Henrys Fork Long Term Monitoring: Summer 2005

Annual project report

by

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Executive Summary

During the summer of 2005, data relating to fish populations were collected at eight sites in the Henrys Fork watershed. These sites were on the mainstem Henrys Fork at Flatrock, Box Canyon, Big Bend, Ashton, St. Anthony, and on the following tributaries: Henrys Lake Outlet, Sheridan Creek, and Fall River (Figure 1). Data have been collected along transects at these sites since 2001 to produce estimates of seasonal and year-to-year variability. Data collected included invertebrate density and species composition, water temperature, size and abundance of juvenile trout, and species of non-game fish.

Water temperatures, at sites were water temperature was recorded during 2005, were similar to those observed during past years except that temperatures at Big Bend and Flat Ranch were somewhat lower during some portion of the summer. This appears to be a result of reduced thermal input rather than increased discharge as discharge was lower during the time comparatively lower water temperatures were observed in 2005.

Game fish have never been observed at the Sheridan Creek and Flat Ranch sites during long-term monitoring visits, but have been observed at all other sites. Estimates of juvenile trout abundance at sites with game fish ranged from ~0.03 fish/100 m^2 at Fall River during 2001 to ~1200 fish/100 m^2 at Box Canyon during 2002. Juvenile trout abundance is highly variable at the Flat Rock and Box Canyon site both of which have relatively high juvenile trout densities (> 200 fish/100 m^2). Juvenile trout densities are lower and more stable at the Big Bend, Ashton, St. Anthony, and Fall River sites. During 2001, juvenile trout densities at Big Bend approached 200 fish/100 m^2 but following were always less than 12 fish/100 m^2. The reason for the observed wide fluctuation is unclear at this time.

Invertebrate indices are quite variable both between years and within samples, Therefore trends in invertebrate indices are difficult to assess. However, after 5 years of data collection some trends are beginning to become discernible. The total number of Taxa observed at the Flat Rock Site seems to be decreasing as does the percent of the taxa that are Ephemeroptera, Plecoptera, and Trichoptera while the percent of individuals that are in the dominant taxa are increasing. These trends, which may indicate habitat degradation, should be watched closely in future years. Conversely, at the Sheridan Creek site conditions may be improving as the same indices outlined above seem to have the opposite trends. Trends in indices at the other sites are not yet apparent or are flat.

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Acknowledgments

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Introduction

In the Henrys Fork basin, various agency, education, and interest group personnel regularly collect data on fish populations, fish habitat, and stream geomorphology. However, due to evolving objectives, personnel turnover, and funding uncertainties, these projects are rarely designed for, or carried out over, an extended (50+-year) period. The Henrys Fork Foundation saw this as a gap in the knowledge about the Henrys Fork watershed system and therefore initiated an attempt to fill the perceived void.

The overall goal of the project was to assess what factors and processes are important in maintaining vigorous trout populations in the river, and how those factors may interact with external factors (such as climate, flow, and land use). Specific objectives were to: 1) track river health in a changing watershed environment; 2) establish a solid understanding of current river conditions for future change analysis and detailed process research, and; 3) document changes in physical, chemical, and biological conditions over time. These goals require the accumulation of consistent data over a long period in order to quantitatively describe not only current river conditions, but also seasonal and annual variability, and eventually long term changes. Assuming this can be done successfully, it should be possible to quantify changes in the Henrys Fork system that may occur due to development, land management changes, catastrophic fire or flood, or even possibly climate changes.

Methods

To accomplish these objectives, we monitored eight sites in the Henrys Fork Watershed from 2001 – 2005. Five of these sites were located on the main-stem Henrys Fork, and the remaining three were located on tributaries at Sheridan Creek, Henrys Lake Outlet, and Fall River (Figure 1, Table 1).

At each site, temperature loggers were deployed to record water temperature continuously throughout the summer, electrofishing was conducted along each bank to collect juvenile trout and non-game fish, and benthic invertebrate samples were collected. Reports for previous years, which include data from the summers of 2000 - 2004 are available at the Henrys Fork Watershed Center in Ashton, Idaho (Gregory 2001, 2002, 2003, 2004; Gregory and Emery 2005).

A permanent transect across a riffle was established at each site. During early summer of each year, a modified Hess sampler was used to collect three benthic invertebrate samples at randomly generated distances across the channel on this transect.

Invertebrates were keyed to the lowest taxa reasonable and invertebrate density, total taxa, modified Hilsenhoff Biotic Index (HBI modified), percent Ephemeroptera, Plecoptera, and Trichoptera (%EPT), percent dominant taxa, and percent predators, shredders, scrapers, filterers, and collectors (Department of Environmental Quality 1996) were calculated from the samples.

During early summer, fish population estimates were conducted with a backpack electrofisher along each bank of each monitoring site. Electrofishing sections began at the permanent transect and extended out from the bank 1 m and upstream for 100 m (except that a 50 m section was used on both sides of the river at the Box Canyon site, because of the high fish densities present). Three passes (removals) were conducted at each location (Van Deventer and

Platts 1986) except more were conducted when the last pass yielded more than 40% of the second-to-last pass and no additional passes were made if no fish were collected. Fish population estimates were calculated using MicroFish 3.0 (Van Deventer and Platts 1986).

Study sites

Henrys Fork of the Snake River

Flat Rock

The Flat Rock site was located downstream from Mack's Inn and upstream from Coffee Pot campground beginning at approximately the Flat Rock Club buildings and extending downstream from that point. The top of the biological sampling area was adjacent to a fence at the lower end of the Flat Rock Club parking lot. Fishing and canoeing are two of the most common human activities observed in that area. A dirt surface road (the driveway for the Flat Rock Club) parallels the north side of the river immediately upstream from the site and a 2-track and fishing trail are present along the north side of the river adjacent to the sampling site. The valley at this point is trough-like and sinuosity is low. Islands were present in the hydrological sampling area and appear to be actively enlarging at the lower end or moving downstream. The riparian area consisted of lodgepole pine along the banks with a grass and sedge understory. Elevation at the site was 1950 m (6420 ft). Stream gradient over the length of the hydrological monitoring site was 0.06%.

Box Canyon

The Box Canyon site was added to the long-term monitoring project in 2002. It was located in the transition zone between Box Canyon and Last Chance (between the community of Last Chance and the base of Box Canyon) on property owned by Hugo Melvoin. It was called the Box Canyon site because it is near the mouth of the canyon and water quality should reflect conditions in Box Canyon. However, the lower gradient there causes macrophyte conditions to more closely resemble those in the Last Chance section. The hydrological sample area had not been designated or surveyed in 2002 but the biological monitoring site began at the upstream Melvoin property line and extended downstream to the downstream property line. Fishing was the most commonly observed human activity. Cattle grazing occurs on the national forest land on the west side of the river. A riparian livestock exclosure fence was built and is maintained by the Henry's Fork Foundation ends just downstream from the sample area. Although the cows have access to the river on the west side, it does not appear heavily used. Houses (primarily summer homes) line the east side of the river with various levels of landscaping and lawn care occurring between the various landowners. Yards that have lawns typically leave a buffer strip between them and the river's edge. Potential sediment sources in the area are fisherman trails along the bank and mobilized sediment from the bottom of Island Park Reservoir. The valley in this section was flat and the stream was slightly sinuous. The overstory along both sides consists primarily of evergreens and the understory was primarily grasses and sedges. Elevation at the site was 1880 m (6165 ft).

Big Bend

The Big Bend site was located in Harriman State Park between Last Chance and the historic buildings of the old Railroad Ranch on a horseshoe bend of the river known locally as Big Bend. The top of the hydrological sample area is near a small, unnamed stream, which enters the Henrys Fork on the left side. The top of the biological sample area is near the downstream end of the bluff that is present on the northwest side of the river. Fishing was the most commonly observed human activity and although cattle and horse grazing takes place on Harriman State Park, the river has been fenced in a permanent riparian exclosure since the mid 1980's. Potential sediment sources in the area are fisherman trails along the banks, especially along the base of the above-mentioned bluff, and an irrigation canal return upstream from the site. The valley in this section was trough-like and sinuosity was moderate. The riparian area had no overstory vegetation and the understory was primarily grasses and sedges. Elevation at the site was 1870 m (6140 ft). Stream gradient over the length of the hydrological monitoring site was 0.07%.

Ashton

The Ashton site was added to the long-term monitoring project in 2002. The hydrological sample area had not been designated or surveyed in 2002 but the biological monitoring site began just above the two islands upstream from Hwy 20 Bridge, which crosses the head of Ashton Reservoir and ends just downstream from those same two islands. Fishing was the most commonly observed human activity. Potential sediment sources in the area include a paved road on the north side of the river and a few un-maintained fishing access roads. The valley in this section was box-like and the stream was straight and confined. The overstory along the north side is cottonwood trees and willows and along the south side consists of a few alder trees. The understory on both sides was primarily grasses and sedges. Elevation at the site was 1585 m (5200 ft).

St. Anthony

The St. Anthony sample area was located near the downstream most portion of the town of St. Anthony, immediately downstream from the Independent Canal diversion structure. The top of the sample site was the point a few meters downstream from the independent canal diversion where a headgate and culvert allow some water back into the Henrys Fork from the canal. The hydrological monitoring site consisted of only two permanent transects due to the braided channel, and riparian vegetation (cottonwood and willow overstory and grass and cattail understory) which made line-of-site surveying difficult. Fishing was the most frequently observed human activity in the area but streamside vegetation precluded trails along the bank in most areas. Instead, fishermen walked up or down the stream channel. The human activity that most affected the site was probably withdrawal of irrigation water. This sample location is underlain by basalt bedrock, which is visible at locations both upstream from and within the sample location. Most of the substrate in the sample site was gravel and cobble (Gregory 2003). Banks were stable primarily due to the bedrock nature of the channel and the abundance of herbaceous and woody vegetation. The valley type in this area was trough-like and the stream was braided. Elevation at the site was 1500 m (4920 ft) and stream gradient over the length of the hydrological monitoring site was 0.19%.

Henrys Lake Outlet

Flat Ranch

The Flat Ranch sample area was located on Henrys Lake Outlet on property owned by The Nature Conservancy (the Flat Ranch). The top of the sample site (both biological and hydrological) is immediately downstream from a large deep pool, which begins at the upstream property boundary. The primary activities in the area are fishing and cattle grazing. However, The Nature Conservancy has fenced the riparian area and the riparian pasture in which the monitoring site lies is grazed typically only one year in three. It was not grazed during 2000, 2001, or 2002 but was grazed in 2003. The riparian area at the site contained primarily willows and grasses. Elevation at the site was 1957 m (6420 ft).

Sheridan Creek

Sheridan Creek @ Green Canyon Road

The Sheridan Creek @ Green Canyon Road sample site was located immediately downstream from the bridge on Green Canyon road on property owned by Harriman State Park. In 1998 riparian revegetation efforts were conducted downstream of the Green Canyon Road Bridge which involved planting of willows within the sample site. The closest human activity to the area is cattle grazing, although in about 1998 a riparian exclosure fence was installed. Past grazing and past and current irrigation withdrawal, also heavily affected the stream at this site. The valley type in this area was flat and stream sinuosity was high. Grasses and rushes were the primary understory vegetation in this area and there was no overstory. However, in 2001, willows planted within the sample site were about 0.75 m tall and additional willows were planted in this area in the fall of 2000. Elevation at the site was 1935 m (6350 ft).

Fall River

Fall River @ Chester Canal Diversion

The Fall River @ Chester Canal Diversion site was located downstream from the Chester Canal diversion and upstream from the Hwy 20 Bridge. The top of the sample site starts at the base of an island downstream from the diversion dam. Human activities in the area include fishing, mostly wade fishermen although some boating is done, and irrigation withdrawal. Grazing takes place along both banks (cattle on the north side and sheep on the south). The valley in this area was trough-like and stream sinuosity was low. Willows and cottonwoods were the primary overstory vegetation and the understory was grasses and sedges. Elevation at the site was 1560 m (5100 ft). Stream gradient over the length of the hydrological monitoring site was 0.30%.

