

IV.1.10 Area under Protection

The national parks and nature protection areas¹⁷⁾ in both the Bolu and Zonguldak provinces are as listed in Table IV-19 and Figure IV-20.

Yedigöller National Park and Yenice Nature Conservation area (Kavaklı, Çitdere) are close to the project area, but the Köprübaşı project area is not included in these areas.

In addition, 4 Hunting Restricted Areas¹⁸⁾ are located in the periphery of Köprübaşı project area, but Köprübaşı project area does not conflict with them.

In the future reservoir area, following 3 Archeological sites and 2 Cultural wealths¹⁹⁾ are found. Former is evaluated as the first degree asset by Ministry of Culture (Figure IV-21, Figure IV-22).

Archeological Site	(1)	Doruktepe Mound
	(2)	İniştepe Necropole
	(3)	Kayabaşı Antique Building Remains
Cultural Wealth	(1)	Kayabükü Village Mosque
	(2)	Oyukkaya Cave

Although several marble rocks that can be assumed to be the basic stone for the pillars of ancient buildings are found in Belen village belongs to Akçabey village and the road side; however, these places are not included in the Köprübaşı project area.

Table IV-19 Nature Conservation Area

Name	Directorate	Characteristics
Nature Conservation Area		
①Abant Gölü	Bolu-Merkez	Rich Flora and Fauna
②Düzce Samandere	Bolu	Geological
③Rüzgarlar Ebe Cami	Bolu-Merkez	Ebe Pines
④Sukuklü Göl	Bolu-Mudurnu	Rich Flora and Fauna
⑤Kökez	Bolu-Merkez	Fir and Beech Tree
⑥Kavaklı	Zonguldak-Yenice	Taxus baccata Tree
⑦Citodere	Zonguldak-Yenice	Istranca Oak Tree
⑧Yedigöller National Park	Bolu	Rich Flora and Fauna
⑨Kale-Bolu Fındığı	Bolu-Merkez	Rich Flora and Fauna
Hunting Restricted, Breeding Area		
⑩Mengen Geyik Gölü Geyik Koru -ma ve üretme Sahası	Mengen	Protection of Fauna
⑪Göynük-Kapıormani Dagi Geyik Koruma ve üretme Shasi	Göynük	Protection of Fauna
⑫Yedigöller Geyik-Karaca Koru -ma ve üretme Sahası	Bolu	Protection of Fauna
⑬Düzce Efteni Gölü Su Kuslari Koruma ve üretme Sahası	Duzce	Protection of Aves

* () shows Area(Ha).

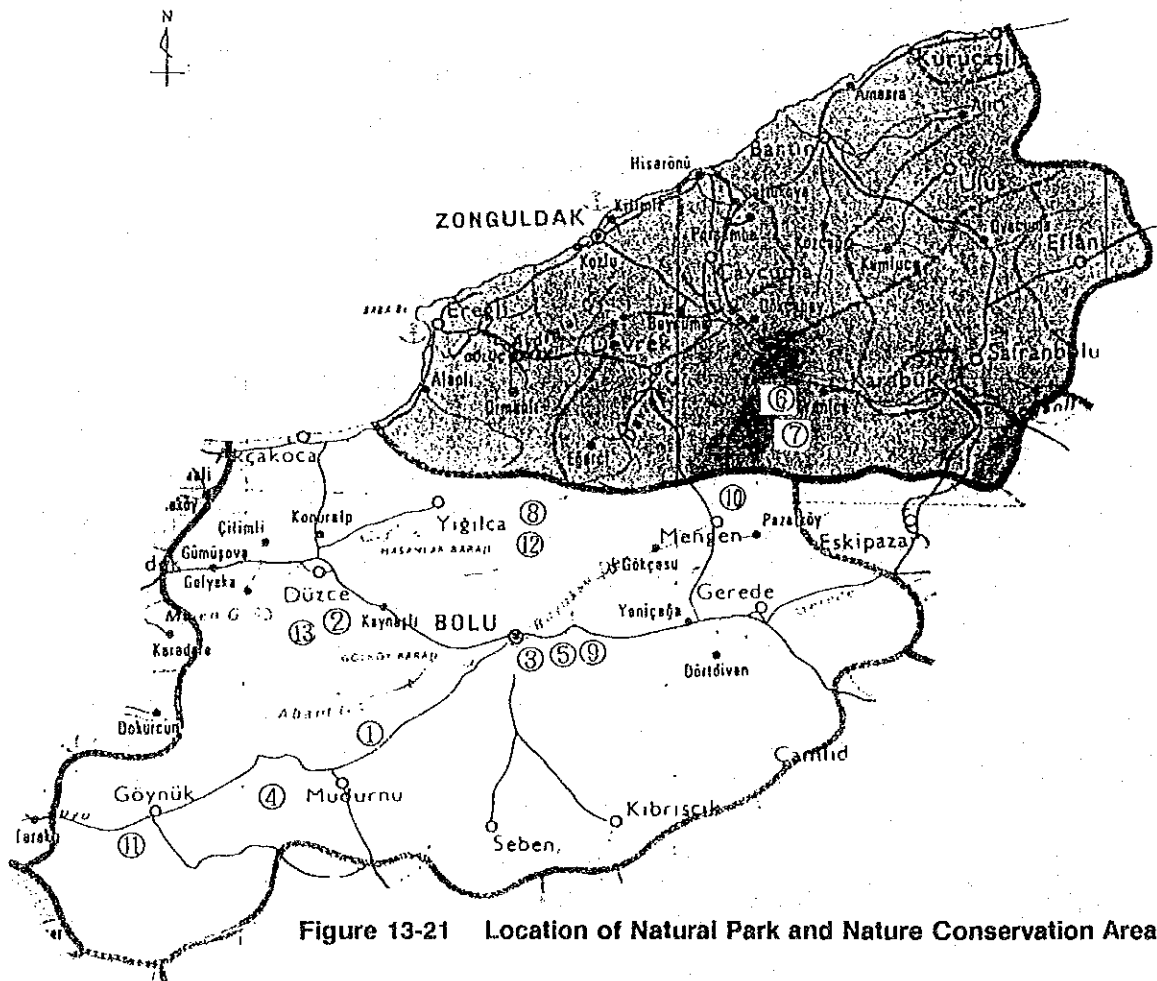


Figure 13-21 Location of Natural Park and Nature Conservation Area

Table IV-19 Nature Conservation Area

Name	Directorate	Characteristics
Nature Conservation Area		
① Abant Gölü	Bolu-Merkez	Rich Flora and Fauna
② Düzce Samandere	Bolu	Geological
③ Ruzgarlar Ebe Cami	Bolu-Merkez	Ebe Pines
④ Süküklü Göl	Bolu-Mudurnu	Rich Flora and Fauna
⑤ Kökez	Bolu Merkez	Fir and Beech Tree
⑥ Kavaklı	Zonguldak-Yenice	Taxus baccata Tree
⑦ Utodere	Zonguldak-Yenice	Istranca Oak Tree
⑧ Yedigöller National Park	Bolu	Rich Flora and Fauna
⑨ Kale Bolu Findigi	Bolu Merkez	Rich Flora and Fauna
Hunting Restricted, Breeding Area		
⑩ Mengen Geyik Gölü Geyik Koruma ve üretim Sahası	Mengen	Protection of Fauna
⑪ Göynük Kapiormanı Dagi Geyik Koruma ve üretim Shası	Göynük	Protection of Fauna
⑫ Yedigöller Geyik Karaca Koruma ve üretim Sahası	Bolu	Protection of Fauna
⑬ Düzce Efteni Gölü Su Kuslari Koruma ve üretim Sahası	Düzce	Protection of Aves

* () shows Area(Ha).

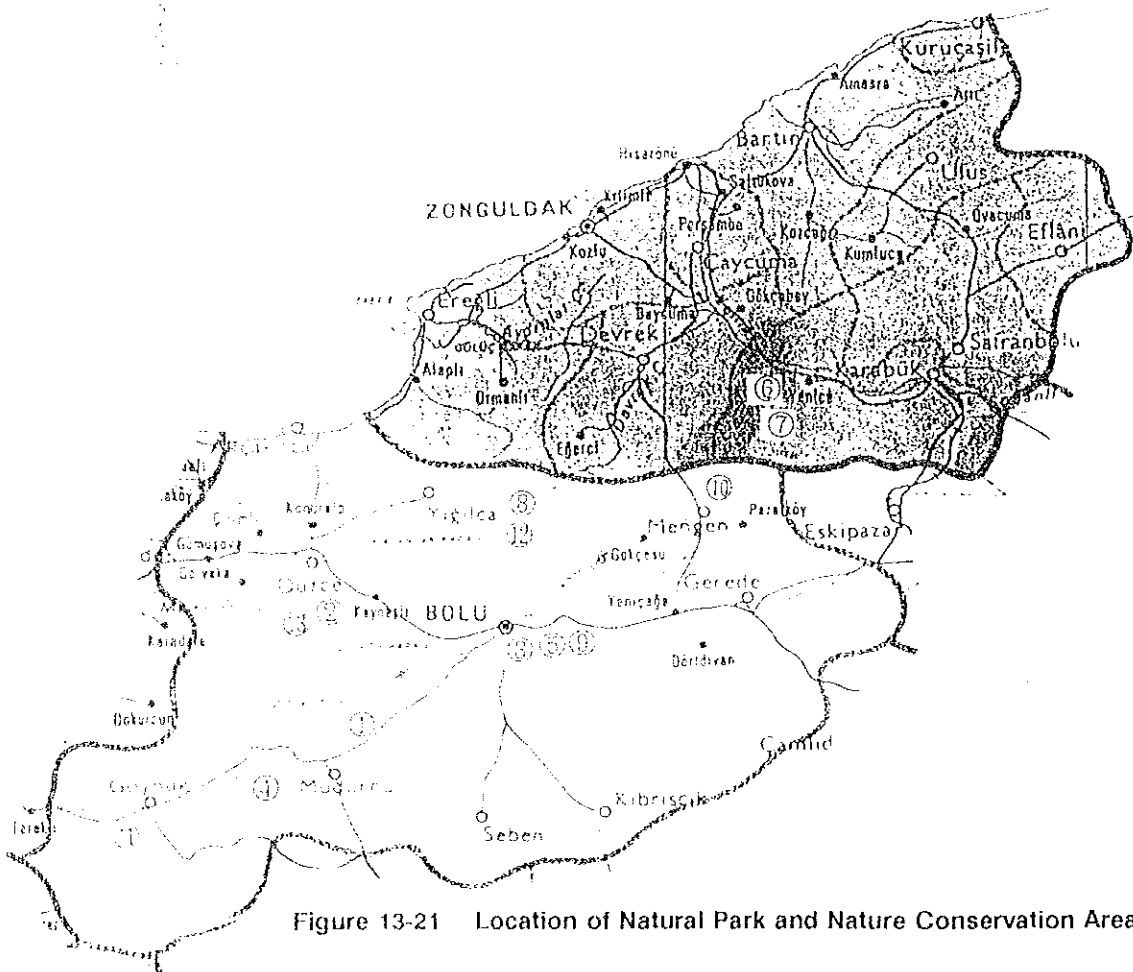
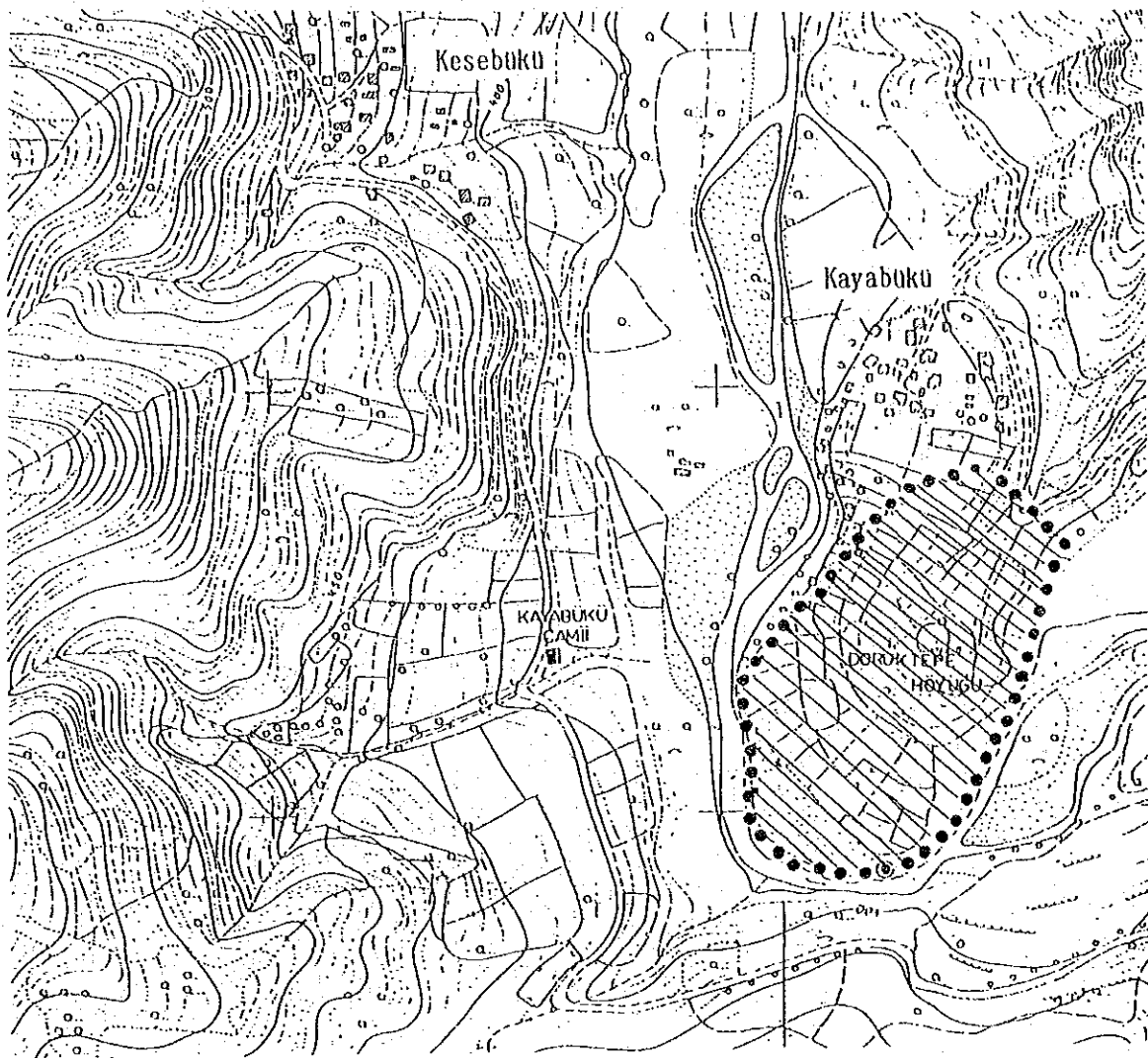


