PART IV DESCRIPTION OF WATERSHEDS

PICTURE 84
Aerial view of Panjshir Valley in Spring 2003.
Parwan, 25 March 2003

I. MAP AND STATISTICS BY WATERSHED

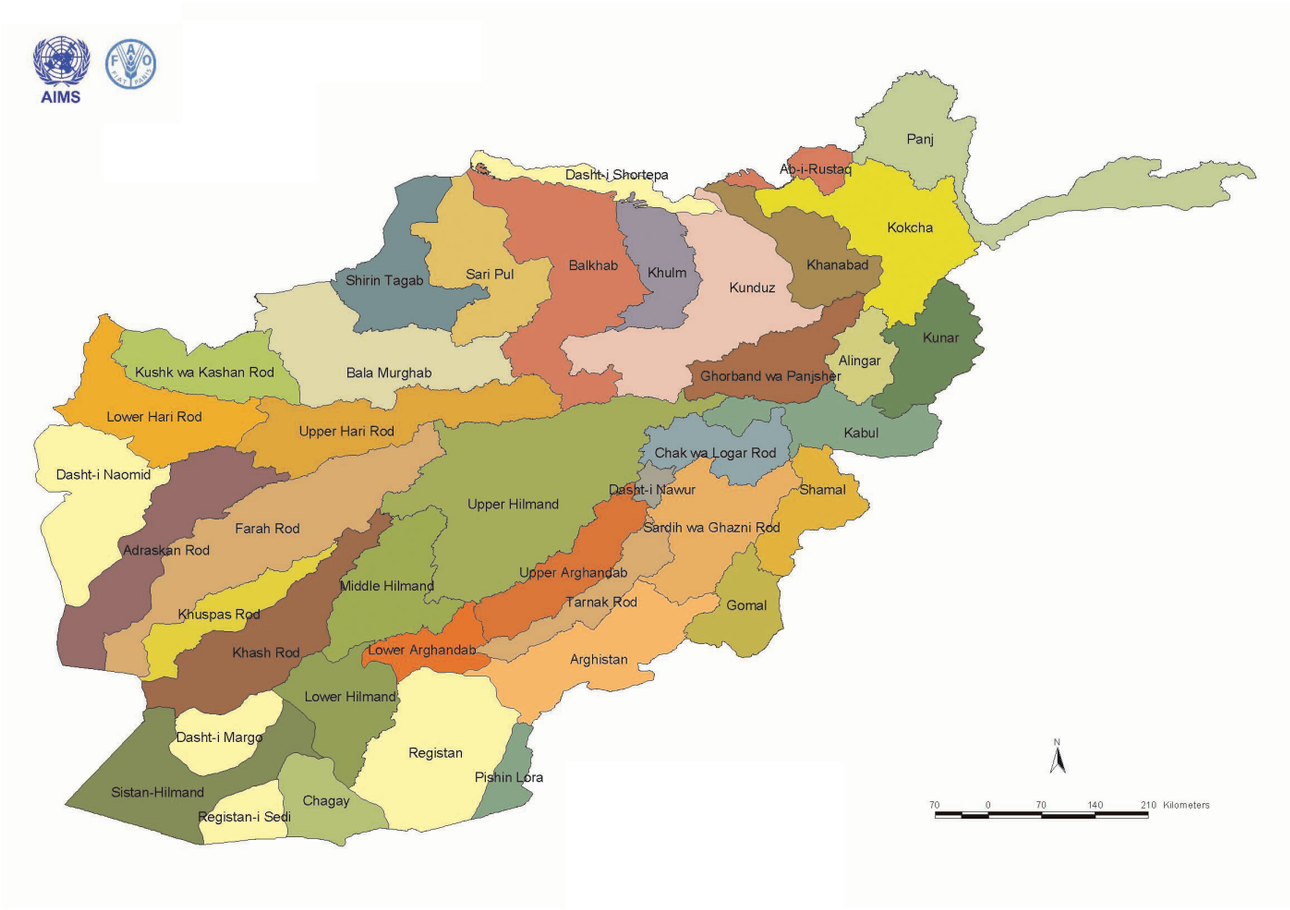
Part IV of the Watershed Atlas describes the 41 watersheds defined in Afghanistan, which includes five non-drainage areas (Map 10 and 11). For each watershed, statistics on landcover are presented. These statistics were calculated based on the FAO 1990/93 landcover maps (Shapefiles), using Arc-View 3.2 software. Graphs on monthly average river discharge curve (long-term average and 1978) are also presented. The data source for the hydrological graph is the Hydrological Year Books of the Government of Afghanistan – Ministry of Irrigation, Water Resources and Environment (MIWRE). The data have been entered by Asian Development Bank and kindly made available for the Atlas. The scales of the graphs for each watershed, or for different watersheds along the same river (e.g. Hilmand) are presented at the same scale for comparison purposes. Finally, where data was available, graphs on rainfall and evapo-transpiration (ETP) have been included.

Tables 12-15 present statistics for each watershed and river basin on catchment areas, population, settlements, irrigated and rainfed farming land, rangeland, lakes and wetlands, snow cover and forests. These statistics have been prepared with data available at the AIMS office in Kabul and processed using Arc-View 3.2 software. These data allow comparisons and classifications based on major characteristics between watersheds and river basins.

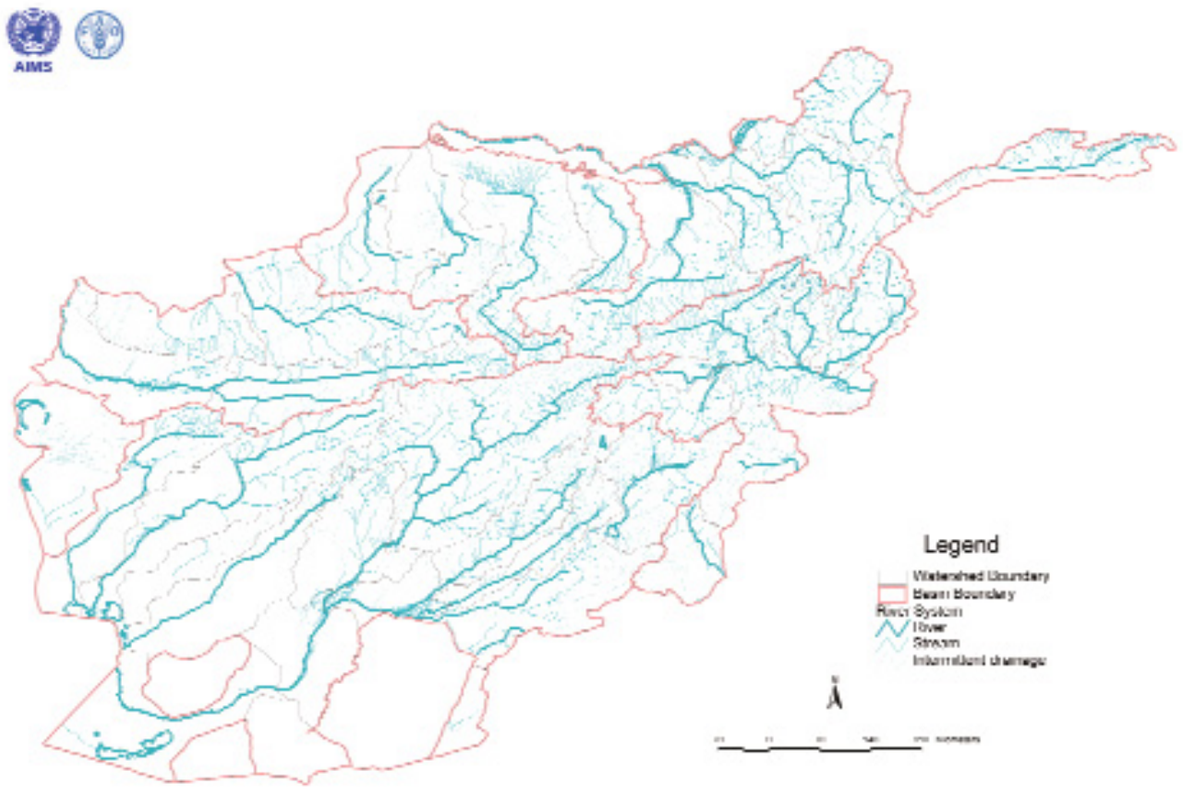
Graphs 21-32 illustrate the main characteristics on area, population and landcover of each watershed. Graph 21 shows that the Upper Hilmand is the largest watershed in Afghanistan, covering 46,882 sq. km, while the smallest watershed is the Dasht-i Nawur, which covers 1,618 sq. km. Graph 22 shows that the largest number of settlements is found in the Upper Hilmand watershed. However, Graph 23 shows that the largest number of people is found in the Kabul, Sardih wa Ghazni, Ghorband wa Panjshir (Shomali plain) and Balkhab watersheds. Graph 24 shows that the highest population density by far is in Kabul watershed, with 276 inhabitants/sq. km. Ab-i Rustaq, Sardih wa Ghazni, Ghorband wa Panjshir (Shomali plain) and Lower Arghandab watersheds also have high population densities, with about 100 inhabitants/sq. km. Graph 25 shows that the permanent snow cover is the highest in Panj, Kokcha and Kunar watersheds. Graph 27 shows that irrigated land is found in most watersheds. However, intermittently cultivated land is mostly found in Balkhab watershed. Graph 29 shows that rangeland is found in most watersheds, but the highest acreage is located in the Upper Hilmand watershed.

River Basin	Watershed	Main River Name	Area (Ha)	Area (sq.km)	%
Amu Darya	Ab-i-Rustaq	Amu Darya	367037	3670	0.57
Amu Darya	Khanabad	Farkhar	1199351	11994	1.86
Amu Darya	Kokcha	Kokcha	2236769	22368	3.46
Amu Darya	Kunduz	Kunduz	2802360	28024	4.34
Amu Darya	Panj	Panj	2463671	24637	3.81
Amu Darya Total			**9069189**	**90692**	**14.04**
Harirod-Murghab	Bala Murghab	Murghab	2535308	25353	3.93
Harirod-Murghab	Kushk wa Kashan Rod	Kushk Rod	1319079	13191	2.04
Harirod-Murghab	Lower Hari Rod	Hari Rod	1793622	17936	2.78
Harirod-Murghab	Upper Hari Rod	Hari Rod	2112358	21124	3.27
Harirod-Murghab Total			**7760366**	**77604**	**12.02**
Hilmand	Adraskan Rod	Adraskan Rod	2126571	21266	3.29
Hilmand	Arghistan Rod	Arghistan	2021861	20219	3.13
Hilmand	Chagay	Chagay	931885	9319	1.44
Hilmand	Dasht-i Nawur	Nawur Lake	161830	1618	0.25
Hilmand	Farah Rod	Farah Rod	3280911	32809	5.08
Hilmand	Khash Rod	Khash Rod	2183992	21840	3.38
Hilmand	Khuspa Rod	Khuspa Rod	942802	9428	1.46
Hilmand	Lower Arghandab	Arghandab	730017	7300	1.13
Hilmand	Lower Hilmand	Hilmand	1414679	14147	2.19
Hilmand	Middle Hilmand	Musa Qula Rod	1644127	16441	2.55
Hilmand	Sardih wa Ghazni Rod	Sardih wa Ghazni Rod	1725200	17252	2.67
Hilmand	Sistan-Hilmand	Hilmand	2157453	21575	3.34
Hilmand	Tarnak Rod	Tarnak Rod	907639	9076	1.41
Hilmand	Upper Arghandab	Arghandab	1316972	13170	2.04
Hilmand	Upper Hilmand	Hilmand	4688198	46882	7.26
Hilmand Total			**26234136**	**262341**	**40.62**
Kabul	Alingar	Alingar	623938	6239	0.97
Kabul	Chak wa Logar Rod	Chak wa Logar Rod	996794	9968	1.54
Kabul	Ghorband wa Panjshir	Panjshir	1296370	12964	2.01
Kabul	Gomal	Gomal	901396	9014	1.40
Kabul	Kabul	Kabul	1299728	12997	2.01
Kabul	Kunar	Kunar	1166449	11664	1.81
Kabul	Pishin Lora	Pishin Lora	420588	4206	0.65
Kabul	Shamal	Shamal	985566	9856	1.53
Kabul Total			**7690829**	**76908**	**11.91**
Northern	Balkhab	Balkhab	2883521	28835	4.47
Northern	Khulm	Khulm	1023033	10230	1.58
Northern	Sari Pul	Sari Pul	1674325	16743	2.59
Northern	Shirin Tagab	Shirin Tagab	1509248	15092	2.34
Northern Total			**7090127**	**70901**	**10.98**
Non-Drainage Area	Dasht-i Margo	Non-Drainage Area	841352	8414	1.30
Non-Drainage Area	Dasht-i Naumed	Non-Drainage Area	2056138	20561	3.18
Non-Drainage Area	Dasht-i Shortepa	Non-Drainage Area	588028	5880	0.91
Non-Drainage Area	Registan	Non-Drainage Area	2667244	26672	4.13
Non-Drainage Area	Registan-i Sedi	Non-Drainage Area	582873	5829	0.90
Non-Drainage Area Total			**6735636**	**67356**	**10.43**
Grand Total			**64580283**	**645803**	**100.00**

TABLE 12
Main river names and areas (in ha and sq. km) by watershed



MAP 10
Watershed map of Afghanistan



MAP 11
River basin and watershed map of Afghanistan with river lines

River Basin	Watershed	Area (sq.km)	Settlements (Number)	%	Settled Population*	%	Population Density (per sq. km)
Amu Darya	Ab-i-Rustaq	3670	231	0.74	358749	1.73	97.74
Amu Darya	Khanabad	11994	622	1.99	668938	3.23	55.77
Amu Darya	Kokcha	22368	1344	4.30	715236	3.46	31.98
Amu Darya	Kunduz	28024	1240	3.97	1090639	5.27	38.92
Amu Darya	Panj	24637	715	2.29	134560	0.65	5.46
Amu Darya Total				**13.30**	**2968122**	**14.34**	**229.87**
Harirod-Murghab	Bala Murghab	25353	735	2.35	301380	1.46	11.89
Harirod-Murghab	Kushk wa Kashan Rod	13191	501	1.60	287829	1.39	21.82
Harirod-Murghab	Lower Hari Rod	17936	639	2.05	824456	3.98	45.97
Harirod-Murghab	Upper Hari Rod	21124	1084	3.47	308610	1.49	14.61
Harirod-Murghab Total				**9.48**	**1722275**	**8.32**	**94.28**
Hilmand	Adraskan Rod	21266	462	1.48	186446	0.90	8.77
Hilmand	Arghistan Rod	20219	1470	4.71	208932	1.01	10.33
Hilmand	Chagay	9319	1	0.00	642	0.00	0.07
Hilmand	Dasht-i Nawur	1618	68	0.22	10987	0.05	6.79
Hilmand	Farah Rod	32809	1029	3.30	381281	1.84	11.62
Hilmand	Khash Rod	21840	339	1.09	92379	0.45	4.23
Hilmand	Khuspa Rod	9428	105	0.34	38987	0.19	4.14
Hilmand	Lower Arghandab	7300	631	2.02	732056	3.54	100.28
Hilmand	Lower Hilmand	14147	246	0.79	317275	1.53	22.43
Hilmand	Middle Hilmand	16441	810	2.59	326897	1.58	19.88
Hilmand	Sardih wa Ghazni Rod	17252	1922	6.15	1868342	9.03	108.30
Hilmand	Sistan-Hilmand	21575	173	0.55	91968	0.44	4.26
Hilmand	Tarnak Rod	9076	837	2.68	261602	1.26	28.82
Hilmand	Upper Arghandab	13170	1361	4.36	316790	1.53	24.05
Hilmand	Upper Hilmand	46882	4587	14.69	1046990	5.06	22.33
Hilmand Total				**44.96**	**5881571**	**28.42**	**376.30**
Kabul	Alingar	6239	465	1.49	287089	1.39	46.01
Kabul	Chak wa Logar Rod	9968	1212	3.88	607283	2.93	60.92
Kabul	Ghorband wa Panjshir	12964	1651	5.29	1440757	6.96	111.14
Kabul	Gomal	9014	190	0.61	16316	0.08	1.81
Kabul	Kabul	12997	1628	5.21	3591820	17.36	276.35
Kabul	Kunar	11664	712	2.28	600237	2.90	51.46
Kabul	Pishin Lora	4206	43	0.14	11320	0.05	2.69
Kabul	Shamal	9856	1138	3.64	630152	3.05	63.94
Kabul Total				**22.54**	**7184974**	**34.72**	**614.32**
Northern	Balkhab	28835	1662	5.32	1344202	6.50	46.62
Northern	Khulm	10230	274	0.88	259410	1.25	25.36
Northern	Sari Pul	16743	529	1.69	573449	2.77	34.25
Northern	Shirin Tagab	15092	504	1.61	605972	2.93	40.15
Northern Total				**9.51**	**2783033**	**13.45**	**146.37**
Non-Drainage Area	Dasht-i Margo	8414	0	0.00	0	0.00	0.00
Non-Drainage Area	Dasht-i Naumed	20561	23	0.07	17441	0.08	0.85
Non-Drainage Area	Dasht-i Shortepa	5880	46	0.15	134187	0.65	22.82
Non-Drainage Area	Registan	26672	0	0.00	0	0.00	0.00
Non-Drainage Area	Registan-i Sedi	5829	0.00	0.00	0.00	0.00	0.00
Non-Drainage Area Total				**0.22**	**151628.66**	**0.73**	**23.67**
Grand Total				**100.00**	**20691604**	**100.00**	**1484.83**

* Based on CSO 2003-04 figures. Nomadic population not included.

