**

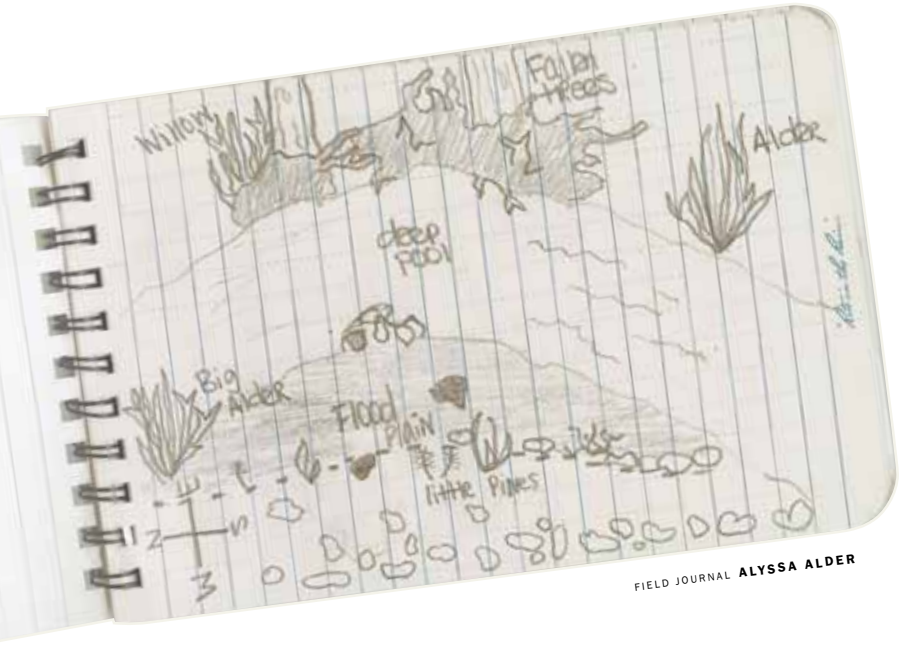
"We got off the school bus and stepped onto a sturdy old bridge. It seemed unusually warm for October; it felt more like late August. In small groups, we began to hike. We were surrounded by a large variety of plants—cottonwoods, aspen, willow, mountain alders, lodgepole pine, ponderosa pine, and douglas fir. Our leader stopped to show us horsetail—it made a popping noise when you pulled it apart—she said that it was an ancient plant that needed a lot of water to survive. As we continued to walk downstream, the types of plants surrounding us began to change a bit. The horsetail disappeared and we began to notice a few juniper trees, bitterbrush, and more pines."

Sydney Randall AGE 16

Local students have returned to Whychus Creek to explore its twists and turns, cobbles and gravels, pine forests and pathways through streamside artwork and poetry. Whether through coordinated projects with local conservation groups or on their own time, young adults have connected to their creek in many different ways. By knowing Whychus Creek, crossing the creek and touching its waters, both literally and emotionally, students have grown an interest in its restoration and protection.

"Walking around the dusty trail beside the creek, I looked around and smiled. The beauty of the area made me feel good that I was at last learning about what I could do to help Whychus Creek and make it a better place for animals and fish. The creek bubbled along to my left and farther away from the creekbed large ponderosa pine trees loomed high above me."

Kelsey Neilson AGE 16



FIELD JOURNAL **ALYSSA ALDER**

Beginning in 2006, students from Sisters High School have adopted many degraded streamside sites. A pine-scented blend of afternoon hikes, sweaty restoration work, streamside sketching, macroinvertebrate discovery, and a two-week escape from walls of the classroom, a multi-year stewardship program between Sisters High School and local conservation organizations has folded students into hands-on projects to connect with Whychus Creek while actively restoring it. These students are current and future stewards of the health of the creek and they have committed themselves in many important ways to the restoration and protection of Whychus.

Dear future students:

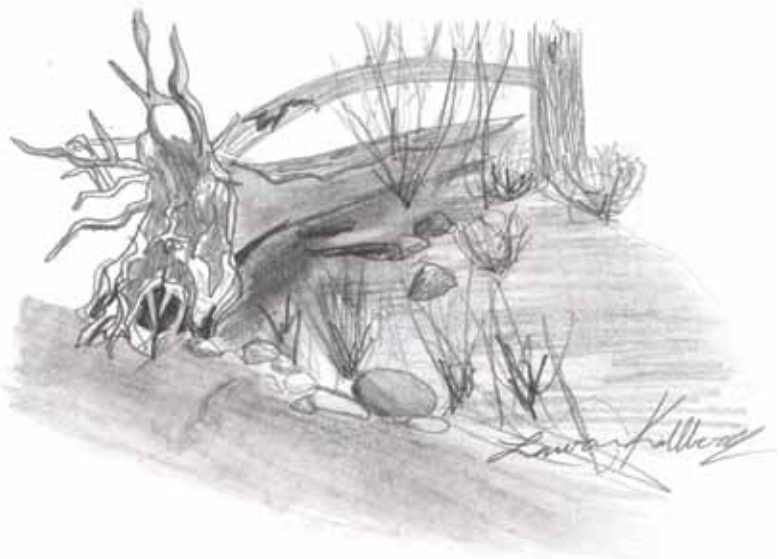
This project on Whychus Creek was pretty awesome. We dug up many willows along an old canal and transplanted them along a degraded section of Whychus Creek which we dubbed Broken Bridge Bend. Even though the weather wasn't very good—it snowed and even hailed on us—and we were trampling through the woods, I feel like I have learned so much about this creek! It is a part of me now and I am glad that I played a small part in protecting it.