Figure 13-21 Location of Natural Park and Nature Conservation Area



(1)

Earthshel



0 1Km

■ Archeological Site and Cultural Wealth Point

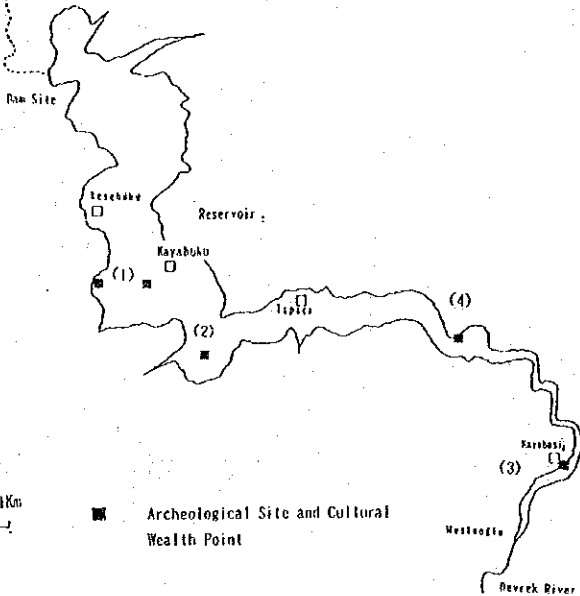
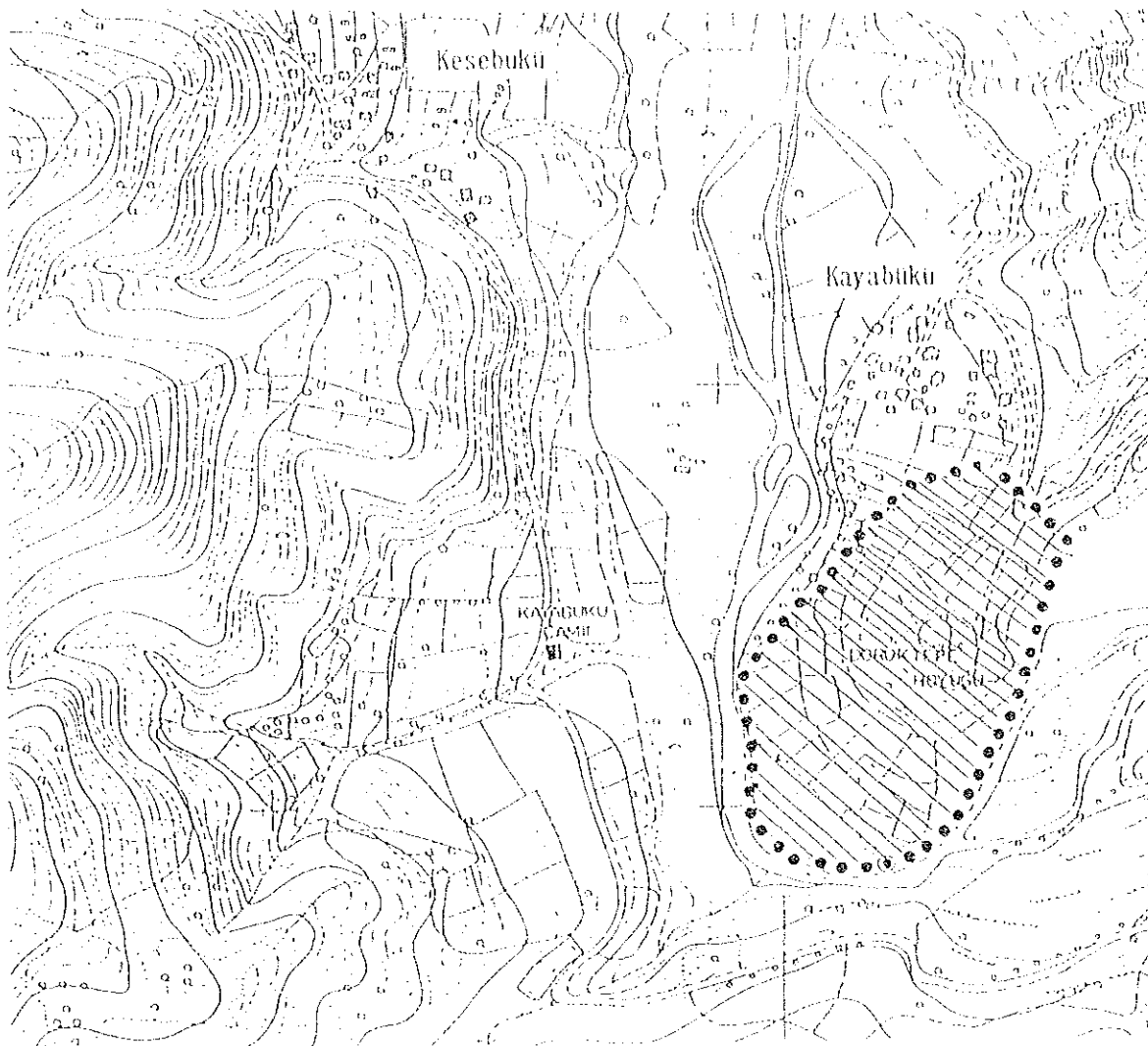


Figure IV-21

Location of Historical Asset and Cultural Wealth



(1)