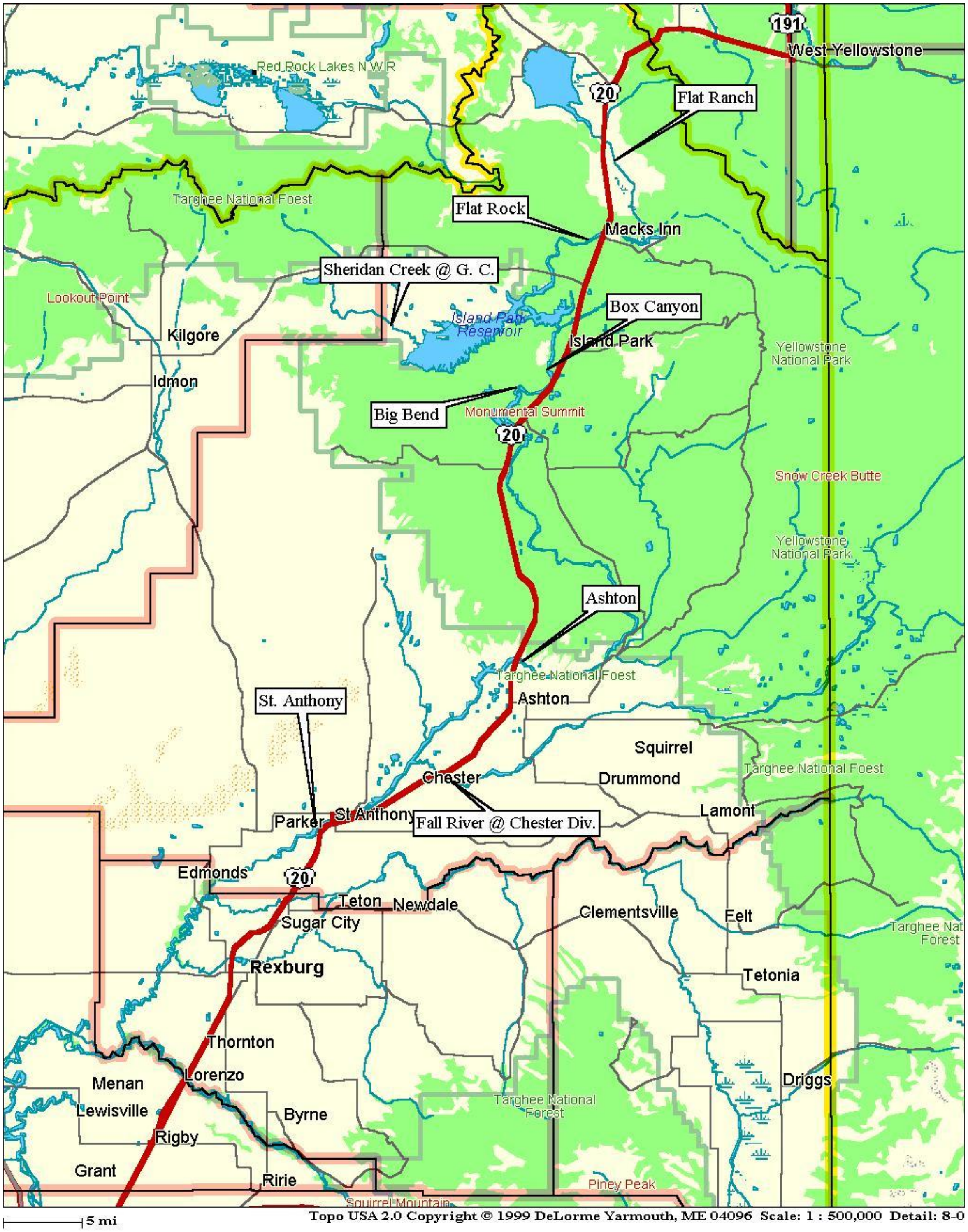

Figure 1. Map of sample site locations (Fremont and Madison Counties, Idaho).

Results and Discussion

Overall trends

Water temperatures, at sites were water temperature was recorded during 2005, were similar to those observed during past years except that temperatures at Big Bend and Flat Ranch were somewhat lower during some portion of the summer. This appears to be a result of reduced thermal input rather than increased discharge at these sites, because discharge was lower during the time comparatively lower water temperatures were observed in 2005.

Game fish have never been observed at the Sheridan Creek and Flat Ranch sites during long-term monitoring visits, but have been observed at all other sites. Estimates of juvenile trout abundance at sites with game fish ranged from ~0.03 fish/100 m^2 at Fall River during 2001 to ~1200 fish/100 m^2 at Box Canyon during 2002. Juvenile trout abundance is highly variable at the Flat Rock and Box Canyon sites both of which have had relatively high juvenile trout densities (> 200 fish/100 m^2). Juvenile trout densities are lower and more stable at the, Ashton, St. Anthony, and Fall River sites. During 2001, juvenile trout densities at Big Bend approached 200 fish/100 m^2 but following were always less than 12 fish/100 m^2. The reason for the observed wide fluctuation is unclear at this time.

Invertebrate indices are quite variable both between years and within samples, Therefore trends in invertebrate indices are difficult to assess. However, after 5 years of data collection some trends are beginning to become discernible. The total number of taxa observed at the Flat Rock Site seems to be decreasing as does the percent of the taxa that are Ephemeroptera, Plecoptera, and Trichoptera while the percent of individuals that are in the dominant taxa are increasing. These trends, which may indicate habitat degradation, should be watched closely in future years. Conversely, at the Sheridan Creek site conditions may be improving as the same indices outlined above seem to have the opposite trends. Trends in indices at the other sites are not yet apparent or are flat.

Henrys Fork of the Snake River

Flat Rock

Water temperatures at the Flat Rock site in 2005 were not accurately recorded because the temperature logger was affected by a spring source. Maximum average daily temperatures are typically around 16 °C at this site (Figure 2).

The June 2005 population estimates for juvenile trout at the Flat Rock site increased from those observed during the past few years (Figure 15). Sculpin were the only non-game fish species caught at this site (Table 8), but dace and shiners have been collected there in the past.

In general, invertebrate indices displayed trends towards poorer invertebrate conditions including lower densities, fewer taxa present, higher proportion of dominant taxa, and slightly increased HBI scores (Figure 10 - Figure 14). However, changes were not significant based on comparisons of 95% confidence intervals.

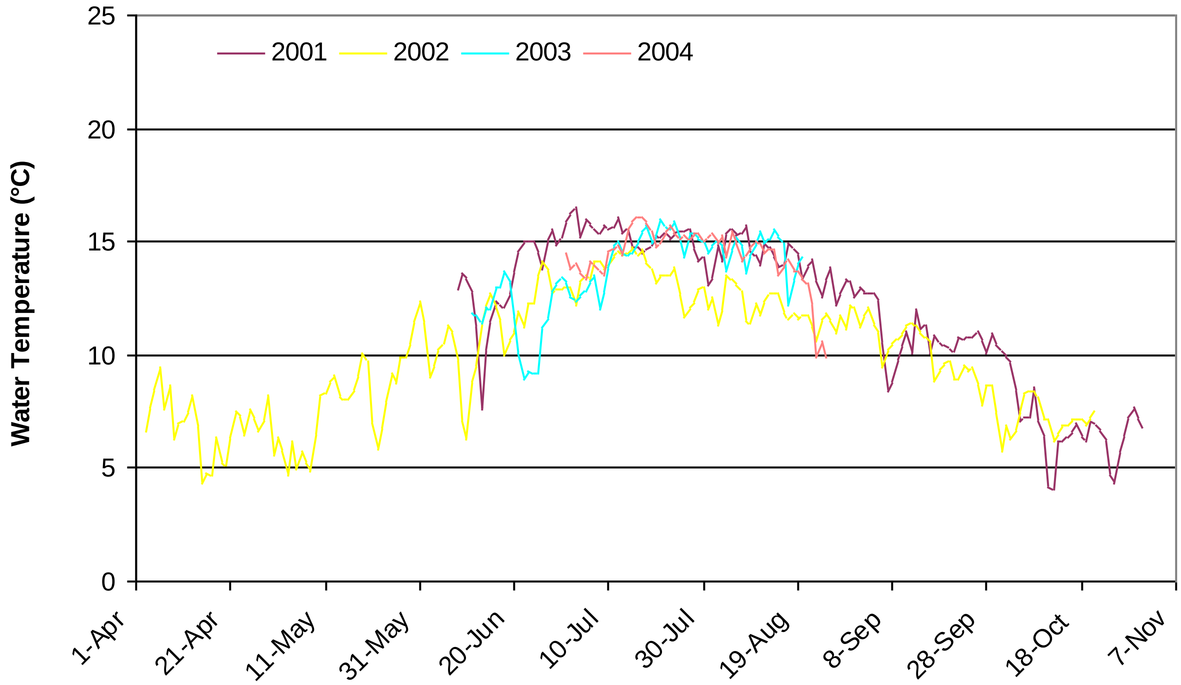

Figure 2. Average daily water temperature at the Flat Rock site.

Box Canyon

The temperature logger at the Box Canyon site was not recovered during 2005. In the past, average daily temperature never exceeded 20 °C (Figure 3).

The 2005 population estimates of juvenile rainbow trout found at the Box Canyon site showed an increase in numbers from the last two years, but remain less than estimates collected in 2002 (Figure 15). Estimates were performed only four days earlier in the year (24 June) in 2005 than 2004 estimates (28 June).

Invertebrate indices at the Box Canyon site were not significantly different from those observed in previous years (Figure 10 - Figure 14). Trends, although not significant were slightly positive including higher EPT%, total taxa, and lower dominant taxa scores. However, changes were minimal in all cases.

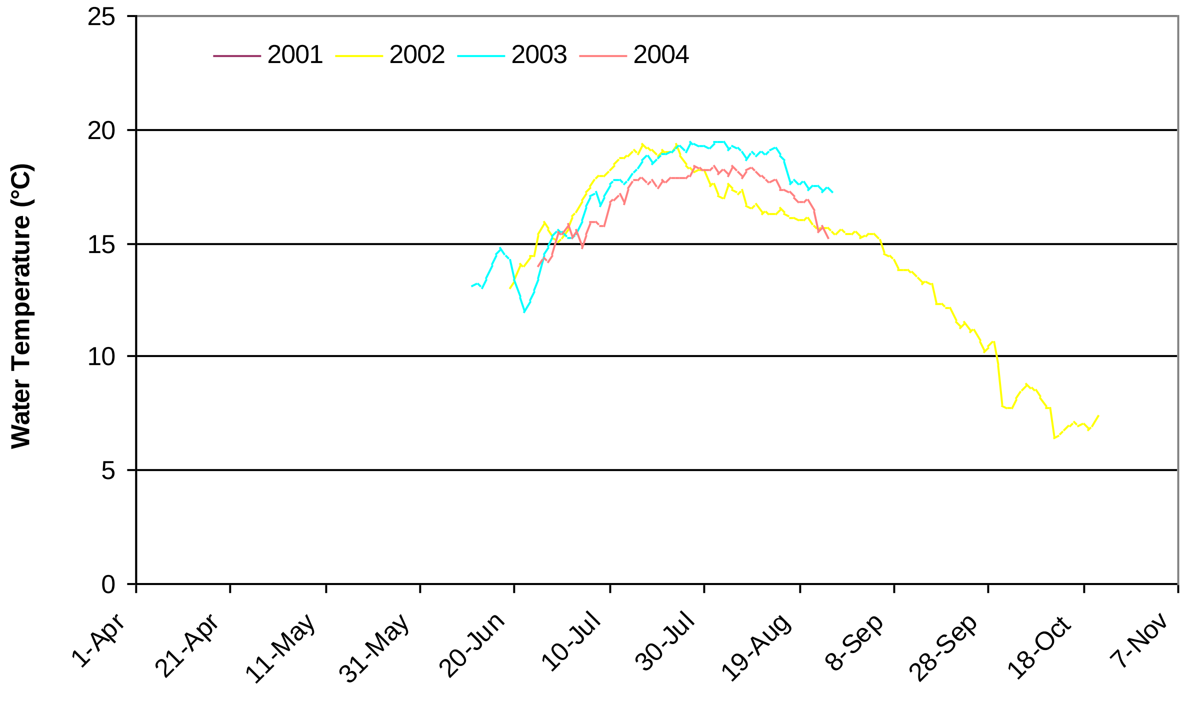

Figure 3. Average daily water temperature at the Box Canyon site.

Big Bend

Water temperatures at the Big Bend site in 2005 were lower than those recorded in 2004, particularly during late summer (July through September). This was likely a result of reduced solar input as discharge was lower during late summer 2005 than it was in previous years when water temperature was recorded. Average water temperatures never exceeded the DEQ's standards of 19 °C (Figure 4). Instantaneous water temperatures exceeded DEQ standards of 22°C on four days in early July when temperatures hit maximum readings of 26°C (Table 2).

