**In cooperation with the U.S. Department of Agriculture,
Natural Resources Conservation Service,
and the San Antonio Water System**

**Hydrologic and Water-Quality Data,
Honey Creek State Natural Area,
Comal County, Texas,
August 2001–September 2003**

Data Series 200

Cover.

Top left: Evapotranspiration tower in the Honey Creek State Natural Area.

Top middle: Recovery of native grasses in the Honey Creek State Natural Area.

Top right: Honey Creek in the Honey Creek State Natural Area.

Middle: Streamflow over the weir on a tributary of Honey Creek.

Bottom left and right: Predominantly ashe juniper cover with oak interspersed.

Hydrologic and Water-Quality Data, Honey Creek State Natural Area, Comal County, Texas, August 2001–September 2003

By Richard N. Slattery, Allen L. Furlow, and Darwin J. Ockerman

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Data Series 200

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Hydrologic and Water-Quality Data, Honey Creek State Natural Area, Comal County, Texas, August 2001–September 2003

By Richard N. Slattery, Allen L. Furlow, and Darwin J. Ockerman

Abstract

The U.S. Geological Survey collected rainfall, streamflow, evapotranspiration, and rainfall and stormflow water-quality data from seven sites in two adjacent watersheds in the Honey Creek State Natural Area, Comal County, Texas, during August 2001–September 2003, in cooperation with the U.S. Department of Agriculture, Natural Resources Conservation Service, and the San Antonio Water System. Data collected during this period represent baseline hydrologic and water-quality conditions before proposed removal of ashe juniper (*Juniperus ashei*) from one of the two watersheds. Juniper removal is intended as a best-management practice to increase water quantity (aquifer recharge and streamflow) and to protect water quality. Continuous (5-minute interval) rainfall data are collected at four sites; continuous (5-minute interval) streamflow data are collected at three sites. Fifteen-minute averages of meteorological and solar-energy-related data recorded at two sites are used to compute moving 30-minute evapotranspiration values on the basis of the energy-balance Bowen ratio method. Periodic rainfall water-quality data are collected at one site and stormflow water-quality data at three sites. Daily rainfall, streamflow, and evapotranspiration totals are presented in tables; detailed data are listed in an appendix. Results of analyses of the periodic rainfall and stormflow water-quality samples collected during runoff events are summarized in the appendix; not all data types were collected at all sites nor were all data types collected during the entire 26-month period.

Introduction

The U.S. Geological Survey (USGS), in cooperation with the U.S. Department of Agriculture, Natural Resources Conservation Service, and the San Antonio Water System,

began a study in 1999 to evaluate the effects of ashe juniper (*Juniperus ashei*) control (removal) as a best-management practice for increasing water quantity (aquifer recharge and streamflow) and protecting water quality in two watersheds in the Honey Creek State Natural Area (HCSNA) in Comal County, Tex. (fig. 1). This study is a follow-up to the Seco Creek Water-Quality Demonstration project (Seco Creek project) (Dugas and others, 1998). Results from the Seco Creek project indicate that the removal of ashe juniper trees might reduce evapotranspiration (ET) and increase water infiltration, aquifer recharge, and springflow. The current study involves the application of Seco Creek project site-specific results to a watershed scale. In one of the two watersheds, referred to as the reference watershed, ashe juniper trees are not being removed; in the adjacent watershed, referred to as the treatment watershed, ashe juniper trees are being removed. Before juniper removal, baseline rainfall, streamflow, ET, and water-quality data were collected from selected sites in the watersheds (fig. 2) during an approximately 2-year period.

Purpose and Scope

The purpose of this report is to document the baseline rainfall, streamflow, ET, and rainfall and storm-runoff (stormflow) water-quality data collected at sites in the reference and treatment watersheds in the HCSNA from August 2001 through September 2003, before juniper removal in the treatment watershed. Three sites are in the reference watershed, and four sites are in the treatment watershed; not all data types were collected at all sites nor were all data types collected during the entire 26-month period. Daily rainfall, streamflow, ET, and summaries of analyses of periodic water-quality samples are listed in tables (at end of report). Continuous (5-minute-interval) rainfall and streamflow, ET (moving 30-minute interval), and periodic rainfall and stormflow water-quality data are listed in the appendix (CD-ROM at back of report).

Figure 1. Location of Honey Creek State Natural Area, Comal County, Texas.

Figure 2. Location of data-collection sites in the Honey Creek State Natural Area, Comal County, Texas.

Description of Watersheds and Sites

The two adjacent HCSNA watersheds are in the catchment area of the Edwards aquifer about 25 miles (40 kilometers) north of San Antonio (fig. 1). The catchment area, adjacent to the outcrop (recharge zone) of the Edwards aquifer to the north, comprises the upper parts of drainage basins of streams that lose water to the Edwards aquifer as the streams cross the recharge zone. The surficial geology of the watersheds primarily comprises rocks of the Lower Glen Rose Limestone, Hensel Sand, and Cow Creek Limestone of the Trinity aquifer (Ashworth, 1983). Soils generally are dark, calcareous stoney clay and clay loam with rock outcrops (U.S. Department of Agriculture, Soil Conservation Service, 1984). Vegetation consists primarily of live oak and dense ashe juniper woods with lesser stands of cedar elm, Spanish oak, and other species.

The watersheds are drained by first-order (headwater) streams that are tributaries to Honey Creek, which is a tributary to the Guadalupe River (fig. 2). The reference watershed has a drainage area of about 0.36 square mile (0.93 square kilometer). The treatment watershed has a drainage area of about 0.56 square mile (1.5 square kilometers). The upper 0.16 square mile (0.41 square kilometer) of the treatment watershed is on private land outside the HCSNA boundary.

Data-collection site number, station number, location, drainage area, type of data, and period of record are listed in table 1. At site 1, only rainfall in the upper part of the reference watershed is recorded (fig. 2). Streams at sites 2–4 are ephemeral and yield runoff only after heavy rainfall. At these three sites, 5-minute rainfall and streamflow data are recorded; also, periodic stormflow water-quality data are collected. Site 5 is a

rainfall water-quality station. ET is monitored at sites 6 and 7 in the reference and treatment watersheds, respectively. The ET sites are in areas of relatively uniform juniper cover, wind fetch, and topography. Both ET sites record 15-minute averages of meteorological and solar-energy-related data that are used to compute moving 30-minute ET values on a 15-minute basis.

Hydrologic and Water-Quality Data

During 2000 and 2001, the USGS installed data-collection stations at the seven sites in the HCSNA (fig. 2; table 1). Rainfall data at sites 1–4 and streamflow data at sites 2–4 are transmitted every 4 hours by way of a Geostationary Operational Environmental Satellite (GOES) to the USGS National Water Information System database. ET data are retrieved from the sites during periodic station service visits. Rainfall and stormflow water-quality samples are collected as composite samples over the duration of the runoff events.

Rainfall Data

Rainfall is collected using 12-inch- (305-millimeter-) diameter tipping-bucket gages. The tipping-bucket rain gage used in this study has an accuracy of ± 1 percent for rainfall intensities of 1 to 3 inches (25 to 76 millimeters) per hour, and ± 3 percent for rainfall intensities of 0 to 1 and 3 to 6 inches (0 to 25 and 76 to 150 millimeters) per hour (NovaLynx Corporation, 2000). To maintain accuracy of the tipping-bucket rain gage, the instruments are periodically inspected and cleaned,

Table 1. Hydrologic and water-quality data-collection sites, Honey Creek State Natural Area, Comal County, Texas.