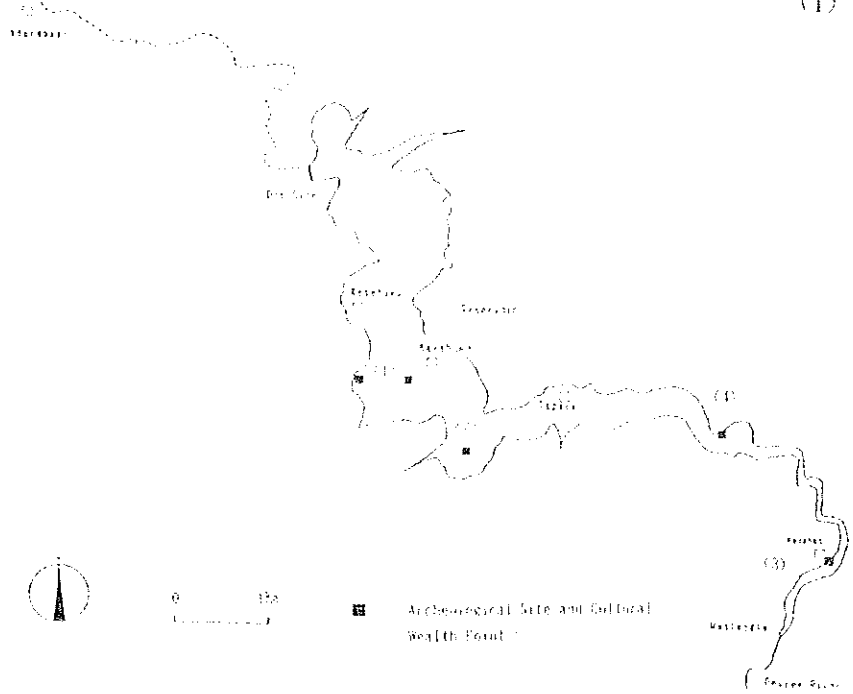


Figure IV-21 Location of Historical Asset and Cultural Wealth

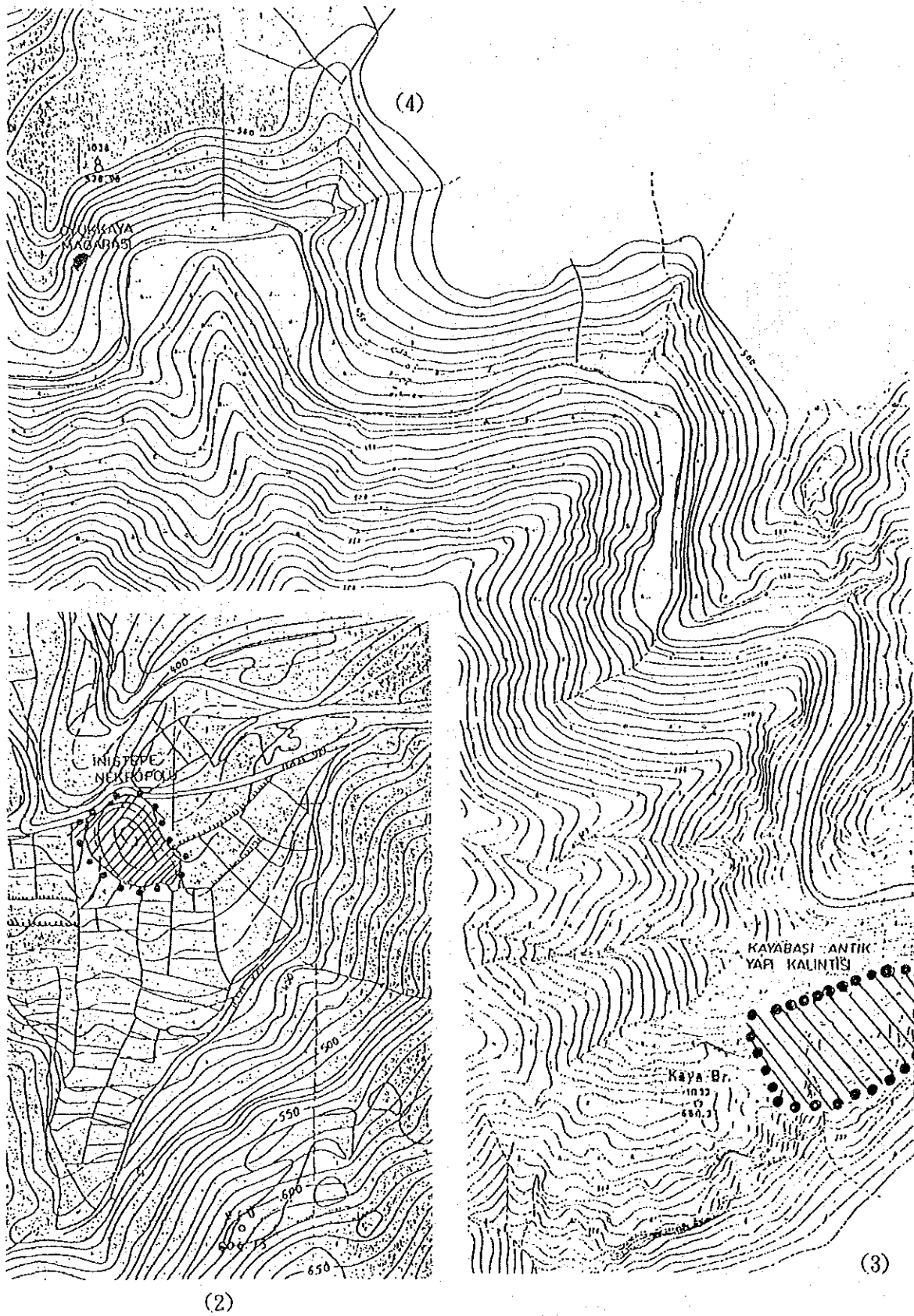


Figure IV-22

Location of Historical Asset and Cultural Wealth

IV.1.11 Forest Resources

(1) Vicinity of the Project Area

Project area is located in the forest area, and northern and southern part near project area has the tessellated land composed by the forest area and the agricultural area (Figure IV-23). 3 forest management areas and 2 forest management areas²⁰⁾ (Figure IV-24) exist respectively in Zonguldak province side and Bolu province side in which the project area is involved.

Table IV-20 shows the kind of major trees²⁰⁾ in the management area.

These management areas²⁰⁾ (Table IV-21) is 5,388 ha in Dirgine-Çaldere section, 40.75 ha in Dirgine-Kozdere section, 74.96 ha in Dirgine-Dirgine section, 12,060 ha in Mengen-Mengen section and 7,212 ha in Mengen-Gökçesu section.

The kind of trees²⁰⁾ in the Forest management (exploitation) areas are Fir (Abies Bornmüllerina), Black pine (Pinus nigra), Beech (Fagus orientalis), Oak (Q. hartwisstane), etc., Main trees in