INDIAN CREEK
STREAM SURVEY REPORT
1999

Quadrangle / Number: Spiral Butte/120, Rimrock Lake/121

Mouth Location: T13N, R13E, Sec. 6 NW SE
Tributary to the North Fork Tieton River
Stream Order: 3
Stream Class: 2
Watershed Code: 17,03,00,02, NFS 24-DA,DB,DC,DD,DF,DG
Total Stream Length: 8.2 miles
Drainage Area: 12,636 acres

Distance Surveyed: 3.5 Miles
Survey Dates: August 12-30, 1999
Surveyors: Jeff Hosman, K. Yuki Reiss

November 25, 1999

METHODOLOGY

The 1999 Indian Creek stream inventory was completed using the methods described in the USFS Stream Inventory Handbook, Level I & II, version 9.9. All of the habitat unit lengths were measured with a string box. Additional information was *measured* or collected at every Nth riffle and pool. At N^{th} riffles, widths were measured, while the remaining widths were estimated. In order for the wood to be counted as large woody debris in the survey, it had to be located within the bankfull width of the stream channel where it could *interact with normal flows*. Information on fish populations was not systematically collected during the survey. Indian Creek is one of the most important bull trout spawning steams on the Naches Ranger District. Annually a team of graduate students from Central Washington University has been monitoring and sampling bull trout and other species in Indian Creek. Preliminary results suggest that Indian creek bull trout are a separate population form the South Fork Tieton bull trout. In addition, South Fork Tieton and adult bull trout are slightly larger. That information is available in other documents. Indian Creek has heen snorkeled as part of the University's studies. Bull trout usually move into the stream for spawning in mid-September. They then remain in Indian Creek and await the Kokanee spawn. Bull trout feed on the adult Kokanee before returning to Rimrock Lake. (Rimrock Lake is drawn down in September to a very low level in anticipation of winter precipitation.)

Stream substrate was visually analyzed and assigned a percent value. Areas having unstable banks were recorded and areas of embeddedness were recorded in the comments on form C3. The data obtained from the survey is stored in IBM spread sheet program format, it will later be transferred to the SMART Database.

FOREST STANDARDS AND GUIDELINES

- Stream temperature maximum should be $\leq 61^{o}F$ on any day and/or the average of seven days should be $\leq 58^{o}F$.
- Potential large wood should be maintained at a level of 20%
- Vegetative ground cover should be provided by trees, shrubs, grasses, sedges and duff within the floodplain and true riparian zone
- Moderately steep gradient (>3%) streams will maintain 1+ pools for every 6 bankfull channel widths.
- In-channel wood should be $\geq$ 20 pieces per 1,000 linear feet or 105.6/mile
- East Side wood standard used.

---Small wood is >6" in diameter at the small end and minimum of 20 feet long.
---Medium wood is >12" in diameter at the small end and minimum 35 feet long.
---Large wood is >20" in diameter at the small end and minimum of 35 feet long.
---If a piece of large wood does not meet the length criteria listed above, but is longer than twice the bankfull width for the reach it can be counted in the size class above.

- Fine sediment maintained at <20% fines as the area weighted average in spawning habitat (pool tail outs and glides).
- Meet Washington State Water Quality Standards for AA streams.

•Compliance with the Aquatic Conservation Strategy objectives

BASIN SUMMARY

This survey began at the mouth of Indian Creek at Rimrock Reservoir in T13N R13E Section 6, NW1/4 of the SE 1/4. The mouth enters Rimrock Reservoir below Highway 12. The entire stream is on Forest Service Land. The survey was completed in reach 1. Valley form and channel type changed at the end of the reach, located approximately 3.5 miles upstream from the mouth, T14N R12E Section 26, middle of the NW 1/4. The end of reach 1 is approximately 3/4 of a mile inside the Wilderness boundary. Indian Creek and its tributaries drain more than 12,636 acres (9,168 acres within the subwatersheds draining into reach 1). The surveyed portion of the stream is located within the Tieton Late Successional Reserve (RW 153) and wilderness designations from the Northwest Forest Plan. Recreation, Unroaded, Unmotorized (RE3) and wilderness are the designation of the Wenatchee Forest Plan. Indian Creek is included in a Critical Habitat Area for spotted owls. Indian Creek originates from Apple and Pear Lakes. The water is extremely clear.

Reach 1 is a Rosgen B4 channel type with a section of C4 channel type. The mouth area is also a B channel. The mouth and section of stream through NSO 10 are characterized as a wide depositional (alluvial) floodplain. Cobble, boulders and gravel form an area about 200-300 feet in width in some spots with no vegetation. Even in areas where there are abundant trees the riparian floor is still dominated by boulders and rocks and the channel is fairly wide. There are many wood complexes and individual logs. Indian Creek condition and channel forming agents were observed while minnow trapping during the spring of 1999. It is noted that the location and position has changed by the time the stream survey data was collected. 1999 was an unusual year, having a July peak runoff (rather than May or June).

Above this zone, the channel varied from confined with eroded banks to moderately wide. Indian Creek contains some braiding throughout the reach were the valley allows the stream to widen and meander. Approximately 2794 feet of braiding or 0.53 miles were part of 6 braided areas. There are also a number of side channels and springs that input flow into Indian Creek.

Indian Creek has some natural (LWD and rock) and human influenced fish passage barrier (recreational rock weirs), they did not prohibit the use of available habitat by fish. (These barriers are probably only effective during very low flow.) Fish were found throughout the reach. They tended to be very quick to move out of sight which made identification difficult. Several pools contained very large (20+") fish presumed to be bull trout. One dead bull trout was observed. The trout's head was cut off, like a human might cut it. Both the head and body were still on site and the fish was decomposing.

A previous survey of Indian Creek occurred in 1990. Surveyors were Scott Hoefer and John (Sam) Bissell. Following the data from this survey a comparison of the two surveys will be displayed.

Known fish distribution in Indian Creek includes westslope cutthroat, sculpin, bull trout, Eastern brook trout. Precipitation ranges between 42-79 inches/year. Lower Indian Creek is susceptible to rain-on-snow events. Average summer stream temperatures are between 45 and 56°F near the mouth.

Historical Uses

Indian Creek served as a portion of the "Cowlitz Trail, a travel thoroughfare linking tribes east and west of the Cascades. The trail followed the Tieton river through McAllister Meadow (now Rimrock Reservoir) up Indian Creek and then west to Cowlitz Pass. Yakama and Kittitas people remained primary inhabitants of the area until the 1850's when their populations were significantly reduced by epidemics of smallpox, measles and other introduced diseases. The introduction of Euro-American lifeways and technologies since the mid 1850's including the grazing of domestic animals, agriculture, large scale timber harvest and modern transportation system brought with it an increase in both the rate and scale of human interaction with the landscape.

Mining

Precious metals did not abound in the Upper Tieton drainage, thus few prospectors remained in the area. It is expected that prospecting occurred on all of the streams.

Settlement

Access limitations and little available suitable land for farming limited settlement in the Upper Tieton drainage. Russell ranch was established between Russell Creek and the mouth of Indian Creek in the area presently used by Rimrock Reservoir. It was not until 1907 that the first dirt road was completed up the Tieton Canyon to the headgates of the Tieton Irrigation Canal. A pine tree near Indian Creek falls marks the location where early settler John McAllister was found dead in August 1913.

Unclaimed lands in the Upper Tieton Watershed came under the jurisdiction of "Pacific Forest Reserve" in 1893 and the area became part of the "Mount Rainier Forest Reserve" in 1897- 1933. In 1933 the area became part the National Forest system.

Water Development

In 1902/1905 plans for the Yakima-Tieton Irrigation project were approved. By 1909 the 12 mile long concrete canal along the south side of the Tieton river was completed. Work on the Rimrock Dam began in 1917 and was completed in 1924. This work effectively sealed off the upstream area from anadromous fisheries.

It is interesting to note that the people of this time were not unaware of the consequences linked to irrigating. Upon returning from an inspection of a reservoir, C.H. Swigart stated that the people of the valley 'must take their choice between game fish and big red apples. If they must have fish the government might as well go out of the business of operating storage dams' (Gossett 1979:357). For all practical intents and purposes, salmon have been extinct in the Tieton River since the early 1920's.