[Type of data: prec, continuous rainfall (5-minute data-collection interval); sf, continuous streamflow (5-minute data-collection interval); qws, periodic stormflow water quality; qwp, periodic rainfall water quality; et, evapotranspiration (30-minute data-collection interval).--, not applicable]

Site no. (fig. 2)	USGS station no.	Station name	Latitude	Longitude	Drainage area (square miles)	Type of data	Period of record
1	295040098283701	Honey Creek rain gage no. 1	29°50'40"	98°28'37"	--	prec	10/01/01–09/30/03
2	08167347	Unnamed tributary Honey Creek site 1C	29°51'18"	98°29'03"	0.36	prec sf	10/01/01–09/30/03 10/01/01–09/30/03
3	08167350	Unnamed tributary Honey Creek site 1T	29°51'00"	98°28'21"	.16	qws prec sf	08/30/01–06/30/02 10/01/01–09/30/03 10/01/01–09/30/03
4	08167353	Unnamed tributary Honey Creek site 2T	29°51'21"	98°28'42"	.40	qws prec sf	08/30/01–06/30/02 10/01/01–09/30/03 10/01/01–09/30/03
5	295108098283201	Honey Creek rainfall water quality	29°51'08"	98°28'32"	--	qws qwp	08/30/01–06/30/02 10/11/02–06/30/02
6	295104098285900	Honey Creek reference evapotranspiration	29°51'04"	98°28'59"	.36	et	03/19/02–09/30/03
7	295102098283200	Honey Creek treatment evapotranspiration	29°51'02"	98°28'32"	.56	et	03/19/02–09/30/03

and calibration checks are performed as described by the manufacturer. The rainfall data are processed further by eliminating values for periods of known bad record.

Daily rainfall at sites 1–4 for water years¹ 2002–03 are listed in tables 2–5 (at end of report), respectively. The 5-minute rainfall data for water years 2002–03 are listed in the appendix.

Streamflow Data

Weirs constructed at sites 2–4 are used as streamflow or discharge measuring devices. Stage data recorded by pressure transducer gages are used to compute streamflow using theoretical stage-discharge relations developed for each of the weirs and calibrated using streamflow measurements across a range in stage (Bos, 1989; Hulsing, 1967). The streamflow gages are serviced periodically and crest-stage gages are used to verify recorded peak stages occurring during runoff events.

Daily mean streamflows for sites 2–4 for water years 2002–03 are listed in tables 6–8 (at end of report), respectively. The 5-minute streamflow data for water years 2002–03 are listed in the appendix. Because of the short durations of flow at the sites, the number of discharge measurements made were insufficient to accurately calibrate the theoretical weir equations; daily mean discharges at all three sites therefore are rated only as “fair” (95 percent of the daily discharges are within 15 percent of the true discharge), and estimated daily mean discharges (daily values footnoted in tables 6 and 8 (at end of report), are rated as “poor” (daily discharges having less than “fair” accuracy) (Novak, 1985).

Total runoff at sites 2–4 for water-years 2002 and 2003 was about 135, 118, and 384 acre-feet (0.17, 0.15, and 0.47 cubic hectometer), respectively. About 68 percent of total runoff from the watersheds (sum of runoff at sites 2 and 4) occurred during the period June 30–July 15, 2002.

Flow duration at sites 2–4 is relatively short. For all runoff events occurring in water years 2002 and 2003, the maximum continuous flow duration was about 178 hours at site 2 (July 1–8, 2002).

Evapotranspiration Data

ET from sites 6 and 7 is computed from measured properties: net radiation, soil heat flux, soil temperature, soil moisture, difference in air temperature at two different heights, and difference in air vapor pressure at the same two heights. From these data, the energy-balance Bowen ratio method is used to calculate sensible- and latent-heat fluxes (Brutsaert, 1982; Dingman, 2002; Shuttleworth, 1993). Energy balance at land surface is expressed as

$$R - G + \Delta S = H + LE, \quad (1)$$

where

- R is net radiation, in watts per square meter;
- G is soil heat flux, in watts per square meter;
- ΔS is change in heat storage in the soil, in watts per square meter;
- H is sensible heat flux, in watts per square meter; and
- LE is latent heat flux, in watts per square meter.

The product LE combines the latent heat of vaporization (L), in joules per kilogram, and the rate of evaporation (transpiration) (E), in kilograms per square meter per second.

The Bowen ratio (B) is defined as the ratio between H and LE , which, assuming equal turbulent bulk-transfer coefficients, also is expressible in terms of vertical gradients of air temperature and air vapor pressure. The equation for B thus is

$$B = H/LE = \gamma \frac{\Delta T}{\Delta e}, \quad (2)$$

where

- γ is the psychrometric constant, in kilopascals per degree Celsius;
- ΔT is the difference in air temperature at the two heights, in degrees Celsius; and
- Δe is the difference in air vapor pressure at the two heights, in kilopascals.

LE is computed by algebraic rearrangement of equations 1 and 2:

$$LE = \frac{R - G}{1 + B}. \quad (3)$$

Net radiation, R , is the algebraic sum of incoming and outgoing longwave (terrestrial) and shortwave (solar) radiation. A net radiometer used to measure R at each site is located about 38 feet (12 meters) above land surface. When R data are not available because of instrument malfunction, ET is estimated by regression using data from incoming shortwave radiation, which is measured by a pyranometer.

Soil heat flux, G , is estimated from three soil heat flux plates. The three flux plates are buried at a depth of about 6 inches (15 centimeters) at various exposures of shade and sun.

The change in heat storage, ΔS , requires several sensors. Four soil temperature probes are placed in the soil about 2 inches (5.1 centimeters) above the heat flux plates. Two soil moisture probes are placed at about the same depth as the temperature probes. Soil moisture probes measure the volumetric water content of the soil, which is assumed to reflect the moisture content of the top 6 inches (15 centimeters) of soil.

The differences in air temperature and in air vapor pressure, ΔT and Δe , are computed from measurements by two aspirated air temperature and two air vapor pressure sensors; the sensors in each pair are separated vertically by about 6.5 feet (2.0 meters) about 22 feet (6.7 meters) above land surface. The positions of each sensor in the respective pairs (temperature and vapor pressure) are mechanically reversed by an automated

¹ A water year is the 12-month period October 1 through September 30, designated by the calendar year in which the water year ends.

control system, top to bottom and bottom to top, every 15 minutes to compute moving average ΔT and Δe . The sensor reversal is necessary to obtain unbiased estimates of ΔT and Δe .

The properties are measured every 20 seconds, then 15-minute averages are computed and recorded by a data logger. The 15-minute averaged data are used to compute ET values using a 30-minute moving average of the Bowen ratio, B ; a 30-minute interval for the moving average allows the temperature and vapor pressure sensors time to cycle through position reversal.

Daily ET data from sites 6 and 7 during mid-March 2002 through mid-March 2003 and during September 2003 are listed in tables 9 and 10 (at end of report), respectively. Thirty-minute ET data are listed in the appendix. ET data from sites 6 and 7 were compared for the days during which values were available from both sites. During the period March 19, 2002–September 30, 2003, data were available from both sites for 360 days. During these 360 days, total ET was 26.57 inches (675 millimeters) at site 6 and 27.27 inches (693 millimeters) at site 7.

Water-Quality Data

Rainfall water-quality samples are collected at site 5 and analyzed for field properties (pH and specific conductance), major ions, nutrients, and the isotope ratios for hydrogen (deuterium/protium [δD]) and for oxygen (oxygen-18/oxygen-16 [$\delta^{18}O$]). Stormflow water-quality samples are collected at sites 2–4 and analyzed for field properties (pH and specific conductance), major ions, nutrients, pesticides, the isotope ratios δD and $\delta^{18}O$, and suspended sediment (concentration and sand/silt composition). Table 11 (at end of report) lists dates of runoff events and types of samples collected during 2001–02 at site 5 for rainfall water-quality analysis and at sites 2–4 for stormflow water-quality analysis.

All water-quality samples were collected by USGS personnel. Samples are analyzed for major ions, nutrients, and pesticides by the USGS National Water Quality Laboratory (NWQL) in Denver, Colo. Major inorganic ions were analyzed using methods documented by the American Public Health Association (1998), Fishman (1993), Fishman and Friedman (1989), and Wershaw and others (1987). Nutrients were analyzed using methods documented by Fishman (1993) and Patton and Truitt (2000). Pesticides were analyzed using methods described by Furlong and others (2001), Lindley and others (1996), Madsen and others (2003), and Zaugg and others (1995).

