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mine where similar geomorphologic and geologic conditions occur. This program will be developed and implemented by September 2000.

Anticipated Effects of Subsidence. Future subsidence in the permit area is anticipated to be similar to that which has occurred in the past. Subsidence is expected to average about 4 feet above longwall panels, with a draw angle of about 15 degrees. Tension cracks are expected to occur in areas of subsidence with these cracks healing to some degree following formation. Tension cracks are anticipated to be less pronounced above longwall workings than above continuous-miner workings.

Previous surveys have indicated that no substantial damage has occurred to vegetation as a result of subsidence within the permit area. The only effects observed have been exposed plant roots where tension cracks have formed.

It is anticipated that subsiding under portions of East Fork Box Canyon will result in a slight flattening of the stream gradient, which will increase pooling of the stream through a stretch of several hundred feet of the stream. Cracks will also likely develop across the East Fork Box Canyon Creek directly above the longwall panels and along the gate roads. These crack zones will form shortly after undermining of the stream bed. They are anticipated to be 1 to 2 inches or less in width with these cracks healing to some degree following formation. Details of the expected location of the cracks are given in Appendix 7-19. If cracks do develop in the channel floor and appear to be taking surface water from the creek, sealing of these cracks will be done with bentonite grout. Use of bentonite grout for the sealing of the cracks in the channel floor is discussed in Section 3 of the Pines Tract FEIS (1999).

5.2.5.2 Subsidence Control

Adopted Control Measures. As indicated above, SUFCO Mine has adopted subsidence-control measures in areas where surface resources are to remain protected. These controls consist primarily of leaving support pillars in place in those areas designated on Plate 5-10 as not

planned for subsidence. Based on experience and data collected from the permit area, the design of support pillars for those areas where subsidence is not planned has been based on the following equations:

$$SF = SD/OS \tag{5-1}$$

where SF = safety factor against pillar failure (fraction)

SD = support strength density (psi)
= $(Y_c)(1-ER)$

Y_c = average compressive yield strength of the coal (psi)
= 3090 psi for the Upper Hiawatha seam

ER = extraction ratio (fraction)
= $1-(A_p/A_t)$

A_p = pillar area (ft^2)

Water discharged from the mine will continue to be monitored at sites Link Portal West and Link Portal East, as part of the quarterly water monitoring program. Significant changes in water chemistry and the apparent causes will be reported to the Division.

The only actual loss of groundwater from the hydrologic balance is that water which is the difference between the average as-shipped moisture minus the inherent moisture or in-situ moisture of the coal and leaves the basin upon mining. Based on an average coal moisture loss of groundwater content of 1.8 percent and a long-term coal production rate of 6 million tons per year, approximately 80 AF/yr of groundwater is removed from the basin. This represents about 2 percent of the average annual flow of Quitchupah Creek above Link Canyon.

Several springs and stream locations in the permit area are monitored for quantity and quality as prescribed by the M&RP water monitoring program. Analysis of the monitored flows indicated that very little impact has occurred to springs and streams. Erik Petersen of Petersen Hydrologic, Inc evaluated the flow data collected from several springs and surface flows in the Box Canyon drainage. His evaluation was forwarded to Sufco in the form of a letter report dated August 14, 2003 and is included in Appendix 7-19. Mr. Petersen determined that since mining began in the Pines Tract, a few of the area springs have exhibited an increase in flow during a period of prolonged drought. He also concluded that perhaps one spring, Pines 303, in the lower portion of the Box Canyon, may have experienced reduced flows as a result of mining activities. However, because of the prolonged drought in the area that began in 1998, it is not possible to determine with certainty whether mining activities, drought conditions, or both have resulted in the loss of spring flow. A loss in flow from this spring was a predicted possibility described in the Pines Tract EIS. The loss of flow from this spring(less than 4 gpm) has apparently not adversely affected area vegetation or wildlife. Because of the increased discharge of springs farther up canyon, the loss of the less than 4 gpm contribution of ground water from Pines 303 to Box Canyon Creek is insignificant to the total flow of the creek. No water rights were found to have been filed on this spring discharge.

Mr. Petersen has noted an increase in the flow of springs Pines 209 and 212 and in the flow of the Main Fork of Box Canyon Creek that appears to coincide with mining in the western

portion of the Pines Tract. He reasons that the increase in spring flow is related to subsidence enhanced recharge or hydraulic conductivity of the aquifers sourcing the springs. The increase in spring flow has resulted in the increase in flow in the Main Fork of Box Canyon Creek. This has been noted as a positive impact to the creek during a time of drought. Analysis of the flow data presented by Petersen suggests the increase in flow from these springs may be short lived. He has also indicated that flow from these springs will not cease but should return to near pre-mining rates. In fact, the data presented in his August 14, 2003 letter report suggests the flow rates may already be beginning to return to pre-mining rates.

Potential Hydrocarbon Contamination. Diesel fuel, oils, greases, and other hydrocarbon products are stored and used at the site for a variety of purposes. Diesel and oil stored in above-ground tanks at the mine surface facilities may spill onto the ground during filling of the storage tank, leakage of the storage tank, or filling of the vehicle tank. Similarly, greases and other oils may be spilled during use in surface and underground operations.

The probable future extent of the contamination caused by diesel and oil spillage is expected to be small for three reasons. First, because the tanks are located above ground, leakage from the tanks can be readily detected and repaired. Second, spillage during filling of the storage or vehicle tanks is minimized to avoid loss of an economically valuable product. Finally, the Spill Prevention Control and Countermeasure Plan presented in Appendix 7-6 provides inspection, training, and operation measures to minimize the extent of contamination resulting from the use of hydrocarbons at the site.

The potential for hydrocarbon contamination of the environment at the Link Canyon Substation or the reopened Link Canyon Mine Portal is minimal since no fuels or lubricants will be stored at this site. If a catastrophic failure of the transformers at the substation occurred, the minimal volume of oil would be contained behind the berm to be built around the equipment.

Road Salting. No salting of the mine road occurs within the permit area. This impact is not a significant concern.

Coal Haulage. Coal is hauled over the paved county road from the mine portal area to Interstate Highway 70. Past experience has indicated that approximately one truck load of coal (43 tons) is spilled annually. Residual coal following cleanup of the spill may wash into local streams during a runoff event. Possible impacts to the surface water are increased total suspended solids and turbidity from the fine coal particulates. The probability of a spill occurring in an area sufficiently close to a stream channel to introduce coal to the stream bed is considered small.

In order to minimize fugitive coal dust haulage trucks are either covered or modified to reduce the amount of coal dust blown off the trucks. The impact from fugitive coal dust is therefore considered to be insignificant due to the small amounts lost during haulage in the permit and adjacent areas.

7.2.9 Cumulative Hydrologic Impact Assessment (CHIA)

A Cumulative Hydrologic Impact Assessment to include the permit and adjacent areas is to be prepared by the UDOGM.

on Plates 5-2D and 5-2E. Similar information for the Link Canyon Portal facility area is presented on Plate 5-2F.

Locations and elevations of each station to be used for water monitoring during coal mining and reclamation operations are presented on Plate 7-3.

The construction details and cross sections for the concrete sediment trap are located in the "Alternate #1 Drainage Facilities and Sediment Control Plan" (Appendix 7-8). The existing topography and cross sections for the main sedimentation pond are located on Plates 7-4 and 7-5. The design topography and cross sections for the waste rock disposal site sedimentation pond are located in Volume 3 of this M&RP.

Other Cross Sections and Maps. Other relevant cross sections or maps are presented and discussed in Chapter 5 of this M&RP.

7.3.1.8 Water Rights and Replacement

~~This section applies to surface mining only. Therefore, this section does not apply to the SUFCO Mine where surface mining does not occur.~~ Ground and surface water rights do exist within the Sufco Mine permit area. Mitigation has been performed at stock pond locations where claims have been made that the available surface water has been impacted by subsidence. Mitigation at these locations has been performed by the placement of bentonite in the bottom of stock ponds and by hauling replacement water to the ponds for livestock use during summer months.

The Permittee will replace the water supply of any land owner if such a water supply proves to be contaminated, diminished or interrupted as a result of mining operations. First, a determination will be made by the Division in accordance with R645 - 301- 731.800 as to whether or not material damage has occurred. Then, in accordance with Regulation R645-301-525.510, the operator will correct any material damage resulting from subsidence caused to surface lands (which includes water rights), to the extent technologically and economically feasible. Negotiations will be held immediately with the impacted party to determine the appropriate mitigation activities. The restoration of water flows to impacted sources will be

accomplished using the Best Technology Currently Available (BTCA). These activities may include, but not necessarily be limited to: piping or trucking water to the location of the loss; sealing surface fractures to prevent further losses (i.e., stream floors on bed rock or in shallow alluvium), and; construction of a ground water well and the installation of pumps to restore flows. If the above efforts are not successful, then the operator will explore the transferring of water rights to the injured party in flow equal to the determined loss and/or monetary reimbursement for proven material damages.

7.3.2 Sediment Control Measures

The existing sediment control measures within the permit area have been designed, constructed, and maintained to prevent additional contributions of sediment to streamflow or to runoff outside the permit area. In addition, they have been designed to meet applicable effluent limitations, and minimize erosion to the extent possible.

The structures to be used for the runoff-control plan for the permit area include disturbed and undisturbed area diversion channels, sedimentation ponds, containment berms, silt fences, and road diversions and culverts.

7.3.2.1 Siltation Structures

The siltation structures within the permit area consist of the sedimentation ponds described in Section 7.3.2.2.

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sealing surface fractures to prevent further losses (i.e., stream floors on bed rock or in shallow alluvium), and; construction of a ground water well and the installation of pumps to restore flows. If the above efforts are not successful, then the operator will explore the transferring of water rights to the injured party in flow equal to the determined loss and/or monetary reimbursement for proven material damages.

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The structures to be used for the runoff-control plan for the permit area include disturbed and undisturbed area diversion channels, sedimentation ponds, containment berms, silt fences, and road diversions and culverts.

7.3.2.1 Siltation Structures

The siltation structures within the permit area consist of the sedimentation ponds described in Section 7.3.2.2.

APPENDIX 7 - 19

Probable Hydrologic Consequences of Longwall Mining of the 3 Left Panel Modification Area at the SUFCO Mine

PETERSEN HYDROLOGIC

14 August 2003

Mr. Mike Davis
Canyon Fuel Company, LLC
SUFCO Mine
397 South 800 West
Salina, Utah 84526

Mike,

At your request, I have performed this analysis of the response of springs and streams in the Pines area to coal mining at the SUFCO Mine. The data used in this analysis were collected by Canyon Fuel Company and its consultants as part of baseline hydrologic monitoring and subsequent quarterly monitoring activities.

Discharge and water quality data for each of the spring and creek monitoring sites in the Pines area are presented in Table 1. Monitoring site locations are shown on Figure 1. Discharge hydrographs for each monitoring site together with time-series plots of electrical conductivity are presented in Figure 2A-2L. Also included on Figure 2 are plots of the Palmer Hydrologic Drought Index (PHDI; NCDC, 1998) for Utah Region 4. The PHDI is utilized in this analysis to aid in determining whether discharge variability at springs and creeks is the result of climatic change or other factors.

The PHDI is a monthly value generated by the National Climatic Data Center using a variety of hydrologic parameters that indicates wet and dry spells. The PHDI is calculated from parameters including precipitation, temperature, evapotranspiration, soil water recharge, soil water loss, and runoff. It is a useful tool for evaluating the relationship between climate and groundwater and surface-water discharge data. From the plot of the PHDI (Figure 2), it is apparent that the wetness of the region peaked in 1998. From 1998 to 2002 the region experienced a gradual drying-out, ending in a period of extreme drought in mid-2002. During the period from mid-2002 to the present, the region appears to be transitioning to near normal climatic conditions.

In the following discussion, the responses of individual springs and creeks to longwall coal mining are characterized.

SPRINGS

Pines 105

Spring Pines 105 discharges from fractured Castlegate Sandstone in the east fork of the East Fork of Box Canyon. Discharge from Pines 105 shows both seasonal and climatic variability (Figure 2A). The discharge from Pines 105 has declined gradually since 1998, which corresponds with the climatic conditions as indicated by the PHDI. The water quality of groundwater at Pines 105 (as reflected by the plot of electrical conductivity in Figure 2A and an inspection of Table 1) has remained relatively constant.