Recreation

By 1940 'developed' campsites included Indian Creek camps and Indian Creek summer homes. Indian Creek trail remains a popular route for hikers and horse persons to enter the wilderness.

Grazing

Prior to 1897, settlers and stockmen were free to graze their livestock in the forests when, where and how they chose. 'The race to see who could get the most stock on the range before someone else got there first (Cooper 1950a:1). In the Tieton, most of this cattle grazing was by local settlers who lived in or near by. "Overall, their herds were small and their impact minor: (Holstine 1994:7.3). Sheep were more suited to the rugged terrain. By 1889 the number of sheep in Yakima County had increased 3 fold.

By 1899 there were upwards of 261,000 sheep reported in the county. By the turn of the century irrigation interests were lobbying for protection of forest reserves for irrigation and the practice of sheep grazing became less favored. Current allotments allow cattle grazing in the areas down lake from Indian Creek.

Timber Harvest

Until 1950, timber harvest in the Upper Tieton Watershed was very limited. Most of the harvest was associated with the building of Clear Lake Dam and the clearing of right-of-way for access roads. Evidence of timber harvest is found both east and west of Indian Creek, however, it appears to have been buffered back out of the riparian areas.

Road History

In 1951 the present highway from Rimrock Dam through white pass was completed. Construction of other roads in the watershed closely reflected the opening of the areas to timber harvest. Indian Creek is paralleled by road 1308. The road is probahly as close as 300 feet at one point but averages nearer 1000 feet from Indian Creek. Highway 12 crosses Indian Creek less than 1/4 mile from its mouth. Indian Creek is flanked by Indian Creek summer homes and Indian Creek Campground between Highway 12 and Rimrock Reservoir. Some of the summer home yards were taken over by the creek during the 1995/1996 floods.

Geology

Geomorphic processes within the watershed have been dominated by volcanic activity and recent glaciation. The younger volcanic rocks typical form ridges and upland plateaus, while the basement rocks of the Russell Ranch formation can be found on the lower slopes of the watershed. Large scale faulting is limited to the northeast margins of the watershed where the Indian Creek complex marks the upthrow side of a high angle fault between the Indian Creek complex and the Russell Ranch Formation. An infered fault may be responsible for the Indian Creek drainage.

Glaciation has played a major role in landform development within the watershed. Effects of glaciation are readily apparent throughout the watershed. As mentioned, the distinctive features of the headwaters of Indian Creek are a result of glacial scouring of volcanic flows. The resulting landform features include gentle relatively flat terrain with numerous small ponds and lakes. Glacial till is present in the first order drainages at the head and the broad scoured passes on the ridge separating Indian Creek and Rattlesnake speak of heavy glacial scouring.

Andesites and dacites are the volcanic rock predominately found flanking the southern and western edges of the plateau that makes the headwaters of Indian Creek and south of Highway 12 in the Round Mountain Area. Exposures of Indian Creek complex can be found east of Indian Creek This ridge forming unit consists of weakly foliated plutonic rocks bounded on the east by a fault contact wit the Russell Ranch formation Mass wasting is common on the northern end of this formation. The complex is approximately 155 million years old.

Indian Creek has it's headwaters at Apple and Pear Lakes and through Blankenship meadows.

MANAGEMENT ISSUES

- Summer homes, dispersed and developed camping within the riparian area.

MANAGEMENT RECOMMENDATIONS

- Visit area during high use weekends and educate public on riparian reserves through one on one discussions and interpretive signing.
- Rehabilitate the degraded hiking and livestock trail to Blankenship Meadows and the Pear and Apple Lake area.
- **Continue to monitor bull trout use and habitat.**
- **Continue to monitor stream condition.**

REACH SUMMARY

Reach 1

Reach 1 was surveyed between August 12, 1999 and August 30, 1999. This reach began at mouth of Indian Creek T13N R13E Section 6, NW1/4 of the SE 1/4 and ended at the change in valley form approximately 3/4 miles inside the wilderness boundary at T14N R12E Section ~~23~~ 26, middle of the NW 1/4. The total length surveyed was 3.5 miles.

Estimated valley width is 500 feet.
Mapped channel gradient is <3%.
A total of 2,794 feet or 0.53 mi. of braided stream is present within this reach.
Six tributaries entered Indian Creek in reach 1. The first 3 tributaries contributed approximately 1-2% of the flow each; the second 3 tributaries contributed approximately 15-26% of the flow each.

Flow Regime

Channel types were evaluated as Rosgen B4, with sections of C4 chanel. There is a long stretch of braided channel and numerous long side channels in this stretch of the reach. The flow measurement was recorded in August 2, 1999 by Jeff Hosman as 58.21 cubic feet per second in this reach. The water was clear during the survey. Three tributary provided approximately 2% of the mainstem flow while the upper 3 tributaries provided 20%, 26% and 15% by visual estimate.

Vegetation

The reach is part of the Wenatchee Forest Plan area that was designated as RE3 and wilderness. It has not had previous timber harvest within the riparian zone. Recent timber harvest in the vicinity occurred 20 years ago or longer. The upland vegetation types are Douglas fir, and grand fir with some Pacific silver fir and sub-alpine fir. There are occasional cut banks. It is anticipated that there is a fair amount of sediment input where stream banks were raw and steep. The stream bad a variable floodplain area. Some of the reach ha ad moderately confined channel, while other areas showed recent (1-20 year) use of most of the available adjacent floodplain. The floodplain dominant vegetation was alder, with some of the older zones having converted to cottonwood and conifers.

Pool/Riffle Habitat

Of the 3.5 miles of stream surveyed in this reach, 4.57% was pool habitat and 95.43% was classified as riffle by length.
There are an estimated 8.85 pools/mile and 12.56 riffles per mile.
This is a 0.7 : 1 ratio.
By habitat numbers 31 NSO were pools and 44 NSO were riffle habitats.

Average Riffle Measurements
- Length: 401.1 feet
- Width: 22.7 feet
- Max. Depth: 2.2 feet Width/Depth Ratio: 10.3:1.
- Bank Full Widths: 35.8 feet

Average Pool Measurements
- Length: 27.3 feet

Width: 17.45 feet
Max. Depth: 2.6 feet
5 Pools had max. depth >=3 feet. (15% of pools)
Forest Plan Standard of pools per mile: (35.8 X 6=) a pool every 214.8 feet
or 24.6 pools per mile
Forest Plan Standard for Pools Met? NO - pools per mile = 9.4 (33/3.5)

Substrate

Riffle habitats showed the following break down in substrate within this reach.
(Estimated during Stream Survey)

Sand	5.9%
Gravel	32.5%
Cobble	50.8%
Small boulder	10.5%
Bedrock	0.3%

Pool habitats showed the following breakdown in substrates within this reach.
(Estimated during Stream Survey)

Sand	16.7%
Gravel	37.1%
Cobble	38.6%
Small boulder	7.6%
Bedrock	0.0%

Pebble Count information from riffles showed

Count 1		Count 2	
< 2mm:	14%	< 2mm:	8%
Fines(=<6mm):	14%	Fines (=<6mm):	10%
D35:	24.5 mm	D35:	41.7 mm
D50:	43.7 mm	D50:	59.8 mm
D84:	125.9 mm	D84:	151.2 mm
D95:	197.6 mm	D95:	251.5 mm

Bank erosion and unstable banks were an estimated 471 feet or 2.6% of the reach.

Forest Plan Standard calls for < 20% fines in pools. The estimated sand value indicates that it is likely this reach does meet that standard.

The uplands near Apple and Pear Lakes and Blankenship meadows are very late melting and wet during the summer. This reservoir supplies cold water to Indian Creek, its tributaries and springs throughout the summer.

Large Woody Material

Easternside Standard -- 58.2/mile small with - complexes = 33 total recorded or 9.4/mile.
-- 20.0/mile mediuml
-- 5.7/mile large
Total 83.9 pieces per mile

Forest Plan standard calls for >105 pieces per mile, so this reach does not meets the forest large wood material standard. This is due to the flashy nature o flows in this system, which transport wood out of the system or leave it high and dry on gravel bars.

Temperatures

Water temperatures ranged between 45° - 56°F during the survey.

A hobo type thermographs was set up in this reach on July 1999 and remained in the stream until the end of September 1999. Temperatures recorded during that period ranged from 45°F to 53°F.