Samples for analysis of environmental isotopes were submitted to the USGS Reston Stable Isotope Laboratory in Reston, Va. δD was analyzed using a gaseous hydrogen equilibration technique at 30 °C (Coplen and others, 1991). $\delta^{18}O$ was analyzed using a carbon dioxide-water equilibration technique (Epstein and Mayeda, 1953). The hydrogen and oxygen isotopic results are reported as δD and $\delta^{18}O$ (per mil) relative to the Vienna Standard Mean Ocean Water (Coplen, 1994).

Suspended sediment samples (concentration and sand/silt composition) were analyzed by the Iowa Sediment Laboratory in Iowa City, Iowa, using methods described by Guy (1969) and Matthes and others (1991).

Field data quality-assurance procedures were applied to ensure and preserve the representativeness of the water-quality samples obtained. These procedures follow the guidelines of the U.S. Geological Survey (2002), “Quality Assurance Project Plan,” and the U.S. Geological Survey (variously dated), “National Field Manual for the Collection of Water-Quality Data.” These procedures include adherence to sampling equipment cleaning protocols for removal of potential contaminants to the sampling equipment prior to sampling; periodic quality-assurance equipment sampling to test for possible contaminants that might bias the results of the environmental samples; and following standards for sample collection, processing, and sample holding times.

Rainfall samples are collected by an automatic sampler. When rainfall occurs, a moisture sensor activates a mechanism to uncover a clean, polyethylene collection bucket. When rainfall ends, the sampler mechanism re-covers the collection bucket to prevent evaporation and contamination of the sample. Each rainfall sample is a single composite sample representing average quality conditions during the runoff event. The samples were retrieved as soon as possible after a runoff event, chilled, and shipped overnight to the NWQL for analysis. Three composite rainfall samples were collected at site 5 during 2001–02. Results of rainfall water-quality sample analyses are listed in the appendix.

Stormflow samples also are collected by automatic samplers. The automatic samplers at each site are programmed to begin sampling when flow occurs (stage rises above the crest of the weir). At each site as many as 24 discrete samples are collected at variable time intervals during a runoff event. The discrete samples from each site are combined into a single, flow-weighted composite sample for all analyses except sediment. For sediment analysis, five discrete samples that coincide with different phases of the runoff hydrograph (rising stage, rising stage mid-way to peak, peak stage, falling stage mid-way of recession after peak, and falling stage at the tail of recession) are each separately analyzed for suspended sediment concentrations and sand/silt composition. The sand/silt composition analysis yields the percentage of sediment by weight that is finer than 0.0024 inch (0.062 millimeter).

During 2001–02, 10 composite samples for constituents other than sediment were collected and analyzed from sites 2–4 (five samples for site 2, three samples for site 3, and two samples for site 4). One event-composite sample from each of the sites (August 30, 2001) was analyzed for selected pesticides. (Results indicate no detection of pesticides at or above laboratory reporting limits.) During 2001–02, 49 sediment samples were collected during runoff events from sites 2–4 (27 samples for site 2, 13 samples for site 3, and nine samples for site 4). Results of stormflow water-quality sample analyses are listed in the appendix.

Summary

The U.S. Geological Survey, in cooperation with the U.S. Department of Agriculture, Natural Resources Conservation Service, and the San Antonio Water System, began a study in 1999 to evaluate the effects of ashe juniper (*Juniperus ashei*) control (removal) as a best-management practice for increasing water quantity and protecting water quality in two adjacent watersheds in the Honey Creek State Natural Area in Comal County, Tex. In one of the two watersheds, referred to as the reference watershed (drainage area about 0.36 square mile [0.93 square kilometer]), ashe juniper trees are not being removed; in the adjacent watershed, referred to as the treatment watershed (drainage area about 0.56 square mile [1.5 square kilometers]), ashe juniper trees are being removed. Before juniper removal, baseline rainfall data, streamflow data, ET data, rainfall water-quality data (field properties, major ions, nutrients, and the isotope ratios δD and $\delta^{18}O$), and stormflow water-quality data (field properties, major ions, nutrients, pesticides, the isotope ratios δD and $\delta^{18}O$, and suspended sediment) were collected from seven sites in the watersheds during the approximately 2-year period from August 2001 through September 2003; not all data types were collected at all sites nor were all data types collected during the entire 26-month period.

Continuous (5-minute interval) rainfall data are collected using 12-inch- (305-millimeter-) diameter tipping-bucket gages at four sites; continuous (5-minute interval) streamflow data are collected (measured using weirs and a stage-discharge relation developed for each weir) at three sites. Fifteen-minute averages of meteorological and solar-energy-related data recorded at two sites are used to compute 30-minute ET values on the basis of the energy-balance Bowen ratio. Periodic rainfall water-quality data are collected at one site and stormflow water-quality data at three sites. Daily rainfall, streamflow, and ET totals are presented in tables; detailed data are listed in an appendix. Results of analyses of the periodic rainfall and stormflow water-quality samples collected during runoff events are summarized in the appendix.

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Table 2. Daily rainfall at site 1 (USGS station 295040098283701, Honey Creek rain gage no. 1), Honey Creek State Natural Area, Comal County, Texas.

[In inches; --, not collected or computed]

Water year October 2001 to September 2002 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.02	0	0.07	0	0	0.04	0	0	0	5.68	0	0
2	0	0	1.26	0	0	.01	0	0	0	5.21	0	.01
3	0	0	.07	0	0	0	0	0	0	2.62	0	0
4	0	0	0	.03	.01	0	0	0	0	1.57	0	0
5	0	.03	.04	.65	.54	0	0	0	0	1.81	0	0
6	0	0	0	0	0	0	.21	0	0	0	0	0
7	0	0	0	0	.02	0	.92	0	0	.01	0	1.80
8	0	0	1.69	0	--	.01	.06	0	0	.07	.36	.42
9	.05	.17	0	0	--	0	0	0	0	.36	0	.51
10	0	0	0	0	--	0	0	0	0	0	.34	.01
11	--	0	.51	0	--	0	0	0	0	.02	0	0
12	--	0	.01	0	--	0	0	--	0	.30	0	0
13	--	0	.02	0	--	0	0	--	0	.19	0	0
14	0	.61	0	0	--	0	0	--	0	1.36	0	0
15	0	6.47	.17	0	--	0	0	0	.08	.36	0	.15
16	0	0	.03	0	0	0	.11	0	0	.10	0	.01
17	0	.11	0	0	0	0	0	0	0	.38	0	0
18	0	0	0	0	0	.04	0	0	0	0	0	0
19	0	.07	0	.01	.06	.55	0	0	0	0	0	1.13
20	0	0	0	0	0	.03	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	.02	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	.19	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	.01	--	0	0	0	0
26	0	0	0	0	0	0	.01	--	0	0	0	0
27	0	0	0	0	0	0	0	--	0	0	0	0
28	0	.05	0	0	0	0	0	--	0	0	0	0
29	0	.03	0	0	--	0	0	--	.27	0	.16	0
30	0	0	0	0	--	.34	0	0	4.19	0	0	0
31	0	--	0	.11	--	0	--	0	--	0	0	--
Total	--	7.54	3.89	.99	--	1.02	1.32	--	4.54	20.04	.86	4.04