TABLE 13
Population and settlements by watershed

River Basin	Watershed	Area (sq.km)	Snow Cover (sq.km)	%	Water Bodies (sq.km)	%	Marsh-lands* (sq.km)	%
Amu Darya	Ab-i-Rustaq	3670	0.05	0.00	3.1	0.12	500.4	11.98
Amu Darya	Khanabad	11994	923.42	6.31	1.3	0.05	62.9	1.51
Amu Darya	Kokcha	22368	2843.85	19.44	5.6	0.23	12.1	0.29
Amu Darya	Kunduz	28024	257.97	1.76	0.5	0.02	82.0	1.96
Amu Darya	Panj	24637	6359.89	43.48	51.8	2.09	20.4	0.49
Amu Darya Total		**90692**	**10385.19**	**71.00**	**62.4**	**2.51**	**677.8**	**16.23**
Harirod-Murghab	Bala Murghab	25353	7.86	0.05	6.6	0.26	27.4	0.66
Harirod-Murghab	Kushk wa Kashan Rod	13191	0.00	0.00	3.6	0.15	4.0	0.10
Harirod-Murghab	Lower Hari Rod	17936	0.00	0.00	2.5	0.10	55.3	1.32
Harirod-Murghab	Upper Hari Rod	21124	41.40	0.28	0.0	0.00	40.3	0.97
Harirod-Murghab Total		**77604**	**49.27**	**0.34**	**12.7**	**0.51**	**127.1**	**3.04**
Hilmand	Adraskan Rod	21266	0.00	0.00	345.9	13.93	368.4	8.82
Hilmand	Arghistan Rod	20219	0.00	0.00	0.0	0.00	124.9	2.99
Hilmand	Chagay	9319	0.00	0.00	0.0	0.00	0.0	0.00
Hilmand	Dasht-i Nawur	1618	0.00	0.00	138.4	5.57	243.6	5.83
Hilmand	Farah Rod	32809	0.00	0.00	625.0	25.17	190.2	4.55
Hilmand	Khash Rod	21840	0.00	0.00	601.3	24.22	285.1	6.83
Hilmand	Khuspa Rod	9428	0.00	0.00	114.4	4.61	261.9	6.27
Hilmand	Lower Arghandab	7300	0.00	0.00	0.0	0.00	92.4	2.21
Hilmand	Lower Hilmand	14147	0.00	0.00	2.4	0.10	478.7	11.46
Hilmand	Middle Hilmand	16441	3.17	0.02	0.3	0.01	23.4	0.56
Hilmand	Sardih wa Ghazni Rod	17252	0.00	0.00	146.2	5.89	30.0	0.72
Hilmand	Sistan-Hilmand	21575	0.00	0.00	208.5	8.40	170.1	4.07
Hilmand	Tarnak Rod	9076	0.00	0.00	0.0	0.00	0.0	0.00
Hilmand	Upper Arghandab	13170	0.00	0.00	26.8	1.08	2.4	0.06
Hilmand	Upper Hilmand	46882	69.99	0.48	62.4	2.51	12.7	0.30
Hilmand Total		**262341**	**73.15**	**0.50**	**2271.5**	**91.48**	**2283.7**	**54.67**
Kabul	Alingar	6239	1052.48	7.20	1.4	0.06	0.0	0.00
Kabul	Chak wa Logar Rod	9968	0.00	0.00	2.3	0.09	31.8	0.76
Kabul	Ghorband wa Panjshir	12964	871.86	5.96	10.7	0.43	0.5	0.01
Kabul	Gomal	9014	0.00	0.00	0.0	0.00	50.4	1.21
Kabul	Kabul	12997	53.69	0.37	7.3	0.29	71.8	1.72
Kabul	Kunar	11664	2096.15	14.33	1.2	0.05	48.3	1.16
Kabul	Pishin Lora	4206	0.00	0.00	0.4	0.02	49.9	1.19
Kabul	Shamal	9856	0.00	0.00	1.1	0.05	11.2	0.27
Kabul Total		**76908**	**4074.19**	**27.86**	**24.5**	**0.99**	**263.8**	**6.32**
Northern	Balkhab	28835	44.36	0.30	22.4	0.90	191.1	4.57
Northern	Khulm	10230	0.00	0.00	0.0	0.00	5.5	0.13
Northern	Sari Pul	16743	0.00	0.00	8.6	0.35	7.0	0.17
Northern	Shirin Tagab	15092	0.00	0.00	1.9	0.08	1.9	0.04
Northern Total		**70901**	**44.36**	**0.30**	**32.9**	**1.33**	**205.4**	**4.92**
Non-Drainage Area	Dasht-i Margo	8414	0.00	0.00	0.0	0.00	26.0	0.62
Non-Drainage Area	Dasht-i Naumed	20561	0.00	0.00	79.5	3.20	281.4	6.74
Non-Drainage Area	Dasht-i Shortepa	5880	0.00	0.00	0.0	0.00	311.7	7.46
Non-Drainage Area	Registan	26672	0.00	0.00	0.0	0.00	0.0	0.00
Non-Drainage Area	Registan-i Sedi	5829	0.00	0.00	0.0	0.00	0.0	0.00
Non-Drainage Area Total		**67356**	**0.00**	**0.00**	**79.5**	**3.20**	**619.1**	**14.82**
Grand Total		**645803**	**14626.15**	**100.00**	**2483.4**	**100.02**	**4176.9**	**100.00**

* Permanently and seasonally inundated

TABLE 14
Snow cover, water bodies and marshlands by watershed

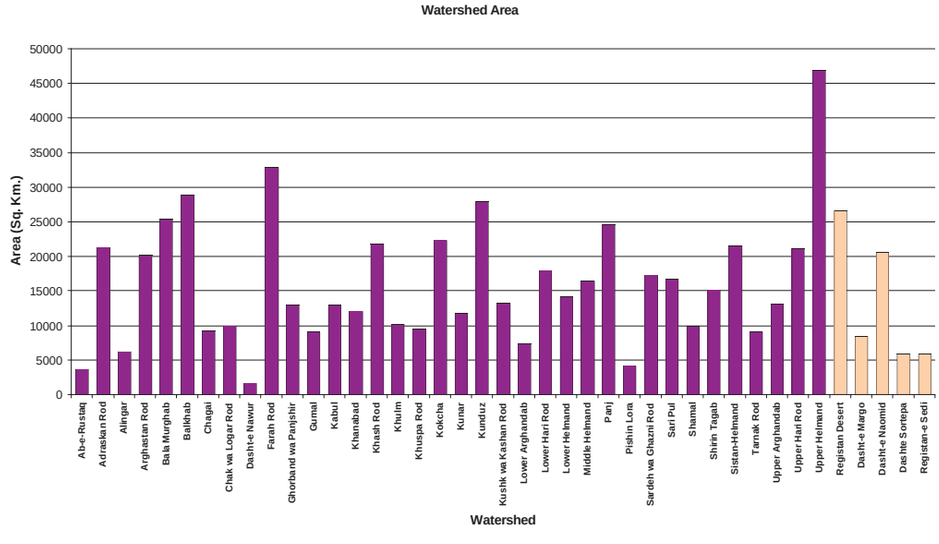
River Basin	Watershed	Irrigated land * (sq.km)	%	Intermit-tently Cultivated (sq.km)	%	Rain-fed Land ** (sq.km)	%	Range-land (sq.km)	%	Forest Cover *** (sq.km)	%
Amu Darya	Ab-i-Rustaq	644	4.13	35	0.21	1649	3.65	620	0.21		0.00
Amu Darya	Khanabad	932	5.98	25	0.15	2186	4.84	5872	2.01	331	2.54
Amu Darya	Kokcha	586	3.76	102	0.62	4638	10.27	13390	4.59	20	0.15
Amu Darya	Kunduz	1291	8.27	233	1.41	3461	7.66	21086	7.23	292	2.24
Amu Darya	Panj	87	0.56	86	0.52	1223	2.71	15674	5.37	4	0.03
Amu Darya Total		**3540**	**22.70**	**481**	**2.92**	**13156**	**29.13**	**56643**	**19.41**	**648**	**4.96**
Harirod-Murghab	Bala Murghab	286	1.83	342	2.07	3269	7.24	21310	7.30	0	0.00
Harirod-Murghab	Kushk wa Kashan Rod	108	0.70	134	0.81	4283	9.48	7190	2.46	71	0.55
Harirod-Murghab	Lower Hari Rod	1080	6.93	570	3.45	528	1.17	4740	1.62	28	0.21
Harirod-Murghab	Upper Hari Rod	251	1.61	238	1.45	1291	2.86	19240	6.59	0	0.00
Harirod-Murghab Total		**1725**	**11.06**	**1284**	**7.79**	**9371**	**20.75**	**52481**	**17.98**	**99**	**0.76**
Hilmand	Adraskan Rod	314	2.02	562	3.41	112	0.25	5523	1.89		0.00
Hilmand	Arghistan Rod	276	1.77	741	4.50	401	0.89	9721	3.33	72	0.55
Hilmand	Chagay		0.00		0.00	0	0.00		0.00	0	0.00
Hilmand	Dasht-i Nawur	10	0.06	51	0.31	25	0.05	1103	0.38	0	0.00
Hilmand	Farah Rod	238	1.52	1163	7.06	197	0.44	13257	4.54	0	0.00
Hilmand	Khash Rod	21	0.13	484	2.94	20	0.04	5243	1.80	0	0.00
Hilmand	Khuspa Rod	24	0.15	276	1.67	0	0.00	1554	0.53	0	0.00
Hilmand	Lower Arghandab	194	1.24	918	5.57	50	0.11	304	0.10	7	0.05
Hilmand	Lower Hilmand	780	5.00	155	0.94	0	0.00	2	0.00	0	0.00
Hilmand	Middle Hilmand	392	2.51	657	3.99	30	0.07	7975	2.73	0	0.00
Hilmand	Sardih wa Ghazni Rod	1065	6.83	1196	7.25	337	0.75	11791	4.04	35	0.27
Hilmand	Sistan-Hilmand	1	0.01	366	2.22	0	0.00		0.00	0	0.00
Hilmand	Tarnak Rod	259	1.66	898	5.45	66	0.15	5006	1.72	0	0.00
Hilmand	Upper Arghandab	415	2.66	428	2.59	58	0.13	9746	3.34	0	0.00
Hilmand	Upper Hilmand	769	4.93	1107	6.72	1048	2.32	42035	14.40	0	0.00
Hilmand Total		**4758**	**30.50**	**9002**	**54.61**	**2344**	**5.19**	**113258**	**38.81**	**114**	**0.87**
Kabul	Alingar	161	1.03	33	0.20	1	0.00	1588	0.54	2095	16.03
Kabul	Chak wa Logar Rod	489	3.13	235	1.43	520	1.15	8541	2.93	0	0.00
Kabul	Ghorband wa Panjshir	895	5.74	195	1.18	188	0.42	9170	3.14	105	0.80
Kabul	Gomal	4	0.03	56	0.34	19	0.04	3560	1.22	229	1.75
Kabul	Kabul	934	5.99	363	2.20	44	0.10	6280	2.15	1068	8.18
Kabul	Kunar	178	1.14	197	1.20	573	1.27	2775	0.95	5081	38.88
Kabul	Pishin Lora		0.00	507	3.08	55	0.12	404	0.14	0	0.00
Kabul	Shamal	399	2.56	194	1.18	154	0.34	4835	1.66	3563	27.27
Kabul Total		**3060**	**19.62**	**1781**	**10.80**	**1554**	**3.44**	**37152**	**12.73**	**12141**	**92.91**
Northern	Balkhab	1274	8.17	2304	13.97	7002	15.50	13300	4.56	1	0.01
Northern	Khulm	146	0.93	343	2.08	1653	3.66	5988	2.05	63	0.48
Northern	Sari Pul	571	3.66	521	3.16	4682	10.36	6756	2.32	0	0.00
Northern	Shirin Tagab	387	2.48	703	4.27	5410	11.98	6103	2.09	0	0.00
Northern Total		**2378**	**15.25**	**3870**	**23.48**	**18747**	**41.50**	**32148**	**11.02**	**64**	**0.49**
Non-Drainage Area	Dasht-i Margo		0.00		0.00	0	0.00		0.00	0	0.00
Non-Drainage Area	Dasht-i Naumed	0	0.00	17	0.10	0	0.00	75	0.03	0	0.00
Non-Drainage Area	Dasht-i Shortepa	137	0.88	50	0.30	0	0.00	57	0.02	1	0.01
Non-Drainage Area	Registan		0.00		0.00	0	0.00		0.00	0	0.00
Non-Drainage Area	Registan-i Sedi		0.00		0.00	0	0.00		0.00	0	0.00
Non-Drainage Area Total		**138**	**0.88**	**67**	**0.41**	**0**	**0.00**	**131**	**0.05**	**1**	**0.01**
Grand Total		**15598**	**100.00**	**16485**	**100.00**	**45172**	**100.00**	**291813**	**100.00**	**13067**	**100.00**

* Intensively cultivated (one and two crops/year)

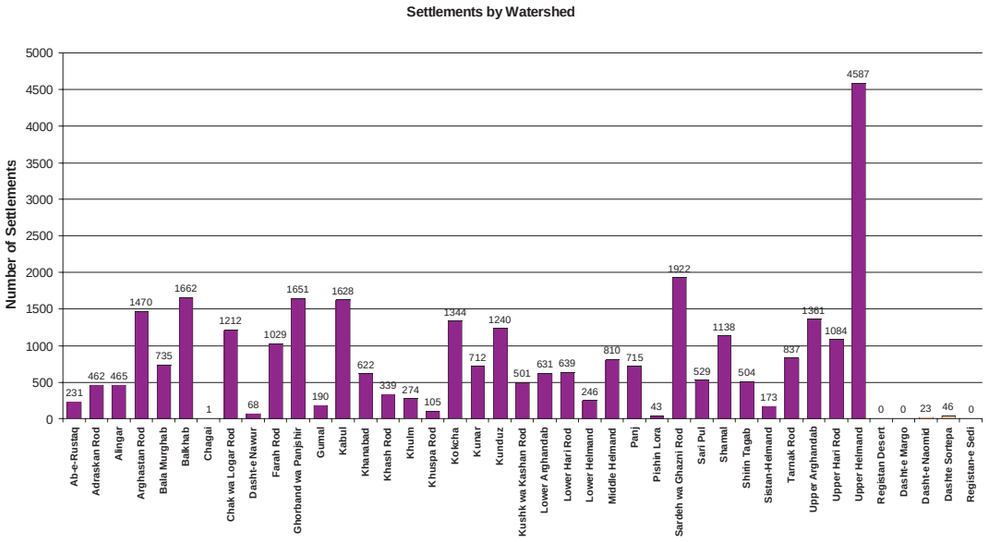
** Sloping and flat-lying areas

*** Degenerated, open and closed forest cover

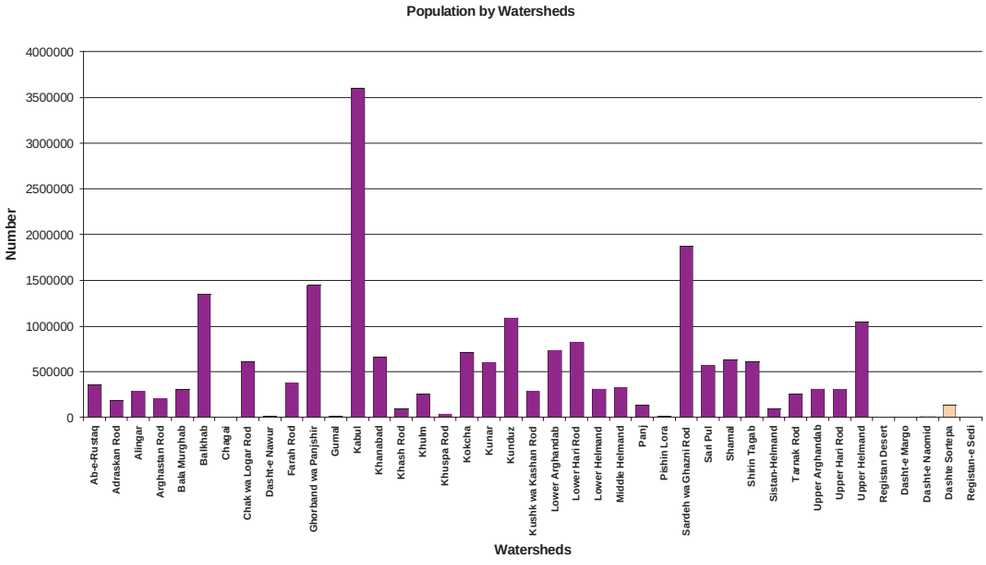
TABLE 15
Agriculture land, rangeland and forest cover by watershed



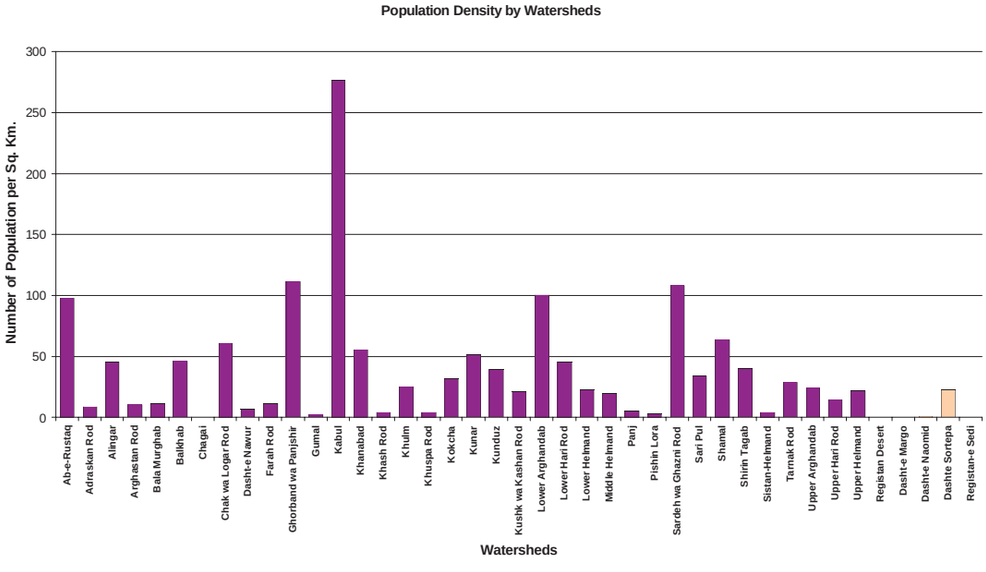
GRAPH 21
Area (sq. km) of each watershed



