

Figure 13-6 River Water Utilization Plan of Berta River System and Pollution Sources

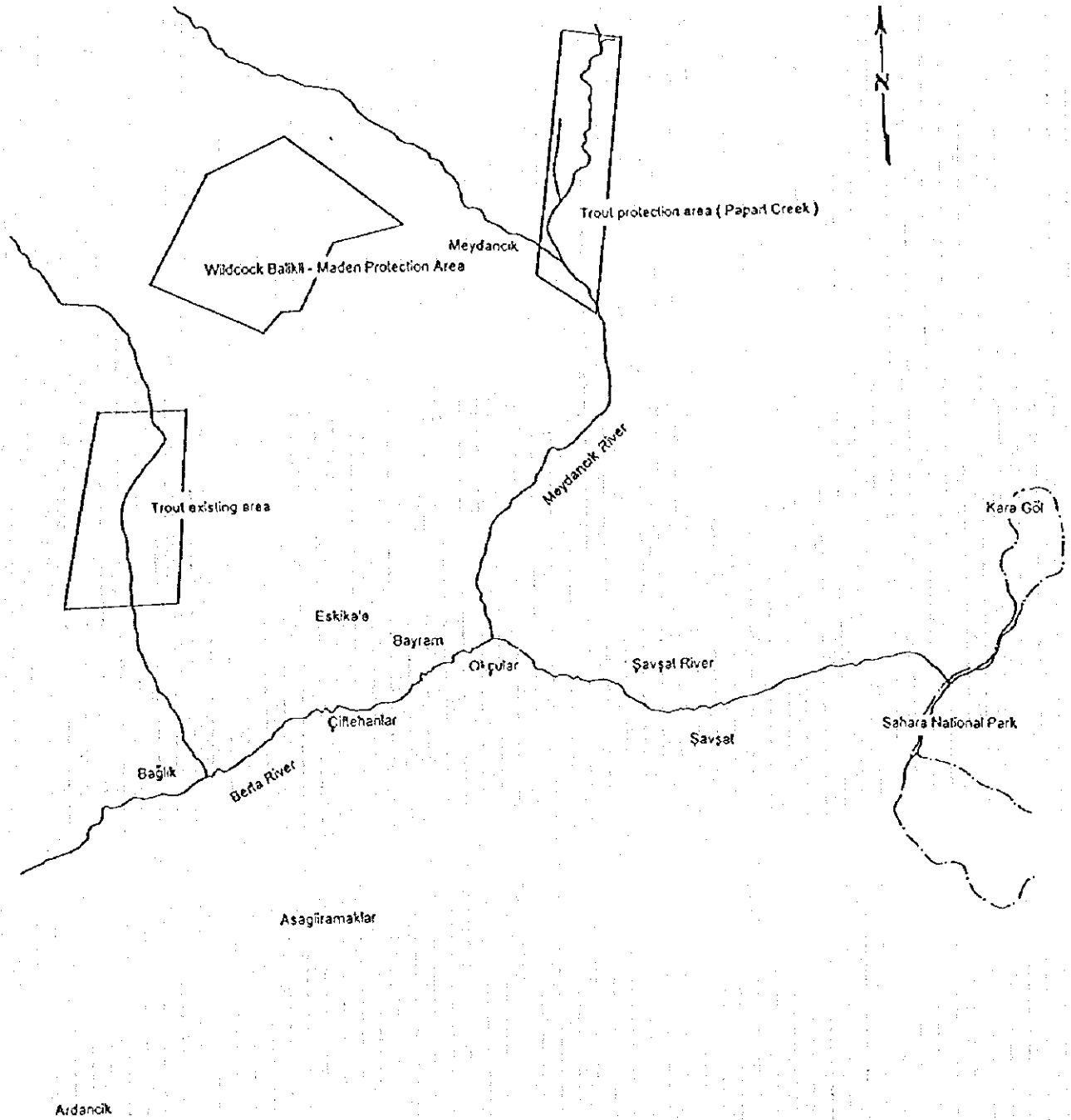
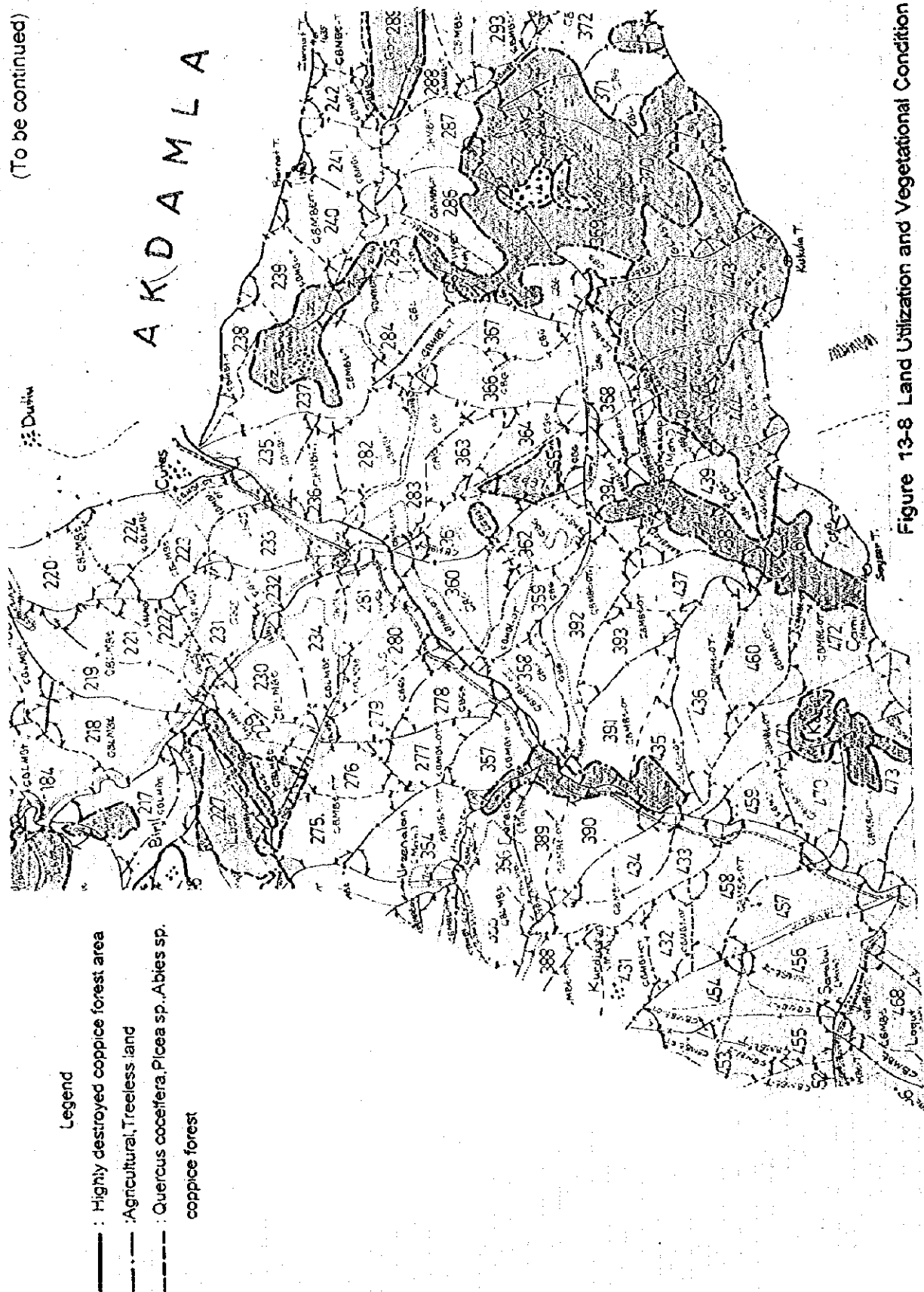


Figure 13-7 Location of Trout Existing Area and Protection Area

(To be continued)



(To be continued)

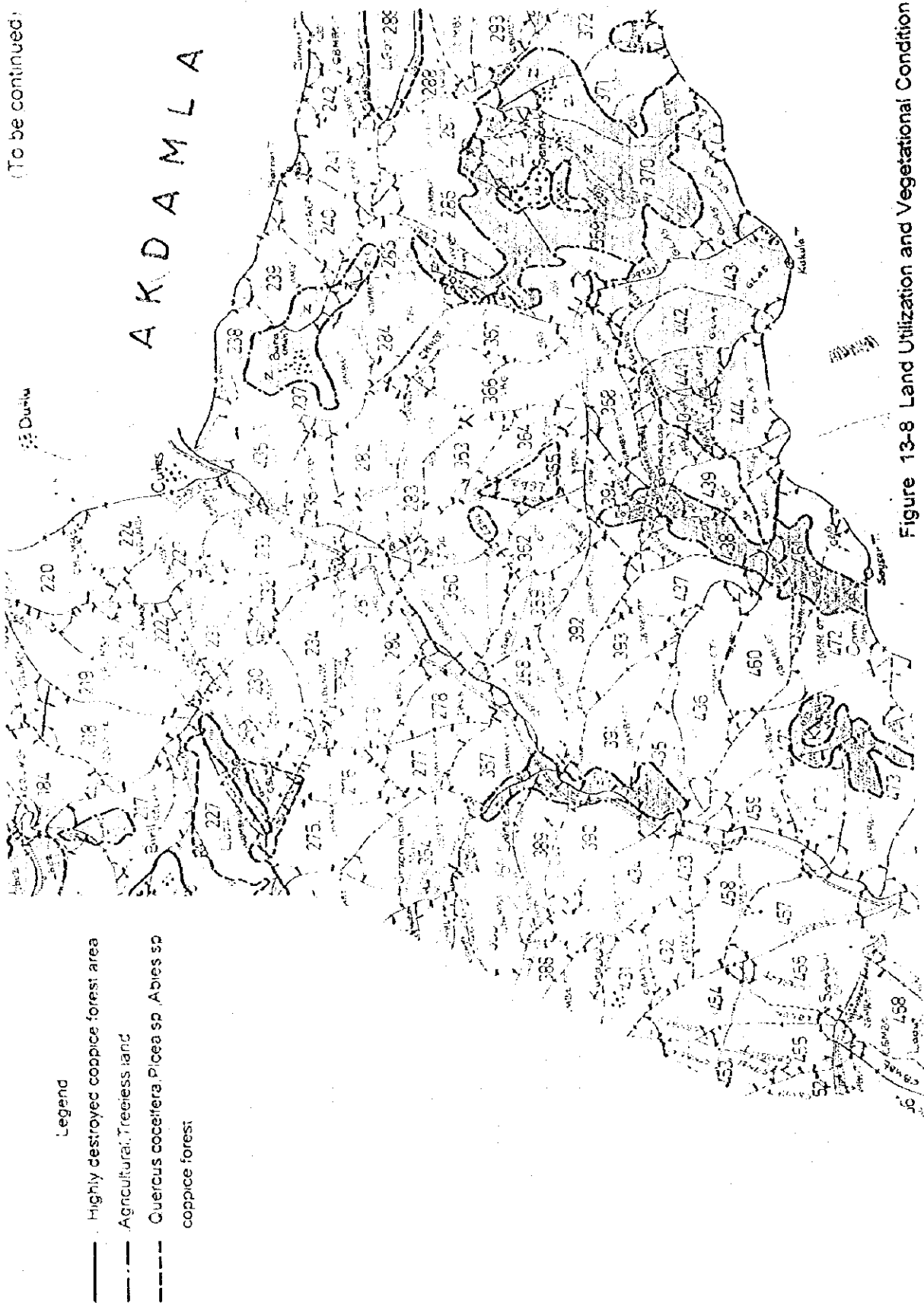


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

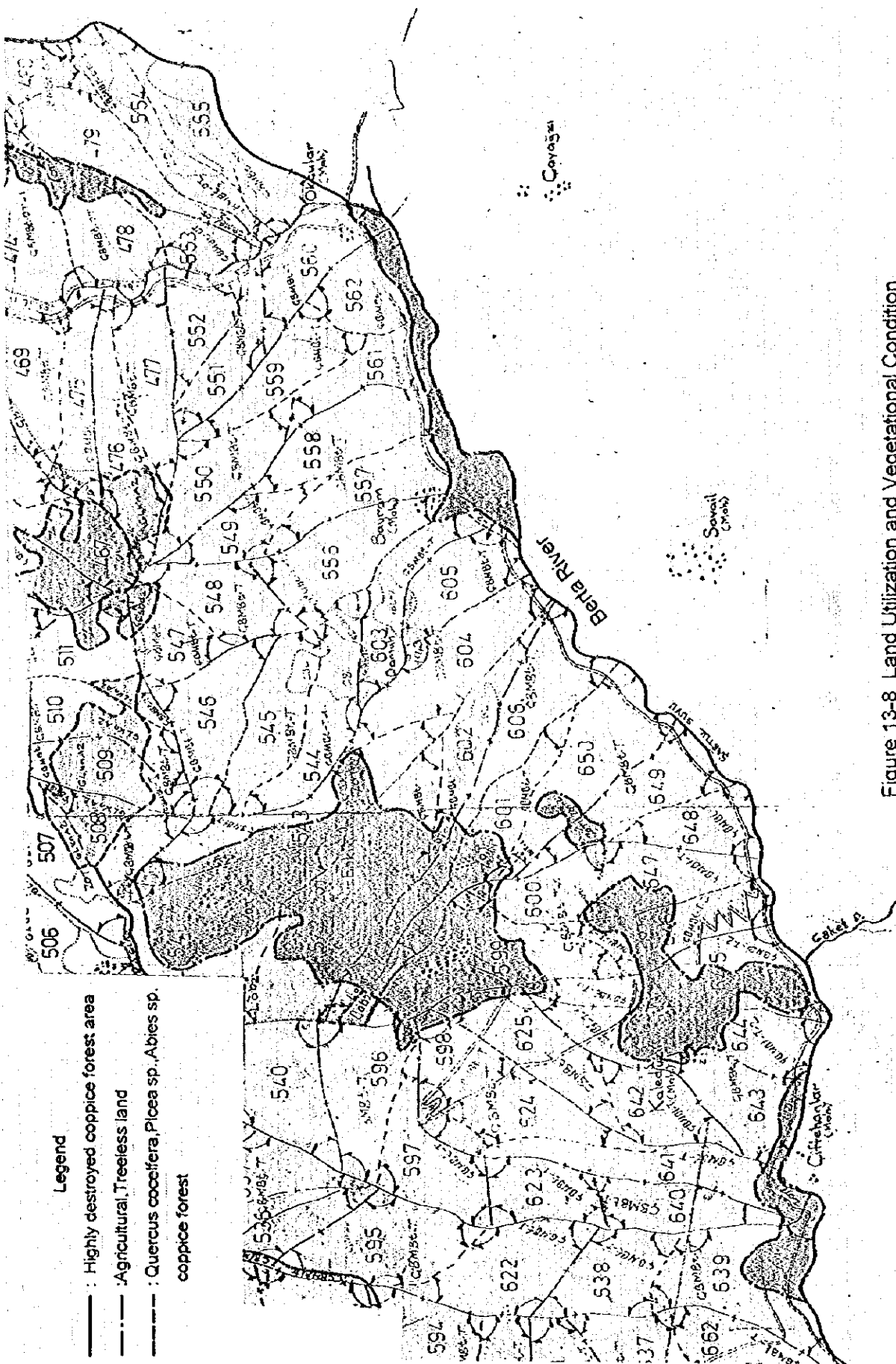


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

Legend

- : Highly destroyed coppice forest area
- - - : Agricultural, Treeless land
- - - : Quercus coccifera, Picea sp., Abies sp. coppice forest