The 7 day maximum temperature average reached 52.2 °F
0 days reached > 61 °F
0 days averaged >58 °F

This does meet the forest plan standard of: Stream temperature maximum should be $\leq 61^{o}F$ on any day and/or the average of seven days should be $\leq 58^{o}F$.

Tributary temperatures:

Trib 1 50 °F at 1415
Trib 2 49 °F at 1305
Trib 3 48 °F at 1620
Trib 4 48 °F at 1140
Trib 5 47 °F at 1100
Trib 6 44 °F at 1600

Fish Species

Fish were observed throughout the reach many of them were easily spooked and this prevented identification. Species known to inhabit Indian Creek include westslope cutthroat trout, sculpin, mountain white fish, kokanee salmon and bull trout. Systematic bull trout surveys were executed by Central Washington University over the past 4-5 years in Indian Creek. Surveys showed a large number of spawning bull trout. Some of the individuals sampled and tagged were approaching 3 feet in length. Bull trout were sampled as they returned downstream from spawning. Many of the bull trout delayed their return trip to Rimrock Reservoir to feast on adult kokanee salmon that spawned in Indian Creek. Stream surveyors observed several large fish (>20") each day, some showing evidence of streamer tags.

This Section is a brief comparison of data from the 1990 Stream Survey and the 1999 data.

The 1990 stream survey data was collected using version 4.0 of the revised Hankin and Reves methodology. Survey dates for reach 1, reach 2, reach 3 were August 2-15, 1990.

During the 1990 survey the flow in Indian Creek was 31.13 CFS on August 1, 1990.
During the 1999 survey the flow in Indian Creek was 58.21 CFS in August 2, 1999.

Surveyed length for Reach 1(and reach 2-3 in 19909)
(From the mouth of Indian Creek to where the stream gradient change significantly.)
4.16 miles in 1990.
3.5 miles in 1999.

Number of Pool/Mile
3.8 per mile in 1990.
9.4 per mile in 1999.

Pieces of LWD/Mile
36/418/83 pieces per mile in 1990. (reach 1/ reach 2 / reach 3)
(Unsure what standard was used --It looks like west side standard)

25.7 pieces per mile in 1999.
Large Woody Material
Eastern Standard -- 58.2/mile small with - complexes = 33 total recorded or 9.4/mile.
-- 20.0/mile medium
-- 5.7/mile large
Total 83.9 pieces per mile
Forest Plan standard calls for >105 pieces per mile, so this reach does not meets the forest large wood material standard.

Embeddedness:
52% / 42% / 100% embedded in 1990. (reach 1/ reach 2 / reach 3)
Not recorded in 1999.

Stream Bank Cover:
51-75% in 1990. (reach 1/ reach 2 / reach 3)
Not recorded in 1999.

Temperatures:
44°F - 54°F in 1990. (reach 1/ reach 2 / reach 3)
Water temperatures ranged between 45°F- 56°F during the 1999 survey.

Tributary temperatures 1999:

Trib 1 50 °F at 1415

Trib 2 49 °F at 1305
Trib 3 48 °F at 1620
Trib 4 48 °F at 1140
Trib 5 47 °F at 1100
Trib 6 44 °F at 1600

Observations:

Interesting how this is a stream that is relatively unmanaged and yet it misses the Wenatchee Forest Plan Standards by such a hig margin on several key indicators. It appears to be a very changeable and probably flood prone stream. Channel changes locations in the floodplain annually.

Similarities between the surveys are that stream temperatures have remained consistently low. Flow amount has remained relatively high. Channel and location of LWD changes by the year and season. Braiding, side channels and relatively large size of the substrate in the floodplain is similar.

One differences was the lack of description of bull trout sightings at the same time of year. Is the population improving?

Support Documentation

Maps
Aerial Photos
Data Presentation
Spread Sheet
GIS Reach Input
Slide

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Reach	Mapped River Miles from	to	NSO from	NSO to	Corrected Length in feet	Percent Area	W.D.	# Pools	Pools Freq.	# LWM	LWM Freq.	Gradient	Rosgen Class
1	.0	3.5	1	88	18544.00	100.00	16.41	31	.038	17	.021	0	B
otals					18544.00	100.00	16.41	31	.038	17	.021	0	

Stream Survey Management

Species Observed Summary

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Species	Total Miles Present	Reach	NSO

USDA Forest Service
Region 6
Forest: 17
District: 08

Stream Survey Management
Special Features Summary

12/21/1999

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Reach	Miles	Falls	Chutes	Dams	Max Height in feet	Marshes	Braids	Culverts
1	3.51	0	0	0	.00	0	6	0
Totals:	3.51	0	0	0	.00	0	6	0

USDA Forest Service
Region 6
Forest: 17
District: 08

Stream Survey Management
Riparian Vegetation Summary

12/21/1999

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

ZONE 1

		Inner	Floodplain Vegetation Class Percentages							Vegetation Species													
	Corrected	Zone	GF	SS	SP	ST	LT	MT	NV	GF		SS		SP		ST		LT		MT		V
Reach	Miles	Width								O	U	O	U	O	U	O	U	O	U	O	U	O
1	3.51	100	82	1	11	6	0	0	0	GF	GF	CD	HA	HA	HA	CC	HA					
1	3.51	0	0	0	0	0	0	0	0													

USDA Forest Service — Stream Survey Management — Page 1
Region 6 — Reach Characterization — 12/21/1999
Forest: 17
District: 08

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999
Stream Order: 3

Reach	Mapped River Miles From	To	Valley Length in mi	Mapped Channel Gradient	Sinuosity	Mapped Valley Width Estimate in feet	Rosgen Channel Type	Inner Riparian Zone Width in ft	Valley Form
1	.0	3.5	2.23	0	****	500	B	100	9
Totals			2.23	0	93.00				

USDA Forest Service
Region 6
Forest: 17
District: 08

Stream Survey Management
Hydrology Summary

12/21/1999

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

table Reach	Rosgen Channel Type	Entrench Ratio	Flow (CFS)	Corr Miles	Average BnkFul Depth ft	Average Riffle Width ft	Bankfull W:D	Pool Residual Depth ft	Wollman Summary D50	D85	D50	D85	Water Temp	Percent Banks
1	B	5.37	58.20	3.51	1.56	22.56	26.88	1.36					53	.00
otals		5.37		3.51	1.56	22.56	26.88	1.36						100.00

Stream Survey Management

Calibration Ratios Summary

Forest : 17
District : 08
Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date : 12-AUG-1999

Observer	Length	Width	Area	Count	SS
REIS,K.,Y.	1.0000	1.0418	0.9641	19	

* WARNING: Habitat type not measured adequately -- data suspect.

** WARNING: Habitat type not measured at all -- ratio could not be calculated.

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Reach	Corr. /Mile	Pools /Mile	Pools > 3 Mile	Pools > 3 Freq.	Pools with 1-3 pieces LWM(CI 1&2)	Pools with > 3 pieces LWM(CI 1&2)	Riffles /Mile	Riffles width 1-3 pieces LWM(CI 1&2)	Riffles width > 3 pieces LWM(CI 1&2)
1	3.51	8.83	1.42	.000	12	0	10.82	16	7
Totals	3.51	8.83	1.42	.000	12	0	10.82	16	7

USDA Forest Service
Page 1 of 1
Region 6
12/21/1999
Forest: 17
District: 08

Stream Survey Management

95% Confidence Interval Summary

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Reach	Corrected Pool Area (sq ft)	Pool Confidence Interval	n	Corrected Riffle Area (sq ft)	Riffle Confidence Interval	n
1	14366.91	1422.55	10	325805.41	12602.12	9

Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Reach	Corr. /Mile	Pools /Mile	Pools > 3 Mile	Pools > 3 Freq.	Pools with 1-3 pieces LWM(CI 1&2)	Pools with > 3 pieces LWM(CI 1&2)	Riffles /Mile	Riffles width 1-3 pieces LWM(CI 1&2)	Riffles width > 3 pieces LWM(CI 1&2)
1	3.51	8.83	1.42	.000	12	0	10.82	16	7
otals	3.51	8.83	1.42	.000	12	0	10.82	16	7