10 Hydrologic and Water-Quality Data, Honey Creek State Natural Area, Comal County, Texas, August 2001–September 2003
Table 2. Daily rainfall at site 1 (USGS station 295040098283701, Honey Creek rain gage no. 1), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	--	--	--	--	0.04	0	0	0	0	0	0
2	0	--	--	--	--	.05	0	0	.78	0	0	0
3	0	--	--	--	--	.10	0	0	0	0	0	0
4	0	--	--	--	--	0	0	0	1.16	0	0	0
5	0	--	--	--	--	.02	0	0	1.61	--	0	0
6	0	--	--	--	--	0	.02	.01	.04	--	0	0
7	.49	--	--	--	--	0	0	0	0	--	0	0
8	1.80	--	--	--	--	0	0	0	0	--	0	0
9	.35	--	--	--	--	.01	0	0	0	--	0	0
10	.04	--	--	--	--	0	0	0	.41	--	.19	0
11	.01	--	--	--	--	.04	0	0	0	.01	.06	1.20
12	0	--	--	--	--	.03	0	0	0	0	.36	.50
13	--	--	--	--	--	.01	0	0	--	0	0	0
14	--	--	--	--	--	0	0	0	--	0	0	.40
15	--	--	--	--	--	0	0	0	.66	.11	0	0
16	--	--	--	--	--	0	0	0	0	.43	0	0
17	--	--	--	--	--	.01	0	0	0	0	0	.01
18	--	--	--	--	--	.15	0	0	0	0	0	.36
19	--	--	--	--	--	0	0	0	0	0	0	.01
20	--	--	--	--	--	0	0	0	0	0	0	.31
21	--	--	--	--	--	0	0	0	0	0	0	.78
22	--	--	--	--	--	.17	.12	0	0	0	0	0
23	--	--	--	--	--	.01	.04	0	0	0	0	0
24	--	--	--	--	--	0	0	0	0	0	0	0
25	--	--	--	--	--	.09	0	0	0	0	0	0
26	--	--	--	--	--	0	0	.01	.37	0	0	.22
27	--	--	--	--	--	0	0	0	0	0	0	0
28	--	--	--	--	0	0	0	0	.04	0	0	0
29	--	--	--	--	--	0	0	0	0	0	0	0
30	--	--	--	--	--	0	0	0	0	0	0	0
31	--	--	--	--	--	0	--	0	--	0	0	--
Total	--	--	--	--	--	.73	.18	.02	--	--	.61	3.79

Table 3. Daily rainfall at site 2 (USGS station 08167347, Unnamed tributary Honey Creek site 1C), Honey Creek State Natural Area, Comal County, Texas.

[In inches; --, not collected or computed]

Water year October 2001 to September 2002 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0.10	0	0	0.05	0	0	0	5.98	0	0
2	0	0	1.23	0	0	.01	0	0	0	5.06	0	0
3	0	0	.08	0	0	0	0	0	0	2.76	0	0
4	0	0	0	.11	.01	0	0	0	0	2.00	0	0
5	0	0	0	.46	.56	0	0	0	.04	1.99	0	0
6	0	0	0	0	0	0	.24	0	0	0	0	0
7	0	0	0	0	.01	0	.94	0	0	.01	0	1.40
8	0	.02	1.93	0	0	0	.07	0	0	.03	.32	.57
9	.07	.11	0	0	0	0	0	0	.01	.29	0	.74
10	0	0	.01	0	0	0	0	0	0	0	.75	.01
11	2.31	0	.51	0	0	0	0	0	0	0	.01	0
12	1.43	0	.01	0	0	0	0	0	0	.34	0	0
13	.69	0	.02	0	0	0	0	1.24	0	.20	0	0
14	0	.60	0	0	0	0	0	0	0	2.00	0	0
15	0	6.12	.21	0	0	0	0	0	.07	.80	0	.07
16	0	.03	.03	0	0	0	.09	0	.09	.11	0	0
17	0	.07	0	0	0	0	0	.01	0	.21	0	0
18	0	0	0	0	0	.05	0	0	0	.01	0	0
19	0	.07	.01	.01	.11	.77	0	0	0	0	0	.70
20	0	0	0	0	0	.03	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	.01	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	.29	0	0	0	0	0	0	0	0
25	0	0	.01	0	0	0	.01	0	0	0	0	0
26	0	0	0	0	0	0	.01	.09	0	0	0	0
27	0	0	0	0	0	0	0	0	.01	0	0	0
28	0	.17	0	0	0	0	0	1.21	.06	0	0	0
29	0	.04	0	0	--	0	0	0	.16	0	.16	0
30	0	0	0	0	--	1.62	0	0	3.96	0	0	0
31	0	--	0	.12	--	0	--	0	--	0	0	--
Total	4.50	7.23	4.16	.99	.69	2.53	1.36	2.55	4.40	21.79	1.24	3.49

12 Hydrologic and Water-Quality Data, Honey Creek State Natural Area, Comal County, Texas, August 2001–September 2003
Table 3. Daily rainfall at site 2 (USGS station 08167347, Unnamed tributary Honey Creek site 1C), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.12	0	0	0	0	0.04	0	--	--	0	--	0.01
2	0	.96	0	0	.01	.05	0	--	--	.02	--	0
3	0	.14	.12	0	0	.12	0	--	--	.01	--	0
4	0	.68	.60	0	0	0	0	--	--	--	--	0
5	0	.01	0	0	.12	.03	0	--	--	--	0	.08
6	0	0	0	0	.09	0	.01	--	--	--	0	0
7	.43	0	0	0	0	0	0	--	--	--	0	0
8	1.78	0	.62	0	.16	0	0	--	0	.30	0	0
9	.46	0	.81	0	.02	0	0	--	0	0	0	0
10	0	0	0	0	0	0	0	--	.42	0	.19	0
11	0	0	.01	.07	0	.06	0	--	0	0	.07	.83
12	0	0	.55	1.21	.03	.03	0	--	0	0	.36	.49
13	.03	0	0	0	.06	.01	0	--	2.11	0	0	0
14	.12	0	.01	0	.03	0	0	--	0	0	.01	.82
15	0	0	0	.01	0	0	0	--	.70	--	0	0
16	0	0	0	0	0	0	0	--	0	--	0	0
17	0	0	0	0	0	0	0	--	0	--	0	.01
18	.10	0	0	0	0	.13	0	--	0	--	0	.40
19	1.37	0	0	0	.03	0	0	--	0	--	0	0
20	.02	0	0	0	2.14	0	--	--	0	--	0	--
21	.03	0	0	0	.27	0	--	--	0	--	0	--
22	.64	0	.04	0	0	.22	--	--	0	--	0	--
23	.71	0	.37	0	0	.01	--	--	0	--	.04	--
24	1.52	0	0	0	.01	0	0	--	0	--	0	--
25	.03	0	0	.16	0	.14	0	--	0	--	0	--
26	.03	1.05	0	.01	.30	0	0	--	.21	--	0	--
27	.03	0	.01	0	0	0	0	--	0	--	0	--
28	.08	0	0	.02	0	0	0	--	.12	--	0	--
29	.01	0	.08	.01	--	0	0	--	0	--	0	--
30	0	0	.12	0	--	0	0	--	0	--	.25	--
31	.01	--	.01	0	--	0	--	--	--	--	.16	--
Total	7.52	2.84	3.35	1.49	3.27	.84	--	--	--	--	--	--

Table 4. Daily rainfall at site 3 (USGS station 08167350, Unnamed tributary Honey Creek site 1T), Honey Creek State Natural Area, Comal County, Texas.

[In inches; --, not collected or computed]

Water year October 2001 to September 2002 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0.01	--	--	0.04	0	0	0	6.36	0	0
2	0	0	--	--	--	.02	0	0	0	5.60	0	.02
3	0	0	--	--	--	0	0	0	0	2.97	0	0
4	0	0	--	--	--	0	0	0	0	1.61	0	0
5	0	0	--	--	--	0	0	0	.01	2.10	0	0
6	0	0	--	--	--	0	.25	0	0	0	0	.02
7	0	0	--	--	--	0	1.29	0	0	.05	0	2.01
8	0	.04	--	--	--	.02	.08	0	0	.06	.40	.52
9	.05	.12	--	--	0	0	0	0	0	.36	0	.57
10	0	0	--	--	0	0	0	0	0	0	.45	.01
11	2.44	0	--	--	0	0	0	0	0	0	.01	0
12	1.46	0	--	--	0	0	0	0	0	.19	0	0
13	.78	0	--	--	0	0	0	1.28	0	.21	0	0
14	0	.75	--	--	0	0	0	0	0	1.39	0	0
15	0	6.49	--	--	0	0	0	0	.16	.80	0	.16
16	0	.02	--	--	0	0	.11	0	.08	.09	0	0
17	0	.01	--	--	0	0	0	.04	0	.37	0	.01
18	0	0	--	--	0	.05	0	0	0	0	0	0
19	0	0	--	--	.13	.98	0	0	0	0	0	1.32
20	0	0	--	--	0	.03	0	0	0	0	0	0
21	0	0	--	--	0	.01	0	0	0	0	0	0
22	0	0	--	--	0	0	0	0	0	0	0	0
23	0	0	--	--	0	0	0	0	0	0	0	0
24	0	0	--	--	0	0	0	0	0	0	0	0
25	0	0	--	--	0	0	.01	0	0	0	0	0
26	0	0	--	--	0	0	.02	.12	0	0	0	0
27	0	0	--	--	0	0	0	0	.01	0	0	0
28	0	.02	--	--	.01	0	0	1.24	.02	0	0	0
29	0	0	--	--	--	0	0	0	.18	0	.15	0
30	0	0	--	--	--	1.50	0	0	4.30	0	0	0
31	0	--	--	--	--	0	--	0	--	0	0	--
Total	4.73	7.45	--	--	--	2.65	1.76	2.68	4.76	22.16	1.01	4.64