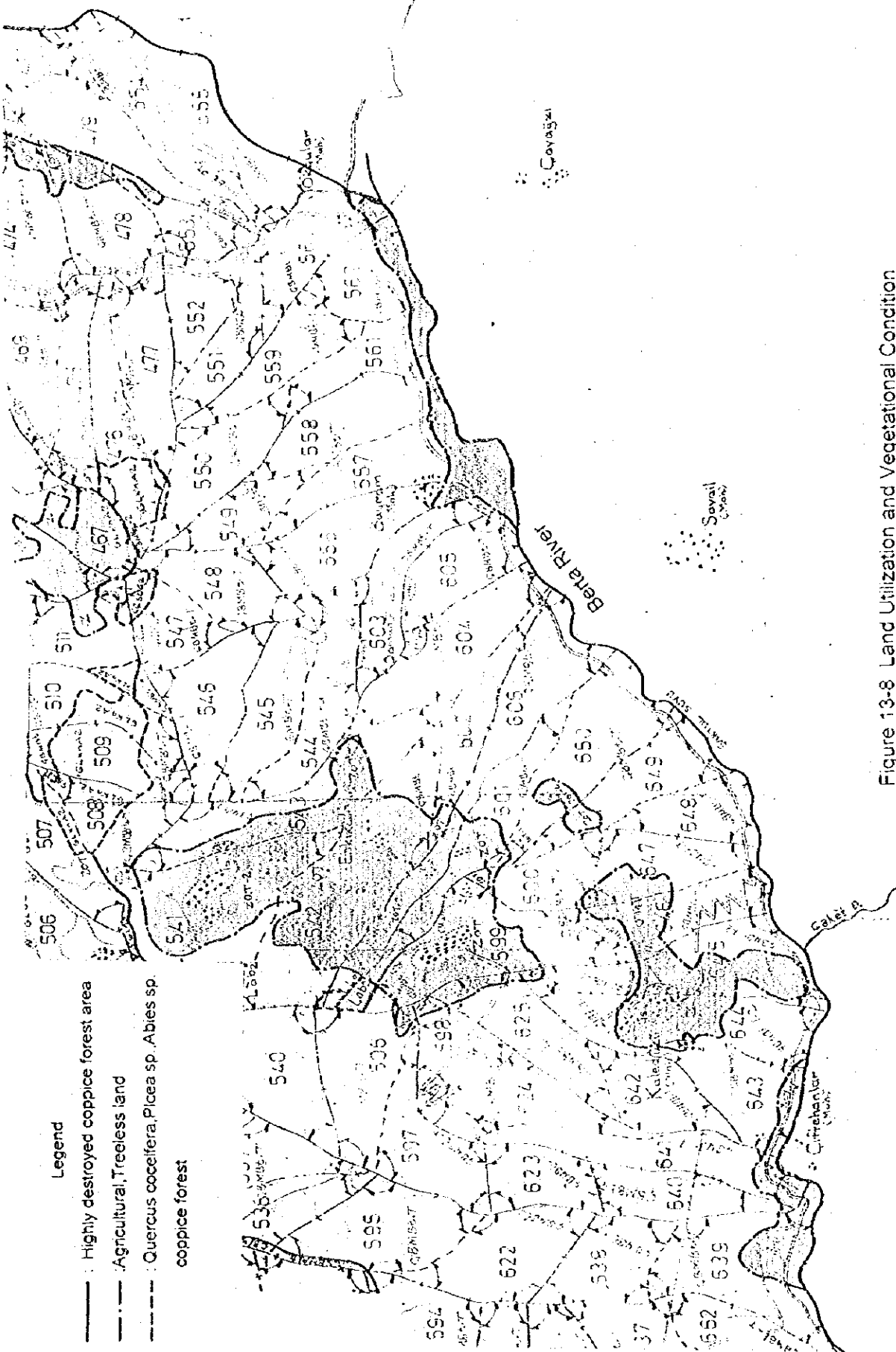


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

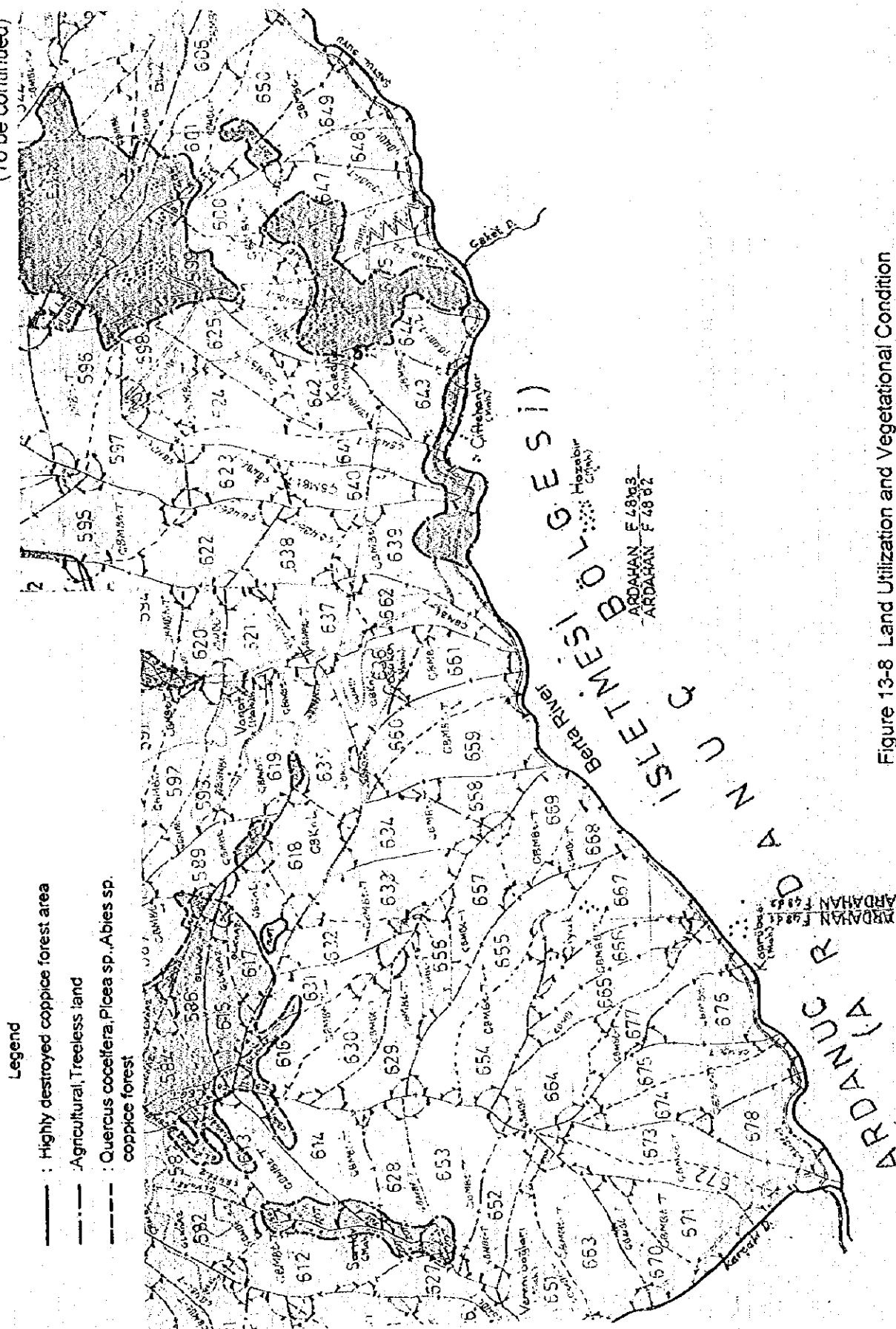


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

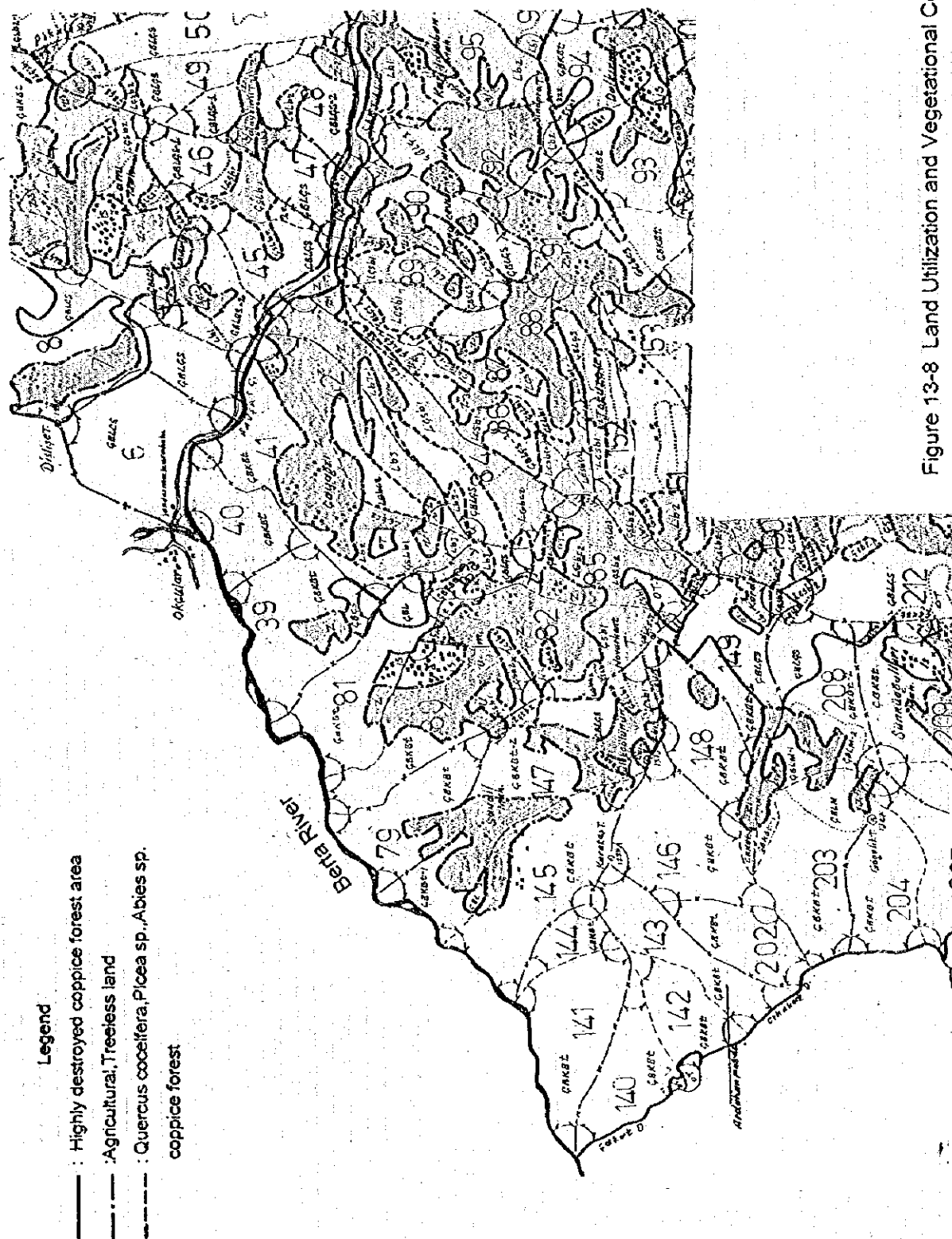


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

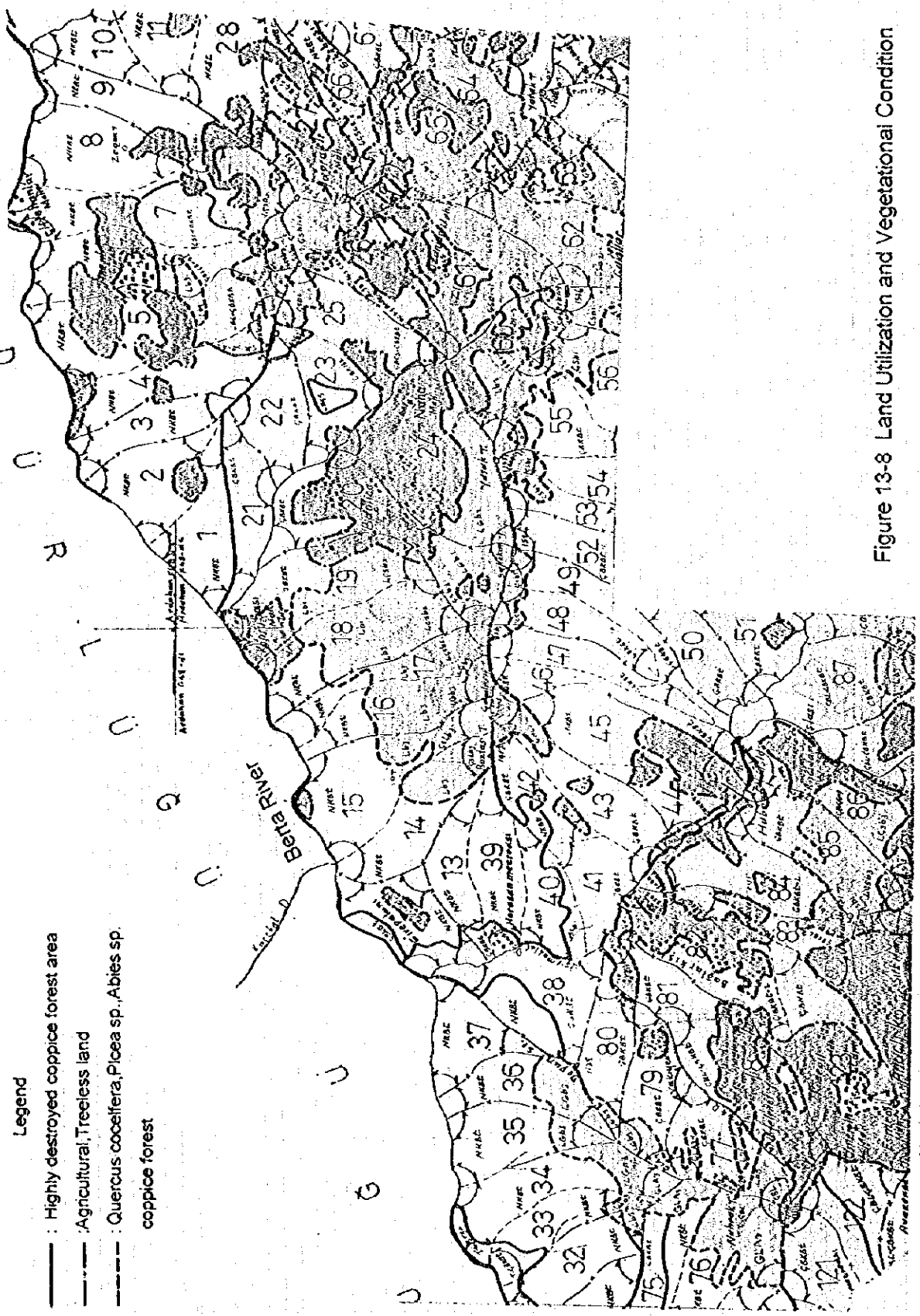


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

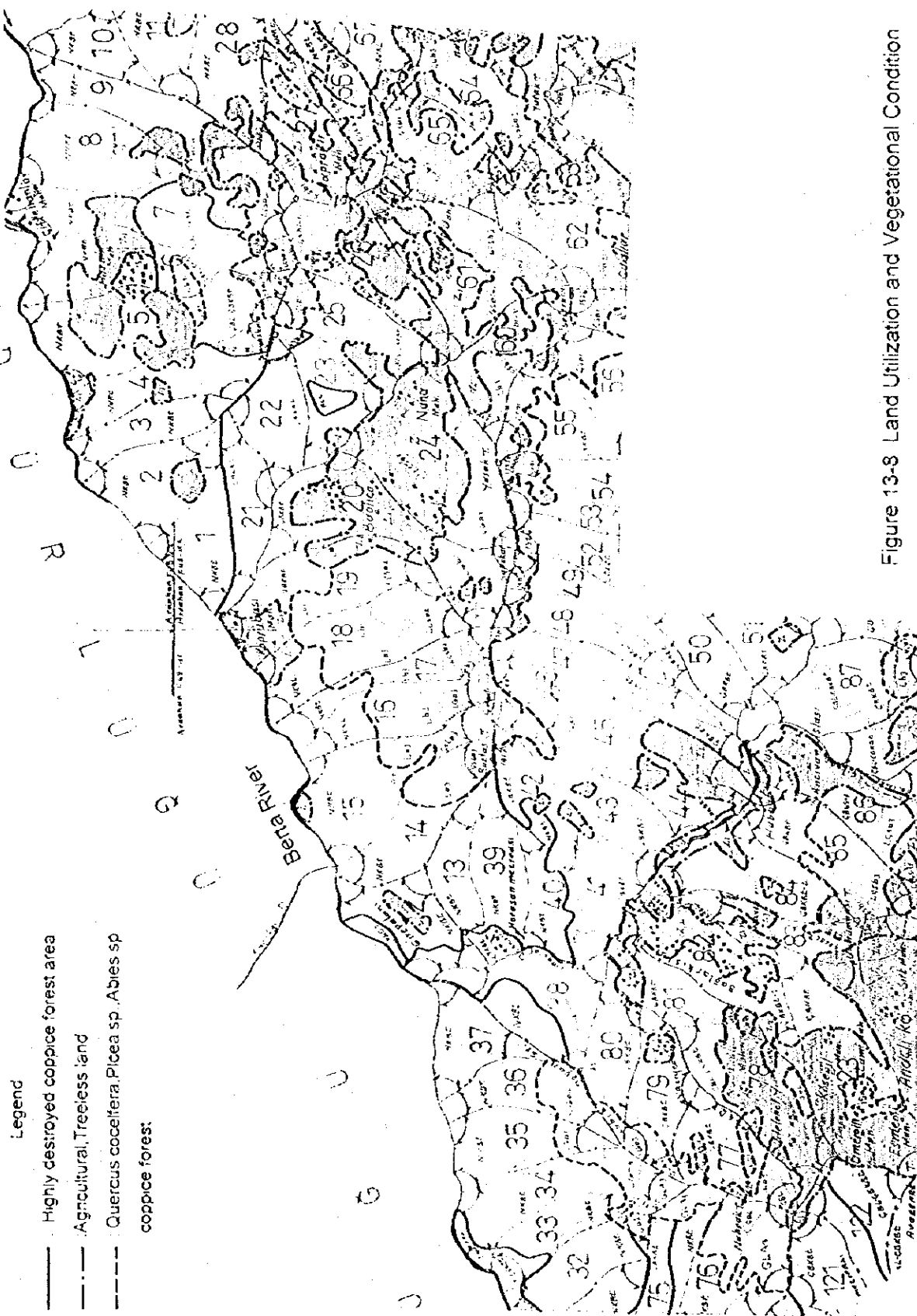


Figure 13-8 Land Utilization and Vegetational Condition

(To be continued)

Legend

- : Highly destroyed coppice forest area
- - - : Agricultural, Treeless land
- - - : *Quercus coccolifera*, *Picea* sp., *Abies* sp.
coppice forest