Estimates of juvenile trout abundance continued to be lower than those observed during 2001 but were higher than observations from 2002 – 2004 (Figure 15). This is somewhat surprising as 2001 population estimates were conducted over three weeks earlier in the year than estimates from 2005 (Table 3 and Table 7). Additionally, population estimates done both in early and mid summer during 2002 were low compared to estimates conducted during 2001 (Table 6 and Table 7). The reason for the wide fluctuation in juvenile trout densities is not apparent at this time.

Invertebrate metrics for the Big Bend site were similar to those observed in previous years and no trend change was apparent (Figure 10 - Figure 14).

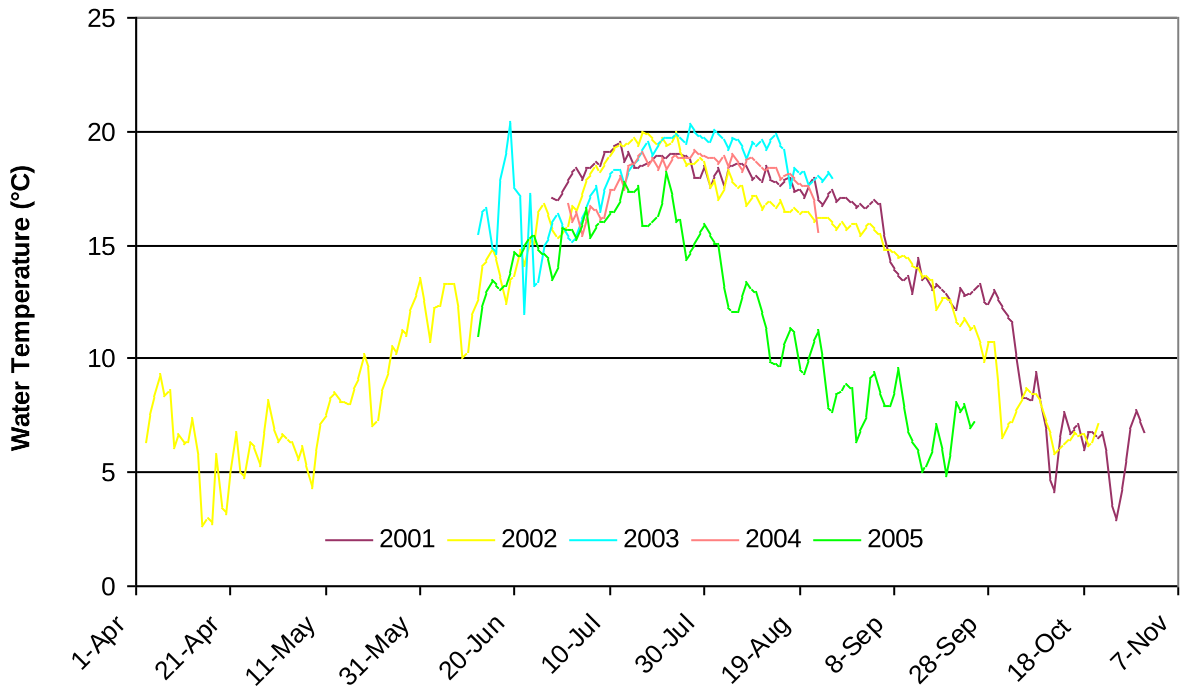

Figure 4. Average daily water temperature at the Big Bend site.

Ashton

Water temperatures at the Ashton site were not obtained during 2005 as the temperature logger was lost. Maximum average daily temperatures are typically around 20 °C at this site (Figure 5).

Juvenile fish estimates were only conducted on the right bank of the Ashton site due to high discharge that made it difficult to cross the river. These estimates were similar to those obtained at this site in previous years (Figure 15).

Invertebrate density was slightly lower than that observed during previous years although the difference was not significant (Figure 10). All other invertebrate indices were similar to previous years (Figure 11 - Figure 14).

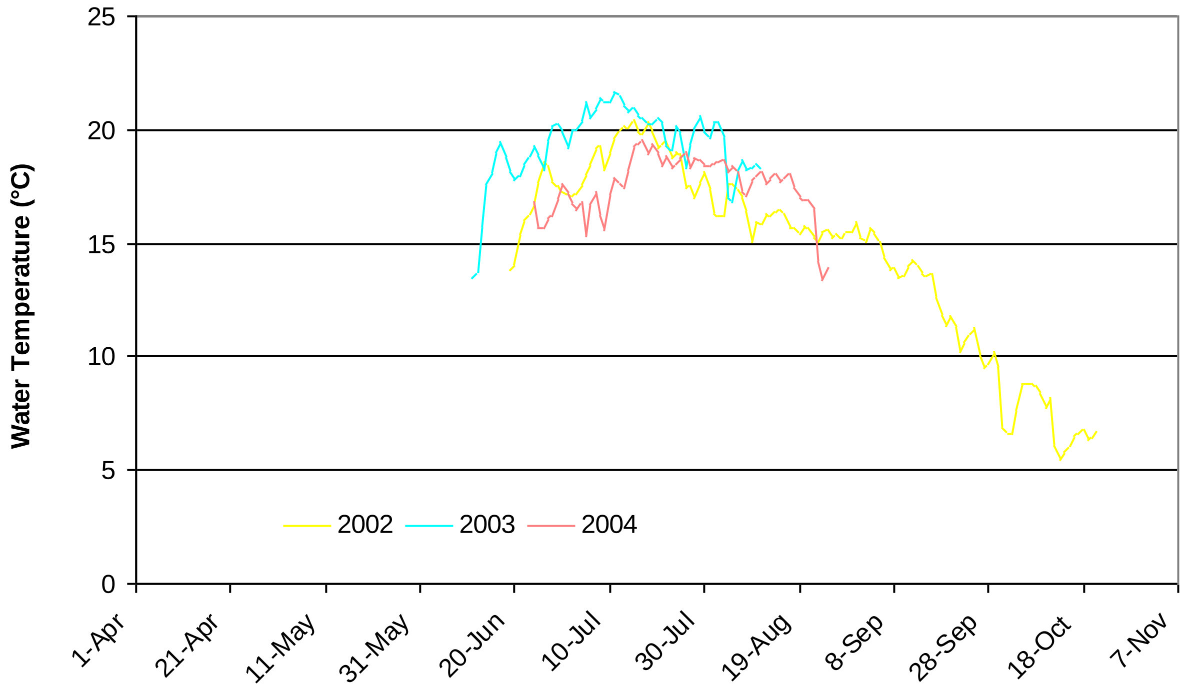

Figure 5. Average daily water temperature at the Ashton site.

St Anthony

The water temperature record at the St. Anthony site was interrupted when the temperature logger was exposed to air from 29 June – 11 August. During the time water temperature was recorded (12 June – 28 June and 12 August – 31 October) average water temperatures exceeded the DEQ's standards on only one day (Figure 6) and instantaneous temperatures exceeding the standards seven times. This site should be visited throughout the summer especially when flows drop below 1450 cfs to ensure that the monitor is properly submerged.

Juvenile trout populations were slightly higher than those observed during the previous years but were still relatively low and within the range of population densities previous observed (Figure 15).

Invertebrate metrics for the St. Anthony site were similar to those observed in previous years and no trend change was apparent (Figure 10 - Figure 14).

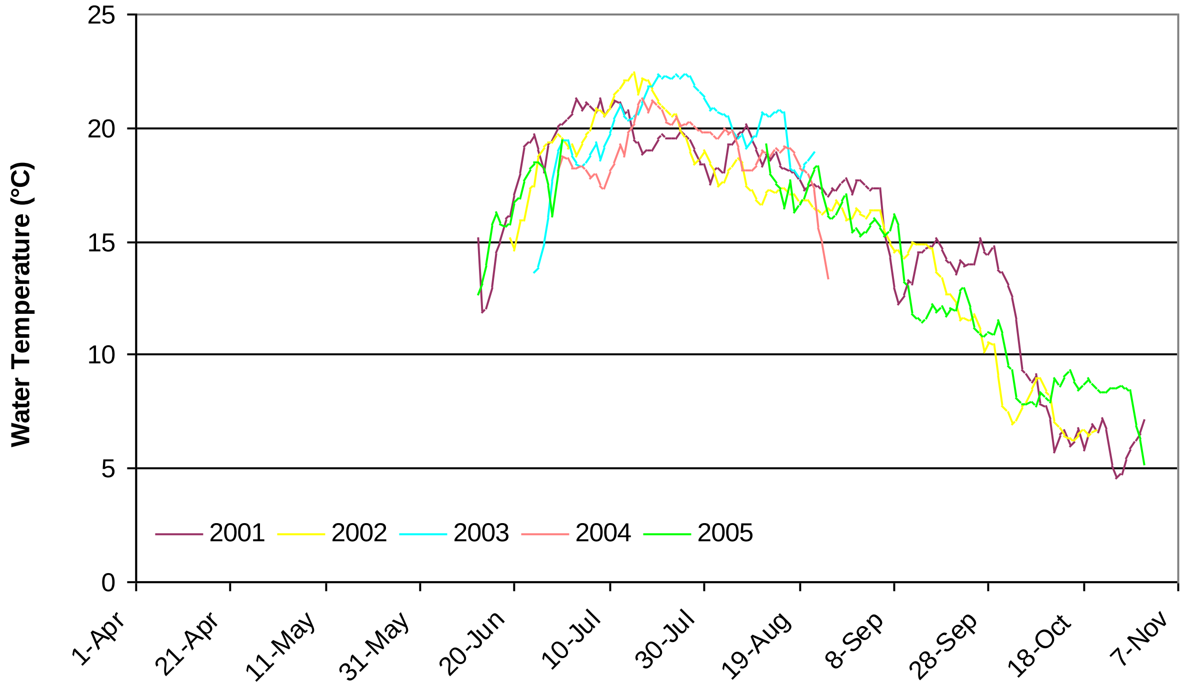

Figure 6. Average daily water temperature at the St. Anthony site.

Henrys Lake Outlet

Flat Ranch

Water temperature at the Flat Ranch site during late summer was lower than that observed during 2003. This likely is a function of reduced solar input rather than discharge, as discharge was lower during late summer 2005 than for the similar period during 2003. The DEQ standards for cold water biota were exceeded on 36 days at the Flat Ranch site during 2005 when instantaneous and average daily water temperatures exceeded 22°C and 19°C respectively (Figure 7, Table 2). This is an increase over 2004 when DEQ's standards were exceeded on only 12 days. Monitor exposure could be an explanation for this temperature increase and should be observed throughout the monitoring season.

No juvenile rainbow trout were observed at Flat Ranch in 2005 (Table 3), similar to the last two years (Table 4 and Table 5). Dace, shiners and sculpin were non-game species collected at this site (Table 8).

Invertebrate metrics for the Flat Ranch site were similar to those observed in previous years and no trend change was apparent (Figure 10 - Figure 14).

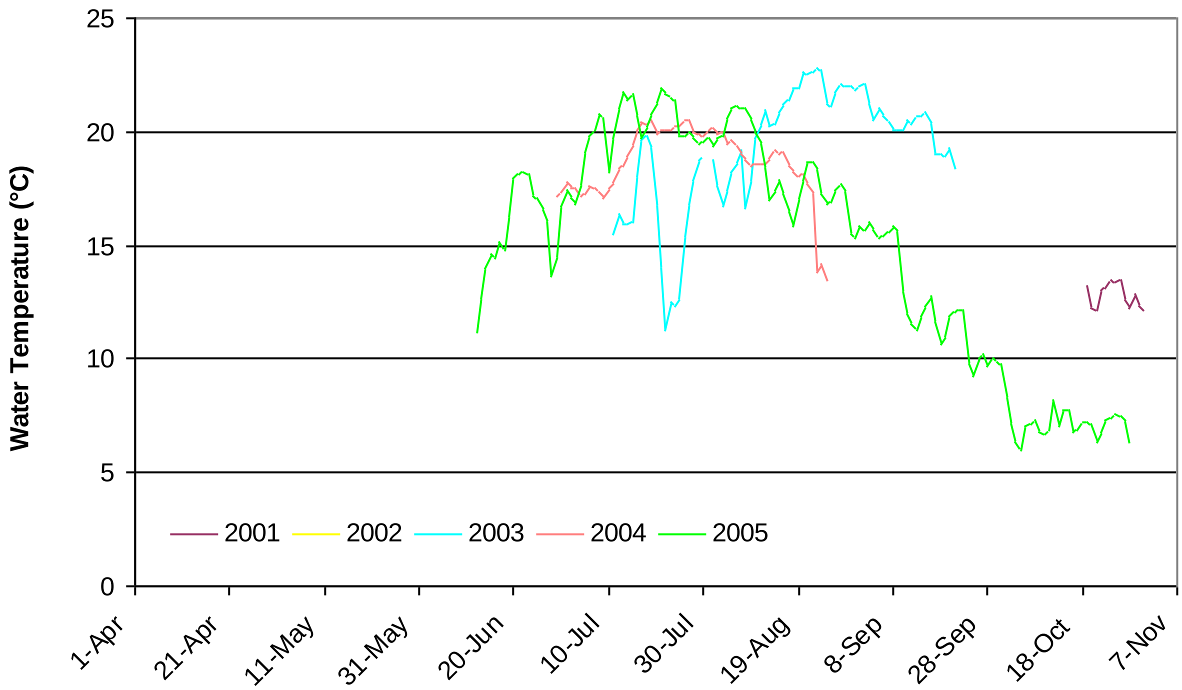

Figure 7. Average daily water temperature at the Flat Ranch site.