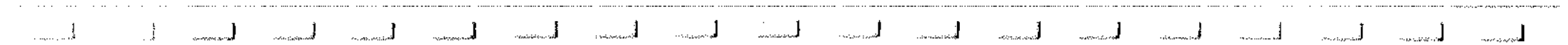
Watershed : 1703000224
Stream Name : INDIAN CREEK 99
Survey Start Date: 12-AUG-1999

Reach	Corr. Miles	Large Wood/Mile	Large Class/Mile	Medium Class/Mile	Small Class/Mile	% Pools	% Riffles	% Side Channels	% Special Cases	Length of Dry in Feet
1	3.51	25.34	4.84	20.50	60.65	3.29	74.67	1.52	20.52	.00
Totals	3.51	25.34	4.84	20.50	60.65	3.29	74.67	1.52	20.52	.00

Pools	Length	Width	Depth	PTC	S	G	C	SB	BR	X	Riffles	Length	Width	Max D	Av. De	S	G	C	SB	BR	X	Wood	B	S	L	X	Erosion
1	21	15	2.4	1.5	20	50	25	5		X	1	121	30	1.5	0.8		40	50	10		X		8	5	1	X	
2	30	14	3.3	1.1	20	40	40			X	2	164	25	1.8	1	10	60	30			X		8	3		X	
3	25	23	2.4	1.5	20	60	20			X	3	195	20	2.5	1.5		40	50	10		X		6	3	1	X	
4	24	12	3.8	1.1		30	70			X	4	460	30	4.5	1.2		30	60	10		X		4	1	2	X	
5	17	25	2.2	1.7	10	10	40	40		X	5	862	22	2	1		40	50	10		X					X	
6	35	13	4.1	1.1	20	20	50	10		X	6	999	19	2.5	1.1		30	50	20		X		22	7	1	X	
7	30	25	2.4	1		30	50	20		X	7	255	27	3	1		40	50	10		X		2			X	
8	18	18	2.9	1.2	10	30	50	10		X	8	275	26	2.1	1.5		30	50	20		X		5	3		X	
9	15	25	2.3	1.5		40	60			X	9	86	21	1.8	1.2	10	40	40	10		X					X	121
10	22	18	3.6	1.2		40	60			X	10	645	30	3	1.3	10	40	40	10		X		2	2	6	X	
11	27	15	2.7	1.4		20	60	20		X	11	30	21	2.4	1	10	20	50	20		X					X	
12	22	22	2.5	0.9	50	50				X	12	240	22	2.1	1.2		30	60	10		X		3	2	2	X	
13	28	16	2.2	0.9	30	30	30	10		X	13	190	15	10	0.8		20	70	10		X		7	3	1	X	
14	25	18	2.9	1.8	20	60	20			X	14	326	50	2.4	0.6						X					X	
15	30	12	2.1	1.3	10	40	50			X	15	318	24	1.9	0.7	20	40	30	10		X		2	1		X	
16	27	16	2.6	1.2	20	20	60			X	16	383	19	2.7	1	10	20	60	10		X		6	4	3	X	100
17	27	17	2.3	1.3	30	30	30	10		X	17	137	17	1.3	0.8		20	70	10		X		4	1		X	
18	22	15	2	1	20	50	30			X	18	817	23	2.5	0.7	10	40	40	10		X		18	3		X	100
19	24	20	2.7	1.2	20	30	40	10		X	19	42	14	2.1	1.5	10	40	50			X		3	1	1	X	
20	30	16	2.8	1.5	20	30	30	20		X	20	130	20	2	1.1	10	30	50	10		X		1			X	
21	18	12	2.3	1.3	10	40	40	10		X	21	140	25	1.2	0.8		30	60	10		X		3			X	
22	14	14	2.2	1.2		50	50			X	22	250	14	1.6	1		30	70			X					X	
23	30	15	1.9	1.3	30	30	30	10		X	23	999	33	3	0.6						X			2		X	
24	18	15	2	1.1		50	30	20		X	24	157	21	3.2	1.1						X					X	
25	20	14	2	1	10	60	20	10		X	25	999	25	2	0.9		30	60	10		X		3	2		X	
26	35	17	2.1	1.1	10	50	40			X	26	250	21	1.8	0.8		30	50	20		X		7	1		X	
27	40	19	2.6	1.3	30	30	30	10		X	27	620	22	1.5	0.8		30	60	10		X		6	1		X	
28	35	18	2.6	1.3	20	20	60			X	28	410	20	1.4	0.7		20	60	20		X		4			X	
29	57	22	2.4	1	30	30	30	10		X	29	911	31	4	0.6						X					X	
30	25	20	2.5	1.2	20	50	20	10		X	30	100	18	1.5	0.8						X		3			X	
31	55	20	3.1	1	40	30	30			X	31	999	27	2	0.6	10	30	50	10		X					X	
32										x	32	210	16	1.3	0.8		30	60	10		X		25	6	1	X	
33										x	33	301	23	2.4	0.7						X					X	
34										x	34	136	20	1.3	0.6		30	70			X		6	2		X	
35										x	35	369	18	1.8	1	10	30	50	10		X		5	2		X	
36										X	36	120	14	1.4	0.8		30	60	10		X		2			X	
37										x	37	950	22	1.4	0.8	10	30	50	10		X		12			X	
38										x	38	540	19	1.6	0.9	10	40	40		10	X					X	150
39										x	39	380	23	1.7	1		30	50	20		X		6	1		X	
40										X	40	999	23	1.6	0.7	20	30	40	10		X			1		X	
totals	846	541	79.9	38.2	520	1150	1185	235	0	X	41	110	22	1.4	0.8	10	50	30	10		X		10			X	
Ave	27.29	17.45	2.58	1.23						X	42	91	20	1.3	0.6	10	30	40	20		X					X	
Max	57	25	4.1	1.8						X	43	612	25	1.4	0.7	20	30	40	10		X		11	13	1	X	
Min	14	12	1.9	0.9						X	44	320	22	2	1.1	20	30	40	10		X					X	
%Sub					16.77	37.10	38.55	7.58			totals	17648	977	95.9	39.3	220	1210	1690	390	10	X	total	204	70	20	X	471
miles	0.16				riffles/mile		12.56				Ave	401.09	22.72	2.23	0.91						X	#/mile	59.2	20.0	5.7	X	
Reach Length		18494	3.50	miles	Pools/Mile		8.85				Max	999	50	10	1.5						X						
%Pools		4.57	%Riffles		95.43						Min	30	14	1.2	0.6												
											%Sub				%sub	5.91	32.53	50.81	10.48	0.27						
											miles	3.34				riffles/mile		12.56								
												Indian Creek															

Bankfull 0.4 35.5'

6 tribs

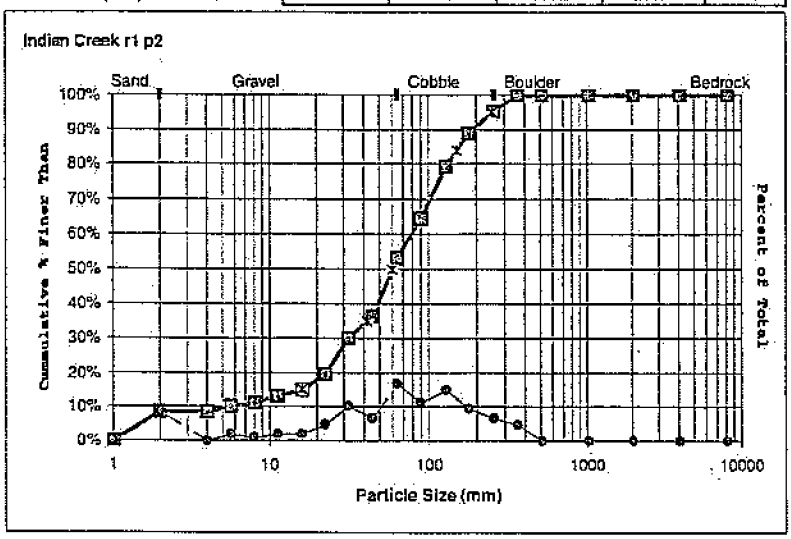


Pebble Count Worksheet

Particle Size (mm)	% finer than	% of Total	Total Count
<2	8%	8%	9
2 - 4	8%	0%	
4 - 5.7	10%	2%	2
5.7 - 8	11%	1%	1
8 - 11.3	13%	2%	2
11.3 - 16	15%	2%	2
16 - 22.3	20%	5%	5
22.3 - 32	30%	10%	11
32 - 45	36%	7%	7
45 - 64	53%	17%	18
64 - 90	64%	11%	12
90 - 128	79%	15%	16
128 - 180	89%	9%	10
180 - 256	95%	7%	7
256 - 362	100%	5%	5
362 - 512	100%	0%	
512 - 1024	100%	0%	
1024-2048	100%	0%	
2048-4096	100%	0%	
Bedrock	100%	0%	
		TOTAL	107

STREAM NAME:	Indian Creek
Reach (enter as r1,r2,etc)	r1
Peb No. (p1 or p2)	p2
ID NUMBER:	NOS 62
DATE:	Aug. 17, 1999
CREW:	Reiss/Hosman
Comments:	

Particle Size Distribution (mm)	Fines <6 mm	D35	D50	D84	D95	% Bedrock
	10%	41.7	59.8	151.2	251.5	0%



Note:Enter Data in Red Col or Rows:Total Count and Stream Description (Name, Date, etc.)