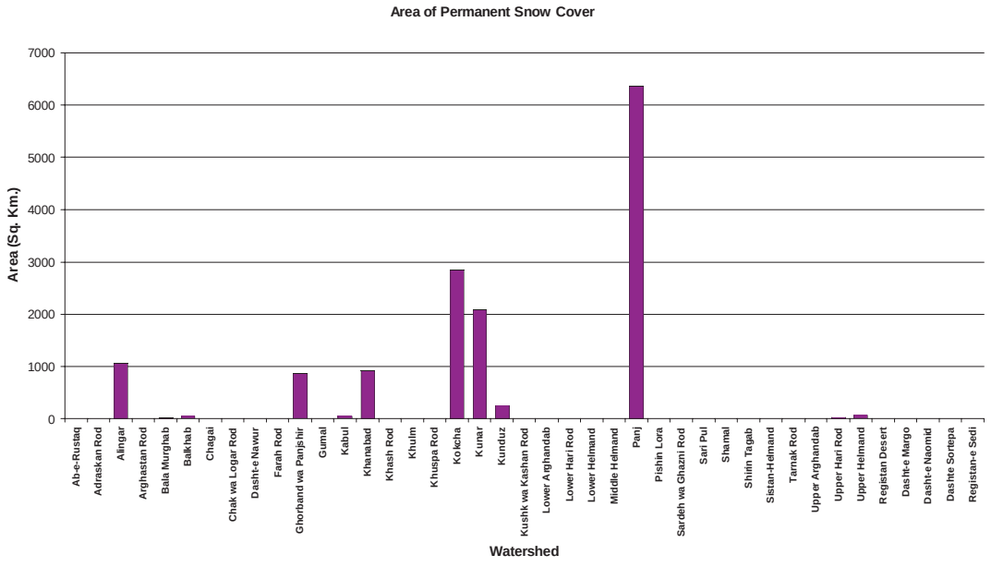
GRAPH 22
Number of settlements by watershed



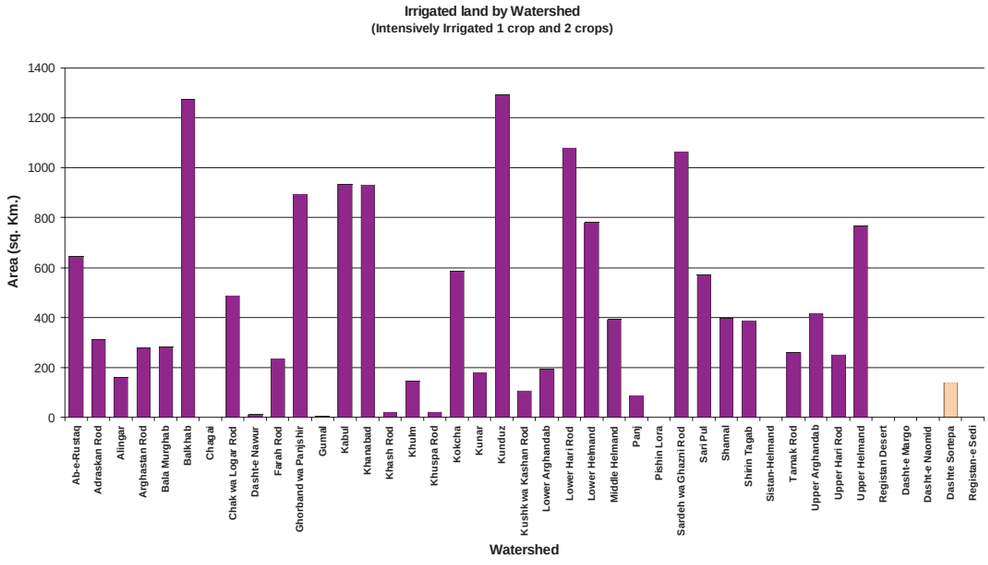
GRAPH 23
Population by watershed



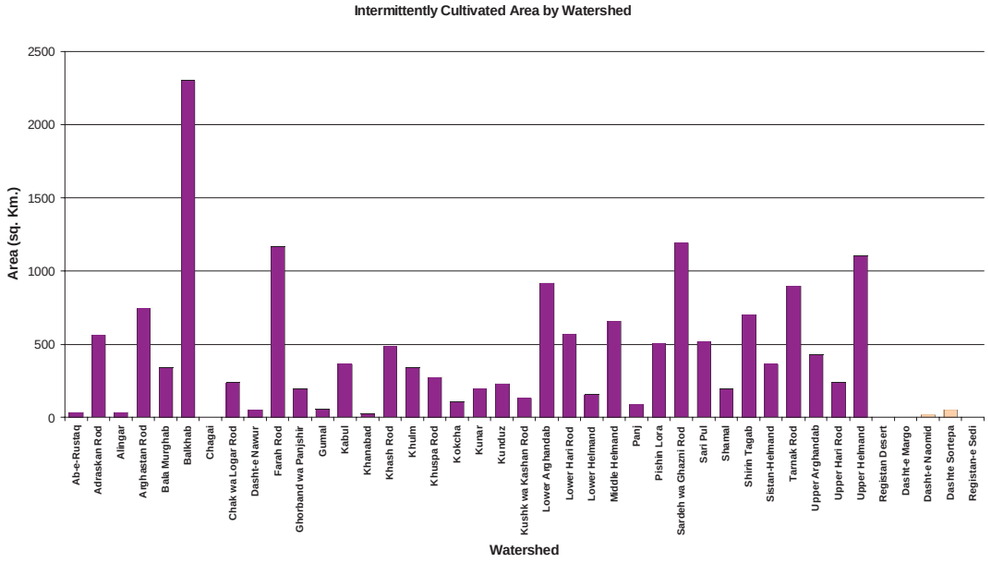
GRAPH 24
Population density by watershed



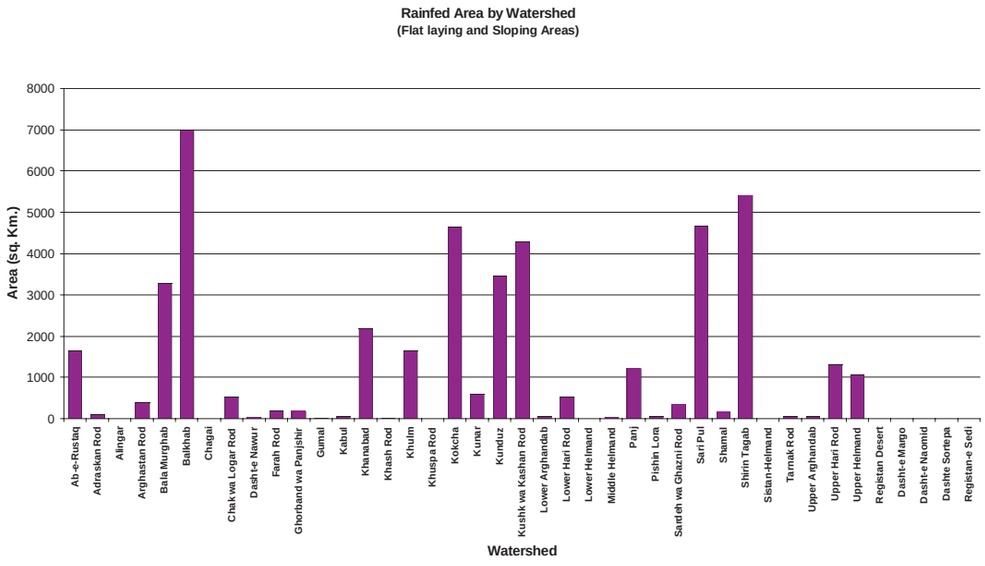
GRAPH 25
Permanent snow cover by watershed



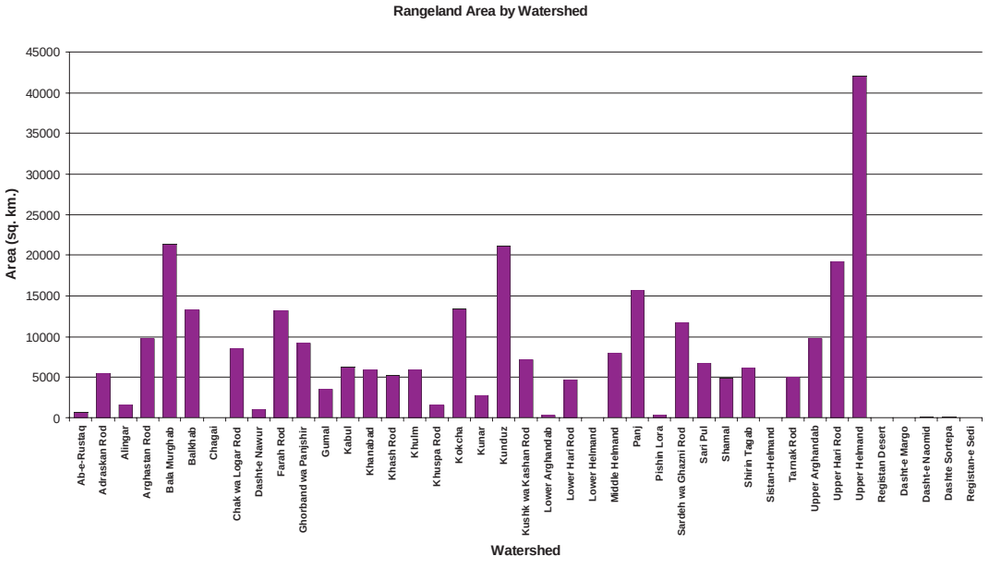
GRAPH 26
Irrigated land (intensively cultivated-one crop/year and intensively cultivated-two crops/year) by watershed



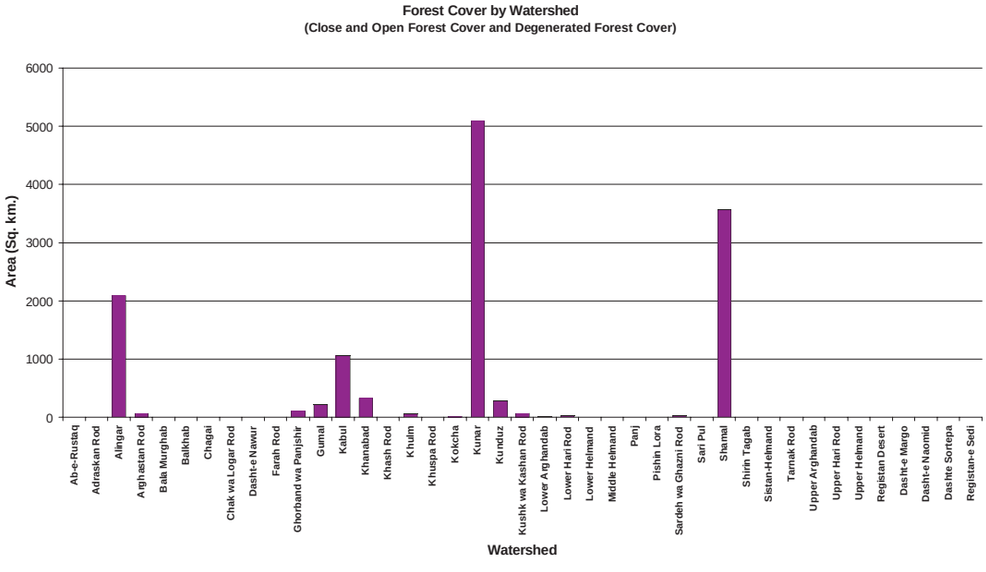
GRAPH 27
Irrigated - intermittently cultivated land by watershed



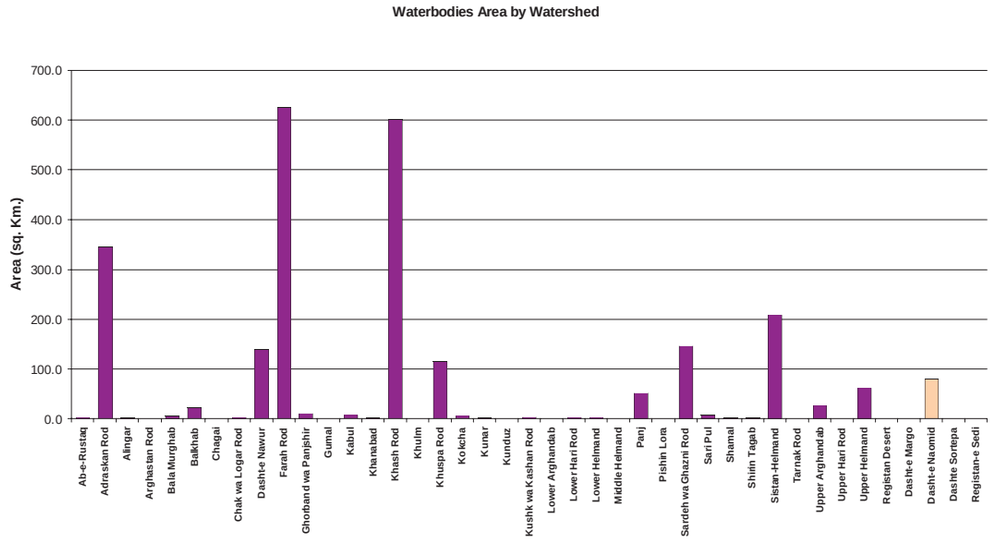
GRAPH 28
Rainfed (sloping and flat-lying areas) by watershed



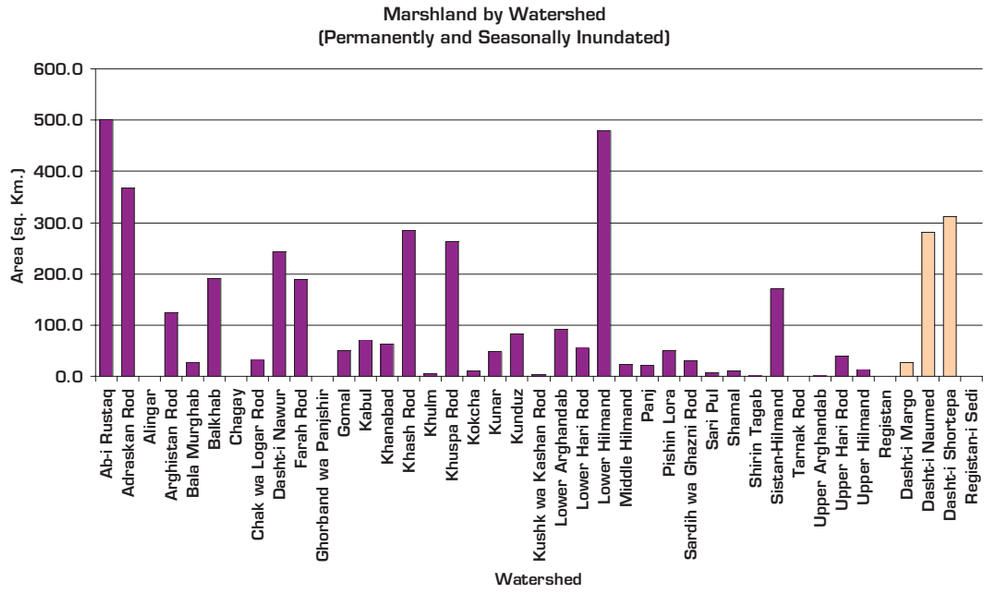
GRAPH 29
Rangeland by watershed



GRAPH 30
Forest cover (closed, open and degenerated classes) by watershed



GRAPH 31
Water bodies area by watershed



GRAPH 32
Marshland (permanently and seasonally inundated) by watershed

II. AMU DARYA RIVER BASIN

1. Panj watershed

The Panj watershed includes all the northeastern rivers, except the Kokcha and Ab-i Rustaq Rivers, that join the Amu Darya River in the northeast. The main rivers of the Panj watershed are the Wakhan Rod (Picture 87) and the Ab-i Pamir, which take their sources in the High Pamir of Afghanistan and Tajikistan. The Ab-i Pamir River takes its source from the Zur Kol Lake, and the Wakhan Rod from Kawl-i Chaqmaqtin Lake. When both rivers join, their names change to Panj or Ab-i Panja River (Picture 88). On the Tajik side, Panj River is called Pyandzh. The name of Panj changes to Amu Darya when it joins the Kokcha River in Takhar province. The High Pamir mountains bear glaciers that maintain flow of the rivers throughout the year (see Picture 86).

The Panj watershed also includes numerous rivers from Sheghnan district (Shewa River), Darwaz district (Kej or Jaway Darya and Durrah-i Sabz Rivers), Khwaha district (Kaf Ab River) and Ragh district (Ragh and Rawinj Ab Rivers) of Badakhshan. The largest lake of the Panj watershed is Shewa Lake, which covers an area of 5.67 sq. km (Picture 85). Shewa Lake faces Tajikistan and its water flows directly to the Panj River; it is not the source of Shewa River. The Shewa River takes its source in the pastureland of Shewa, west of the lake. Unfortunately, no data on river discharge in the Panj watershed available, as historically, hydrological stations were not placed along the various rivers of the Panj watershed.

PICTURE 85
View of Shewa Lake in Sheghnan district.
Badakhshan, 4 September 2003

PICTURE 86
High mountains covered with glaciers in the Wakhan corridor. Badakshan province, 2 September 2003 (N36.86, E71.14, S)

PICTURE 87
Wakhan Rod River at the entrance of the Afghan Pamir in the Wakhan corridor.
2 September 2003 (N37.02, E72.68, E)

PICTURE 88
Panj (or Ab-i Panja) River at the Afghan-Turkmenistan border post in Ishkashim. In the background (left), the highest mountain in Afghanistan; Koh-i Noshaq (7485 meters) and the Tirij Mir mountain (7750 meters) in Pakistan.
Badakhshan, 3 September 2003 (N36.78, E71.56, S)

Table 16 shows that Panj watershed is dominated by rangeland and permanent snow cover, representing, respectively, 64 percent and 26 percent of the watershed area. Total irrigated land, located on the valley floors, represents 0.7 percent of the watershed. Only one crop per year is possible in the whole watershed.

LANDCOVER	Area (Ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	448	4.5	0.02
Fruit Trees	818	8.2	0.03
Irrigated: Intensively Cultivated (1 Crop/Year)	8737	87.4	0.35
Irrigated: Intermittently Cultivated	8622	86.2	0.35
Marshland Permanently inundated	2040	20.4	0.08
Permanent Snow	635989	6359.9	25.82
Rainfed Crops (flat-lying areas)	5094	50.9	0.21
Rainfed Crops (sloping areas)	117204	1172.0	4.76
Rangeland (grassland/forbs/low shrubs)	1567441	15674.4	63.63
Rock Outcrop / Bare Soil	111654	1116.5	4.53
Water Bodies	5185	51.8	0.21
	2463230	**24632.3**	**100.00**

TABLE 16
Landcover classification for Panj watershed

PICTURE 89
View of the Anjuman lake and river below Anjuman pass. Kuran wa Munjan district, Badakhshan, 30 August 2003 (N35.81, E70.30, E)

2. Kokcha watershed

The Kokcha watershed drains water from the high Hindu Kush oriental mountains of Kuram wa Munjan district (Tagab-i Anjuman – Picture 89) and Tagab-i Munjan Rivers, Zebak district (Warduj River) and Keshim district (Keshim River) and other districts of Badakhshan province. The Tagab-i Anjuman and Tagab-i Munjan Rivers meet east of the district centre (Razer) of Kuran wa Munjan and take the name of Kokcha River. The Warduj River joins the Kokcha downstream of Baharak district center. The small hill separating both rivers in Baharak is known as the Mountain of Shirin-o Farhad, which is celebrated as the venue of the love affair between Shirin and Khosrau, a story of very ancient oral tradition in the Persian world. Below, the Keshem River, also called Darya-i Mashad, a tributary to the Kokcha, joins the Kokcha River north of Beluch village.