No longwall mining has occurred in the vicinity of the spring and no mining-related impacts are evident.

Pines 206

Pines 206 is located in the Main Fork of Box Canyon near the Castlegate Sandstone/Blackhawk Formation contact (Figure 1). The spring discharges at the interface of a fractured sandstone layer with an underlying clay-rich confining layer. As indicated by radiocarbon dating and tritium contents, the groundwater discharging from Pines 206 has a mean residence time of approximately 3,000 years (Mayo and Associates, 1999). The discharge from Pines 206 has remained relatively constant and has apparently not been influenced by climatic variability. Likewise, water quality (as reflected by the plot of electrical conductivity and inspection of Table 1), has remained relatively constant. There are no indications of any mining-related impacts to this spring.

Pines 209

Pines 209 discharges from the Blackhawk Formation in the Main Fork of Box Canyon. Like Pines 206, Pines 209 discharges from the base of a fractured sandstone unit at the contact with an underlying clay-rich confining layer. As evidenced by its radiocarbon content (43.96 pmC) and tritium content (1.78 TU), Pines 209 discharges primarily old water with a smaller component of modern groundwater that is less than 50 years old (Mayo and Associates, 2000). Interestingly, discharge from Pines 209 increased steadily from 1997 to 2001, even as climatic conditions were becoming more dry (Figure 2C). Beginning in mid-2001, it appears that discharge rates at Pines 209 began to return to more normal levels. It was predicted in both the Pines Tract EIS (Manti-La Sal National Forest, 1999) and PHC determination (Mayo and Associates, 1999) that increased bedrock fracturing associated with nearby longwall mining could enhance recharge to groundwater systems supporting springs in the Box Canyon area. The observed increase in discharge at Pines 209 could be a

reflection of this phenomenon. Alternatively, it is possible that the increases in flow could be related to subsidence-fracture enhancement of the hydraulic conductivity of the bedrock horizons that support the groundwater system from which Pines 209 discharges. A determination of which of these two mechanisms is primarily responsible for the flow increases at Pines 209 remains problematic.

Water quality at Pines 209 (as reflected in the plot of electrical conductivity; Figure 2C) has remained relatively constant during the period of record.

It is important to note that under either of the above described scenarios, the net impact to the spring discharge has been positive. If the observed flow increases are the result of increased bedrock fracturing, this condition would be anticipated to persist in the future. If the observed flow increases are a result of fracture enhancement of bedrock hydraulic conductivity, it would be anticipated that this condition would persist for a limited period of time. After an initial period of increased discharge with groundwater being taken from aquifer storage, the groundwater system would be expected to return to a steady-state condition. When the steady-state equilibrium condition is restored, it would be anticipated that groundwater discharge rates would return to near pre-mining levels. (i.e., $Q_{in} = Q_{out}$, with no net water taken from storage in the aquifer matrix).

Pines 212

Spring Pines 212 discharges in the Main Fork of Box Canyon from a fractured sandstone horizon. It is apparent that the spring occurs near the contact with an underlying low-permeability horizon. Like the discharge from nearby Pines 209, the discharge from Pines 212 apparently started increasing as early as November 1998 and peaked in early 2001 (Figure 2D). From early 2001 to the present, the discharge from spring Pines 212 appears to be returning to pre-mining levels.

It was predicted in both the Pines Tract EIS (Manti-La Sal National Forest, 1999) and PHC determination (Mayo and Associates, 1999) that increased bedrock fracturing associated with nearby longwall mining could enhance recharge to groundwater systems supporting springs in the Box Canyon area. As discussed for Pines 209 above, the observed increase in discharge at Pines 212 could be a result of this enhanced groundwater recharge or, alternatively, as a result of increased hydraulic conductivity of the aquifer skeleton resulting from nearby longwall mining. Water quality at Pines 212 (as reflected in the plot of electrical conductivity; Figure 2D) has remained relatively constant during the period of record.

It is important to note that under either of the above described scenarios, the net impact to the spring discharge has been positive. If the observed flow increases are the result of increased near-surface recharge resulting from subsidence, this condition would be anticipated to persist in the future. If the observed flow increases are a result of increases in aquifer hydraulic conductivity, it would be anticipated that this condition would persist for a limited period of time. After an initial period of increased discharge with groundwater being taken from aquifer storage, the groundwater system would be expected to return to a steady-state condition. When the steady-state equilibrium condition is restored, it would be anticipated that groundwater discharge rates would return to near pre-mining levels.

Pines 214

Spring Pines 214 discharges in a small side drainage in the East Fork of Box Canyon near the base of the Castlegate Sandstone. Pines 214, which discharges modern groundwater (Mayo and Associates, 1999), shows seasonal discharge variability. It is interesting to note that during several years, the 4th quarter discharge measurement at the spring is greater than the 3rd quarter discharge measurement. This is attributed to the fact that the established flow measuring location for the spring is some distance below the first occurrence of spring discharge in the drainage. Thus, some of the discharge, particularly during the warm 3rd quarter, is likely lost to evapotranspiration as the discharge flows down the stream drainage. During the 4th quarter, when temperatures are cooler and the daylight hours shorter, losses to evapotranspiration are less.

Water quality at Pines 214 (as reflected by the plot of electrical conductivity; Figure 2E) has remained relatively constant during the period of record with the exception of a single monitoring event in November 2000. During that event, the spring was iced-over and the water sample likely contained snow-melt water which resulted in the unusually low electrical conductivity measurement.

There are no indications of any mining-related impacts to discharge or water quality at spring Pines 214.

Pines 218

Pines 218 is a small seep, from which the measured discharge has never exceeded about 0.1 gpm (Table 1). The spring discharges from fractured Castlegate Sandstone bedrock in the upper Main Fork of Box Canyon. It is apparent from Figure 2F that the meager discharge has responded to the general drying-out of the region since late 1998. Water quality at the spring (as reflected by the plot of electrical conductivity; Figure 2F) has remained relatively constant. The low dissolved solids concentrations at

Pines 218 (Table 1) suggest that this spring discharges from a local groundwater system that is largely recharged by precipitation water falling near the spring.

There are no indications of any mining-related impacts to the discharge or water quality at seep Pines 218.

Pines 303

Spring Pines 303 discharges from the Blackhawk Formation in lower Box Canyon adjacent to Box Canyon Creek. It is apparent in Figure 2G that discharge from Pines 303 began to decline in late 1999 or early 2000. By August of 2001 the spring became dry. The discharge declines at Pines 303 (Figure 2G) occurred as the region was transitioning to a period of extreme drought. This suggests the possibility that drought conditions may be partially responsible for the loss of flow from Pines 303. However, an examination of the mode of occurrence of Pines 303 suggests that the declines in discharge may be a result of mining activities.

Pines 303 discharges from a fractured sandstone that is stratigraphically only 100 feet above the mined coal seam at the SUFCO Mine. The flowpath of the groundwater system that supports Pines 303 likely extends above regions that have been mined by the SUFCO Mine (Manti-La Sal National Forest, 1999). Groundwater from Pines 303 has a mean residence time of approximately 3,500 to 4,000 years (Mayo and Associates, 1999). It was predicted in both the Pines Tract EIS (Manti-La Sal National Forest, 1999) and the PHC determination (Mayo and Associates, 1999) that interception of groundwater in the SUFCO Mine could impact the flow at Pines 303. Although Pines 303 has not been directly undermined, groundwater in sandstone channels in the mine roof was intercepted during mining operations at the SUFCO Mine.

It is possible that after mining in the area ceases and as climatic conditions return to normal, discharge at Pines 303 could potentially resume. Pines 303 will continue to be monitored in the future to monitor this possibility.

CREEKS

SUFCO 090

The upper Main Fork of Box Canyon Creek is monitored at station SUFCO 090. The discharge hydrograph for SUFCO 090 is presented in Figure 2H. It is apparent from Figure 2H that the discharge in upper Box Canyon Creek has declined steadily since 1998 in response to the regional drying-out of the area. The discharge at SUFCO 090 correlates well with the plot of the PHDI for the region (Figure 2H). The water quality in upper Box Canyon Creek (as reflected by the plot of electrical

conductance; Figure 2H) has remained essentially constant over the period of record.

There are no indications of any mining-related impacts to water quality or quantity in upper Box Canyon Creek.

Pines 407

The Main Fork of Box Canyon Creek at the confluence with the East Fork is monitored at site Pines 407. The discharge hydrograph for Pines 407 is shown in Figure 2I. It is apparent in Figure 2I that the discharge in Box Canyon Creek was relatively constant from 1997 through 2001. Beginning in 2002, discharge in the creek increased substantially. The electrical conductivity likewise increased somewhat during this same period, possibly a result of an increased contribution of groundwater to the creek . Recent discharge data from 2003 suggest that the discharge in the Main Fork may now be returning to earlier levels. The observed increase in electrical conductivity is likely the result of an influx of groundwater with a TDS concentration greater than that of the creek.

In an attempt to identify the source of the increased flow to Box Canyon Creek, the Box Canyon drainage a short distance above Pines 407 was traversed during August 2003. It was apparent that spring discharge and bank seepage along east side of the canyon bottom within the Blackhawk Formation has increased from that observed during spring and seep surveys in 1997.

As discussed previously, increased discharges from bedrock groundwater systems in the Box Canyon area as a result of bedrock fracturing were predicted in both the Pines Tract EIS (Manti-La Sal National Forest, 1999) and PHC determination (Mayo and Associates, 1999). The observed increase in discharge at Pines 407 could be a result of this phenomenon.

Pines 106

The headwaters of the East Fork of Box Canyon Creek is monitored at Pines 106. This monitoring location is situated at a bedrock high in the stream channel near the base of the Castlegate Sandstone. Pines 106 is located just upstream of the confluence with the east fork of the East Fork. Commonly, the East Fork is dry within 100 yards or less upstream of Pines 106.

The discharge at Pines 106 is meager, with flows rarely exceeding 5 gpm. Seasonal variation in discharge is also evident. The flow history at Pines 106 correlates well with the plot of the PHDI (Figure 2J). There are no indications of mining-related impacts to water quantity or quality at Pines 106.

Pines 403 Pines 403 is located at the mouth of Box Canyon Creek at the confluence with Muddy Creek. The discharge at Pines 403 represents the combined total of discharge from the Main Fork and the East Fork of Box Canyon Creek as well as any other inflows that may occur in the lower reaches of The Box.

It is apparent that with the exception of an increase in flow that began at the end of 2001, the discharge patterns and water quality at Pines 403 have remained fairly consistent (Figure 2L). The increases in flow measured at Pines 403 during 2002 are primarily the result of increases in the discharge from the Main Fork of Box Canyon as measured at Pines 407 discussed above.

Commonly, the discharge measured at Pines 403 is similar to the combined discharge from the upstream locations measured at Pines 407 and Pines 408. However, the discharge measurements at Pines 407 and Pines 408 are rarely performed at the same time as the measurement at Pines 403. Therefore, a direct comparison of these measurements is not meaningful. However, the fact that, generally speaking, the discharge at the downstream location is similar to that at the combined upper stations indicates that there is little contribution to the stream flow in Box Canyon Creek from surface water or groundwater in the lower Box Canyon area.

CONCLUSIONS

From the above discussion, it is apparent that, as predicted in the Pines Tract EIS (Manti-La Sal National Forest, 1999) and in the Probable Hydrologic Consequences of coal mining determination (Mayo and Associates, 1999), with a single possible exception, longwall mining in and adjacent to the Pines area has not resulted in any detrimental impacts to water quality or discharge rates from springs, seeps, or creeks in the Pines area.

Some increases to spring and creek discharge rates have occurred that are likely due to longwall coal mining in nearby areas. These increases were predicted in both the Pines Tract EIS and PHC determination. The observed increase are likely due to enhanced groundwater recharge resulting from mining-related bedrock fracturing, or from the fracture enhancement of the hydraulic conductivity of rocks supporting groundwater systems that provide discharge to springs and creeks in the area.

Discharge from Pines 303 ceased in 2002. This possibility of this occurrence was predicted in both the Pines Tract EIS and the PHC determination. While it is possible

that the regional drought may have partially contributed to this occurrence, it seems likely that the spring went dry primarily as a result of mining activities.