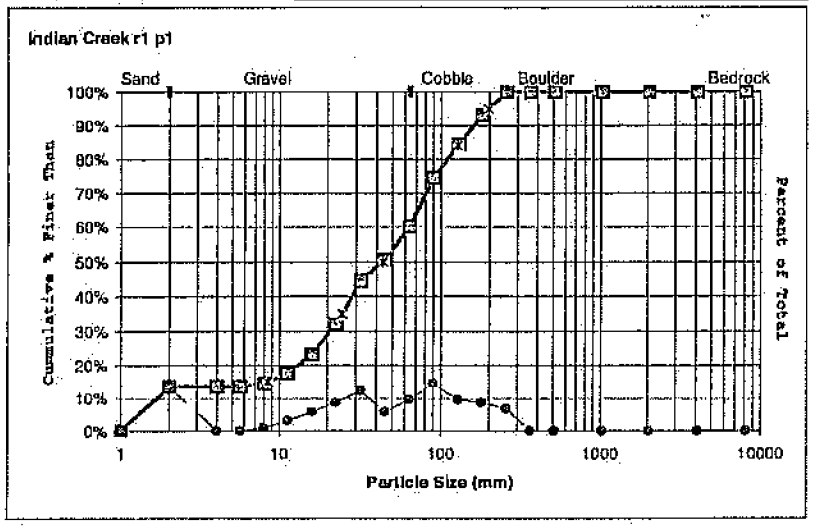
Check Cell Notes (See online help to access cell notes) for specific information. If spreadsheet is slow on data entry you may want to use manual recalculation. (See online he

Pebble Count Worksheet

Particle Size (mm)	% finer than	% of Total	Total Count
< 2	14%	14%	14
2 - 4	14%	0%	
4 - 5.7	14%	0%	
5.7 - 8	15%	1%	1
8 - 11.3	17%	3%	3
11.3 - 16	23%	6%	6
16 - 22.3	32%	9%	9
22.3 - 32	45%	13%	13
32 - 45	50%	6%	6
45 - 64	60%	10%	10
64 - 90	75%	15%	15
90 - 128	84%	10%	10
128 - 180	93%	9%	9
180 - 256	100%	7%	7
256 - 362	100%	0%	
362 - 512	100%	0%	
512 - 1024	100%	0%	
1024-2048	100%	0%	
2048-4096	100%	0%	
Bedrock	100%	0%	
		TOTAL	103

STREAM NAME:	Indian Creek
Reach (enter as r1,r2,etc)	r1
Peb No. (p1 or p2)	p1
ID NUMBER:	
DATE:	Aug. 16, 1999
CREW:	Hosman/Reiss
Comments:	

Particle Size Distribution (mm)	Fines <6 mm	D35	D50	D84	D95	% Bedrock
	14%	24.5	43.7	125.9	197.6	0%



Note:Enter Data in Red Col or Rows:Total Count and Stream Description (Name, Date, etc.)

Check Cell Notes (See online help to access cell notes) for specific information. If spreadsheet is slow on data entry you may want to use manual recalculation. (See online he