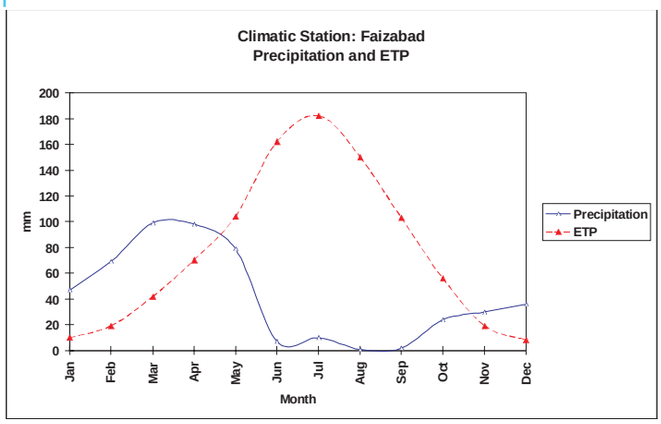
The Kokcha River is a main tributary to the Amu Darya, joining it at Khwaja Ghar in Takhar province at the feet of the Greek city of Ai Khanum, 320 km downstream (Picture 90). The Hindu Kush oriental mountains bear glaciers that maintain the river flow in summer.

Table 17 shows that Kokcha watershed is mainly composed of rangeland (nearly 60 percent) and rainfed crops (18 percent). Based on the FAO 1993 landcover map, permanent snow covers as much as 12 percent of the total watershed area. Total irrigated land represents 3.1 percent of the watershed and is located on valley floors. Part of the irrigated land in low elevations is suitable for double cropping.

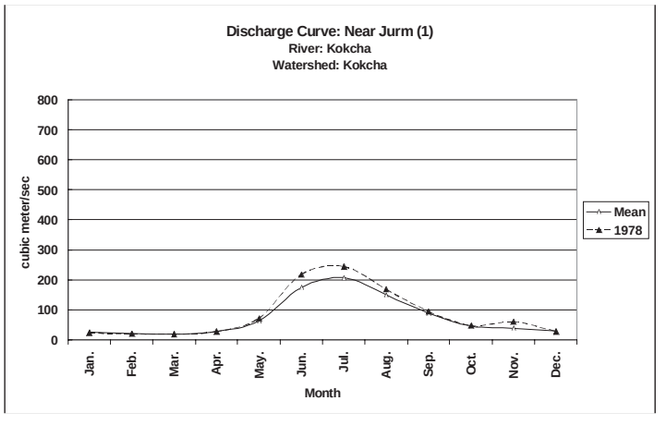
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	702	7.0	0.03
Fruit Trees	4326	43.3	0.19
Irrigated: Intensively Cultivated (1 Crop/Year)	45772	457.7	2.05
Irrigated: Intensively Cultivated (2 Crops/year)	12815	128.1	0.57
Irrigated: Intermittently Cultivated	10235	102.3	0.46
Marshland Permanently inundated	1211	12.1	0.05
Natural Forest (open cover)	1319	13.2	0.06
Permanent Snow	284385	2843.9	12.71
Pistachio Forest	508	5.1	0.02
Rainfed Crops (flat-lying areas)	54234	542.3	2.42
Rainfed Crops (sloping areas)	409554	4095.5	18.31
Rangeland (grassland/forbs/low shrubs)	1339030	13390.3	59.87
Rock Outcrop / Bare Soil	71947	719.5	3.22
Vineyards	136	1.4	0.01
Water Bodies	561	5.6	0.03
	2236734	**22367.3**	**100.00**

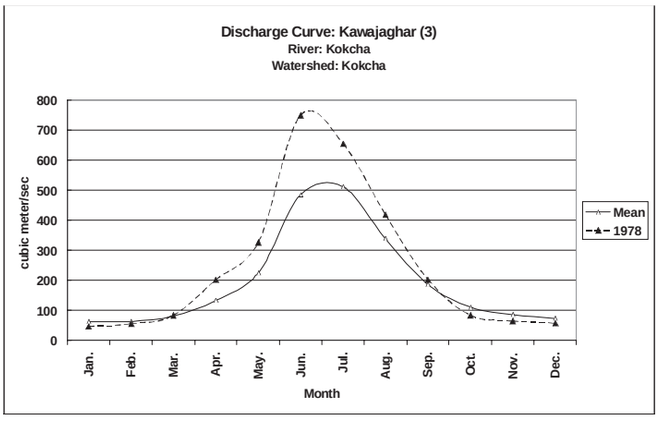
TABLE 17
Landcover classification for Kokcha watershed
LANDCOVER Area

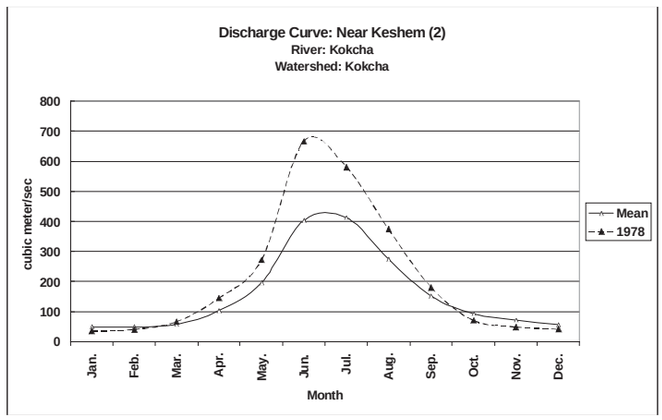
PICTURE 90
View of the Kokcha River at Khwaja Ghar district. On the right, the Kokcha joins the Amu Darya. The plain in Khwaja Ghar district is intensively cultivated with winter wheat as a first crop and paddy rice as a second crop.Takhar, 8 September 2003 (N37.16, E69.42, W)



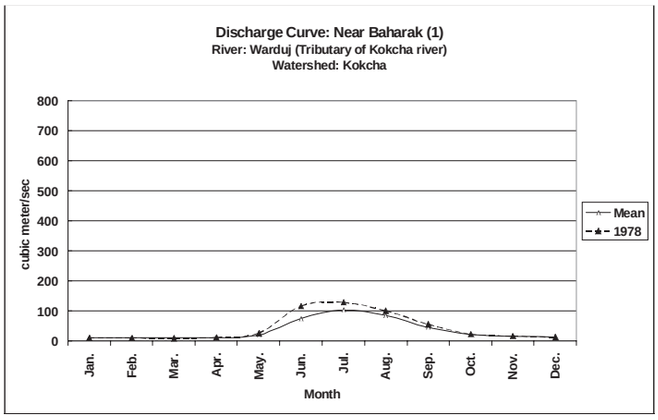
GRAPH 33
Precipitation and ETP in Faizabad

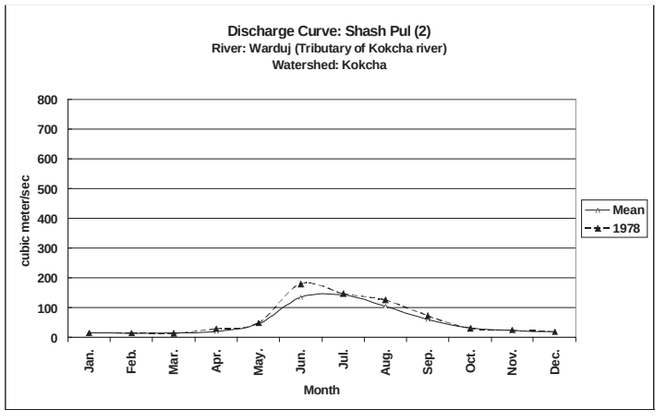




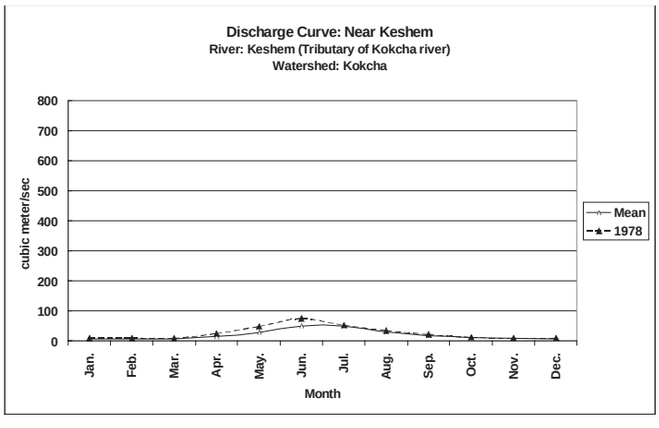


GRAPHS 34, 35 AND 36 AND PICTURE 91
Discharge curves along the Kokcha River and view of the Kokcha River above Jurm. Note at the back, the Ser-i Hawzde forest, 1 September 2003 (N36.04, E70.72, N). Kokcha watershed





GRAPHS 37 AND 38
Discharge curves along the Warduj River, a tributary of the Kokcha River. Kokcha watershed



GRAPH 39
Discharge curves along the Keshem River, a tributary of the Kokcha River. Kokcha watershed

3. Ab-i Rustaq watershed

Ab-i Rustaq watershed is a small watershed at the edge of the Amu Darya (or Panj) River. It includes the small river of Ab-i Rustaq and large stretches of irrigated land along the Amu Darya River between Yangi Qala in Takhar province and Islam Qala in Kunduz province. The irrigated area of Archi is not part of this watershed, as it is irrigated by the Kokcha River through the Archi canal, which takes its source in Khwaja Ghar in Takahr province. No hydrological stations were placed in the Ab-i Rustaq watershed. The watershed comprises an important natural resource, as the Tugai forest grows between the meanders of the Amu Darya River in Afghanistan and Tajikistan.

Table 18 shows that Ab-i Rustaq watershed is dominated by rainfed land (45 percent), rangeland (17 percent) and marshland (13 percent). Irrigated land represents 18.5 percent of the watershed area, and much of it is suitable for double cropping.

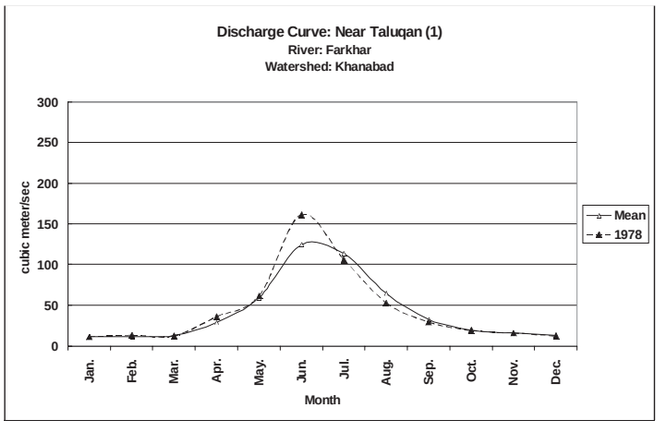
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	552	5.5	0.15
Irrigated: Intensively Cultivated (1 Crop/Year)	20861	208.6	5.68
Irrigated: Intensively Cultivated (2 Crops/year)	43571	435.7	11.87
Irrigated: Intermittently Cultivated	3476	34.8	0.95
Marshland Permanently inundated	50041	500.4	13.64
Permanent Snow	5	0.1	0.00
Rainfed Crops (flat-lying areas)	37271	372.7	10.16
Rainfed Crops (sloping areas)	127602	1276.0	34.77
Rangeland (grassland/forbs/low shrubs)	61975	619.8	16.89
Rock Outcrop / Bare Soil	19026	190.3	5.18
Sand-Covered Areas	1557	15.6	0.42
Settlements	717	7.2	0.20
Water Bodies	310	3.1	0.08
	366965	**3669.7**	**100.00**

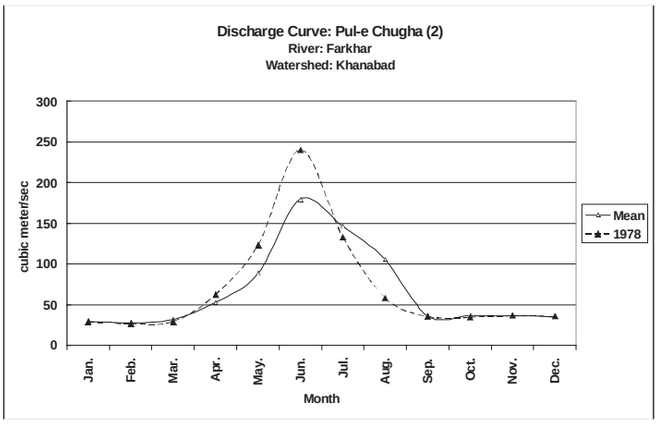
TABLE 18
Landcover classification for Ab-i Rustaq watershed
LANDCOVER Area

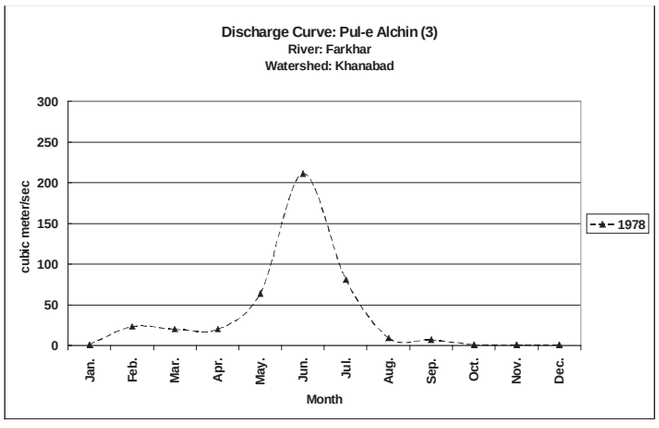
PICTURE 92
View of irrigated plain in Taluqan. Takhar, 6 September 2003 (N36.74, E69.34, E)

4. Khanabad watershed

The Khanabad watershed drains water from the high Khwaja Mohammad Mountains in Warsaj districts (Farkhar River, also called Taluqan River) of Takhar province and in Khost wa Firing district (Chal River) of Baghlan province. The Chal River is joined by a small tributary, the Rod-i Ishkamesh, originating from Ishkamesh district in Takhar; downstream, the river name changes to Darya-i Bangi River. When the Darya-i Bangi River and the Farkhar River meet between Taluqan and Khanabad, the name changes again to Khanabad River. The Khanabad watershed ends where the Khanabad River joins the Kunduz River in the north of Kunduz district. In Khanabad, a dam and related structures were built in 1976 under the supervision of an Indian company[1] with the objective to irrigate 30,000 ha of the surrounding area and generate 11.9 mW of hydropower. To date, the dam has not been completed.





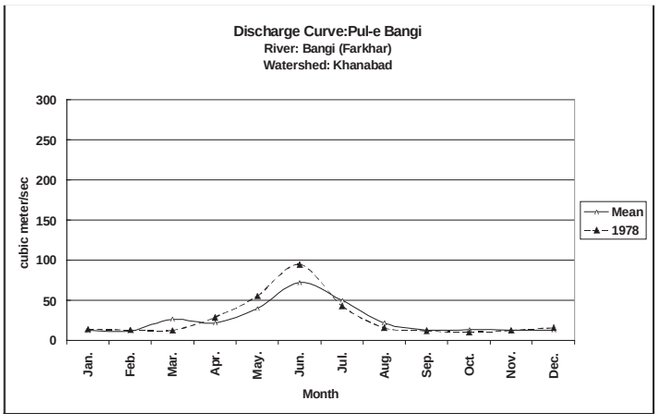


GRAPHS 40, 41 AND 42
Discharge curves along the Farkhar River, Khanabad watershed

Table 19 shows that Khanabad watershed is dominated by rangeland (49 percent) and rainfed land (18 percent) as well as a significant proportion of bare soil and sand covered areas (nearly 14 percent), mostly near the Amu Darya River. Irrigated land represents 8 percent of the watershed area and a significant proportion is suitable for double cropping

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	6524	65.2	0.54
Fruit Trees	878	8.8	0.07
Gardens	548	5.5	0.05
Irrigated: Intensively Cultivated (1 Crop/Year)	52225	522.3	4.35
Irrigated: Intensively Cultivated (2 Crops/year)	41001	410.0	3.42
Irrigated: Intermittently Cultivated	2524	25.2	0.21
Marshland Permanently inundated	6288	62.9	0.52
Natural Forest (open cover)	26612	266.1	2.22
Permanent Snow	92342	923.4	7.70
Pistachio Forest	150	1.5	0.01
Rainfed Crops (flat-lying areas)	36804	368.0	3.07
Rainfed Crops (sloping areas)	181812	1818.1	15.16
Rangeland (grassland/forbs/low shrubs)	587191	5871.9	48.96
Rock Outcrop / Bare Soil	74603	746.0	6.22
Sand-Covered Areas	89111	891.1	7.43
Settlements	541	5.4	0.05
Vineyards	57	0.6	0.00
Water Bodies	130	1.3	0.01
	1199342	11993.4	100.00

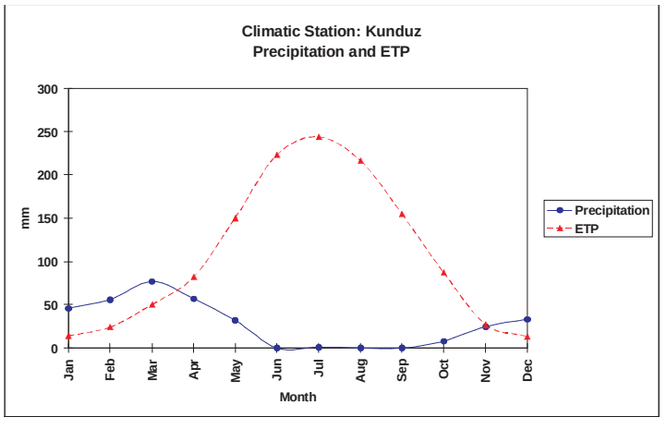
TABLE 19
Landcover classification for Khanabad watershed
LANDCOVER Area



GRAPH 43
Discharge curves on the Bangi River, a tributary of the Farkhar River. Khanabad watershed

[1] WAPCOS, see Government of Afghanistan, MEA,"*Assessment Report for Rehabilitation of Khanabad Irrigation Project*", submitted by Water and Power Consultancy Services, India, November 2002.