REFERENCES CITED

Mayo and Associates, 1999, Investigation of surface-water and groundwater systems in the Pines Tract area, Sevier County, Utah: Probable hydrologic consequences of coal mining in the Pines Tract and recommendations for surface water and groundwater monitoring, unpublished consulting report prepared for Canyon Fuel Company, LLC, Salina, Utah.

Mayo and Associates, 2000, unpublished consulting data collected for Canyon Fuel Company, LLC, Salina, Utah.

Manti-La Sal National Forest, 1999, Final Environmental Impact Statement, Pines Tract.

NCDC (National Climatic Data Center), 1998, Online monthly climatic parameters: www.ncdc.noaa.gov/coop-precip.html.

Please feel free to contact me if you have any questions in this regard.

Sincerely,

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Principal Hydrogeologist

Utah PG #5373615-2250

Table 1 Discharge and water quality of springs and streams in the Box Canyon area.

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
SPRINGS																		
Pines 105	6/17/1997	12	7	6.31	252	130					24	5	8	1	94	<5	5	9
Pines 105	6/28/1997	10	5.2	7.1	202	140					25	5	8	1	87	<5	13	8
Pines 105	8/28/1997	2.61	5.5	7.5	306	120		3			23	5	8		92	<5	10	9
Pines 105	11/3/1997	10	5.3	7.5	193	120	28	4.5			22	5	7	<1	88	<5	9	9
Pines 105	6/29/1998	3	6.9	8.35	260	135		62.5			23	5	8	4	100	<5	11	11
Pines 105	9/16/1998	11.1	5.5	7.7	190	157		0.2			23	5	8	<1	98	<5	13	11
Pines 105	04-Nov-98	8.33	5	6.7	170	142		6.2			22	5	8	<1	92	<5	10	8
Pines 105	22-Jun-99	9.7	4.4	7.2	193	124		1.4			22	6	7	<1	91	<5	11	8
Pines 105	25-Aug-99	7.8	4.9	6.5	195	119		1			21	6	6	<1	87	<5	12	8
Pines 105	27-Oct-99	7.7	3.7	6.75	188	120					21	6	9	<1	90	<5	12	8
Pines 105	6/1/2000	10.0	4.4	7.86	148													
Pines 105	8/23/2000	5.88	4.7	7.34	189	117					22	6	9	<1	88	<5	8	5
Pines 105	11/16/2000	7.3	4.4	7.39	118	137					21	5	7	<1	86	<5	11	8
Pines 105	6/13/2001	7.89	5.3	6.93	158													
Pines 105	8/22/2001	5.4754	5.4	7.15	180													
Pines 105	10/1/2001	3.66	5.2	6.64	265													
Pines 105	5/9/2002	5.52	4.7	6.77	189													
Pines 105	9/21/2002	3.56	5.5	8.27	197													
Pines 105	10/9/2002	5.06	5.8	7.45	147													
Pines 105	6/6/2003	4.89	5	7.12	180													
Pines 105	8/5/2003	2.94	5.1	7.21	189													
Pines 206	6/27/1997	3	7.7	8.2	377	300		0.4			66	27	11	1	358	<5	53	14
Pines 206	8/28/1997	3.23	12	7.6	535	300		0.2			63	26	10		230	<5	100	13
Pines 206	10/29/1997	2.4	6.8	7.4	362	310	180	48			59	24	10	1	195	<5	52	14
Pines 206	6/29/1998	3.2	5.9	7.81	460	316		0.6			55	25	13	1	282	<5	56	18
Pines 206	9/16/1998	2.7	6.8	7.9	450	345		0.7			63	26	10	1	285	<5	52	14
Pines 206	11/4/1998	3	5.9	7.6	480	350		15			60	25	11	1	276	<5	49	10
Pines 206	6/22/1999	3.1	5.6	7.5	511	322		37.2			61	28	11	<1	291	<5	52	13
Pines 206	8/25/1999	2.8	6.8	7.5	538	325					59	26	9	1	269	<5	52	13
Pines 206	10/27/1999	3	6.1	7.7	526	311					61	27	11	1	276	<5	53	13
Pines 206	6/2/2000	3	5.3	7.6	509	336					63	26	10	<1	269	<5	53	12
Pines 206	8/22/2000	3.87	6.4	8.09	506	280					59	25	9	1	272	<5	51	11
Pines 206	11/14/2000	3.3	6	7.57	333	312					61	25	9	1	269	<5	50	12

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
Pines 206	6/13/2001	3.57	5.6	7.73	491													
Pines 206	8/22/2001	3.1596	7.1	7.38	499													
Pines 206	10/1/2001	3.01	7.2	7.54	501													
Pines 206	5/18/2002	3.13	5.9	7.43	504													
Pines 206	9/21/2002	2.93	7.1	8.15	496													
Pines 206	10/9/2002	3.01	7.1	8.03	487													
Pines 206	6/8/2003	3.05	5.8	7.72	437													
Pines 206	8/5/2003	2.63	6.9	7.51	506													
Pines 209	6/27/1997	<1	7.4	8.1	270													
Pines 209	10/29/1997	4	6.3	7.4	251													
Pines 209	10/27/1999	9.4	5.4	7.7	374	224					45	19	8	<1	200	<5	34	8
Pines 209	6/2/2000	9.7	5.1	7.6	365	236					47	18	7	<1	197	<5	33	8
Pines 209	8/22/2000	12.6	5.9	7.99	366	194					44	17	7	<1	196	<5	33	7
Pines 209	11/14/2000	12.8	5.4	8.84	202	234					44	17	7	<1	200	<5	34	8
Pines 209	6/13/2001	14.6	5.9	7.86	374	230					46	18	8	<1	194	<5	37	9
Pines 209	8/22/2001	12.207	6.4	7.65	371	240					45	18	8	1	198	<5	36	9
Pines 209	10/1/2001	12.4	6.5	7.69	374	242					47	18	9	1	201	<5	35	9.1
Pines 209	5/18/2002	13.2	6	7.72	377													
Pines 209	9/21/2002	11.3	6.5	8.24	378													
Pines 209	10/9/2002	12.1	6.4	8.29	379													
Pines 209	6/8/2003	10.8	5.6	7.81	319													
Pines 209	8/5/2003	8.32	6.2	7.82	367													
Pines 212	6/27/1997	1	7.9	7.5	213													
Pines 212	10/29/1997	4.6	5.1	7.8	191													
Pines 212	6/29/1998	3	6.9	8.35	260	164		0.4			28	11	15	2	104	<5	46	14
Pines 212	9/16/1998	4	7.5	8.5	220	218		0.7			29	9	15	1	114	<5	50	14
Pines 212	11/4/1998	6.38	2.7	8.11	270	198		3.1			29	10	15	2	124	<5	42	12
Pines 212	6/22/1999	5.9	6.9	7.9	304	195		12.3			29	11	15	1	115	<5	45	11
Pines 212	8/25/1999	6.5	8.2	8.1	305	184		48.2			28	11	14	1	111	<5	46	12
Pines 212	10/27/1999	6.4	5.3	8.2	291	185					28	12	16	1	109	<5	47	12
Pines 212	6/2/2000	6.25	4.7	8.3	297	200					30	11	15	<1	110	<5	48	11
Pines 212	8/22/2000	8.33	8.2	8.14	292	155					29	10	15	1	102	<5	46	11
Pines 212	11/14/2000	8.6	2.4	8.02	155	212					31	11	17	1	124	<5	55	14
Pines 212	6/13/2001	8.7	5.5	8.23	360													
Pines 212	8/22/2001	8.1682	9	7.94	212													
Pines 212	10/1/2001	8.33	8	7.84	336													

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
Pines 212	5/18/2002	8.33	6.9	8.04	348													
Pines 212	9/21/2002	7.14	7.7	8.32	322													
Pines 212	10/9/2002	7.37	6.7	8.58	331													
Pines 212	6/8/2003	7.15	7.6	8.13	260													
Pines 212	8/5/2003	6.10	9	8.39	325													
Pines 214	6/27/1997	2	7.4	8.8	350	230					40	13	7	1	188	<5	22	6
Pines 214	8/28/1997	1.33	10	8.2	364	230		2.1			47	16	8		227	<5	14	3
Pines 214	11/3/1997	1.7	0.5	8.1	206	210	13	1			44	15	7	<1	218	<5	17	8
Pines 214	6/29/1998	2	11.1	8.26	290	193		0.8			42	14	8	1	207	<5	17	10
Pines 214	9/16/1998	0.61	12.2	7.8	340	248		2.6			46	15	8	<1	215	<5	19	9
Pines 214	04-Nov-98	2.03	-0.1	8.25	280	231		1.9			44	15	8	<1	216	<5	16	8
Pines 214	23-Jun-99	3.4	8	8.4	365	204		0.6			47	17	9	<1	212	<5	20	8
Pines 214	25-Aug-99	1.8	10.5	8.4	385	220		3			45	16	7	<1	205	<5	19	8
Pines 214	27-Oct-99	2.6	1.8	8.5	340	210					44	16	9	1	210	<5	18	8
Pines 214	6/1/2000	2.63	11.4	8.3	364													
Pines 214	8/23/2000	2.05	9.6	8.29	372	223	<5.		7.8	<2.	45	16	8	<1	216	<5	16	7
Pines 214	11/16/2000	1.89	-0.4	7.82	108	235					47	16	8	<1	216	<5	18	8
Pines 214	6/12/2001	2.07	8.8	8.33	351													
Pines 214	8/21/2001	2.3562	11.6	8.57	364													
Pines 214	10/1/2001	2.42	6.3	8.34	339													
Pines 214	5/9/2002	3.21	1.4	8.2	348													
Pines 214	9/21/2002	2.53	11.3	8.87	341													
Pines 214	10/9/2002	2.88	7.8	8.77	346													
Pines 214	6/6/2003	3.11	7.1	8.43	336													
Pines 214	8/5/2003	2.02	11.4	8.46	342													
Pines 218	6/27/1997	<1																
Pines 218	10/29/1997	0																
Pines 218	6/23/1999	seep	8.2		136													
Pines 218	8/25/1999	<0.1	9.9	7.3	165													
Pines 218	10/28/1999	dry																
Pines 218	6/2/2000	0.1	7	7.95	161													
Pines 218	8/22/2000	0.1	10.7	7.87	119													
Pines 218	11/14/2000	0.1	4.1	7.77	134													
Pines 218	6/13/2001	0.032	9.4	7.24	172													
Pines 218	8/21/2001	0.0606	15.4	7.06	237													
Pines 218	10/1/2001	0.0217	8	7.04	220													

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
Pines 218	5/9/2002	0.018	12.3	7.82	154													
Pines 218	9/21/2002	0.0316	8.3	7.82	167													
Pines 218	10/9/2002	0.0198	7.1	7.62	149													
Pines 218	6/6/2003	0	---	---	---													
Pines 218	8/5/2003	0	---	---	---													
Pines 303	6/27/1997	2.6	9	8.5	275	240		2.9			49	19	5	1	222	<5	32	9
Pines 303	8/27/1997	3.16	9	8.2	387	220		1.3			49	19	6		217	<5	27	10
Pines 303	10/29/1997	3.2	7.6	8.4	410	240	<5	0.6			45	19	6	1	232	<5	29	15
Pines 303	6/30/1998	2.24	8.3	8.29	530	218		1.4			45	19	6	1	221	<5	32	11
Pines 303	9/16/1998	3	8.6	8.1	360	272		5			49	18	5	1	222	<5	34	9
Pines 303	11/18/1998	3.55	6.8	8.04	370	251		1.5			49	21	7	1	246	<5	33	5
Pines 303	6/23/1999	2.3	8.6	8.2	415	231		0.8			49	21	6	<1	214	<5	34	8
Pines 303	8/25/1999	2.4	8.5	8.3	400	242		2.3			47	20	5	1	213	<5	31	8
Pines 303	10/27/1999	2.7	7.8	8.3	398	231					49	21	6	11	215	<5	32	9
Pines 303	6/1/2000	0.71	8.5	8	428	267					52	22	6	2	227	<5	36	9
Pines 303	8/22/2000	0.746	9.2	8.21	425	226					49	20	5	2	225	<5	34	8
Pines 303	12/6/2000	0.31	1.5	8.2	464	321					55	26	8	1	256	<5	67	16
Pines 303	6/12/2001	0.133	8.5	8.34	493													
Pines 303	8/21/2001	0																
Pines 303	10/1/2001	0																
Pines 303	5/9/2002	0																
Pines 303	9/21/2002	0																
Pines 303	10/9/2002	0																
Pines 303	6/6/2003	0																
Pines 303	8/5/2003	0																
CREEKS																		
SUFCO 090	6/5/1995	35.904	20.4	7.92	209	170									70	<5	16	7
SUFCO 090	8/24/1995	42.6	16.5	7.83	210	120					24	5	6	3	92	<5	9	6
SUFCO 090	10/3/1995	53.856	16.4	8.12	203	40									85	<5	6	8
SUFCO 090	8/26/1996	21.542	15.9	8.75	182	80									58	7	10	7
SUFCO 090	10/21/1996	35.904	0.75	7.81	201	89									74	<5	13	14
SUFCO 090	6/2/1997	31.2	18.8	8.02	231	80									81	<5	14	7
SUFCO 090	8/18/1997	35.904	20	8.17	209	100									111	<5	12	6
SUFCO 090	10/8/1997	62.832	6.51	7.95	210	110									365	<5	13	8
SUFCO 090	6/20/1998	55.651	22.4	8.11	221				8.6									
SUFCO 090	8/5/1998	26.03	23.1	7.89	219				7.18									

