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– 2012 STREAM FLOW MONITORING REPORT –
SOUTH LEIGH CREEK
TETON RANCH PROPERTY, TETON COUNTY, IDAHO



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INTRODUCTION

The Teton Ranch hired Biota Research and Consulting, Inc. in 2008 to initiate various surface water monitoring efforts in order to facilitate a more complete understanding of local hydrologic conditions. The focus of these monitoring efforts has been associated with the establishment and maintenance of stream flow gauging stations in the South Leigh Creek drainage in Idaho and Wyoming. Collected flow data and associated analyses help inform land owners and agricultural operators during the management of finite surface water resources in the area. Stream flow monitoring information pertinent to Teton Ranch spring 2012 groundwater recharge activities is presented herein in compliance with the Idaho Department of Water Resources (IDWR) water right permit development requirements under permit numbers 22-13689 and 22-13690.

INSTREAM FLOWS

Regional Conditions

Analysis of stream flow data from various sources indicates that the 2012 water year was characterized by average peak flows and below average flow duration throughout the region. A gauge station operated in North Leigh Creek recorded a peak flow magnitude roughly equivalent to the typical 1.5-year return interval flow, but flow duration analyses reveal that 2012 mean daily flows were less than average during 75% of the water year. A US Geological Survey (USGS) gauge station in the Teton River recorded a peak flow magnitude corresponding to a 1.8-year recurrence interval, but flow duration analyses reveal that mean daily flows were less than the 50-year average during 70% of the time in 2012. A USGS gauge station in the Salt River recorded a 1.2-year recurrence interval peak flow, and mean daily flows were less than the 58-year average during 70% of the time in 2012. A USGS gauge station in the Blackfoot River recorded a 1.3-year recurrence interval peak flow, but mean daily flows were less than the 31-year average during 85% of the time in 2012.

Upper South Leigh Creek

There is an operational stream flow gauging station in South Leigh Creek upstream of all known points of diversion. The site is located in Wyoming approximately 1 mile upstream of the Teton Ranch property. The gauge station has operated for the past 4 consecutive years during the local water season, which typically spans from May through October. Operation of the gauge station has enabled measurement of South Leigh Creek virgin flows (the natural flows in the drainage upstream of all points of diversion). These data enable the calculation of total available virgin flows in the subbasin during each year from May 1 through October 15 (expressed in acre-feet). South Leigh Creek virgin flows equaled 35,876 ac-ft in 2009; 29,725 ac-ft in 2010; and 50,167 ac-ft in 2011. In 2012 the total virgin flows equaled only 26,267 ac-ft, or less than 70% of the previous 3-year average. This analysis indicates that there were limited surface water resources in the South Leigh Creek drainage during 2012, even upstream of anthropogenic influence associated with diversion withdrawals and irrigation activities.

Flow data from the South Leigh Creek upstream gauge station enable analysis of virgin flow duration, or the probability that a given daily flow rate (discharge) will be exceeded in South Leigh Creek during any percent of time in a given year. The flow duration curve representing 2012 virgin flows is considerably less than the average flow duration curve from the period of record (Figure 1). This analysis indicates South Leigh Creek discharge was below average during any selected percent of the 2012 water year. For example, the flow duration analysis indicates that during 26% of an average water year South Leigh Creek discharge will equal or exceed 200 cfs. During the 2012 water year, South Leigh Creek discharge equaled or exceeded 200 cfs during only 12% of the water year.

