The Big Wood River Fishery Assessment: Healthy Waters, Healthy Future

Wood River Land Trust's Boxcar Bend Preserve, circa 1990

Prepared by Wood River Land Trust
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"The future of the Big Wood River fishery is dependent on our ability to stop the loss of habitat and restore important degraded areas." –Russ Thurow, 1988.

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For more information contact:

Kathryn Goldman, Project Coordinator
Wood River Land Trust
119 East Bullion Street
Hailey, Idaho 83333
phone: (208) 788-3947
email: kgoldman@woodriverlandtrust.org

Or visit our website at:

www.woodriverlandtrust.org

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Introduction

The Big Wood River is the defining natural feature of the valley that takes its name. Aside from offering many recreational opportunities for valley families and visitors, the river boasts a nationally recognized sport fishery and connects the communities that thrive near its banks.

The Big Wood River (BWR) flows from its origin in the Boulder Mountains near Galena Summit approximately 62 miles to Magic Reservoir, then on to its confluence with the Little Wood River, where they form the Malad River and flow on to the Snake River, near Hagerman. Like all rivers, it is a dynamic and complex system and far more than a simple channel of moving water. Along its course, the BWR is recognized as a premier wild rainbow trout fishery, a source of water for wildlife and people and a place for wildlife. It is a complex web of elements including the vegetation found in the riparian area surrounding the river and along its banks, its floodplain, its flow regime, the stones, gravel, debris, insects and fish found in the river and temperature of the water, all of which combine to form the BWR system. The BWR supports a unique and outstanding fishery. The Wood River sculpin *(Cottus leiopomus)* lives only in the Big Wood River, and the wild rainbow trout *(Oncorhynchus mykiss)* that populate the river are thought to be a relic form of redband trout (Behnke 1979 and 1988 in Thurow 1989).

Kids playing in Big Wood River, 2004

A healthy Big Wood River provides recreation and fishing opportunities, a refuge for wildlife, and plays a vital role in our vibrant local economy. It also serves as the major thread binding the fabric of the Wood River Valley's communities together. Across Ketchum, Hailey and Bellevue, locals and visitors alike recognize the value of this important natural feature that carved the Wood River Valley.

The Wood River Land Trust works to conserve, restore and protect open lands special places, and wildlife habitat in the Wood River Valley. Our mission is inextricably linked with the Big Wood River, as many of the lands we seek to protect are in the riparian corridor, which provides valuable wildlife habitat. As the Wood River Valley's population grows, pressures on the river and its resources make our work even more important to ensure that critical views, wildlife habitats and open space resources remain in the valley even as more people make this place their home.

To best achieve our goals of land protection, Wood River Land Trust is looking at the Big Wood River's fishery as an indicator of the Big Wood River's health. We will use this information to direct our efforts over the years to come. By protecting land that ensures a healthy fishery, we make the most of our conservation work and protect additional resources that the communities in the Wood River value. This report is Phase I of a three part assessment. Phase I of Big Wood River Fishery Assessment compiles existing data and research in an attempt to identify the factors that most limit the health and productivity of the fishery. In Phase II, WRLT will compile historical and current information on stream alterations and land uses on the BWR. WRLT will use the information to educate local elected officials, community leaders and residents about the effects and locations of these alterations and land uses. Phase III will take the data and research from the first two phases and use that information to enact solutions to habitat and water quantity issues at the local and state level and direct our work more strategically.

History and Ecology

The Big Wood River is a geologically young river drainage, with steep gradients, shallow well-drained soils, large bedloads, and a runoff cycle of greatly fluctuating flows. Native vegetation is well adapted to the these fluctuations, exhibiting the fast growth, water tolerance, short life spans, and dense fibrous root systems that are effective in stabilizing stream channels.

Historically, the entire alluvial floodplain functioned as a unit with the stream channel (Thurow 1987). The Big Wood takes its name from the fact that in the past, large woody debris, such as downed cottonwood trees, filled the channel from one side to the other along the river course (Thurow 1987). The debris formed large, deep pools which provided fish with exceptional habitat for feeding and cover from predators. Trout in the lower reaches of the BWR may have migrated substantial distances to spawn in the abundant gravels of the upper watershed.

The Community Library of Ketchum, Regional History Department.
One day's catch, Big Wood River, circa 1900.

Upstream passage has been blocked since Magic Reservoir was constructed in 1909. However, trout in Magic Reservoir and reaches of the river just above the reservoir continued to migrate upstream to spawning areas (Thurow 1988).

Thurow (1994) notes that the Big Wood River has a history of producing large trout weighing over 2.5 kg or 5.5 pounds. Historical evidence of the previous abundance and great biomass of the Big Wood's fishery can still be found in archival sources. Archival newspaper articles (Wood River Times, Pocatello Journal 1893) document a local fishing expedition that resulted in 20-100 pounds of trout per person, with one ton of trout the final tally for the three day fishing trip. Historical photos (see **Attachment III**) repeatedly document approximately eight-to-ten pound trout caught in Hailey, Idaho and Bellevue, Idaho. "Historically, the river has been recognized as a premier wild trout water in Idaho. As a result of human induced changes in the drainage, the abundance of wild trout declined (Thurow 1989)." The changes, largely associated with residential development in the floodplain, flood control efforts and road-building, include diking, channel relocation, riprap of river banks, mining and channel clearance (removal of woody debris from the channel) (Irizarry 1968).

Role of the Floodplain

River floodplains are ever-changing areas that play an extremely valuable role in the hydrologic process and the health of a river system. The floodplain is a ground water recharge area that acts as a sponge to absorb water into the aquifer during high flows or flooding (FISRWG 1998).

Thrush (2000) describes the importance of a river that is free to meander during high flows: "Channel migration is one of the most important processes creating diverse aquatic and terrestrial habitats. Sediment and woody debris are delivered in to the river and floodplains are rebuilt on the inside of the meander." The advance and retreat of water on the floodplain enhances biological productivity and maintains diversity in the system (FISRWG 1998).