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
SUFCO 090	10/3/1998	27.377	8.23	7.76	221				8.23									
SUFCO 090	6/24/1999	21.094	14.2	7.46	237				6.92									
SUFCO 090	8/12/1999	14.81	13.9	7.92	230													
SUFCO 090	10/4/1999	26.03	13.2	7.55	231				3.89									
SUFCO 090	6/21/2000	0.0008	23	7.2	322				5.01									
SUFCO 090	8/1/2000	1.3464	25.7	7.9	203				4.45									
SUFCO 090	10/6/2000	4.2636	12	7.6	235				4.98									
SUFCO 090	6/13/2001	12	10	7.93	185				9.7									
SUFCO 090	8/21/2001	6.4896	18	7.35	234				5.35									
SUFCO 090	10/1/2001	5.73	13	7.22	230				7.88									
SUFCO 090	5/9/2002	9.47	14.1	7.83	173				7.22									
SUFCO 090	9/21/2002	7.6	12.8	8.14	178				6.54									
SUFCO 090	10/9/2002	6.03	8.9	8.18	172				7.79									
SUFCO 090	6/6/2003	0.36	17.4	7.41	199				5.05									
SUFCO 090	8/5/2003	0																
Pines 106	6/18/1997		8	7.5	411	200					44	14	9	1	177	<5	30	11
Pines 106	8/28/1997	25	18.5	7.9	381	220		3.4			46	16	9		192	<5	27	11
Pines 106	11/3/1997	1	6.3	7.6	420	260	19	4.5	6.3	<2	43	16	8	1	219	<5	39	11
Pines 106	6/29/1998	6.8	23.4	7.55	340	214	14	18	4.7	<2	40	13	9	4	186	<5	31	13
Pines 106	9/16/1998	2.2	20.3	7.4	380	274	10	3.3	6.1	<2	48	17	9	2	204	<5	40	13
Pines 106	11/4/1998	3.53	4.5	6.6	320													
Pines 106	6/22/1999	3.3	11	7.8	413													
Pines 106	8/25/1999	1.2	15.2	6.7	151													
Pines 106	10/27/1999	1.4	3.9	7.5	295													
Pines 106	6/1/2000	1.25	15.1	8.1	404													
Pines 106	8/23/2000	1.09	13.9	7.16	277	241			8.69	<2	45	18	10	1	213	<5	30	10
Pines 106	11/16/2000	0.13	-0.3	7.36	296	256	22		10.7	<2	45	17	9	<1	201	<5	34	11
Pines 106	6/13/2001	1.36	11.4	7.29	315	248			7.47	<2	50	19	10	1	206	<5	39	11
Pines 106	8/21/2001	0.7809	11.5	7.23	490	279			7.68	<2	48	19	9	1	214	<5	33	11
Pines 106	10/1/2001	2.42	14	7.11	476	255			6.23	<2	49	18	10	1	215	<5	33	10.8
Pines 106	5/9/2002	2.07	15.4	7.77	409	239			6.54	<2	51	18	10	1	214	<5	35	11
Pines 106	9/21/2002	1.4	16.5	8.24	402	248			6.65		48	19	11	1	211	<5	31	10
Pines 106	10/9/2002	0.556	12.7	7.84	404	234			6.18	<2	49	18	11	1	206	<5	35	12
Pines 106	6/6/2003	0.809	18.6	8.51	358				7.21									
Pines 106	8/5/2003	3.98	17.8	7.86	341				6.27									
Pines 403	6/27/1997	40																

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
Pines 403	8/27/1997	104	14.5	8.5	448	270		1.6		<2	50	22	10		246	<5	37	14
Pines 403	10/22/1997	81	2.3	8.26	519	280	<5	1.2	5	<2	54	27	11	1	259	<5	49	13
Pines 403	6/30/1998	69	13.5	8.52	450	313	217	0.7	6.7	<2	49	27	12	2	255	<5	65	21
Pines 403	9/17/1998	60	16	8.1	470	330	5	3.9	3.7	<2	55	26	11	2	255	<5	56	15
Pines 403	11/18/1998	184	0.3	7.9	360	300	<5	2.4	11	<2	51	26	12	2	227	5	48	<1
Pines 403	6/23/1999	59.2	19.2	8.5	527	298	<5	1.8	6.2	<2	52	30	13	1	231	8	65	15
Pines 403	8/25/1999	47	14.6	8.6	495	294	<5	4.5	6.3	<2	50	27	11	1	230	8	49	13
Pines 403	10/28/1999	56.3	0.7	8.43	467	276	19	1.5	5.2	<2	51	25	12	1	239	<5	52	12
Pines 403	6/1/2000	39.9	15.9	8.15	527	321			6.68	<2	56	29	11	<1	244	<5	60	13
Pines 403	8/21/2000	37.9	15.1	7.81	496	298			6.68	<2	52	25	11	2	259	<5	45	12
Pines 403	12/6/2000		-0.5	8.3	524	361			11.2	4	58	28	13	1	282	<5	51	12
Pines 403	6/17/2001	65	12.9	8.52	502	307			8.63	<0.2	54	28	13	1	239	8	71	15
Pines 403	9/7/2001	26.614	9.8	8.53	479	279			8.33	<2	51	24	12	2	239	<5	54	14.6
Pines 403	11/27/2001	248	0.1	8.55	727	504			8.26	<2	66	56	21	2	340	<5	128	23.6
Pines 403	5/18/2002	174	9.6	8.35	641	365			8	<2	54	43	13	2	291	8	82	14
Pines 403	9/26/2002	141	7.3	8.45	617	395			6.91	<2	54	47	13	1	309	8	82	12
Pines 403	11/18/2002	131	0.1	8.57	605	420			8.44	<2	59	46	12	2	329	5	92	13
Pines 403	6/8/2003	100.3	14.8	8.53	612				6.5									
Pines 407	10/29/1997	39																
Pines 407	6/29/1998	38.7	15.3	8.53	360	240	<5	3.1	4.4	<2	43	18	10	2	168	24	43	13
Pines 407	9/16/1998	24.3	12.1	8.4	340		10	6.1	6.3	<2	46	17	9	2	209	<5	42	12
Pines 407	11/18/1998	67.3	0.2	7.8	320	231	<5	1.2	10.7	<2	43	18	9	1	195	<5	10	48
Pines 407	6/23/1999	49.8	13.6	8.3	434	242	<5	0.9	5.8	<2	48	21	10	1	213	<5	44	10
Pines 407	8/25/1999	43	11.4	8.5	418	251	<5	2	6.1	<2	46	21	10	1	204	<5	40	10
Pines 407	10/27/1999	55.4	0	8.3	382	234	<5	2.1	4.5	<2	45	20	10	1	195	<5	42	10
Pines 407	6/1/2000	38.4	18.5	8.4	432	260			6.86	<2	51	21	10	<1	201	6	46	10
Pines 407	8/22/2000	47.4	15.7	8.39	429	222			7.57	<2	47	20	10	2	216	<5	41	9
Pines 407	11/16/2000	40	0	7.6	336	277			11.2	<2	47	19	10	1	206	<5	50	12
Pines 407	6/12/2001	42.8	15.8	8.62	372				8.94									
Pines 407	8/21/2001	42.771	12.3	8.61	421				7.45									
Pines 407	10/1/2001	47.4	7.7	8.26	416				7.33									
Pines 407	5/9/2002	162	7.6	8.29	611				7.63									
Pines 407	9/21/2002	127	9.4	8.67	579				7.56									
Pines 407	10/9/2002	138	5.4	8.68	636				7.71									
Pines 407	6/6/2003	112	13.6	8.37	631				6.45									
Pines 407	8/5/2003	72.7	16.2	8.25	687				6.01									

Site	Date	Flow gpm	T °C	pH	Cond µS/cm	TDS mg/l	TSS mg/l	Turb NTU	DO mg/l	O&G mg/l	Ca mg/l	Mg mg/l	Na mg/l	K mg/l	HCO3 mg/l	CO3 mg/l	SO4 mg/l	Cl mg/l
Pines 408	10/29/1997	20																
Pines 408	6/29/1998	16.0	18.8	8.54	390	250	<5	2.9	5.2	<2	47	16	10	2	221	<5	36	14
Pines 408	9/16/1998	24.3	15	8.3	390	290	59	15.5	5.5	<2	52	17	10	1	236	<5	34	13
Pines 408	18-Nov-98	11.7	0.4	7.8	300	234	<5	1.6	10.4	<2	46	15	10	2	205	<5	34	14
Pines 408	23-Jun-99	15.3	16.2	8.2	434	255	<5	4.2	5.6	<2	52	19	10	1	228	<5	35	11
Pines 408	25-Aug-99	17	11.5	8.5	428	257	<5	2.8	6.6	<2	51	18	10	<1	221	6	25	11
Pines 408	27-Oct-99	23.6	0.7	8.4	400	246	6	2.7	3.9	<2	49	19	11	1	216	<5	31	12
Pines 408	6/1/2000	9.53	16.3	8.3	405	266	6		6.8	<2	53	17	9	2	213	<5	29	9
Pines 408	8/22/2000	14.6	16.6	8.41	372	196	447		7.47	<2	45	15	10	2	226	<5	19	9
Pines 408	11/16/2000	15	0	7.49	392	262	16		11.5	<2	51	17	10	1	222	<5	34	13
Pines 408	6/12/2001	8.1	15.7	8.66	337				8.98									
Pines 408	8/21/2001	12.252	13.2	8.49	420				7.74									
Pines 408	10/1/2001	17.8	10.9	8.22	404				7.11									
Pines 408	5/9/2002	38.4	10.6	8.26	414				7.14									
Pines 408	9/21/2002	14.6	10.6	8.48	403				7.26									
Pines 408	10/9/2002	21.3	6.9	8.72	402				7.43									
Pines 408	6/6/2003	13.6	16.7	8.41	454				6.31									
Pines 408	8/5/2003	0.217	18.2	8.24	485				5.76									