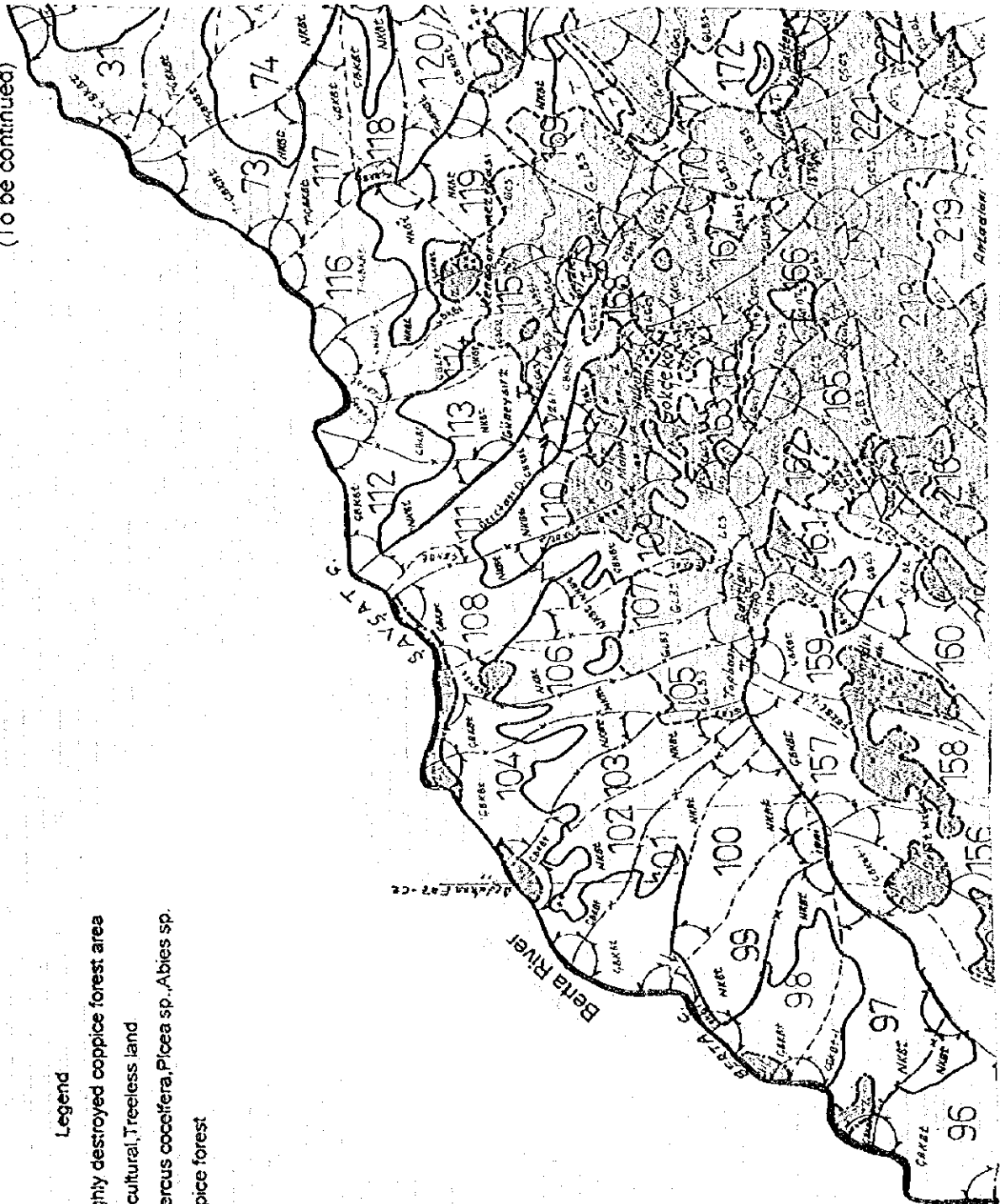


Figure 13-8 Land Utilization and Vegetational Condition

Legend

- : Highly destroyed coppice forest area
- - - : Agricultural, Treeless land
- · - · : *Quercus coccifera*, *Picea* sp., *Abies* sp. coppice forest

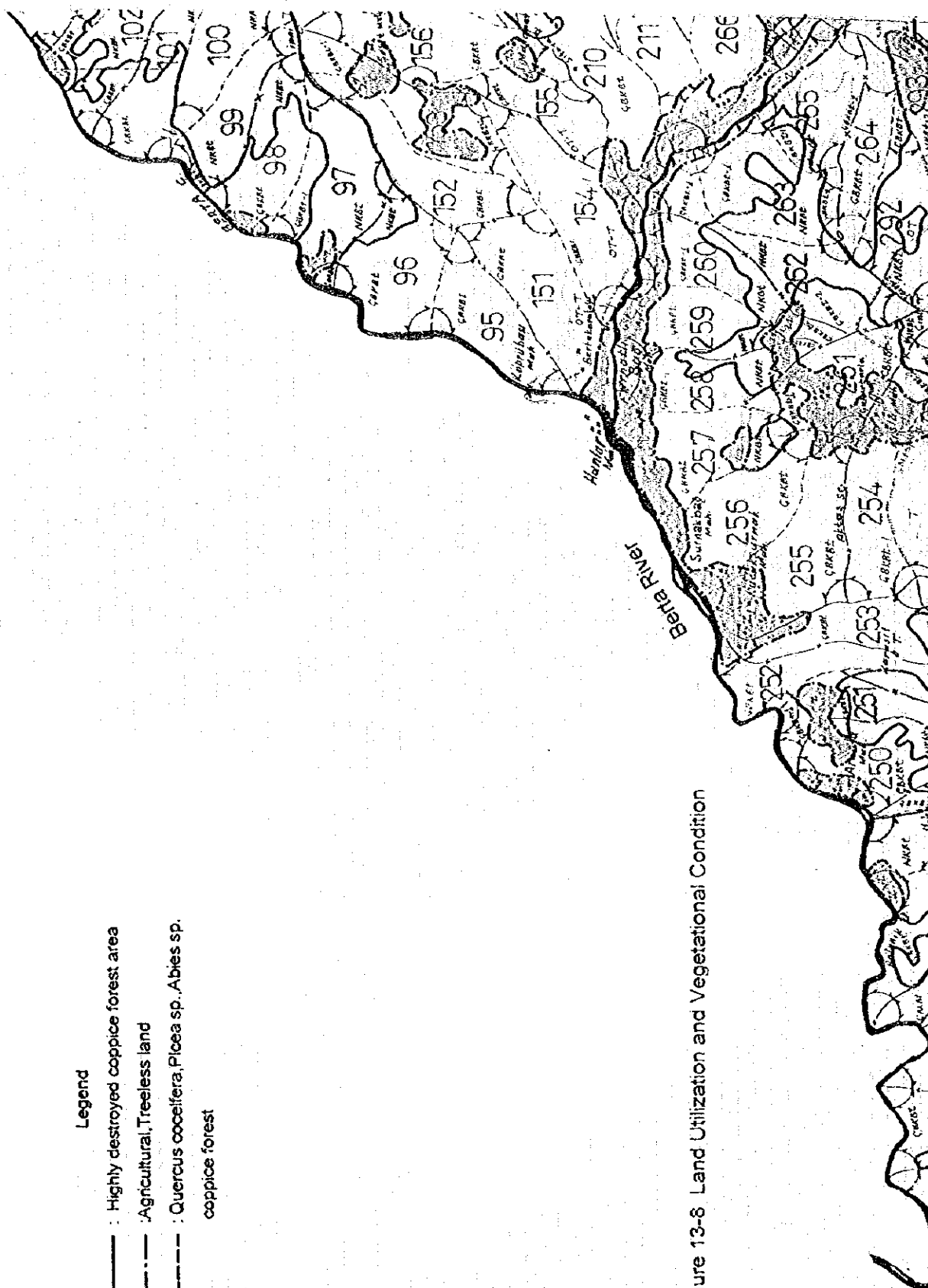
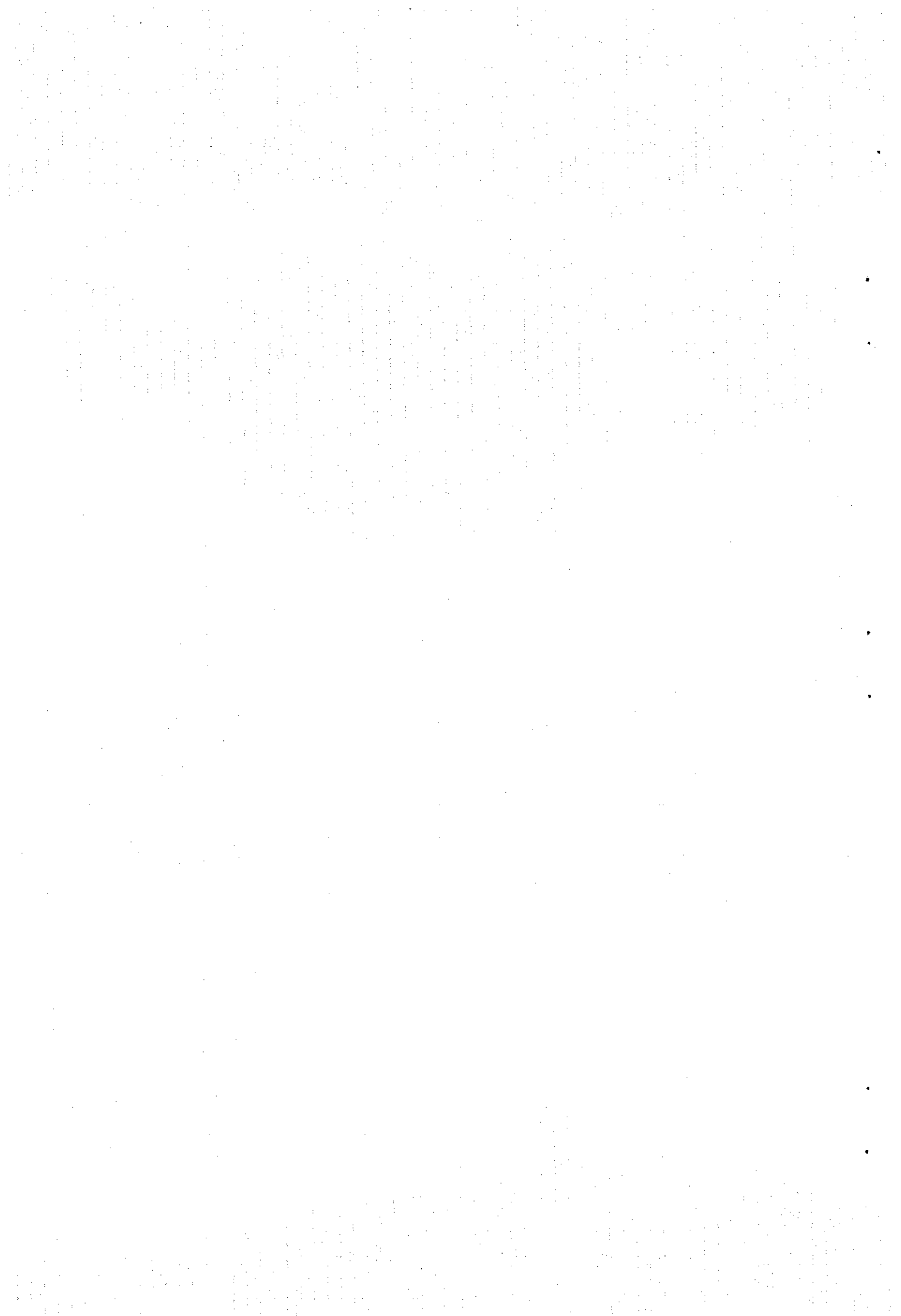


Figure 13-8 Land Utilization and Vegetational Condition



Figure 13-9 Scenery of Bayram Dam Site



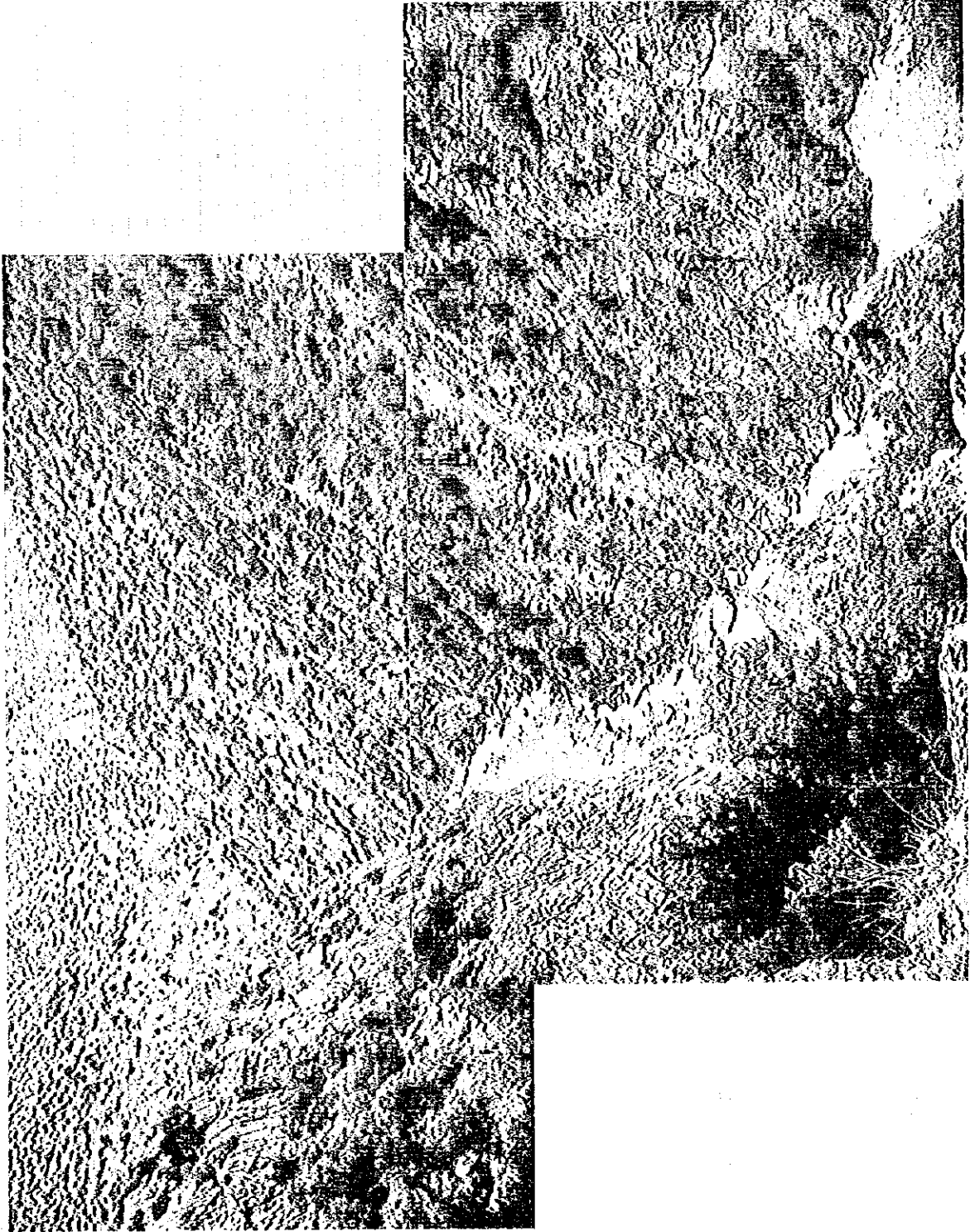
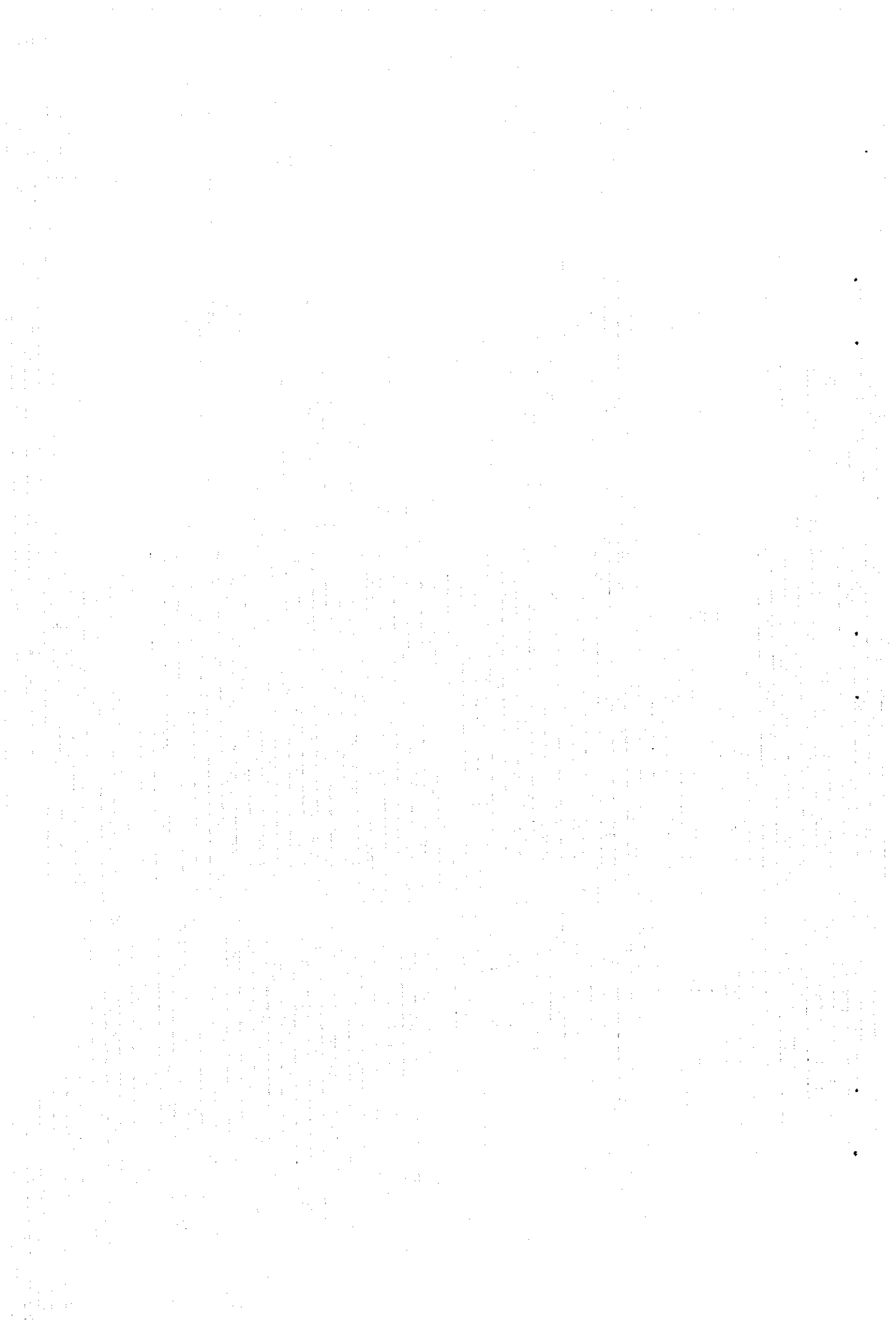