Sheridan Creek

<u>Sheridan Creek</u>

Water temperature was not recorded at this site during 2005, but in past years, average daily water temperature has routinely exceeded 19 °C (Figure 8).

Invertebrate density at the Sheridan Creek site was similar to that observed during previous years (Figure 10). However, the other invertebrate indices improved slightly (Figure 12 and Figure 14), although the only significant difference was a higher percentage of the taxa that were Ephemeroptera, Plecoptera, and Trichoptera (Figure 11).

No trout were collected from this site (Table 3), which was similar to past years (Table 4 and Table 7), but dace and shiners were both collected (Table 8).

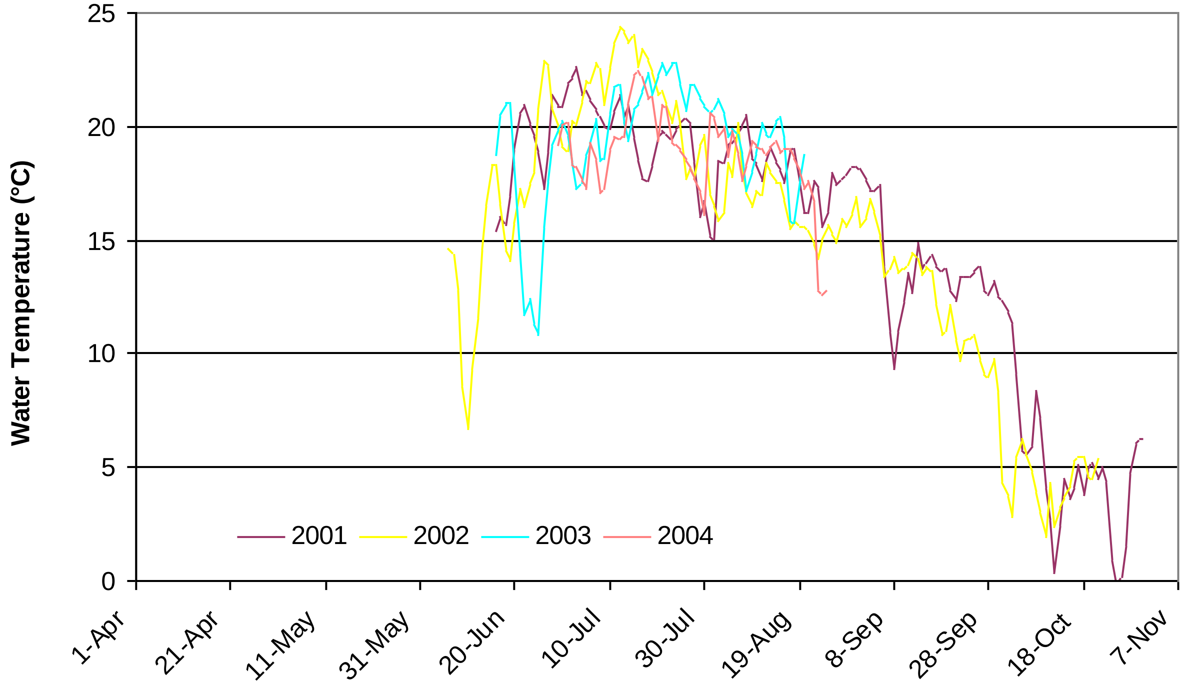

Figure 8. Average daily water temperature at the Sheridan Creek site.

Fall River

Fall River

The water temperature record at the Fall River site was interrupted when the temperature logger was exposed to air for a portion of the summer. During the time water temperature was recorded (12 June – 1 July and 1 August – 31 October) water temperatures exceeded the DEQ's standards on only 2 days and average daily water temperature exceeded 19 °C on 10 days (Figure 9). Temperature logger exposure was believed to occur when water flows dropped below 350-400 cfs.

Fall River juvenile fish estimates showed a slight decrease from numbers observed in 2004 (Table 3 and Table 4), although fish densities were relatively low during both years.

Invertebrate indices showed no discernable trends at the Fall River site over the past five years (Figure 10 - Figure 14).

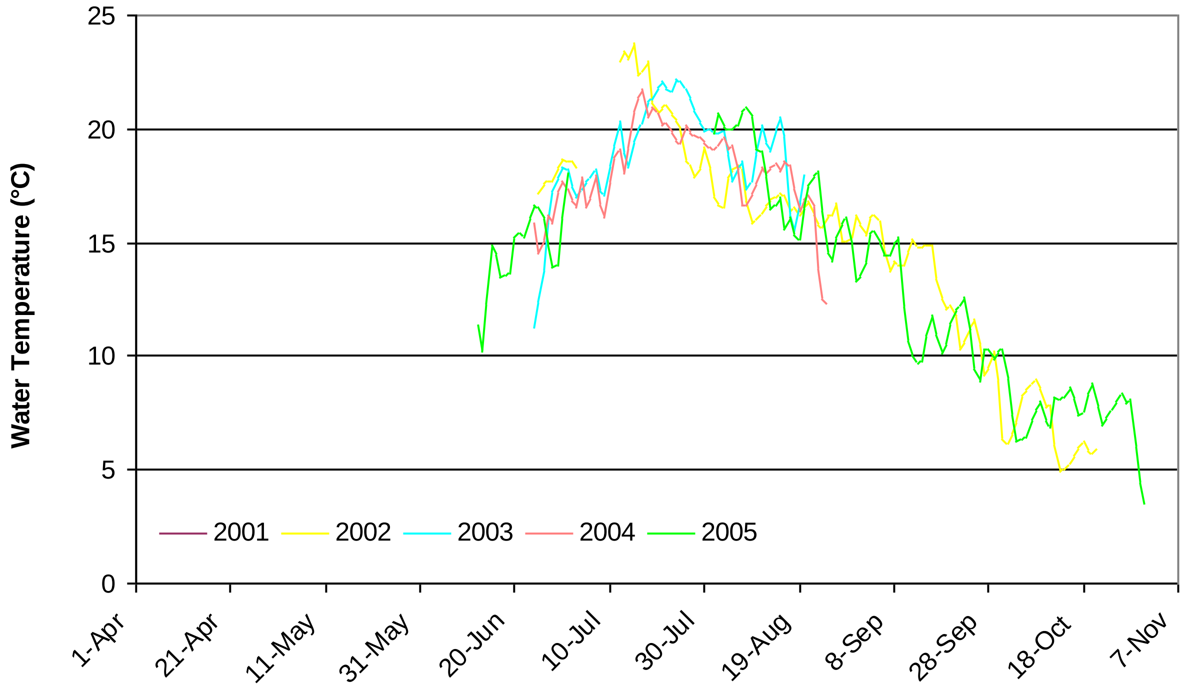

Figure 9. Average daily water temperature at the Fall River site.

Conclusions

This long-term monitoring project was initiated following two unnatural disasters in the Henrys Fork watershed. The first of these was failure of the Marysville Canal during construction of the Fall River Hydroelectric project that occurred on 11 June 1992. On that day, the Marysville Canal ruptured at the point where it crossed the buried penstock. Water from the canal followed the newly excavated penstock corridor for about 1100 m and then flowed along a natural drainage for approximately 500 m where it entered the Fall River. The result was that an estimated 28,000 metric tons of soil washed into the Fall River (Gamblin 1992). The second event occurred during September of that same year, when Island Park Reservoir was drawn down to a minimum pool of approximately 1,000,000 m^3 (270 ac-ft) and held there for two weeks. This resulted in an estimated 25,000 to 45,000 metric tons of sediment being mobilized from the reservoir bottom and transported into the Henrys Fork downstream (HabiTech 1994).

While these two events undoubtedly had an impact on the aquatic systems where they occurred, the magnitude and duration of that effect is unknown for one primary reason, very little to no data were available for these systems prior to the sedimentation events. This, along with a desire to quantify the status and trends in river ecosystem health led to the initiation of this long-term project.

Archer et al. (2004) outlined several criteria for designing monitoring programs capable of detecting change attributable to anthropogenic influences. They stated that: 1) monitoring programs must be able to focus on attributes that are altered by human disturbance; 2) the variables and the methods used to measure them must be sensitive enough to detect changes in ecosystems that are a result of human activities; 3) enough measurements must be taken to adequately characterize the variability of the system of interest, and; 4) methods should be quantifiable and repeatable by different personnel at different location and over different time periods to reduce sampling variability. Archer et al. (2004) further stated that temporal variability may also be a problem when characteristics that are being measured change during the sampling season. Initially, long-term monitoring on the Henrys Fork included a variety of habitat measurements which are no longer recorded including water depths, pool volumes, substrate size composition, macrophyte species composition and density, bank stability, water conductivity, etc. Over time, these measures were found to be too seasonally variable or too variable between observers to detect changes between years. Eventually, long-term monitoring was reduced to three parameters: seasonal water temperature (water temperature recorded hourly throughout the summer), juvenile trout abundance and species composition, and invertebrate density and species composition. These parameters are quantitative, easily repeatable, readily altered by changes in ecosystem health, and are meaningful to trout populations.

Water temperature directly affects fish growth and high temperatures can reduce survival of trout and incubating eggs. Additionally, it is likely that water temperature is responsible for the lack of juvenile trout present at the Sheridan Creek and Flat Ranch sites. Water temperature monitoring should continue as per past monitoring on a yearly basis except it would be beneficial to record temperatures through the spawning and egg incubating season (April – May).

Juvenile trout population monitoring in some areas, particularly the Box Canyon site, may seem unnecessary especially given that survival of juvenile trout to age-1 depends more on flow than summer juvenile trout densities (Mitro et al. 2003). However, anthropogenic events may significantly impact juvenile trout populations even when adult trout populations may not be affected in the same way. For example, increased silt in redds (a reduction in ecosystem health) may reduce incubation success resulting in lower summer densities of juvenile trout but not effect adult trout densities (because seeding is still adequate). Additionally, whirling disease was discovered at the Flat Rock site during 2001 as a result of long-term monitoring. Monitoring of juvenile trout should continue at all sites to document potential changes in densities and species composition. Sampling of juvenile trout at each site should be repeated, as nearly as possible, at the same time of year they were sampled in the past. Sampling should continue annually for a while longer given that nearly all past data are for drought years.

Invertebrates have been used as indicator species for changes in water and habitat quality for years (Merritt and Cummins 1996) and metrics included in this monitoring project appear to be indicating trends. Although this portion of long-term monitoring is the most time consuming and expensive, we also think it is the most readily indicative of conditions and the most repeatable. It could be improved by adding more samples at each site, thereby reducing the confidence intervals around each metric. Sampling should continue annually for a while longer given that nearly all past data are for drought years.

Invertebrate indices and juvenile trout abundances may be influenced by changes in the percentage of the substrate that is sand or silt. It would be useful to consider the addition of actual sand and silt measurements to the long-term monitoring protocol, especially because the two most recent major degradation events have involved fine substrate releases. Archer et al. (2005) evaluated the use of pebble counts for detecting changes in the composition of silt in riffles and concluded that because of the seasonal variability in silt composition and the variability between observers it was impractical for use as a long-term monitoring tool. Use of more rigorous quantitative substrate sampling methods, such as using a core sampler with sieves, may be warranted.