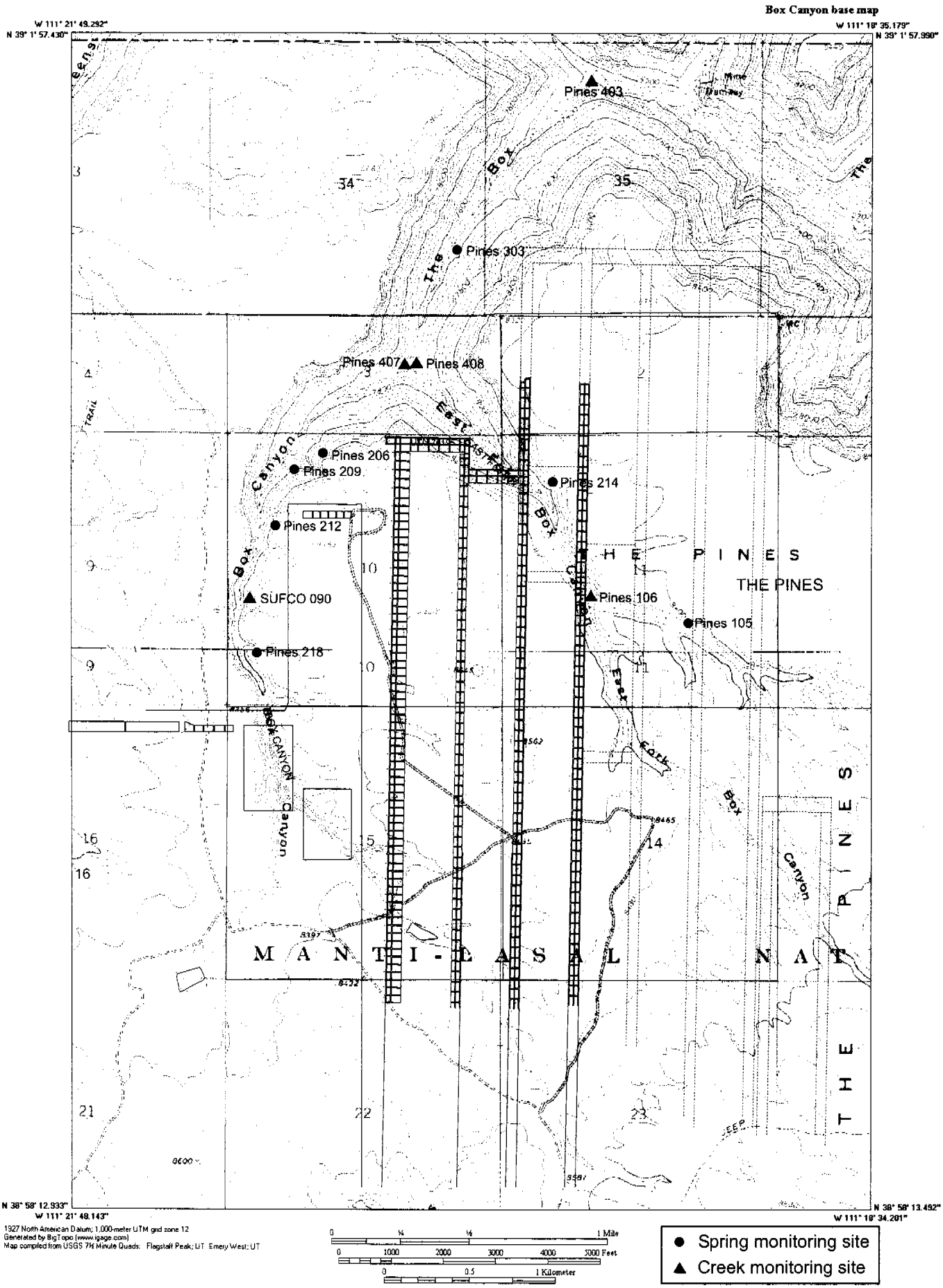

Figure 1 Locations of selected monitoring sites in the SUFCO Mine area.

Spring Pines 105

(Spring in east fork of East Fork of Box Canyon)

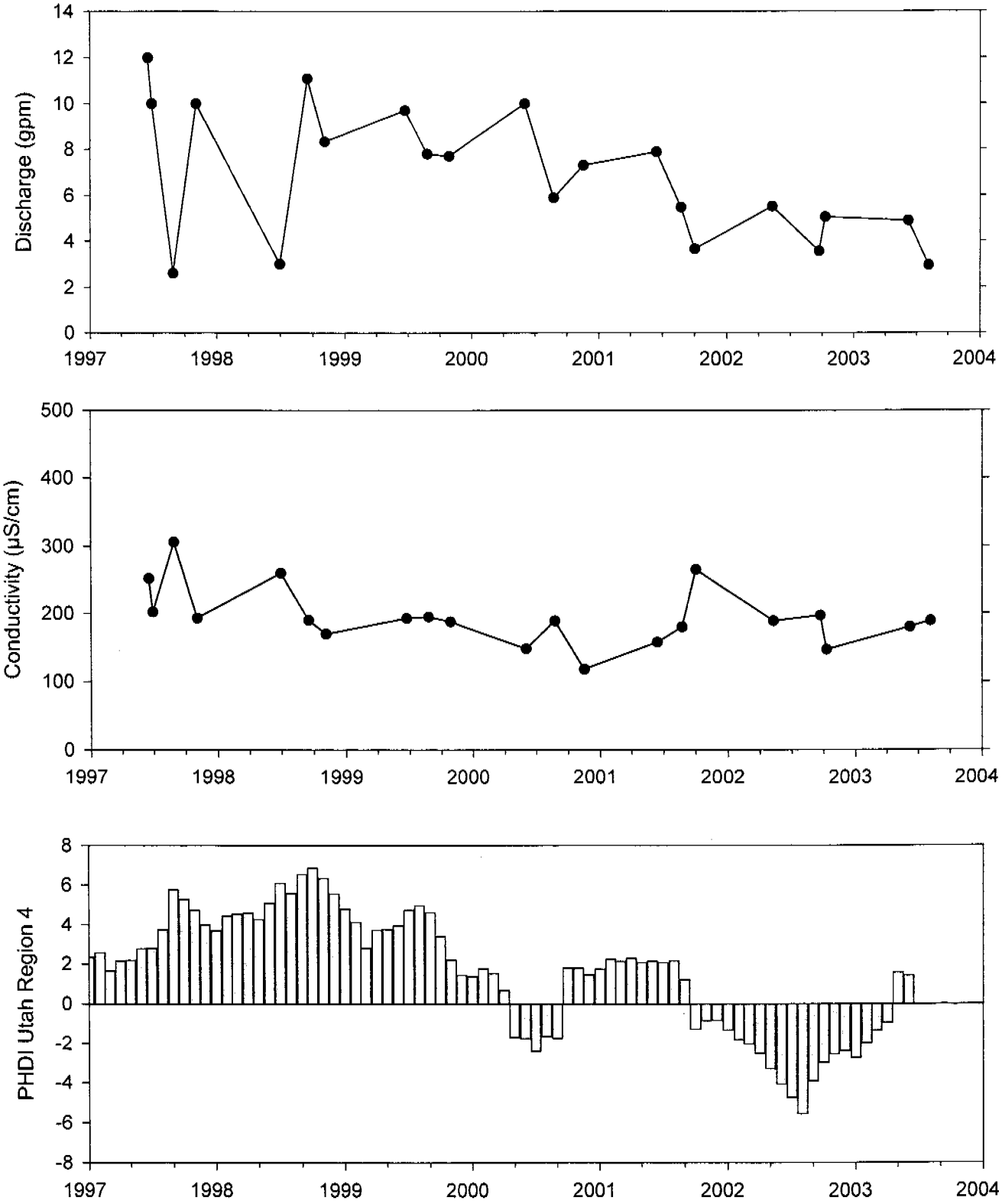

Figure 2A

Spring Pines 206

(Spring in Main Fork of Box Canyon)

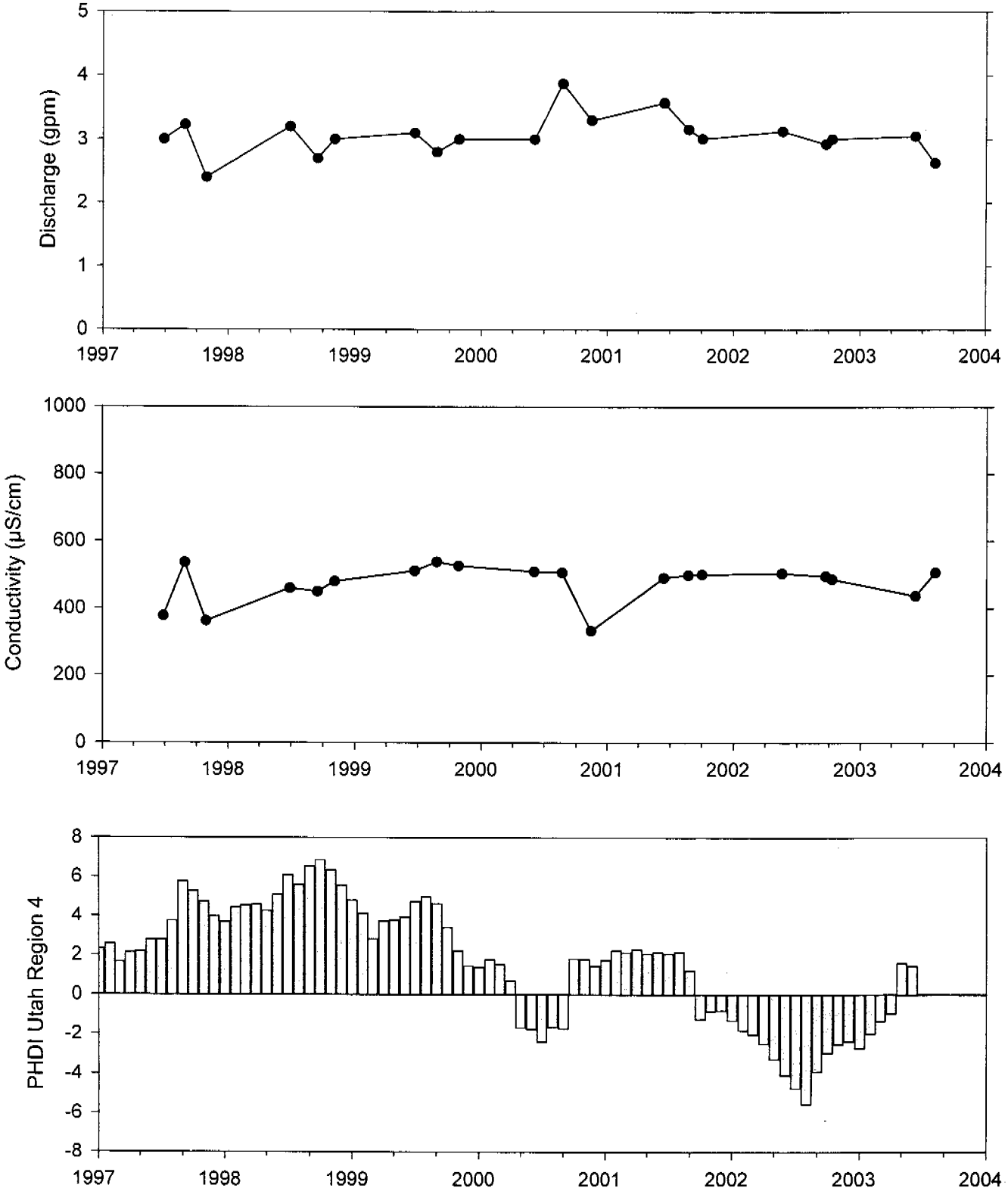

Figure 2B

Spring Pines 209

(Spring in Main Fork of Box Canyon)

