

CHAPTER 5: RIVER RECREATION AND HABITAT

A watershed study was completed on the Roaring Fork River in 1999 for the Colorado Water Conservation Board by BRW, Inc. and Aquatic and Wetland Company. This study won State and National awards, and is considered a model for watershed approaches to river management. The following is an excerpt from the report that has been applied to the Dolores River watershed.

FISHING AND TROUT HABITAT

The Dolores River Fishery

The Dolores River fishery extends from its headwaters near Lizard Head Pass downstream to the City of Dolores and McPhee Reservoir. The Dolores River is canopied with overhanging vegetation and of steep gradient. The fish habitat is characterized by plunge pools, pocket water pools and steep fast flowing riffle area. The lower portion of the river flattens and is the most popular reach for the float fisherman.

Concerns over Whirling Disease prompted the Colorado Wildlife Commission in 1998 to reduce bag limits from eight to two trout west of the Continental Divide in an effort to maintain and improve the fisheries of western slope rivers.

Existing Habitat Degradation

Field survey of the Dolores River quickly indicates past negative impacts to the water quality, riparian habitat, streambank stability, and instream fish habitat. Long and short reaches of the rivers have been degraded and continue to be degraded by past mining, channelization, road and highway impacts, encroachment into the riparian zone, degradation of streambank and fish habitat, berming to reduce flooding potential and a host of lesser habitat modifications. The collective impact of these habitat modifications has been to reduce the capacity of the rivers to retain and maintain their historical resource values. Vigilant and proactive management must be a goal to prevent future deterioration and loss of these important values.

Stream Development Projects

A number of stream habitat development projects have been completed that utilized state of the art stabilization and improvement technique. These projects have been undertaken by the Colorado



Rainbow Trout



Brown Trout



Brook Trout

Division of Wildlife, municipalities, and private parties. Additional work, including plantings, was completed. Various types of log revetments, drop structures, deflectors, vanes, trees, rootwads and boulders have been used to stabilize degrading reaches that lack fish habitat. Overall structural and functional benefits can be extremely positive.

Stream habitat development projects can only be successful when the species (trout) specific habitat requirements are strongly considered, designed and implemented. For example, optimal trout stream habitat is characterized by:

1. Clear, cold spring-fed or snowmelt water,
2. A silt-free rocky substrate in riffle-run areas,
3. An approximate 1:1 pool riffle ratio,
4. Deep, slow, flat surface water pools,
5. Well vegetated stream banks,
6. Abundant instream cover; and
7. Relatively stable water flow, temperature regimes, and streambanks.

Additional requirements include young-of-the-year nursery, spawning, rearing and over-winter habitat. Each of these essential requirements, when implemented, monitored and evaluated, can be provided by a diversity of proven techniques and treatments that provide optimal wildlife habitat with a high degree of project success. Therefore, design plans for habitat development projects need to include those components that work together in a synergistic relationship that will provide the structure and function to achieve the project goals. The four most common component parts in priority order include:

1. Water quality protection,
2. Riparian habitat enhancement,
3. Streambank stabilization, and
4. Instream habitat development.

Each of these requisites should be strongly considered in forthcoming future projects.

Effects on Spawning Trout

Stream habitat development projects in rivers like the Dolores River require the utilization of heavy equipment within the channel that commonly causes mobilization of sediments and periods of high turbidity. A large number of studies have been conducted that examined the effect of high sediment transport and turbidity on trout well being. Generally, it was shown that the level of sediment transport and turbidity created during in-channel construction projects did not have a negative effect on juvenile and sexually mature trout. Whereas short term increased turbidity during trout spawning cycles may pose little or no harm, excessive sediment deposition upon trout spawning beds (redds) may be detrimental by reducing the rate of egg survival and hatching success.



Spawning Rainbow Trout.