Erin Kanzig AGE 16

To the eyes of a high school student, Whychus Creek possesses a myriad of quiet corners to reflect upon, photograph, and sketch. Discovering these quiet corners in their own ways, students create personal and individualized connections to Whychus Creek.

"Even though I have lived in Sisters my whole life, I never really knew this creek. Now, after spending time on Whychus Creek, I know where I am from."

Audrey Tehan AGE 19



STREAMSIDE SKETCH **LAUREN KOLBERG**

A Vast Amount of Caring:

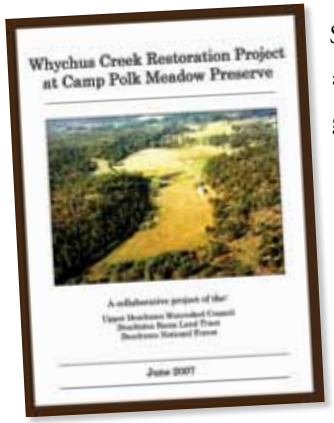
Collective Stewardship

A PAINTING OF THE HEADWATERS OF WHYCHUS CREEK **MAREN BURCK, AGE 17**

"Well I wonder, what their real plan is for Squaw Creek. I've been curious about it..."

Jesse Edgington SISTERS HOMESTEADER

For the past decade, community members, students, conservation organizations, agencies, and many others have come together to restore water and wildness to Whychus Creek. In addition to the protected instream water and native fish that have been returned to Whychus, multiple degraded riparian areas have been adopted by various organizations and community groups for ongoing stewardship projects, restoration, and watershed education.



Several large scale habitat restoration projects are also currently underway. These on-the-ground projects will restore riparian and instream habitat and bring benefits for fish and wildlife by 2010. More than five miles worth of restoration projects are currently in design and many others are planned for the near future. While several years are often needed to fully design and implement the type of large on-the-ground projects that are necessary to restore stream health, the momentum has been building and the shift toward embracing and protecting Whychus as a creek is well-fueled and inspired. There is more caring and commitment invested in the work necessary to restore water, native fish, and healthy habitat to Whychus Creek than at any time in the past. Together, we have chosen to embrace Whychus Creek and restore wildness to the place we cross the water.

"I'd like to see Squaw Creek run."

Jesse Edgington

PHOTO **JIM YUSKAVITCH**

Endnotes

[1] Deschutes National Forest. Whychus Creek Wild and Scenic River Resource Assessment. Sisters, Oregon: U.S. Forest Service, 2007.

[2] Edgington, Jesse. Oral interview with Maret Pajutee, 1998.

[3] Nehlsen, Willa. Historic Salmon and Steelhead Runs of the Upper Deschutes River and Their Environments. Portland, Oregon: Portland General Electric, 1995.

[4] Winch, Martin. Biography of a Place: Passages Through a Central Oregon Meadow. Bend, Oregon: Deschutes Historical Society, 2006.

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The Place We Cross the Water:
Whychus Creek

ECOLOGICAL SUPPLEMENT

PRODUCED BY

THE UPPER DESCHUTES WATERSHED COUNCIL

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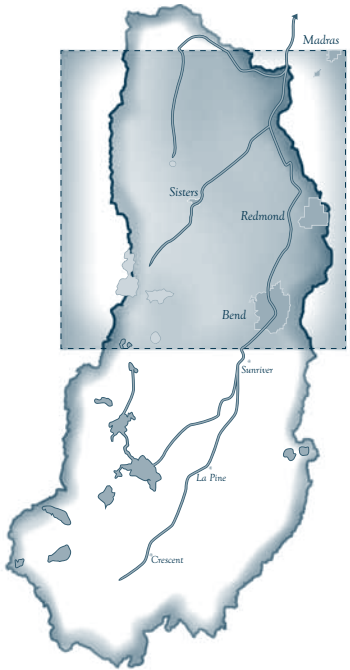
The Place

WE CROSS THE WATER

WHYCHUS CREEK



UPPER DESCHUTES SUBBASIN

Ecological Indicators:

Evaluating Stream Health

Although local memory of spawning steelhead in Whychus Creek has long since faded, the reintroduction that began in 2007 launched new hope that steelhead will once again return to the creek after an absence of more than 40 years.

While this new hope brings tremendous investments in habitat restoration, renewed partnerships to help the creek and many opportunities for scientific research, it also shines a spotlight on one simple question asked repeatedly by the community at large:

Is Whychus Creek healthy?

The answer depends entirely upon your perspective. Is this question about the holistic watershed, including forests, rangeland and urban areas? Or, is this question just focused on the creek corridor? Does 'healthy' mean that you can drink the water without getting sick? That the water is clear? That it supports native redband trout? Or steelhead trout? A 'blue ribbon' fishery? Or, simply that the creek is pretty?

In the science of watershed management, there are many ways to answer these questions and examine each of the deeper layers that cut across the overlapping disciplines of hydrology, ecology, forestry and many others. However, distilling these technical disciplines into simple indicators that illustrate the health of the watershed is difficult because watersheds function as an interconnected network of biological, physical and chemical processes that affect everything from the clarity of the water to the severity of floods and the frequency of forest fires.