Mengen-Gökçesu section which are concerned to reservoir directly are Black pine, Beech and Fir, occupying about 83 % of the forest management area, and the remaining area is occupied by shrubs and other trees.

Annual increase amount of woods⁶⁾ in these sections (Table IV-22) is estimated to 293,452 m³/72,321 ha in Bolu district and 297.171 m³/86,326 ha in Devrek district.

(2) Project Area

The main trees²⁰⁾ (Figure IV-24) in the section up to the outlet from the reservoir and in the reservoir area are

Black pine, Beech, Fir, Hornbeam, etc. Although in the water reservoir area, they exist on the middle and upper slope in the valley, and the lower and middle areas is covered by dry farming fields and shrubs.

No forest can be found at the dam site, excepting pine forest on the summit of precipice in the valley near construction area. Oak trees are found from the downstream side of the Sirvi to the outlet point mixed with trees above mentioned.

Estimated forest area⁸⁾ in the submerged area is about 304 ha.

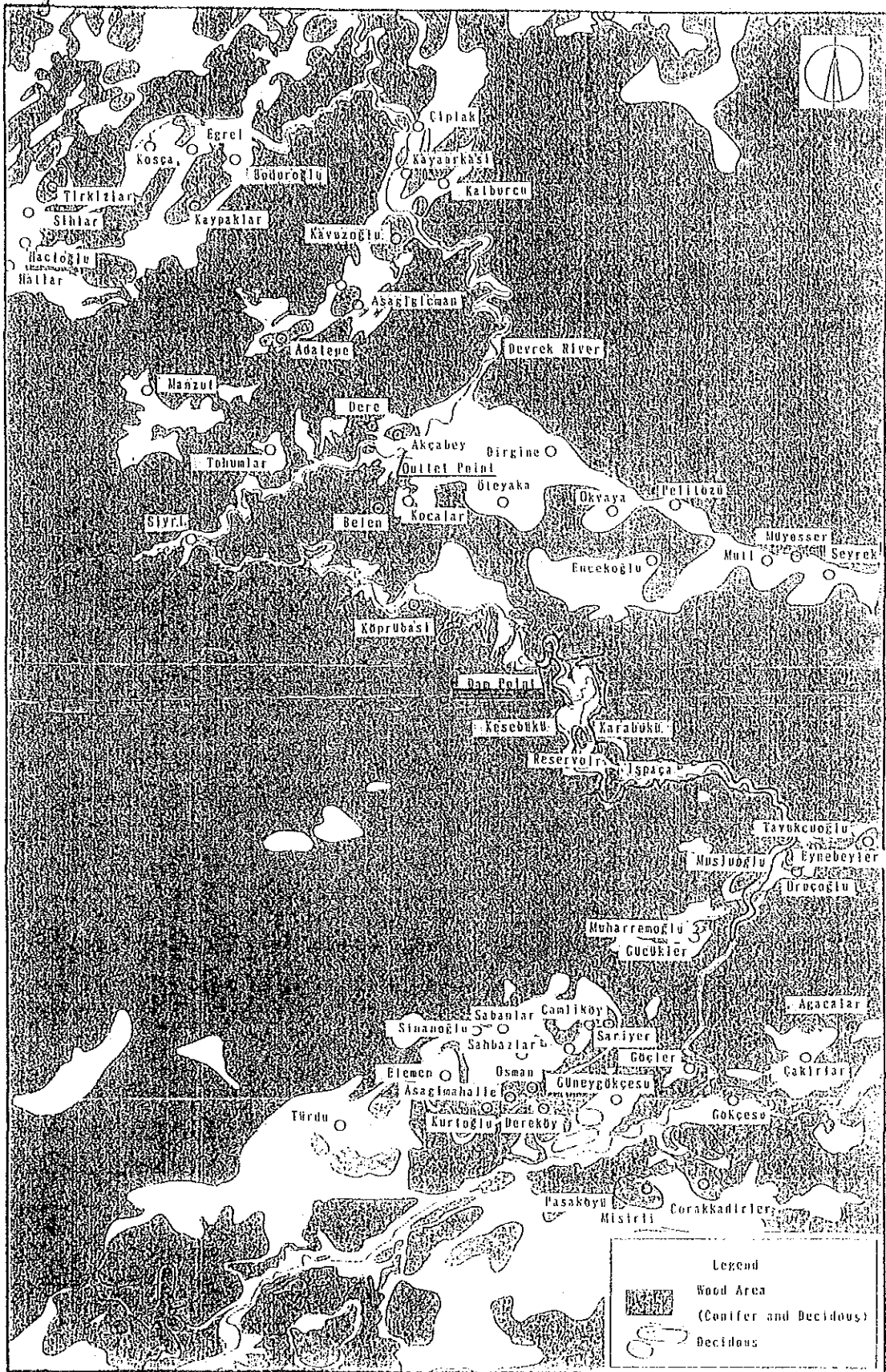
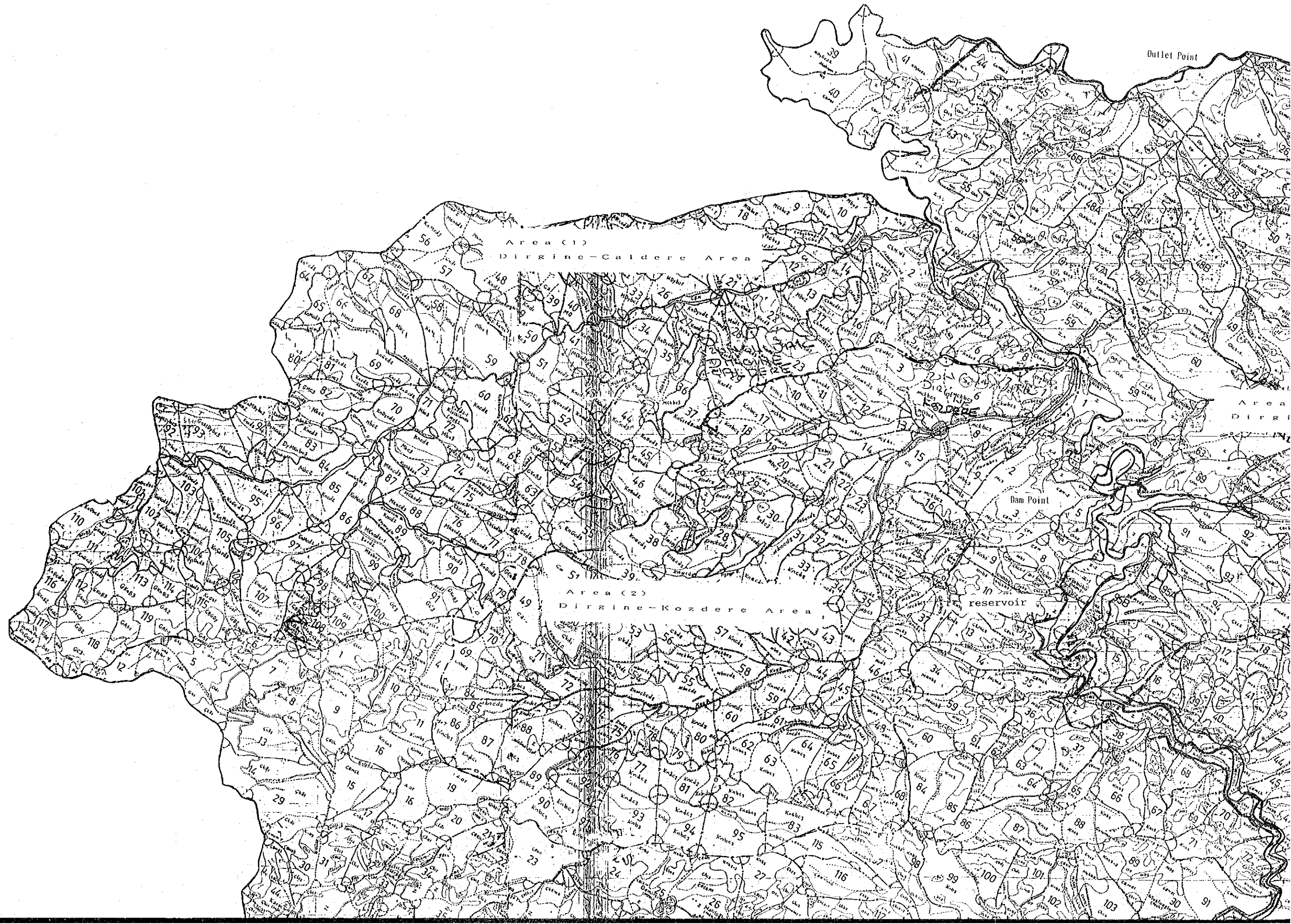
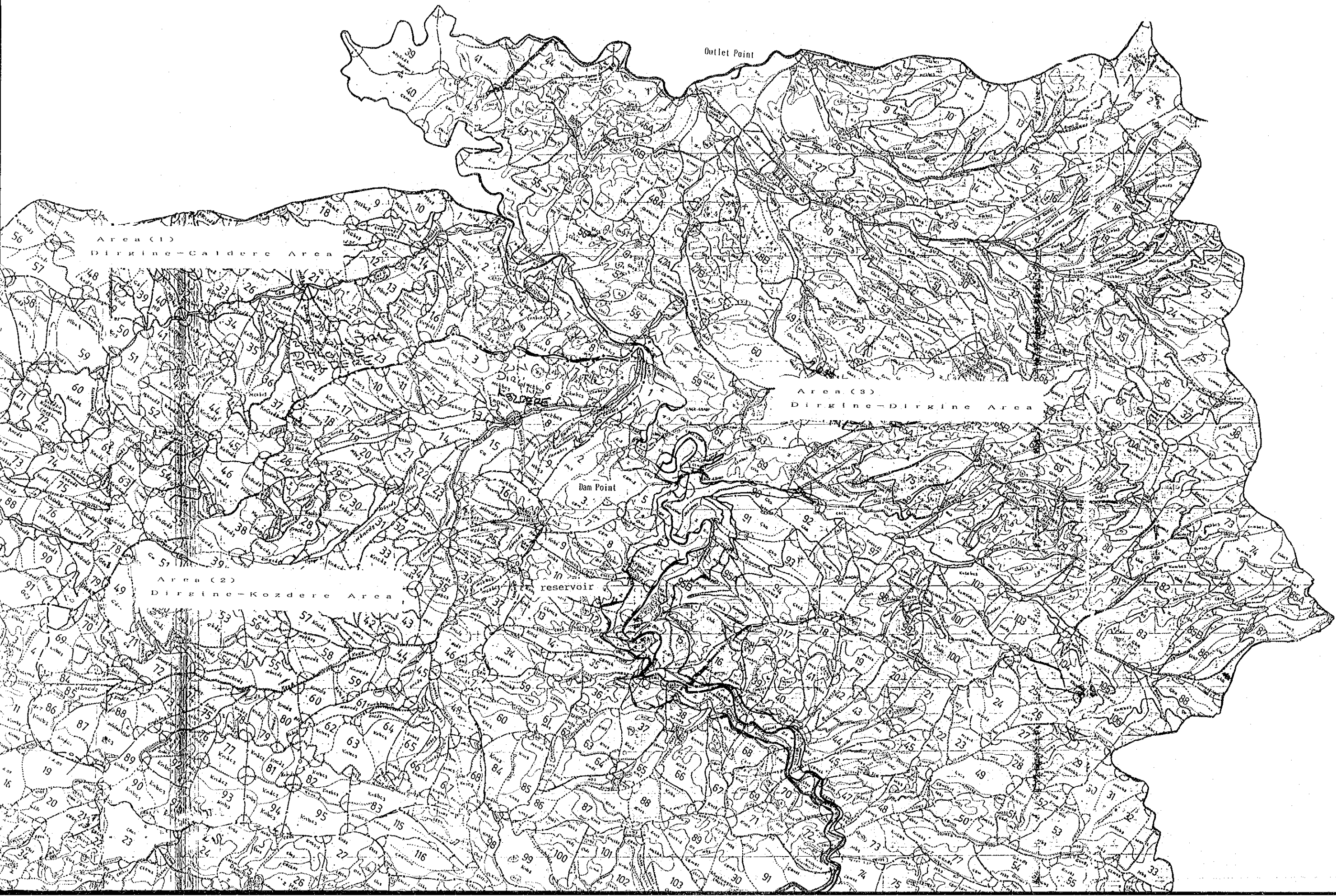