PICTURE 93
Aerial view of the Andarab River (upper right) and the Surkhab River (literally, the 'red water' river) joining at Doshi. Baghlan province, 17 April 2003
(N35.41, E68.24, E)



GRAPH 44
Precipitation and ETP in Kunduz

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	8406	84.1	0.30
Fruit Trees	818	8.2	0.03
Irrigated: Intensively Cultivated (1 Crop/Year)	103332	1033.3	3.69
Irrigated: Intensively Cultivated (2 Crops/year)	25725	257.2	0.92
Irrigated: Intermittently Cultivated	23279	232.8	0.83
Marshland Permanently inundated	8139	81.4	0.29
Marshland Seasonal	59	0.6	0.00
Natural Forest (closed cover)	4947	49.5	0.18
Natural Forest (open cover)	15884	158.8	0.57
Permanent Snow	25797	258.0	0.92
Pistachio Forest	1156	11.6	0.04
Rainfed Crops (flat-lying areas)	51416	514.2	1.83
Rainfed Crops (sloping areas)	250381	2503.8	8.93
Rangeland (grassland/forbs/low shrubs)	2108643	21086.4	75.25
Rock Outcrop / Bare Soil	64633	646.3	2.31
Sand-Covered Areas	93323	933.2	3.33
Sand Dunes	15083	150.8	0.54
Settlements	1283	12.8	0.05
Water Bodies	54	0.5	0.00
	2802359	**28023.6**	**100.00**

TABLE 20
Landcover classification for Kunduz watershed

5. Kunduz watershed

The Kunduz watershed drains water from the high mountains of the central Hindu Kush of Khinjan (Khinjan Rod) and Andarab districts (Andarab River) as well as from Bamyan districts (Bamyan Rod), Kahmard district (Kahmard Rod), Saighan district (Saighan Rod) and Tal wa Barfak districts (Payandeh River). The Bamyan Rod originates from the Foladi Valley and flows at the feet of the famously destroyed Buddhas of Bamyan. Downstream, the river runs through the narrow valley of Darra-i Shikari and joins the Kahmard Rod and Saighan Rod in Doab West of Tal of Barfak. At the junction of these rivers, the names change to Surkh Ab River. The Khamard Rod takes it sources in the Ajar Valley national wildlife reserve. Lower down, a tributary of the Surkhab, the Payandeh, joins the Surkhab River close to Tal wa Barfak town, to the east. The Andarab River rises near the Khawak pass leading to the Panjshir Valley and is joined by its main tributary, the Khinjan Rod, which winds down from the northern slopes of the Salang Pass.

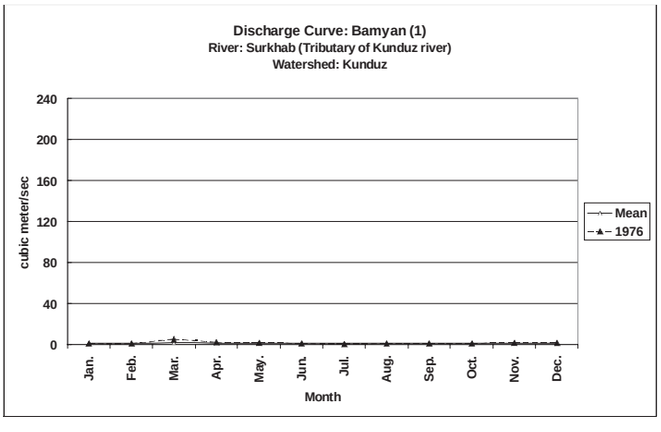
In Doshi town, the Surkh Ab River and the Andarab Rivers meet, and the newly enlarged river takes the name of Pul-i Khumri River (see Picture 93). When the Pul-i Khumri River reaches Kunduz province, it takes the name of Kunduz River. A smaller tributary, the Nahrin River, takes its sources in Nahrin district and joins the main river near Baghlan-i Kohna town. By the time the Kunduz River reaches the Amu Darya at Qala-i Zal, it has covered 480 km.

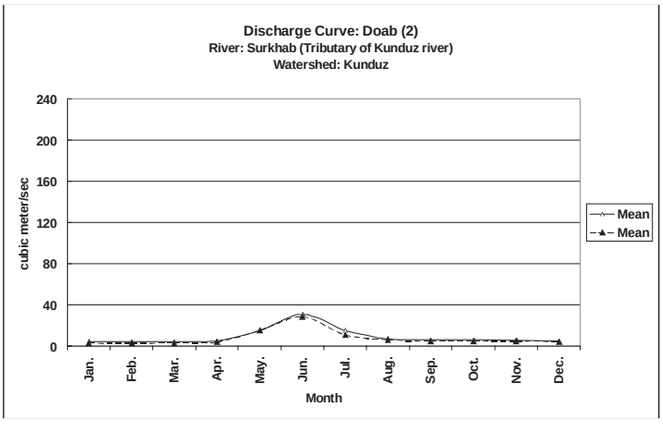
Two hydropower dams have been built in Pul-i Khumri. Pul-i Khumri I was commissioned in the 1950s and built with German and Swiss equipment (Picture 94). Nortconsult-Norplan, which inspected the plant on 29 June 2003, notes that the equipment is robust and certain components are in surprisingly good condition given their age and the poor maintenance of the equipment. Pul-i-Khumri II was commissioned in 1962 and built with Russian equipment. It is still functioning, though silting is a problem in both structures.

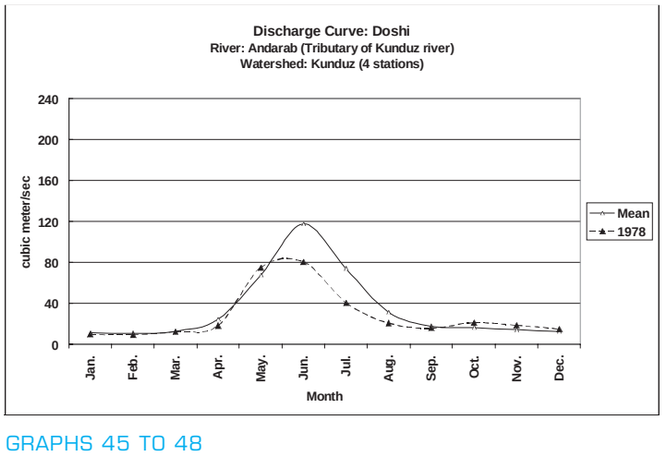
The Kunduz River, along with the Farkhar River, irrigates the perimeter of the former Qataghan province, which comprised the current Baghlan, Kunduz and Takhar provinces. The Kunduz and Khanabad Rivers take their sources from among the highest mountains in Afghanistan. These mountains are generally not covered with glaciers, with the exception of a few in Warsaj district, but thanks to the high elevation, snow melts until late in the summer, keeping a water flow that allows farmers to plant a second crop - typically paddy or maize - after wheat harvesting in June. This intensively irrigated zone in northern Afghanistan is a major production area in the country.

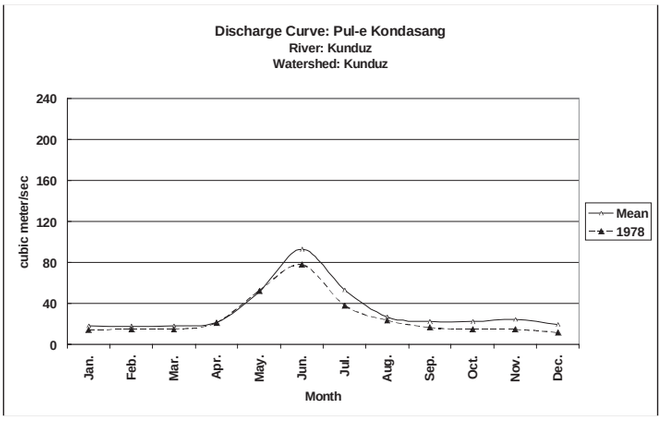
Table 20 shows that Kunduz watershed is chiefly dominated by rangeland (75 percent). Rainfed land represents nearly 11 percent and irrigated crops 5.4 percent of the watershed surface. Most of the irrigated land is suitable for double cropping.

PICTURE 94
Aerial view of Pul-i Khumri. The Pul-i Khumri I hydropower structure is visible. On the left, the canal leading to Pul-i Khumri II hydropower station; on the right, Canal-i Gawargan, which irrigates the Sheshme Shir intensively irrigated land north of Pul-i Khumri. In the middle, the Pul-i Khumri River.
Baghlan, 25 March 2003 (N35.98, E68.68, S

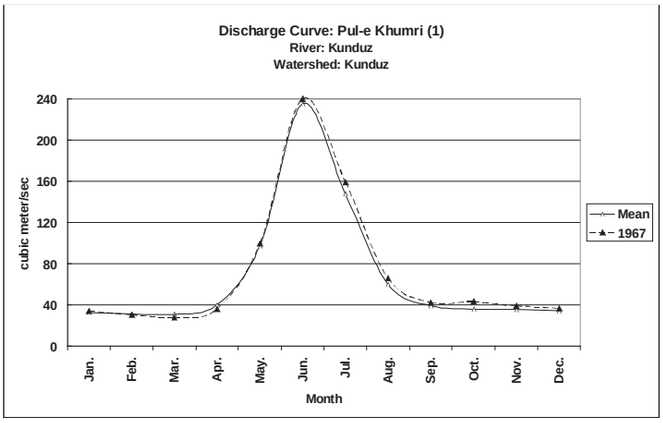


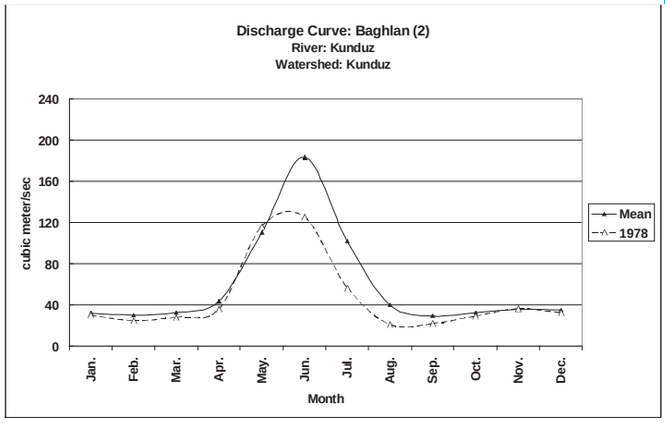


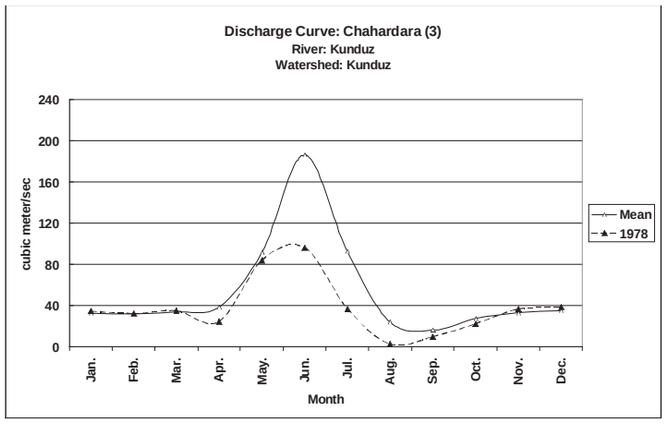


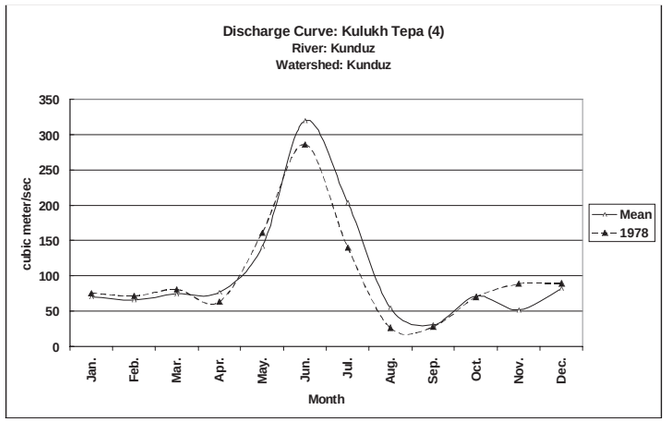


GRAPHS 45 TO 48
Discharge curves on the Bamyan, Surkhab and Andarab Rivers, main tributaries of the Kunduz River. Kunduz watershed



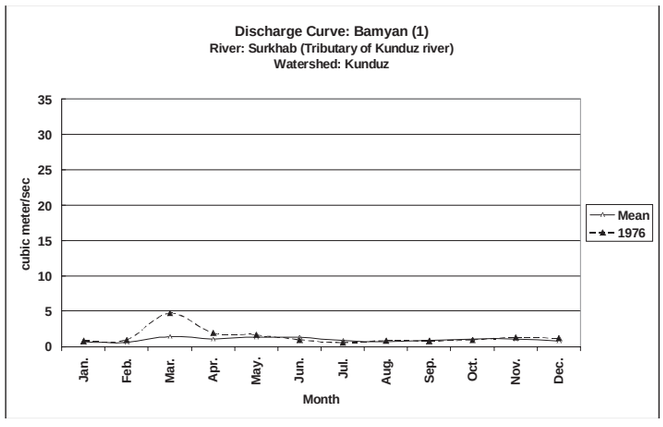


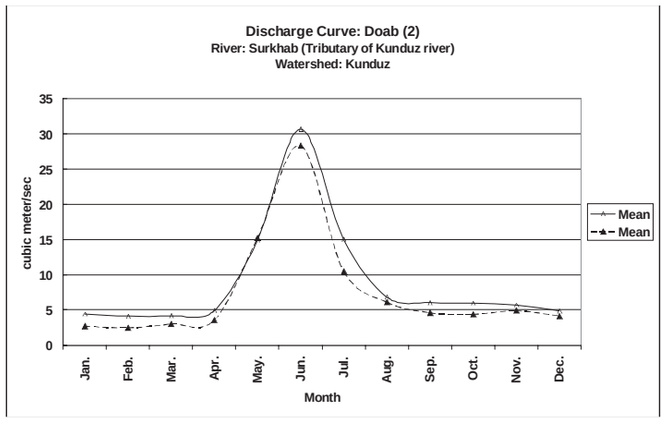




GRAPHS 49 TO 52

Discharge curves along the Kunduz River. Kulukh Tepa is located below the junction between Kunduz and Farkhar Rivers. Note that the Kulukh Tepa graph scale is different from the others. The hydrological station was located too close to the Amu Darya River and thus the data were affected by backwater from the Amu Darya. Kunduz watershed





GRAPHS 53 AND 54

Discharge curves on the Bamyan River at a different scale. Kunduz watershed

III. NORTHERN RIVER BASIN

6. Khulm watershed

The Khulm watershed drains water from the Ruyi Duab and Khuram wa Sarbagh districts. The main river of the Khulm watershed is the Tashkurgan River, also called the Samangan River. In Ruyi Duab, two small torrents from Dara-i Hazarsum and Dara-i Negar form the Darya-i Khuram River, which descends the picturesque gorges of Khuran wa Munjan (see Picture 96), then flows down to irrigate the fertile plain of Samangan (Aibak). West of Aibak town, numerous small streams contribute to the Tashkurgan River flow. After passing the spectacular Tangi-i Tashkurgan gorges downstream, the Tashkurgan River gently irrigates the delta-shaped Khulm oases on the Turkistan plain (see Picture 52). Khulm watershed is the smallest of the northern river basins and the Tashkurgan River is the shortest, at 190 km.

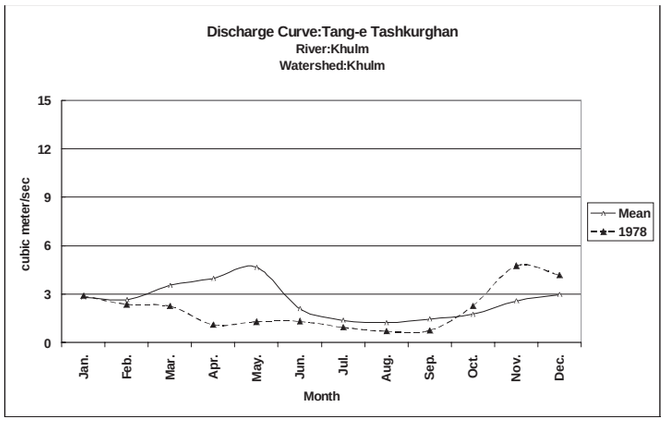
Table 21 shows that Khulm watershed is dominated by rangeland (58 percent) and sand-covered areas (13 percent) in the Turkistan plain. Rainfed land represents as much as 16 percent (Picture 95) and irrigated land 4.8 percent of the watershed surface. However, much of the irrigated land, approximately 64 percent, is intermittently irrigated (*zamin-i paikali* - see description of agriculture systems in Northern river basin section). The FAO 1990/93 landcover data do not record double cropping areas in the Khulm watershed.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	6315	63.1	0.62
Fruit Trees	2076	20.8	0.20
Irrigated: Intensively Cultivated (1 Crop/Year)	14567	145.7	1.42
Irrigated: Intermittently Cultivated	34258	342.6	3.35
Marshland Permanently inundated	555	5.5	0.05
Pistachio Forest	979	9.8	0.10
Rainfed Crops (flat-lying areas)	31517	315.2	3.08
Rainfed Crops (sloping areas)	133784	1337.8	13.08
Rangeland (grassland/forbs/low shrubs)	598815	5988.2	58.53
Rock Outcrop / Bare Soil	55850	558.5	5.46
Sand-Covered Areas	136599	1366.0	13.35
Sand Dunes	7331	73.3	0.72
Settlements	389	3.9	0.04
	1023033	**10230.3**	**100.00**

TABLE 21
Landcover classification for Khulm or Tashkurgan watershed

PICTURE 95
Rainfed land near along the main road near Koh-i Tshadar Tapa near Aibak
25 March 2003 (N36.26, E68.14, S)

PICTURE 96
Aerial view of Khuram wa Sarbagh gorges in Samangan. The catchment area of the central Hindu Kush Mountains is visible in the left background. The Khulm River carves spectacular gorges (arrow) before the valley opens near Aibak. Outlines of plowed rainfed farming are visible on both sides of the gorges. Samangan province, 25 March 2003 (N36.24, E68.08, S)



GRAPH 55
Discharge curve on the Khulm River. Khulm watershed

7. Balkhab watershed

The Balkhab watershed takes its source from Band-i Amir Lake, surrounded by the Zard Zang Mountains, and Koh-i Hissar Mountains of Yakaolang district of Bamyan province. Above Band-i Amir, the river is called Darya-i Chakari. Below the Band-i Amir lakes, the river is called Rod-i Band-i Amir and is supplemented by a number of small torrents such as the Kashandara stream in Kohistanat in Sari Pul province and the Kotal-i Sat Barg (see Picture 97) in Yakaolang district. Below, in Kohistanat and Balkhab districts, the river bears the name of Balkhab River, while further downstream, from Keshindi district in Balkh province, the river is simply called Balkh. Between Keshindi and Sholgara district centres, the Balkh River is supplemented by a tributary, the Dara-i Suf River, which takes its source from Samangan province highlands. Balkh River opens in the Turkistan plain in Deh Dadi (Picture 100) and irrigates large stretches of land in the oases of Balkh, Fayzabad, Aqca, Mingajik, and Mardyan. Balkhab watershed is the largest of the Northern river basin, and Balkh River the longest, at over 460 km.