Spawning Seasons and Habitat

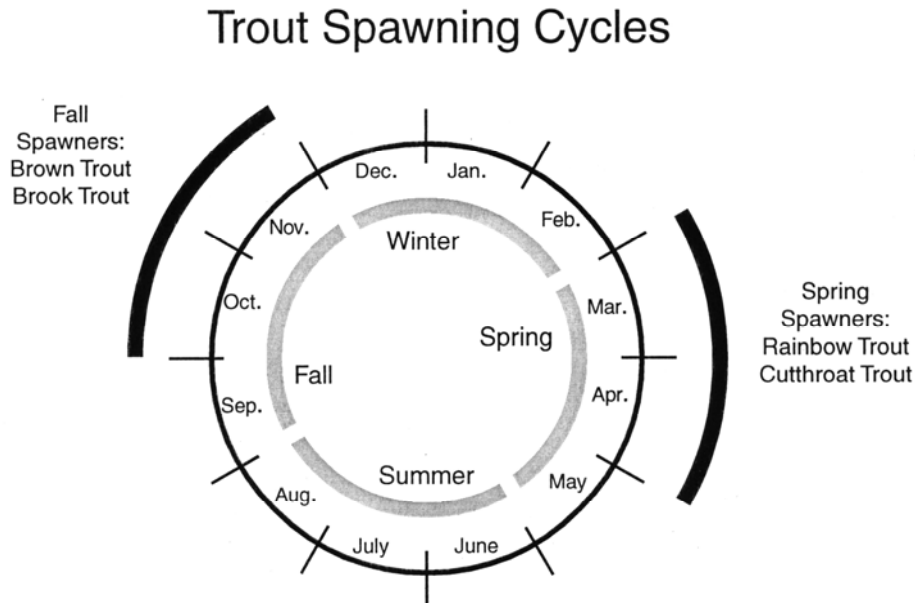
Rainbow trout and cutthroat trout tend to spawn at low water flow during the early spring about the time the ice cover leaves. Brown and brook trout tend to spawn in the early winter season about the time that ice begins to cover the streambed.

Although there are minor trout species differences, spawning trout exhibit definite preferences for specific locations, water velocities, water depth and substrate gravel size. The preferred spawning location is at the head of a riffle (tail out of a pool) in areas containing gravel ranging in size between pea size and three inches. Commonly, water depth ranges between six and eighteen inches and velocity approximates 1.5 feet per second.

Water flowing out of a pool encounters the head of the riffle where a hydrostatic head is created causing water to flow into and up through the interstitial spaces of the gravel substrate. Trout deposit eggs in self-created nests (or redds) approximately six inches deep in the gravel at the head of the riffle. Therefore water moves up through the nest and thereby flushes away fines and sediment while providing much needed oxygen for embryonic development.

Construction Practices and Spawning

Instream construction generally occurs for approximately four hours in the morning and four hours in the afternoon. Although water quality can be decreased during these periods, trout are well adapted to withstand episodic periods of high sediment transport and turbidity. Water quality tends to quickly return to normal following the end of the workday and remains normal until work begins the next workday. Therefore, water quality remains high during the remaining sixteen hours of the day. Nevertheless, when possible it is best to avoid scheduling instream construction projects in areas where trout are known to be actively spawning to avoid excessive sediment deposition on the spawning beds (redds) which reduces the rate of egg survival and hatching success.



RECREATIONAL VALUE OF THE DOLORES RIVER

Road improvements in the Valley have made the Dolores River increasingly accessible to recreation. When the winter ski crowds have receded from the Valley, there is a short period of respite before visitors pour in to enjoy the warm weather recreation the Valley offers. The Valley and river provides entertainment for residents and visitors who make use of the rivers' many recreational opportunities including fishing, rafting and kayaking. While these users love the river, their adoration will leave its toll if left uncontrolled.

Fishing

The American Sportfishing Association tabulates figures for fishing participation and economic impact in the State of Colorado. These figures include expenditures related to specific trips, sport fishing equipment, licenses, and lodging as well as wages and salaries related to sport fishing. Obviously, recreational fishing is of immense economic importance within the State and to some extent in the Dolores River Valley. The sport continues to increase annually emphasizing the need for long-term planning and resource management. The popularity of fishing in the State is reflected in the number of fly shops, outfitters, guides and associated businesses. However, water quality has impacted the fishery of the Dolores River in the Rico area.