Figure IV-23 Distribution of Forest Area







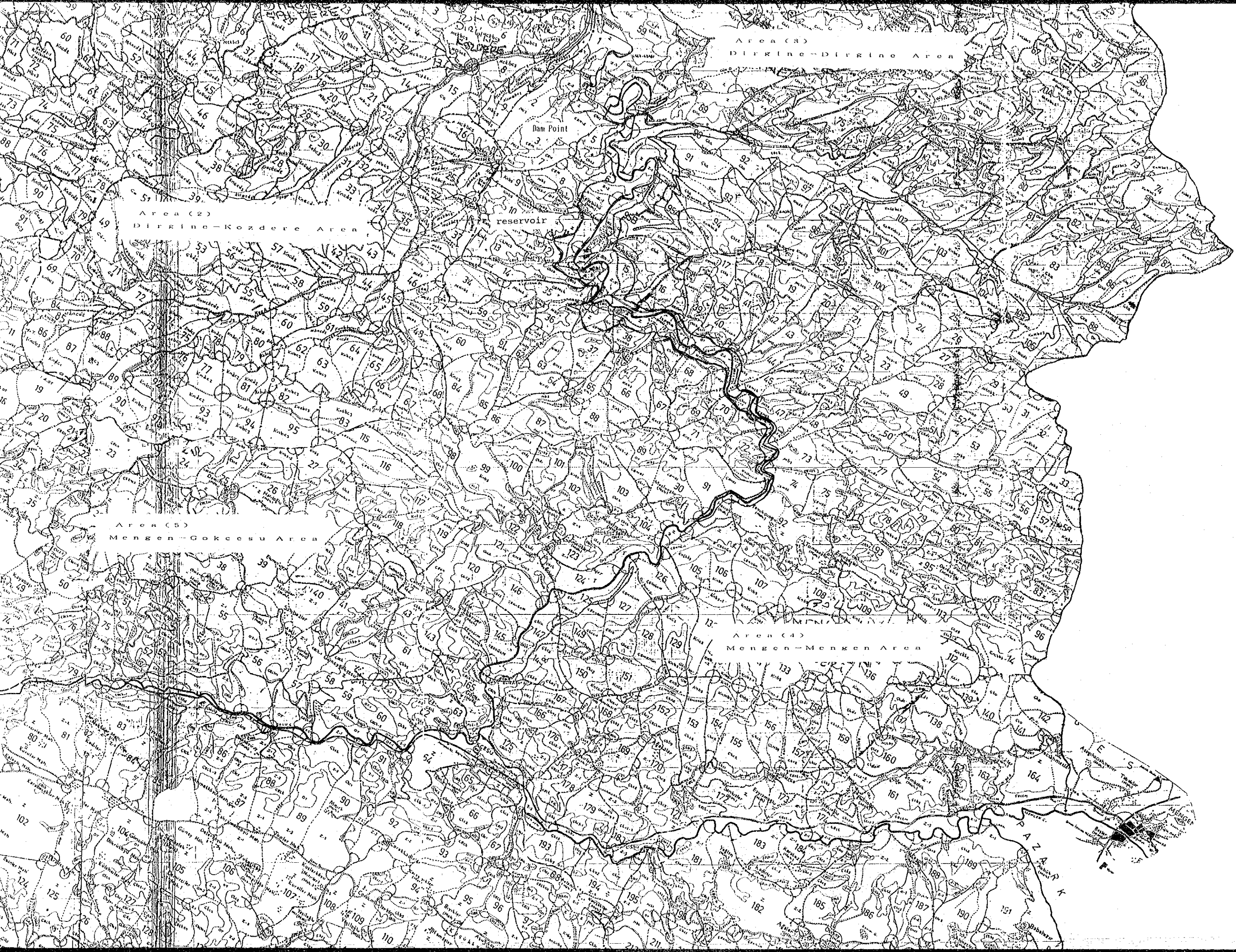
Area (1)
Dirgine

Area (2)
Dirgine-Kozdere Area

reservoir

Area (5)
Mengen-Gokcesu Area

Area (4)
Mengen-M



Area (1)
Dirgine-Dirgine Area

Area (2)
Dirgine-Kozdere Area

Area (5)
Mengen-Gokcesu Area

Area (4)
Mengen-Mengen Area

Dan Point

reservoir

AZAK

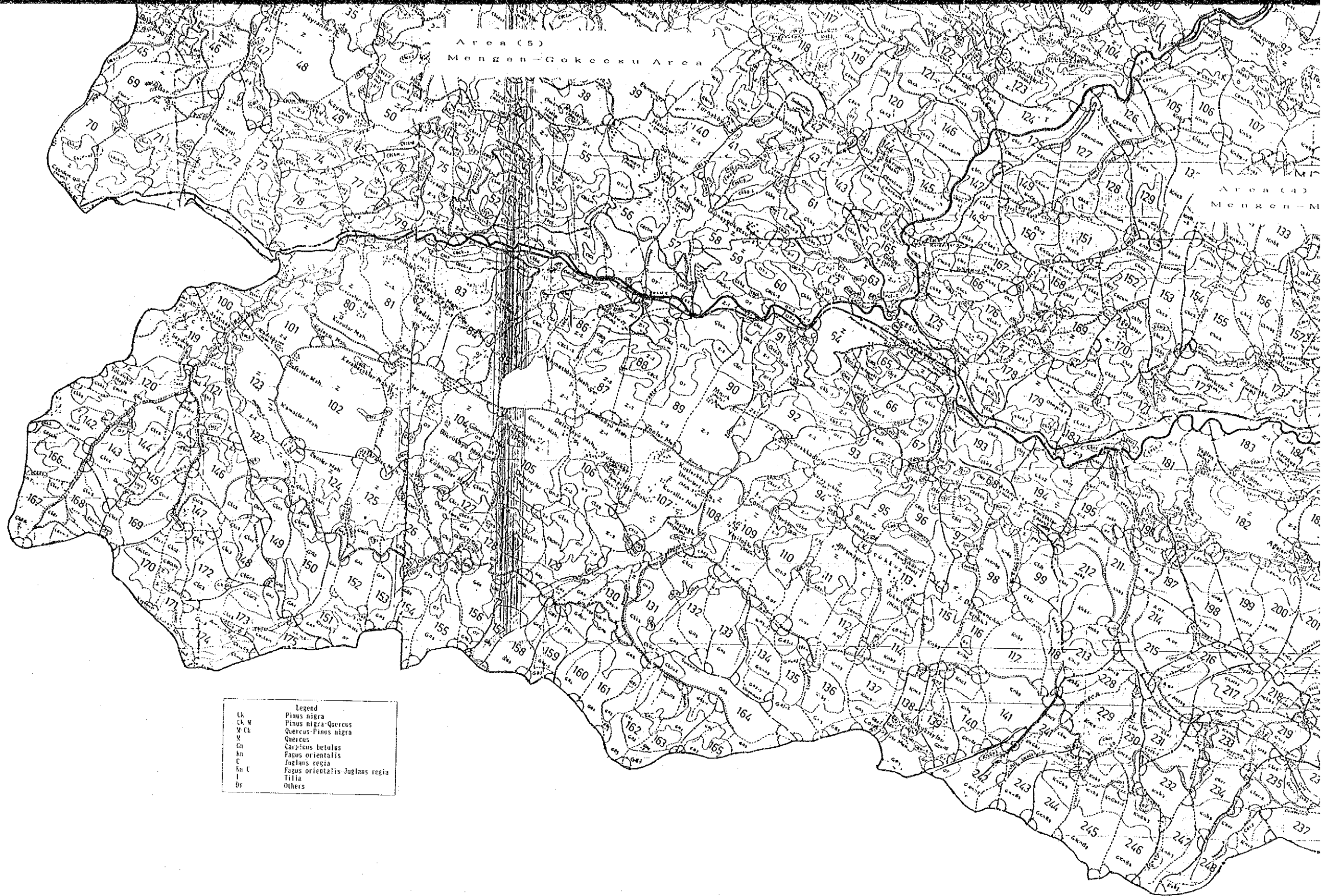


Figure IV-24 Forest Exploitation Area in Planned Area and Distribution of Main Tree Kind in Project Area

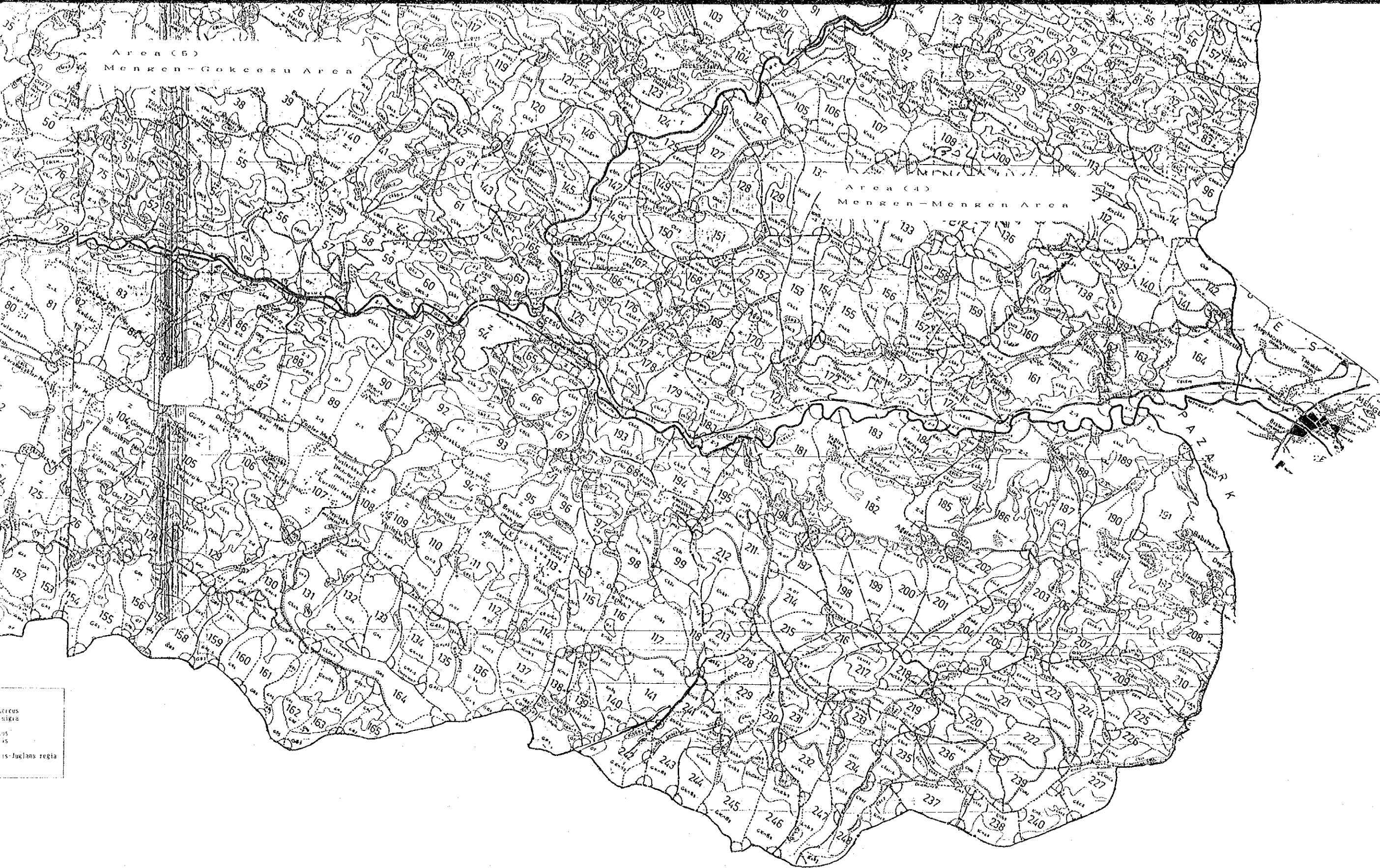


Figure IV-24 Forest Exploitation Area in Planned Area and Distribution of Main Tree Kind in Project Area

Table IV-20

Plant Type of Forest Exploitation Area

Area	1. Zonguldak-Dirgine Çaldere 2. Zonguldak-Dirgine Kozdere 3. Zonguldak-Dirgine Dirgine	4. Bolu-Mengen Mengen 5. Bolu-Mengen Gokcesu
Type	Pinus nigra Pinus sylvestris Abies bormulleriana Fagus orientalis Quercus Carpinus betulus Populus tremula Tilia Ulmus campestris Ulmus glutiasa Fraxinus exelsia Acer campestris Cretatus monapia Ilex oxuifolium Hederna helix Prunus lauracerasus Pteridium Rosa canina Pubus ideus Rubus fritiose Sambucus nigra Sorbus torminalis Thymus serpilium Urtica dioica Coryllus avellana Fragaria vesca Euphorbia Verbascum Equicetum Rhododendron Gramium	Pinus nigra Abies bormulleriana Fagus orientalis Quercus Carpinus betulus Populus tremula Tilia Acer campestris Hederna helix Pteridium Rubus friticose Urtica diosia Fragaria vesca Rhododentron Gramium Platanus orientalis Comrus Phillyrea medra Cistus Myrtulus

Table IV-21

Forest Area and Main Type of Wood

Area (*)	Expr. Class (**)	Area (ha)	Kind *** of Tree (ha)						
			C	G	Kn	M	Ck	Dy	
1	A	406.5	171.0		1.0				
	B	2664.0			933.5	11.5		8.5	
	C	1631.5			33.5	680.0			
	D	686.0		255.0	968.5	691.5		13.0	
	Total	5388.0	(3.0)	(4.7)	(18.0)	(12.9)		(0.4)	
2	A	512.0						157.0	
	B	2375.5			1547.5	11.5		11.5	
	C	1187.0			30.0	461.5			
	D								
	Total	4074.5			(38.7)	(11.6)		(4.0)	
3	B	1748.0	4.5		749.5	8.0			
	A	4048.0	2613.5	65.5	28.5	157.0			
	E	1462.5	47.5		66.5	95.0			
	F	237.5	1.0			100.5			
	Total	7496.0	(35.6)	(0.9)	(11.3)	(4.8)			
4	H	6183.5			23.5	1003.0	4005.5		
	I	5159.0			3143.5	395.5	10.0		
	G	297.0							
	F	420.0				31.5	153.5		
	Total	12059.5			(26.3)	(11.9)	(34.6)		
5	J	4412.5			17.0	54.5	3581.0		
	B	1411.5			1030.0	2.0	9.5		
	G	1388.0		1267.0					
	Total	7212.0		(17.6)	(14.9)	(0.1)	(49.8)		

(*): Area 1:Zonguldak Dirgine-Çaldere, Area 2:Zonguldak Dirgine-Kozdere,
Area 3:Zonguldak Dirgine-Dirgine, Area 4:Bolu Mengen-Mengen,
Area 5:Bolu Mengen-Gökçesu

(**): Exploitation Class : A -Pinus, B -Fagus, C -Quercus, D -Selected Purpose,
E-Mixed, F-Protection, G - Abies, H- Pinus nigra-Quercus,
I -Fagus-Quercus, J-Pinus nigra

(***): C -Pinus sylvestris, G -Abies bormulleriana, Kn -Fagus orientalis,
M -Quercus hartwissstana, Ck -Pinus nigra, Dy-other hardwood

(****): () shows percent.

Table IV-22

Forest Area and Amount of Wood

Quality	Bolu	Mengen	Devrek	Reservoir
Small Wood Area(ha)	72,321 (60.0)	45,636	86,326 (64.9)	
• Wood Richness(m ³)	11,916,529 (99.1)	—	16,775,004 (99.2)	
• Yearly Increase in Wood Richness(m ³)	293,452	—	297,171	
Annual Increase rate (%)	2.5	—	1.8	
Copse Area(ha)	1,987 (1.5)	883	10,857 (8.8)	
• Copse Richness (m ³)	102,540 (<0.1)	—	109,060 (<0.1)	
• Yearly Increase in Copse Richness(m ³)	6,526	—	2,780	
Annual Increase Rate (%)	6.4	—	2.5	
Unqualified Copse area(ha)	1,877 (<0.1)	—	2,824 (2.3)	
• Unqualified Copse Richness (m ³)	3,013 (<0.1)	—	34,691 (<0.1)	
• Yearly Increase in Unqualified Richness(m ³)	0.60	—	454	
Annual Increase Rate (%)	<0.1	—	1.3	
Bushland Meadow, Other Area(ha)	52,964 (41.0)	21,111	23,941 (19.3)	
Total Area (ha)	129,149	—	123,948	304
Total Amount(m ³)	12,022,082	—	16,918,755	—

* () means Percent(%) to Total.

IV.1.12 Flora and Fauna

IV.1.12.1 Flora

(1) Vicinity of the Project Area

According to the map of geographical divisions²¹⁾ within Turkey (Figure IV-25), the Bolu and Zonguldak provinces are located in the region called Black Sea Zone.

Most part of this region is bordered on the Black Sea, and its coast is composed of sharp cliffs.

Mountains of more than 3,000 m exist in the region of Tatos Daglari located in the northeast side of Rize.

The geological base in this area is the basic igneous rock and granite, which are distributed to the jagged ridges of high mountains.

In the western region from Ordu province, high mountains retract from the sea coast. Rocks in these areas are a basic igneous rock and flysch, and the ridges of mountains are covered with a crystalline limestone and marble.

Major rivers in this region are Çoruh, Yeşilırmak, Kızılırmak, Filyos and Sakarya rivers.