IndianAll

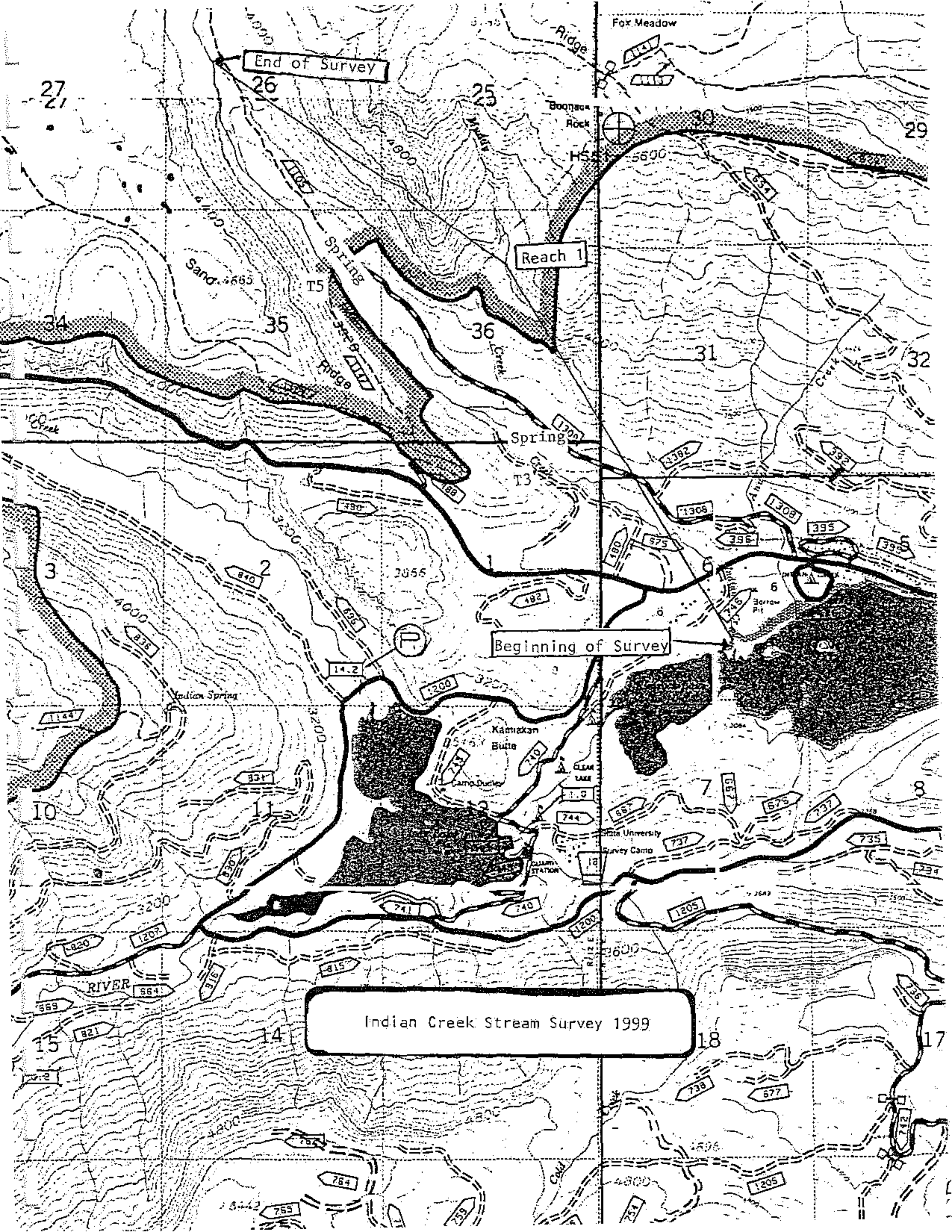
Flow Worksheet

STATION NAME: Indian Creek
DATE: Summer 1999 (August)
PARTY: J. Hosman

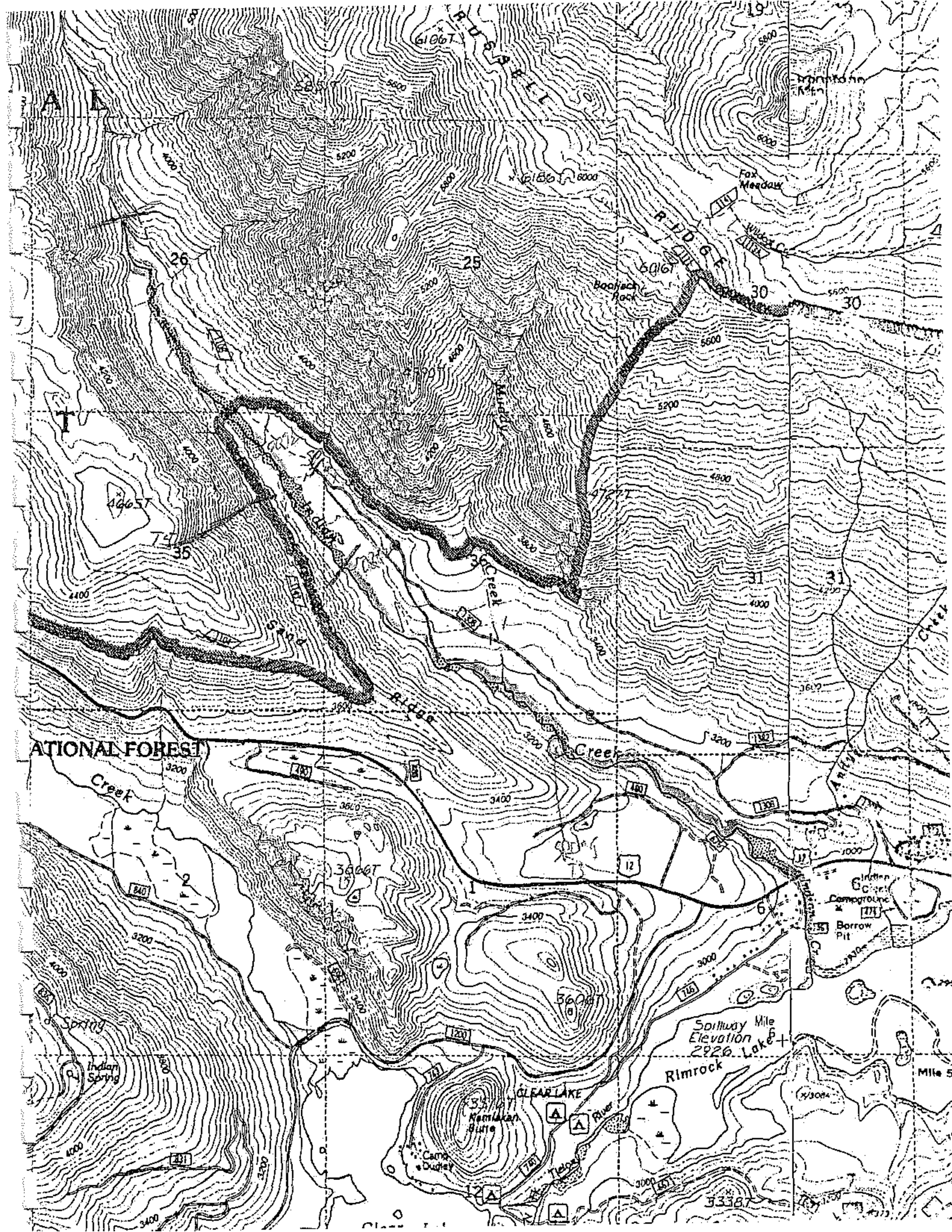
WIDTH	27.0 ft
AVERAGE DEPTH	0.9 ft
VELOCITY	2.4 fps
XSA	24.6 sq ft
FLOW	58.2 cfs

Note: Left edge of water and right edge of water should be the first and last entries and they should have zero depth and velocity
Blue areas are only areas to enter data.

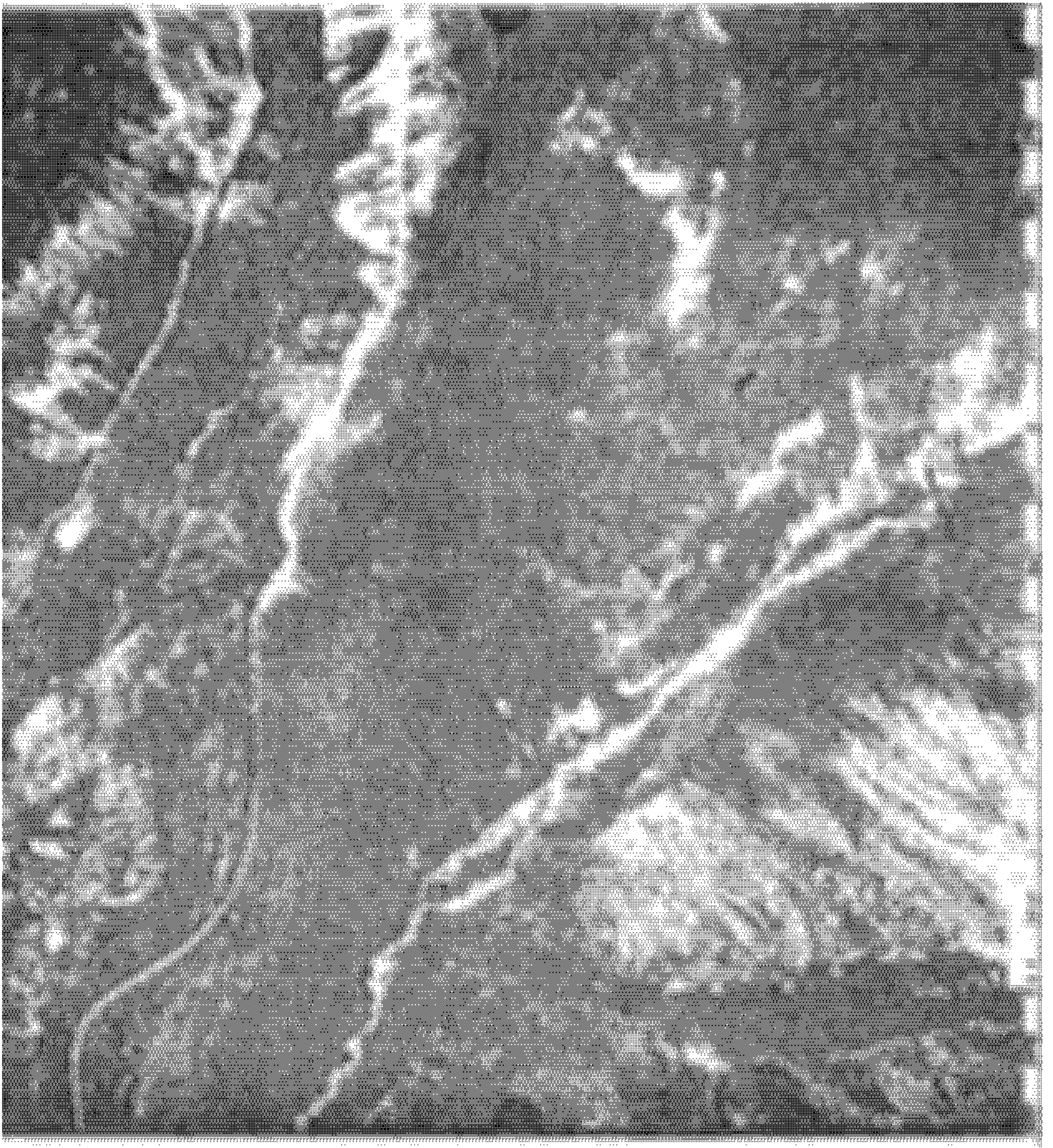
Obs #	Distance From Initial Point (ft)	Width (ft)	Depth (ft)	Observation Depth Down From Surface (ft)	Velocity At Point (fps)	2nd obs depth down (.8 for deep section)	2nd Velocity At .8 depth (for deep sections) (fps	Mean Velocity (fps)	Area (sq ft)	Flow (cfs)	% Total Flow
1 LEW	0.0	1.3	0.00		0.0			0.0	0.0	0.00	0.00
2	2.5	2.5	1.10	0.6	1.0			1.0	2.8	2.67	0.05
3	5.0	2.5	1.00	0.6	1.8			1.8	2.5	4.38	0.08
4	7.5	2.5	1.00	0.6	2.3			2.3	2.5	5.63	0.10
5	10.0	2.5	1.30	0.6	2.7			2.7	3.3	8.81	0.15
6	12.5	2.5	1.30	0.6	3.2			3.2	3.3	10.37	0.18
7	15.0	2.5	1.20	0.6	4.2			4.2	3.0	12.54	0.22
8	17.5	2.5	0.90	0.6	2.8			2.8	2.3	6.37	0.11
9	20.0	2.5	0.70	0.6	2.7			2.7	1.8	4.73	0.08