Concerns of Fishermen and Outfitters

Those who fish the Dolores River and the outfitters who serve some of them have expressed three primary concerns: **ACCESS, WATER QUALITY** and **HABITAT QUALITY**. Public access to the river is a significant concern to fisherman and boaters. Some would like to see the number of access points increased. Others would like to see more public information about access, including better maps. Some landowners have expressed reservations about property damage that might happen if there are not adequate controls on public access. Concern has also been stated regarding the need to assure that access is safe and that the risk of accidents is minimized. In some cases urban development, including the development of roads and highways has had an adverse effect on access.

Habitat quality includes diversity of the river and the quality of the water in the rivers. Trout need a combination of fast moving water and slow pool areas with protective cover. Reaches of the river that are highly unstable have turned into one long riffle section. When the river cannot dissipate its energy, it continues to wash away at the bed and banks resulting in a reduction of trout habitat. Pools and protective cover have been filled with sediment. Encroachment into fish habitat adjacent to the rivers due to urban development and supporting infrastructure leads to instability and is a concern. There may be a need to incorporate better mapping of fish habitat and more careful review procedures into local land use approval processes to lessen the risk of future encroachment further degrading important habitat.

Boating

The Colorado River Outfitters Association conducts an annual survey and produces a report titled, "River Use in the State of Colorado." Economic impact is calculated as direct expenditures multiplied by 2.56 (economic multiplier). The economic multiplier as defined by the Colorado Tourism Board is the number of times a dollar is spent in the local area before being spent outside that area.

As water quality and fisheries improve, there will be more demand for river recreation. Adequate access is always a concern for the public. There are a finite number of potential public access points along the river, and as river usage increases, proper management of those access points becomes a concern. Some of the issues that have arisen over access points include environmental impact concerns and permitting issues associated with commercial use of publicly owned land. Establishing designated access points and managing those areas to accommodate rafters allows for less congestion and more regulated usage.

Commercial User Days In The State Of Colorado 1988 - 1997

Figure III-12 . Commercial Boater Days in the State of Colorado.

River	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Animas	12,000	13,000	10,000	18,000	22,000	26,000	28,600	30,200	23,000	37,000
Animas - Upper	510	510	690	730	810	887	369	368	0	400
Arkansas	109,883	119,045	157,380	157,862	181,716	185,123	201,040	199,109	228,153	235,931
Blue	2,138	1,400	1,928	2,288	2,173	4,129	416	9,338	5,854	5,361
Clear Creek		600	650	800	900	3,700	4,400	5,900	7,543	11,889
Colorado - Glenwood	15,000	21,300	26,938	32,435	39,149	31,256	46,579	26,150	32,764	43,146
Colorado - Upper	21,500	21,000	26,593	33,032	30,877	33,571	34,405	31,020	36,757	36,758
Colorado - Horsethief/Ruby	2,540	2,660	3,560	3,870	5,013	4,954	4,614	5,387	3,654	4,875
Colorado - Westwater	7,041	6,468	6,351	6,841	7,473	8,780	9,456	8,408	7,077	6,614
Dolores	1,595	1,111	10	968	1,258	1,707	1,493	3,257	0	2,333
Eagle	1,888	2,270	3,188	1,888	3,888	10,200	3,702	10,700	11,500	11,700
Eagle - Upper		1,108	1,642	2,182	949	952	700	2,862	2,038	2,825
Green/Yampa	14,885	15,204	16,836	17,700	19,313	20,513	19,870	22,936	20,097	20,408
Gunnison Gorge	1,942	3,056	2,760	3,618	2,921	3,304	3,996	1,804	3,377	3,289
Gunnison - Upper	957	1,038	835	2,201	1,808	1,946	1,485	1,123	1,365	1,774
Gunnison - Escalante		24	115	241	286	213	179	275	2,083	2,340
Gunnison - Lake Fork	293	394	178	426	292	276	446	1,476	1,081	1,850
North Platte	1,289	324	490	535	182	832	192	1,010	949	908
Piedra		14	71	55	35	37	67	76	17	31
Poudre	7,148	8,581	11,779	14,345	19,355	21,415	24,949	30,845	33,235	31,981
Rio Grande	2,800	2,800	2,800	2,800	2,800	2,800	2,000	2,900	2,800	3,000
Roaring Fork - Upper	1,500	1,500	1,500	1,500	1,500	1,500	2,000	4,000	4,500	5,074
Roaring Fork - Lower	3,000	3,000	1,500	1,500	1,500	2,000	2,500	5,000	1,100	1,200
San Juan - Pagosa	300	400	600	600	600	600	1,400	1,600	1,200	2,680
San Miguel	50	60	125	365	1,518	2,181	1,642	3,321	1,157	2,000
South Platte				5,000	5,000	700	101	816	112	137
Taylor		5,843	5,683	9,008	8,400	11,910	12,877	12,859	15,655	13,612
Total User Days	208,327	232,686	286,480	326,157	363,963	381,771	412,258	430,475	448,374	489,154
% Change From Previous Year		11.7%	23.1%	13.8%	11.6%	4.9%	8.0%	4.4%	4.2%	9.1%
User Day Change From Previous Year		24,359	53,794	39,677	37,806	17,808	30,487	18,217	17,899	40,780