PICTURE 97
View from Kotal-i Sat bark (3500 m) in the high catchment area of Balkh watershed. Yakaolang district, Bamyan, 3 June 2003 (N34.52, E66.72, E)

PICTURE 99
Panoramic view of rainfed hills between Keshindi and Sholgara. 14 May 2003 (N36.12, E66.88, N)

Table 22 shows that Balkhab watershed is dominated by rangeland (46 percent) and sand-covered areas (14 percent) in the Turkistan plain. Rainfed land represents as much as 24 percent (Pictures 99 and 101) and irrigated land 12.4 percent of the watershed surface. However, much of the irrigated land, approximately 64 percent, is intermittently cultivated (*zamin-i paikali* -see description of agriculture systems in Northern river basin section). Double cropping is limited to areas close to the top of the river delta in Deh Dadi.

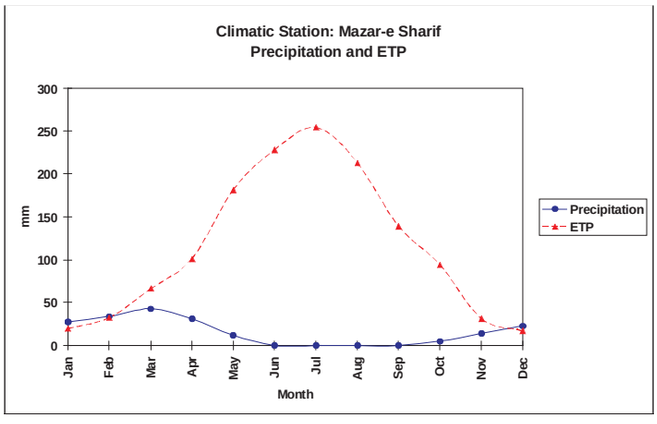
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	2156	21.6	0.07
Irrigated: Intensively Cultivated (1 Crop/Year)	121999	1220.0	4.23
Irrigated: Intensively Cultivated (2 Crops/year)	5369	53.7	0.19
Irrigated: Intermittently Cultivated	230368	2303.7	7.99
Marshland Permanently inundated	16197	162.0	0.56
Marshland Seasonal	2911	29.1	0.10
Natural Forest (open cover)	82	0.8	0.00
Permanent Snow	4436	44.4	0.15
Rainfed Crops (flat-lying areas)	25310	253.1	0.88
Rainfed Crops (sloping areas)	674933	6749.3	23.41
Rangeland (grassland/forbs/low shrubs)	1330028	13300.3	46.13
Rock Outcrop / Bare Soil	52073	520.7	1.81
Sand-Covered Areas	409749	4097.5	14.21
Sand Dunes	1831	18.3	0.06
Settlements	3839	38.4	0.13
Water Bodies	2242	22.4	0.08
	2883521	**28835.2**	**100**

TABLE 22
Landcover classification for Balkhab watershed

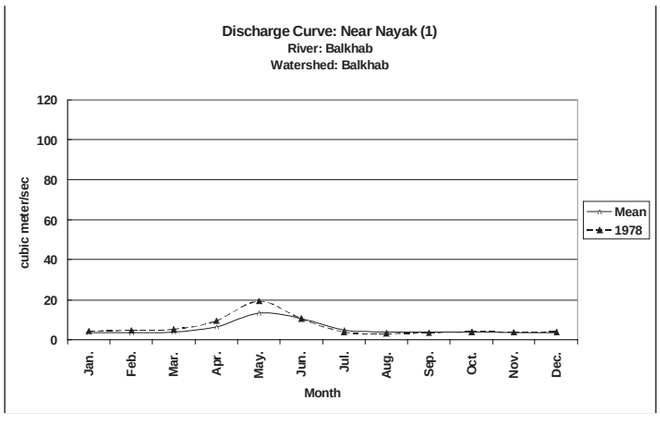
PICTURE 98
View of Ak Kupruk, Keshindi district centre along the Balkhab river. 14 May 2003 (N36.09, E66.85, SW)

PICTURE 100
Balkh River in Dehdadi district. Note the irrigation canal intake (right). 3 March 2003 (N36.65, E66.92, N)

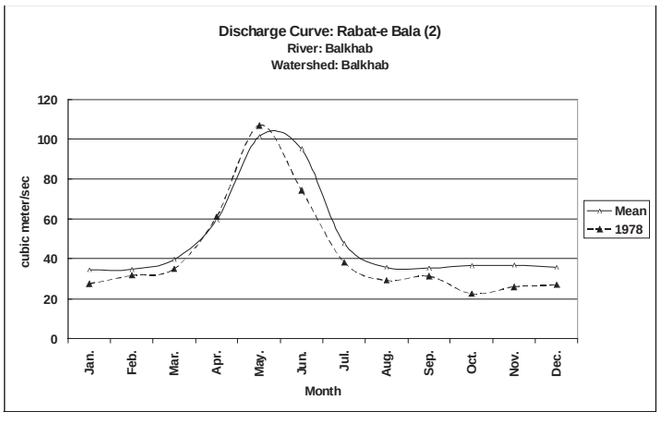
PICTURE 101
Rainfed cultivation on the northern foothills, which were traditionally used as pastureland.
Balkh, 3 March 2003 (N36.67, E66.72, S)



GRAPH 56
Precipitation and ETP in Mazar-i Sharif



GRAPH 57
Discharge curves along the Balkh River. Balkhab watershed



GRAPH 58
Discharge curves along the Balkh river. Balkhab watershed

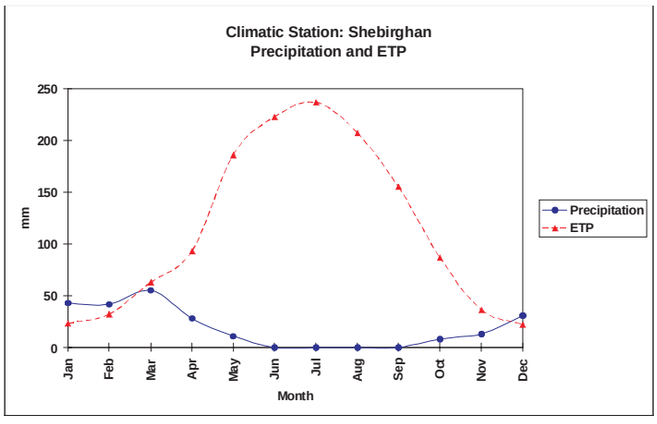
8.Sari Pul watershed

The Sari Pul watershed drains water from Kohistanat district (Sari Pul River) and Sangcharak district (Ab-i Sya River) of Sari Pul province. Ab-i Syah (also called Shorab) takes it source from four parallel valleys from the Sangcharak district. These four rivers (Jifan, Lar-i Badamak, Lar-i Surkh and Kashan) meet in the region of Sabz-i Kalan in Sozma Qala district. The Sari Pul River originates from a number of complex valley systems in Kohistanat district. The Sari Pul and Ab-i Sya Rivers meet 10 km south of Sari Pul town, at the Ab-i Safid Tangi gorges. The river then takes the name of Sari Pul until the diversion structure splits it into natural channels: the Darya-i Syah, on the east side, irrigates the area of Yangi Aregh; and the Darya-i Safid, on the west side, irrigates the Khwaja du Koh district (see Picture 102).

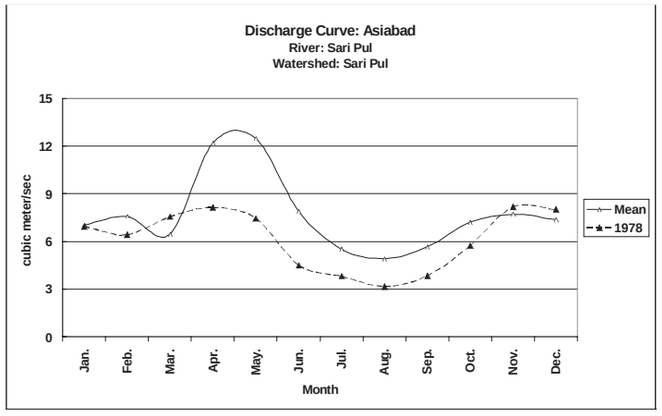
Table 23 shows that Sari Pul watershed is dominated by rangeland (40 percent) and sand-covered areas (25 percent) in the Turkistan plain (Jawzjan province). Rainfed land represents as much as 28 percent and irrigated land 6.5 percent of the watershed surface (Picture 103). However, much of the irrigated land, approximately 48 percent, is intermittently cultivated (*zamin-i paikali* - see description of agriculture systems in Northern river basin section), located in Jawzjan province as well as Sayyed district of Sari Pul. The FAO 1990/93 landcover data do not record double cropping areas in the Khulm watershed.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	1106	11.1	0.07
Irrigated: Intensively Cultivated (1 Crop/Year)	57125	571.3	3.41
Irrigated: Intermittently Cultivated	52074	520.7	3.11
Marshland Permanently inundated	697	7.0	0.04
Rainfed Crops (flat-lying areas)	15544	155.4	0.93
Rainfed Crops (sloping areas)	452638	4526.4	27.03
Rangeland (grassland/forbs/low shrubs)	675606	6756.1	40.35
Sand-Covered Areas	415900	4159.0	24.84
Settlements	54	0.5	0.00
Vineyards	2717	27.2	0.16
Water Bodies	861	8.6	0.05
	1674323	**16743.2**	**100.00**

TABLE 23
Landcover classification for Sari Pul watershed



GRAPH 59
Precipitation and ETP in Shiberghan



GRAPH 60
Discharge curves along the Sari Pul River.
Sari Pul watershed

PICTURE 102
Diversion structure in Jawzjan separating the Sari Pul River into two natural channels; Darya-i Syah (on the right) and Darya-i Safid (on the left). Jawzjan province, 17 May 2003 (N36.35, E65.86, W)

PICTURE 103
Panoramic view of the Kashan valley between Khwaja Qala and Qata Qala.
Sari Pul, Sozma Qala province, 16 May 2003 (N36.00, E66.22, SE)

9. Shirin Tagab watershed

The Shirin Tagab watershed drains water from Bilcherak district (Shiring Tagab River), Pashtun Kot district (Maimana Rod), and Almar/Qaizar district (Qaisar Rod) of Faryab province. The Shirin Tagab and Qaisar Rod meet a few kilometres below Dawlatabad. The river then maintains the name of Shirin Tagab and dries in the irrigation canals of Andkhoi, after having traveled 320 km.

The Shiring Tagab River takes its sources from Kohistan district. In Belcherak, the Cheshma-i Khwab River joins the Shiring Tagab River, just after passing through scenic rapids south of Belcherak town. Upstream, the Cheshma-i Khwab divides into five small valleys: Darra-i Khwaja Ghar, Darra-i Sakh, Darra-i Zang, Darra-i Takhra and Darra-i Rabat. These scenic valleys, particularly the waterfalls of Darra-i Zang, have strong tourism potential.

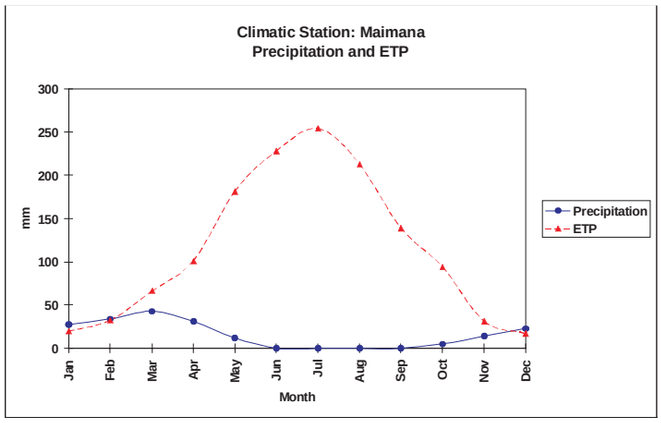
The main tributary of the Shirin Tagab is the Maimana Rod, which takes it source from Ser Hawz dam (Picture 105) in the Pashtun Kot district south of Maimana town. In the upper valley of Pashtun Kot, the river is called Ab-i Ser Hawz (Picture 104). North of Maimana town, the Maimana Rod is supplemented by a number of small streams and the Qaisar Rod River (Picture 106), which takes its source from the Selsala-i Bande Turkistan Mountains.

Table 24 shows that Shirin Tagab watershed is dominated by rangeland (40 percent), rainfed land (36 percent) and sand-covered areas (in Andkhoi district). Irrigated land represents 7.2 percent of the watershed surface, but much of this land (approximately 64 percent) is intermittently cultivated. The FAO 1990/93 landcover data do not record double cropping areas in the Shirin Tagab watershed.

PICTURE 104
Maimana Rod in Pashtun Kot district, 18 May 2003 (N35.83, E64.87, S).

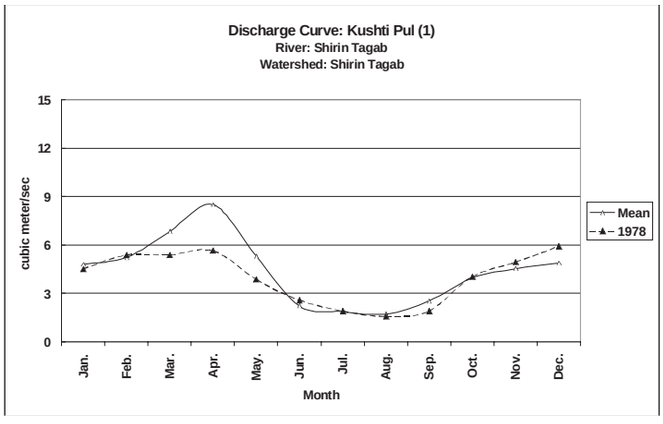
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	7653	76.5	0.51
Irrigated: Intensively Cultivated (1 Crop/Year)	38749	387.5	2.57
Irrigated: Intermittently Cultivated	70312	703.1	4.66
Marshland Permanently inundated	185	1.9	0.01
Rainfed Crops (flat-lying areas)	5417	54.2	0.36
Rainfed Crops (sloping areas)	535535	5355.4	35.48
Rangeland (grassland/forbs/low shrubs)	610315	6103.2	40.44
Rock Outcrop / Bare Soil	6638	66.4	0.44
Sand Covered Areas	233592	2335.9	15.48
Settlements	640	6.4	0.04
Water Bodies	187	1.9	0.01
	1509223	**15092.2**	**100.00**

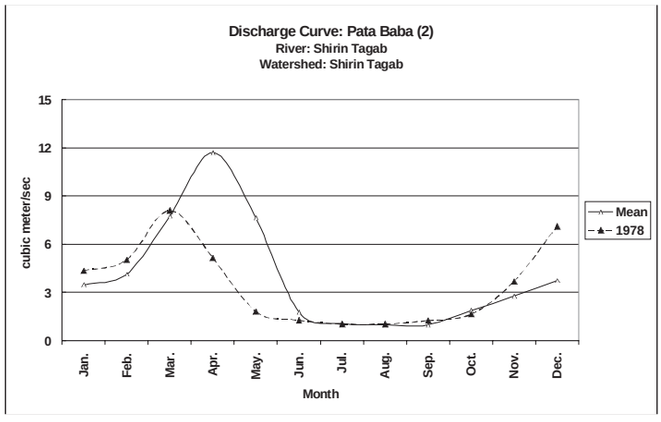
TABLE 24
Landcover classification for Shirin Tagab watershed



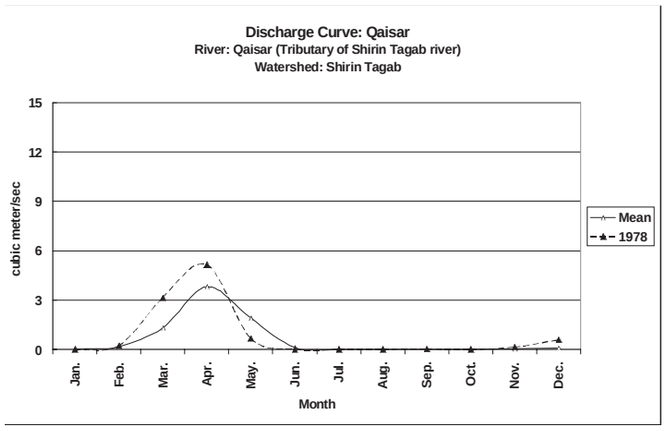
GRAPH 61
Precipitation and ETP in Shiberghan

PICTURE 105
View of Ser Hawz dam in Pashtun Kot.
18 May 2003 (N35.60, E64.81, SW)





GRAPHS 62 AND 63
Discharge curves along the Shirin Tagab River. Shirin Tagab watershed



GRAPH 64
Discharge curves along the Qaisar River, a tributary of the Shirin Tagab River. Shiring Tagab watershed

PICTURE 106
View of Qaisar area above the Qaisar Rod River. Faryab,
19 May 2003 (N35.69, E64.31, W)

IV. HARIROD-MURGHAB RIVER BASIN

10. Bala Murghab watershed

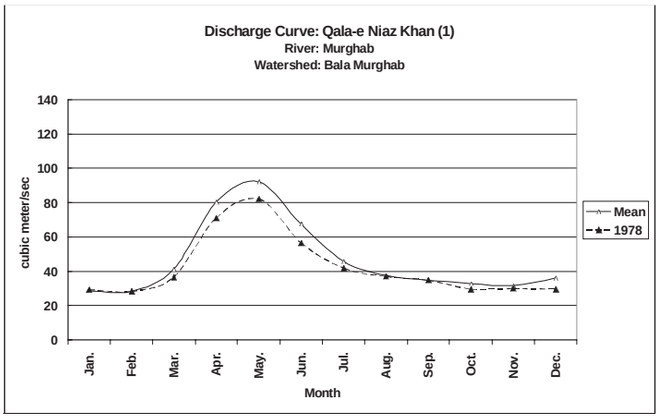
The Bala Murghab watershed includes the Bala Murghab River (Picture 107) and the Ghormach River, an eastern tributary. Bala Murghab watershed drains water from Chaghcharan (Ghor province), Kohistan (Faryab province) and Jawand (Badghis province). The Bala Murghab River takes its source from three different mountainous chains: the southern slope of the Tirband-i Turkistan Mountains, the northern slope of the Safid Koh Mountains and the western slope of the Koh-i Hissar Mountains in complex valley systems. Eventually, the main water flows of Rod-i Murghab, Darya-i Jawand, Ab-i Puda, Darya-i Anarak and Rod-i Gazestan join together in Jawand district to form the Murghab River. Below, another tributary, the Dara-i Boom ('Valley of the Eagle Owl') River, joins the Murghab River.