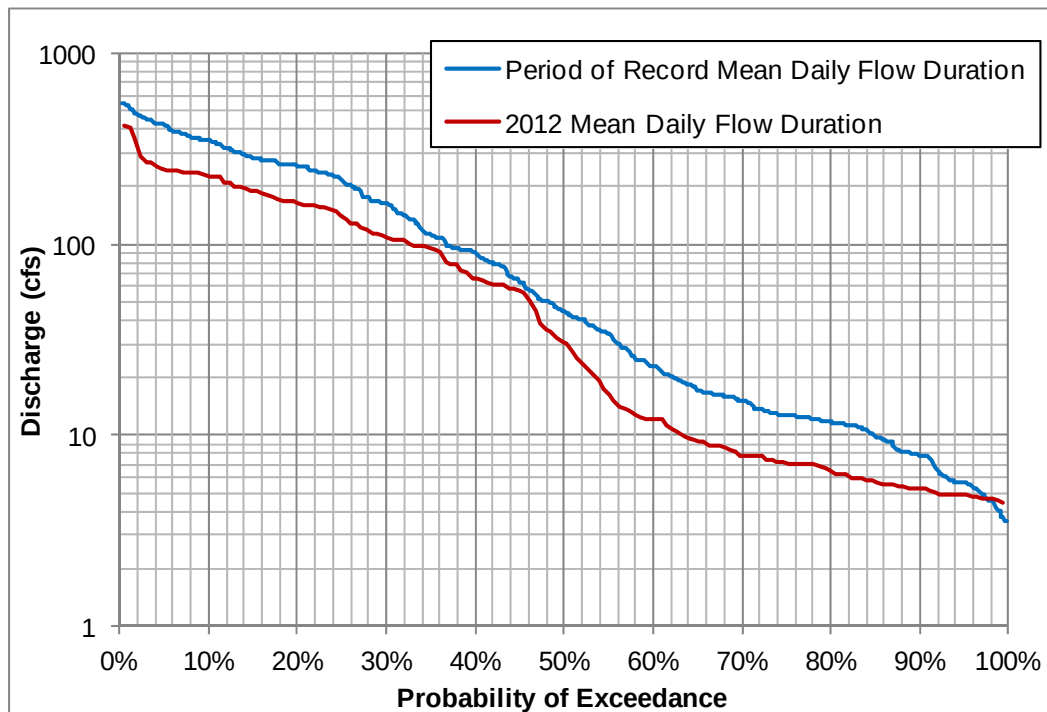


Figure 1. Period of record average versus 2012 flow duration curves in South Leigh Creek upstream of all points of diversion, Teton County, Wyoming.

South Leigh Creek at State Line Road

A stream flow gauging station located in South Leigh Creek proximate to State Line Road was maintained and operated during 2012. The gauge station is situated in a section of rated stream channel upstream of a rock vane that was installed previously during a channel restoration and habitat enhancement project. Instantaneous discharge and local stage were measured at the gauge station from April to October in 2012, across a wide range of observed discharge levels (photographs 1 through 5). Measurements were conducted in accordance with established USGS stream gauging protocols, and enabled calibration of a stage-discharge correlation specific to the site. The gauge station was equipped with a computerized data logger programmed to record water stage at 15-minute intervals throughout the deployment period, and those data were correlated to discharge using site specific stage-discharge rating information. This effort enabled compilation of a high-resolution hydrograph depicting instantaneous discharge (at 15-minute intervals), mean daily discharge, and measured discharge in South Leigh Creek at the State Line Road gauge station during the 2012 water year (Figure 2).



Photographs 1-5. South Leigh Creek State Line Road gauge station during various discharge levels recorded during 2012 (Photo 1 at 22.5 cfs on April 10, 2012; Photo 2 at 106 cfs on May 22, 2012; Photo 3 at 242 cfs on June 4, 2012; Photo 4 at 118 cfs on June 15, 2012; Photo 5 at 23 cfs on July 20, 2012).