Given this complexity, practicality dictates that a short publication must focus on only a few simple indicators that describe the health of Whychus Creek. These indicators must be presented in terms that are interesting and meaningful to readers of many different backgrounds and with varying degrees of scientific training. And, just as importantly, they must be simple, technically accurate and based on readily available data. With these criteria in mind, our focus is on the following four general indicators:

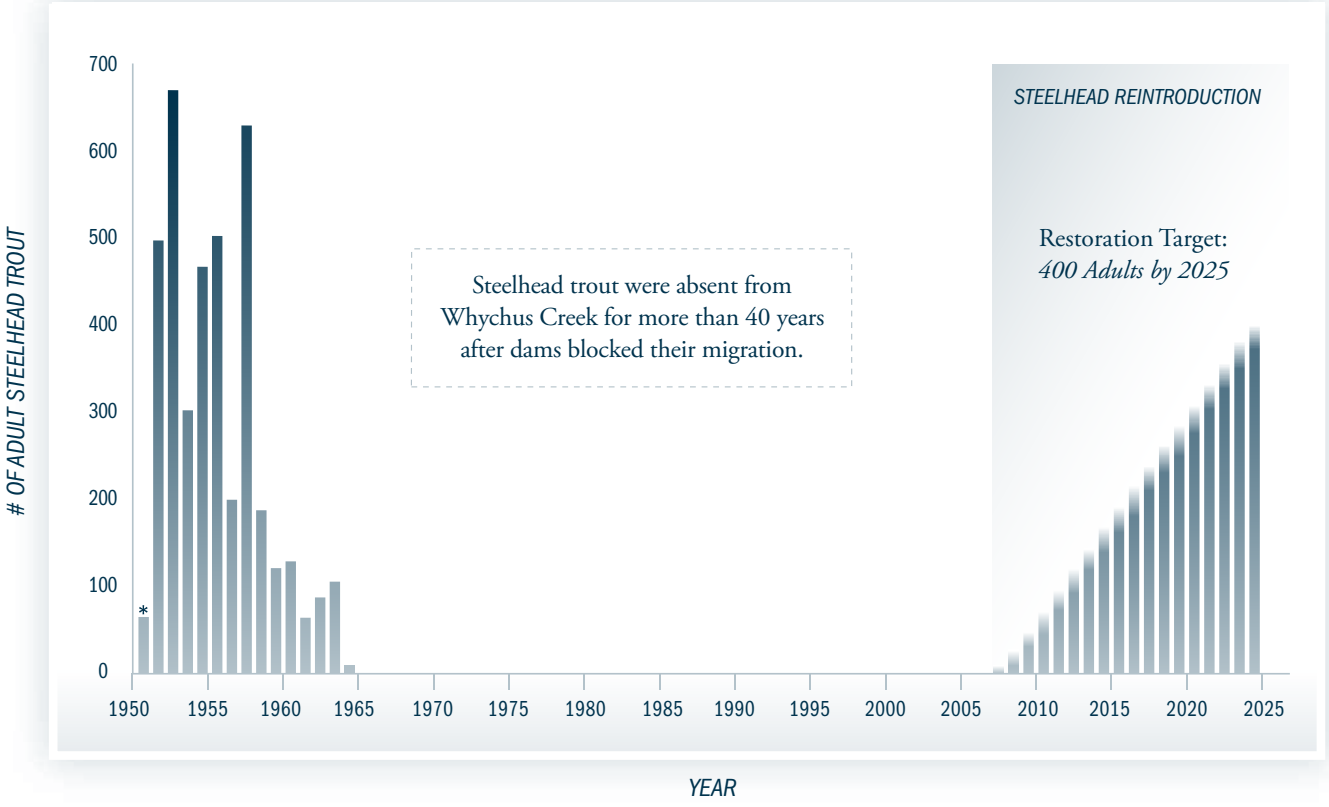
Fish Populations
What is the population size of an iconic native fish species, such as steelhead trout?

Fish Habitat
Does the creek provide suitable habitat for native fish?

Water Temperature
Does the water remain cool enough during the summer months to support native fish?

Instream Flow
Is there sufficient streamflow in the creek during the summer months to support a healthy creek?

While there are no perfect ecological indicators that can tell the complete story of a complex interconnected ecosystem, these four can provide a brief window into the health of Whychus Creek. And, as they are refined over time, they can provide a common language for measuring, evaluating and communicating about the health of the creek.



History of Adult Steelhead in Whychus Creek

Steelhead trout surveys in the 1950s to 1960s identified as many as 619 adults in Whychus Creek.[1] Even though these surveys were conducted many years after impacts in Whychus Creek reduced available habitat, they provide an important backdrop for the ongoing steelhead trout reintroduction program. Reintroduction began in 2007 and will continue for many years to come. (Note: * denotes incomplete data).

Steelhead Trout:

Reintroducing a Native Species

A steelhead trout spawning in the Deschutes River basin will likely travel thousands of miles on its journey down the Columbia River, to the Pacific Ocean and back again. Along the way, a myriad of factors–fishing, predation, dams, ocean conditions and others–will play into the probability of any single fish completing the multi-year cycle from egg to spawning adult. Ultimately, only a few percent will actually survive to complete their journey back home to their natal spawning grounds. Even though steelhead can spawn more than once, very few fish will survive to complete several successful spawning cycles.