10	22.5	2.5	0.70	0.6	0.9			0.9	1.8	1.54	0.03
11	25.0	2.3	0.70	0.6	0.8			0.8	1.6	1.20	0.02
12	27.0	1.0	0.00	0.6	0.0			0.0	0.0	0.00	0.00
13		0.0		0.6				0.0	0.0	0.00	0.00
14		0.0		0.6				0.0	0.0	0.00	0.00
15		0.0		0.6				0.0	0.0	0.00	0.00
16		0.0		0.6				0.0	0.0	0.00	0.00
17		0.0		0.6				0.0	0.0	0.00	0.00
18		0.0		0.6				0.0	0.0	0.00	0.00
19		0.0		0.6				0.0	0.0	0.00	0.00
20		0.0		0.6				0.0	0.0	0.00	0.00
21		0.0		0.6				0.0	0.0	0.00	0.00
22		0.0		0.6				0.0	0.0	0.00	0.00
23		0.0		0.6				0.0	0.0	0.00	0.00
24		0.0		0.6				0.0	0.0	0.00	0.00
25		0.0		0.6				0.0	0.0	0.00	0.00
26		0.0		0.6				0.0	0.0	0.00	0.00
27		0.0		0.6				0.0	0.0	0.00	0.00
28		0.0		0.6				0.0	0.0	0.00	0.00
29		0.0		0.6				0.0	0.0	0.00	0.00
30		0.0		0.6				0.0	0.0	0.00	0.00
31		0.0		0.6				0.0	0.0	0.00	0.00
32		0.0		0.6				0.0	0.0	0.00	0.00
33		0.0		0.6				0.0	0.0	0.00	0.00
34		0.0		0.6				0.0	0.0	0.00	0.00
35		0.0		0.6				0.0	0.0	0.00	0.00
36		0.0		0.6				0.0	0.0	0.00	0.00
37		0.0		0.6				0.0	0.0	0.00	0.00
38		0.0		0.6				0.0	0.0	0.00	0.00
39		0.0		0.6				0.0	0.0	0.00	0.00
40		0.0		0.6				0.0	0.0	0.00	0.00
41		0.0		0.6				0.0	0.0	0.00	0.00
								22.2	24.6	58.21	1.00