Riparian vegetation has evolved with flooding; willows and cottonwoods depend on flooding for regeneration. Replacement of native vegetation in favor of non-native residential landscaping and lawns removes an important component of the river system that slows high flows, reduces flood damage and assists with groundwater recharge. Similarly, woody debris also slows flows, provides cover for fish and increases the food supply for fish populations. River alteration and floodplain development impair or completely destroy these functions by removing native vegetation and woody debris.

Channelization, or the process of straightening the natural curves in river courses, also negatively impacts the river system. Channelization results in elimination of the overflow channels, which causes peak flows to be higher and more erosive and base flows lower, as a result of the reduced water storage capacity (Thurow 1989). Minus these crucial components that strategically dissipate its energy, the steam's channels become unstable, erosion accelerates and the stream incises its channel ever deeper (Bottom et al. 1985 in Thurow 1989). A properly functioning floodplain, including intact, native riparian vegetation, is critical to the long term persistence of a quality fishery.

Large Woody Debris

Woody debris is another critical component of trout habitat and a healthy river. Removal of woody debris can increase stream velocities and adversely affect the channel and riparian vegetation. (Benke et al.1985 in Thurow 1989). Increased stream velocities result in more erosive and destructive high flows. Zika and Peter (2002) showed that "large woody debris can serve as a method of reconstructing channelized streams to improve salmonid habitat." They found that the abundance and biomass of rainbow trout increased in sections of stream where whole trees were inserted in to a channelized stream.

Roni and Quinn (2001) studied 30 streams in western Oregon and Washington to test the responses of juvenile salmonids to artificial placement of large woody debris. They found that placement of woody debris resulted in significantly higher densities of salmonids. Their study indicated that in-stream large woody debris increases habitat complexity, reduces sediment transport, traps gravel needed for spawning, stabilizes channels, provides food for aquatic invertebrates and provides stream nutrients, resulting in an overall increase in stream productivity (Bisson et al. 1997 in Roni and Quinn 2001). Woody debris is positively associated with a productive and healthy fishery, as it dissipates stream energy during high flows, assists with the creation of side channels and provides deep pools for fish habitat.

River Alterations: Effects on the Fishery

Since the 1940's, man-induced activities have extensively altered trout habitat in the Big Wood River (Thurow 1987). Declines in trout populations as a function of stream alterations are well documented. Thurow (1987) noted that "alterations of the stream channel and riparian habitat adversely affect stream hydraulics (Marston 1982; Bottom el al. 1985), nutrient pathways (Schlosser 1982), invertebrate production (Benke et al. 1985), and fish production."

The Community Library of Ketchum, Regional History Department.
USDA Forest Service Ketchum Ranger District, circa 1950.
"Big Wood River Maintenance."

As part of a study to evaluate the effects of stream alterations on Idaho's rivers, Irizarry (1969) surveyed portions of 45 streams for river alterations, totaling 1,138 miles. Comparisons from electrofishing showed the total number of game fish in natural areas as opposed to altered areas was 10 to 1; while in weights of game fish, the natural areas out produced the altered areas by 14 to 1 (Irizarry 1969). Furthermore, Irizarry notes "recovery of the stream ecology is extremely slow or in some instances almost nil." Gebhards (1969) notes that areas on the Yankee Fork of the Salmon River dredge mined 30 years ago still produce 97 percent less pounds of game fish than undisturbed areas of the same stream. An area altered in association with railroad construction on the Portneuf River in 1882 still remains 83 percent below productivity of areas where the channel remains unaltered (Gebhards 1969). Cumulatively, the negative impacts associated with stream alterations pose a multi-faceted threat to maintaining healthy rivers and the fisheries they support.

In the 1960's destructive channel clearance and channelization projects on the Big Lost and the Big Wood helped prompt the passage of legislation to protect Idaho's stream channel which states that "the public health, safety and welfare requires that the stream channels of the state and their environments be protected against alteration for the protection of fish and wildlife habitat, aquatic life, recreation, aesthetic beauty, and water quality (Idaho Code Section 42-3801)." However, no effort has been made to collectively investigate the number or impacts of the alterations on the Big Wood River since Irizarry's work.

Limiting Factors of the Fishery

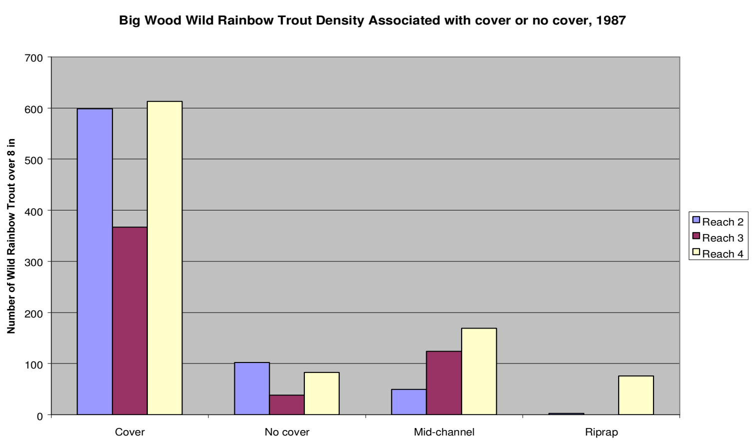
Limiting factors are conditions and resources that regulate population levels or growth. Theoretically, biological populations are limited by one or a very few factors that are needed in some minimum amount by individuals in the population. If the amount of that resource in the environment is increased, then the population will increase to some new level at which it will be limited by another resource (or the same resource at a higher level).