With so many factors contributing to the life cycle of a steelhead trout, the absence of steelhead in Whychus Creek does not tell a complete story about the health of the creek. However, tracking the presence of steelhead trout does tell us something important about our progress in restoring this iconic species. It helps answer: Is the reintroduction working? Is Whychus Creek healthy enough to support spawning steelhead?

No one knows how many steelhead spawned in Whychus Creek before European settlement began in the 1800s. However, some rather optimistic estimates are as high as 9,000 spawning adults and it is widely accepted that Whychus Creek was one of the most productive steelhead streams in Central Oregon.[1] Distributed evenly along the 35 miles of Whychus Creek that were accessible to steelhead, 9,000 adults would result in an average of one fish every 21 feet.

The only quantitative survey data is from the 1950s to early 1960s, which is more than 50 years after diversions began to dewater Whychus Creek and during the same time period as the construction of the Pelton Round Butte Dams. As a result, these data represent only the waning years of steelhead trout in Whychus Creek and tell us little about the ultimate potential of the creek. Nevertheless, the surveys in the 1950s to 1960s counted a high of 619 adults in the 1952-1953 season, but estimated that there were as many as 1,000 in the creek. However, by 1965 there were only 10 adults counted and the population disappeared soon thereafter.[1]

Ironically, the extirpation of steelhead in Whychus Creek was not caused by blockage of the upstream migration of adult steelhead but instead by problems with the downstream migration of young smolts. The construction of the Pelton Round Butte dams created the massive Lake Billy Chinook at the confluence of the Deschutes, Crooked and Metolius Rivers. This reservoir, with its tangled web of currents, proved to be too much for migrating smolts. The mixing of cold water from the Metolius River and warm water from the Crooked and Deschutes Rivers created circulation patterns that led the smolts astray, such that they never found their downstream passage.

Are we making progress?

The reintroduction of any species that has been absent for 40 years is complex business. There are issues of genetics, changes in habitat and dam retrofits. And, because of the complex life cycle of steelhead, reintroduction could fail even if Whychus Creek were perfectly healthy.

However, when nearly 200,000 steelhead fry were released in 2007, we passed an important milestone on the path to seeing steelhead trout in Whychus Creek for the first time in more than 40 years. With these first experimental fish instream and many more releases to follow in subsequent years, we must now wait and see how many are successful in their return as adults.

While waiting for the first adult steelhead to return in 2010 or 2011, we can look to other aspects of Whychus Creek to examine its health, including fish habitat, water quality and stream flow.

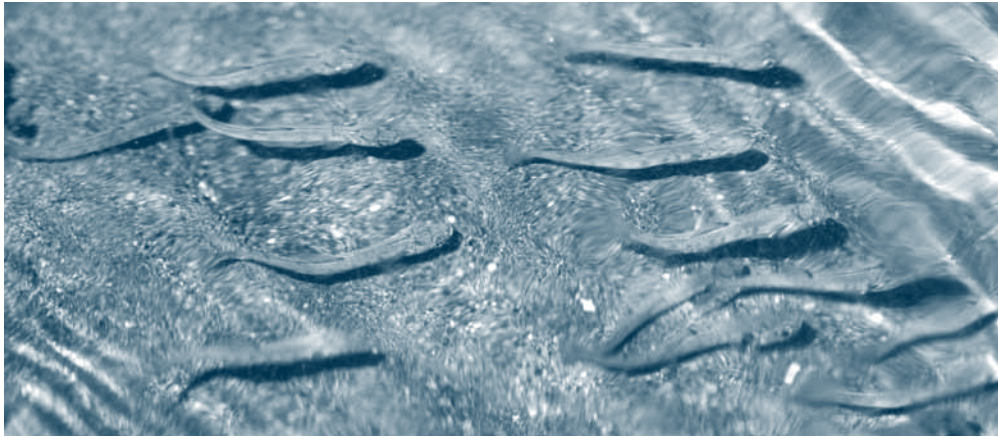


PHOTO **JIM YUSKAVITCH**

Fish Habitat:

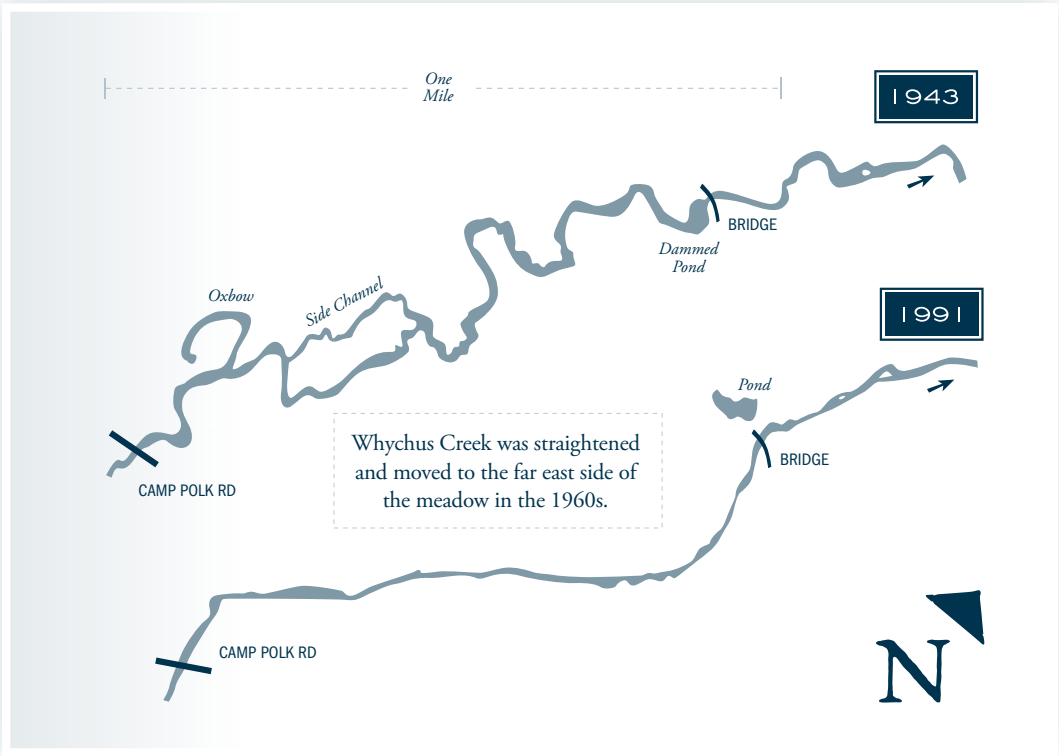
Restoring a Healthy Creek

Throughout its life cycle, a steelhead trout will be in Whychus Creek at least twice: once as an egg, fry and smolt, then again several years later when it returns as a spawning adult. During each of these periods, it will have slightly different habitat needs. In the early stages, it will need well-oxygenated water, good sources of food and emergent vegetation along the banks of the creek. As a spawning adult, it will also need deep pools, good cover from woody material and abundant spawning gravels.

Since the early European settlers moved into the Whychus Creek area, fish habitat along the creek has been impacted by a suite of changes on the landscape. Livestock grazing, urban development, irrigation diversions and other activities have all gradually affected the quality of fish habitat. And, some more extreme events, such as the channelization of 18 miles of creek in the 1960s, have wrecked havoc on specific reaches of the creek.[2]

Some of the most devastating effects of channelization are exemplified at Camp Polk Meadow, a site where extensive research has been conducted and comprehensive stream restoration plans are underway. Here, channel modifications reduced habitat diversity, one of the key components of a healthy aquatic ecosystem. Important habitat features like pools, oxbows, side channels and riparian vegetation were lost as the creek was straightened and berms were built to contain flood flows. In addition, the straightened channel has brought increased flow velocities and accelerated erosion, resulting in channel instability many years after the bulldozers have left the creek. At one specific site, for example, the creek banks remain so unstable that more than 13 feet of bank erosion was measured during one month in 2007.[3]

The combined effects of channelization and other land management practices ultimately influence the quality of available fish habitat. To measure this, fish biologists have been surveying the length of Whychus Creek, collecting data on substrate, cover, pools and other attributes. By running these data through HabRate, a computer model, biologists can score specific reaches of creek as 'good', 'fair' or 'poor' habitat for spawning or rearing steelhead trout. Based on 2007 data, the 35.2 miles of potential spawning habitat for steelhead trout are made up of 0.0 miles of 'good', 28.4 miles of 'fair' and 6.8 miles of 'poor' quality habitat.[4] Given that Whychus Creek historically provided some of the best habitat for spawning steelhead, these data suggest that we have a long way to go in our collective effort to restore habitat for a self-sustaining population.



Channelization of Whychus Creek

Channelization efforts in the 1960s straightened many reaches of Whychus Creek, resulting in significant losses to important habitat such as oxbows and side channels.[4] At Camp Polk Meadow, where channelization severely impacted important spawning habitat, collaborative restoration projects will help re-create spawning areas, wetlands, floodplains and other important components of the creek ecosystem.

Are we making progress?

Our baseline understanding of habitat conditions has vastly improved over the last few years because new investments in steelhead reintroduction and associated habitat restoration have fueled more field surveys and studies than at any time in the past. In 2008, more than 20 miles of Whychus Creek will be surveyed to help refine our understanding of habitat conditions.[4] This will bring a better understanding of needs and opportunities, which will help guide investments in management and restoration. Over the long term, this will help us track and evaluate our collective progress in restoration.

In addition, many habitat restoration projects are currently underway, with benefits that fish and wildlife will 'feel' by 2010. These include new projects to protect riparian areas, restore instream habitat and reconnect floodplains damaged during the channelization of the 1960s. More than five miles worth of restoration projects are currently in design and many others are lying in waiting. While several years are often needed to fully design, implement and see the benefit of habitat restoration, the long-term trajectory is promising. There is more energy, commitment, and investment in habitat restoration now than at any time in the past.

PHOTO **SCOTT McCAULOU**

Water Temperature:

Staying Cool for Native Fish

In some parts of the United States, water quality can be quite easy to assess. Rivers can be so polluted that they may smell funny, flow in toxically vibrant colors or even catch on fire (the Cuyahoga River in Ohio was so polluted that it actually caught fire twice).

We are very fortunate not to face these kinds of toxic pollution in Whychus Creek. However, there are other aspects of water quality, such as temperature, that are less obvious to the casual observer but just as critical for important fish species such as resident redband trout or anadromous steelhead trout.