14 Hydrologic and Water-Quality Data, Honey Creek State Natural Area, Comal County, Texas, August 2001–September 2003
Table 4. Daily rainfall at site 3 (USGS station 08167350, Unnamed tributary Honey Creek site 1T), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.03	0	0	0	0	0.04	0	0	0	0	0	0.03
2	0	1.13	0	0	.02	.05	0	0	.83	.02	0	0
3	0	.14	.12	0	0	.08	0	0	0	0	0	0
4	0	.77	.56	0	0	0	0	0	1.38	.32	0	0
5	0	0	0	0	.13	.01	0	0	1.49	1.67	0	.08
6	0	0	0	0	.10	0	.02	0	.06	1.53	0	.01
7	.30	0	0	0	0	0	0	.02	0	.21	0	0
8	2.72	0	.77	0	.19	0	0	0	0	.29	0	0
9	.52	0	.99	0	.02	0	0	0	0	0	0	0
10	0	0	.01	0	.01	0	0	0	.45	0	.12	0
11	0	0	.01	.08	0	.04	0	0	0	0	.06	1.29
12	0	0	.72	1.37	.04	0	0	0	0	0	.29	.48
13	.03	0	0	0	.08	.01	0	0	2.24	0	0	0
14	.13	0	0	0	.03	0	0	0	.01	0	.08	.12
15	0	0	0	.01	0	0	0	0	.78	.10	0	0
16	0	0	0	0	0	0	.01	0	0	.65	0	0
17	0	0	0	0	0	.01	0	0	0	0	0	0
18	.10	0	0	0	0	.14	0	0	0	0	0	.31
19	1.40	0	0	0	.04	0	.01	0	0	0	0	0
20	.02	0	0	0	2.62	0	0	0	0	0	0	.31
21	.05	0	0	0	.23	0	0	0	0	0	0	.80
22	.63	0	.06	0	.01	.18	.03	0	0	0	0	0
23	1.12	0	.40	0	0	.01	.04	0	0	0	.01	0
24	1.63	0	.01	0	.01	0	0	0	0	0	.01	0
25	.05	0	0	.21	0	.14	0	0	0	0	0	0
26	.01	.88	0	.03	.28	0	0	.02	.29	0	0	.24
27	.04	0	.01	0	0	0	0	0	0	0	0	0
28	.09	0	0	.02	.01	0	0	0	.02	0	0	0
29	.01	0	.10	.01	--	0	0	0	0	0	0	0
30	0	0	.14	0	--	0	0	0	0	0	.06	0
31	.01	--	0	0	--	0	--	0	--	0	.12	--
Total	8.89	2.92	3.90	1.73	3.82	.71	.11	.04	7.55	4.79	.75	3.67

Table 5. Daily rainfall at site 4 (USGS station 08167353, Unnamed tributary Honey Creek site 2T), Honey Creek State Natural Area, Comal County, Texas.

[In inches; --, not collected or computed]

Water year October 2001 to September 2002 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0.10	0	0	0.04	0	0	0	6.21	0	--
2	0	0	1.23	0	0	.01	0	0	0	5.18	0	--
3	0	0	.07	0	0	0	0	0	0	2.60	0	--
4	0	0	.01	.11	.01	0	0	0	0	1.86	0	--
5	0	0	.01	.50	.56	0	0	0	.09	1.97	0	--
6	0	0	0	0	0	0	.24	0	0	--	0	--
7	0	0	.01	.01	.01	0	1.03	0	0	--	0	--
8	0	.02	1.75	0	0	.01	.07	0	0	--	--	--
9	.05	.11	0	0	0	0	0	0	0	--	--	--
10	0	0	0	0	0	0	0	0	0	--	--	--
11	2.24	0	.51	0	0	0	0	0	0	--	--	--
12	1.34	0	.02	0	0	0	0	0	0	--	--	--
13	.69	0	.02	0	0	0	0	1.21	0	--	--	--
14	0	.68	.01	0	0	0	0	0	0	--	--	--
15	0	6.14	.20	0	0	0	0	0	.07	--	--	--
16	0	.01	.04	0	0	0	.09	0	.11	--	--	--
17	0	.08	0	0	0	0	.01	.03	0	--	--	--
18	0	0	0	0	0	.05	0	0	0	--	--	--
19	0	.03	0	.01	.12	.80	0	0	0	0	--	--
20	0	.02	0	0	0	.03	0	0	0	0	--	--
21	0	.01	.01	0	0	0	0	0	0	0	--	--
22	0	0	0	.01	0	0	0	0	0	0	--	--
23	0	0	.01	0	0	0	0	0	0	0	--	--
24	0	0	0	.27	0	0	0	0	0	0	--	--
25	0	0	.01	0	0	0	.01	0	0	0	--	--
26	0	0	0	0	0	0	.01	.10	0	0	--	--
27	0	0	0	0	0	0	0	0	.02	0	--	--
28	0	.03	0	0	.01	0	0	1.21	.03	0	--	--
29	0	.16	.01	0	--	0	0	0	.16	0	--	--
30	0	0	0	0	--	1.64	0	0	4.17	0	--	--
31	0	--	0	.13	--	0	--	0	--	0	--	--
Total	4.32	7.29	4.02	1.04	.71	2.58	1.46	2.55	4.65	--	--	--

Table 5. Daily rainfall at site 4 (USGS station 08167353, Unnamed tributary Honey Creek site 2T), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	--	--	--	--	--	--	--	--	0	0	0	0.01
2	--	--	--	--	--	--	--	--	.69	.01	0	0
3	--	--	--	--	--	--	--	--	0	.01	0	0
4	--	--	--	--	--	--	--	--	.98	.18	0	0
5	--	--	--	--	--	--	--	--	.94	1.16	0	.06
6	--	--	--	--	--	--	--	--	.04	1.14	0	.01
7	--	--	--	--	--	--	--	--	0	.17	0	0
8	--	--	--	--	--	--	--	--	0	.24	0	0
9	--	--	--	--	--	--	--	--	0	0	0	0
10	--	--	--	--	--	--	--	--	.30	0	.15	0
11	--	--	--	--	--	--	--	--	0	0	.07	.73
12	--	--	--	--	--	--	--	--	0	0	.28	.39
13	--	--	--	--	--	--	--	--	1.69	0	0	0
14	--	--	--	--	--	--	--	--	.01	0	.02	.55
15	--	--	--	--	--	--	--	0	.57	.06	0	0
16	--	--	--	--	--	--	--	0	.01	.45	0	0
17	--	--	--	--	--	--	--	0	0	0	0	.01
18	--	--	--	--	--	--	--	0	0	0	0	.30
19	--	--	--	--	--	--	--	0	0	0	0	0
20	--	--	--	--	--	--	--	0	0	0	0	.25
21	--	--	--	--	--	--	--	0	0	0	0	.69
22	--	--	--	--	--	--	--	0	0	0	0	0
23	--	--	--	--	--	--	--	0	0	0	.04	0
24	--	--	--	--	--	--	--	0	0	0	0	0
25	--	--	--	--	--	--	--	0	0	0	0	0
26	--	--	--	--	--	--	--	0	.18	0	0	.21
27	--	--	--	--	--	--	--	0	0	0	0	0
28	--	--	--	--	--	--	--	0	.10	0	0	0
29	--	--	--	--	--	--	--	0	.01	0	0	0
30	--	--	--	--	--	--	--	0	0	0	.20	--
31	--	--	--	--	--	--	--	0	--	0	.12	--
Total	--	--	--	--	--	--	--	--	5.52	3.42	.88	--

Table 6. Daily mean streamflow at site 2 (USGS station 08167347, Unnamed tributary Honey Creek site 1C), Honey Creek State Natural Area, Comal County, Texas.