Thurow collected data during three field seasons in 1986-88 to evaluate the status of the trout fishery, identify the limiting factors of the Big Wood River's fishery, and make recommendations on how to improve it. Goals of the study included: comparing fish populations in altered and unaltered reaches; examining the value of woody debris as fish habitat; examining the abundance, distribution and age structure of the fish stocks; assessing the impact of water diversions; and evaluation of the fishing regulation in different stream reaches. This information is still the most in-depth and comprehensive study on limiting factors associated with the Big Wood's fishery. *In conjunction with supporting studies, Thurow's study shows that the amount and quality of habitat and water quantity are the limiting factors for the trout fishery in the Big Wood River.*

Quality Habitat and Fish Density

Thurow collected habitat data through electrofishing and snorkeling surveys on segments of the Big Wood River demarcated as: Reach 1- Magic to Glendale Diversion; Reach 2- Glendale Diversion to Star Bridge; Reach 3- Star Bridge to Deer Creek Bridge; Reach 4- Deer Creek to Red Top; Reach 5- Red Top to Warm Springs; Reach -: Warm Springs to North Fork; and Reach 7- North Fork to Easley. Thurow correlated fish densities with habitat types and cover components. See **Attachment I** for a detailed description of these research reaches of the Big Wood River.

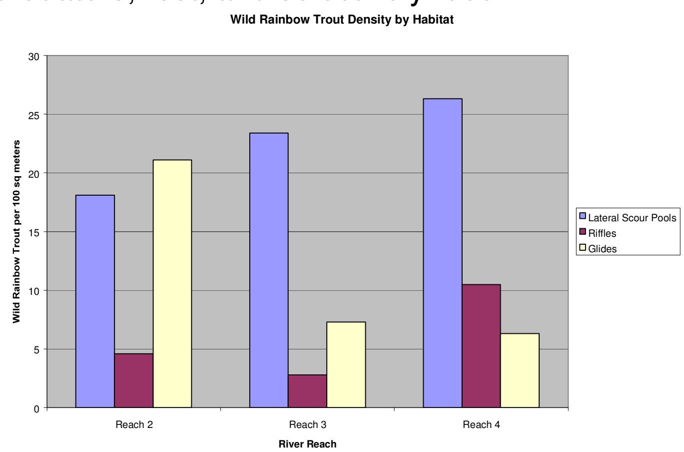
Thurow (1988) stated that, "although several factors, including angler harvest and irrigation withdrawal affect its fish populations, the most critical factor limiting the trout population in the Big Wood River appears to be the amount and quality of fish habitat*. The future of the Big Wood River fishery is dependent on our ability to stop the loss of habitat and restore important degraded areas* (emphasis added)*.*"



Trout densities were influenced more by the presence of cover, than by type of habitat. Large woody debris (such as cottonwood trees or root wads) was the most abundant cover component, followed by roots and undercut banks (Thurow 1989). Snorkel estimates revealed trout densities eight to ten times higher in areas with cover components than without. Comparing densities in 100 square meters, an area roughly the size of two football fields, there was no statistical difference between areas with riprap and areas without cover. Trout densities averaged

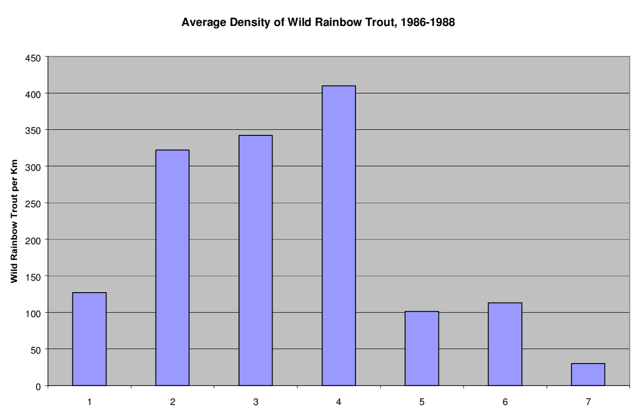
17.4 fish/100 m² where cover was present, 1.2 fish/100 m² where no cover was present, and 2.1 fish/100 m² in areas containing rip-rap (Thurow 1987).

Thurow (1988) found that in the Big Wood River, low-gradient riffles, lateral scour pools, and glides were the most common habitat types accounting for 57%, 24% and 12% of the surface area of the stream respectively. Pools, in particular lateral scour pools, supported the largest trout densities. Depth was not quantified as a cover component in Thurow's studies, but he documented (1989) that trout densities were also positively related to depth at sites with cover components present. In particular, larger trout were most affected by depth, as larger trout need deeper areas to hide from predators, rest, and selectively feed.



Among lateral scour pools, sites with cover supported more than ten times the density of trout than sites without cover. Thurow also found a positive relationship between percent cover and fish density for all habitat types combined. Of 2,224 trout observed in 37 sites, 71% were associated with cover components such as root wads, root clusters, stumps, large woody debris anchored in the stream channel (Thurow 1987).

Reaches 2-4 are the most productive portions of the Big Wood. Thurow (1990) found that Reaches 2-4 supported more than three times the density of trout than Reaches 5 and 6. Trout grew more quickly below Warm Springs Creek than above, and Reaches 2-4 supported more larger and older fish as well. Densities of 300 mm (11.81 inches) and 400 mm (15.74 inches) trout were 2.5 and 3.4 times more abundant in Reaches 2-4 than in Reach 6. Reaches 2-4 below Warm Springs Creek also play a vital role in wild rainbow trout's life cycle. Trout migrate upstream to spawn, with the most movement occurring in reaches downstream from Warm Springs Creek. The majority of mainstem spawning happens between Glendale Diversion and Warm Springs Creek (Thurow 1990).



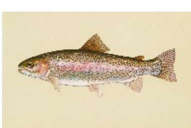
Historically, the BWR has always maintained a popular and quality sport fishery. Thurow's research documented catch rates on average of more than one trout per hour, with more than 50% of creeled fish exceeding 300 mm or 11.81

inches. While Thurow noted that fish managers had the opportunity to balance natural mortality with harvest to improve the population size structure, he also concluded that regulations had a minor influence in the total abundance of trout and emphasized that habitat issues are more important than fishing regulations to preserve the long-term viability of the fishery (Thurow 1994).