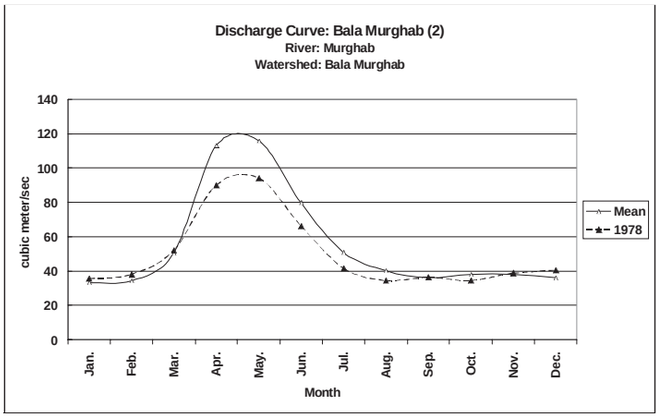
The Ghormach River (also called Karawal Kana or Chichaktu River) takes its sources in the northern part of Tirband-i Turkistan and drains water from the Qaisar district in Faryab province and Ghormach district in Badghis province. The Ghormach River joins the Murghab River at the Afghan-Turkmen border (Picture 108). Beyond the Afghan border, the Murghab irrigates the oasis of Merv in Turkmenistan, 750 km from its source.

Table 25 shows that the Bala Murghab watershed is largely dominated by rangeland (84 percent). Rainfed land represents 13 percent and irrigated land only 2.5 percent, out of which 55 percent is intermittently cultivated, indicating the low use of the Murghab water for irrigation in Badghis province. The FAO 1990/93 landcover data records a very small amount of double cropping in the Bala Murghab watershed.

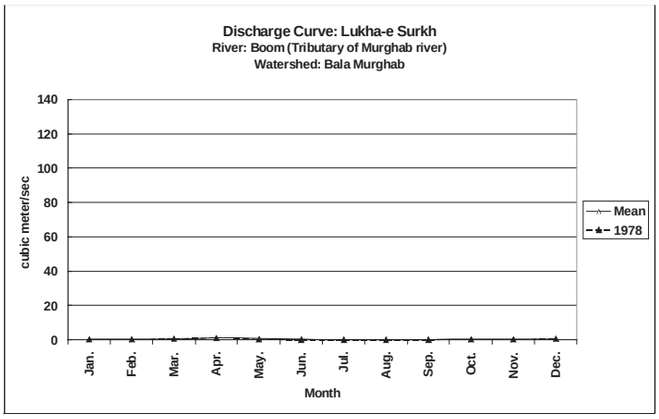
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	26	0.3	0.00
Irrigated: Intensively Cultivated (1 Crop/Year)	28259	282.6	1.11
Irrigated: Intensively Cultivated (2 Crops/year)	298	3.0	0.01
Irrigated: Intermittently Cultivated	34202	342.0	1.35
Marshland Permanently inundated	2740	27.4	0.11
Natural Forest (closed cover)	85	0.9	0.00
Natural Forest (open cover)	2052	20.5	0.08
Permanent Snow	786	7.9	0.03
Pistachio Forest	4502	45.0	0.18
Rainfed Crops (flat-lying areas)	25833	258.3	1.02
Rainfed Crops (sloping areas)	301048	3010.5	11.87
Rangeland (grassland/forbs/low shrubs)	2131034	21310.3	84.06
Rock Outcrop / Bare Soil	3716	37.2	0.15
Water Bodies	658	6.6	0.03
	2535239	**25352.4**	**100.00**

TABLE 25
Landcover classification for Bala Murghab watershed





GRAPHS 65 AND 66
Discharge curves along the Murghab River. Bala Murghab watershed



GRAPH 67
Discharge curves on the Boom River, a tributary of the Murghab River. Bala Murghab watershed

PICTURE 107
View of the Bala Murghab valley. 21 May 2003
(N35.36, E63.41, NE)

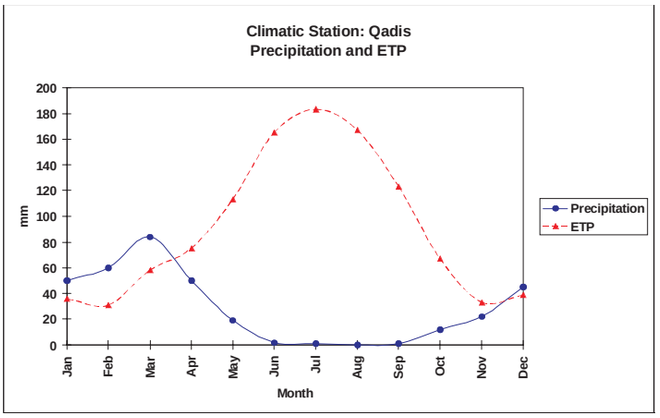
PICTURE 108
View of Ghormach (right) and Murghab Rivers joining along the border. The Murghab River marks the border between the two countries. Badghis, 21 May 2003 (N35.71, E63.22, N)

11.Khushk wa Kashan Rod watershed

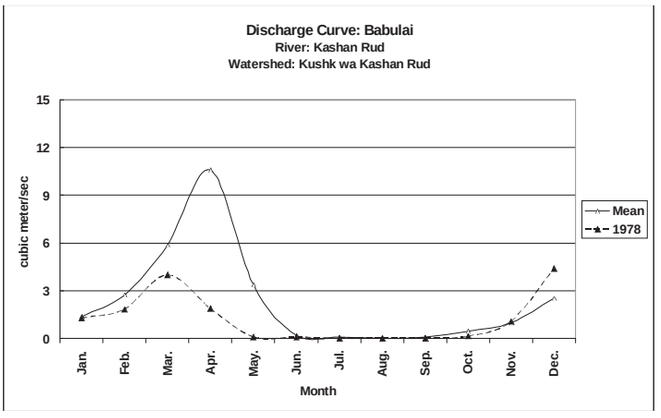
The Khusk wa Kashan Rod watershed includes all the western tributaries of the Murghab River that join on the other side of the Afghan border. All of these tributaries take their source from the Paropamisus Mountains in western Afghanistan, between Qadis in the east and Gulran in the west. The Kotal-i Sabzsak Pass, at 2,390 m elevation, links Herat to Badghis in the Paropamisus Mountains and is renowned for its juniper forests. The Kashan Rod watershed drains water from the Darya-i Qadis (Qadis district), Ab-i Gharmak (Qala-i Naw) and Darya-i Ab Kamari (Ab Kamari district).

The Kushk River takes it source from Kush-i Kuna district (Picture 109) and flows northwest, forming the border between Afghanistan and Turkmenistan for a distance of approximately 13 km up to the Turkhundi border point. The Kushk River is supplemented by ephemeral streams such as the Darye-i Dukhi and the Darya-i Moqur at Tukhundi. Finally, on the western part of the watershed, the Rod-i Gulran drains seasonal water that joins the Murghab River downstream in Turkmenistan.

Table 26 shows that the Kashan wa Kushk watershed is dominated by rangeland (54 percent) and rainfed land (40 percent). Irrigated land represents only 1.8 percent, out of which 55 percent is intermittently cultivated. The FAO 1990/93 landcover data record a very small number of double cropping areas in the Kashan wa Kushk watershed.



GRAPH 68
Precipitation and ETP in Qadis

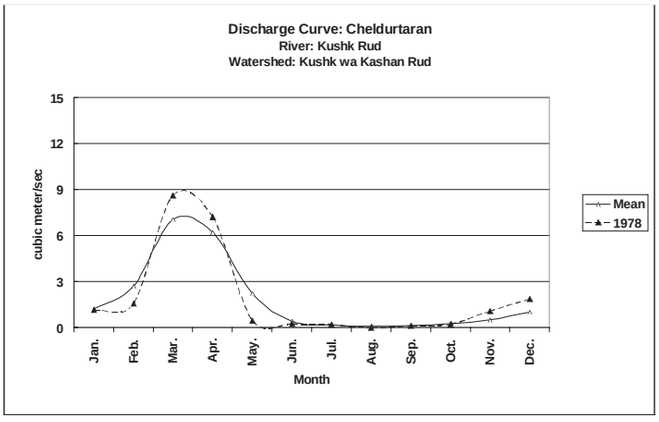


GRAPH 69
Discharge curves on the Kashan River, a tributary to the Murghab River (which joins the Murghab in Turkmenistan). Kushk wa Kashan Rod watershed

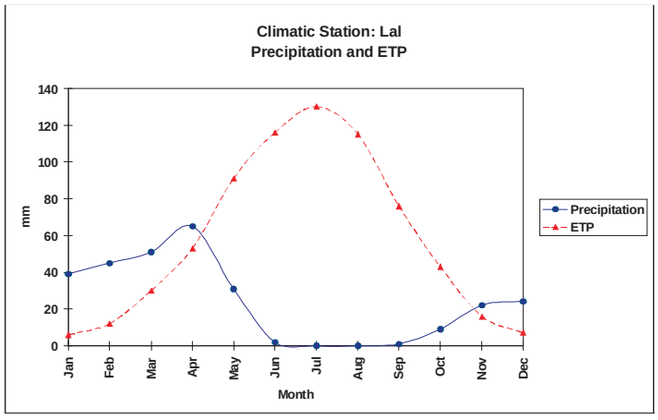
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	3374	33.7	0.26
Fruit Trees	85	0.8	0.01
Irrigated: Intensively Cultivated (1 Crop/Year)	10726	107.3	0.81
Irrigated: Intensively Cultivated (2 Crops/year)	117	1.2	0.01
Irrigated: Intermittently Cultivated	13409	134.1	1.02
Marshland Permanently inundated	342	3.4	0.03
Marshland Seasonal	63	0.6	0.00
Natural Forest (closed cover)	2408	24.1	0.18
Natural Forest (open cover)	1341	13.4	0.10
Pistachio Forest	23712	237.1	1.80
Rainfed Crops (flat-lying areas)	95681	956.8	7.26
Rainfed Crops (sloping areas)	428290	4282.9	32.48
Rangeland (grassland/forbs/low shrubs)	718983	7189.8	54.53
Rock Outcrop / Bare Soil	19483	194.8	1.48
Settlements	213	2.1	0.02
Water Bodies	363	3.6	0.03
	1318590	**13185.9**	**100.00**

TABLE 26
Landcover classification for Khushk wa Kashan Rod watershed

PICTURE 109
View of the Kushk River in Kushk-i Kuna district. Badghis, 23 May 2003 (N34.83, E62.56, NW)



GRAPH 70
Discharge curves on the Kushk River, a tributary to the Murghab River (which joins the Murghab in Turkmenistan). Kushk wa Kashan Rod watershed



GRAPH 71
Precipitation and ETP in Lal

12. Upper Hari Rod watershed

The Upper Hari Rod watershed is the source of the Hari Rod River. The Hari Rod River (Pictures 112 and 113) originates from several high mountainous chains, over 3,000 m above sea level, which were formed on the side of the Hari Rod geological fault. On the southern slope are the Sefid Koh Mountains, also called Firuz Koh; on the northern slope are the Band-i Baian and Kasa Murgh Mountains; and on the western slope are the Koh-i Babar Mountains. Numerous valley systems contributing to the Hari Rod River flow directly to the east-west-oriented valley. However, a main tributary, the Darya-i Lal, flows parallel and joins the Hari Rod River in Shinia village (Picture 110).

On the southern slope of the Kassa Murgh Mountains, the Kawgan Rod River flows and joins the Hari Rod River on the eastern side of Pashtun Zargun district (Herat province). At that point, the valley widens and the agriculture changes from valley floor irrigation to intensive farming in open valleys. This is where the Upper Hari Rod watershed ends and gives place to the Lower Hari Rod watershed. In Chisti Sharif, excavation and foundation work for Bandi Salma dam was started before the war along the Hari Rod River.

Table 27 shows that the Upper Hari Rod watershed is largely dominated by rangeland (91 percent). Rainfed land represents 6 percent (Picture 111) and irrigated land on the valley floors represents only 2.3 percent, out of which 49 percent is intermittently cultivated. Rainfed farming is practised in high elevations with low yields. The FAO 1990/93 landcover data record a very small number of double cropping areas in the Upper Hari Rod watershed.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	366	3.7	0.02
Irrigated: Intensively Cultivated (1 Crop/Year)	24978	249.8	1.18
Irrigated: Intensively Cultivated (2 Crops/year)	76	0.8	0.00
Irrigated: Intermittently Cultivated	23837	238.4	1.13
Marshland Permanently inundated	3944	39.4	0.19
Marshland Seasonal	91	0.9	0.00
Permanent Snow	4140	41.4	0.20
Rainfed Crops (flat lying areas)	66068	660.7	3.13
Rainfed Crops (sloping areas)	63072	630.7	2.99
Rangeland (grassland/forbs/low shrubs)	1924047	19240.5	91.09
Rock Outcrop / Bare Soil	1739	17.4	0.08
	2112358	**21123.6**	**100.00**

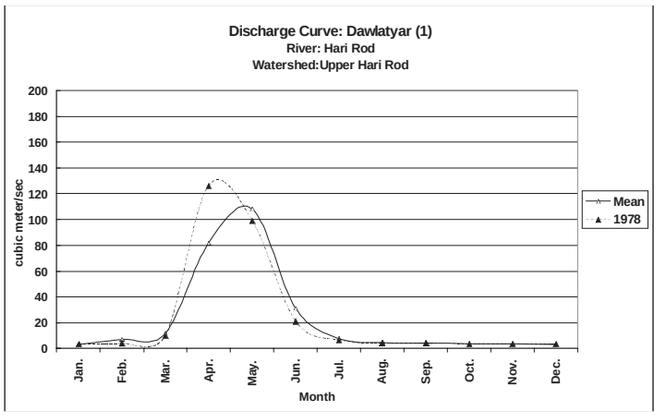
TABLE 27
Landcover classification for Upper Hari Rod watershed

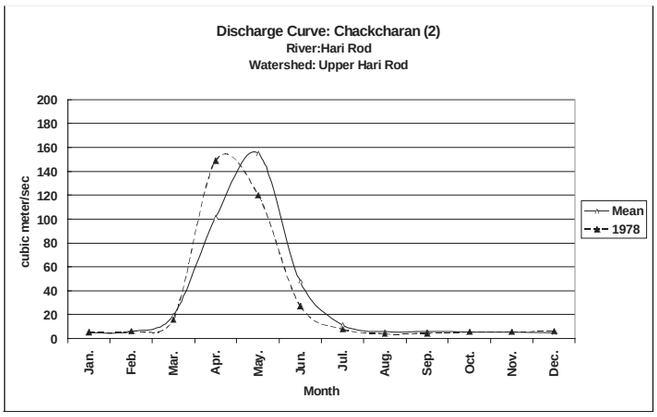
PICTURE 110
View of the Darya-i Lal flowing under the old bridge of Shinia. Ghor, 2 June 2003 (N34.51, E65.67, W)

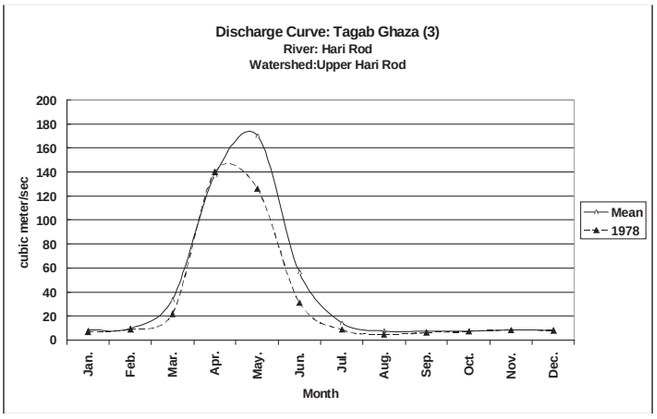
PICTURE 111
Rainfed cultivation high elevation in Lal district. 3 June 2003 (N34.51, E66.37, S)

PICTURE 112
View of the Hari Rod River. Shahrak, Ghor province
1 June 2003 (N34.36, E64.22, NW)

PICTURE 113
Aimaq (semi-nomadic) settlement along the Hari Rod river. Shahrak, 1 June 2003 (N34.36, E64.15, N)

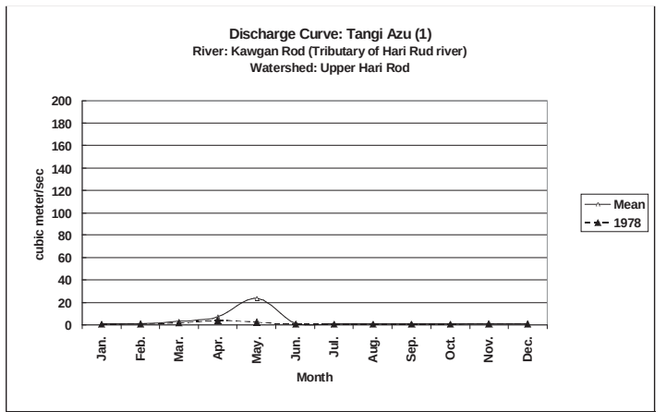


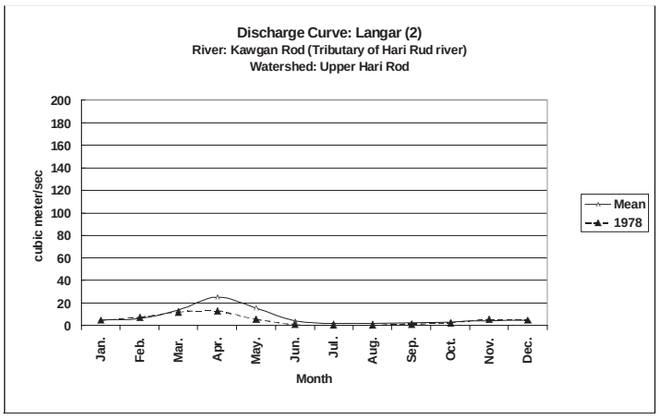




GRAPHS 72, 73 AND 74

Discharge curves along the Hari Rod River. Upper Hari Rod watershed





GRAPHS 75 AND 76

Discharge curves along the Kawgan River, a tributary to the Hari Rod River. Upper Hari Rod watershed