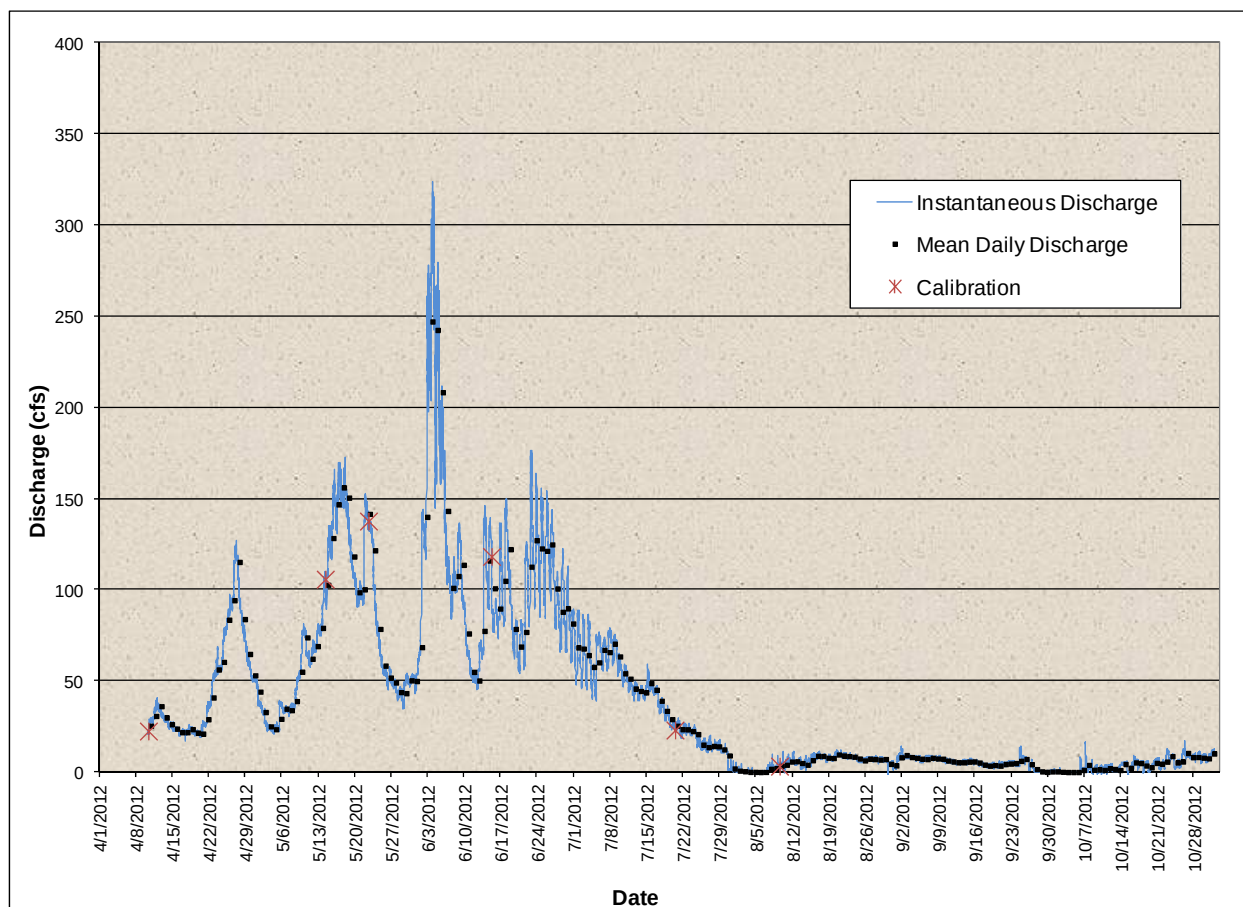


Figure 2. South Leigh Creek 2012 hydrograph at State Line Road, Teton Ranch property, Teton County, Idaho.

The South Leigh Creek State Line Road gauge station recorded an instantaneous peak discharge of 323 cubic feet per second (cfs) and a mean daily peak discharge of 247 cfs on June 3, 2012. The 2012 peak flow magnitude was roughly equivalent to the 1.5-year recurrence interval flow, or bankfull discharge, in the reach. Comparison of mean daily flow data from the State Line gauge station between 2008 and 2012 (Figure 3) reveals the following:

1. The temporal duration of runoff in 2012 was only 3 days, which is incredibly short compared to the 4 previous years in the period of record; and
2. After the short duration runoff in 2012, mean daily discharge in South Leigh Creek was below average compared to the 4 previous years in the period of record.