[In cubic feet per second; --, not collected or computed]

Water year October 2001 to September 2002 daily mean values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0	0	0	0	0	0	0	8.3	0	0
2	0	0	0	0	0	0	0	0	0	11	0	0
3	0	0	.04	0	0	0	0	0	0	6.8	0	0
4	0	0	0	0	0	0	0	0	0	4.4	0	0
5	0	0	0	0	0	0	0	0	0	7.4	0	0
6	0	0	0	0	0	0	0	0	0	.62	0	0
7	0	0	0	0	0	0	0	0	0	.19	0	0
8	0	0	2.1	0	0	0	0	0	0	.04	0	0
9	0	0	.13	0	0	0	0	0	0	.07	0	0
10	0	0	.06	0	0	0	0	0	0	.02	0	0
11	.03	0	.28	0	0	0	0	0	0	0	0	0
12	.12	0	.13	0	0	0	0	0	0	0	0	0
13	2.1	0	.01	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	1.8	0	0
15	0	11	0	0	0	0	0	0	0	.71	0	0
16	0	.28	0	0	0	0	0	0	0	.17	0	0
17	0	.12	0	0	0	0	0	0	0	.18	0	0
18	0	.03	0	0	0	0	0	0	0	.08	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	--	0	0	0	0	0	0	0
30	0	0	0	0	--	.03	0	0	.58	0	0	0
31	0	--	0	0	--	0	--	0	--	0	0	--
Total	2.25	11.43	2.75	0	0	.03	0	0	.58	41.78	0	0
Mean	.07	.38	.09	0	0	0	0	0	.02	1.35	0	0
Maximum	2.1	11	2.1	0	0	.03	0	0	.58	11	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Acre-feet	4.5	23	5.5	0	0	.06	0	0	1.2	83	0	0

Table 6. Daily mean streamflow at site 2 (USGS station 08167347, Unnamed tributary Honey Creek site 1C), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily mean values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0
2	0	.18	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0
3	0	.16	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0
4	0	.55	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0
5	0	.21	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
6	0	.04	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ .02	0	0
7	0	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
8	.19	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
9	0	0	.64	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
10	0	0	.04	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
11	0	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
12	0	0	¹ .29	¹ 0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
13	0	0	¹ .11	¹ 0	0	¹ 0	¹ 0	¹ 0	¹ .15	¹ 0	0	0
14	0	0	¹ .02	0	0	¹ 0	¹ 0	¹ 0	¹ .01	¹ 0	0	0
15	0	0	¹ 0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
16	0	0	¹ 0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
17	0	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
18	0	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
19	.05	0	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	0
20	0	0	0	0	¹ 2.0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
21	0	0	0	0	¹ .10	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
22	.02	0	0	0	¹ .02	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
23	.73	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
24	2.6	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
25	.55	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
26	.24	.03	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
27	.12	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
28	.03	0	0	0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
29	0	0	0	0	--	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
30	0	0	0	0	--	¹ 0	¹ 0	¹ 0	¹ 0	¹ 0	0	¹ 0
31	0	--	0	0	--	¹ 0	--	¹ 0	--	¹ 0	0	--
Total	4.53	1.17	1.10	0	2.12	0	0	0	.16	.02	0	0
Mean	.15	.04	.04	0	.08	0	0	0	.01	0	0	0
Maximum	2.6	.55	.64	0	2.0	0	0	0	.15	.02	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Acre-feet	9.0	2.3	2.2	0	4.2	0	0	0	.3	.04	0	0

¹ Estimated.

Table 7. Daily mean streamflow at site 3 (USGS station 08167350, Unnamed tributary Honey Creek site 1T), Honey Creek State Natural Area, Comal County, Texas.

[In cubic feet per second; --, not collected or computed]

Water year October 2001 to September 2002 daily mean values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0	0	0	0	0	0	0	10	0	0
2	0	0	0	0	0	0	0	0	0	17	0	0
3	0	0	.01	0	0	0	0	0	0	5.6	0	0
4	0	0	0	0	0	0	0	0	0	2.7	0	0
5	0	0	0	0	0	0	0	0	0	6.1	0	0
6	0	0	0	0	0	0	0	0	0	.23	0	0
7	0	0	0	0	0	0	0	0	0	.07	0	0
8	0	0	1.1	0	0	0	0	0	0	.02	0	0
9	0	0	.10	0	0	0	0	0	0	.04	0	0
10	0	0	.02	0	0	0	0	0	0	.01	0	0
11	0	0	.14	0	0	0	0	0	0	0	0	0
12	.01	0	.09	0	0	0	0	0	0	0	0	0
13	.58	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	.31	0	0
15	0	9.7	0	0	0	0	0	0	0	.56	0	0
16	0	.26	0	0	0	0	0	0	0	.11	0	0
17	0	.05	0	0	0	0	0	0	0	.09	0	0
18	0	0	0	0	0	0	0	0	0	.03	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	--	0	0	0	0	0	0	0
30	0	0	0	0	--	0	0	0	.01	0	0	0
31	0	--	0	0	--	0	--	0	--	0	0	--
Total	.59	1.01	1.46	0	0	0	0	0	.01	42.87	0	0
Mean	.02	.33	.05	0	0	0	0	0	0	1.38	0	0
Maximum	.58	9.7	1.1	0	0	0	0	0	.01	17	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Acre-feet	1.2	20	2.9	0	0	0	0	0	.02	85	0	0

Table 7. Daily mean streamflow at site 3 (USGS station 08167350, Unnamed tributary Honey Creek site 1T), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily mean values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	.08	0	0	0	0	0	0	0	0	0	0
3	0	.06	0	0	0	0	0	0	0	0	0	0
4	0	.30	0	0	0	0	0	0	0	0	0	0
5	0	.10	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	.14	0	0	0	0	0	0	0	0	0	0	0
9	0	0	.09	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	.15	0	0	0	0	0	0	0	0	0
13	0	0	.01	0	0	0	0	0	.05	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	1.0	0	0	0	0	0	0	0
21	0	0	0	0	.05	0	0	0	0	0	0	0
22	0	0	0	0	.01	0	0	0	0	0	0	0
23	.38	0	0	0	0	0	0	0	0	0	0	0
24	1.7	0	0	0	0	0	0	0	0	0	0	0
25	.23	0	0	0	0	0	0	0	0	0	0	0
26	.07	0	0	0	0	0	0	0	0	0	0	0
27	.01	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	--	0	0	0	0	0	0	0
30	0	0	0	0	--	0	0	0	0	0	0	0
31	0	--	0	0	--	0	--	0	--	0	0	--
Total	2.53	.54	.25	0	1.06	0	0	0	.05	0	0	0
Mean	.08	.02	.01	0	.04	0	0	0	0	0	0	0
Maximum	1.7	.30	.15	0	1.0	0	0	0	.05	0	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Acre-feet	5.0	1.1	.5	0	2.1	0	0	0	.1	0	0	0

Table 8. Daily mean streamflow at site 4 (USGS station 08167353, Unnamed tributary Honey Creek site 2T), Honey Creek State Natural Area, Comal County, Texas.