On the botanical environment, it is said that the presence of these 5 rivers has a great role²¹⁾ to penetrate Mediterranean flora elements to the inland from the Black Sea coast.

The east area of Black Sea coast has much precipitation and mountains located there are frequently covered by fogs. Although the rainfall decreases in the west side region of Ordu province, area near Zonguldak has much rainfall.

Area to the western part from the coast near Zonguldak has a feature of Mediterranean vegetation²¹⁾ by dry summer, which controls a growth of forest growing in the inland.

Most part of the this region is divided into Euro-Siberian region, high humid climate contributes to the distribution of Mesophytic Vegetations. In this area, deciduous forest is dominant at low and middle elevation areas.

On the other hand, the area mixed with the Mediterranean vegetation is spread along the Black Sea coast.²¹⁾

Mountains below tree line in Bolu and Zonguldak provinces including the project area are composed of forest and shrubs, and the low land on elevation is covered by deciduous trees and frequently mix with evergreen shrubs.²¹⁾

Higher the altitude, the coniferous trees increase, and they become the dominant kind of trees.

The major species²¹⁾ of vegetation are as listed below, but it is said that the number of kinds sharply decrease in the west region.

Species of tree:

Acer campestre, A. trautvetteri, Alnus glutinosa, Buxus sempervirens, Carpinus betulus, C. orientalis, Castanea sativa, Cornus australis, Corylus avellana, C. colurna, Crataegus microphylla, Fagus orientalis (frequently dominant), Q. pedunculiflora, Daphne pontica, Fraxinus excelsior, Hedera colchica, Hypericum androsaemum, Laurocerasus officinalis, Mespilus germanica, Ostrya carpinifolia, Pinus nigra subsp. pallasiana, P. sylvestris, Quercus petraea, Q. hartwissiana, Rhododendron luteum, R. ponticum, Smilax exelsa, Sorbus torminalis, Staphylea pinnata, Tilia rubra.

Species of herbs:

Argyrolobium calycinum, Astrantia maxima, Calamintha grandiflora, Cardamine bubifera, Circana lutetiana, Edimedium pubigerum, Epimedium pubigerum, Euphorbia amygdabidas, Galium odoratum, Helleborus orientalis, Lathyrus aureus, Pyrola spp., Ranunculus brutius, Salvia glutinosa, S. forskahlei, Trachystemon orientale, Valeriana alliariifolia.

Table IV-23 reports the major kind of trees^{22), 23)} and herbs in Yedigöller National Park and Yenice Nature Conservation Area that are closest to the project area of Bolu and Zonguldak provinces. According to the lists of flora in both areas, the following 6 endemic species are reported.

Heracleum platyaenium of Apiaceae family
Antchemis cretica and Cicerbita variabilis of Compositae family,
Beta intermedia of Chenopodiaceae family
Dianthus kastembeluensis of Caryophyllaceae family
Euphorbia amygdabides of Euphorbiaceae family

(2) Project Area

As shown in Figure IV-24 the dry farming areas and villages exist sporadically at a high percentage in the north region near project area and these areas seem to be fields already developed as well as south region from the junction of Bolu and Mengen rivers. In these areas, major elements of vegetation near settlements and villages are some kinds of deciduous trees and shrubs.

According to the vegetation map²⁰⁾ (Figure IV-24) at the project area including its vicinity, the representative tree kinds are Pinus nigra, Quercus, Carpinus betulus, Fagus orientalis, Juglans regia, Tilia and Acer.

The situation of vegetation at the project area can be summarized as follows from the component of plant community and its distribution.

- a) Dam site and its vicinity: The natural vegetation at the dam site is very poor, and the low area at downstream excluding the river bed is used for agriculture.
Upper area on the left and right side slope in dam site becomes sporadic vegetation mainly consisting of pine (Pinus nigra) or Oak (Quercus).
- b) Reservoir and its vicinity: River bed and Kesebükü and Kayabükü village as well as the agriculture fields exist in the reservoir area. The agriculture fields occupy the most part of it. In these area, natural vegetation is very poor. The natural vegetation consists of oak and pine which is distributed to Ispaça quarter from the elevation of 440 ~ 450 m on both sides; furthermore, the distribution of beech can be seen on the right side to Gökçesu village and this vegetation is spreading to the inland.
- c) Outlet point and its vicinity: excepting riverbed, small agriculture fields are distributed with a copse.
- d) Between dam site and outlet: the left bank up to the Sirvi where the river is curved from the dam site is mainly occupied by the agriculture fields excepting for the shrubs, mainly pine, on the river side. On the right steep slope, the mixed forest of pine and oak is distributed. Oak and other kinds of shrubs are distributed between the Sirvi and the Outlet.

According to the vegetation survey on herbs (Figure

IV-16, Table IV-24), based on the distribution situation of plant community and the development items concerned with the location of facilities, such as dam site and reservoir, 47 kinds (7 kinds are unknown) of herbs were found, but endemic species have not been found.

In addition, rare species and an economically important species²⁴⁾ also have not been found.

(Perform the vegetation survey taking the seasonality into consideration, including each construction area.)

IV.1.12.1 Fauna

(1) Vicinity of the Project Area

According to the knowledge of kind of wild animals^{17), 25)} (Table IV-25) in the National Park and Nature Conservation Areas in Bolu and Zonguldak provinces, the inhabitation of 6 kinds of Weasel (Mustelidae), 2 kinds of Dog (Canidae), 1 kind of Rabbit (Leporidae), 2 kinds of Deer (Cervidae), 1 kind of Bear (Ursidae), 1 kind of Wild Boar (Suidae), 2 kind of Cat (Felidae) and 2 kind of Hedgehog (Erinaceidae) are reported. Also 26 families of birds are known.

(2) Project Area

According to the information obtained from a question Study at the project area, the inhabitation of following wild animals is known.

Village	Gökçesu	Köprübaşı	Kayabükü	Akçabey
MAMMALS				
Antler (Geyik)	a few	yes	a few	yes
Roe deer (Karaca)	a few	yes	a few	many
Bear (Ayı)	many	yes	many	many
Pig (Domuz)	most	yes	most	most
Wolf (Kurt)	a few	yes	many	yes
Fox (Tilki)	many	yes		yes
Squirrel (Sincap)	many	yes		yes
Jackal (Çakal)	many			
Hare (Tavşan)	many	yes		
Pine marten (Sansar)		yes		
Marten (Kunduz)	yes	yes		

REPTILE and AMPHIBIA

Snake		o	o	o	o
Water snake		o	o	o	o
Rizard	o	o	o	o	
Frog	o	o	o	o	

() shows Turkish name.

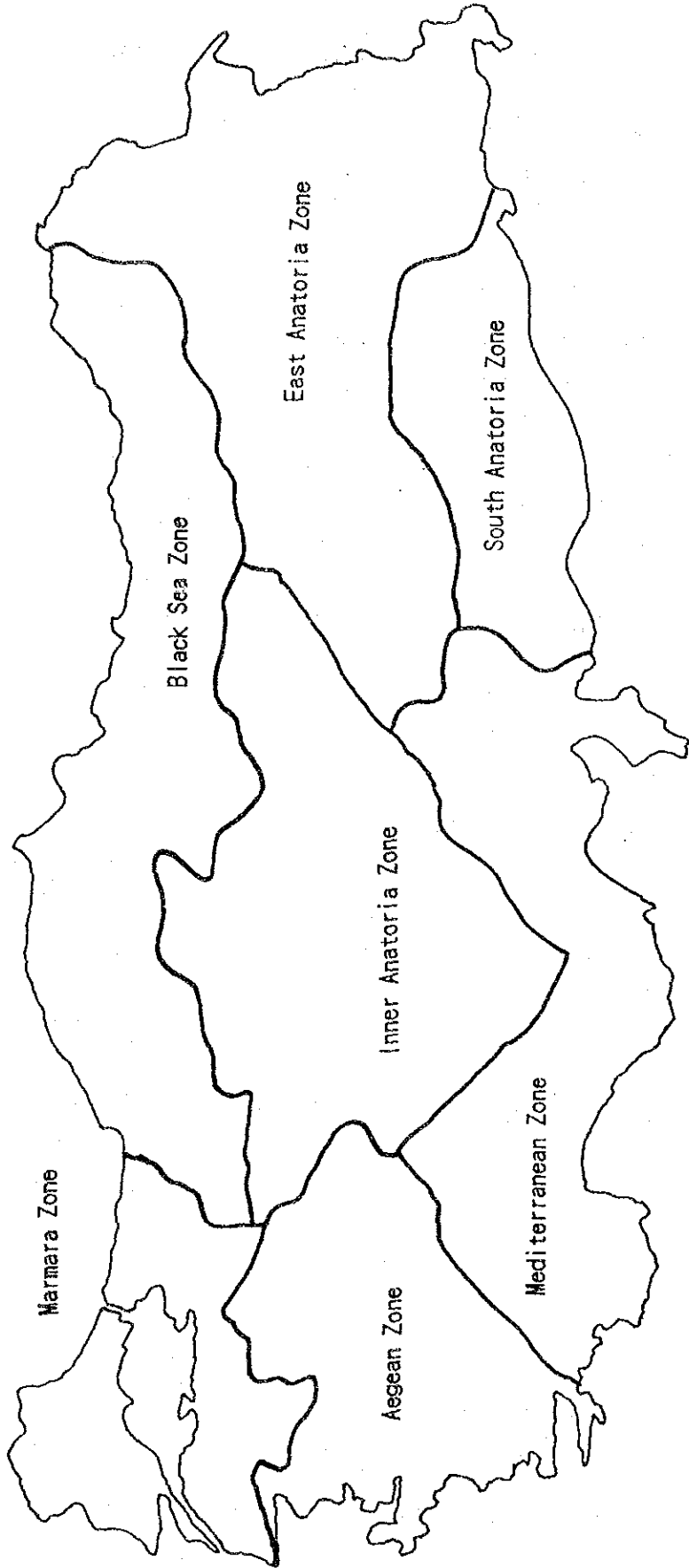


Figure IV-25 Geographical Division within Turkey

a) b)
Table IV-23 Plant Species in National Park and Nature Conservation Area

Pinaceae	Abies bormulleriana (Fir) A. nordmanniana Pinus nigra (Black pine) P. sylvestris
Taxaceae	Taxus baccata (Yellow tree)
Oleaceae	Fraxinus ornus (Ash tree)
Betulaceae	Coryllus avellana
Coryllus	eoluma (Wild hazel) Carpinus betulus L. (Hornbeam) Aluinus glutinosa (L.)
Tilliaceae	Tilla tomentosa T. rubra (Linden tree)
Aceraceae	Acer plantanoides L. (Maple) A. trautvetteri A. sp.
Ulmaceae	Ulmus campestris (Elm)
Fagaceae	Fagus orientalis (Beach) Quercus dschorochensis Q. hartwisstana (Oak)
Buxaceae	Buxus sempervirens (Boxwood)
Taxodiaceae	Sorbus aucupania (Rowan)
Cupressaceae	Juniperus excelsa (Juniper)
Aspidiaceae	Dryopteris-flix-mas(L.) D. caucasica Polystichum aculeatum (L.) P. setiferum
Aspleniaceae	Asplenium onopteris L. A. trichomanes L. Phyllitis scolopendrium(L.)
Equisetaceae	Equisetum telmateia E. arvense L.
Hypolepidaceae	Polypodium vulgare L. A. trautvetteri