In Whychus Creek, water temperature is an important ecological indicator because redband and steelhead trout require cool, clean water. However, many human activities along the creek have caused water temperatures to climb as high as 24°C / 75°F, which is well above the 18°C / 64°F maximum temperature standard established by the State of Oregon to protect native fish.[5] While some creeks in Central Oregon may naturally flow with this kind of warm water, Whychus Creek is naturally very cold, with temperatures that would not likely exceed 16°C / 61°F under undisturbed conditions.[6]

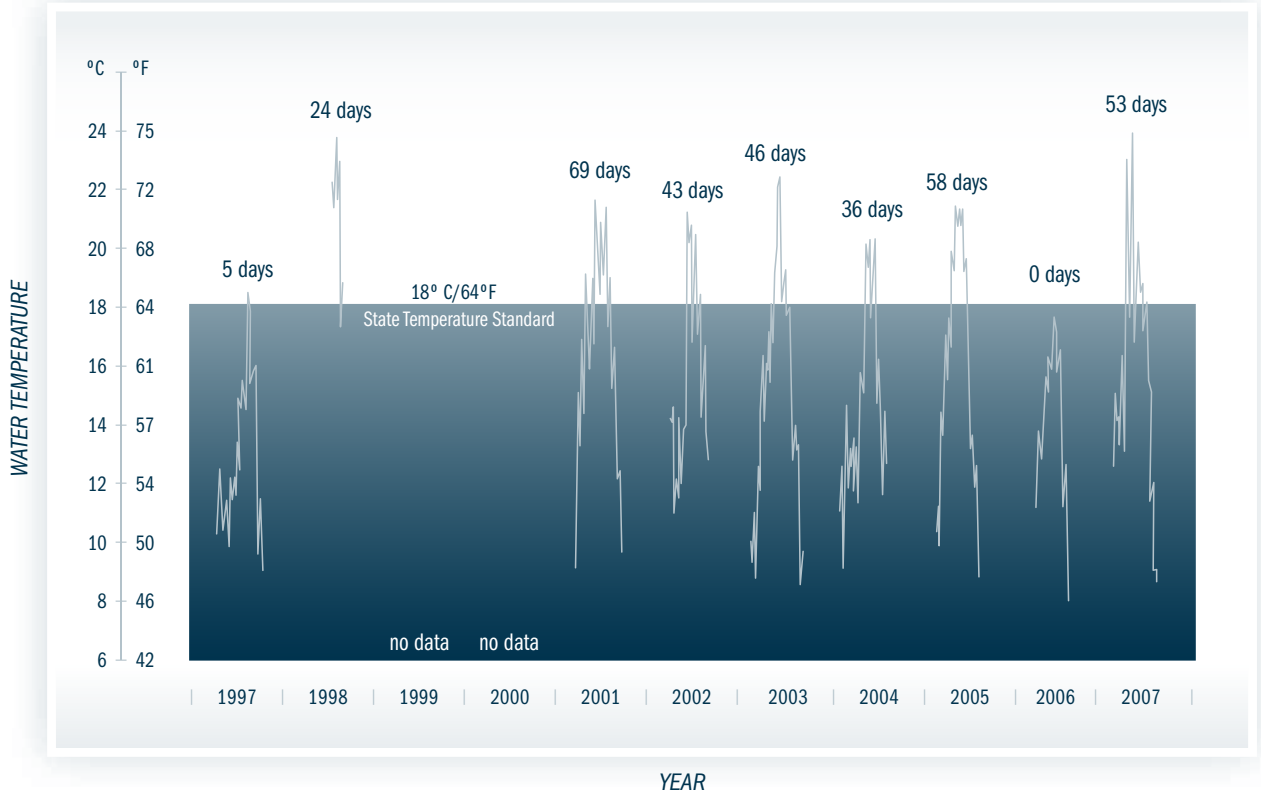
If we can understand how we have caused the stream temperatures to rise, we can respond by working together to reduce temperatures back into a range that better reflects natural variability. During this process, which may take a few decades, we can use measurements of temperature to track our collective progress in restoration.

Are we making progress?

Research has shown that water temperature is directly related to the amount of instream flow. When irrigation diversions reduce instream flow, temperatures rise. When more water is left instream, temperatures drop.[5 6 7]