Sources: National Park Service
 US Forest Service
 Bureau of Land Management
 Local Outfitters

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Planning for River Access and Use

The need for identifying access points and planning for recreational use of the river has been felt throughout the Valley. The first step in managing access is defining responsible access. Responsible access can be defined: “When the general public has been granted access to a particular area, they are expected to utilize and enjoy such an area in a manner which does not compromise its natural quality, integrity, or beauty.”

The following is a listing of elements and standards of “responsible access”.

I. Preserve Habitat

1. Development of access points must consider the maintenance of water quality and the preservation of native riparian vegetation and sensitive wildlife and aquatic habitat.
2. Access is prohibited near extremely critical habitat such as, but not limited to, bald eagle nesting sites.
3. Access in areas of deer and elk migration should be controlled. Consider trail closures during peak migration times.

II. Acknowledge the Fragility of Riparian Areas

1. Trail planning should include determination of allowed trail uses (pedestrian, horseback, trail bike, etc.) based on wildlife habitat, vegetation sensitivity, and terrain. Constraints may include sensitive meadows or riparian areas, steep or eroded riverbanks, and wildlife use. Some areas may be unsuitable for any trails.
2. The number of private trails accessing the river should be minimized. Consider using one trail to provide river access to a cluster of houses

III. Plan Comprehensively

1. Site management and maintenance plans should be incorporated in high-impact areas for long-term upkeep of the area.
2. Signage should be posted with information about and/or notification regarding sensitive habitat, vegetation, fishing and boating regulations, leash laws, migration areas, human health concerns, etc.
3. Communication with the public should include education and encouragement of responsible individual behavior.
4. Trails and access sites should be clearly identified and marked to avoid random access and to encourage the development of low impact access points. Base a limited number of access points and trails on an overall river management plan. Wherever possible, establish designated trails.

IV. Design in Harmony with the Landscape

1. Design trails to control erosion and drainage with steps and grading. Encourage vegetation to grow to the trail’s edge. Use native and natural materials. Work with natural terrain, trees and boulders, and make them part of the design.
2. Establish setbacks for recreation and development.
3. In the construction of trails, minimize impacts outside the actual trail width by using smaller scale equipment and place fences around existing vegetation for protection.
4. In landscaping and revegetation efforts, use native species that are appropriate for their location (i.e. hydrophytes – water loving plants - near the water and xeric – drought tolerant plants - upslope).

VEGETATION AND RIPARIAN HABITAT

One of the most critical factors in ensuring river stability is the health of the vegetation and riparian habitat along a river. Once a river stabilized, healthy vegetation and habitat will need to be reestablished and maintained.

Functions and Values

Riparian habitat is any land adjoining or directly influencing a body of water. It includes the land immediately alongside small creeks and rivers, including the riverbank itself. The green zones along the banks of rivers and streams and around springs, bogs, wet meadow, lakes and ponds are considered riparian areas. Riparian areas comprise less than 1% of the public land, yet 75% of wildlife species inhabit riparian areas for at least part of the year. With the loss of over 50% of our wetlands and riparian areas in Colorado, the protection of the remaining acreage is extremely important. Riparian habitat is the most productive natural ecosystem in Colorado, which provides many important functions, and is characterized as follows.