Figure 13-10 Scenery of Bağlık Dam Site



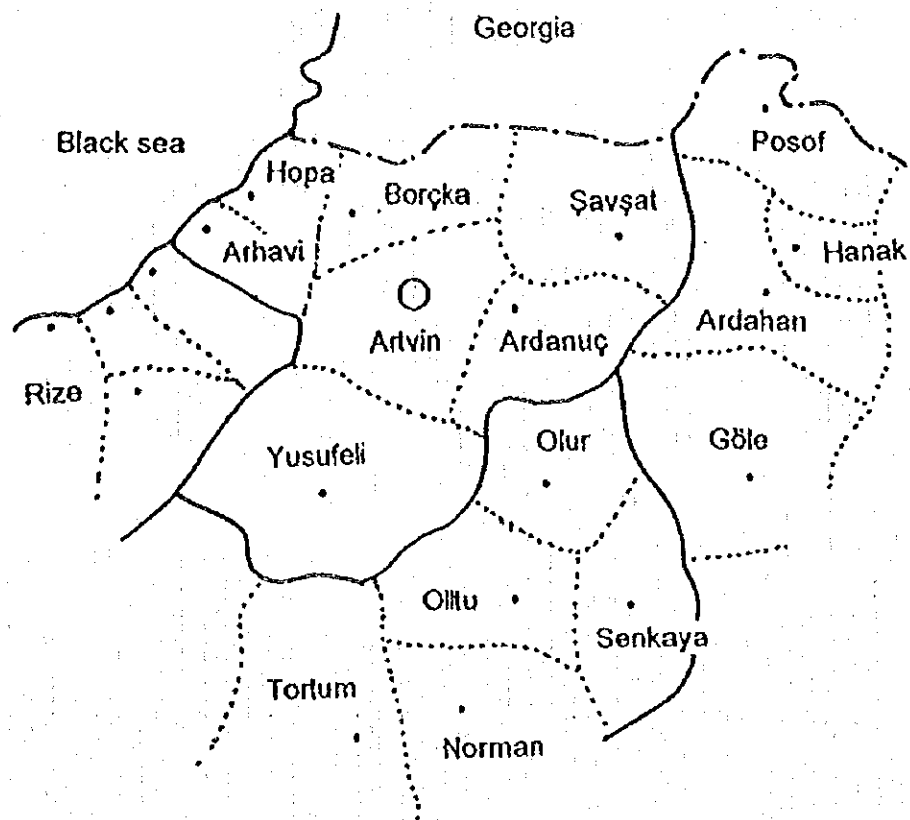


Figure 13-11 Administrative Boundary

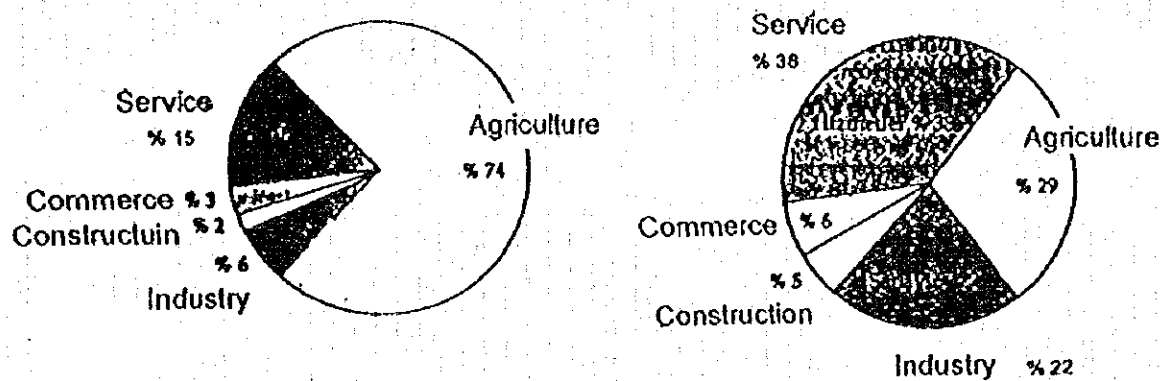


Figure 13-12 Labor Distribution and Production in Artvin Province(1985)

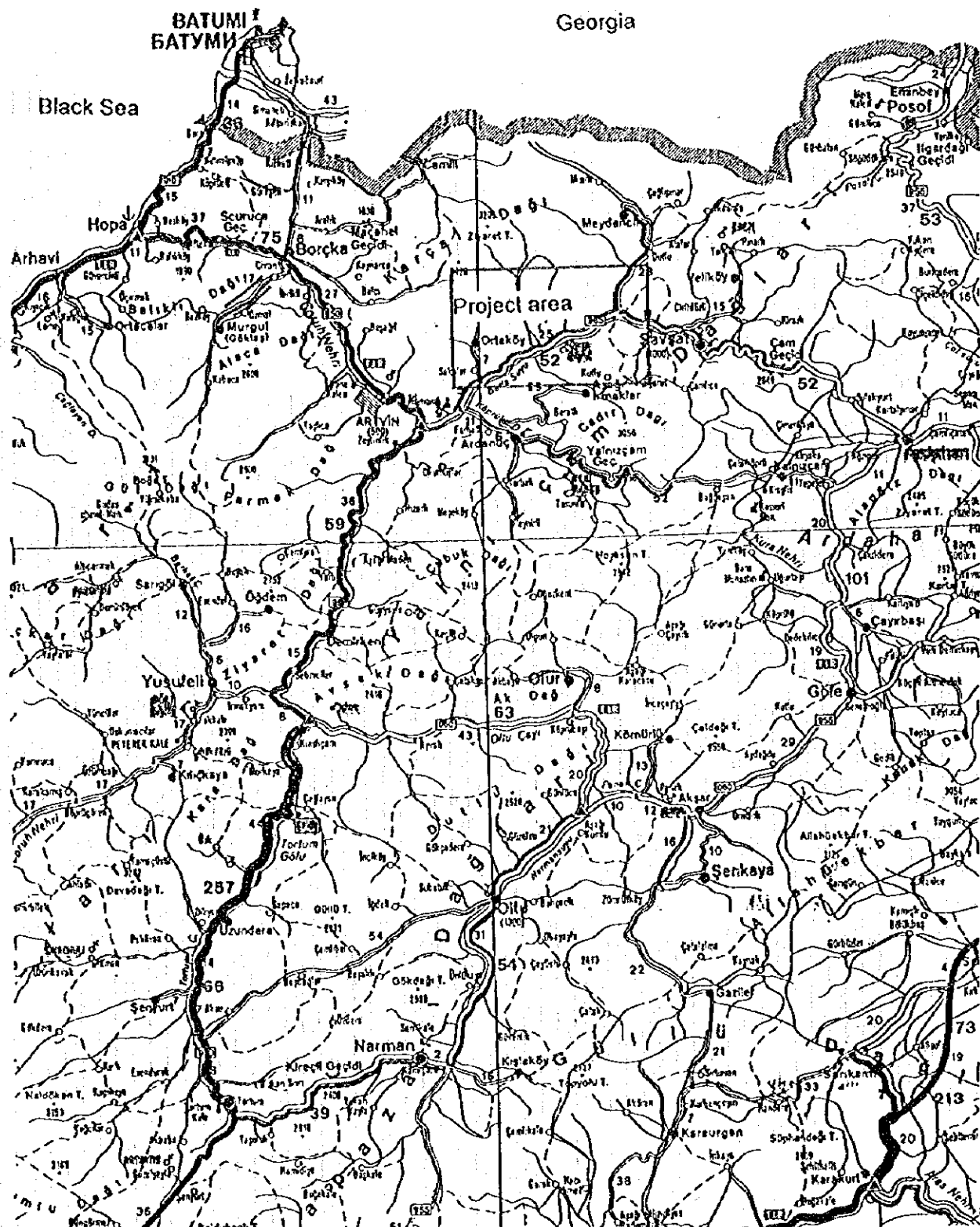


Figure 13-13 Transportation Route

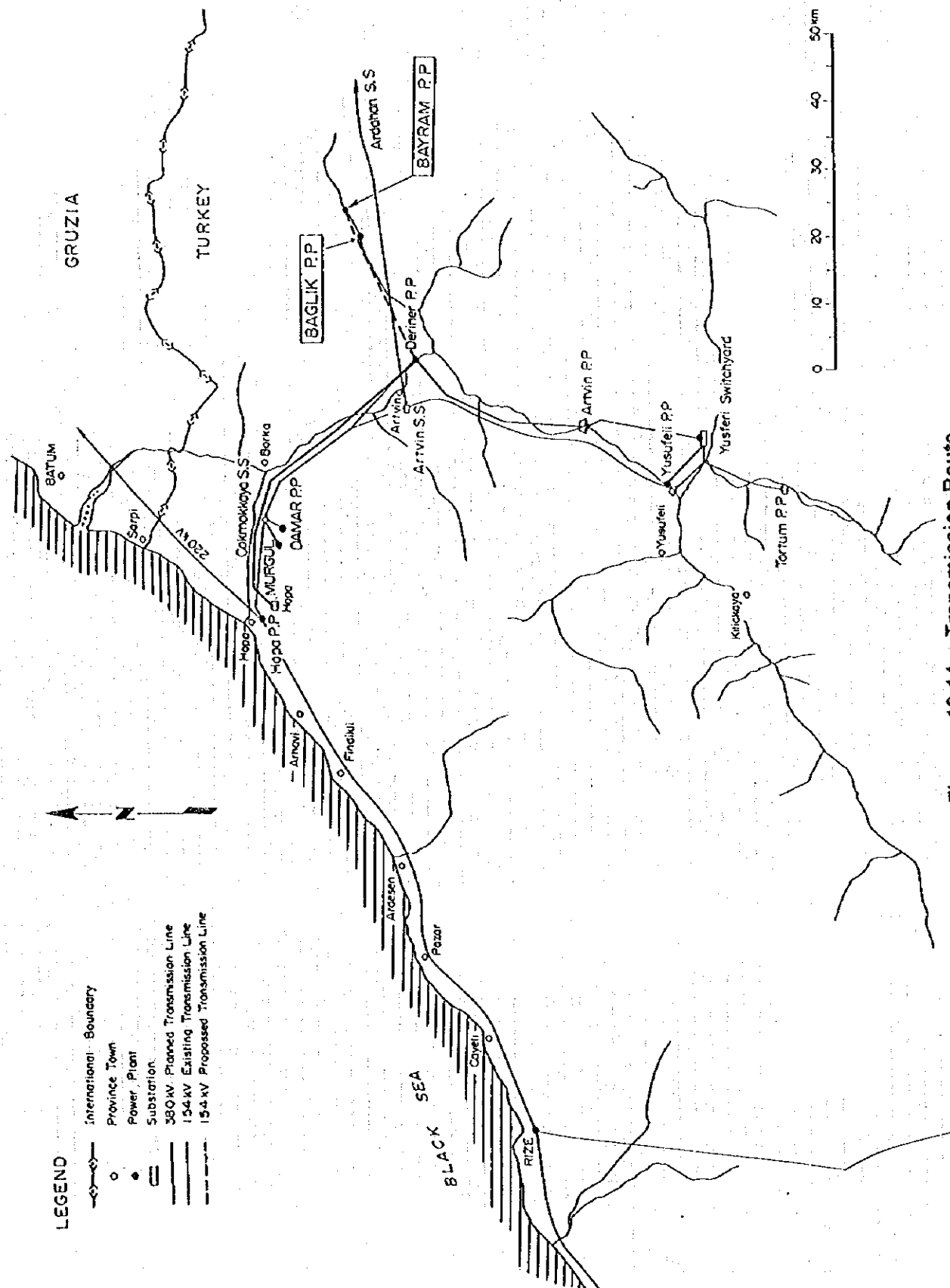


Figure 13-14 Transmission Route

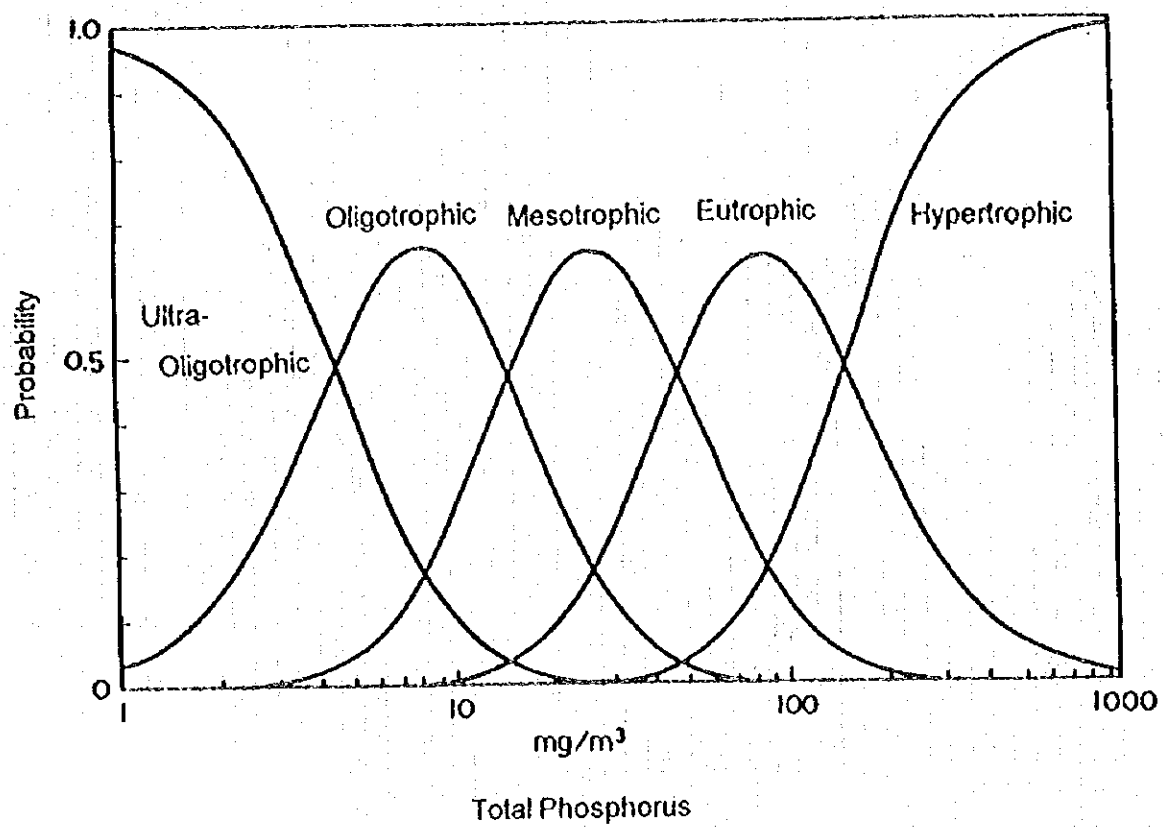


Figure 13-15 Probability Distribution of Nutrition Level

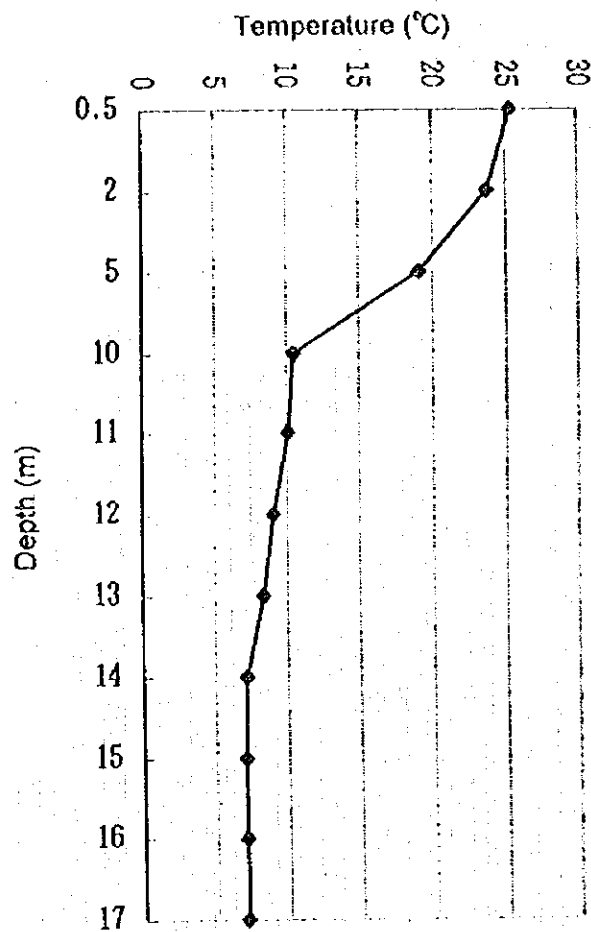


Figure 13-16 Vertical Distribution of Water Temperature at Tortum Lake in Summer

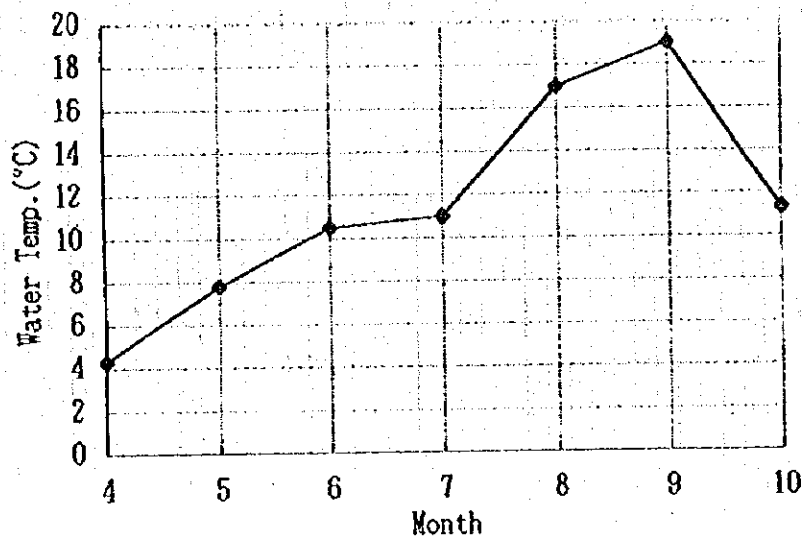


Figure 13-17 Water Temperature of Berta River (Observation Term: 1990-1994)

