

CRYSTAL RIVER STREAM MANAGEMENT PLAN

RECENT ACCOMPLISHMENTS

Study/Project	Description	Results/Status
Drought Year Snapshot Flow Assessment	<p>The Crystal River from Avalanche Creek to the confluence with the Roaring Fork River was studied during the exceptionally dry 2012 Water Year in order to obtain a clearer picture of those sections of the river particularly vulnerable to degradation of stream health due to lack of streamflow and excessively warm water temperatures (referred to as 'pinch points').</p> <p><i>Key partners:</i> S.K. Mason Environmental, LLC (now Lotic Hydrological, LLC)</p>	<p>The study found that several miles of the Crystal River between Thompson Creek and Prince Creek are particularly prone to de-watering. September flows at several locations were so low that they were nearly unmeasurable. These conditions persist from the mouth of Crystal Canyon to outlying subdivisions in Carbondale. River segments experiencing extreme low-flow conditions sometimes heated to temperatures known to be detrimental to the region's trout fishery.</p> <p><i>For more information:</i> <u>Snapshot Assessment of the Roaring Fork Watershed - A Synoptic Approach to Characterizing Low Flow Conditions on the Crystal and Roaring Fork Rivers in the Autumn of 2012.</u></p>
Threshold Flow Assessment (CWCB ISF)	<p>The suitability of the CWCB's 100 cfs summer and 60 cfs winter instream flow rights for habitat maintenance on the lower Crystal River were investigated.</p> <p><i>Key partners:</i> Lotic Hydrological, LLC</p>	<p>This Project utilized two instream flow assessment methodologies to identify stream flows beneficial to aquatic habitat in riffle segments of the lower Crystal River. Knowing these conditions could assist CWT in determining minimum thresholds for leasing opportunities in the most flow-depleted section of the Crystal River. Results show discharges ranging from 40 cfs to 60 cfs as a potential preliminary threshold for leasing efforts on the Crystal River.</p>
Water Rights Allocation & Accounting Model	<p>A computer model was constructed and used to simulate streamflow in the lower Crystal River across a range of hydrological conditions (average/moderate drought/severe drought) and under different water resource management scenarios, including implementation of 3 potential water conservation management plans for the Town of Carbondale.</p> <p><i>Key partners:</i> Lotic Hydrological, LLC; Univ. of Michigan</p>	<p>Results of the modeling simulation provide a mechanism for assessing the impacts associated with different types of water use and conservation strategies on lower Crystal River stream flows in the future. The analysis indicated that the most effective conservation measures proposed by the Town of Carbondale exist at the Carbondale Ditch and Weaver and Leonhardy Ditch. None of the Town's proposed water conservation management plans resulted in meaningful gains in stream flow downstream of the Nettle Creek municipal water supply.</p> <p><i>For more information:</i> <u>Water Rights Allocation and Accounting Model Development for the Lower Crystal River.</u></p>
Pilot Ditch Project	<p>9 major water right holders in the Crystal River Watershed agreed to institute a short-term voluntary diversion reduction in September of 2013.</p> <p><i>Key partners:</i> Colorado Water Trust; Lotic Hydrological, LLC</p>	<p>The pilot project was not implemented due to unusual summer monsoon conditions.</p>
Coal Basin Stream Gage	<p>A permanent stream gage and companion meteorological station were procured and set up in Coal Basin.</p> <p><i>Key partners:</i> USFS – Rocky Mountain Research Station; Lotic Hydrological, LLC</p>	<p>The equipment is currently providing hydrologic/meteorologic information to support the design of site- and process-specific mitigation measures in Coal Basin. In the future it will also be used to determine the effectiveness of on-the-ground restoration efforts in Coal Basin.</p>
Sediment Source Analysis	<p>A computer tool was used to analyze sources of erosion in the Crystal River Watershed, with an emphasis on Coal Basin. The main objective</p>	<p>A draft report summarizing the results of the analysis is being finalized. The analysis indicates that Coal Basin produces the highest amounts of the coarse sediment</p>