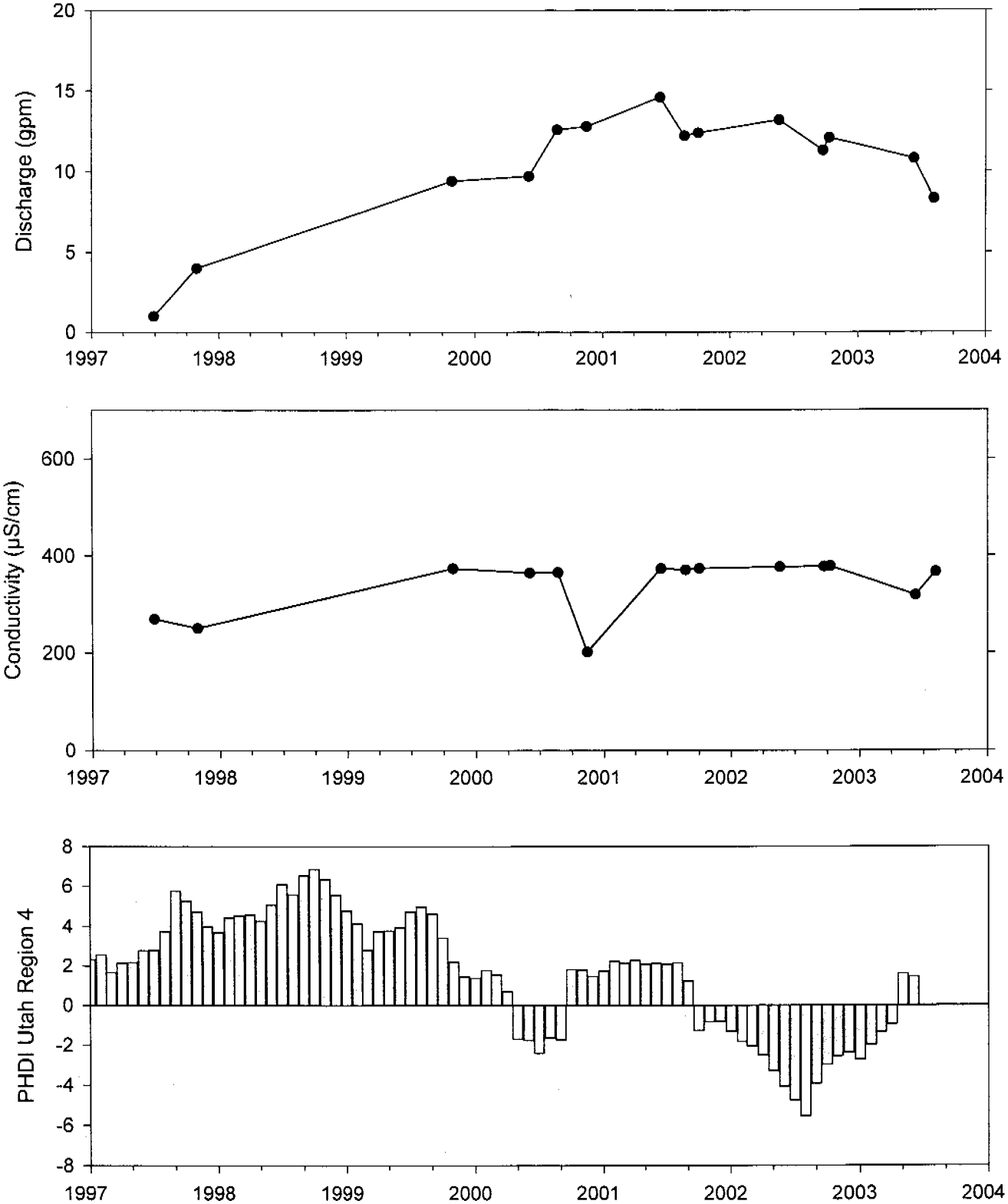

Figure 2C

Spring Pines 212

(Spring in Main Fork of Box Canyon)

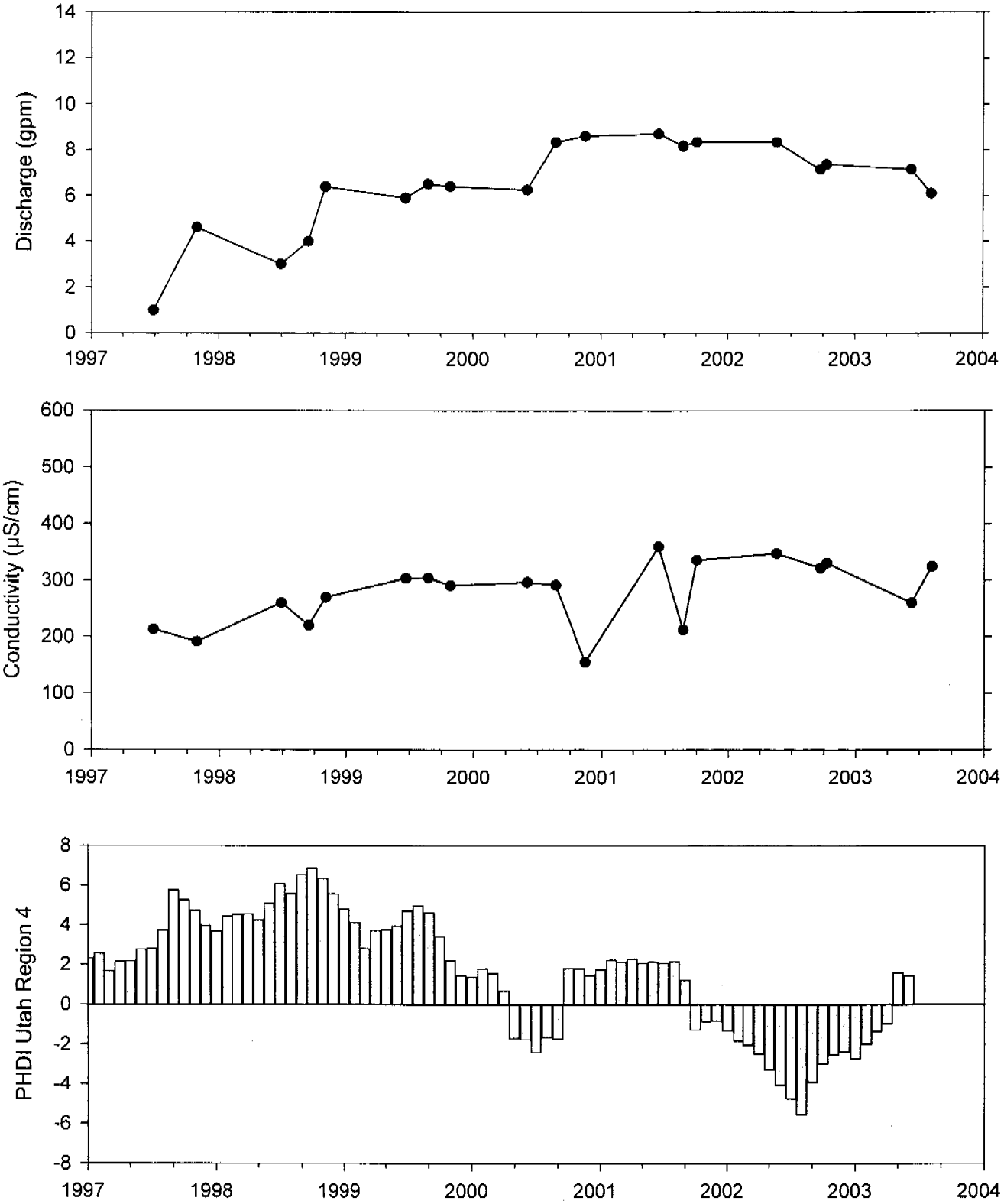

Figure 2D

Spring Pines 214

(Spring in East Fork of Box Canyon)

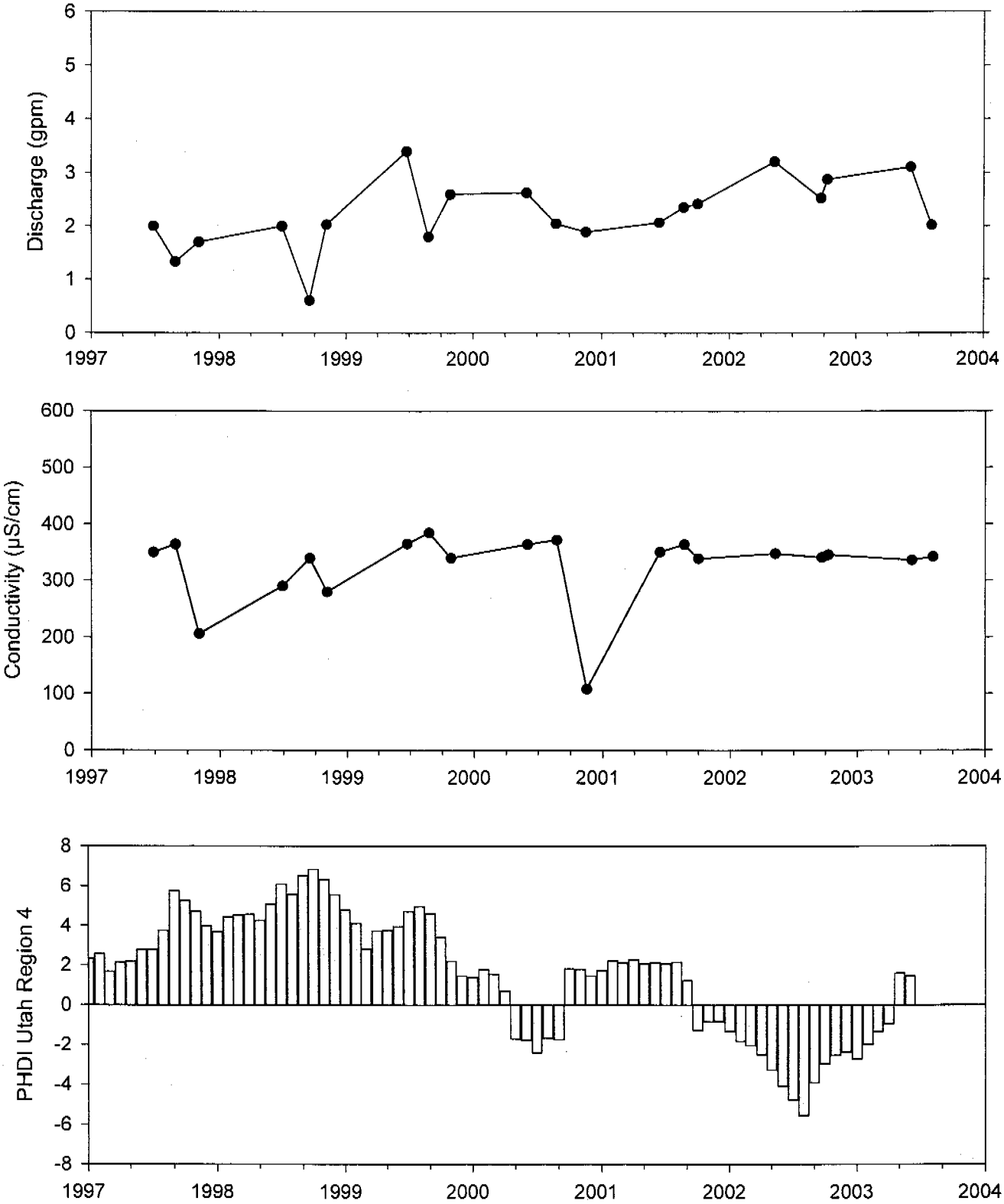

Figure 2E

Spring Pines 218

(Seep in upper Main Fork Box Canyon)

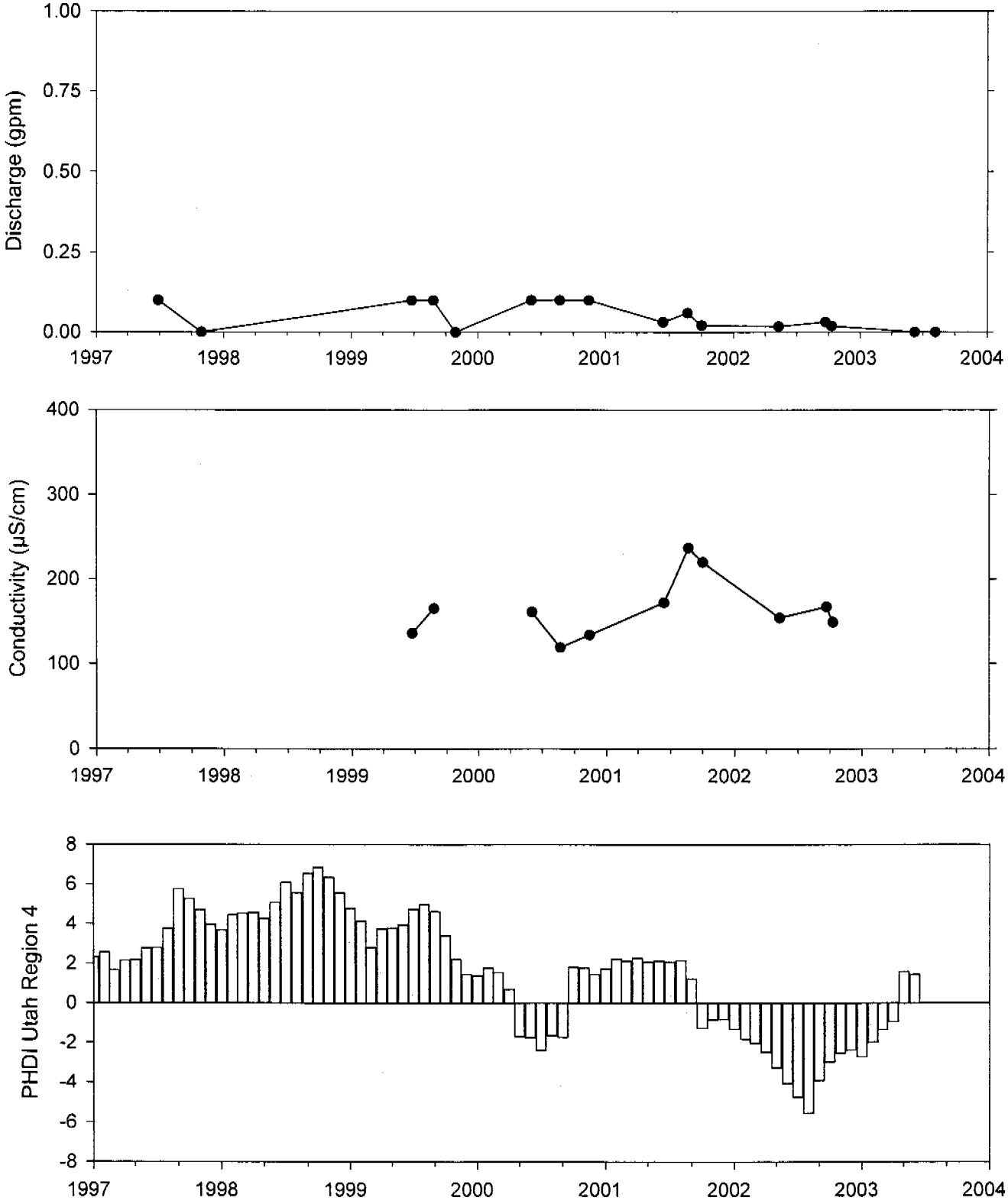

Figure 2F

Spring Pines 303

(Spring in lower Box Canyon)