Compensation

Fish populations compensate for losses, so harvest of fish, without significantly reducing the population, is possible. Annual mortality rates in the Big Wood River are large and compensatory mortality may be occurring (Thurow 1990). Compensatory mortality is achieved when exploitation rates decrease and natural mortality increase (Thurow 1990); each fish killed due to angling will simply replace a fish that would have died due to natural causes, such as competition for limited food or habitat.

River alterations have left an enduring legacy for the Wood River. Thurow suggested (1990) that habitat capacity during the winter months may ultimately determine the carrying capacity of the system because trout protected from exploitation during the summer may succumb to natural mortality during the winter, when competition for food and the effects of variable water temperatures are exacerbated. Flows are at a low point in the winter months, temperatures are also low and the combination makes winter tough on fish. Activities which degrade habitat can reduce growth and increase the severity of winter temperatures fluctuations. With less weight reserves on the fish going into winter, temperature fluctuations may have a greater impact on the fish and cause higher mortality. This situation could be aggravated by continued habitat degradation which may reduce the trout population and mask any potential benefits from regulation changes (Thurow 1990).



Water Quantity: Agricultural Irrigation

Water is a scarce and valuable resource in the West and the Big Wood River drainage is no exception. Water quantity, spawning grounds and the stream channel itself in the BWR are affected by agricultural diversion and drought. Thurow (1988) describes impacts to fish from water diversions:

- Fish enter unscreened diversions and are killed when diversions are dewatered.
- A 1922 decree authorizes irrigators to divert the entire Big Wood River in a Bypass Canal. Diverting of the water effectively dewaters a 6 km reach of the river below the Glendale diversion, killing all fish present.
- Diverting the entire river down the Bypass Canal blocks all passage of fish.

- Use of bulldozers and other large equipment to divert water is destructive to aquatic habitat.

Hauck (1949 in Thurow 1988) surveyed the canal system and found largest populations in the Baseline Bypass and the District canals. Thurow's field data (1988) confirm these concentrations. Thurow proposed screening the canals or gradual water removal from the stream through headgate manipulation, known as staged reductions. Studies on the Gallatin River in Montana showed that these efforts could reduce fish losses (Clothier 1953 in Thurow 1988), by stimulating upriver movements of fish out of canals. Thurow emphasized prioritizing an appropriate diversion test site, using a control site, and evaluating the effectiveness of the test at the end of the irrigation season. Megargle (1999) evaluated fish loss in 4 canals on the BWR, the Hiawatha, Osborn, Cove, and District canals. However, high water precluded trapping fish for entire season on the District Canal. Megargle ended his study a year early due to extreme difficulty in establishing reliable exploitation rates.

The Baseline Bypass Canal is the site of a series of different water diversion activities that have negative impacts to trout populations. Thurow (1988) makes several recommendations regarding these impacts. Bulldozers enter the streambed each year to create a gravel berm to completely divert the river, killing resident fish, and severely disrupting steam hydraulics and aquatic habitat. The berm also blocks fish passage for spawning. Thurow recommends a staged reduction at the Glendale diversion that would stimulate fish movement upstream, concentrate fish close to the berm, and facilitate fish salvage.

Trout Unlimited and local fishing guides rescuing fish from BWR canal, 2005.

A different method of diversion which keeps bulldozers out of the stream channel would better protect trout populations. Thurow recommends investigation into the basis for the 1922 decree that entitles irrigators to divert the entire river into the Bypass canal at the Glendale diversion. The decree is based on the premise that a net water savings of 18 cfs results when the river is diverted out of its natural channel (Upper Big Wood Water Users Association vs. Chapman, August 9, 1922). If the river remains in its natural channel, the 18 cfs supposedly percolates through the streambed and is "lost." It would be beneficial for a hydrologist to perform a flow analysis to test this premise.

While efforts to screen diversions and conduct staged drawdowns are certainly laudable, their effects would be marginal in terms of the long term health of the fishery. The health of the fishery can best be protected by focusing on quality habitat protection and restoration, and addressing the water quantity issue at a higher level, such as state legislation allowing for in-stream flow water rights for fish and wildlife. Phase III of this assessment will address water quantity at the local and state level.

Drought

Bruns and Minshall (1979) studied effects of drought on the Big Wood River. A regional drought (snowfall was at twenty percent of the average for 1958-1972) prompted inquiry into the conditions of the stream biota. Although precipitation and peak and mean annual flow were indicative of drought conditions, minimum flows were not unusually low. Under normal conditions, the Big Wood River approaches baseflow in December, which presumably continues at least through February.

In 1977, due to very low spring runoff, the Big Wood returned much earlier to its baseflow. The ability of the river to maintain baseflow for such a long period of time, from August through March, is due to its spring-fed headwater tributaries. Bruns and Minshall concluded that critically low water years are at least partly a result of cumulative effects. Negative effects from low water years result when back to back low water years occur. If 1976 had been a below normal water year (it was above normal), the biota of the Big Wood River water aquatic and riparian habitats could have been seriously degraded. Repeated drought years can and will stress the fishery and all other life that depends on the Big Wood River.

Four Biological Units of the Big Wood River

The two factors limiting the Big Wood's fishery affect specific sections of the river in different ways and sometimes work in combination. Thurow (1990) divided the upper main river (upstream from Magic Reservoir) into four units based on its biological capabilities. See **Attachment I** for details on location of the four units.

- The first unit stretches from Magic reservoir to Glendale Diversion. Thurow identified this unit as "severely limited by withdrawal of water from the channel for irrigation."
  Below the Glendale diversion, the Big Wood River provides fish habitat and fishing opportunities primarily during early spring, as fish migrate from Magic Reservoir to upstream spawning areas. Fishing opportunities and fish densities decline through spring and early summer and this section

goes dry when bulldozers push up gravel to form the Glendale Diversion dam.