- **Buffer Zone:** The corridors that neighbor the river act as a natural defense mechanism for the river which protects it from negative impacts (water quality degradation, streambank erosion, thermal increases, etc.) and enhances the functioning of the ecosystem. Widespread development along riverbanks has stripped rivers of much of their natural ability to cleanse themselves and has destroyed significant wildlife and fisheries habitat.
- **Habitat:** Riparian areas provide habitat for both aquatic and terrestrial creatures. Shrubs and low growth provide cover and protection from prey, sun and foul weather, and larger shrubs and trees provide nesting sites for birds. Trees and limbs provide a stable base for microscopic plants and animals and provide habitat and refuge for fish. Temporary pools form breeding areas for frogs, toads and salamanders. Shading from vegetation maintains cooler water temperatures enjoyed by fish. These low light conditions also discourage the growth of algae and other nuisance plants. Riparian corridors connect habitats from the mountains to the seas, creating migration corridors.
- **Food:** Organic debris supplies aquatic plants and animals with the necessary compounds to survive. Leaf litter is essential to the production of macroinvertebrates, a key link in the aquatic food chain. Woody debris traps leaf litter and finer particles, retaining nutrients and providing food, niches, and habitats for small invertebrates. The invertebrates then shred and consume the leaves and fine litter and in turn become food sources for larger prey.
- **Bank Stabilization:** Riparian areas help stabilize riverbanks and protect them during flooding. Roots of riparian vegetation reinforce soil in the same way rebar reinforces concrete. When saturated, banks with no vegetation are prone to collapse. Riparian vegetation decreases water velocity, thus decreasing scour, undercutting and instability. The vegetation provides breaks that slow wind that would normally dry out pastures and crops or remove valuable topsoil.
- **Flood Hazard Protection:** Riparian vegetation soaks up water during high flows, reducing peak flows and lessening the risk and severity of flash floods. Vegetation influences water flows in the river by providing temporary storage gradually conveying water to the river and water table. This can help reduce the level of downstream flooding. Additionally, vegetation slows the flow of flood-water, lessening its erosional capabilities.
- **Pollution Reduction:** The riparian zone traps both sediment and nutrients washed from upslope areas. Sediment loaded runoff is detained in riparian zones, allowing the sediments to settle out

before it can be deposited in the river. Vegetation roots take up contaminants from overland runoff (such as nitrogen and phosphorus from fertilizers). These nutrients might otherwise be washed into streams, affecting water quality, negatively impacting aquatic animals and promoting the growth of nuisance plants and algae. Riparian vegetation uses sub-surface water which influences water flows and thus the quantity of nutrients, salts, or other contaminants entering rivers by this route.

- **Aesthetic Appeal:** Healthy, vegetated river banks have value in the visual amenity that they provide for the people to enjoy in their recreation and living environments, and as they travel through a river corridor.

Developments associated with the ski areas, golf courses and other recreation, residential, agricultural and commercial developments are widespread in the valley. Historical mining and timbering operations have dramatically affected lands in the upper reaches of the watershed. These various land uses introduce problems associated with habitat fragmentation, hydrological alterations, non-native species invasions, and alteration of natural fire regimes.

Low elevation riparian vegetation is generally in a deteriorated condition. Human uses, such as grazing, housing and roads have destroyed or altered a large percentage of the montane riparian corridor. Intact vegetation is currently threatened by continued development, altered hydrologic flow and offsite influences. The narrow valleys and canyons of the basin have resulted in a concentration of human settlement and development in riparian zones. River alterations include reservoirs and water diversions.

Critical Areas

Because of the functions and values provided by riparian and associated wetland areas, those areas still existing throughout the watershed should be considered highly valuable and should be protected accordingly.

- The extent of current and potential habitat for the elements present, considering the ecological processes necessary to maintain or improve existing conditions;
- Species movement and migration corridors;
- Maintenance of surface water quality within the site and the surrounding watershed;
- Maintenance of the hydrologic integrity of the groundwater, e.g., by protecting recharge zones;
- Land intended to buffer the site against future changes in the use of surrounding lands;
- Exclusion or control of invasive exotic species;
- Land necessary for management or monitoring activities.

Recommendations to Preserve Critical Reaches

The following recommendations may be proposed in the Dolores River Valley:

- 1 Determine the areas of importance for critical habitat in the area.
- 2 Develop and implement a plan for protecting conservation sites, with the most attention directed toward sites with high biodiversity significance.
- 3 Review proposed activities in or near conservation sites so that the activities do not adversely affect natural heritage elements.
- 4 Promote proper management of the natural resources that exist within the Dolores Valley.