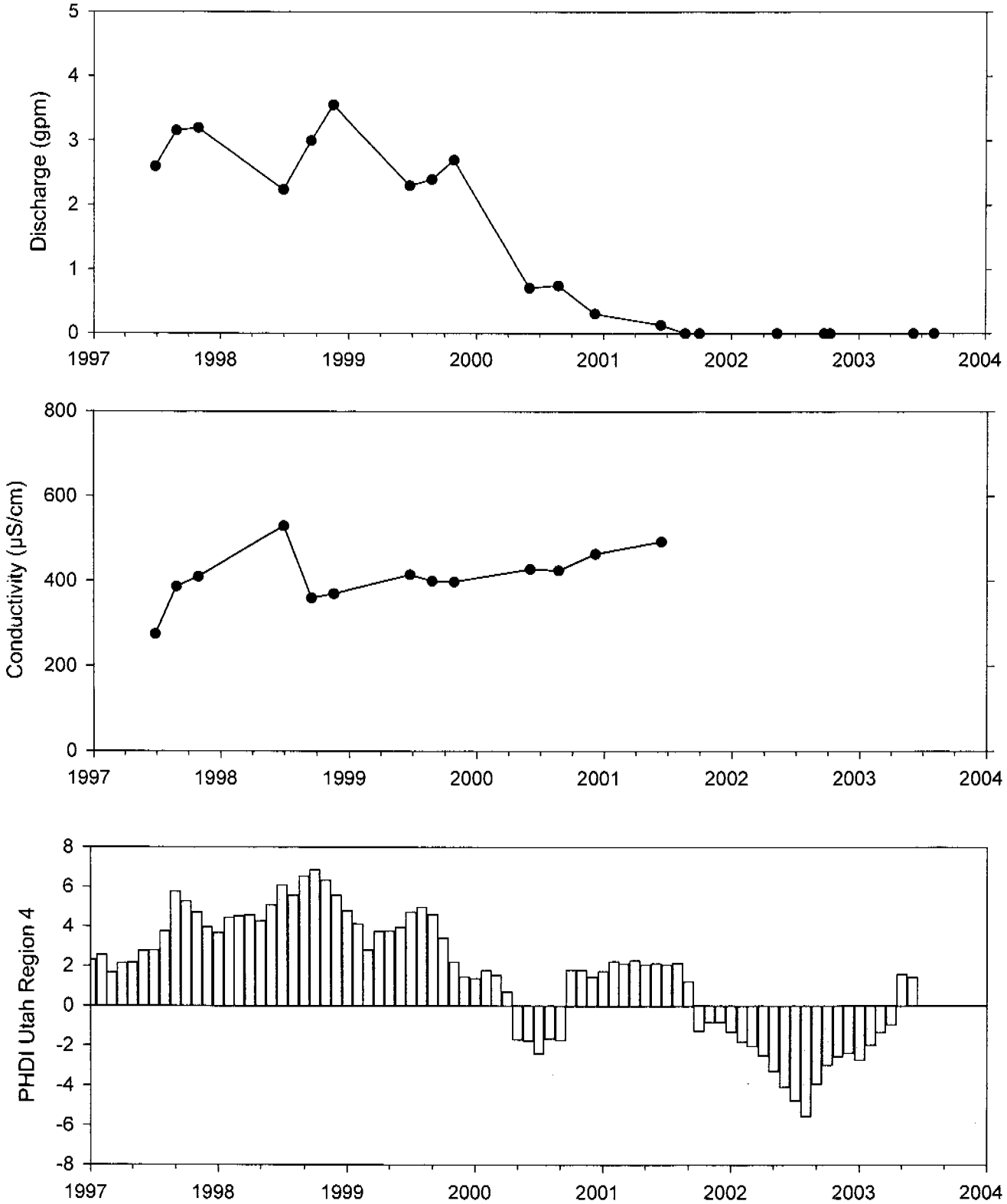

Figure 2G

Creek SUFCO 090

(Upper Main Fork Box Canyon Creek)

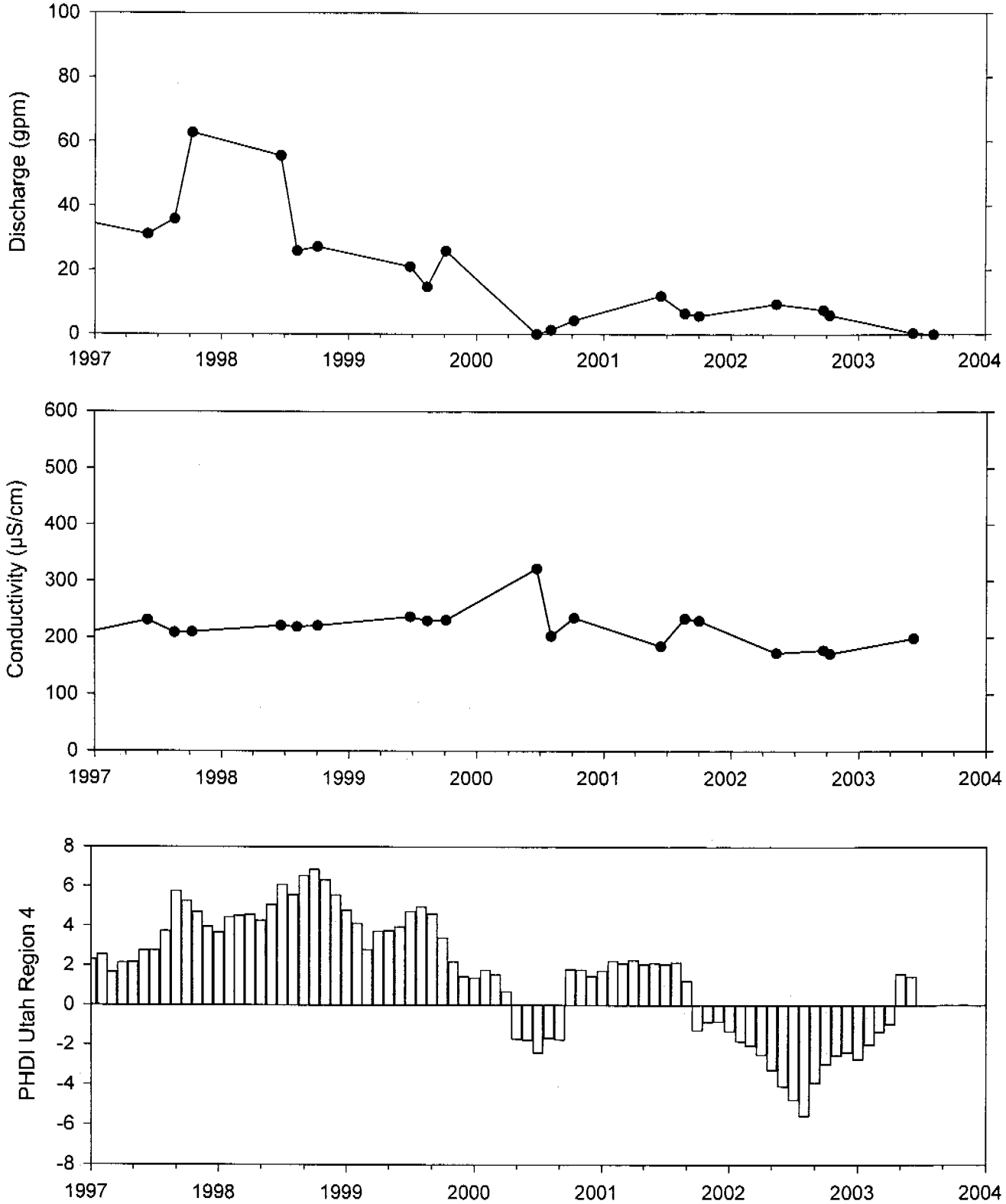

Figure 2H

Creek Pines 407

(Main Fork Box Canyon at East Fork)

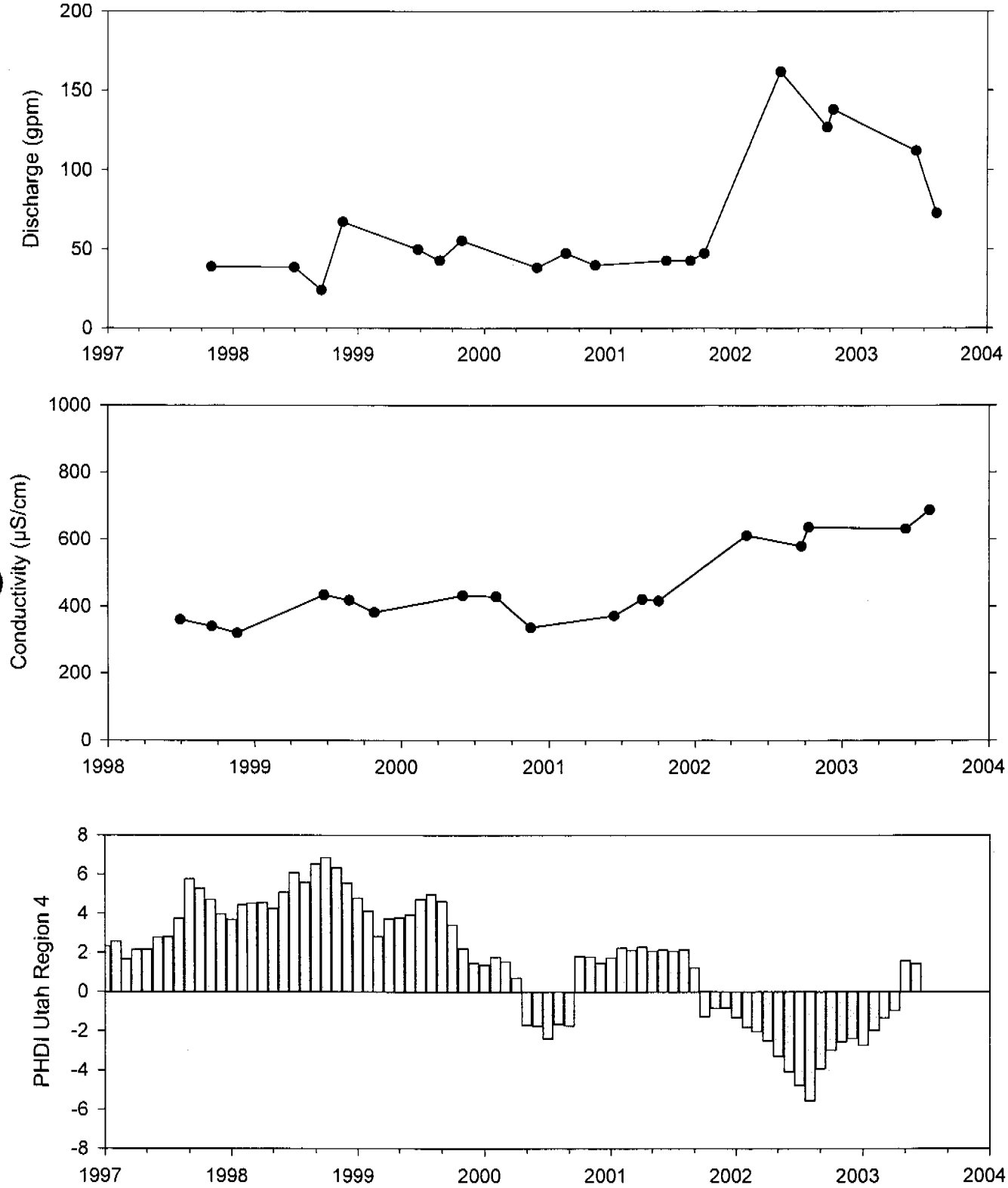

Figure 2I

Creek Pines 106

(Headwaters East Fork Box Canyon Creek)