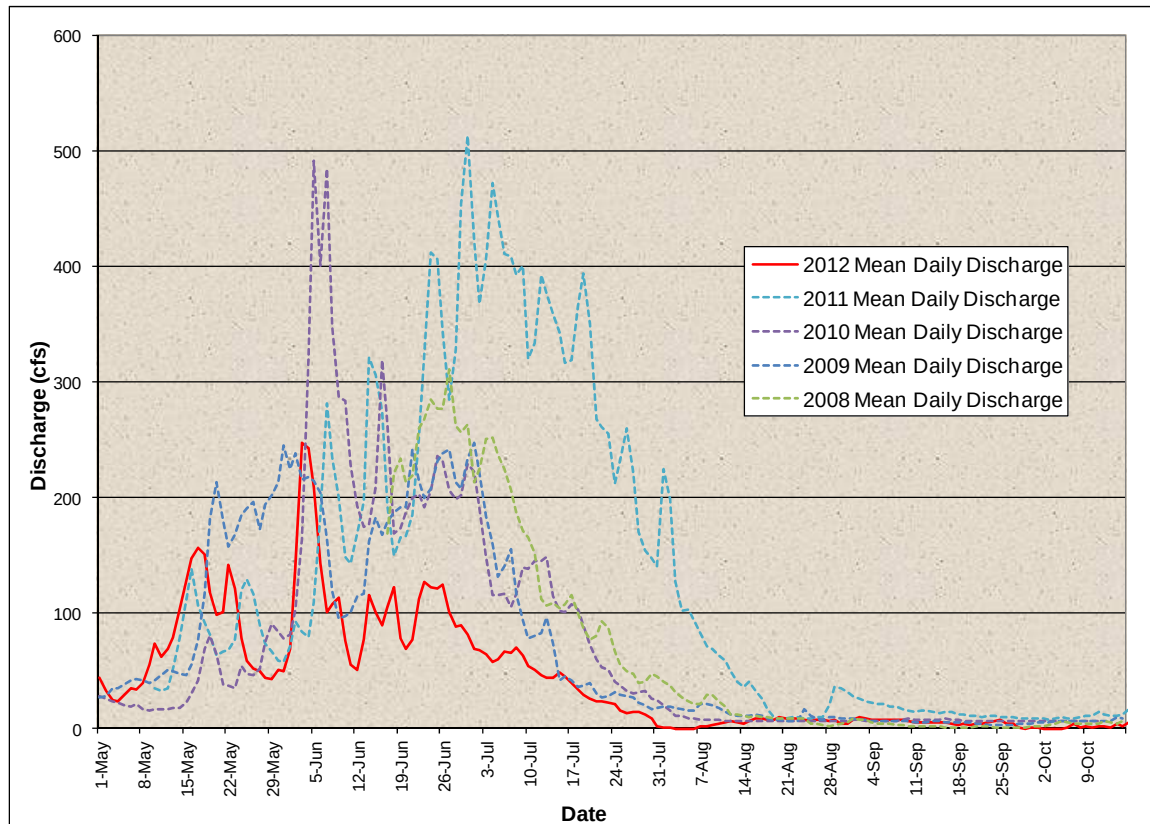


Figure 3. Mean daily discharge in South Leigh Creek at State Line Road from 2008 to 2012, Teton Ranch property, Teton County, Idaho.

An Idaho Department of Water Resources permit condition associated with Teton Ranch recharge activities under water right permit numbers 22-13689 and 22-13690 requires that at least 100 cfs remain in South Leigh Creek at the State Line Road gauge station location prior to, and during, the diversion of surface water for ground water recharge. Instream flows at this location reflect the diversion withdrawals of 3 upstream locations including (1) the Kilpack Canal with diversion capacity of about 10 cfs, which supplies the Teton Ranch groundwater recharge system; (2) a pump station with diversion capacity of about 5 cfs; and (3) the Hog Canal with diversion capacity of about 100 cfs. During spring runoff in 2012, daily monitoring of discharge at the gauge station was completed in order to inform diversion activities associated with groundwater recharge at the Teton Ranch. Instream flows at the South Leigh Creek State Line Road gauge exceeded 100 cfs on 28 discontinuous days in the spring of 2012. Diversion activities for groundwater recharge occurred for 6 continuous days when instream flows exceeded 100 cfs, from June 3 to June 8, 2012.