- The second unit stretches from the Glendale Diversion upstream to Warm Springs Creek (see **Attachment II**). This unit was identified as supporting a wild population of rainbow trout with the potential to produce trout exceeding 500 mm or 19.69 inches. Severe habitat alterations and withdrawal of water limit the trout population in the lower portion of this river unit (from the Glendale diversion to Star Bridge). Due to the existing alterations and the river's productivity in this area, this is the section of river that offers the greatest opportunity for restoration projects and protection of existing unaltered areas that will benefit the fishery. It is worth noting that the growth rates for trout in this section of the river are comparable to the Henry's Fork of the Snake River (Thurow 1990), a nationally renowned trout fishery.

- The third unit was identified as that portion of the river from Warm Springs Creek to the North Fork of the Big Wood River. This area also supports a viable rainbow trout population, but trout in this section of the river grow more slowly than in downstream areas and natural mortality is very high. Rainbow trout in this area do have the potential to obtain sizes exceeding 400 mm or 15.75 inches.

- The fourth unit, from the North Fork of the Wood River to the headwaters, supports a small population of rainbow trout. Natural conditions such as cold water temperatures, lack of nutrients and lower fecundity, or the ability of the fish to produce a great number of eggs, limit this portion of the fishery.

Alteration, Protection and Restoration: Lessons To Date

Protection of existing unaltered habitat and preservation of the natural functions of the BWR and its floodplain will be the greatest area of focus for WRLT conservation efforts. Thurow assisted with trout population monitoring when drop structures were placed in the river and a section of Highway 75 was realigned to move it further away from the river in 1990. The drop structures were constructed of nested, large rocks strategically placed across the channel. Drop structures are designed to trap bedload and reduce headcutting and erosion of streambanks. Thurow's (1989) pre-construction density estimates were 131 trout per km (.62 mile). Thurow's single post project estimate was 78 trout per km. Flows were significantly lower, 44% of pre-project flows, and may have influenced the densities. Idaho Fish and Game Regional Supervisor Dave Parrish (2005) notes that "biological populations fluctuate immensely." Lower flows can cause those great fluctuations on an annual basis or during extended drought periods.

Saldi-Caromile et al. (2004) recognizes potential benefits of drop structure placement but also caution that "…drop structures are an 'unnatural anomaly in the fluvial system'[3] and may have serious negative impacts on the stream ecosystem. For instance, drop structures prevent the channel from moving laterally or adjusting vertically to maintain itself…and they may become barriers to target fish passage if the downstream channel incises or a downstream structure fails. Therefore, drop structures should only be applied where necessary, and only where they will be monitored regularly to ensure they do not become barriers to fish passage." Dave Parrish agrees and emphasizes the natural functions of the river over restoration or alteration efforts that confine the river or place "hard structures" such as riprap or drop structures. "We should limit the number of hard structures in the river," says Parrish, who notes that the Big Wood River experiences pulses of high sediment load when sediment that builds up behind drop structures is released, clogging fish gills and negatively impacting the water quality (2005).

Monitoring and maintenance of any restoration project requires the allocation of time, money and resources. It is a challenge that must be met. Monitoring is a key component of restoration efforts to identify successes and learn from past mistakes. Restoration is just one piece of the BWR's future. The Wood River Land Trust will also focus intently on protection efforts for unaltered areas and prioritize projects that secure the natural, undisturbed dynamics of the river for the future health of the watershed.

Solutions: Protecting the Big Wood River's Fishery

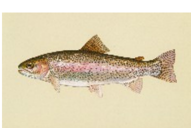
Residents, local government, community organizations, homeowner associations, property owners, visitors who love the Big Wood River and the Wood River Land Trust must cooperate in our efforts to bring solutions to bear on the habitat and water quantity limits that affect the health of our fishery and our river. These areas of focus will be critically important to our success:

1. **Public education/outreach**:The Big Wood River and its fishery would greatly benefit from a public education campaign to teach residents and visitors to the Wood River valley, landowners, policy makers, and other key individuals about the value of the floodplain, riparian vegetation and other important factors influencing fish habitat. Homeowners often take action out of ignorance that damages the floodplain and riparian vegetation. A program to educate valley residents and second homeowners about the best ways to protect themselves against flooding, and the best site plans and landscaping for new homes is crucial.

2. **Restoration and Protection of the River Corridor:** Restoration measures should include re-vegetation of degraded banks with native

vegetation that grows quickly, provides good fish habitat and stabilize banks; potential additions of anchored woody debris in the stream channel; and on-going monitoring of all previous and newly developed restoration projects to identify successful techniques. WRLT will focus on biological unit number two, the most productive area of the river for the fishery (see **Attachment II**).

3. **Local Land Use Regulations and Legislation:** We need local ordinances and state laws to help us protect the fish and the river. These ordinances and laws should:
    - Regulate development in the floodplain through buffer zones that maintain the riparian habitat and allow the natural functions of the floodplain to take place in high water events. Buffers should include areas inundated at peak flows.
    - Maintain backwater and overflow areas, and use building techniques for roads that maintain these areas. Ordinances need to maintain the natural sheet flooding across the floodplain, in order to perpetuate the scouring action from high flows that develops and maintains riparian vegetation and groundwater recharge.
    - Direct local and state officials to promote alternatives to riprap, such as anchoring trees and brush bundles in the stream channel and restoration of riparian vegetation.
    - Keep woody debris in the river as a general practice. Consider removal of debris only in very specific cases and use only the minimal equipment needed.
    - Require river and stream bank restoration as part of the subdivision approval process. Linking the river restoration process to growth ensures that the community values of a quality fishery and healthy river are preserved as our community grows.
    - Conversion of agricultural land to residential subdivisions should return water to the river whenever possible; water rights in excess of those required to meet the needs of the subdivision should be directed back in to the river.