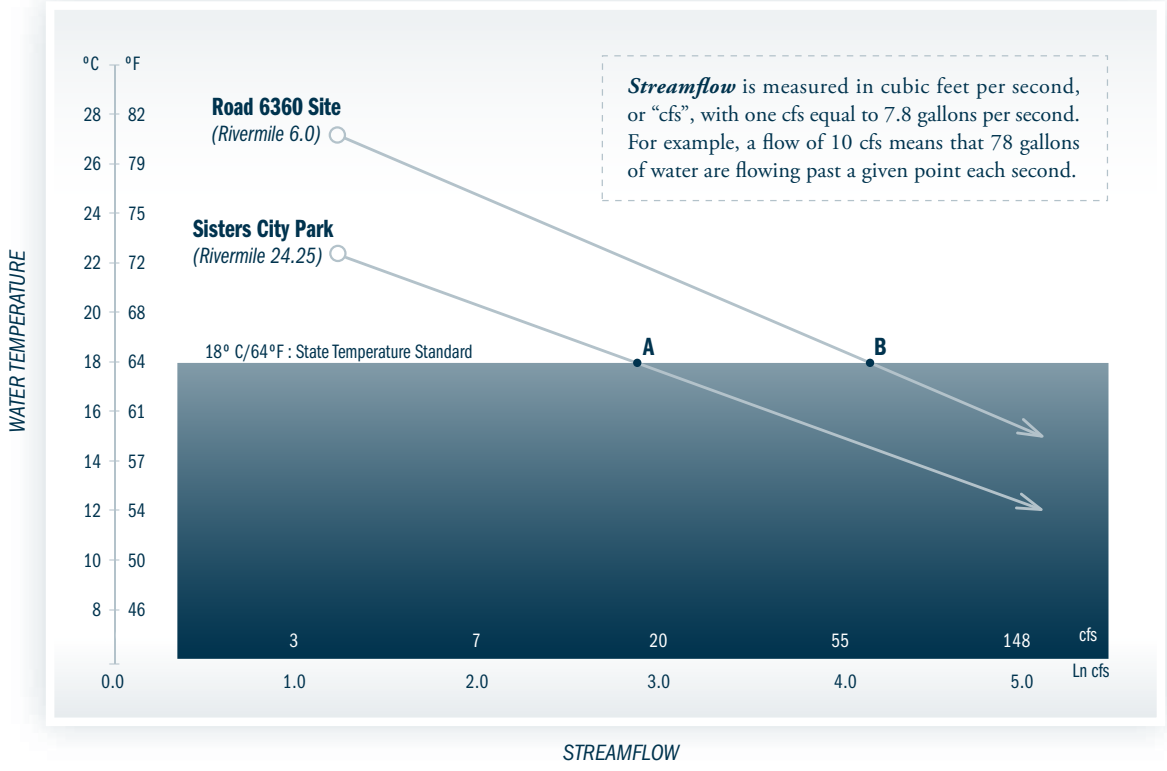
However, the precise relationship between temperature and flow is very complicated because the flow needed to maintain temperatures below the 18°C / 64°F standard is different in different reaches of Whychus Creek. For example, maintaining 18°C / 64°F in the downstream reaches of Whychus Creek (Rivermile 6.0) may require up to three times the amount of water that is needed to maintain the same temperature at the Sisters City Park (Rivermile 24.25). While some natural downstream warming is expected, the rate of warming has been increased significantly by reduced instream flow.[5 6 7]

Despite these complexities, the good news is that each year since 1999 more and more water has been left instream through water conservation projects championed by irrigators and conservation organizations.[8 9] While annual variations in climate, shade from riparian vegetation, quality of wetlands and other factors will continue to influence water temperature, the continued progress in flow restoration is an important trend that will ultimately bring valuable benefits for the health of Whychus Creek.



Whychus Creek Water Temperatures, 1997-2007

Data collected by many local organizations over the past 10 years have shown that Whychus Creek water temperatures exceeded the 18°C / 64°F standard between zero and 69 days per year.[5] While climate, snowpack and other natural variations can affect water temperature, studies have shown that Whychus Creek would remain far cooler if flows were increased by decreasing the volume of water diverted.[6]



Temperature-Streamflow Relationship in Whychus Creek

Data from 2003 to 2006 indicate that temperatures in Whychus Creek are inversely correlated with the natural logarithm of streamflow, meaning that water temperatures tend to decrease as streamflows increase.[5] Point A shows that the state temperature standard of 18°C / 64°F was met at the Sisters City Park when there was approximately 20 cubic feet per second (cfs) of flow instream. Point B, representing a monitoring site 18 miles downstream, illustrates that the state standard was met when there was approximately 60 cfs instream. This reflects how temperatures increase as the creek flows downstream and that the location of the monitoring site is critical to understanding how streamflow and temperature are related.

Instream Flow:

Rewatering the Creek

Because water temperature is so closely linked to the volume of water flowing downstream, another critical indicator of the health of the creek is flow. How much water is flowing in the creek?

The first irrigation diversions began in Whychus Creek in 1871 and by 1912 summer flows in portions of Whychus Creek were entirely diverted for irrigation use.[1] For the next three generations, there was little attention paid to whether or not any water was left in the creek during the hot summer months. In fact, up until the mid 1990s, there were many years when reaches of Whychus Creek ran dry.

Today, portions of Whychus Creek are still reduced to a trickle as almost 90% of the water is diverted upstream of Sisters. The result is a very strange and highly modified streamflow that varies greatly depending upon where you are. For example, in an average July you might observe the following along the creek:

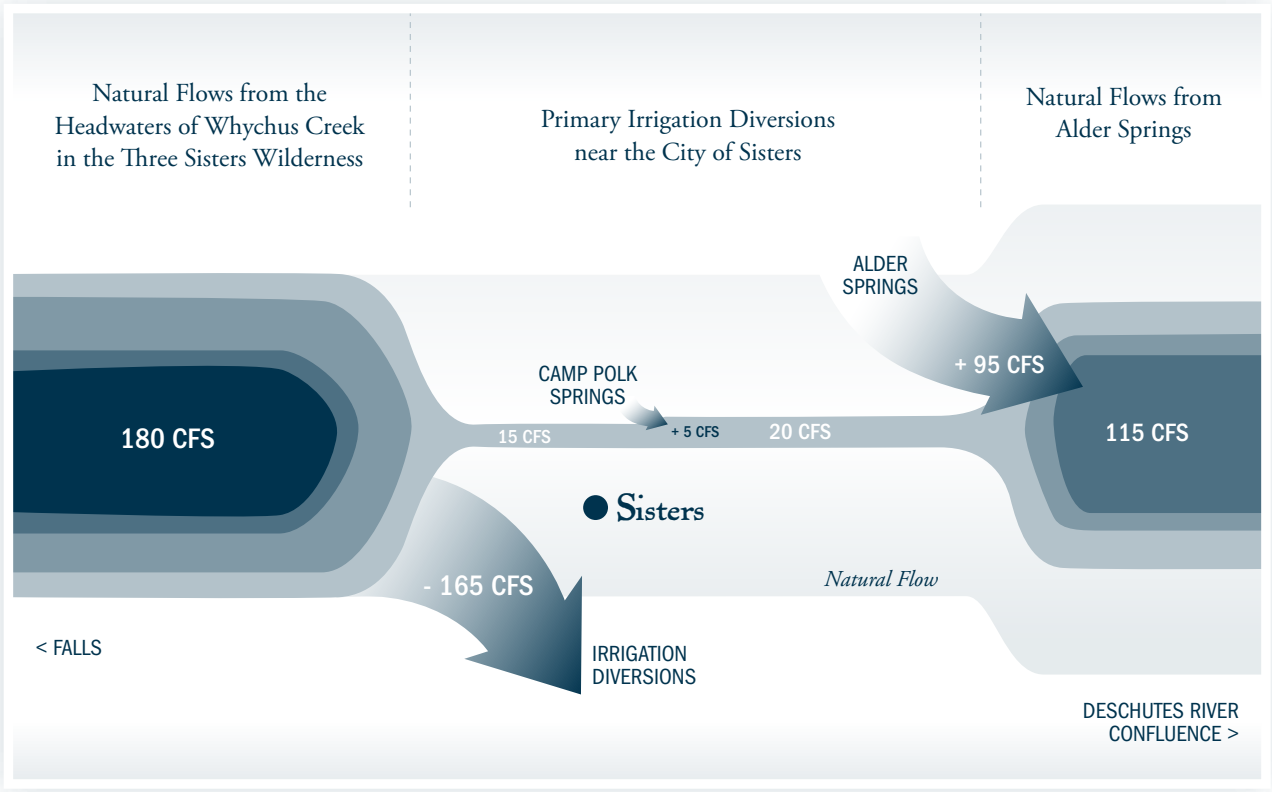
- **180 cubic feet per second (cfs)** flowing in the Deschutes National Forest upstream of Sisters (above any diversions);
- **15 cfs** flowing through the Sisters City Park (after most of the diversions); and
- **115 cfs** flowing at the mouth (after Alder Springs has added cold, clean water).[8 9]

In addition to affecting stream temperature, these types of streamflow modifications may also alter many other physical, chemical and biological processes critical to overall stream health. For example, reduced water availability in the summer may hamper growth of riparian vegetation, thus reducing habitat for terrestrial and aquatic wildlife and contributing to increased erosion along the streambanks. These changes in vegetation patterns and bank stability can, in turn, alter spawning and rearing habitat, streamside wetlands and other components of the ecosystem.

Are we making progress?

Although the vast majority of the water in Whychus Creek continues to be diverted in the summer months, summer minimum instream flows at the Sisters City Park have risen from zero cfs to approximately 20 cfs over the last 10 years.[8 9] While this is barely more than 10% of natural flow, it represents a tremendous accomplishment resulting from the dedicated collaboration and multi-million dollar investments of the local irrigation district, farmers and conservation organizations. Creative strategies in voluntary water marketing, brokering, conservation and transfers have all been used to help improve streamflow while retaining water necessary for agricultural needs.

Significant hurdles remain. Keeping Whychus Creek cool enough for native fish throughout its entire length will require more instream flow than is currently present during the summer months.[6 7] While this flow may not be socially, economically or politically feasible in the immediate future, continued collaboration on flow restoration projects is one of the most effective ways to continue the important progress of the past 10 years.



Streamflow in Whychus Creek

Streamflow in Whychus Creek is reduced to approximately 10% of natural flow during the summer irrigation season. The diversions leave more than 20 miles of Whychus Creek with very little instream flow, causing increased water temperatures and other ecological impacts. Ongoing streamflow restoration projects are making important progress in restoring these summer instream flows.

Progress in Restoration:

Working for a Healthy Creek

In watershed management, clear 'Yes' or 'No' answers are notoriously elusive as the interconnected web of factors–terrestrial and aquatic, immediate and cumulative, physical and biological–all play into how we answer seemingly simple questions.

However, indicators can often help us better capture, understand and communicate about conditions in a creek such as Whychus. While they can simplify and clarify our communication to some extent, indicators simultaneously remind us that we should not place too much emphasis on any single factor in a specific place at a specific time. For example, while water quality may be nearly pristine upstream of Sisters in the winter, it may be very poor 20 miles downstream the following summer. Therefore, how should we answer the question, 'Is Whychus Creek healthy?'

The four indicators presented here tell complementary stories of Whychus Creek as a living stream with some significant challenges. At the same time, however, Whychus Creek is the focus of tremendous investment and committed community action, all pointing toward a future with cleaner water, stronger native fish populations and better habitat than at any time in the past several decades.

As this progress in restoration continues, we should periodically check back on core indicators to see how Whychus Creek evolves. Are steelhead adults successfully spawning in Whychus Creek? Is summer water temperature declining? Are instream flows moving toward a more natural condition? Are habitat restoration projects making a difference?

With enhanced understanding, we can also begin exploring new indicators that examine other aspects of the biological, physical and chemical processes in Whychus Creek and its watershed. Many critical ones, such as forest health, invasive species, or fish passage, are not included here but should be examined in the future. As this work continues, our suite of indicators will expand, our understanding and communication will become richer, and our commitment to protecting and restoring Whychus Creek will become more firmly rooted in our community.

Endnotes

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