[In cubic feet per second; --, not collected or computed]

Water year October 2001 to September 2002 daily mean values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0	0	0	0	0	0	0	33	0	0
2	0	0	0	0	0	0	0	0	0	47	0	0
3	0	0	0	0	0	0	0	0	0	18	0	0
4	0	0	0	0	0	0	0	0	0	10	0	0
5	0	0	0	0	0	0	0	0	0	22	0	0
6	0	0	0	0	0	0	0	0	0	.22	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	3.2	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	¹ 0	0	0
10	0	0	0	0	0	0	0	0	0	¹ 0	0	0
11	.03	0	0	0	0	0	0	0	0	¹ 0	0	0
12	.16	0	0	0	0	0	0	0	0	¹ 0	0	0
13	3.2	0	0	0	0	0	0	0	0	¹ 0	0	0
14	0	0	0	0	0	0	0	0	0	¹ 3.1	0	0
15	0	43	0	0	0	0	0	0	0	¹ 1.5	0	0
16	0	.29	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	0	0	0	0	0	0	0	0	0	0	0	0
24	0	0	0	0	0	0	0	0	0	0	0	0
25	0	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	--	0	0	0	0	0	0	0
30	0	0	0	0	--	.02	0	0	.36	0	0	0
31	0	--	0	0	--	0	--	0	--	0	0	--
Total	3.39	43.29	3.20	0	0	.02	0	0	.36	134.82	0	0
Mean	.11	1.44	.10	0	0	0	0	0	.01	4.35	0	0
Maximum	3.2	43	3.2	0	0	.02	0	0	.36	47	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Acre-feet	6.7	86	6.3	0	0	.04	0	0	.7	267	0	0

Table 8. Daily mean streamflow at site 4 (USGS station 08167353, Unnamed tributary Honey Creek site 2T), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily mean values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0
4	0	.12	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	.01	0	0	0
6	0	0	0	0	0	0	0	0	0	.08	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0
8	.08	0	0	0	0	0	0	0	0	0	0	0
9	0	0	.25	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	.08	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	.29	0	0	0
14	0	0	0	0	0	0	0	0	.01	0	0	0
15	0	0	0	0	0	0	0	0	.01	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0
19	.05	0	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	3.4	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	0	0	0	0
22	0	0	0	0	0	0	0	0	0	0	0	0
23	.44	0	0	0	0	0	0	0	0	0	0	0
24	3.7	0	0	0	0	0	0	0	0	0	0	0
25	.02	0	0	0	0	0	0	0	0	0	0	0
26	0	0	0	0	0	0	0	0	0	0	0	0
27	0	0	0	0	0	0	0	0	0	0	0	0
28	0	0	0	0	0	0	0	0	0	0	0	0
29	0	0	0	0	--	0	0	0	0	0	0	0
30	0	0	0	0	--	¹ 0	0	0	0	0	0	0
31	0	--	0	0	--	0	--	0	--	0	0	--
Total	4.29	.12	.33	0	3.40	0	0	0	.32	.08	0	0
Mean	.14	0	.01	0	.12	0	0	0	.01	0	0	0
Maximum	3.7	.12	.25	0	3.4	0	0	0	.29	.08	0	0
Minimum	0	0	0	0	0	0	0	0	0	0	0	0
Acre-feet	8.5	.2	.7	0	6.7	0	0	0	.6	.2	0	0

¹ Estimated.

Table 9. Daily evapotranspiration at site 6 (USGS station 295104098285900, Honey Creek reference evapotranspiration), Honey Creek State Natural Area, Comal County, Texas.

[In inches; --, not collected or computed]

Water year October 2001 to September 2002 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	--	--	--	--	--	--	0.099	0.110	0.106	0.039	0.122	0.062
2	--	--	--	--	--	--	.098	.067	.106	.039	.131	.062
3	--	--	--	--	--	--	.064	.073	.096	.133	.140	.057
4	--	--	--	--	--	--	.042	.053	.101	.164	.127	.049
5	--	--	--	--	--	--	.047	.079	.099	.105	.108	.049
6	--	--	--	--	--	--	.031	.089	.122	.103	.116	.054
7	--	--	--	--	--	--	.041	.074	.100	.128	.111	.023
8	--	--	--	--	--	--	.170	.079	.088	.123	.087	.040
9	--	--	--	--	--	--	.118	.078	.092	.173	.144	.065
10	--	--	--	--	--	--	.085	.080	.084	.126	.108	.151
11	--	--	--	--	--	--	.107	.269	.081	.143	.156	.162
12	--	--	--	--	--	--	.101	.187	.077	.184	.150	.130
13	--	--	--	--	--	--	.109	.151	.077	.071	.134	.147
14	--	--	--	--	--	--	.079	.118	.071	.076	.127	.151
15	--	--	--	--	--	--	.081	.101	.091	.086	.117	.063
16	--	--	--	--	--	--	.127	.093	.096	.116	.129	.050
17	--	--	--	--	--	--	.098	.085	.066	.077	.118	.072
18	--	--	--	--	--	--	.089	.106	.064	.156	.113	.081
19	--	--	--	--	--	0.025	.084	.099	.052	.164	.120	.068
20	--	--	--	--	--	.068	.100	.079	.062	.136	.104	.158
21	--	--	--	--	--	.111	.066	.082	.057	.144	.106	.134
22	--	--	--	--	--	.062	.080	.073	.058	.162	.098	.143
23	--	--	--	--	--	.055	.108	.077	.051	.150	.099	.105
24	--	--	--	--	--	.073	.106	.049	.054	.160	.086	.122
25	--	--	--	--	--	.029	.071	.075	.053	.151	.087	.098
26	--	--	--	--	--	.067	.093	.120	.049	.145	.089	.114
27	--	--	--	--	--	.063	.094	.079	.047	.122	.078	.124
28	--	--	--	--	--	.071	.100	.087	.053	.134	.070	.092
29	--	--	--	--	--	.030	.107	.122	.057	.126	.067	.085
30	--	--	--	--	--	.135	.098	.114	.044	.136	.107	.090
31	--	--	--	--	--	.100	--	.111	--	.130	.073	--
Mean	--	--	--	--	--	--	.090	.099	.075	.126	.110	.093
Maximum	--	--	--	--	--	--	.170	.269	.122	.184	.156	.162
Minimum	--	--	--	--	--	--	.031	.049	.044	.184	.067	.023
Total	--	--	--	--	--	--	2.70	3.06	2.25	3.90	3.42	2.80

Table 9. Daily evapotranspiration at site 6 (USGS station 295104098285900, Honey Creek reference evapotranspiration), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.111	0.037	0.047	0.058	0.051	--	--	--	--	--	--	0.050
2	.088	.022	.029	.046	.022	--	--	--	--	--	--	.040
3	.091	.018	.022	.047	.069	0.038	--	--	--	--	--	.049
4	.096	.024	.047	.040	.048	.052	--	--	--	--	--	.051
5	.085	.108	.030	.040	.020	.025	--	--	--	--	--	.066
6	.082	.087	.040	.025	.044	.086	--	--	--	--	--	.041
7	.067	.069	.018	.043	.019	.085	--	--	--	--	--	.037
8	.052	.069	.011	.046	.017	.043	--	--	--	--	--	.030
9	.093	.064	.015	.055	.081	.064	--	--	--	--	--	.038
10	.068	.085	.029	.044	.068	.077	--	--	--	--	--	.030
11	.078	.079	.032	.020	.047	.021	--	--	--	--	--	.111
12	.076	.081	.051	.016	.018	.027	--	--	--	--	--	.105
13	.047	.056	.074	.014	.021	.098	--	--	--	--	--	.081
14	.039	.055	.050	.044	.027	.089	--	--	--	--	--	.110
15	.105	.050	.031	.025	.063	.044	--	--	--	--	--	.101
16	.098	.057	.040	.060	.056	.079	--	--	--	--	--	.071
17	.083	.054	.034	.034	.058	.051	--	--	--	--	--	.072
18	.030	.050	.045	.041	.036	.120	--	--	--	--	--	.083
19	.050	.069	.066	.031	.025	.103	--	--	--	--	--	.050
20	.071	.066	.052	.044	.025	.017	--	--	--	--	--	.034
21	.022	.067	.042	.056	.019	--	--	--	--	--	--	.131
22	.061	.055	.031	.040	.110	--	--	--	--	--	--	.105
23	.084	.050	.034	.034	.091	--	--	--	--	--	--	.073
24	.024	.034	.048	.021	.023	--	--	--	--	--	--	.115
25	.036	.031	.030	.015	--	--	--	--	--	--	--	.085
26	.028	.019	.026	.012	--	--	--	--	--	--	--	.097
27	.042	.036	.052	.020	--	--	--	--	--	--	--	.146
28	.021	.044	.042	.019	--	--	--	--	--	--	--	.113
29	.106	.041	.012	.058	--	--	--	--	--	--	--	.104
30	.079	.050	.033	.028	--	--	--	--	--	--	--	.103
31	.045	--	.071	.058	--	--	--	--	--	--	--	--
Mean	.070	.050	.040	.040	--	--	--	--	--	--	--	.080
Maximum	.111	.108	.074	.060	--	--	--	--	--	--	--	.146
Minimum	.021	.018	.011	.014	--	--	--	--	--	--	--	.030
Total	2.06	1.63	1.18	1.14	--	--	--	--	--	--	--	2.32

Table 10. Daily evapotranspiration at site 7 (USGS station 295102098283200, Honey Creek treatment evapotranspiration), Honey Creek State Natural Area, Comal County, Texas.