Next Steps: WRLT Fish Assessment Phase II

The findings of Phase I have clearly demonstrated the need for further research on river alterations on the Big Wood River. In Phase II of the Big Wood Fishery Assessment, Wood River Land Trust will concentrate its efforts to restore and protect the river between Warm Springs Creek and the Glendale diversion in order to best protect the fishery. To target our efforts within this area, we will identify specific areas where the river has been altered through channelization, diking, riprap or channel clearance. Phase II of the Fishery Assessment will include searching appropriate county, state and federal records for documents associated with these historic and recent river alterations and ground truthing these projects to create a map of known river alterations. Phase II will also include maps overlaid on historic and recent aerial photographs with land use information such as residential development, roads and riparian forest to show historic land uses and the changes to the Big Wood River corridor and the valley over time. Phase II record searches, ground truthing and mapping will help WRLT identify priority areas for restoration projects and protection efforts. These maps will also assist us in the public education and outreach effort necessary to implement more protective local land use regulations. Working with local elected officials, educators, concerned citizens and other conservation organizations, we can ensure a healthy future for the Big Wood River and its fishery.

How You Can Help Support Our Efforts

Wood River Land Trust needs your help to conduct future phases of the Healthy Waters, Healthy Future project. To help secure the future of the fishery you can:

- Act as a River Ambassador: educate your neighbors, friends, colleagues
- Be a voice at local government meetings: support strong local land use regulations that protect the floodplain and its natural functions for the fishery
- Contribute to WRLT: donate to WRLT to complete the Phase II analysis of the river by identifying and mapping diking, riprap and other river alterations. Contributions can be made by mail, phone or online at: www.woodriverlandtrust.org.

Executive Summary

The upper Big Wood River has long been recognized as a productive wild trout stream (IDFG 1986 in Thurow 1987). As residential development, flood control and road building efforts and other human impacts have increased, the fishery has declined (IDFG 1986 in Thurow 1987). Detailed studies of the Big Wood River's fishery indicate that the amount and quality of habitat and water quantity are the limiting factors for the fish populations in the upper Big Wood River (from Magic Reservoir to the headwaters). River alterations in the floodplain greatly impact the available habitat for wild rainbow trout. These alterations include the use of riprap, diking, channel relocation, and removal of large woody debris from the channel (Irizarry 1968, Thurow 1987).

Thurow (1990) divided the Big Wood River into four biological units to describe the factors that limit the productivity of the fishery and opportunities to protect the fishery and health of the river. Unit one, from Magic Reservoir to the Glendale diversion, is most limited by water quantity, as the river goes dry due to agricultural irrigation each year.

From the Glendale diversion to Warm Springs Creek, or biological unit number two, the fishery is most affected by the stream alterations and also affected by water quantity. Unit two is the most productive area of the river where fish are more densely concentrated. As the most productive stretch of the fishery, this is the area that offers the greatest opportunity to improve the health of the fishery with restoration efforts and land protection projects.

From Warm Springs Creek north to the headwaters the fishery is limited primarily by natural conditions such as the colder water temperatures and lack of nutrients in the river system. Unit three, from Warm Springs to the North Fork of the Big Wood, supports a viable rainbow trout population, but growth rates are slower than in the lower stretches of the river.

The fourth unit, from the North Fork of the Wood River to the headwaters, supports a small population of rainbow trout and natural mortality rates are very high. **Attachment I** details the research reaches and biological units of the river.

Restoration of altered reaches on the river and protection of existing unaltered areas will help secure the future of the Big Wood River's fishery in the face of rapid development pressures and population growth. Public education and outreach about the function, values and qualities of a healthy riparian corridor and floodplain are key to such protection efforts. Local land use regulations aimed at protecting and restoring the fishery are also critically important to the future of the Big Wood River. These regulations should:

- Limit residential development in the floodplain and protect its natural functions
- Promote alternatives to flood control methods like riprap
- Keep large woody debris in the river
- Promote the return of water to the river when agricultural properties are converted to subdivisions and
- Require restoration projects as part of the subdivision approval process.

For more information contact:

Kathryn Goldman, Project Coordinator
Wood River Land Trust
119 East Bullion Street
Hailey, Idaho 83333
phone: (208) 788-3947
email: kgoldman@woodriverlandtrust.org
www.woodriverlandtrust.org