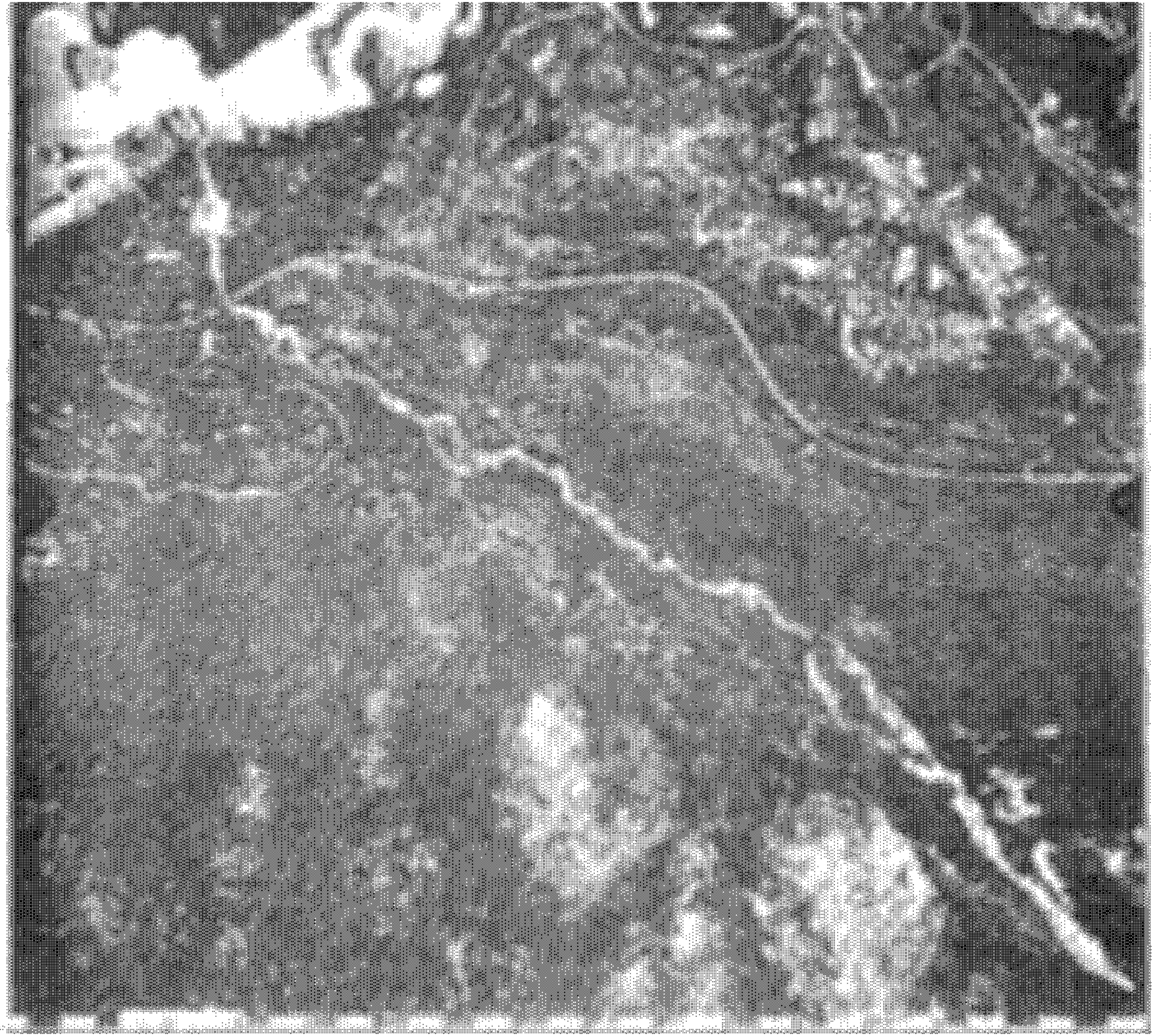


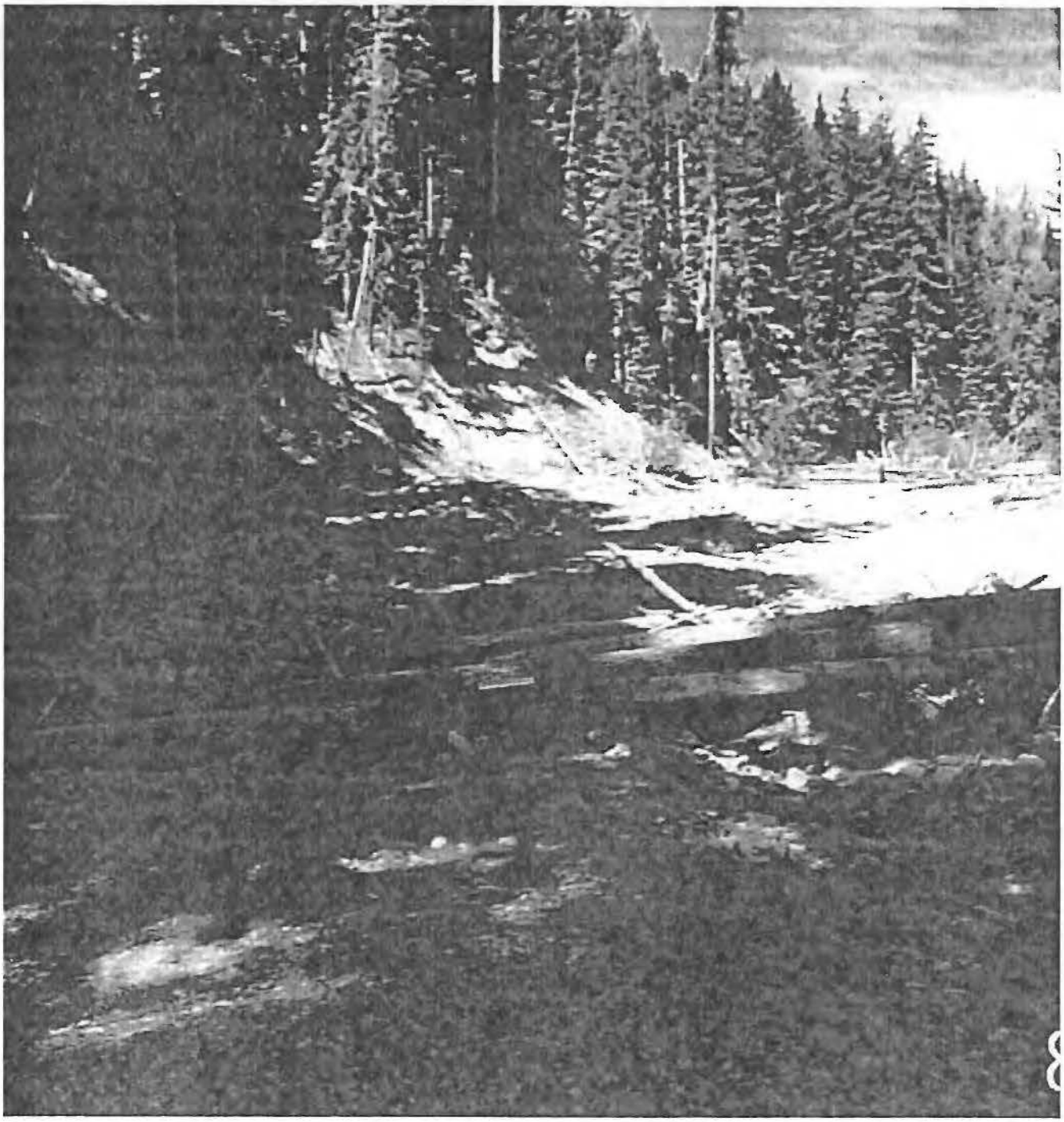
End of Survey
Fox Meadow
Ridge
Boonaca Rock
Reach 1
Spring
Sand
T5
Ridge
Spring
T3
Beginning of Survey
Indian Spring
Kamiakan Butte
Camp Ducker
Clear Lake
State University Survey Camp
RIVER
Indian Creek Stream Survey 1999

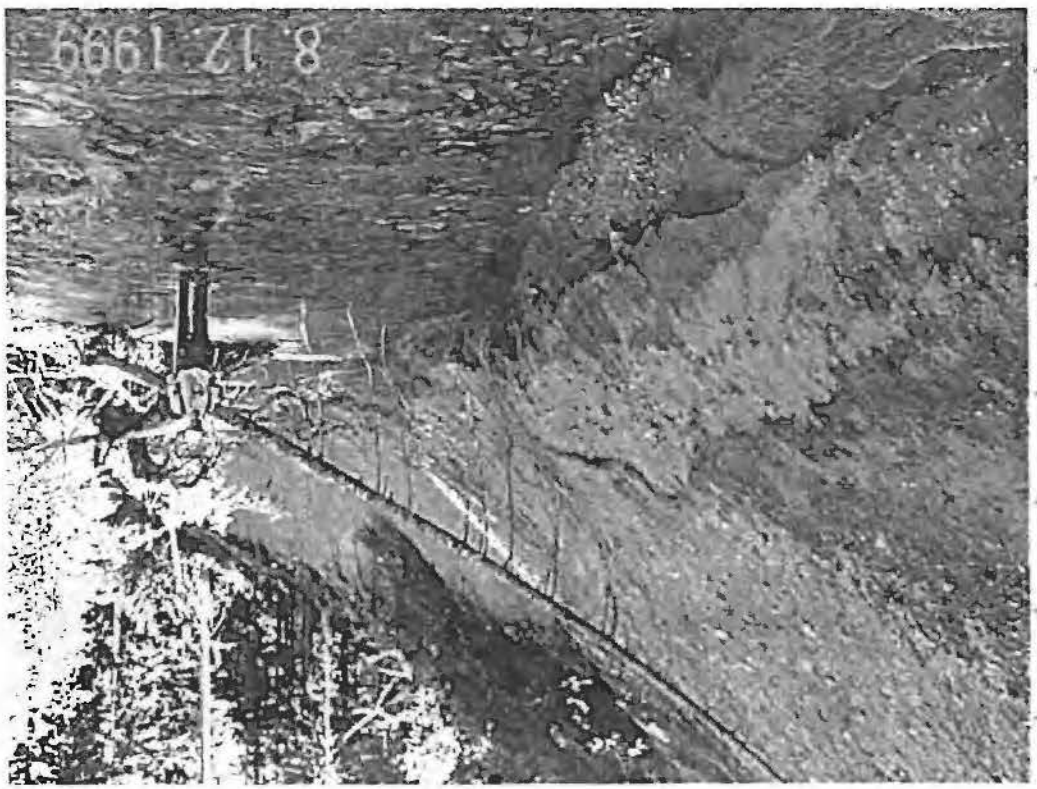


RUSSELL RIDGE
ATIONAL FOREST
Indian Creek
Sand Ridge
Creek
Booljack Rock
Fox Meadow
Wildcat Cr.
Indian Creek Campground
Borrow Pit
Spillway Elevation 2926
Mile 6
Lake
Rimrock
CLEAR LAKE
Kamiakan Butte
Camp Dudley
Tieton River
Indian Spring
Spring
Mile 5





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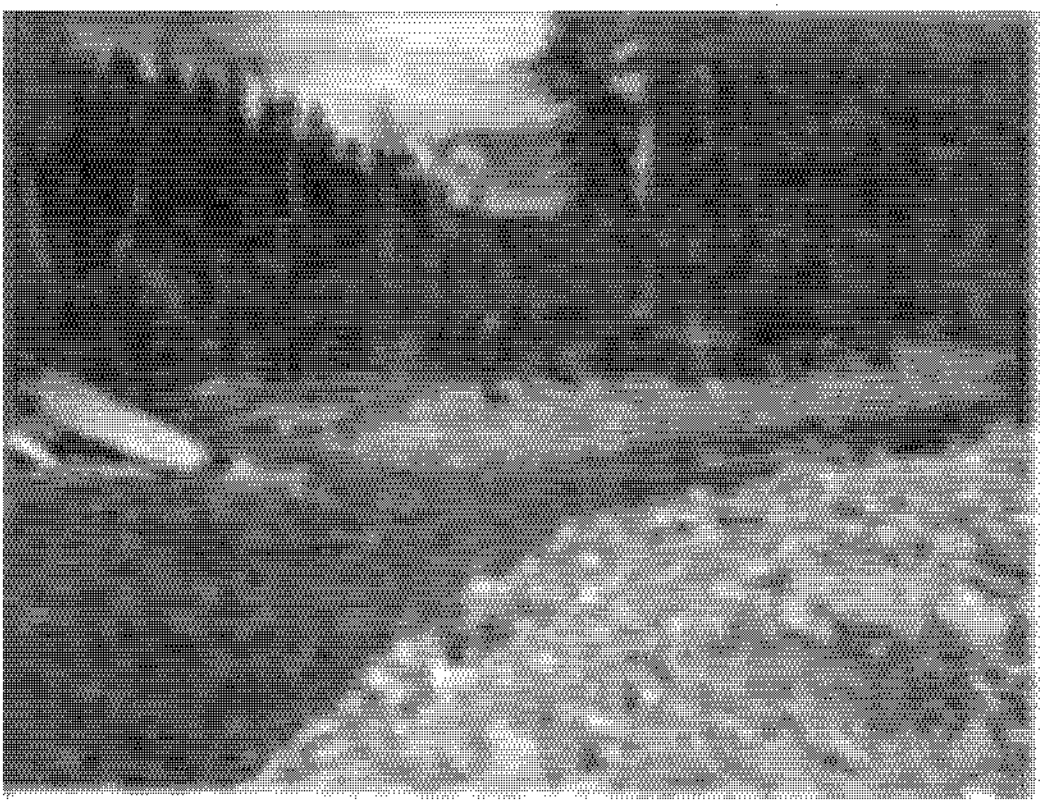

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