- 5 Promote cooperation among landowners and pertinent government agencies and non-profit conservation organizations to protect natural diversity.
- 6 Prohibit the introduction and/or sale of non-native species that are known to negatively and profoundly affect natural areas, especially wetlands and riparian areas.
- 7 Increase public awareness of the benefits of protecting significant natural areas.
- 8 Consider open space acquisition and/or conservation easements for important conservation areas where appropriate and necessary to protect their ecological values.
- 9 Consider using incentives, including tax incentives, to promote conservation actions on private lands.

Buffer Zone Recommendations

- 1) Maintain a minimum building setback from the high water mark. This would decrease flood damage, decrease potential for loss of life and property, preserve wildlife, increase wildlife habitat, protect riparian and wetland areas, and decrease erosion.
- 2) Create a transition area between development and the river called a “natural area buffer zone,” which would:
 - Establish, preserve, or improve a continuous natural landscape buffer along the river.
 - Utilize native plant cover to the maximum extent feasible in landscaping.
 - Preserve the ability to view the river (building height should be limited).
 - Preserve public access to the river within the buffer zone (i.e: greenbelt, bike paths, etc.).
 - These buffer zones are often 30, 50 or 100 feet or more from the ordinary high water mark. Because the Dolores River through Rico has a history of moving and is unstable due to the high energy and bedload, it may be prudent to chose a wider buffer zone to keep development out of inherent flood hazard areas.
- 3) Map wetland boundaries to ensure their protection.
- 4) Establish a committee to act as a referral agency for all projects on or near the river.

Wildlife Protection Zones

- 1) Create a buffer zone along the entire river corridor by linking protected areas together.
- 2) Acquire greenbelt areas using purchase, use agreements, donation, land exchanges, easement, or leases. Encourage private property owners to allow public access. Assist and facilitate voluntary access programs when necessary.
- 3) Support Colorado Division of Wildlife recommendations:
 - Conserve important cross-valley migration corridors.
 - Preserve critical winter range areas for big game.

Elements and Standards of a Healthy Aquatic Ecosystem

Headwaters: The headwaters of a watershed define much of the overall health of the river downstream, providing life-giving nutrients and beginning the transportation of aquatic species that will enrich the entire length of the waterway. If the headwaters of a stream are laden with metals, silt or pollutants, the effects are felt throughout the river.

Natural Flows: Maintenance of healthy flows is essential to aquatic health. Rivers in their natural state have cycles of high and low flows that are vital to maintaining a healthy river ecosystem. Significantly changing the natural flow regime disrupts the life cycles of fish, other aquatic species and vegetation and changes the river structure, causing erosion.

Pools and Riffles: Healthy river ecosystems have a 1:1 ratio of pools to riffles. Riffles are areas of shallower water and steeper gradient. Riffles serve to aerate the water and provide habitat for aquatic insects and therefore providing feeding areas to fish. Pools are areas of deeper, slow moving water with a shallower surface gradient. Pools accumulate detritus and are important for organic decomposition and nutrient recycling. They provide cool water resting habitat for fish.

Riparian Vegetation and Zones: A healthy riparian zone is essential to a healthy, functioning river ecosystem. Riparian functions and values are described earlier in this chapter.

Periphyton: Periphyton is a living film created when nutrients accumulate. It consists of green algae, diatoms, golden-brown algae, red algae, blue-green bacteria, and water moss. It is an important food source for insects and other invertebrates. It increases and supports the biological diversity of the river.

Invertebrates: Macroinvertebrates are those organisms seen without magnification. Microinvertebrates are those organisms seen only with magnification. Invertebrates are used as key indicators of water quality and stream health. They are important food sources for other insects, fish, reptiles, amphibians, and birds.

Fish: A healthy community of diverse fish populations is an indicator of a healthy stream. Populations commonly found in mountain rivers include: rainbow, brook, and brown (non-native) trout; cutthroat trout (native); whitefish, johnny darter, fathead minnow, mottled sculpin, longnose sucker, and white sucker.