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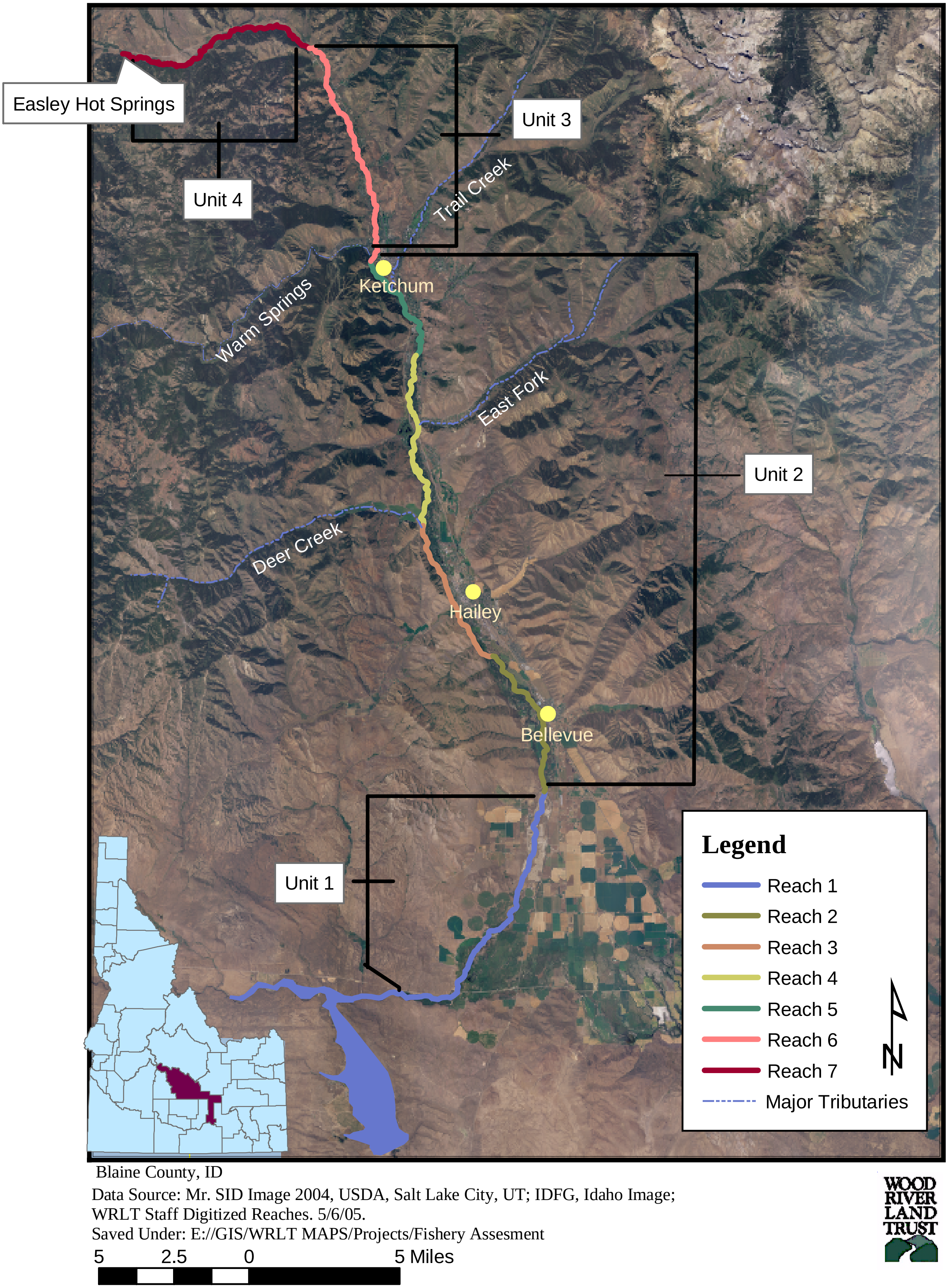
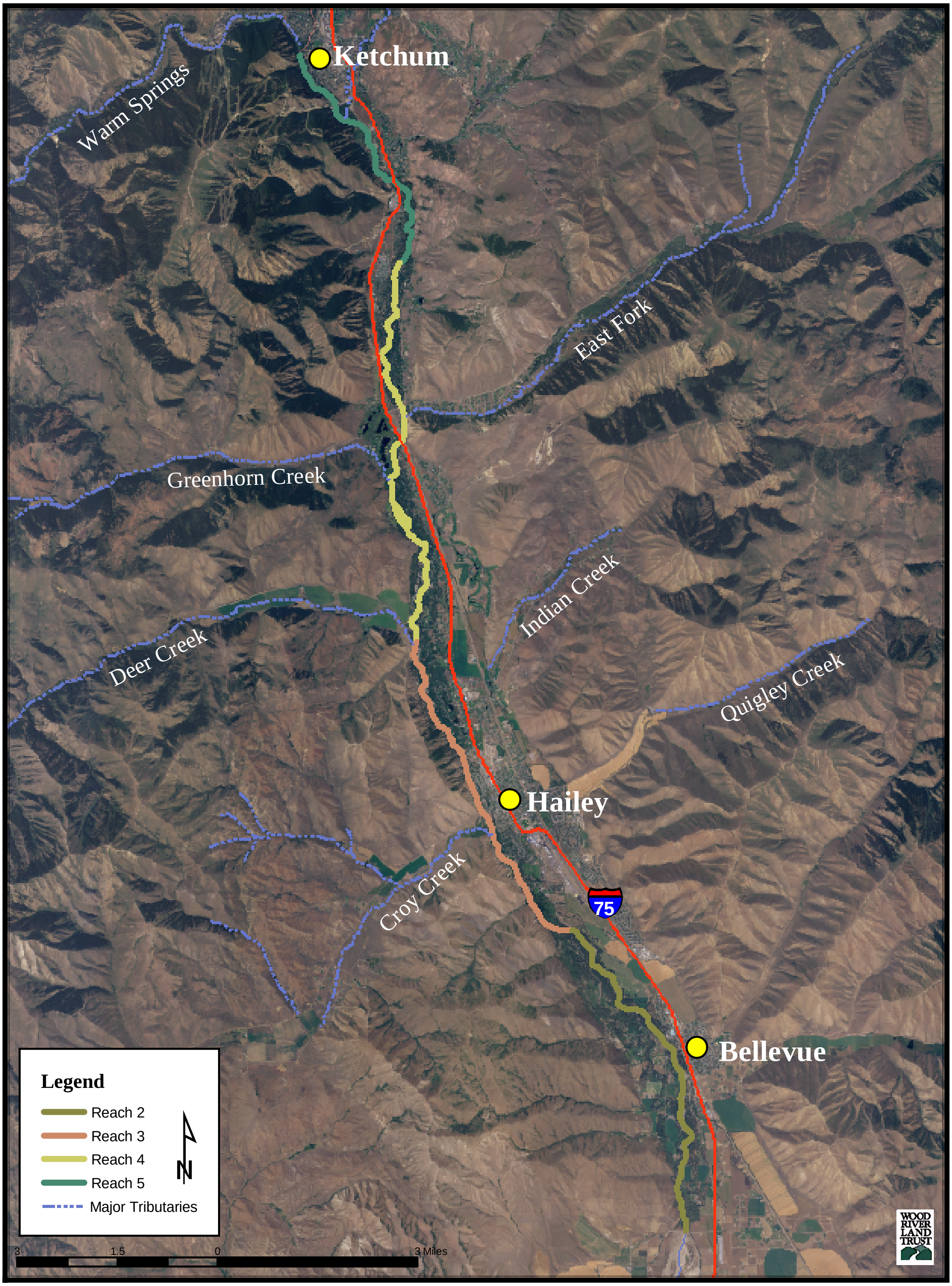
Attachment I
Biological Units and Data Reaches