One survey method that was originally part of the long-term monitoring protocol was the use of survey equipment to determine stream bottom elevation at transects across the channel. While we are unfamiliar with the analyses associated with these measurements, Kim Clarkin (Pers. Comm.) outlined transect survey uses, suggestions for timing of repeat surveys. Cross section (transect) survey data are useful for determining aggradation and degradation along with any other kind of channel change including widening, bar formation, and sediment slug tracking. Resurveying transects is crucial for tracking channel change in the lower river (below St Anthony) where the river becomes truly alluvial, and especially where it was influenced by the Teton dam failure. Transect surveys should be done at every long term monitoring sampling site every five years at lower river and upper river sites until trends and natural variation can be quantified. Cross sections should be surveyed more frequently after a restoration project. In the stable sections of the middle river, cross section surveys repeated every 10 years should be adequate.

The repeatability of surveys completed to date is questionable given the level of training of the interns doing the surveying. Therefore, it may be worthwhile to hire a survey team to survey cross sections at the monitoring sites which can be bench-marked to a regular survey grid.

Thereafter, comparison surveys could be accurately redone after any number of years. \

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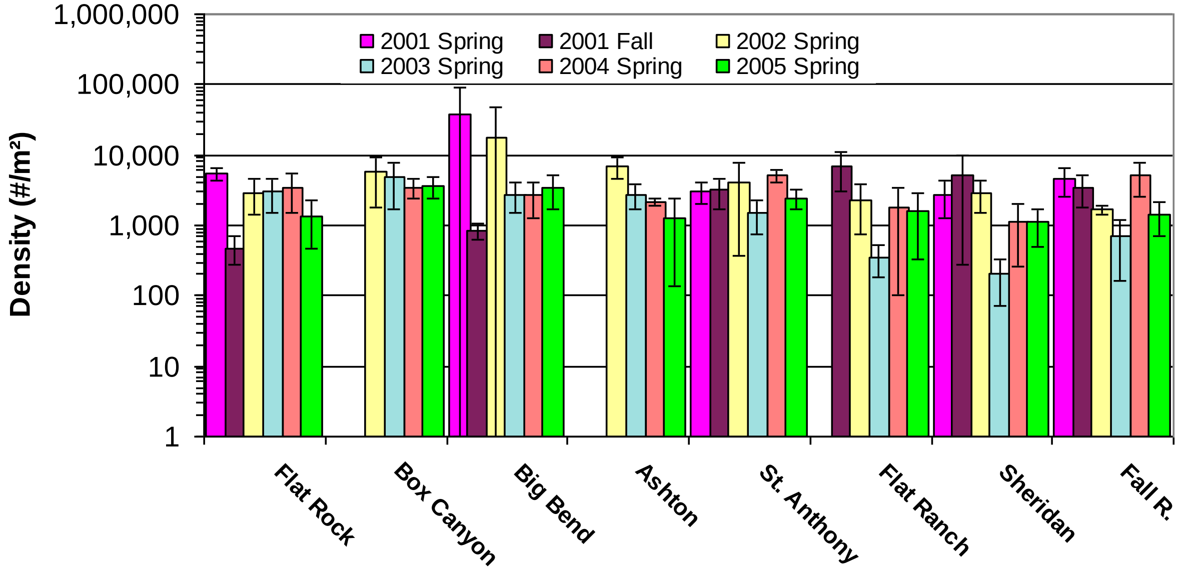

Figure 10. Number of invertebrates/m^2 of substrate at given locations. Data are means (with 95% confidence intervals) of 3 modified Hess samples collected at each site in late May or early June (spring) and late July or early August (fall).

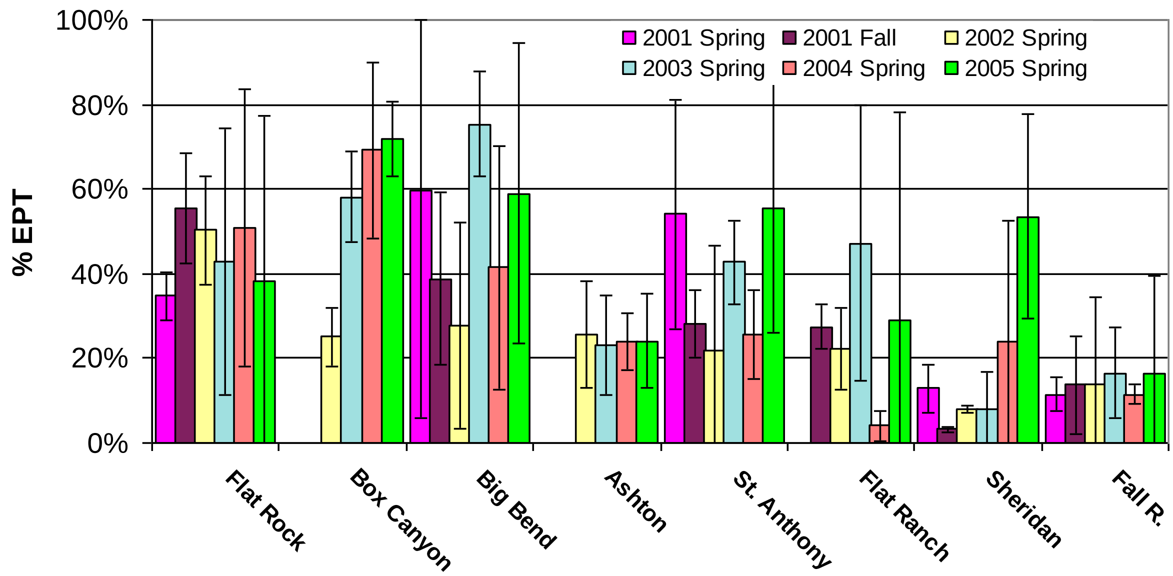

Figure 11. Percent Ephemeroptera, Plecoptera, and Trichoptera (EPT) in the sample. Data are means (with 95% confidence intervals) of 3 modified Hess samples collected at each site in late May or early June (spring) and late July or early August (fall).

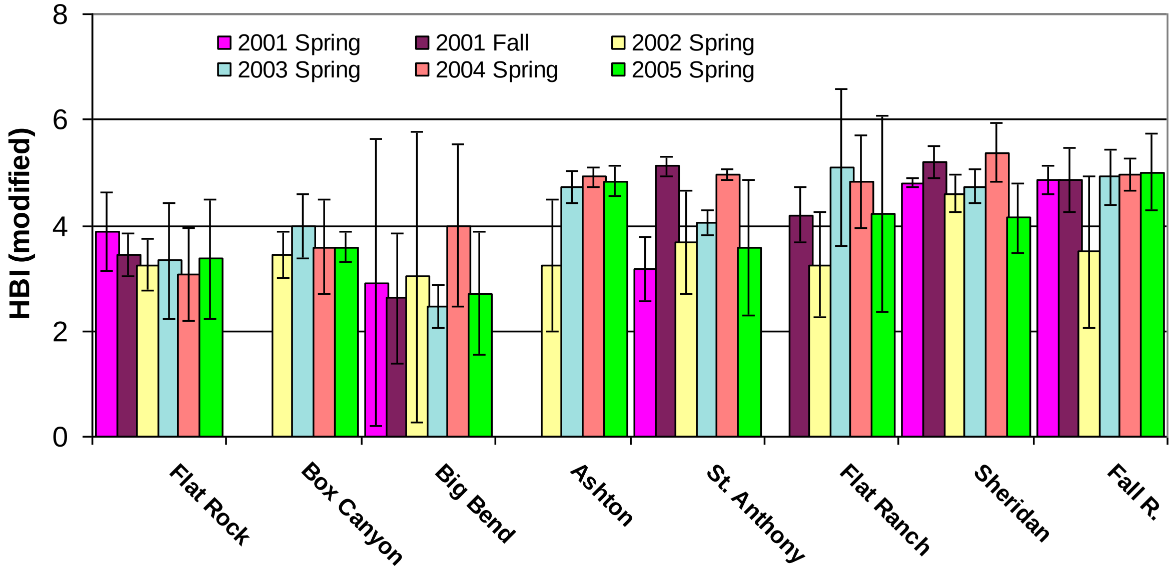

Figure 12. Modified Hilsenhoff Biotic Index (HBI Modified) for a given location. Data are means (with 95% confidence intervals) of 3 modified Hess samples collected at each site in late May or early June (spring) and late July or early August (fall).

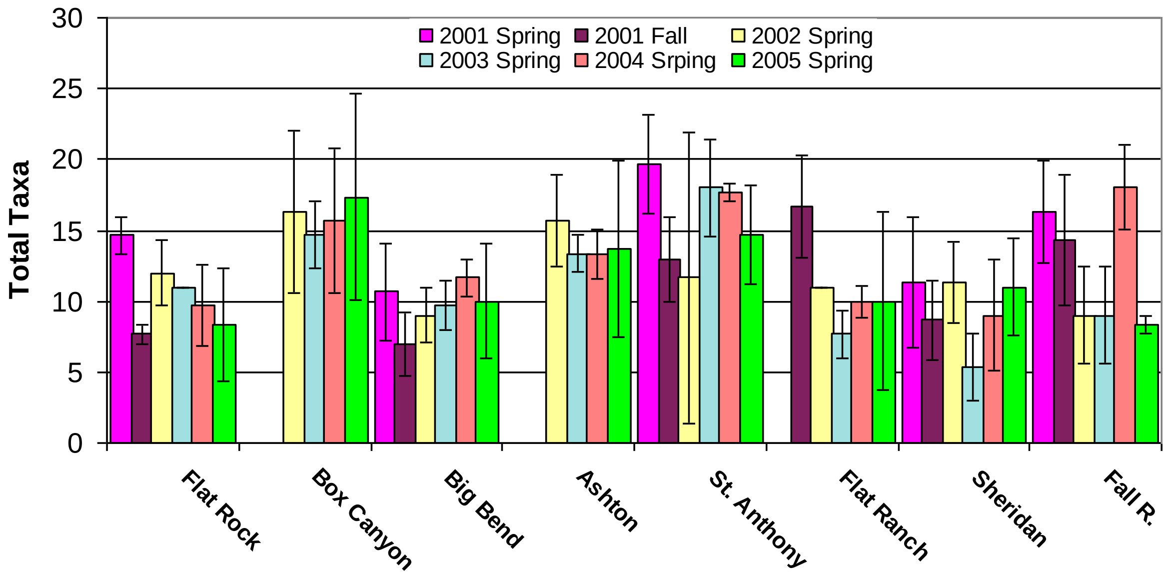

Figure 13. Number of taxa observed at a given location. Data are means (with 95% confidence intervals) of 3 modified Hess samples collected at each site in late May or early June (spring) and late July or early August (fall).

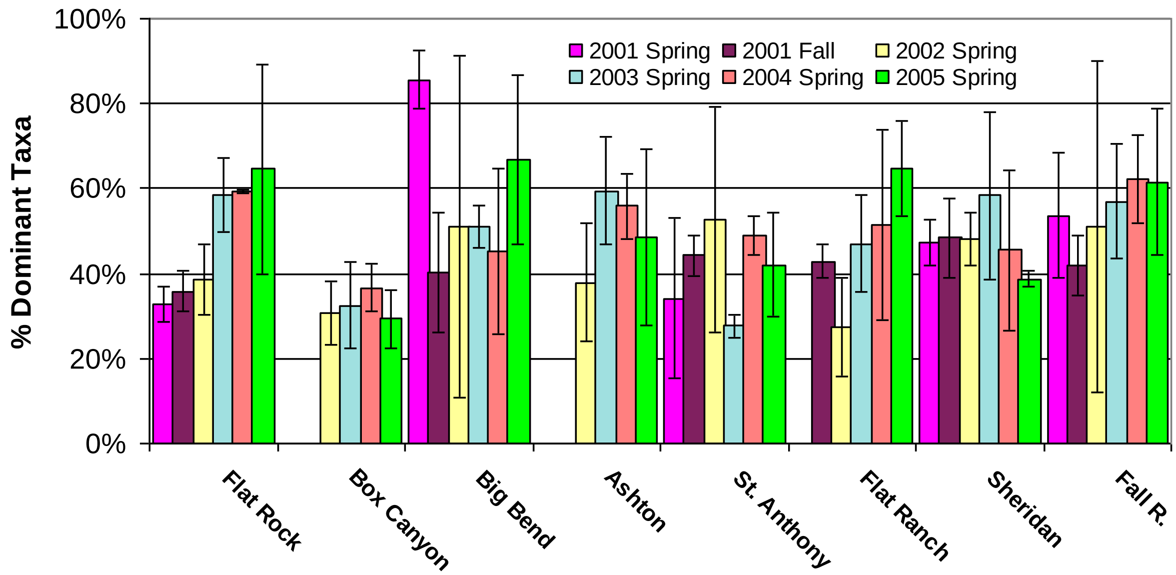

Figure 14. Percent of the invertebrates that come from the dominant taxa. Data are means (with 95% confidence intervals) of 3 modified Hess samples collected at each site in lat May or early June (spring) and late July or early August (fall).