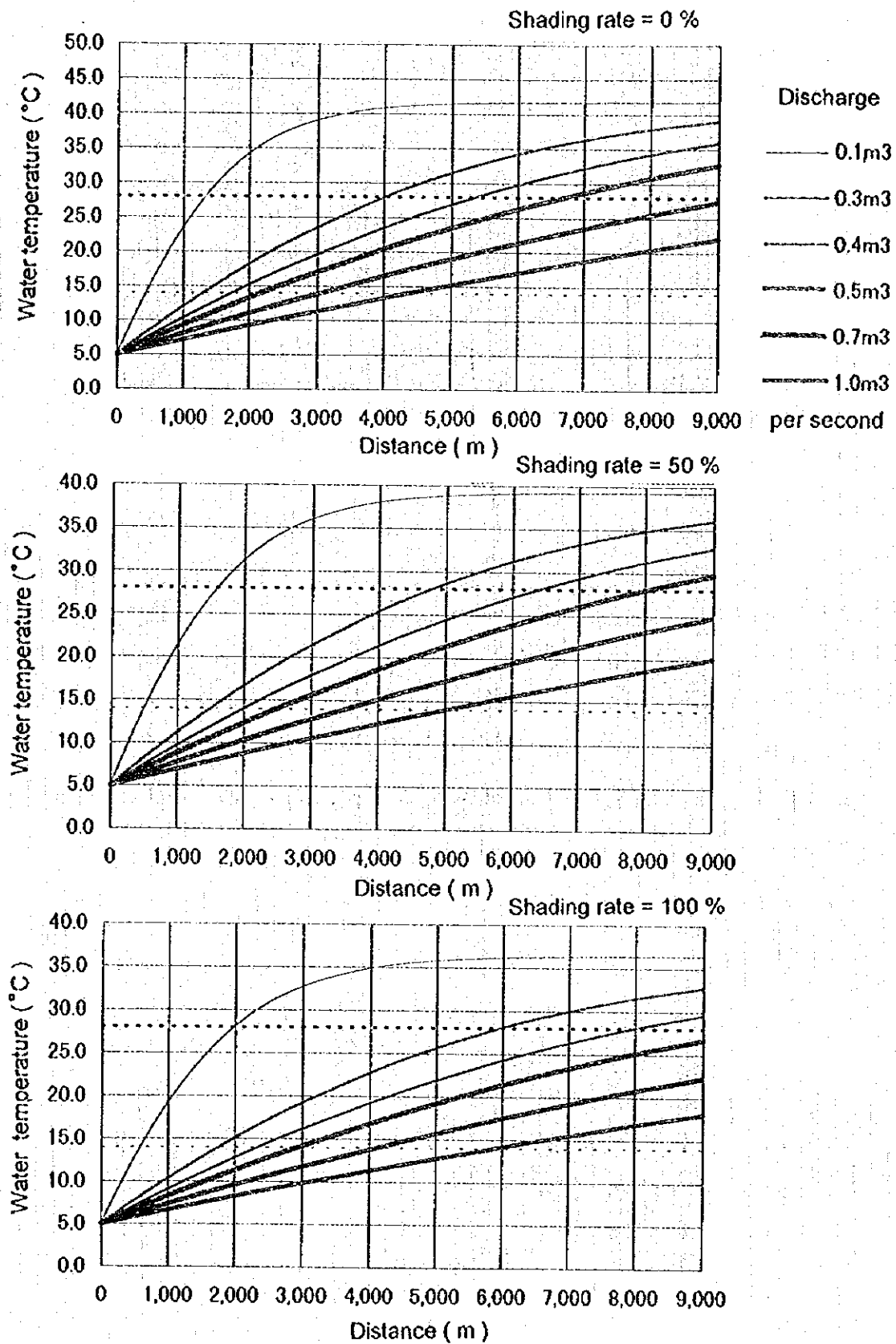


Figure 13-18 Water Temperature Change obtained by Model Simulation

Case (1) Air temperature = 43°C

Humidity = 82 %

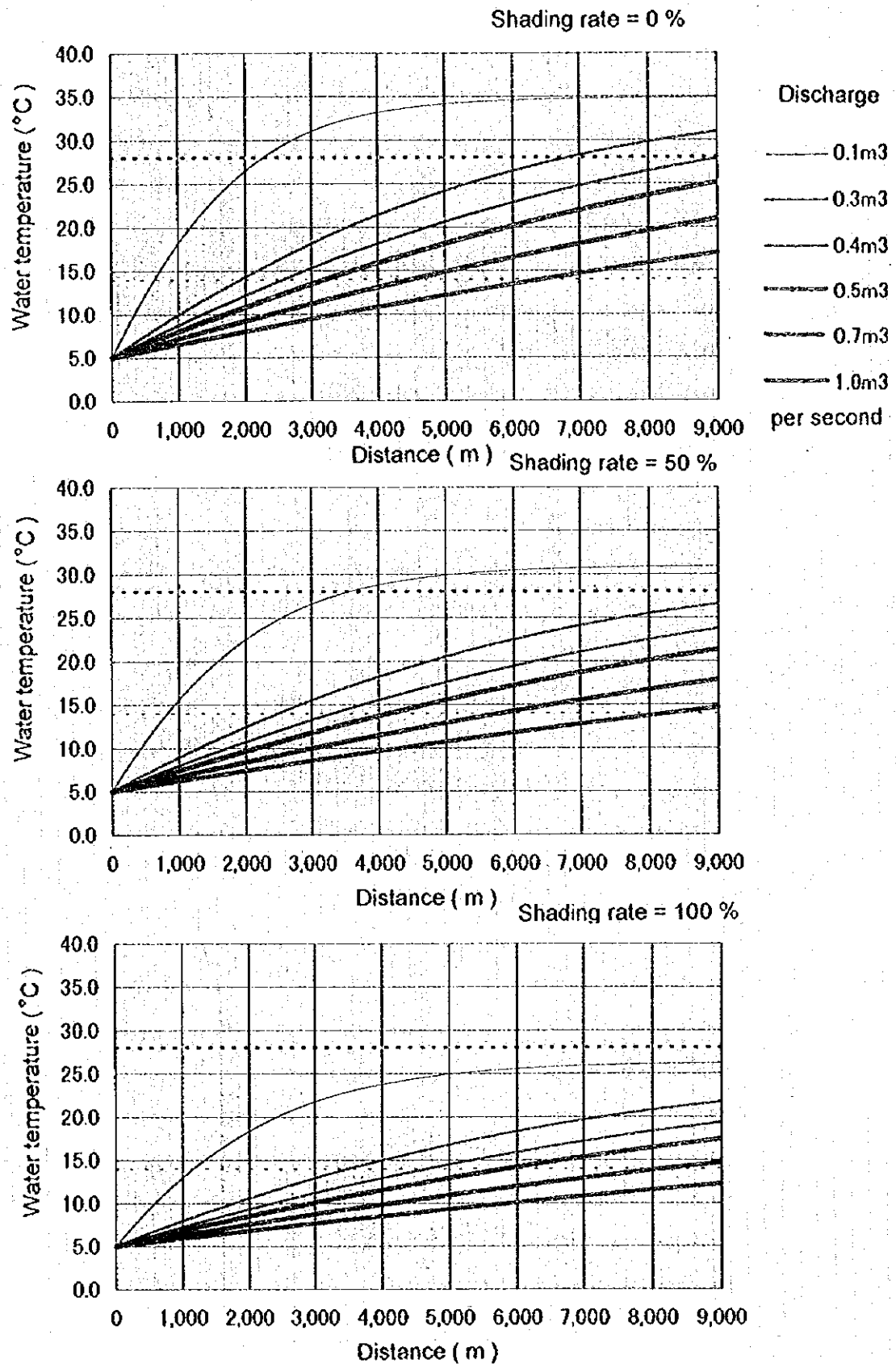


Figure 13-18 Water Temperature Change obtained by Model Simulation

Case (2) Air temperature = 34°C

Humidity = 70 %

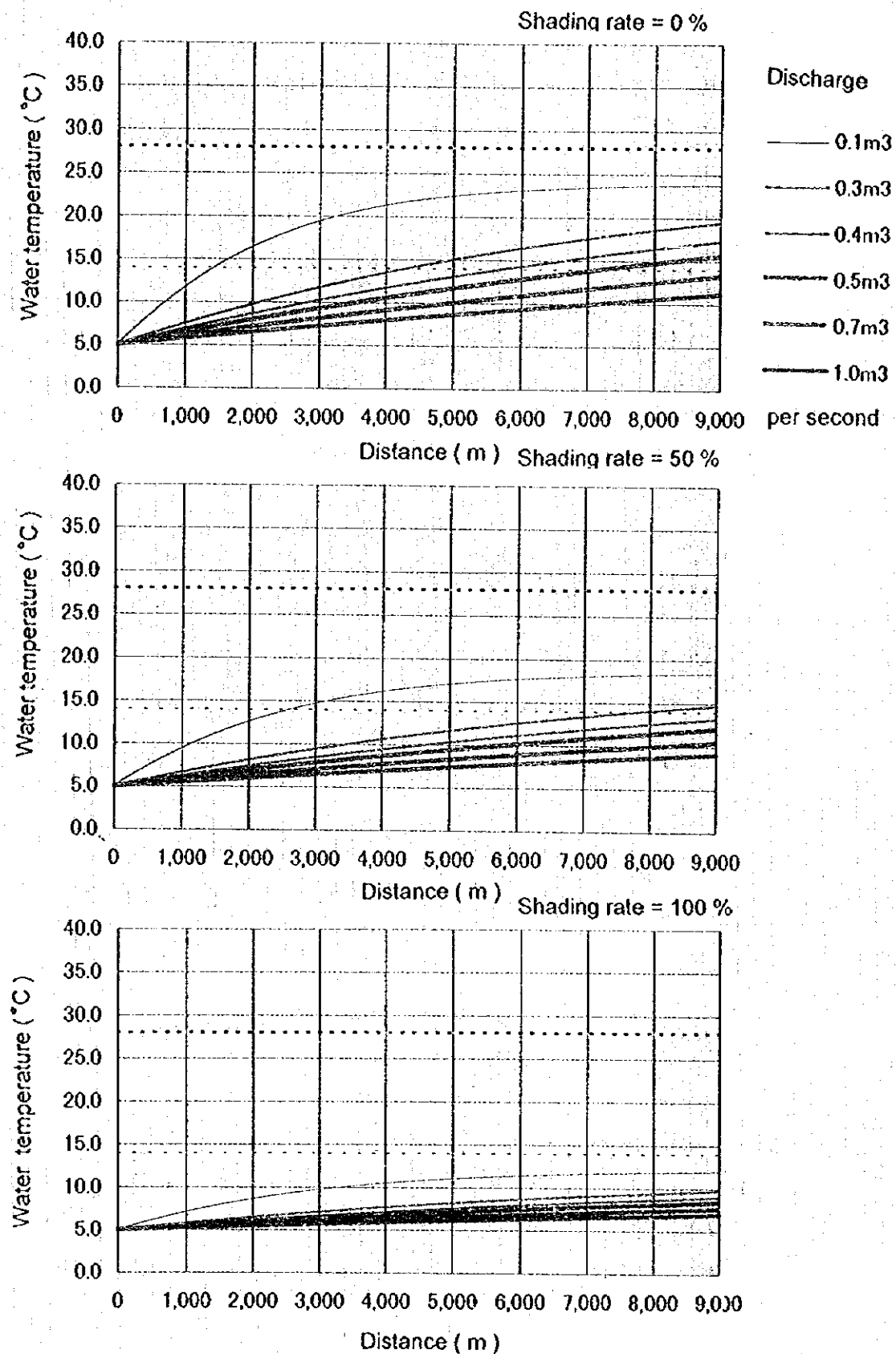


Figure 13-18 Water Temperature Change obtained by Model Simulation

Case (3) Air temperature = 21°C

Humidity = 72 %

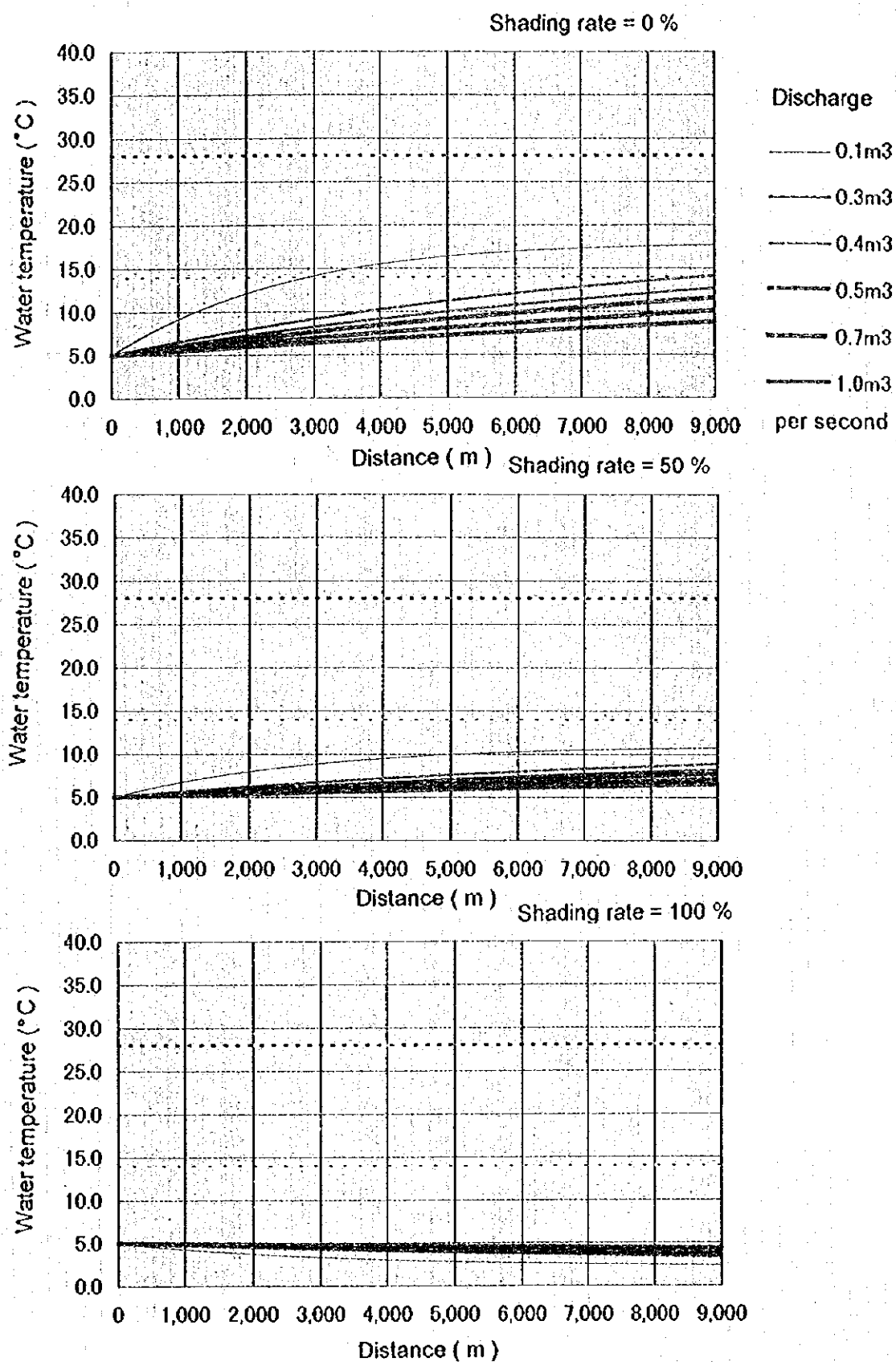


Figure 13-18 Water Temperature Change obtained by Model Simulation

Case (4) Air temperature= 12°C

Humidity = 61%

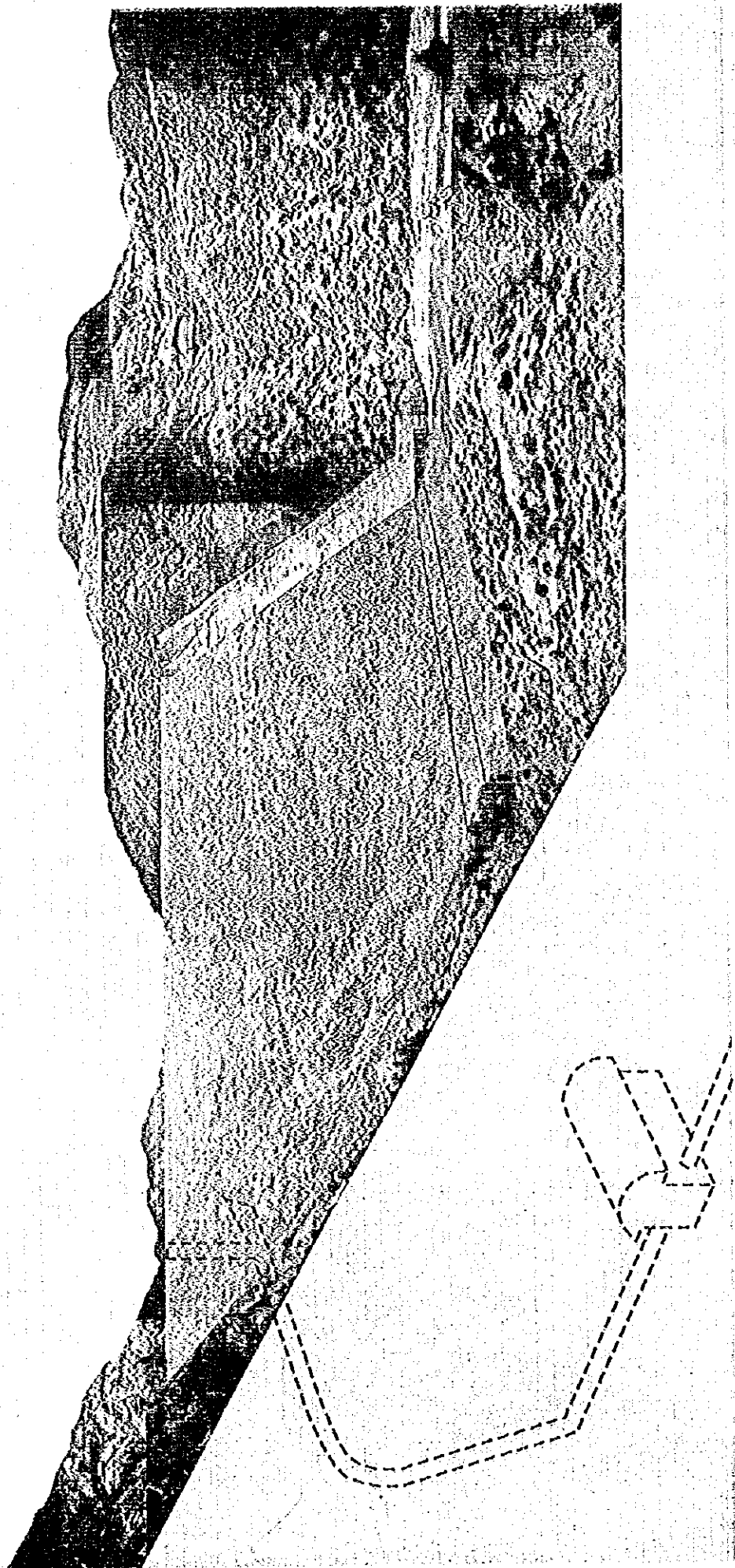


Figure 13-19 Future Scenery of Bayram Dam Site

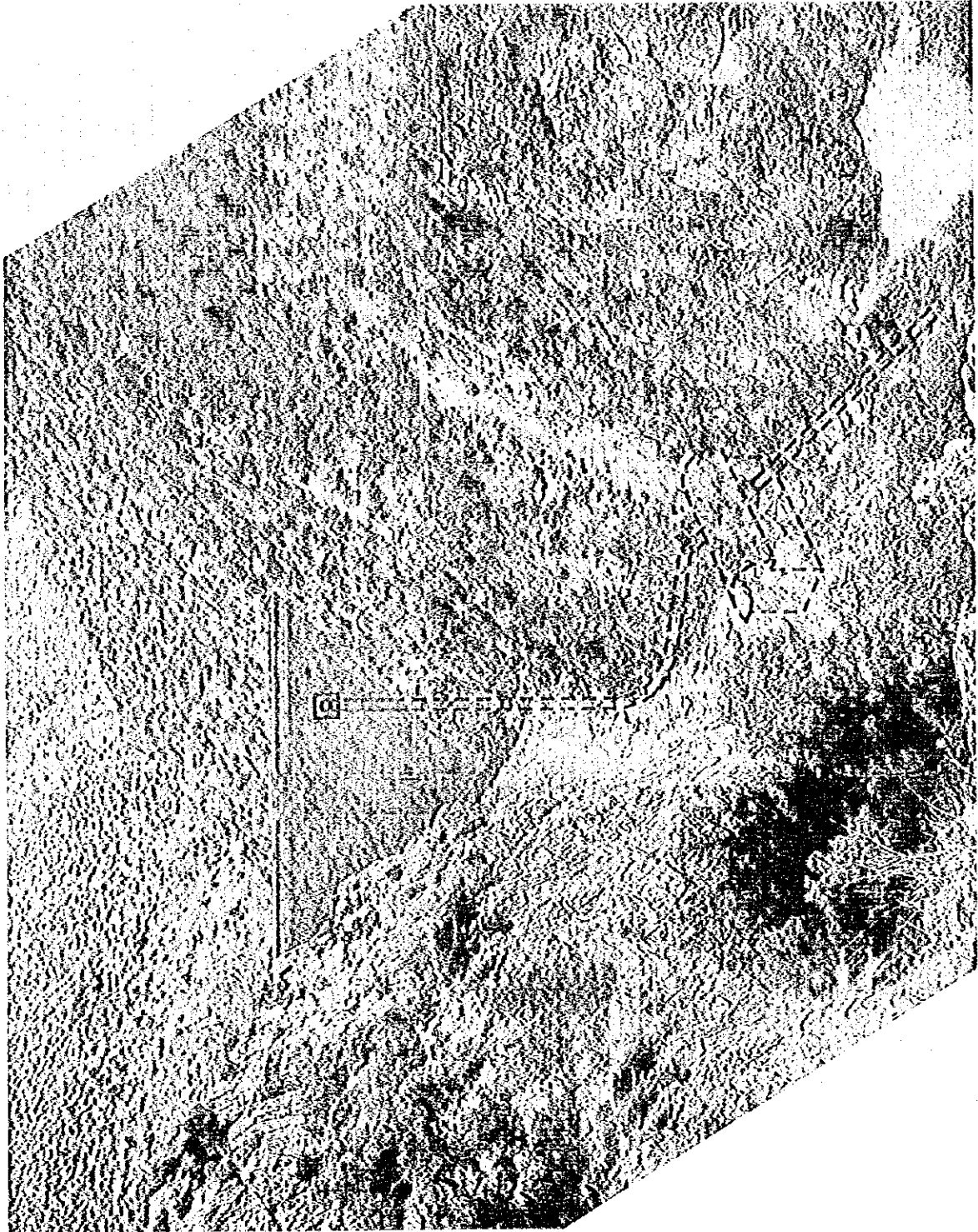


Figure 13-20 Future Scenery of Baglik Dam Site

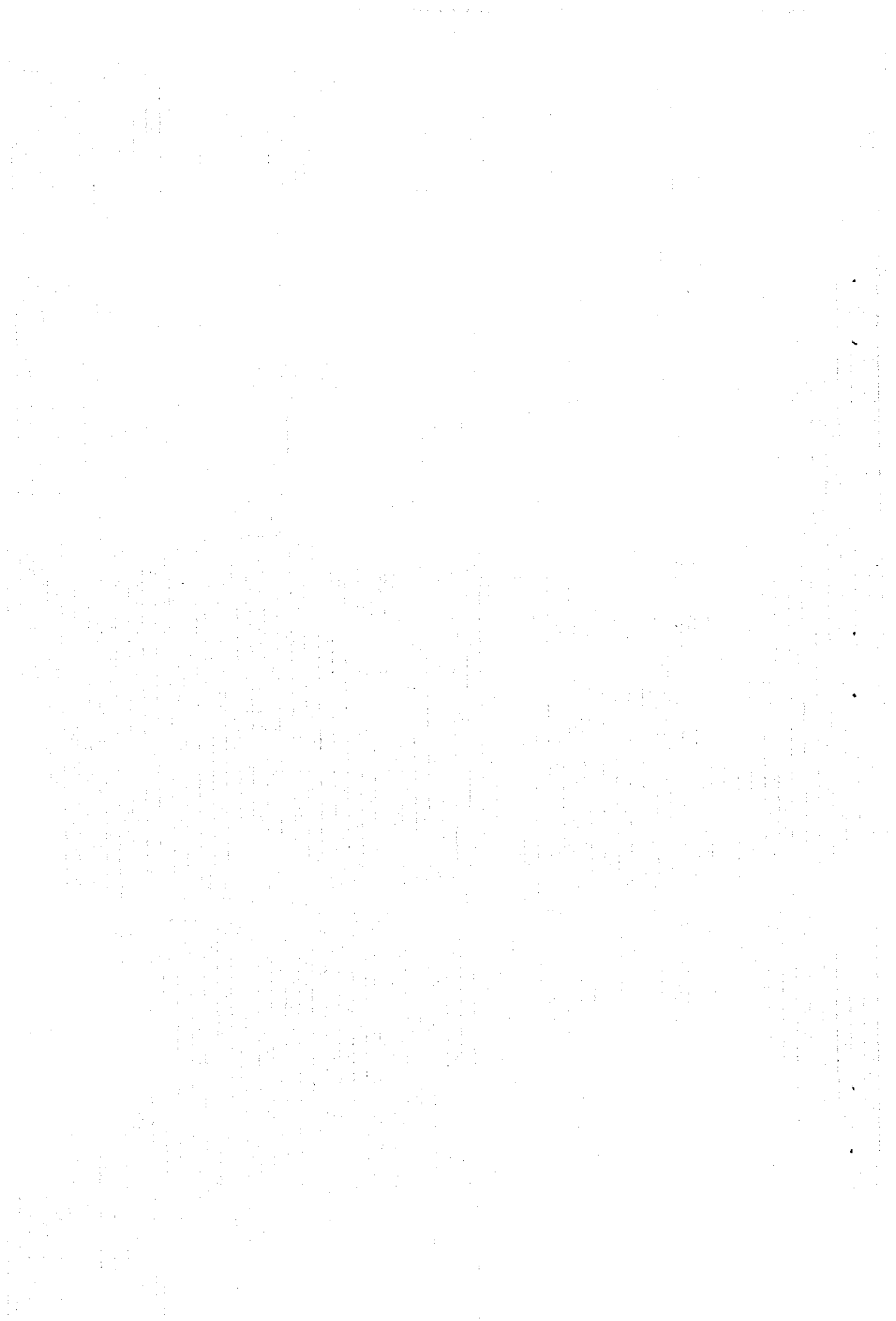


Table 13-1 Project Items

	Project Name	Bayram	Bağlık
Reservoir	Catchment Area (km ²)	1,159	1,509
	Annual Average Inflow (m ³ /sec)	19.20	24.90
	High Water Level (m)	740.00	530.00
	Normal Water Level (m)	722.00	528.50
	Low Water Level (m)	686.00	527.00
	Available Drawdown (m)	54.00	3.00
	Gross Storage Capacity(10 ⁶ m ³)	133.00	7.30
	Effective Storage Capacity(10 ⁶ m ³)	113.00	1.00
	Reservoir Area (km ²)	3.38	0.37
Dam Type	Type	Rock Fill	Con.Gra.
	Height from Foundation (m)	145	74
	Crest Length(m)	415	190
	Volume(10 ³ m ³)	6,200	195
Penstock	Type	Tunnel	Tunnel
	Diameter(m)	3.3	3.6
	Length(m)	321	213
Power House	Type	Undergr.	Undergr.
Tailrace Tunnel	Type	Hosresho	Hosresho
	Diameter(m)	4.6	4.9
	Length(m)	7,930	4,454
Development Plan	Firm Discharge(m ³ /sec)	10.70	13.00
	Maximum Discharge(m ³ /sec)	43.00	52.00
	Tail Water Level(m)	530.00	392.00
	Gross Head (m)		
	Maximum	213.00	138.00
	Normal	192.00	136.50
	Minimum	156.00	135.00
	Loss of Head(m)	9.10	5.60
	Effective Head(m)		
	Maximum	200.90	132.40
	Normal	182.90	130.90
	Minimum	146.90	129.40
	Installed Capacity(MW)	68	59
	Firm Peak Power(MW)	58.0	56.4
	Annual Energy(Gwh)		
Environmental Protection Discharge (m ³ /sec)	Average	247.9	221.4
	Firm	141.4	124.2
	Secondary	106.5	97.2
Environmental Protection Discharge (m ³ /sec)		0.5	0.5

Table 13-2(1) Construction Schedule

Item	Quantity	1st				2nd				3rd				4th				5th			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Preparatory Works																					
Diversion Tunnel	D : 5.70 m L : 795 m																				
Coffer Dam	Em : 109 x 10 ³ m ³																				
Dam	Ex : 745 x 10 ³ m ³ Em : 6,036 x 10 ³ m ³ Grouting : 58,600 m																				
Spillway	Ex : 595 x 10 ³ m ³ Conc : 47,800 m ³																				
Outlet Works																					
Intake	Ex : 105,000 m ³ Conc : 6,200 m ³																				
Penstock	Ex : 5,000 m ³ Conc : 2,300 m ³ L : 321 m																				
Powerhouse	Access Tunnel L : 906 m Cable Tunnel L : 375 m Ex : 27,000 m ³ Conc : 9,100 m ³																				