[In inches; --, not collected or computed]

Water year October 2001 to September 2002 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	--	--	--	--	--	--	0.102	--	0.101	0.039	0.120	0.071
2	--	--	--	--	--	--	.104	--	.096	.041	.120	.069
3	--	--	--	--	--	--	.069	--	.089	.132	.129	.074
4	--	--	--	--	--	--	.043	--	.087	.165	.121	.063
5	--	--	--	--	--	--	.055	--	.088	.100	.106	.063
6	--	--	--	--	--	--	.031	--	.151	.116	.111	.069
7	--	--	--	--	--	--	.057	--	.102	.155	.111	.032
8	--	--	--	--	--	--	.181	--	.090	.168	.087	.053
9	--	--	--	--	--	--	.132	--	.088	.193	.155	.069
10	--	--	--	--	--	--	.093	--	.087	.144	.113	.165
11	--	--	--	--	--	--	.117	--	.083	.156	.160	.167
12	--	--	--	--	--	--	.005	--	.083	.176	.138	.139
13	--	--	--	--	--	--	--	0.113	.083	.074	.124	.136
14	--	--	--	--	--	--	--	.119	.080	.081	.107	.127
15	--	--	--	--	--	--	--	.089	.116	.093	.104	.080
16	--	--	--	--	--	--	--	.082	.124	.120	.111	.056
17	--	--	--	--	--	--	--	.076	.086	.075	.110	.072
18	--	--	--	--	--	--	--	.100	.073	.173	.105	.082
19	--	--	--	--	--	0.029	--	.091	.067	.167	.108	.074
20	--	--	--	--	--	.082	--	.073	.069	.132	.098	.182
21	--	--	--	--	--	.114	--	.077	.068	.143	.092	.143
22	--	--	--	--	--	.066	--	.069	.069	.144	.089	.153
23	--	--	--	--	--	.061	--	.073	.058	.129	.087	.108
24	--	--	--	--	--	.086	--	.047	.060	.146	.082	.126
25	--	--	--	--	--	.031	--	.073	.048	.135	.078	.112
26	--	--	--	--	--	.075	--	.120	.050	.130	.079	.130
27	--	--	--	--	--	.065	--	.084	.055	.115	.078	.118
28	--	--	--	--	--	.080	--	.092	.045	.129	.077	.105
29	--	--	--	--	--	.032	--	.125	.069	.117	.075	.091
30	--	--	--	--	--	.146	--	.119	.151	.129	.110	.090
31	--	--	--	--	--	.114	--	.111	--	.116	.081	--
Mean	--	--	--	--	--	--	--	--	.084	.127	.105	.101
Maximum	--	--	--	--	--	--	--	--	.151	.193	.160	.032
Minimum	--	--	--	--	--	--	--	--	.045	.039	.075	.182
Total	--	--	--	--	--	--	--	--	2.51	3.93	3.27	3.02

Table 10. Daily evapotranspiration at site 7 (USGS station 295102098283200, Honey Creek treatment evapotranspiration), Honey Creek State Natural Area, Comal County, Texas—Continued.

Water year October 2002 to September 2003 daily values												
Day	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
1	0.089	0.041	0.049	0.064	0.056	--	--	--	--	--	--	0.044
2	.080	.021	.030	.046	.028	--	--	--	--	--	--	.031
3	.079	.009	.022	.051	.072	0.056	--	--	--	--	--	.047
4	.095	--	.047	.043	.053	.052	--	--	--	--	--	.062
5	.085	.116	.032	.044	.017	.029	--	--	--	--	--	.078
6	.083	.090	.047	.029	.055	.098	--	--	--	--	--	.040
7	.068	.072	.021	.042	.021	.099	--	--	--	--	--	.028
8	.049	.074	.012	.052	.018	.043	--	--	--	--	--	.029
9	.104	.073	.023	.055	.089	.071	--	--	--	--	--	.031
10	.072	.089	.029	.043	.066	.083	--	--	--	--	--	.024
11	.085	.078	.034	.021	.051	.018	--	--	--	--	--	.104
12	.080	.076	.048	.017	.018	.027	--	--	--	--	--	.109
13	.047	.057	.076	.015	.024	.104	--	--	--	--	--	.081
14	.039	.059	.053	.050	.038	.096	--	--	--	--	--	.113
15	.110	.051	.042	.027	.064	.049	--	--	--	--	--	.098
16	.088	.056	.047	.062	.061	.082	--	--	--	--	--	.060
17	.088	.055	.038	.036	.062	.051	--	--	--	--	--	.064
18	.032	.050	.049	.048	.039	.123	--	--	--	--	--	.078
19	.057	.061	.069	.036	.029	.117	--	--	--	--	--	.050
20	.077	.061	.060	.049	.031	.049	--	--	--	--	--	.047
21	.028	.060	.050	.060	.019	--	--	--	--	--	--	.136
22	.072	.053	.038	.040	.113	--	--	--	--	--	--	.106
23	.087	.050	.037	.034	.098	--	--	--	--	--	--	.061
24	.033	.034	.053	.020	.023	--	--	--	--	--	--	.098
25	.037	.031	.031	.015	--	--	--	--	--	--	--	.078
26	.027	.024	.027	.017	--	--	--	--	--	--	--	.097
27	.042	.038	.049	.021	--	--	--	--	--	--	--	.148
28	.021	.046	.050	.018	--	--	--	--	--	--	--	.113
29	.104	.045	.012	.058	--	--	--	--	--	--	--	.098
30	.088	.053	.038	.031	--	--	--	--	--	--	--	.093
31	.047	--	.063	.058	--	--	--	--	--	--	--	--
Mean	.068	.056	.041	.039	--	--	--	--	--	--	--	.075
Maximum	.110	.116	.076	.064	--	--	--	--	--	--	--	.148
Minimum	.021	.009	.012	.015	--	--	--	--	--	--	--	.024
Total	2.09	1.62	1.28	1.20	--	--	--	--	--	--	--	2.25

Table 11. Water-quality sample site, date, and type, Honey Creek State Natural Area, Comal County, Texas.

[X, sample collected; --, sample not collected]

Rainfall water quality

Date	Sample type			
	Field property	Major ion	Nutrient	Isotope
Site 5 (USGS station 295108098283201 Honey Creek rainfall water quality)				
10/11/2001	X	X	X	X
11/15/2001	X	X	X	X
06/30/2002	X	X	X	X

Stormflow water quality

Date	Sample type					
	Field property	Major ion	Nutrient	Pesticide	Isotope	Sediment
Site 2 (USGS station 08167347 Unnamed tributary Honey Creek site 1C)						
08/30/2001	X	X	X	X	X	X
10/11/2001	X	X	X	--	X	X
11/15–16/2001	X	X	X	--	X	X
03/30/2002	--	--	--	--	--	X
04/07/2002	X	X	X	--	X	--
06/30/2002	X	X	X	--	X	X
Site 3 (USGS station 08167350 Unnamed tributary Honey Creek site 1T)						
08/30/2001	X	X	X	X	X	X
10/11/2001	X	X	X	--	X	X
06/30/2002	X	X	X	--	X	X
Site 4 (USGS station 08167353 Unnamed tributary Honey Creek site 2T)						
08/30/2001	X	X	X	X	X	X
06/30/2002	X	X	X	--	X	X

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