*These tables were made by the lists of plant species growing in
a) Yedigöller National Park, b) Yenice Nature Conservation Area

-
- Anacardiaceae
Rhus coriaria L.
- Apiaceae(Umbelliferae)
Angelica sylvestris L.
Anthriscus nemorosa
Astrantia maxima
Caucalis platycarpus L.
Eryngium giganteum
Ferulago platycarpa
Heracleum platyaenium Boiss (Endemic)
Laser trilobum (L.)
Oenanthe pimpinelloides L.
Sanicula europea L.
Torilis japonica
Cenanthe pimpinelliodes L.
- Aquifoliaceae
Ilex colchica
- Araliaceae
Hedera helix L.
- Aristolochiaceae
Aristolochia pontica
- Asclepiadaceae
Vincetoxicum hiundinaria
- Asteraceae(Compositae)
Anyhemis tinctoria L.
A. triumfetti(L.)
Carduus nutans L.
Centaurea iberica
Cirsium avense(L.)
Petrae Olarslan
Antchemis cretica L. (Endemic)
Antchemis sp.
Cicerbita variabilis (Endemic)
Cirsium vulgare
C. arvense L.
Conyza canadensis(L.)
Doronicum orientale
Eupatorium cannabinum L.
Hieracium medianiforme(Euxine)
H. vagum
Inula vulgaris
Lapsana communis L.
Lagfia arvenis(L.)
Mycelis muralis(L.)
Petasites hybridus(L.)
Scariola viminea(L.)
Solidago virgaurea L.
Stepotorhamphus tuberosus
Tanacetum poterifolium
Taraxacum officinale
Tripleurospermum tenuifolium
-

-
- Asteraceae (Compositae)
Tussilago farfara L.
Xanthinum strumarium L.
- Betulaceae
Alnus glutinosa (L)
Carpinus betulus L.
Coryllus avellana L.
- Boraginaceae
Myosotis lithospermifolia
Trachystemon orientalis (L.)
- Brassicaceae(Cruciferae)
Alliaria petiolata
Alyssum murale
Arabis caucasica
Barbarea trichopoda
Cardamine bulbifera(L.)
C. impatiens L.
- Campanulaceae
Campanula glomerata L.
C. lyrata
C. persicifolia L.
C. rapunculoides L.
Campamula sp.
- Caprifoliaceae
Sambucus ebulus L.
S. nigra L.
- Caryophyllaceae
Dianthus calocephalus
D. kastembeluensis (Endemic)
D. calocephalus
Minuartia hirsuta
Moehringia trinervia (L.)
Petrohragia saxifraga (L)
Saponaria glutinosa
Silene compacta
S. vulgaris
S. dichotoma
S. italica(L.)
- Celestraceae
Euonymus latifolius (L.)
- Chenopodiaceae
Beta intermedia (Endemic)
- Cistaceae
Cistus creticus L.
- Convolvulaceae
Calystegia sylvatica
Convolvulus cantabrica L.
- Cornaceae
Cormus mas L.
-

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- Crassulaceae
Sedum album L.
S. pallidum
S. telephium L.
- Cyperaceae
Carex pendula
- Datisceae
Datisca cannabina L.
- Discoraceae
Tamus communis L.
- Dipsacaceae
Scabiosa columbaria L.
- Ericaceae
Arbutus unedo L.
Erica arborea L.
Monotropa hypopithys L.
Rhododendron ponticum L.
Vaccinium aretostaphylos. L.
- Pyrolaceae
Monotropa hypopithys
- Euphorbiaceae
Euphorbia amygdaloides L. (Endemic)
Euphorbia stricta L.
- Fabaceae
Anthyllis vulneraria L. (Endemic)
Argyrolobium biebersteinii
Astragalus glycyphyllos L.
Chamaecytisus hirsutus(L.)
Coronilla varia L.
Doryenium graecum (L.)
D. pentaphyllum Scop. subsp. anatolicum
Galega officinalis L.
Genista lydia
- Leguminosae
Lathyrus aphaca L.
L. aureus
L. laxiflorus
L. undulatus
Lanthrus sp.
Lotus corniculatus L.
Melilotus officinalis (L.)
Trifolium arvense L.
T. campestre
T. hybridum L.
T. medium L.
T. pannonicum Jacq. subsp. elongatum
T. pratense L.
T. repens L.
T. resupinatum
T. rytidosemium
Trifolium sp.
Vicia cracea
-

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- Leguminosae
 - Vicia grandiflora*
 - Gentianaceae
 - Gentiana asclepiadea* L.
 - Geraniaceae
 - Geranium purpureum*
 - G. pyrenaicum*
 - G. robertianum* L.
 - Geranium* sp.
 - Hypericaceae
 - Hypericum androsaemum* L.
 - H. montbretii*
 - Iridaceae
 - Crocus ancyrensis*
 - C. speciosus*
 - Juglandaceae
 - Juglans regia* L.
 - Juncaceae
 - Juncus effusus* L.
 - Lamiaceae
 - Brunella laciniata* (L.)
 - Calamintha grandiflora*
 - Clinopodium vulgare* L. subsp. *arundanum*
 - Lamium garanicum* L. subsp. *laevigatum*
 - L. maculatum* L.
 - Lycopus europeus* L.
 - Mentha pulegium* L.
 - Phlomis russeliana*
 - Salvia forskahlei* L.
 - S. glutinosa* L.
 - Stachys cretica* L.
 - S. iberica* M.
 - Teucrium chamaedrys* L.
 - Liliaceae
 - Allium jubatum*
 - A. stamineum*
 - Colchicum bowlesianum*
 - Lilium martagon* L.
 - Muscari racemosum* (L.)
 - Ornithogalum oligophyllum*
 - Ruscus hypogiossum* L.
 - Loranthaceae
 - Viscum album* L.
 - Malvaceae
 - Alcea pallida*
 - Oleaceae
 - Jasmiium fruticans* L.
 - Onagraceae
 - Cireaeluteiana* L.
 - Epilobium angustifolium* L.
 - E. lanceolatum*
 - E. montanum* L.
-

Orobanchaceae
Orobanche rubens

Orchidaceae
Cephalanthera rubra(L.)
Dactylorhiza ramona S.
Orehis palustris
O. pinetorum

Paraveraceae
Chelidonium majus L.
Corydalis caucasica
Papaver lacorum

Plantaginaceae
Plantago major L.

Poaceae
Briza media L.
Bromus sterilis L.
Dactylis glomerata L.
Festuca drymeju
F. ovina L.
F. pratensis
Hordelymus europaeus(L.)
Lolium rigidum
Phleum montanum
Poa bulbosa L.
P. nemoralis L.

Potamogetonaceae
Potamogeton berchtoldi

Primulaceae
Cyclamen coum
Lysimachia verticillaris
Primula vulgaris L.

Ranunculaceae
Clematis vitalba L.
Helleborus orientalis L.
Ranunculus brutius

Resedaceae
Reseda lutea L.

Rosaceae
Crataegus pentagyna
Fragaria vesca L.
Geum urbanum L.
Laurocerasus officinalis
Malus sylvestris
Mespilus germanica L.
Pyrus elaeagnifolia
Rosa canina L.
Rubus canescens
R. discolor
R. hirtus
Sanguisorba minor
Sorbus kusnetzovii
S. aucuparia

(Continue)

Rubiaceae
Asperula involucrata
A. odorata L.
A. taurina L.
Galium rotundifolium
G. verum L.

Salicaceae
Populus tremula L.

Santalaceae
Thesium ramosum

Saxifragaceae
Saxifraga cymbalaria L.
S. rotundiflora L.

Scrophulariaceae
Digitalis ferruginea L.
Linaria genistifolia(L.)
Melampyrum arvense L.
Verbascum eriocarpum
Veronica anagallis-aquatica L.
V. chamaedrys L.

Solanaceae
Atropa belladonna
Solanum dulcamara L.

Thymelacaeae
Daphne pontica L.

Urticaceae
Urtica dioica L.

Valerianaceae
Valeriana alliariifolia

Verbenaceae
Verbena officinalis L.

Violaceae
Viola sieheana

Table IV-24 Main Species of Flora found in Planned Area (April-July)

Speices	* Area(1)	(2)	(3)	(4)	(5)
Labiatae	Lamium purpureum	○	○	○	
	Mentha pulegium	○	○	○	○
Umbelliferae	Anthriscus nemorosa	○		○	
Urticaceae	Urtica dioica	○	○		
Scrophulariaceae	Veronica	○		○	
	Diditalis ferrusinea				○
Euphorbiaceae	Euphorbia myrsinels	○			
	Euphorbia apios		○		
	Euphorbia (1)	○			
	Euphorbia (2)	○	○	○	
Plantaginaceae	Plantago	○	○		○
Liliaceae	Muscari camosum	○	○	○	○
Compositae	Bellis perevis		○		
	Doronica orientale				○
Violaceae	Viola odorata				○
Graniaceae	Geranium			○	○
Unknown	Pteridium			○	○
Rosaceae	Fragaria vesca			○	
	Sangvisorba minor				○
	Potentilla recta				○
	Geum urbanum			○	
Cruciferae	Unknown	○		○	
Primulaceae	Primula vulgaris				○
Hypericaceae	Hyperricum montbretii		○		
Dipsaceae	Scabiosa columbaria	○	○		
Crassulaceae	Sedum album		○		
Fabaceae	Lotus corniculatus		○		○
	Trifolim pratense		○		
	Trifolium nigrescens	○	○		
	Trigonella	○			○
Lamiaceae	Psorolea bituminosa				○
	Clinopodium vulgare		○	○	
	Teucrium polium		○		
	Teucrium chamaedrys				○
Cistaceae	Cistus creticus				○
Ranunculaceae	Clematis vitalba				○
Asteraceae	Cirsium vulgare				○
	Crepis saucta	○	○		
Malvaceae	Alcea pallida	○			
Apiaceae	Oenanthe pimpinelloides		○		
Unknown(1)				○	
(2)					○
(3)			○		
(4)					○
(5)					○
(6)			○		
(7)		○			

* Area : (1) Reservoir Area(Kayabuku), (2)Dam site, (3)Water Reducing Section(Çaldere First Tributary-Köprübasi), (4)Water Reducing Section(Karadere Third Tributary-Sirvi Village), (5) Area near Outlet.

Table IV-25

Main Species inhabiting in Bolu and Zonguldak Area

MANMALS

Mustelidae	Mustera erminea Martes foina Martes martes Martes sp. Meles meles Lutra lutra
Canidae	Vulpes vulpes(Fox) Canis lupus
Leporidae	Lepus europeus
Cervidae	Cervus elaphus Capreolus capreolus
Ursidae	Ursus arctos
Suidae	Sus scrofa
Erinaceidae	Erinaceus europaeus
Felidae	Lynx lynx Felis sylvestris

AVES

Anatidae	Tadorna ferruginea Anas platyrhynchos Aras acuta
Phasianidae	Coturnix coturnix
Rallidae	Rallus aquaticus
Scolopacidae	Scolopax rusticola Gallinago gallinago
Columbidae	Columba livid Columba oenas Columba palumbus Streptopelia turtur Streptopelia decaocto Streptopelid senegalensis
Muscicapidae	Turdus merula
Phalacrocoracidae	
Corvidae	Garrulus glandarinus
Accipitridae	Accipiter sp.
Ardeidae	
Ciconiidae	
Cuculidae	
Strigidae	
Caprimulgidae	
Meropidae	
Coraciidae	
Picidae	
Motacillidae	
Pycnonotidae	
Sylviidae	
Paradoxornithidae	
Certhiidae	
Fringillidae	
Passeridae	
Oriolidae	

IV.1.13. Dairy Breeding Resources

(1) Vicinity of the Project Area

The areas (Table IV-6) of pasture and meadow⁶⁾ in Bolu, Mengen and Devrek districts are 50,488 (ha), 2,188 (ha) and 6,450 (ha) respectively, and cover about 3 %, 2.4 % and 5.5 % respectively of the land for each district. These areas are quite small as compared with the area of farming fields for agriculture.