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	<p>was to determine what sources of erosion are controllable and have the greatest potential for mitigation by future projects/programs. The causes and potential for mitigation of the channel sedimentation and associated flooding in the vicinity of the Town of Redstone were also reviewed.</p> <p><i>Key partners:</i> Earth Systems Institute; USFS – Rocky Mountain Research Station; USFS – White River NF</p>	<p>in the Crystal River. However, much of this sediment is produced as a result of natural conditions; the controllable sources of coarse sediment probably do not exceed 10% of the total.</p> <p>The analysis also determined that a sediment wedge downstream of Coal Basin in the vicinity of Redstone is likely being supplied from areas upstream of the Coal Basin confluence. Thus, if a goal is to reduce coarse sediment supply to the Crystal River in the vicinity of Redstone, controllable sources of sediment may be $\leq 1\%$.</p>
<p>Coal Basin Biochar Pilot Study</p>	<p>10-acres of some of the highest sediment-producing portions of the decommissioned mining road network in Coal Basin are being reclaimed as part of a pilot project to determine the cost-effectiveness and utility of using soil amendments such as biochar for landscape-scale restoration in Coal Basin.</p> <p><i>Key partners:</i> USFS – White River NF</p>	<p>A more natural drainage pattern has been restored and project areas seeded with native vegetation are showing varying degrees of growth – dependent, in part, upon the soil amendment. Weed control and fencing to prevent cattle grazing in some areas has also been undertaken on-site.</p> <p>Site monitoring is ongoing. Several years of vegetation monitoring and soil moisture data are necessary to evaluate the different restoration techniques.</p> <p><i>For more information:</i> South Fork of Dutch Creek Pilot Project Report.</p>
<p>Water Quality Analysis</p>	<p>Water quality data was collected and analyzed for Coal Basin and the Crystal River.</p> <p><i>Key partners:</i> Colorado Mesa University</p>	<p>A draft report analyzing water quality data collected from several sources is being finalized. Among other issues, the data is being examined to determine whether existing water quality standards are being met.</p>
<p>Macroinvertebrate Analysis</p>	<p>Macroinvertebrate sampling was conducted and analyzed for Coal Basin and the Crystal River.</p> <p><i>Key partners:</i> Timberline Aquatics, Inc.; USFS - White River NF</p>	<p>A report analyzing the results of sampling conducted in 2012, in conjunction with 2012 water quality/quantity monitoring and sampling previously conducted in 2011, is being finalized. The report will address questions such as how macroinvertebrate community health changes with changing stream flow conditions.</p>
<p>Roaring Fork Watershed Regional Water Efficiency Plan</p>	<p>Initiated in 2013, this multi-stage planning effort will develop/update 5 local Water Efficiency Plans and integrate them into a single Regional Water Efficiency Plan. The Regional Water Efficiency Plan will outline a strategy for regional cooperation to implement and extend cost-effective water efficiency measures (e.g., water loss audits, leak detection) in the Roaring Fork Watershed. The Regional Water Efficiency Plan may also identify opportunities to coordinate projects for improving and maintaining overall watershed health.</p> <p><i>Key partners:</i> Ruedi Water and Power Authority; Community Office for Resource Efficiency; Colorado River District; City of Aspen; Town of Basalt; Town of Carbondale; City of Glenwood Springs; Snowmass Water &</p>	<p>Individual Water Efficiency Plans for the 5 participating water providers are currently being worked on. Development of the Regional Water Efficiency Plan is scheduled to commence later this summer. Stakeholder/public review of the Regional Water Efficiency Plan will occur during the fall of 2014. Colorado Water Conservation Board approval is expected to be sought by the end of 2014.</p> <p>The planning and stakeholder engagement process is being informed by work completed by a team of Univ. of Michigan graduate students. The Michigan team examined regional water conservation planning strategies across the Western U.S. and used the ‘lessons learned’ by these other jurisdictions to make recommendations for the planning process in the Roaring Fork Watershed in their final report - Informing the Development of a Regional Water Conservation Plan for the Roaring Fork Watershed</p>

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	Sanitation District; Univ. of Michigan; Element Water Consulting	