Surge Chamber																					
Traffic Tunnel	D : 4.60 m L : 7,930 m																				
Switchyard																					
Hydraulic Equipment	Outlet Valve : 1 Unit Spillway Gate : 2 Units Intake Gate : 1 Unit Draft Gate : 1 Unit Tailrace Gate : 1 Unit Penstock : 600 t																				
Electro-Mechanical Equip.																					
Transmission Line																					

Table 13-2(2) Construction Schedule

Item	Quantity	1st				2nd				3rd				4th				5th			
		1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4	1	2	3	4
Preparatory Works																					
Diversion																					
Dam	Ex: $147 \times 10^3 \text{ m}^3$ Dam Conc.: $195 \times 10^3 \text{ m}^3$ Grouting: 18,100 m																				
Spillway	Ex: $21,000 \text{ m}^3$ Conc: $9,600 \text{ m}^3$																				
Intake	Conc: 500 m^3																				
Penstock	Ex: $3,000 \text{ m}^3$ Conc: $1,300 \text{ m}^3$ L: 213 m																				
Powerhouse	Access Tunnel L: 563 m Cable Tunnel L: 268 m Ex: $33,000 \text{ m}^3$ Conc: $10,500 \text{ m}^3$																				
Surge Chamber																					
Tailrace Tunnel	D: 4.90 m L: 4,454 m																				
Hydraulic Equipment	Spillway Gate: 2 Units Intake Gate: 1 Unit Draft Gate: 1 Unit Tailrace Gate: 1 Unit Penstock: 950 t																				
Electro-Mechanical Equip.																					
Transmission Line																					

Table 13-3 Land Expropriation Cost and Relocation Cost

Item	da	US\$
Land expropriation cost		
Bayram and Bağlık dam reservoir	243.9	$1,378 \times 10^3$
Borrow area	105.25	685×10^3
Total		$2,063 \times 10^3$
Relocation cost for public facilities		
		$19,192 \times 10^3$
Total		$21,255 \times 10^3$

Table 13-4 Monthly Mean Air Temperature

Location	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Artvin (1948-1991)	2.7	3.9	7.1	12.1	15.9	18.7	20.6	20.6	17.8	13.8	9.2	4.5
Şavşat (1964-1990)	-1.4	-0.3	4.1	9.6	14.2	17.2	20.2	20.2	16.8	11.3	5.4	0.6

Table 13-5 Monthly Precipitation

Location	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Artvin (1946-1994)	88.8	72.2	55.0	53.2	54.0	47.5	29.3	27.0	35.1	58.7	68.0	90.7
Şavşat (1957-1994)	50.2	50.3	52.7	73.0	77.2	84.0	51.1	40.3	38.5	50.6	60.9	66.3

Table 13-6 Monthly Snow Depth

Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Şavşat (1958-1987)	93	83	86	22						34	97	125

Table 13-7 Wind Velocity and Direction

Location	Jan.	Feb.	Mar.	Apr.	May	Jun	Jul.
Arvin	18.8 SE	22.1 SSE	21.8 NW	21.4 NNW	18.8 NW	21.5 SSW	17.8 NW
(1959 -	18.8 ESE						
1990)	Aug.	Sept.	Oct.	Nov.	Dec.		
	16.0 WNW	17.5 NW	15.2 SW	24.2 NW	23.0 SE		

Table 13-8 Monthly Humidity

Location	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
Arvin (1948-1991)	63	63	62	61	64	67	71	71	69	66	64	64
Şavşat (1964-1987)	61	59	59	60	63	64	64	63	61	63	66	66

Table 13-10 'Water Flow Rate at Bayram Dam Site

Dam Site : Bayram

Catchment Area : 1,159 km²

(m³/sec)