The main kinds of livestock animals⁶⁾ (Table IV-26) in these areas are fowls, sheep, goats and cows, and in addition, horses and donkeys are bred in Mengen and Devrek districts. Furthermore, bees are also cultured in these areas. 12 kinds (Table IV-27) of livestock products are produced, such as milk, yoghurt, cheese and butter.

Table IV-26 Number of Breeding Animals in Surrounding Districts

Kind of Animals	Bolu	Mengen	Devrek
Cow	94,339	25,524	11,713
Calves	114,976		
Bull	19,669		
Sheep	218,077	3,521	14,963
Goat	75,110	10,350	805
Water buffaloes	11,241	1,213	
Horse		136	80
Donkey		412	355
Poultry	514,000	48,159	54,700
Old bee Hives		75	495
Modern Bee Hives		4,700	4,507

(Unit: head)

Table IV-27 Amount of Annual Production from Animals

Type of Products	Bolu	Mengen	Devrek
Red meat	134		
Milk	4,500		
Butter	80		
Yoghurt	750		
Cheese	225		
Egg	3,600,000 (pieces)		
Wool	18		
Mohair	0.1		
Hair	1.4		
Honey	46.7		
Wax	2.3		
Skin	25		
Fish	10		

(Complete this table)

(Unit: ton)

(2) Project Area

There are no large scale pasture and meadow which can manage the livestock excepting the small area on the slope of hills in the project area. Most animals are bred in the limited area like a barren and narrow land at the edge of the farming area and the slope of mountains. Kinds of animals in Gökçesu, Kayabükü, Köprübaşı and Akçabey villages are water buffalo, cows, sheep and goats (Table IV-28). As shown in table, scale of livestock is quite small as well as the poultry farming in order to obtain the animal foods only for self consumption of the residents. Kinds of livestock products are milk, yoghurt, butter, meat and eggs.

Table IV-28 Number of Breeding Animals (Heads)

Kind	Gökçesu	Kayabükü	Köprübaşı	Akaçabey
Water buffalo			} 300	} 300
Cow				
Sheep			} 200	} 200
Goat				

(Unit: head)

IV.1.14. Mineral and Fossil Fuel Resources

There are several coal mines near the Avsur, Merkesier, Kadılar and Gölçük villages²⁶⁾, etc. between Bolu city and Gökçesu village (Figure IV-26). Since these mines are located at upstream area from the project area, they are not included in the future reservoir and dam construction areas.

IV.1.15. Points and Area of High Landscape Value and Recreation

Yedigöller National Park shown in Table IV-18 is the area which has high landscape value and the recreational value near the vicinity of the project area and the location is about 12 km distant from dam site.

Dam facility and reservoir (Figure V-1) on the Köprübaşı project are sited within the steep valley and furthermore there are no objects to give high landscape value, including other recreational facilities. The representative places where can view the dam facility and reservoir from the places such as settlement, road and farming fields are only several spots as shown in Figure IV-27, Figure IV-28 Dam and reservoir do not come into sight from the National Park.

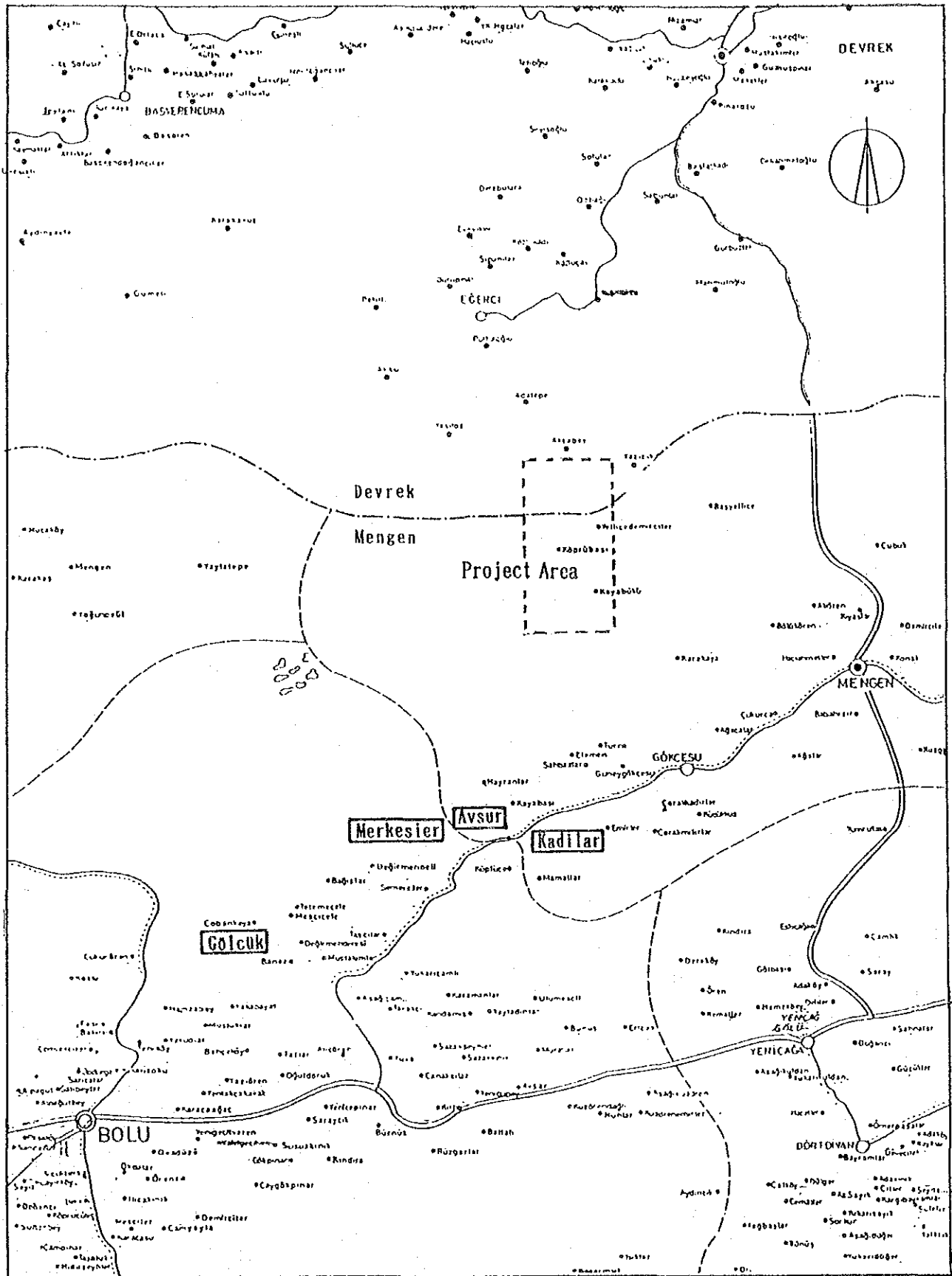


Figure IV-26 Distribution of Mine

Coal Mine



Figure IV-27 Present Scene of Dam Site and Reservoir Area near Kayabükü Village

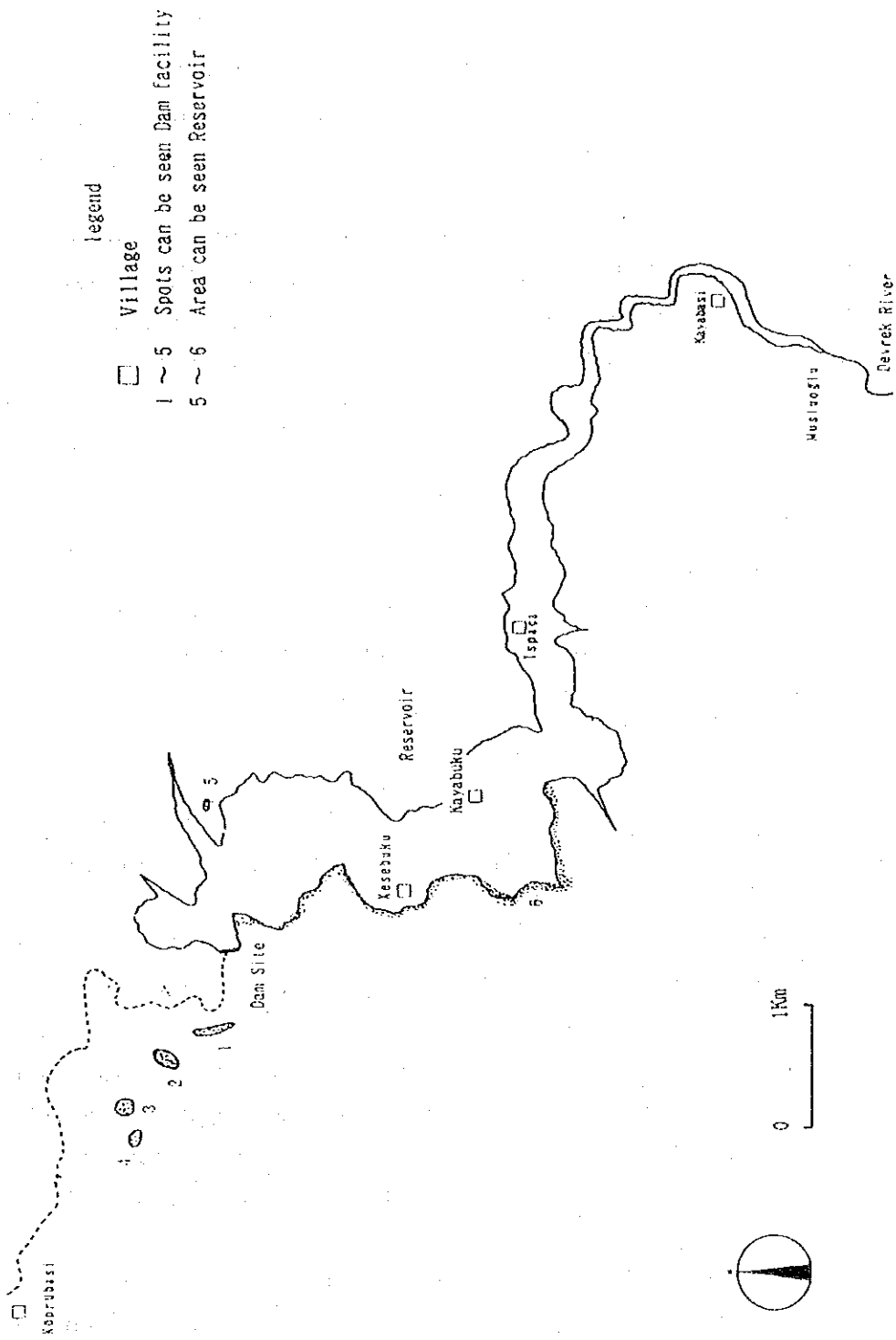


Figure IV-28 Spots can be seen Dam Facility and Reservoir