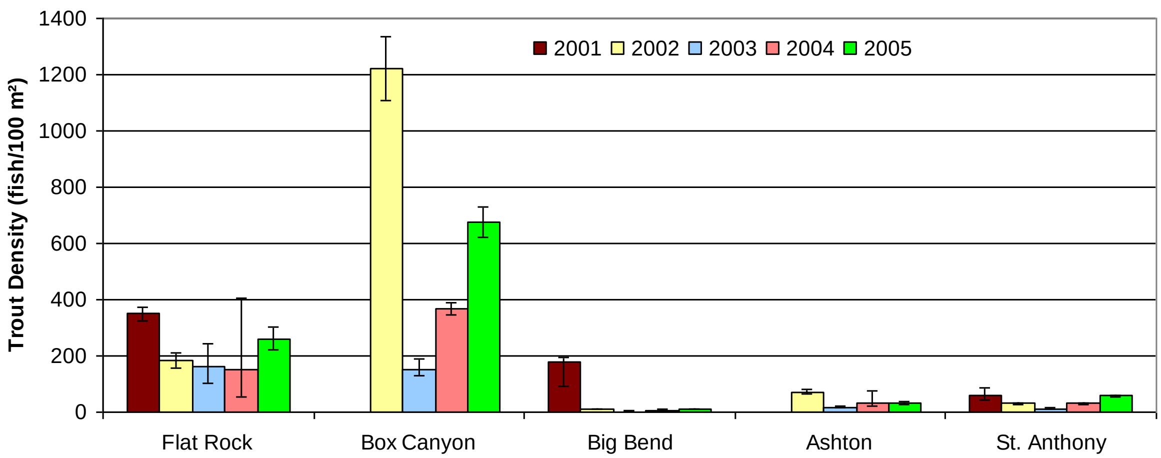

Figure 15. Estimated density of juvenile rainbow trout present along the banks at the five monitoring sites on the Henrys Fork.

Table 1. Relative location and UTM (NAD27) of sample sites in the Henrys Fork drainage.

Stream Site	Northing	Easting	Site Location
Henrys Fork			
Flat Rock	4927086	472135	Downstream from the Flat Rock Club buildings
Box Canyon	4913558	467485	Adjacent to the Hugo Melvoin property at Last Chance
Big Bend	4911592	464203	Upstream from the Stock Bridge in Harriman Sate Park
Ashton	4884284	464549	Upstream from the hwy 20 bridge across the inlet to Ashton Reservoir
St. Anthony	4867584	443885	Downstream from the Independent Canal diversion
Henrys Lake Outlet			
Flat Ranch	4935744	474038	At upstream Nature Conservancy property boundary
Sheridan Cr.			
Green Canyon	4917812	452521	Downstream from Green Canyon road
Fall River			
Chester	4827012	457669	Below Chester Diversion

Table 2. Period of water temperature record at each site from 2001 – 2005 and the number of days that water temperature exceeded Idaho Department of Environmental Quality water temperature standards for cold-water biota (maximum daily water temperature exceeds 22 °C with a maximum daily average greater than 19°C).

Stream / Site	Year	Installation Date	Retrieval Date	Data break: Stop record	Data break: Start record	# of days water temp >= 22 °C	# of days mean water temp >= 19 °C	# of days both previous occurred
Henrys Fork								
Flat Rock	2005	12-Jun-05	28-Oct-05				No data	
	2004	1-Jun-04	25-Aug-04			0	0	0
	2003	11-Jun-03	20-Aug-03			0	0	0
	2002	3-Apr-02	22-Oct-02			0	0	0
	2001	8-Jun-01	31-Mar-02			0	0	0
Box Canyon	2005						Logger was lost	
	2004	25-Jun-04	25-Aug-04			0	0	0
	2003	11-Jun-03	26-Aug-03			0	17	0
	2002	3-Apr-02	22-Oct-02			2	6	2
Big Bend	2005	12-Jun-05	25-Sep-05			4	0	0
	2004	1-Jun-04	25-Aug-04			35	4	4
	2003	12-Jun-03	26-Aug-03			40	31	28
	2002	19-Jun-02	22-Oct-02			29	15	14
	2001	28-Jun-01	31-Mar-02			18	8	8
Ashton	2005						Logger was lost	
	2004	24-Jun-04	25-Aug-04			0	5	0
	2003	11-Jun-03	11-Aug-03			50	40	40
	2002	19-Jun-02	22-Oct-02			3	16	3
St. Anthony	2005	12-Jun-05	13-Nov-05	28-Jun	11-Aug	7	1	1
	2004	29-Jun-04	25-Aug-04			32	29	26
	2003	24-Jun-03	22-Aug-03			45	44	42
	2002	19-Jun-02	22-Oct-02			31	30	30
	2001	12-Jun-01	17-Jun-02			40	40	35
Henrys Lake Outlet								
Flat Ranch	2005	12-Jun-05	13-Nov-05			46	42	36
	2004	29-Jun-04	25-Aug-04			12	26	12
	2003	11-Jun-03	21-Aug-03			58	43	42
	2002						Logger was lost	
Sheridan Creek								
Green								
	2005						Logger was lost	
	2004	29-Jun-04	25-Aug-04			49	30	30
	2003	16-Jun-03	20-Aug-03			59	43	43
	2002	6-Jun-02	22-Oct-02			33	52	33
	2001	15-Jun-01	4-Jun-02			54	2	2
Fall River								
Chester	2005	12-Jun-05	9-Nov-05	12-Jun	11-Aug	3	0	0
	2004	24-Jun-04	25-Aug-04			36	24	24
	2003	24-Jun-03	20-Aug-03			39	28	28
	2002	25-Jun-02	22-Oct-02	4-Jul	11-Jul	24	15	15
	2001						Logger was lost	

Table 3. Species, total catch, estimated population (fish/100 m² of bank habitat), and mean size of trout captured with a backpack electro-fisher along 100 m² of bank at the various sites within the Henrys Fork watershed during 2005.

Stream - site	Bank (looking upstream)	Sampling Method	Date	Length (m)	Total Captured	Population Estimate	Density Fish/100 m²	Lower 95% CI	Upper 95% CI	Rainbow % of popn	Mean Length (mm)	Brook % of popn	Mean Length (mm)	Brown % of popn	Mean Length (mm)
Henrys Fork															
Flat Rock	Right	3 pass	22-Jun-05	100	245	276	276	254	298	100%	30	-	-	-	-
Flat Rock	Left	3 pass	22-Jun-05	100	177	248	248	188	308	100%	33	-	-	-	-
Box Canyon	Left	3 pass	24-Jun-05	50	244	315	630	562	698	100%	32	-	-	-	-
Box Canyon	Right	4 pass	24-Jun-05	50	309	360	720	678	762	100%	32	-	-	-	-
Big Bend	Left	3 pass	30-Jun-05	100	10	10	10	8	12	100%	30	-	-	-	-
Big Bend	Right	3 pass	30-Jun-05	100	12	12	12	12	12	100%	33	-	-	-	-
Ashton	Left	3 pass	7-Jul-05	100	29	32	32	29	39	72%	34	3%	40	24%	50
St. Anthony	Left	3 pass	8-Jul-05	100	66	66	66	66	68	21%	38	-	-	79%	62
St. Anthony	Right	3 pass	8-Jul-05	100	46	49	49	46	55	41%	46	-	-	57%	62
Sheridan Creek															
Green Canyon	Left	1 pass	5-Jul-05	100	0	-	-	-	-	-	-	-	-	-	-
Green Canyon	Right	1 pass	5-Jul-05	100	0	-	-	-	-	-	-	-	-	-	-
Henrys Lake Outlet															
Flat Ranch	Left	1 pass	5-Jul-05	100	0	-	-	-	-	-	-	-	-	-	-
Flat Ranch	Right	1 pass	5-Jul-05	100	0	-	-	-	-	-	-	-	-	-	-
Fall River															
Chester	Left	3 pass	6-Jul-05	100	25	35	35	11	59	100%	33	-	-	-	-
Chester	Right	3 pass	6-Jul-05	100	4	4	4	4	4	100%	33	-	-	-	-

Table 4. Species, total catch, estimated population (fish/100 m² of bank habitat), and mean size of trout captured with a backpack electro-fisher along 100 m² of bank at the various sites within the Henrys Fork watershed during 2004.

Stream - site	Bank (looking upstream)	Sampling Method	Date	Length (m)	Total Captured	Population Estimate	Density Fish/100 m²	Lower 95% CI	Upper 95% CI	Rainbow % of popn	Mean Length (mm)	Brook % of popn	Mean Length (mm)	Brown % of popn	Mean Length (mm)
Henrys Fork															
Flat Rock	Left	3 pass	6-Apr-04	100	25	28	28	25	36	88%	32	0.12	45	-	-
Flat Rock	Right	4 pass	6-Apr-04	100	82	273	273	82	773	88%	35	0.12	51	-	-
Box Canyon	Left	3 pass	28-Jun-04	50	169	179	358	338	378	100%	41	-	-	-	-
Box Canyon	Right	3 pass	28-Jun-04	50	179	189	378	358	396	100%	36	-	-	-	-
Big Bend	Left	1 pass	14-Jun-04	100	0	-	-	-	-	-	-	-	-	-	-
Big Bend	Right	3 pass	14-Jun-04	100	8	8	8	8	9	100%	24	-	-	-	-
Ashton	Left	4 pass	20-Jun-04	100	17	29	29	17	69	88%	30	0.12	58	-	-
Ashton	Right	4 pass	20-Jun-04	100	25	40	40	25	78	92%	34	0.08	66	-	-
St. Anthony	Left	3 pass	4-Jun-04	100	29	31	31	29	36	100%	29				
St. Anthony	Right	3 pass	4-Jun-04	100	29	30	30	29	33	86%	28	-	-	0.14	54
Sheridan Creek															
Green Canyon	Left	1 pass	14-Jun-04	100	0	-	-	-	-	-	-	-	-	-	-
Green Canyon	Right	1 pass	14-Jun-04	100	0	-	-	-	-	-	-	-	-	-	-
Henrys Lake Outlet															
Flat Ranch	Left	1 pass	16-Jun-04	100	0	-	-	-	-	-	-	-	-	-	-
Flat Ranch	Right	1 pass	16-Jun-04	100	0	-	-	-	-	-	-	-	-	-	-
Fall River															
Chester	Left	1 pass	23-Jun-04	100	2	-	-	-	-	100%	26	-	-	-	-
Chester	Right	4 pass	23-Jun-04	100	50	74	74	50	113	100%	28	-	-	-	-

Table 5. Species, total catch, estimated population (fish/100 m² of bank habitat), and mean size of trout captured with a backpack electro-fisher along 100 m² of bank at the various sites within the Henrys Fork watershed during 2003.