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Ave.
1942	12.6	25.6	12.7	11.2	14.4	21.0	95.7	99.5	44.4	21.7	11.5	9.6	31.7
1943	10.7	12.8	12.1	9.2	8.5	10.1	33.3	47.5	30.6	16.0	9.8	7.8	17.4
1944	8.2	9.0	8.6	7.5	8.6	19.1	32.5	106.8	54.1	30.0	11.1	8.7	25.4
1945	7.7	8.9	6.3	5.6	5.4	6.8	24.7	44.6	35.4	15.3	7.4	5.8	14.5
1946	6.2	6.2	5.8	7.4	5.6	9.2	30.1	48.3	41.0	19.7	12.1	7.7	16.6
1947	11.5	8.8	6.9	6.7	7.6	20.3	30.1	23.5	18.9	9.1	5.8	5.2	12.9
1948	6.3	10.9	6.9	6.6	6.6	6.9	32.2	47.8	42.6	13.3	7.6	7.3	16.3
1949	6.9	6.3	5.3	5.0	5.0	8.4	20.1	44.9	25.5	8.6	6.1	5.5	12.3
1950	5.7	5.3	4.9	4.6	5.1	11.1	39.4	47.8	26.3	14.1	7.0	5.1	14.7
1951	8.9	7.6	6.4	5.9	5.9	8.8	31.1	37.8	32.5	13.5	7.6	8.0	14.5
1952	13.9	10.8	7.8	7.1	8.5	10.4	41.8	44.9	33.0	18.7	8.5	6.4	17.7
1953	5.6	5.5	5.0	4.5	5.3	6.3	29.0	46.5	34.9	16.2	8.8	8.4	14.7
1954	6.9	7.0	5.5	5.6	6.8	12.2	41.3	63.1	47.3	24.4	10.5	7.9	19.9
1955	6.9	6.4	5.8	4.7	5.3	7.6	17.6	27.8	16.6	6.0	3.9	3.9	9.4
1956	3.9	4.0	4.4	4.0	6.3	7.9	30.6	37.8	33.8	15.1	6.8	5.6	13.4
1957	5.0	4.7	4.2	3.4	5.6	14.9	31.7	45.4	38.4	15.6	7.1	5.8	15.2
1958	5.6	6.0	5.6	4.9	5.4	11.0	32.5	45.5	34.9	13.7	6.5	6.5	14.9
1959	6.1	6.0	6.0	6.0	5.0	12.2	33.3	55.6	43.4	18.5	9.7	7.6	17.4
1960	10.1	9.4	7.2	12.6	21.9	30.3	74.2	81.9	50.0	25.0	11.5	7.0	28.4
1961	6.6	6.0	5.4	3.7	4.4	8.0	31.7	36.4	24.7	6.8	3.5	3.4	11.7
1962	3.9	5.0	7.5	5.6	6.7	23.9	42.1	53.0	34.6	14.4	6.4	6.3	17.4
1963	6.2	6.5	6.5	6.9	7.9	10.5	58.8	89.7	84.4	44.1	17.2	8.4	28.9
1964	7.9	7.3	6.7	6.3	6.4	13.7	44.7	64.3	47.9	14.8	7.6	6.9	19.5
1965	11.2	8.0	10.6	7.0	6.5	24.9	51.0	58.0	41.7	17.0	4.9	3.3	20.3
1966	12.0	13.2	8.3	8.9	10.9	13.8	41.7	66.1	34.9	13.6	5.2	5.1	19.5
1967	4.1	3.3	4.0	3.3	4.2	9.6	32.9	68.8	35.8	28.7	12.4	9.3	18.0
1968	7.9	9.6	21.3	12.4	12.3	23.6	111.6	122.1	61.5	27.1	13.1	10.5	36.1
1969	9.8	9.2	8.8	5.2	5.9	15.1	46.0	72.7	25.7	8.3	4.7	5.5	18.1
1970	13.9	8.1	7.4	7.1	9.2	15.7	43.2	37.7	17.1	8.6	6.3	7.0	15.1
1971	14.6	9.9	8.6	6.8	9.1	19.7	30.3	60.0	40.5	13.2	10.4	4.4	19.0
1972	7.9	7.6	9.5	6.7	7.1	12.7	56.6	51.3	47.3	19.7	8.3	9.6	20.4
1973	8.4	8.7	6.5	5.9	9.6	11.4	31.3	57.6	45.5	19.1	6.7	5.1	18.0
1974	6.3	8.1	6.9	5.3	5.2	14.6	23.0	58.6	28.0	8.1	5.3	9.8	14.9
1975	5.5	5.6	5.3	5.3	5.3	13.8	53.4	47.8	34.1	11.0	4.9	5.4	16.5
1976	7.8	6.1	5.2	5.7	6.0	13.9	48.3	78.4	51.8	23.2	8.4	7.1	21.8
1977	11.3	8.2	6.9	5.6	6.4	11.1	31.2	56.0	37.1	15.4	7.7	6.5	17.0
1978	8.2	7.7	5.9	5.5	9.2	16.5	45.4	74.9	48.3	22.0	9.7	6.3	21.6
1979	6.8	7.3	7.3	8.0	10.3	13.9	35.7	60.2	48.7	22.7	8.6	5.1	19.6
1980	7.4	13.9	10.7	7.5	8.0	18.0	59.0	65.9	27.5	10.8	6.9	5.8	20.1
1981	7.5	8.0	7.6	6.2	6.7	11.9	26.5	49.7	59.1	20.8	8.5	7.7	18.3
1982	7.5	8.2	8.8	7.9	6.8	9.3	34.0	44.1	19.0	13.3	8.3	5.7	14.4
1983	9.0	8.5	4.8	6.2	5.6	20.4	47.7	60.9	39.5	12.0	3.4	3.4	18.5
1984	8.2	15.2	7.5	6.3	6.8	21.5	36.4	49.2	28.4	17.5	8.0	4.6	17.5
1985	3.8	5.8	4.8	4.6	6.2	18.5	68.4	65.6	20.8	7.5	5.1	8.5	18.3
1986	14.5	10.6	9.1	7.3	9.4	18.3	53.0	56.7	50.3	19.1	4.6	4.9	21.5
1987	6.2	5.4	4.8	5.7	17.2	12.2	65.8	89.8	42.0	7.8	7.3	10.0	22.9
1988	7.8	7.6	7.2	8.2	12.5	32.6	83.8	96.6	60.3	26.8	14.4	12.9	30.9
1989	18.2	15.4	13.4	9.3	10.2	67.0	111.1	70.2	40.4	12.1	4.1	5.7	31.4
1990	6.3	6.0	5.2	3.6	5.6	18.2	45.4	72.5	34.9	16.6	5.4	5.5	18.8
1991	7.2	12.5	7.5	5.8	7.1	26.5	47.1	35.9	27.4	11.9	5.9	4.4	16.6
1992	4.1	4.2	4.9	4.8	5.0	12.9	52.0	55.0	68.0	18.2	9.1	6.9	20.4
1993	19.7	19.8	8.9	9.0	8.5	15.9	66.5	85.7	61.2	17.7	7.9	6.7	27.3
1994	6.2	15.9	9.5	9.1	9.9	23.3	64.6	45.3	24.6	9.5	6.2	5.0	19.1
Ave.	8.4	8.7	7.4	6.5	7.8	16.0	45.7	59.5	39.2	16.5	7.9	6.7	19.2

Table 13-11 Water Flow Rate at Bağlık Dam Site

Dam Site	Bağlık												
Catchment Area	1509 km ²												(m ³ /sec)
Year	Oct	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Ave.
1942	16.7	32.8	16.8	15.0	19.1	27.0	116.0	120.3	55.5	27.9	15.4	13.0	39.6
1943	14.3	17.0	16.0	12.5	11.6	13.6	42.1	59.1	38.8	20.9	13.2	10.7	22.5
1944	11.1	12.2	11.7	10.3	11.7	24.7	41.1	128.7	67.0	38.0	14.8	11.8	31.9
1945	10.5	12.1	8.7	7.8	7.7	9.4	31.7	55.6	44.7	20.1	10.2	8.1	18.9
1946	8.7	8.7	8.2	10.1	7.9	12.5	38.2	60.0	51.4	25.5	16.0	10.5	21.5
1947	15.4	12.0	9.5	9.3	10.5	26.2	38.2	30.1	24.5	12.3	8.1	7.4	16.9
1948	8.7	14.6	9.6	9.1	9.1	9.5	40.8	59.4	53.3	17.6	10.5	10.1	21.0
1949	9.5	8.8	7.4	7.1	7.1	11.4	25.9	55.9	32.7	11.6	8.6	7.8	16.1
1950	8.0	7.5	6.9	6.6	7.3	14.9	49.5	59.4	33.6	18.5	9.6	7.2	19.1
1951	12.1	10.4	8.8	8.2	8.3	11.9	39.5	47.4	41.1	17.8	10.5	10.9	18.9
1952	18.3	14.5	10.6	9.8	11.6	14.0	52.3	55.9	41.8	24.2	11.6	8.9	22.8
1953	7.9	7.7	7.0	6.5	7.5	8.8	36.9	57.8	44.0	21.1	12.0	11.4	19.0
1954	9.5	9.7	7.7	7.8	9.5	16.2	51.7	77.5	58.9	31.3	14.0	10.8	25.4
1955	9.6	8.9	8.1	6.7	7.5	10.5	22.9	35.3	21.7	8.3	5.7	5.6	12.6
1956	5.6	5.8	6.3	5.8	8.8	10.7	38.8	47.4	42.7	19.9	9.4	7.9	17.4
1957	7.1	6.7	6.0	5.0	7.9	19.6	40.1	56.6	48.2	20.5	9.8	8.1	19.6
1958	7.9	8.4	7.8	6.9	7.7	14.7	41.1	57.8	44.0	18.0	9.0	9.0	19.4
1959	8.4	8.4	8.3	8.3	7.1	16.2	42.1	68.7	54.2	24.0	13.1	10.5	22.4
1960	13.5	12.7	9.9	16.7	28.3	38.4	90.8	99.7	62.1	32.0	15.4	9.7	35.8
1961	9.2	8.4	7.6	5.4	6.4	10.9	40.1	45.8	31.7	9.4	5.2	5.1	15.4
1962	5.6	7.1	10.3	7.9	9.4	30.6	52.6	65.6	43.7	18.9	8.8	8.7	22.4
1963	8.7	9.0	9.0	9.5	10.8	14.0	72.6	108.9	102.7	55.0	22.4	11.4	36.2
1964	10.8	10.0	9.2	8.7	8.9	18.1	55.8	79.0	59.6	19.5	10.4	9.5	25.0
1965	14.9	11.0	14.2	9.6	9.0	31.8	63.3	71.6	52.2	22.1	7.0	4.9	26.0
1966	15.9	17.5	11.3	12.1	14.7	18.2	52.1	81.2	44.0	17.9	7.3	7.2	24.9
1967	5.9	4.9	5.8	4.9	6.2	12.9	41.6	84.3	45.1	36.5	16.4	12.6	23.1
1968	10.7	12.9	27.4	16.4	16.3	30.2	134.4	146.5	75.8	34.5	17.3	14.1	44.7
1969	13.1	12.5	11.9	7.4	8.4	19.8	57.4	88.9	32.9	11.3	6.7	7.7	23.2
1970	18.3	11.1	10.1	9.7	12.5	20.5	54.0	47.3	22.3	11.7	8.8	9.7	19.7
1971	19.2	13.3	11.7	9.4	12.3	25.5	38.5	73.9	50.7	17.4	14.0	6.4	24.3
1972	10.8	10.4	12.8	9.3	9.8	16.8	69.9	63.6	59.0	25.5	11.3	13.0	26.0
1973	11.4	11.8	8.9	8.2	13.0	15.1	39.7	71.1	56.8	24.7	9.3	7.2	23.1
1974	8.7	11.1	9.4	7.5	7.4	19.2	29.6	72.3	35.7	11.1	7.5	13.3	19.4
1975	7.8	7.9	7.5	7.5	7.5	18.1	66.2	59.4	43.0	14.7	7.0	7.6	21.2
1976	10.6	8.5	7.3	8.0	8.4	18.3	60.1	95.5	64.3	29.7	11.4	9.8	27.7
1977	15.0	11.2	9.5	7.9	9.0	14.8	39.5	69.2	46.6	20.2	10.6	9.0	21.9
1978	11.2	10.5	8.2	7.7	12.6	21.5	55.7	91.4	60.1	28.3	13.1	8.8	27.5
1979	9.4	10.1	10.0	10.9	13.9	18.3	45.0	74.1	60.5	29.1	11.7	7.3	25.0
1980	10.1	18.3	14.4	10.3	10.9	23.4	72.8	80.9	35.1	14.4	9.5	8.2	25.7
1981	10.2	11.0	10.3	8.7	9.3	15.9	33.8	61.7	72.9	26.8	11.6	10.5	23.6
1982	10.3	11.0	11.8	10.6	9.2	12.4	45.7	59.4	25.6	17.9	11.2	7.7	19.4
1983	12.0	11.4	6.4	8.3	7.5	27.5	64.3	82.0	53.2	16.1	4.6	4.5	24.8
1984	11.1	20.4	10.1	8.5	9.1	29.0	49.1	66.3	38.2	23.5	10.7	6.2	23.5
1985	5.1	7.8	6.4	6.2	8.3	24.9	92.2	88.4	28.0	10.1	6.8	11.4	24.6
1986	19.5	14.3	12.2	9.8	12.6	24.6	71.4	76.3	67.8	25.7	6.1	6.6	28.9
1987	8.4	7.2	6.4	7.6	23.2	16.4	88.6	121.0	56.6	10.4	9.8	13.4	30.8
1988	10.4	10.2	9.6	11.0	16.8	43.9	112.9	130.2	81.3	36.0	19.3	17.4	41.6
1989	24.4	20.7	18.0	12.4	13.6	90.2	149.8	94.6	54.4	16.3	5.5	7.6	42.3
1990	8.0	7.9	7.0	4.8	7.4	23.6	60.7	96.9	51.9	22.4	7.5	7.4	25.5
1991	9.3	17.2	10.3	7.5	9.6	35.4	59.3	46.8	40.6	16.7	7.9	5.8	22.2
1992	5.2	6.4	6.6	5.8	5.8	17.0	69.9	85.2	82.0	26.6	11.4	9.4	27.6
1993	29.7	27.9	13.5	11.7	12.8	22.4	84.5	119.7	77.5	24.1	11.1	9.2	37.0
1994	7.3	19.2	12.0	11.5	12.1	30.6	84.9	61.7	33.6	13.5	8.5	6.3	25.1
Ave.	11.3	11.9	10.1	8.9	10.6	21.2	58.3	75.3	49.9	21.7	10.7	9.1	24.9

Table 13-12 Water Quality of Berta River (November)

Loc.	Temp(°C)	pH(-)	DO(mg/l)	COD(mg/l)	NH3-N	NO2-N	NO3-N	PO4-P	T-P	O-P
St.1	8.2	8.46	10.4	16	0.08	0.003	0.7	0.09	0.21	0.12
St.2	8.6	8.40	10.4	>1	0.08	0.002	0.4	0.03	0.04	0.01
St.3	9.7	8.35	10.8	4	0.07	0.002	0.3	0.01	0.07	0.06
I			8	25	0.2	0.002	5		0.02	
II			4	50	1	0.01	10		0.16	
III			3	70	2	0.05	20		0.65	
IV			>3	>70	>2	>0.05	>20		>0.65	
E.C.L-(a)			7.5	3					0.005	
E.C.L-(b)			5	8					0.1	

St.1 : Şavşat, St.2 : Bayram, St.3 : Bağlık point.

Unit : mg/l

I,II,III,IV : Water class

E.C.L -(a),(b) : Eutrophication control limit

Water flow rate (m³/sec) on 27th of November :

Location	Discharge
2327	6.5
St.1(23/3)	10.1
23/2	1.37
St.2 (Bayram dam site)	6.16
St.3 (Bağlık dam site)	9.74

Table 13-13 Local Irrigation Activity

Village	Water source	Size(da)	Crops	Fertilizer
Bayram		no		
Dereici	Canal	153	Corn,Pasture	
Bağlık	Tributary	50	Corn	350kg/year/ 920m ²
			Potato 300kg/ 920m ²	
			Bean 250kg/ 920m ²	
Okçular	Canal	120	Corn 450kg/ da	3 tons/ da
	(6 m ³ /da-daily, 30 m ³ /da-season)		Pasture 250kg/ da	
Savail	no			
Köprübaşı	no			
Ciftehanlar	Spring	150	Corn, fluits	Animal fertilizer
	(6 m ³ /da-daily, 30 m ³ /da-season)			
Horsan	Spring	9200m ²	Corn	Animal fertilizer
mezrassi	(3 tons/ 920m ² - season)		Potato 300kg/920m ² Bean 250kg/920m ² Fluits	

Footnotes : No other river and river water utilization.

Source : By hearing survey, 1996

Table 13-14 Fish Living in Berta River System

Salmoniformes	Salmonidae	Salmo trutta labrax(*)
		Salmo trutta macrostigma
Cypriniformes	Cyprinidae	Cyprinus carpio
		Alburnoides bipunctatus
		Barbus plebejus escherichi
		Barbus cycloopsis (***)
		Barbus capio capio
		Chondrostoma colchicum
		Gabio gabio
		Leuciscus cephalus
		Leuciscus borysthenous
		Capoeta capoeta steboidi
		Capoeta tinca
		Vimba vimba tenella
	Gobiidae	Necomacheilus angorae
		Necomacheilus porthera
Siluriformes	Siluridae	Silunis glanis (**)

Living zone (*) : Artvin - Hatilla creek , Berta creek, Karcil creek,
Yusuferi - Barhal creek (Production and hunting).

(**) : Limited in Çoruh river.

(***) : Limited in Çoruh Hatilla creek.

Source : Information from Hacetepe University and the Ministry
of Forest (1996)

Table 13-15 Animals Living in Artvin Region

Local name		Species
Mammals		
Maral geyik	Deer	<i>Cervus elaphus maral</i>
Karaca	Roe	<i>Capreolus capreolus</i>
Yaban keçisi	Wild goat	<i>Capra aegagrus</i>
Bezoar keçisi	Bozoar goat	<i>Capra cretensis</i>
Yaban domuzu	Wild pig	<i>Sus scrofa</i>
Dağ keçisi		
Kakım	Ermine	<i>Mustella arminea</i>
Çengel boynuzlu dağ keçisi	Chamois	<i>Ropicapra ropicapra</i>
Çakal	Jackal	<i>Canis aureus</i>
Boz ayı, esmer ayı	Bear	<i>Urous arctos</i>
Tilki	Fox	<i>Vulpes vulpes</i>
Vaşak	Lynx	<i>Lynx lynx</i>
Pars	Leopard	<i>Panthera par dustuliane</i>
Kurt	Wolf	<i>Canis lupus</i>
Porsuk	Badger	<i>Meles meles</i>
Avrupa tavşanı	European rabbit	<i>Lepus eunopeanus cavcasicus</i>
Su Samuru	Otter	<i>Lutra lutra</i>
Ağaç sansarı	Tree pine marten	<i>Martes nivalis</i>
Kaya sansarı	Rock marten	<i>Martes forne</i>
Gelincik	Weasel	<i>Martes nivalis</i>
Sincap	Squirrel	<i>Seturus vulgaris</i>
Reptiles and Amphibia		
	Hylidae	<i>Hyla arborea</i>
	Pelodytidae	<i>Peloytes caucassicus</i>
	Ranidae	<i>Rana ridibunda</i>
	Emydidae	<i>Emys orbicularis</i>
	Lacertidae	<i>Lacerta derjugini</i>
		<i>Ophisops elegans</i>
	Testudinidae	<i>Testudo graeca</i>
	Viperidae	<i>Vipera kaznakovi</i> (Protected)

(Bird)

English name	Species
-	Tetraogal caspius
Cavcasian black cock	Lyrurus molkosiewrczi
Red partridge	Alectoris chukar
Quail	Coturnix coturnix
Stock dove	Streptopelta turtur
Wood cock	Scolopox rusticola
Bustard	Otis tarda
Rock pigeon	Columba livia
Fieldfare thrush	Turdus pilaris
Black bird	Turdus merula
	Ortolus oriolus
	Amas platyrhynchos
Duck	Amas strepera
Falcon	Falco peregrinus
Elenor falcon	Falco peregrinus
	Circus cyaneus
Steppe falcon	Circus macrourus
Meadow falcon	Circus pygmaeus
	Falco cherrug
	Falco biarmicus
White head sea eagle	Haliaeetus leucoryphus
Pigeon falcon	Falco columbarius
	Falco subbuteo
Red foot kestrel	Falco tinnunculus
Small k	Falco naumanni
Kestrel	Falco tinnunculus
Shoot foot hawk	Accipiter brevipes
Black vulture	Aegypius monachus
Red vulture	Gyps fulvus
Beared vulture	Gypaetus barbatus
White vulture	Neophron percnopterus
Snake eagle	Circus gallicus
W.sea eagle	Haliaeetus albicilla
Rock eagle	Aquila chrysaetos
	Aquila heliaca
Steppe eagle	Aquila rapax
Other eagles	Accipiter nisus
	Circus aeruginosus
	Milvus migrans
	Buteo buteo
	Pernis ptilorhynchus
	Hierax fasciatus
	Hierax pennatus
	Milvus milvus

(Insects)