Blaine County, ID
Data Source: Mr. SID Image 2004, USDA, Salt Lake City, UT; IDFG, Idaho Image; WRLT Staff Digitized Reaches. 5/6/05.
Saved Under: E://GIS/WRLT MAPS/Projects/Fishery Assesment

WOOD RIVER LAND TRUST

Attachment II
Biological Unit Two



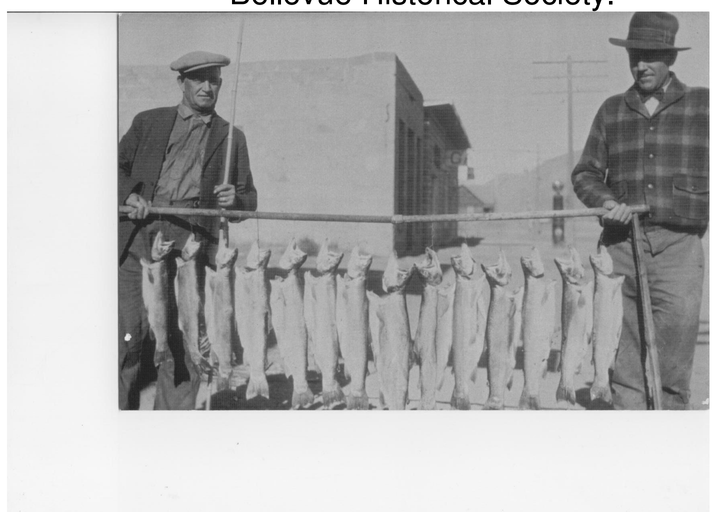
Data Source: Mr. SID Image 2004, USDA, Salt Lake City, UT; IDFG, Idaho Image;
WRLT Staff Digitized Reaches. 5/6/05.
Saved Under: E://GIS/WRLT MAPS/Projects/Fishery Assesment

Attachment III

Historical Photographs

“One Hour’s Catch,” Hailey, Idaho, circa 1900.
The Community Library of Ketchum, Regional History Department.

Bellevue, Idaho, circa 1920.
Bellevue Historical Society.



“One day’s catch,” Hailey, Idaho, circa 1900.
The Community Library of Ketchum, Idaho, Regional History Department.

Attachment IV

Idaho Statesman 5-24-05 article

Since the first printing of Healthy Waters, Healthy Future: The Big Wood River Fishery Assessment, a number of newspapers in Idaho covered the release of an economic study which quantifies the value of angling and boating in Eastern Idaho. While the study took place in Eastern Idaho and Montana, its conclusions are valuable to other Idaho communities where tourism and our quality of life are recognized assets and rivers plays a vital role in the local economy. The webpage from the *Idaho Statesman* is included below.

Trout fishing is big money in southeast Idaho

Study: Better fishing would mean even more

Roger Phillips / Idaho Statesman file

The Henrys Fork of the Snake River in eastern Idaho was part of a study that determined that anglers spent $46 million in that region last year, and they would spend more if there were more or bigger wild fish.

The Associated Press Edition Date: 05-24-2005

IDAHO FALLS — A new study of anglers and boaters who ply the blue-ribbon trout waters straddling Idaho and Wyoming shows that they spent $46 million in their pursuits last year and would pay $32 million more annually if there were more — or bigger — wild fish in the Henry's Fork and South Fork of the Snake River.

Conservationists, who helped pay for the survey of nearly 800 anglers last year that formed the basis for the study, said it's the first time a dollar figure has been placed on the tourism business generated by trout fishing between Jackson Hole on the upper Snake River in Wyoming and the Henry's Fork River in eastern Idaho.

"This survey shows fishing, as long as it is managed properly, is an economy that can use the renewable resource in perpetuity," said study author John Loomis of Colorado State University, who was scheduled to present his findings during a conference in Jackson, Wyo., today and in Idaho Falls on Thursday.

Steve Trafton, executive director of the Henry's Fork Foundation, said the research demonstrates that trout fishing is a powerful economic engine in eastern Idaho, generating 1,192 jobs in Fremont, Jefferson, Bonneville, Madison and Teton counties in the Henry's Fork and Upper Snake River drainages. Another 1,460 jobs depend on fishing and boating in Teton County, Wyo.

Loomis and students from Idaho State University contacted 787 anglers and boaters along 11 river segments from Wyoming's Jackson Dam on the Snake to Idaho's Island Park on the Henry's Fork between May and September 2004. In addition to asking anglers about current spending habits, researchers asked how much they would spend if they caught twice as many fish or caught fish that were 25 percent larger.

The study estimates that anglers in pursuit of bigger or more plentiful fish would create another 1,000 jobs and generate $32 million in additional revenue.

Trafton said conservationists hope the study's findings will catch the attention of politicians, federal land management agencies and water managers, encouraging them to work to improve local trout fisheries. He points to the Henry's Fork downstream from St. Anthony, northeast of Idaho Falls, where the wild trout numbers are a fraction of what's found on the upper stretches of the river. Groups such as the Henry's Fork Foundation and Trout Unlimited say wild fish populations could be improved in the lower reaches with trout-friendly water releases from upstream dams and by installing screens to prevent fish from swimming into irrigation canals.

Chris Jansen Lute, water resources program manager for the U.S. Bureau of Reclamation's regional office in Boise, monitored the study and said the dollar figure is important to policy decisions.

"This study demonstrates that careful water management can support not only a strong irrigated agricultural economy, but a healthy fishery economy as well," Lute said. "Done well, we can have both."