Stream - site	Bank (looking upstream)	Sampling Method	Date	Length (m)	Total Captured	Population Estimate	Density Fish/100 m²	Lower 95% CI	Upper 95% CI	Rainbow % of popn	Mean Length (mm)	Brook % of popn	Mean Length (mm)	Brown % of popn	Mean Length (mm)
Henrys Fork															
Flat Rock	Left	3 pass	25-Jun-03	100	77	82	82	77	89	100%	30	-	-	-	-
Flat Rock	Right	3 pass	25-Jun-03	100	124	243	243	124	400	81%	39	19%	59	-	-
Box Canyon	Left	3 pass	25-Jun-03	50	24	33	66	48	110	100%	36	-	-	-	-
Box Canyon	Right	3 pass	25-Jun-03	50	105	118	236	210	264	100%	39	-	-	-	-
Big Bend	Left	1 pass	16-Jun-03	100	1	-	0.01	-	-	100%	24	-	-	-	-
Big Bend	Right	2 pass	16-Jun-03	100	5	5	5	5	6	100%	25	-	-	-	-
Ashton	Left	2 pass	24-Jun-03	100	13	14	14	13	19	77%	53	-	-	23%	63
Ashton	Right	2 pass	24-Jun-03	100	16	17	17	16	22	94%	46	-	-	6%	55
St. Anthony	Left	3 pass	1-Jul-03	100	17	17	17	17	19	100%	39	-	-	-	-
St. Anthony	Right	2 pass	1-Jul-03	100	3	3	3	3	10	67%	50	33%	119	-	-
Sheridan Creek															
Green Canyon	Left	1 pass	16-Jun-03	100	0	-	-	-	-	-	-	-	-	-	-
Green Canyon	Right	1 pass	16-Jun-03	100	0	-	-	-	-	-	-	-	-	-	-
Henrys Lake Outlet															
Flat Ranch	Left	1 pass	16-Jun-03	100	0	-	-	-	-	-	-	-	-	-	-
Flat Ranch	Right	1 pass	16-Jun-03	100	0	-	-	-	-	-	-	-	-	-	-
Fall River															
Chester	Left	1 pass	2-Jul-03	100	0	-	-	-	-	-	-	-	-	-	-
Chester	Right	1 pass	2-Jul-03	100	0	-	-	-	-	-	-	-	-	-	-

Table 6. Species, total catch, estimated population, and mean size of trout captured with a backpack electro-fisher along 100 m² of bank at the various sites within the Henrys Fork watershed during 2002.

Stream - site	Bank (looking upstream)	Sampling Method	Date	Length (m)	Total Captured	Population Estimate	Density Fish/100 m²	Lower 95% CI	Upper 95% CI	Rainbow % of popn	Mean Length (mm)	Brook % of popn	Mean Length (mm)	Brown % of popn	Mean Length (mm)
Henrys Fork															
Flat Rock	right	5 pass	5-Jun-02	100	141	227	227	131	314	100%	26	-	-	-	-
Flat Rock	right	3 pass	8-Jul-02	100	199	220	220	203	236	99%	35	1%	75	-	-
Flat Rock	right	3 pass	13-Aug-02	100	139	148	148	139	157	98%	38	2%	-	-	-
Flat Rock	left	4 pass	3-Jun-02	100	192	222	222	199	245	100%	31	-	-	-	-
Flat Rock	left	3 pass	3-Jul-02	100	58	71	71	58	90	100%	29	-	-	-	-
Flat Rock	left	3 pass	13-Aug-02	100	219	227	227	219	235	99%	36	1%	82	-	-
Box Canyon	right	3 pass	2-Jul-02	50	334	461	922	766	1078	100%	32	-	-	-	-
Box Canyon	left	3 pass	4-Jul-02	50	675	759	1518	1446	1588	100%	41	0.1%	145	-	-
Big Bend	right	4 pass	4-Jun-02	100	15	15	15	15	16	100%	26	-	-	-	-
Big Bend	right	3 pass	2-Jul-02	100	17	20	20	17	29	100%	31	-	-	-	-
Big Bend	left	3 pass	4-Jun-02	100	7	7	7	7	7	100%	27	-	-	-	-
Big Bend	left	4 pass	2-Jul-02	100	29	-	0.29	-	-	100%	23	-	-	-	-
Ashton	right	3 pass	15-Jul-02	100	101	107	107	101	115	94%	48	-	-	6%	66
Ashton	left	4 pass	15-Jul-02	100	33	37	37	34	43	94%	35	-	-	6%	85
St. Anthony	Right	3 pass	16-Jul-02	100	18	18	18	18	19	61%	42	-	-	39%	79
St. Anthony	Left	3 pass	16-Jul-02	100	41	42	42	41	45	5%	60	-	-	95%	61
Sheridan Creek															
Green Canyon	right	1 pass	5-Jun-02	100	0	-	-	-	-	-	-	-	-	-	-
Green Canyon	right	1 pass	3-Jul-02	100	0	-	-	-	-	-	-	-	-	-	-
Green Canyon	left	1 pass	5-Jun-02	100	0	-	-	-	-	-	-	-	-	-	-
Green Canyon	left	1 pass	3-Jul-02	100	0	-	-	-	-	-	-	-	-	-	-
Henrys Lake Outlet															
Flat Ranch	right	1 pass	3-Jun-02	100	0	-	-	-	-	-	-	-	-	-	-
Flat Ranch	right	1 pass	26-Jun-02	40	0	-	-	-	-	-	-	-	-	-	-
Flat Ranch	left	1 pass	3-Jun-02	100	0	-	-	-	-	-	-	-	-	-	-
Flat Ranch	left	1 pass	26-Jun-02	40	0	-	-	-	-	-	-	-	-	-	-
Fall River															
Chester	Right	4 pass	8-Jul-02	100	9	21	21	9	95	100%	29	-	-	-	-
Chester	Left	3 pass	18-Jul-02	100	1	-	0.01	-	-	100%	53	-	-	-	-

Table 7. Species, total catch, estimated population, and mean size of trout captured with a backpack electro-fisher along stream bank sites (1 m wide) at sample locations within the Henrys Fork watershed during 2001.

Stream - site	Bank (looking upstream)	Sampling Method	Date	Length (m)	Total Captured	Population Estimate	Density Fish/100 m²	Lower 95% CI	Upper 95% CI	Average size	Rainbow	Brook	Cutthroat
Henrys Fork													
Flat Rock	Left	3 pass	7-Jun-01	100	316	367	367	336	398	34	100%	-	-
Flat Rock	Right	4 pass	7-Jun-01	100	312	332	332	318	345	26	100%	-	-
Big Bend	Left	3 pass	5-Jun-01	100	38	41	41	38	48	29	100%	-	-
Big Bend	Right	2 pass	5-Jun-01	100	150	315	315	150	345	25	100%	-	-
St. Anthony	Left	3 pass	11-Jun-01	100	53	56	56	53	62	27	100%	-	-
St. Anthony	Right	4 pass	11-Jun-01	100	36	60	60	36	112	31	100%	-	-
Sheridan Creek													
Green Canyon	Left	3 pass	6-Jun-01	100	0	-	-	-	-	-	-	-	-
Green Canyon	Right	3 pass	6-Jun-01	100	0	-	-	-	-	-	-	-	-
Fall River													
Chester	Left	3 pass	8-Jun-01	100	1	-	0.01	-	-	25	100%	-	-
Chester	Right	3 pass	8-Jun-01	100	6	-	0.06	-	-	26	100%	-	-

Table 8. Species of non-game fish captured with a backpack electrofisher along the banks at various sites within the Henrys Fork watershed during 2005.

Stream Reach	Dace	Sculpin	Shiner
Henrys Fork			
Flat Rock		X	
Box Canyon	X	X	X
Big Bend	X		X
Ashton	X	X	X
St Anthony	X	X	X
Henrys Lake Outlet			
Flat Ranch	X	X	X
Sheridan Creek			
Green Canyon	X		X
Fall River			
Chester	X	X	X

Appendix A. Invertebrate metrics for sample locations in the Henrys Fork drainage during 2005.

Stream	Reach	Date	#/sample	#/m²	Total Taxa	HBI* Modified	% EPT	% Dominant Taxa	% Predators	% Shreaders	% Scrapers	% Filterers	% Collectors
Henrys Fork													
	Flat Rock	21-Jun-05	158	2235	8	2.4	71%	60%	1%	0%	0%	0%	99%
		21-Jun-05	79	1117	12	3.2	42%	46%	1%	0%	1%	0%	94%
		21-Jun-05	52	736	5	4.4	2%	88%	8%	0%	0%	0%	92%
		mean	96	1363	8.3	3.4	38%	65%	3%	0%	0%	0%	95%
		U CI	159	2244	12	4.5	77%	89%	8%		1%		99%
		L CI	34	481	4	2.2	0%	40%	0%		0%		91%
	Box	13-Jun-05	278	3932	20	3.8	64%	28%	2%	6%	7%	6%	83%
		21-Jun-05	319	4512	22	3.6	73%	24%	1%	9%	4%	27%	85%
		21-Jun-05	172	2433	10	3.3	79%	36%	1%	3%	0%	5%	95%
		mean	256	3626	17.3	3.6	72%	29%	1%	6%	4%	12%	88%
		U CI	342	4840	24.6	3.9	81%	36%	2%	9%	8%	27%	95%
		L CI	170	2412	10.1	3.3	63%	23%	1%	3%	0%	0%	80%
	Big Bend	21-Jun-05	180	2546	6	1.6	89%	87%	1%	0%	0%	0%	99%
		21-Jun-05	185	2617	11	2.8	61%	56%	3%	0%	0%	0%	97%
		21-Jun-05	374	5290	13	3.7	27%	58%	2%	0%	0%	1%	96%
		mean	246	3484	10.0	2.7	59%	67%	2%	0%	0%	0%	97%
		U CI	371	5254	14.1	3.9	94%	87%	3%			1%	99%
		L CI	121	1714	5.9	1.5	23%	47%	1%			0%	95%
	Ashton	13-Jun-05	172	2433	20	4.6	35%	28%	6%	1%	23%	19%	68%
		13-Jun-05	44	622	10	5.0	18%	55%	0%	2%	14%	7%	82%
		15-Jun-05	54	764	11	5.0	19%	63%	0%	2%	4%	11%	91%
		mean	90	1273	13.7	4.8	24%	48%	2%	2%	13%	12%	80%
		U CI	171	2412	19.9	5.1	35%	69%	6%	3%	24%	19%	93%
		L CI	9	134	7.4	4.6	13%	28%	0%	1%	3%	5%	67%
	St. Anthony	13-Jun-05	197	2786	12	2.3	83%	54%	0%	0%	1%	8%	97%
		13-Jun-05	201	2843	14	4.4	32%	34%	2%	0%	16%	15%	77%
		13-Jun-05	122	1726	18	4.0	51%	38%	7%	2%	3%	7%	87%
		mean	173	2452	14.7	3.6	55%	42%	3%	1%	7%	10%	87%
		U CI	224	3164	18.1	4.9	85%	54%	8%	2%	16%	15%	99%
		L CI	123	1739	11.2	2.3	26%	30%	0%	0%	0%	5%	76%
Henrys Lake Outlet													
	Flat Ranch	21-Jun-05	26	368	9	5.0	8%	62%	15%	0%	0%	4%	77%
		21-Jun-05	129	1825	5	5.3	0%	76%	23%	0%	0%	0%	77%
		21-Jun-05	177	2504	16	2.3	79%	57%	3%	2%	1%	0%	93%
		mean	111	1565	10.0	4.2	29%	65%	14%	1%	0%	1%	82%
		U CI	198	2800	16.3	6.1	78%	76%	25%	2%	1%	4%	92%
		L CI	23	330	3.7	2.4	0%	54%	2%	0%	0%	0%	72%
Sheridan Creek													
	Green Canyon	21-Jun-05	106	1499	11	4.2	44%	41%	5%	0%	4%	3%	78%
		21-Jun-05	96	1358	14	3.5	78%	38%	4%	0%	19%	2%	63%
		21-Jun-05	34	481	8	4.6	38%	38%	9%	0%	6%	0%	85%
		mean	79	1113	11.0	4.1	54%	39%	6%	0%	9%	2%	75%
		U CI	123	1737	14.4	4.8	78%	41%	9%		19%	3%	89%
		L CI	35	488	7.6	3.5	29%	37%	3%		0%	0%	62%
Fall River													
	Chester	6-Jul-05	50	707	9	4.3	40%	44%	2%	0%	8%	6%	82%
		6-Jul-05	128	1810	8	5.3	5%	70%	2%	0%	2%	1%	97%
		6-Jul-05	125	1768	8	5.4	5%	71%	2%	0%	0%	1%	98%
		mean	101	1429	8.3	5.0	16%	62%	2%	0%	3%	3%	92%
		U CI	151	2136	9.0	5.7	40%	79%	2%		8%	0%	102%
		L CI	51	721	7.7	4.3	0%	44%	1%		0%	0%	82%

Appendix B. Invertebrates collected during spring 2005 at sample locations in the Henrys Fork drainage