Acrididae	<i>Acrida bicolor anatólica</i> , <i>Aiolopus thalassinus thalassinus</i> , <i>Anacridium aegyptium aegyptium</i> , <i>Calliptamus barbarus barbarus</i> , <i>Calliptamus barbarus cephalotes</i> , <i>Calliptamus barbarus pallidipes</i> , <i>Calliptamus italicus italicus</i> , <i>Calliptamus tenuicercis tenuicercis</i> , <i>Chorthippus apricarius</i> , <i>Chorthippus dorsatus dichrous</i> , <i>Chorthippus macrecherus macrecherus</i> , <i>Chorthippus mollis mollis</i> , <i>Dociostaurus brevicolis</i> , <i>Dociostaurus genei</i> , <i>Dociostaurus hauensteini</i> , <i>Euprepocnemis polarans polarans</i> , <i>Oedus decorus</i> , <i>Oedipoda germanica meridionalis</i> , <i>Oedipoda miniata miniata</i> , <i>Oedipoda schocji</i> , <i>Pseudocercus lateritius</i> , <i>Pseudocercus oedipoides</i> , <i>Ramburiella bolivari</i> , <i>Stauroderus scalaris scalaris</i> , <i>Stauroderus nigrogeniculatus</i> , <i>Sphingonotus turcicus</i> , <i>Thisoicetrinus pterostichus</i>
Empusidae	<i>Empusa fasciata</i>
Gryllidae	<i>Acheta domesticus</i> , <i>Gryllus bimaculatus</i> , <i>Gryllus campestris</i> , <i>Oecanthus pellucens</i>
Gryllotalpidae	<i>Gryllotalpa gryllotalpa</i> , <i>Bolivarina brachyptera</i> , <i>Hierodula transcaucasica</i> , <i>Mantis religiosa</i>
Mantidae	<i>Bolivarina brachyptera</i> , <i>Hierodula transcaucasica</i> , <i>Mantis religiosa</i>
Pyrgomorphidae	<i>Pyrgomorpha guentheri</i>
Tetrigidae	<i>Tetrix depressa depressa</i>
Tettigoniidae	<i>Anadrymadusa adzharaica</i> , <i>Bucephaloptera bucephala</i> , <i>Conocephalus discolor</i> , <i>Homorocoryphus nitidulus</i> , <i>Isophya zernovi</i> , <i>Leptophyes slobodkina</i> , <i>Pradrymadusa aksirayi</i> , <i>Parapholidoptera dignata</i> , <i>Parapholidoptera dignata ziganensis</i> , <i>Phaneroptera nana sparsa</i> , <i>Poecilimon ersisi</i> , <i>Poecilimon smillii</i> , <i>Poecilimon tauricola</i> , <i>Platycleis intermedia</i>
Tridactylidae	<i>Tridactylus variegatus</i>

Table 13-16 Trend on Population and Agricultural Area at Upstream Area

Population Decrease Trend at Upstream Area

Year	Veliköy	Cirirdüzü	Tepeköy	Şenocak	Küplüce	Kurudere	Çoraklı	Dalkırmaz
1970	1,054	842	1,716	472	561	528	1,061	468
1975	988	1,251	1,680	525	562	725	1,568	580
1980	980	814	1,522	452	507	471	912	480
1985	768	642	1,226	378	290	407	687	335
1990	633	505	929	329	341	343	587	260

(Source: Şavşat City Office, 1996)

Trend on Agricultural Land Area (Da)

Year	Veliköy	Cirirdüzü	Tepeköy	Şenocak	Küplüce	Kurudere	Çoraklı	Dalkırmaz
1986	6,000	3,790	6,160	740	2,100	2,100	4,175	1,020
1989	3,800	735		620		4,950	2,800	580
1991	3,668		5,764	1,664	1,231	1,061	2,238	1,020

(Source: Şavşat City Office, 1996)

Table 13-17 Movement of Residents at Several Villages

	Center village	Summer Popu.	Winter Popu.
Bayram(Mah)	Eskikale	200	250
Dereici (Mah)		130	130
Bağlık (Mah)		10	50-60
Okçular(Mah)	Eskikale	45	45
Savail(Mah)	Üzümlü	80	80
Köprübaşı(Mah)		60	40
Çiftehanlar(Mah)		120	120
Horasan mezraasi	Anacılı Köy	395	50-60
Çayağzı			395

(by hearing survey, 1996)

Table 13-18 Land Utilization in Artvin Province

Type	Artvin	Şavşat	Ardanuç
Pasture	521,659	137,719	16,600
Meadow	153,942	84,885	32,875
Forest	1,651,117	301,163	369,445
Brush land	936,940	192,464	72,076
Dry agriculture with fallow	12,899	-	10,109
Dry agriculture without fallow	305,424	97,630	49,583
Irrigated field	48,831	19,920	5,230
Orchard	22,220	880	1,800
Vineyard	6,500,200	155	
Tea	46,585	-	-
Nuts	18,415	-	-
Olive	4,400	-	50
Total agriculture area	3,730,115	835,847	558,381
Settlement area	104,469	34,765	7,319
Water surface area	-	-	-
River bed	5,675	1,050	-
Bank	1,525	-	-
Swampy	50	-	-
Rocky and others uncultivated land	1,410,346	242,546	41,680
Total not agriculture area	1,522,065	278,371	48,999
Total area	5,252,180	1,104,218	607,380

(Source; Census of Population: 1990)

Table 13-19 Some Agriculture Income of Artvin Province

(Artvin province; 1994))

Type of activity	Area (da)	Production cost (TL/da)	Annual income (TL/da)
Mixed fruits orchard	719.28	4,500,000	3,236,760,000
Vegetable	472.97	3,750,000	1,773,637,000
Poplar tree	42.97	2,100,000	90,237,000
Vineyard	323.72	1,200,000	388,464,000
Pasture	22.75	500,000	11,375,000
Irrigated class (1)	16.00	1,800,000	28,800,000
Irrigated class (2)	16.88	1,500,000	25,320,000
Not irrigated	83.75	600,000	50,250,000
Total			7,680,563,000
Annual agricultural income/ family			49,095,902
Annual income by animal raising /family			14,728,770
Annual total income			63,824,672
Annual total income per capita			14,842,946
Maximum total annual income per capita			22,264,419
Minimum total annual income per capita			5,37,1789

Table 13-20 Income and Employment

Village	Major source	Monthly income	Unemployment
Bayram	Agriculture and animal breeding	10,000,000 TL/house	50 (20%)
Dereici	Agriculture and animal breeding		
Bağlık	Animal breeding, agriculture and forestry	5,000,000 TL/house social works	No person having special works. Employed person recorded is 5.
Okçular	Agriculture and animal breeding	8,000,000 TL/house	20 (44%)
Savail	Agriculture and animal breeding	10,000,000 TL/house	40 (50%)
Köprübaşı	Animal breeding and fruits production	5,000,000 TL/house	30 (75%)
Çiftçihanlar	Agriculture, breeding and forestry Transportation	10,000,000 TL/house	50 (42%)
Horasan mezraası	Animal breeding and vegetable	5,000,000 TL/house	Not so many

Footnotes: () shows percentage to winter population.

Source: By hearing survey, 1996.

Table 13-21 Main Civil Works of Bayram Project

Item	Description	Amount of Works	
Diversion Tunnel	Type: Horseshoe Pressure		
	D: 5.70 m L: 795 m	Tunnel Ex. Lining Conc.	28,000 m ³ 6,600 m ³
Cofferdam	Type: Rockfill	Em	109 x 10 ³ m ³
Dam	Type: Rockfill Height: 145 m	Ex. In open	745 x 10 ³ m ³
		Em. of Core	868 x 10 ³ m ³
		Em. of Filter	802 x 10 ³ m ³
		Em. of Rock	4,367 x 10 ³ m ³
		Total Approx. (including coffer dam)	6,200 x 10 ³ m ³
Spillway	Type: Shute B: 10.0 m H: 12.5 m	Ex. In open	595 x 10 ³ m ³
		Concrete	47,800 m ³
		Gate	2 sets
Intake	Type: Horizontal	Ex. In open	103,000 m ³
		Concrete	6,200 m ³
		Gate	1 set
Intake Tunnel	Type: Circular Pressure		
	D: 3.3 m L: 65 m	Tunnel Ex. Lining Conc.	2,000 m ³ 700 m ³
Penstock	Type: Embedded		
	D: 3.3~2.5m L: 321 m	Tunnel Ex. Filling Conc.	5,000 m ³ 2,300 m ³
		Steel	600 t
Power house	Type: Underground		
	B: 19.0 m	Cavern Ex.	27,000 m ³
	H: 41.0 m	Concrete	9,100 m ³
	L: 44.5 m	Gate	1 set
Tailrace Tunnel	Type: Horseshoe Non Pressure		
	D: 4.6 m	Tunnel Ex.	212,000 m ³
	L: 7,930 m	Lining Conc. Gate	37,600 m ³ 1 set

Table 13-22 Main Civil Works of Bağlık Project

Item	Description	Amount of Works	
Dam	Type: Concrete Gravity	Ex. In open	147 x 10 ³ m ³
		Concrete	195 x 10 ³ m ³
	Height: 74 m		
Spillway	Type: Shute		
	B: 14.0 m	Ex. In open	21,000 m ³
	H: 11.0 m	Concrete	9,600 m ³
		Gate	2 sets
Power Intake	Type: Attached to	Concrete	500 m ³
	Dam body	Gate	1 set
Penstock	Type: Embedded		
	D: 3.6~3.0 m	Tunnel Ex.	3,000 m ³
	L: 213 m	Filling Conc.	1,300 m ³
		Steel	350 t
Power house	Type: Underground		
	B: 21.0 m	Cavern Ex.	33,000 m ³
	H: 41.5 m	Concrete	10,500 m ³
	L: 50.0 m	Gate	1 set
Tailrace Tunnel	Type: Horseshoe Non Pressure		
	D: 4.9 m	Tunnel Ex.	141,000 m ³
	L: 4,454 m	Lining Conc.	15,100 m ³
		Gate	1 set

Table 13-23 Excavation Works and Wastsoil Disposal Area

Project	Purpose	Mark	Area (1,000m ²)	Volume (1,000m ³)	Remarks
Bayram Project H.W.L. = 740 m	Quarry Site	Q	90	4,000	Party within Bayram reservoir
	Borrow Area	A	500	-	Alternative Area
	Borrow Area	B	460	-	Alternative Area
	Borrow Area	C	830	1,500	Selected Area
	Disposal Area, Aggregate Plant for Bayram & Bağlık Project	D1	160	2,800	Within Bayram reservoir
	Disposal Area	D2	60	1,100	Within Bayram reservoir
	Disposal Area	D3	30	400	Within Bayram reservoir
	Disposal Area & Concrete Plant	D4	50	900	
	Disposal Area & Penstock Factory for Bayram & Bağlık Project	D5	30	500	
	Disposal Area	D6	20	200	
Bağlık Project H.W.L. = 530 m	Concrete Plant, Grout Plant	T1	2	-	
	Core Stock Pile	T2	20	-	
	Concrete Plant, Camp Facilities	T3	20		
	Disposal Area	D7	40	400	
	Disposal Area	D8	10	100	
	Disposal Area	D9	20	200	
	Disposal Area	D10	20	200	
	Concrete Plant	T4	1	-	
	Concrete Plant, Camp Facilities	T5	10	-	

Table 13-24 Machinery and Equipment for the Project

Item		Machinery and Equipment		Bayram	Bağlık
Dam	Excavation	Wheel loader	7.7m ³ class	3	2
		Dump truck	45/32t class	12	6
		Bulldozer	42/32t class	10	5
		Crawler drill	15m ³ /min	2	2
	Embankment	Wheel loader	7.7m ³ class	6	-
		Dump truck	45/32t class	24	-
		Bulldozer	42/32t class	16	-
		Vibratory roller	15t class	6	-
	Concrete	Aggregate plant	150t/h	1	-
		Concrete plant	60m ³ /h	1	-
	Dam concrete	Cable crane	13.5t	-	1
		Aggregate plant	150t/h	-	1
		Concrete plant	120m ³ /h	-	1
Underground power house	Excavation	Jumbo	2 boom	2	2
		Load haul dump	3.8m ³	3	3
		Shotcrete	10m ³ /h	3	3
	Concrete	Concrete pump	85m ³ /h	2	2
		Concrete plant	60m ³ /h	1	1
	Installation	Crane	120t class	1	1
Tailrace tunnel	Excavation	Jumbo	3 boom	6	4
		Load haul dump	3.8m ³	6	4
		Shotcrete	10m ³ /h	6	4
	Concrete	Concrete pump	85m ³ /h	6	4
		Concrete plant	60m ³ /h	2	1

Table 13-25 Air Temperature and Humidity at Artvin and Şavşat

Month		4	5	6	7	8	9	10
Air temperature (°C)								
Artvin	max.	34.4	36.4	39.0	42.0	43.0	39.4	33.9
	min.	-4.3	-0.6	3.7	9.7	9.8	4.2	-1.6
	mean	12.0	16.1	18.7	20.6	20.6	17.9	13.8
Muratlı	max.	37.8	36.5	41.7	41.1	35.5	35.2	29.0
	min.	-3.2	2.5	2.4	9.9	10.8	4.4	0.4
	mean	11.6	15.5	18.5	20.8	20.5	18.0	13.7
Ardanuç	max.	33.5	36.7	40.5	43.0	42.5	38.8	43.1
	min.	-3.5	1.5	3.0	7.9	7.2	7.2	3.4
	mean	13.0	17.2	20.3	23.2	23.0	23.0	19.8
Şavşat	max.	20.9	31.6	36.0	38.0	38.8	35.1	31.0
	min.	-8.5	-2.0	-4.6	6.0	4.2	0.9	-6.5
	mean	9.6	14.5	17.3	20.2	20.4	16.7	11.4
Humidity (%)								
Şavşat	max.	77	77	74	83	79	69	76
	min.	44	51	51	58	54	54	54
	mean	60	63	64	64	63	61	63
Artvin	max.	70	74	74	84	80	80	77
	min.	48	56	58	65	64	54	52
	mean	61	65	68	72	71	70	66

Table 13-26 Equation and Parameters to be used in Prediction of Water Temperature

Parameter	Case = XX	
B	= 3.00	Width of river(m)
q	= 1,000,000	Density of water (kg/m ³)
Cp	= 4,190.00	Specific heat of water (Ws/kg/centigrade)
Q	= variable	Flow rate (m ³ /s)
A	= 49.00	Altitude of sun (degree)
Ea	= 0.00	Water vapor pressure (mmHg)
C	= 0.00	Amount of cloud (0-1)
P	= 1.00	Shading rate (0-1)
Rs	= 0.05	Reflection rate of sun ray (0-1)
D	= 5.67E-08	Stefan-Boltzmann's constant
Ta	= 43.00	
Ke	= 40.00	Resistance quotient of latent heat (W/m ² Hg)
TO	= 5.00	Water temperature (centigrade)
X	= 10.00	Definite interval to be used in calculation (m)
Fundamental equation		
$T' = T + dT/dx \cdot X$		T'=Water temperature at next interval (centigrade)
		T=Water temperature of definite interval (centigrade)
		dT/dx+Water temperature change at definite interval (centigrade)
Related equation		
$dT/dx = B/(qCpQ) \cdot (Hs - Hsr + Ha - Har - Hb + He + Hc)$		
		Hs=Radiant heat by sun (W/m ²)
		Hsc=Reflection of Hs (W/m ²)
		Ha=Radiant heat by air (W/m ²)
		Har=Reflection of Ha (W/m ²)
		Hb=Radiant heat by water surface (W/m ²)
		He=Latent heat (W/m ²)(transfer of heat by evaporation)
		Hc=Sensible heat (W/m ²)(transfer of heat by conduction)
$Hs - Hsr = 1390 \cdot (\sin A) \cdot (10 - Y) \cdot (1 - 0.65C^2) \cdot (1 - P) \cdot (1 - Rs)$		
$Y = 0.055 \cdot (1 + 0.053 \cdot Ea) \cdot (\csc A)$		
$Ha - Har = 0.97 \cdot D \cdot (Ta + 273)^4 \cdot (Ca + 0.031 \cdot Ea^{0.5})$		
$Ca = 0.74 \cdot (2.67 \cdot (35.6 - Ta) / (10(5.35 - 2.8 \cdot Z)))$		
$Z = 1 - 0.65 \cdot C^2$		
$Hb = 0.97 \cdot D \cdot (T + 273)^4$		
$He = Ke \cdot (Ea - Ew)$		
$Hc = 0.5 \cdot Ke \cdot (Ta - T)$		
Equation to be used to calculate saturated water vapor pressure		
$E = 10 \cdot (-2613 / (T + 273) - 0.003499(T + 273) + 11.1844)$		
(E: Saturated water vapor pressure (mmHg))		
$Ea = E \cdot Ha / 100$		
(Ha : Relative humidity (%), T * Air temperature (centrigrade))		

Table 13-27 Some Limitations on Water Temperature for Carp (*Cyprinus Carpio*)

Item	Range (°C)
Suitable temperature for egg hatching	14-30(18-22), (20-22)
Growth	20-28
Temperature to pass winter	7<
Suitable range for spawning	14-20, 18-20
Egg hatching rate	24 (50%)
Temperature fluctuation from 20°C	
15°C up	0 % in spawning
12°C down	0% in spawning
Up from temperature less than 10°C	no influence
Down from the temperature less than 7°C	no influence
Suitable range to live to be assumed	higher than 14°C and lower than 28°C

Source; Ecological data of aquatic organisms, Japan (1983)

Table 13-28 Value of Parameter to be used in Estimation of Water Temperature

By using monthly maximum temperature value from 1949 to 1985 at Artvin

Case 1	Air temperature	43°C (July :42°C , August: 43°C)
	Humidity	82 % (July :84 % , August: 80%)
Case 2	Air temperature	34°C (April)
	Humidity	70 % (April)

By using monthly mean temperature value from 1949 to 1985 at Artvin

Case 3	Air temperature	21°C (July: 21°C, August: 21°C)
	Humidity	72% (July: 72%, August: 71%)
Case 4	Air temperature	12°C (April)
	Humidity	61% (April)

Shading rate of sun light

0 % , 50 % , 100 %

River width 3 m

Discharge from dam : 0.1 , 0.3 , 0.4 , 0.5 , 0.7 , 1.0 m³/sec

5°C(Data from Tortum Lake)