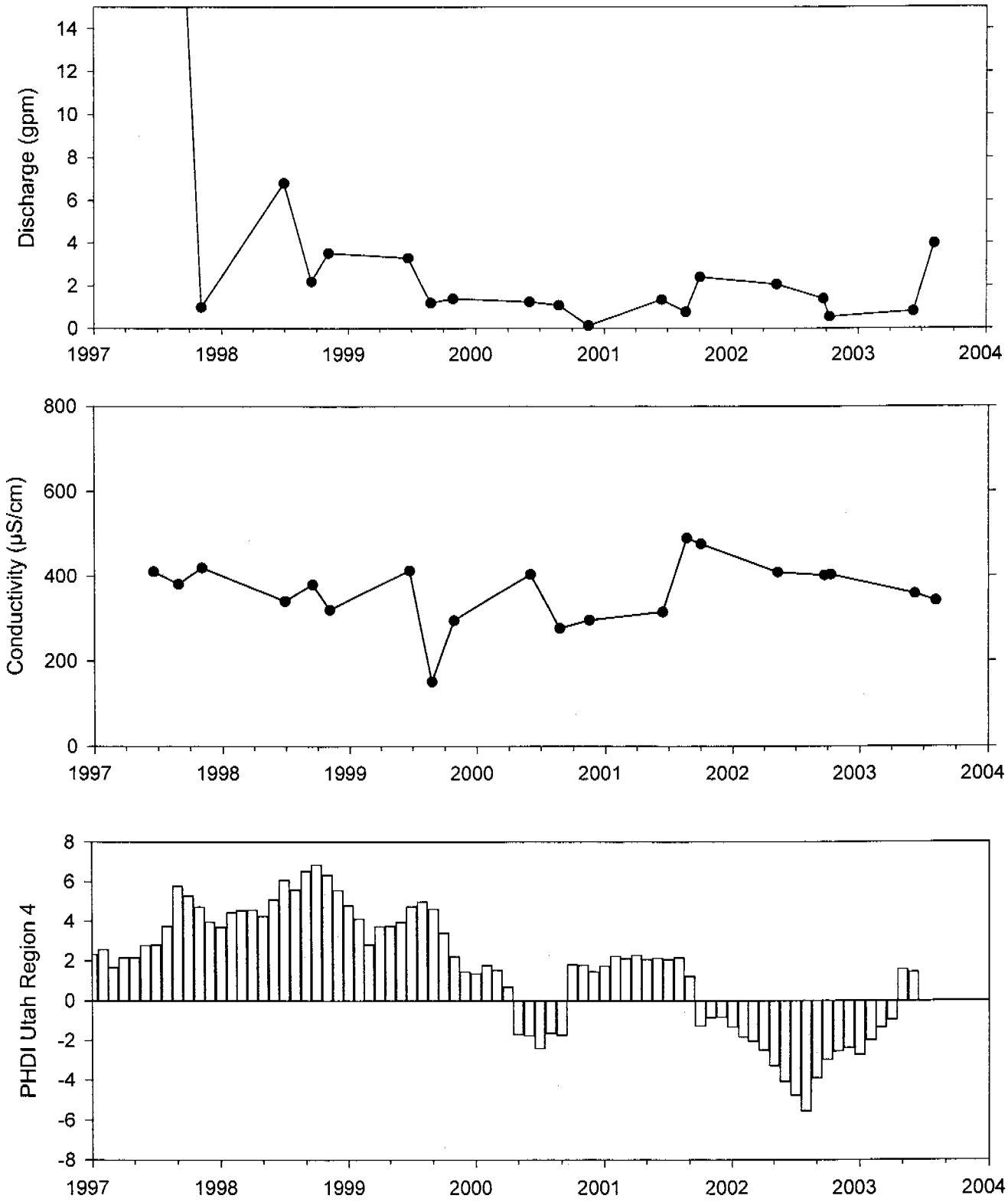

Figure 2J

Creek Pines 408

(Lower East Fork Box Canyon Creek)

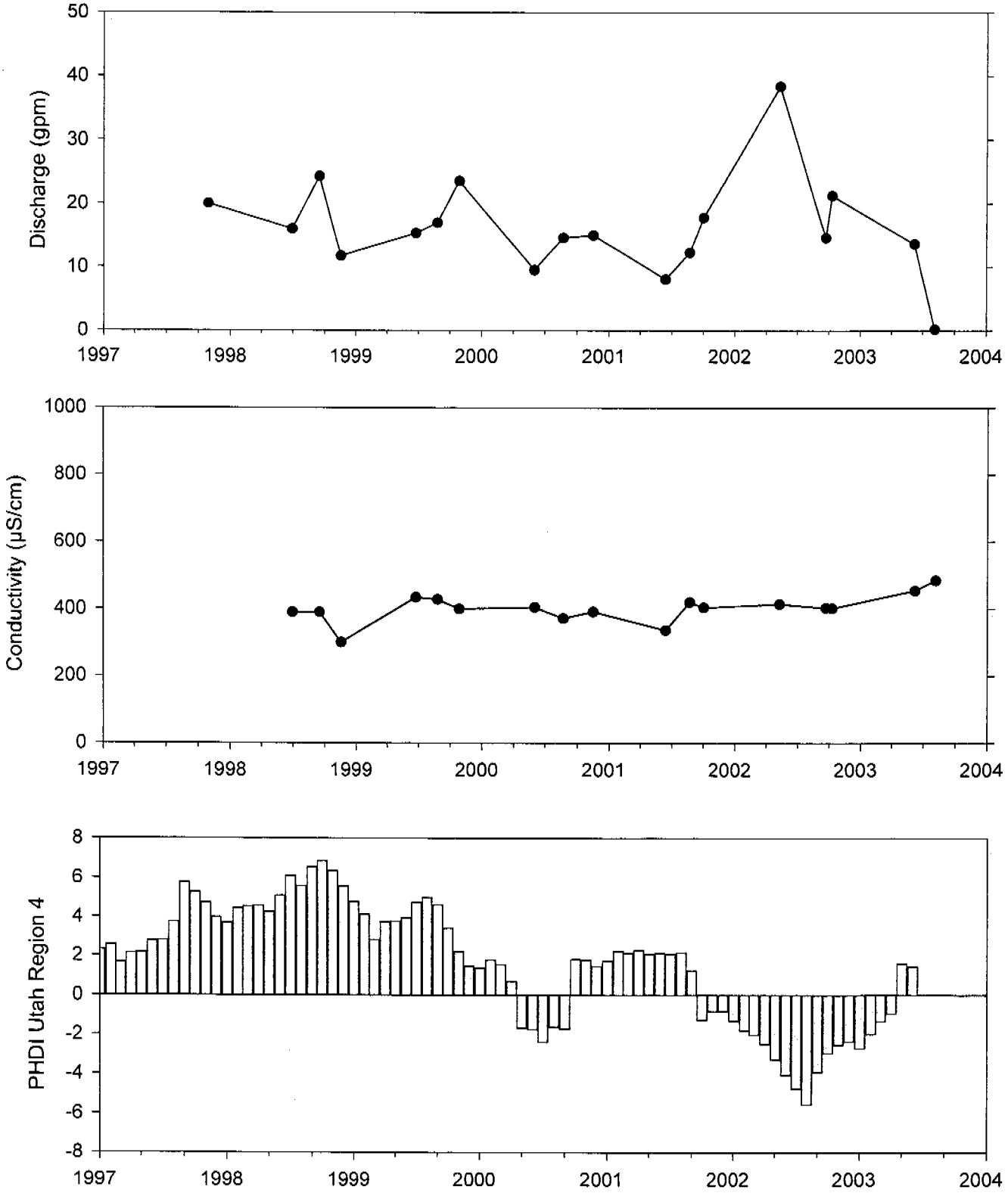

Figure 2K

Creek Pines 403

(Box Canyon Creek at Muddy Creek)

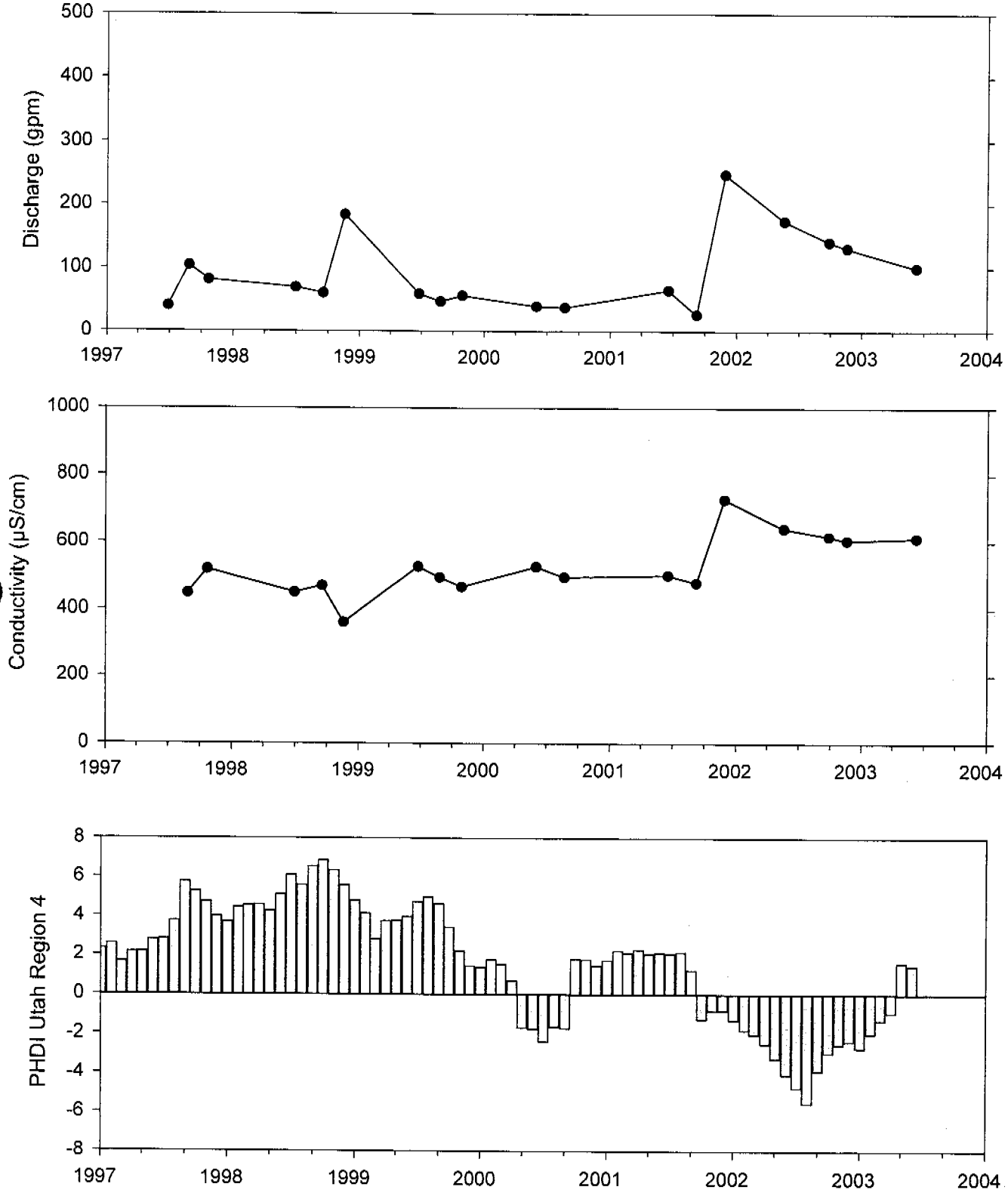

Figure 2L