Order **Family** **Genus**	Tolerance Level	Trophic Relationship	6/21/2005 Flat Rock n=3	6/13/2005 Box Canyon n=3	6/21/2005 Big Bend n=3	6/13/2005 Ashton n=3	6/13/2005 St. Anthony n=3	6/21/2005 Flat Ranch n=3	6/21/2005 Sheridan Creek n=3	7/6/2005 Fall River n=3
Ephemeroptera			0	0	0	0	0	0	0	0
Baetidae			0	0	0	0	0	0	0	0
*Acentrella sp.**			0	0	0	3	0	0	0	4
Baetis sp.	4	Collector/Gatherer	16	192	29	5	13	25	81	1
Barbaetis sp.	4	Collector/Gatherer	0	0	0	0	0	0	0	0
Callibaetis sp.	9	Collector/Gatherer	0	0	0	0	0	0	0	0
Paracloedes sp.	4	Collector/Gatherer	0	0	0	0	0	0	0	0
*Baetid #1**			0	0	0	0	0	0	0	0
Baetiscidae			0	0	0	0	0	0	0	0
Baetisca	?		0	0	0	0	0	0	0	0
Caendiae			0	0	0	0	0	0	0	0
Brachycercus sp.	?	Collector/Gatherer	0	0	0	0	0	0	0	0
Cercobrachys sp.	?	Collector/Gatherer	0	0	0	0	0	0	0	0
Caenis	7	Collector/Gatherer	0	0	0	0	0	0	0	0
Ephemerellidae			0	0	0	0	0	0	0	0
Attenella sp.	3	Collector/Gatherer	0	0	0	0	0	0	0	0
Caudatella sp.	1	Collector/Gatherer	0	0	0	0	0	0	0	0
Caurinella sp.	?	Collector/Gatherer	0	0	0	0	0	0	0	0
Drunella sp.	0	Collector/Gatherer	1	27	0	0	8	3	0	0
Ephemerella sp.	1	Collector/Gatherer	119	139	330	33	154	102	4	0
Seratella sp.	2	Collector/Gatherer	1	0	4	0	0	0	0	0
Timpanoga sp.	7	Collector/Gatherer	0	0	0	0	0	0	0	0
Ephemeridae			0	0	0	0	0	0	0	0
Ephemera sp.	11	Collector/Gatherer	0	0	0	0	0	0	0	0
Hexagenia sp.	11	Collector/Gatherer	0	0	0	0	0	0	0	0
Heptageniidae			2	0	0	0	1	0	20	0
Anepeorus sp.	4	Scraper	0	0	0	0	0	0	0	0
Cinygma sp.	4	Scraper	0	0	0	0	0	0	0	0
Cinygmula sp.	4	Scraper	0	0	0	0	0	0	10	0
Epeorus sp.	0	Scraper	0	7	0	0	0	0	1	4
Heptagenia sp.	4	Scraper	0	0	0	0	0	0	2	0
*Nixe sp.**			0	0	0	0	0	0	0	0
Rithrogena sp.	0	Scraper	1	1	0	1	0	0	0	0
Leptophllebidae			0	3	0	0	0	0	0	0
*Choroterpes sp.**			0	0	0	0	0	0	0	0
Leptophlebia sp.	1	Collector/Gatherer	0	0	0	0	0	0	0	0
Paraleptophlebia s	1	Collector/Gatherer	0	0	0	0	0	0	0	0
Tricorythidae			0	0	0	0	0	0	0	0
Tricorythodes sp.	5	Collector/Gatherer	0	0	0	2	20	0	0	0
Siphlonuridae			0	0	5	0	0	0	0	0
Ameletus sp.	0	Collector/Gatherer	0	0	0	0	0	0	0	0
Parameletus sp.	7	Collector/Gatherer	5	0	0	0	0	3	0	0
Siphlonurus sp.	7	Collector/Gatherer	0	0	0	0	0	0	0	0
Sminthuridae			0	0	0	0	0	0	0	0
Sminthurides	?	Collector/Gatherer	0	0	0	0	0	0	0	0
Total Ephemeroptera			145	369	368	44	196	133	118	9
Plecoptera			0	0	1	0	2	0	0	16
Amphinemurinae			0	0	0	0	0	0	0	0
Amphinemura sp.	2	Shredder	0	0	0	0	0	0	0	0
Capniidae			0	0	0	0	0	0	0	0
Allocapnia sp.	1	Shredder	0	0	0	0	0	0	0	0
Chloroperlidae			0	0	0	0	0	0	0	0
Alloperla Sp.	1	Predator	0	0	0	0	0	0	0	0
Kathroperla sp.	1	Collector/Gatherer	0	0	0	0	0	0	0	0
Paraperla sp.	1	Predator	0	0	0	0	0	0	0	0
Plumiperla sp.	11	Predator	0	0	0	0	0	0	0	0
Suwallia sp.	1	Predator	0	0	0	0	0	0	0	0
Sweltsa sp.	1	Predator	0	0	0	0	0	0	0	0
Utaperla sp.	1	Collector/Gatherer	0	0	0	0	0	0	0	0
Leuctridae			0	0	0	0	0	0	0	0
Perlomyia sp.	0	Shredder	0	0	0	0	0	0	0	0
Nemouridae			0	0	0	0	0	0	0	0
Malenka sp.	2	Shredder	0	0	0	0	0	0	0	0
Ostrocerca Sp.	2	Shredder	0	0	0	0	0	0	0	0
Zapada sp.	2	Shredder	0	0	0	0	0	0	0	0
Perlidae			0	0	0	0	0	0	0	0
Acroneuria sp.		Predator	0	0	0	0	0	0	0	0
Calineura sp.	3	Predator	0	0	0	0	0	0	0	0
Eccoptura sp.	1	Predator	0	0	0	0	0	0	0	0
Hesperoperla sp.	1	Predator	0	0	0	0	0	0	0	0
Perlesta sp.	1	Predator	0	0	0	1	0	0	0	0
Perlinae			0	0	0	0	0	0	0	0
Claassenia sp.	3	Predator	0	3	0	0	1	0	0	0
Perlodidae			1	0	0	0	0	5	0	0
*Cultus sp.**			0	1	0	0	0	0	0	0
Diura sp.	2	Scraper/Predator	0	4	0	0	0	0	0	0
Frisonia sp.	8	Scraper	0	0	0	0	0	0	0	0
Isogenoides sp.	2	Predator	0	0	0	0	0	0	0	0
Isoperla sp.	2	Predator	0	0	0	0	1	1	0	0
*Kogotus sp.**			0	0	0	0	0	0	0	0
Salmoperla sp.	2	Predator	0	0	0	0	0	0	0	0
Setvena sp.	2	Predator	0	0	0	0	0	0	0	0
Pteronarcyidae			0	0	0	0	0	0	0	0
Pterenarcella sp.	0	Shredder	0	0	0	0	0	0	0	0
Pterenarcys sp.	0	Shredder	0	1	0	1	0	0	0	0
Taeniopterygidae			0	0	0	0	0	0	0	0
Doddsia sp.	2	Scraper	0	0	0	0	0	0	0	0
Total Plecoptera			1	9	1	2	4	6	0	16

Appendix B. Invertebrates collected during spring 2005 at sample locations in the Henrys Fork drainage

Order	Tolerance	Trophic	6/21/2005	6/13/2005	6/21/2005	6/13/2005	6/13/2005	6/21/2005	6/21/2005	7/6/2005
Family	Level	Relationship	Flat Rock	Box Canyon	Big Bend	Ashton	St. Anthony	Flat Ranch	Sheridan Creek	Fall River
Genus			n=3	n=3	n=3	n=3	n=3	n=3	n=3	n=3
Trichoptera			0	0	0	0	0	0	0	0
Brachycentridae	1	Collector/Filterer	0	16	0	20	17	0	0	5
Glossosomatidae	3	Scraper	0	1	0	0	0	0	0	2
Helicopsychidae	3	Scraper	0	7	0	8	5	0	10	0
Hydropsychidae	4	Collector/Filterer	0	93	2	5	37	0	5	0
Hydroptilidae	4	Predator	0	0	0	0	0	0	2	0
Lepidostomatidae	3	Shredder	0	47	0	0	0	1	0	0
Leptoceridae	4	Collector/Gatherer	0	2	2	0	31	0	0	0
Limnephilidae	4	Shredder	0	0	0	0	0	0	0	0
Philopotamidae	3	Collector/Filterer	0	0	0	0	0	0	0	0
Polycentropodidae	6	Collector/Filterer	0	1	0	0	0	0	0	0
Psychomyiidae	2	Scraper	0	0	0	0	0	0	0	0
Rhyacophilidae	0	Predator	0	0	0	0	0	0	0	0
Uenoidae	0	Shredder	0	0	0	0	0	2	0	0
Total Trichoptera			0	167	4	33	90	3	17	7
Coleoptera			0	0	0	0	0	0	0	0
Amphizoidae	1	Predator	0	0	0	0	0	0	0	0
Carabidae	4	Predator	0	0	0	0	0	0	0	0
Dytiscidae	5	Predator	0	0	0	0	0	0	0	0
Elmidae	4	Collector/Gatherer	2	9	2	22	83	11	62	81
Halipidae	7	Macrophyte Piercer	0	0	0	0	0	0	8	0
Heteroceridae			0	0	0	0	0	0	0	0
Hydrophilidae	5	Predator	0	0	0	0	0	0	0	0
Limnichidae	?	Collector/Gatherer	0	0	0	0	0	0	0	0
Staphylinidae	?		0	0	0	0	0	0	0	0
Diptera			0	0	0	0	0	0	0	0
Athericidae	2	Predator	0	0	0	0	0	0	0	1
Blephariceridae	0	Shredder	0	0	0	0	0	0	0	0
Ceratopogonidae	6	Predator	1	1	2	1	0	6	2	1
Chironomidae	6	Collector/Gatherer	25	178	103	99	90	9	19	200
Dixidae	1	Collector/Gatherer	0	0	0	0	0	0	0	0
Empididae	6	Predator	0	1	0	0	4	0	0	0
Pschodidae			0	0	0	0	0	0	0	0
Simulidae	6	Collector/Filterer	0	0	1	16	0	1	0	0
Stratiomydae	8	Collector/Gatherer	0	0	0	0	0	0	0	0
Thaumaleidae	11	Scraper	0	0	0	0	0	0	1	0
Tipulidae	3	Shredder	0	3	0	2	1	0	0	0
Tabanidae	8	Predator	0	0	0	0	0	0	1	0
			0	0	0	0	0	0	0	0
Anisoptera	1	Predator	0	0	0	0	0	0	0	0
Amphipoda	4	Collector/Gatherer	109	4	242	0	0	128	1	0
Cladocera	8	Collector/Filterer	0	0	0	0	0	0	0	0
Daphnidae	8	Collector/Filterer	0	0	0	0	0	0	0	0
Collembola	10	Collector/Gatherer	0	0	0	0	0	0	0	0
Conchostraca			0	0	0	0	0	0	0	0
Copepoda	8	Collector/Gatherer	0	0	0	0	0	0	0	0
Harpacticoida			0	0	0	0	0	0	0	0
Crustacea	8	Collector/Gatherer	0	0	0	0	0	0	0	0
Gastropoda	7	Scraper	0	12	0	38	34	2	0	0
Hemiptera	11	Predator	0	0	0	0	0	0	0	0
Corixidae	10	Unknown	0	0	0	0	0	2	0	0
Veliidae			0	0	0	0	0	0	0	0
Hirudinea	10	Predator	5	4	10	8	4	30	5	0
Hydracarina	8	Predator	0	1	1	1	4	1	1	3
Lepidoptera			0	0	0	0	0	0	0	0
Pyralidae	5	Shredder	0	0	0	0	2	0	0	0
pyraustinae	5	Shredder	0	0	0	0	0	0	0	0
Megaloptera	4	Predator	0	0	0	0	0	0	0	0
Mollusca	11	Scraper	0	0	0	0	0	0	0	0
Nematoda			1	0	0	3	0	0	0	1
Nematomorpha	11	Parasite	0	0	0	0	0	0	0	0
Odonata	11	Predator	0	0	0	0	0	0	0	0
Gomphidae	1	Predator	0	0	0	0	0	1	1	0
Oligacheata	5	Collector/Gatherer	0	5	0	0	0	1	0	0
Pelecypoda	8	Collector/Filterer	0	0	0	0	0	0	0	0
Pisidiinae*			0	6	6	1	10	0	0	0
Porifera			0	0	0	0	0	0	0	0
Tricladida			0	0	0	0	0	0	0	0
Planariidae	1	Macrophyte Piercer	0	0	0	0	0	0	0	0
Annelida*			5	7	20	75	13	41	2	4
Unknown			0	0	0	0	0	0	0	0