

## BEST MANAGEMENT PRACTICES PROJECT (URBAN): BOULDER CREEK ENHANCEMENT PROJECT

Conducted by: City of Boulder  
 On the Web: [www.ci.boulder.co.us](http://www.ci.boulder.co.us)  
 Contact: Chris Rudkin, City of Boulder  
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 Matching Funds: \$398,000



Boulder Creek

The Boulder Creek Enhancement Project was designed to evaluate a holistic approach to water quality control. It also provided the opportunity to test the feasibility and effectiveness of combining off-site nonpoint source treatment with traditional point source treatment to achieve water quality goals.

During the mid-1980s, the City of Boulder faced increased regulation of its wastewater treatment plant (WWTP) under the National Pollutant Discharge Elimination System permitting requirements that protect the designated uses of receiving waters. One critical protected use was for aquatic life downstream of the WWTP.

The WWTP discharges an average of 17 million gallons per day into Boulder Creek. During high-demand periods, the creek is dominated by wastewater. In addition, City officials discovered that historic land use practices — agriculture, grazing, surface mining and water diversions — were accelerating and aggravating in-stream water quality problems. Stream water quality and habitat were being degraded. Degrading factors included the straightening and shortening the stream channel, creation of a wider and shallower streambed and destruction of riparian vegetation.

Boulder received a grant in 1989 from Colorado's Nonpoint Source Program to evaluate the new approach to water quality control. Off-site stream improvements also were evaluated to determine how nonpoint source pollution limits the WWTP's effectiveness in controlling water quality at a critical point several miles below the plant's discharge.

The Boulder Creek Enhancement Project utilized best management practices (BMPs) to improve overall stream quality and enhance traditional point source treatment to achieve water quality goals. The project investigated techniques to stabilize pH and temperature fluctuations, and to reduce turbidity and un-ionized ammonia in the creek's main stem section.

BMPs vary according to current land use and include:

- Cattle exclusion (fencing)

- Bank stabilization
- Channel modification (thalweg pools)
- Reaeration
- Wetland enhancement
- Planting of riparian vegetation

Early attempts to construct a dynamic computer model of the Boulder Creek system showed that a full-scale demonstration project was the only practical means to evaluate the effect of channel modifications, revegetation, and erosion control on in-stream quality and habitat.

Comprehensive testing allows sediment loads, hydraulics, weather, and other complex factors — such as algal growth within the stream — to occur in real time, rather than being simulated in a computer model. Projects such as Boulder Creek also require real-time verification since, unlike a computer model, seasonal and long-term effects cannot be generated quickly. Full-scale testing incorporates all the complex and synergistic effects that occur in a natural system and reflects a system more accurately than a model.

The initial project, completed in spring 1990, resulted in improving 1.3 stream miles. The second phase, completed in spring 1991, added 1.1 stream miles with an additional NPS grant for \$75,000. With an NPS grant of \$42,000, another 0.5 miles was added the following spring. A fourth phase was designed to improve an additional 1.7 miles using a mix of local and NPS funding. At its completion in 1994, the project improved 4.6 miles of channel below the WWTP.

Dividing the project into phases allowed design improvements to be made on the initial BMPs while Phase II and III BMPs were being built. Since the BMPs were all somewhat untried, this phasing was important to the project's success. It allowed knowledge gained through early experience to improve later performance.

The Boulder Creek project is transferable to other streams requiring similar treatment. Riparian restoration in particular, which provides multiple benefits to wildlife, water quality and property owners, can also increase the effectiveness of existing traditional treatment facilities.