PICTURE 114

View of rice cultivation in Cheshti Sharif district. In Cheshti Sharif, rice is directly broadcasted in the field (no transplanting) and planted in late spring as a first crop. Cheshti Sharif, Herat, 1 June 2003 (N34.34, E63.82, SE)

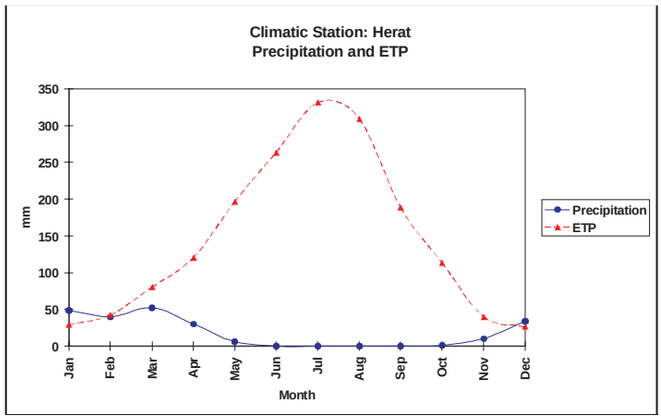
13. Lower Hari Rod watershed

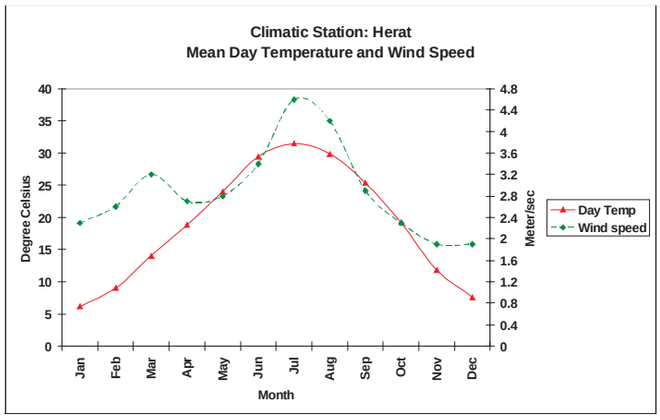
The Lower Hari Rod watershed drains water from the Upper Hari Rod watershed, the Karukh Rod, the Senjab Rod and two streams in Gulran districts (Tsharbar and Pushan). At about 100 km west of Herat, the Hari Rod River turns north to form the border between Afghanistan and Iran. It dries up in the irrigated fields of the Tejen oasis in Turkmenistan. The Karukh Rod takes it source on the southern slopes of the Paropamisus Mountains near the Sabzak Pass.

Table 28 shows that the Lower Hari Rod watershed is largely dominated by bare soil (61 percent) and rangeland (26 percent). Rainfed land represents 2 percent and irrigated land - which forms the traditional perimeter of Herat - represents only 3.6 percent of the total surface to the watershed. The area cultivated with second crops (chiefly pulses and rice) varies significantly from one year to the next depending on the Hari Rod River flow. The second crop is also limited due to the strong *bad-i sad o bist roz* wind blowing in summer which, in conjunction with high temperatures, results in the highest ETP in the country.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	2767	27.7	0.15
Fruit Trees	476	4.8	0.03
Gardens	85	0.8	0.00
Irrigated: Intensively Cultivated (1 Crop/Year)	107712	1077.1	6.01
Irrigated: Intensively Cultivated (2 Crops/year)	318	3.2	0.02
Irrigated: Intermittently Cultivated	56952	569.5	3.18
Marshland Permanently inundated	5290	52.9	0.29
Marshland Seasonal	238	2.4	0.01
Rainfed Crops (flat-lying areas)	26317	263.2	1.47
Rainfed Crops (sloping areas)	26519	265.2	1.48
Rangeland (grassland/forbs/low shrubs)	474041	4740.4	26.43
Rock Outcrop / Bare Soil	1089360	10893.6	60.74
Settlements	1128	11.3	0.06
Vineyards	2120	21.2	0.12
Water Bodies	251	2.5	0.01
	1793572	**17935.7**	**100.00**

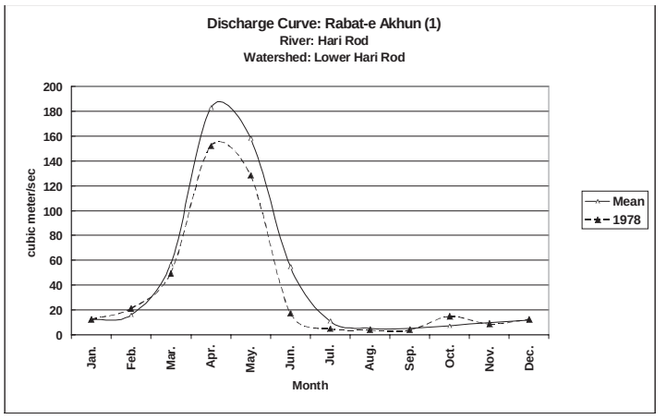
TABLE 28
Landcover classification for Lower Hari Rod watershed

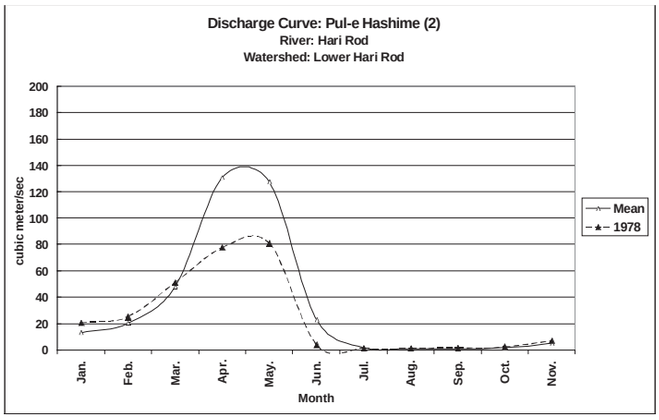


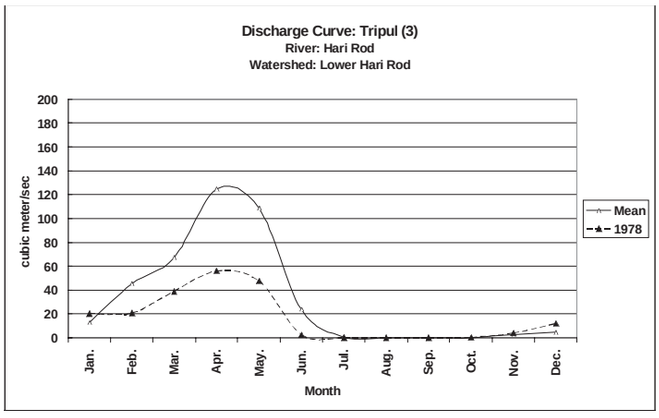


GRAPHS 77 AND 78
Left, Precipitation and ETP; right, wind speed and temperature

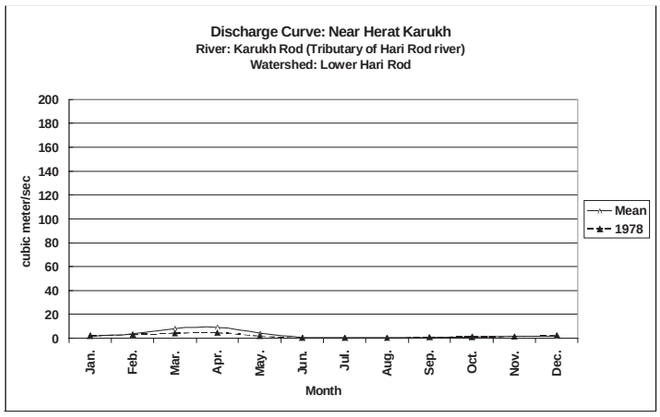
PICTURE 115
View of irrigated crops in Herat province.
Injil district, 30 May 2003 (N34.34, E62.70, E)







GRAPHS 79, 80 AND 81
Discharge curves along the Hari Rod River.
Lower Hari Rod watershed



GRAPH 82
Discharge curves along the Karukh Rod River,
a tributary of the Hari Rod. Lower Hari Rod watershed

V. HILMAND RIVER BASIN

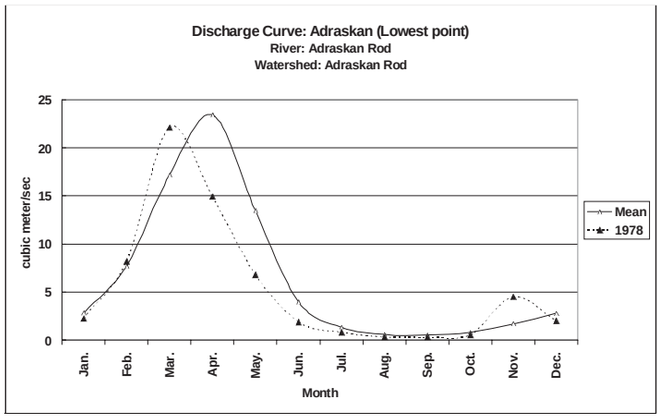
14. Adraskan Rod watershed

The Adraskan Rod watershed drains the water from the Sia Koh Mountains of Adraskan and Farsi districts (Herat province). The Adraskan Rod watershed's main river is the Adraskan Rod, also called Shindand Rod (Picture 116). In Shindand ('Green Place' in Persian), the Adraskan Rod is joined by a small tributary, the Rod-i Gaz. The river than takes the name of Harut Rod in Farah province. Downstream in Anar Dara province, a second tributary, the Darya-i Anar Dara, joins the river. Both the Adraskan Rod as well as the Farah Rod end in the marshes of Hamum-i Sabiri, part of Hamum-i Hilmand. However, intensive use of the water for irrigation milks out these rivers and meagre tributaries; it is only during flood periods that the rivers refill the Hamum. The Adraskan Rod is bordered in the west by a non-drainage zone, the Dasth-i Naomid.

Table 29 shows that the Andraskan Rod watershed is largely dominated by bare soil (66 percent) and rangeland (26 percent). Irrigated land represents only 4.1 percent - mostly located in Shindan district - of the total surface to the watershed. However, most of the irrigated land (64 percent) is intermittently cultivated (called *zamin-i bawri* – see description of intermittently irrigated land under the Northern river basin section).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	388	3.9	0.02
Irrigated: Intensively Cultivated (1 Crop/Year)	31421	314.2	1.48
Irrigated: Intensively Cultivated (2 Crops/year)	23	0.2	0.00
Irrigated: Intermittently Cultivated	56191	561.9	2.64
Marshland Permanently inundated	11390	113.9	0.54
Marshland Seasonal	25445	254.5	1.20
Rainfed Crops (flat-lying areas)	6861	68.6	0.32
Rainfed Crops (sloping areas)	4292	42.9	0.20
Rangeland (grassland/forbs/low shrubs)	552340	5523.4	25.97
Rock Outcrop / Bare Soil	1402926	14029.3	65.97
Settlements	702	7.0	0.03
Water Bodies	34592	345.9	1.63
	2126571	**21265.7**	**100.00**

TABLE 29
Landcover classification for Adraskan Rod watershed



GRAPH 83
Discharge curves on the Adraskan Rod River.
Adraskan Rod watershed

PICTURE 116
View of the Adraskan Rod near Adraskan district centre.
Herat, 25 May 2003 (N33.64, E62.26, NE)

15. Farah Rod watershed

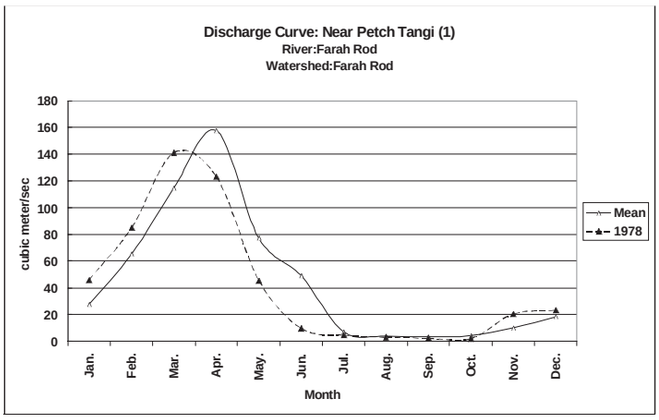
The Farah Rod watershed drains water from the Siah Koh and Tshalap Dalan Mountains of Sharak and the Saghar district (Farah Rod River, Picture 117) and Taywara district (Rod-i Ghor River, also called Rod-i Nizgan) of Ghor province. The Farah Rod River has several tributaries contributing to the water flow. In Gulistan district, the Malmand Rod joins the Farah Rod River near the village of Qarya-i Durbas. Below, above the main road between Herat and Kandahar, the Farah Rod is supplemented by the Rod-i Zar Mardan in the Bala Buluk district. The Farah Rod, as well as the Adraskand Rod, ends in the marshes of Hamum-i Sabiri. A number of small seasonal streams flow into the Farah Rod, including the Takhe Ghale Kaftar, Takhe Nalak and Rod-i Salagh. At 320 km, the Farah Rod River is the longest of the series of rivers draining into the Hamum- Hilmand west of Hilmand. The Farah Rod River irrigates the oases of Farah and Lash wa Juweyn (Picture 118).

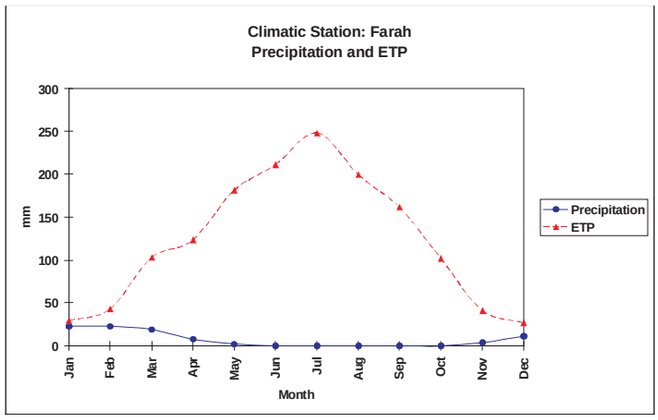
Table 30 shows that the Andraskan Rod watershed is dominated by bare soil (52 percent) and rangeland (40 percent). Irrigated land represents only 4.3 percent - mostly located in Bala Buluk district - of the total surface of the watershed. However, most of the irrigated land (83 percent) is intermittently cultivated (called *zamin-i bawri* – see description of intermittently irrigated land under the Northern river basin section).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	143	1.4	0.00
Irrigated: Intensively Cultivated (1 Crop/Year)	23760	237.6	0.72
Irrigated: Intermittently Cultivated	116310	1163.1	3.55
Marshland Permanently inundated	6576	65.8	0.20
Marshland Seasonal	12446	124.5	0.38
Rainfed Crops (flat-lying areas)	6239	62.4	0.19
Rainfed Crops (sloping areas)	13504	135.0	0.41
Rangeland (grassland/forbs/low shrubs)	1325673	13256.7	40.41
Rock Outcrop / Bare Soil	1713056	17130.6	52.21
Settlements	706	7.1	0.02
Water Bodies	62496	625.0	1.90
	3280910	**32809.1**	**100.00**

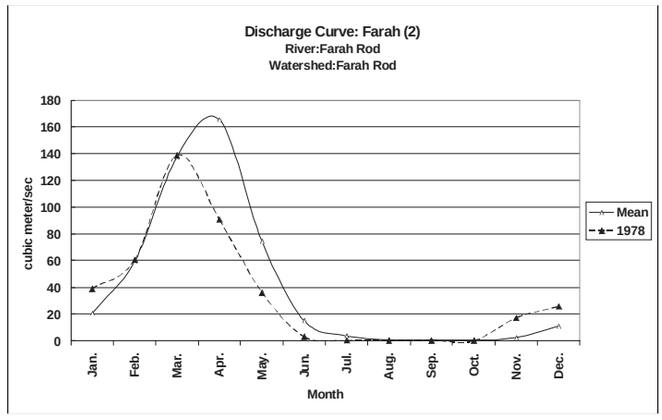
TABLE 30
Landcover classification for Farah Rod watershed

PICTURE 117
View of Farah Rod River from bridge near Farah Rod district centre. Farah, 25 May 2003 (N32.75, E62.62, SW)





GRAPH 84
Precipitation and ETP in Farah Province centre



GRAPHS 85 AND 86
Discharge curves along the Farah Rod River.
Farah Rod watershed

PICTURE 118
View of Lash wa Joweyn near the Hamum-i Saberi.
Farah, 27 May 2003 (N31.79, E61.65, S)

16. Khuspas Rod watershed

The Khuspas Rod watershed drains water from the Siah Band Mountains in Gulistan (Farah). In the upper part of the watershed (Gulistan district), the river is called Darye-i Kohistan. The Darya-i Kohistan the lowest part of the district, the Darya-i Kohistan forms a delta composed of several streams where limited land is cultivated. It is only in the southwest of Sultan-i Bawka that a myriad of seasonal streambeds join together to form the Khsupas Rod River. The Khupas Rod ends in the marshes of Hamum-i Puzak (part of Hamum-i Hilmand). No hydrological data exist for the Khuspas Rod watershed.

Table 31 shows that the Khuspas Rod watershed is dominated by bare soil (76 percent), which is mostly located in the Bakwa Desert (Dasht-i Bakwa), and rangeland (16 percent). Irrigated land represents only 3.2 percent of the total surface the watershed. Morevoer, almost all the irrigated land (92 percent) is intermittently cultivated (called *zamin-i bawri* – see description of intermittently irrigated land under the Northern river basin section). This intermittently irrigated land is mostly concentrated in a narrow strip of irrigated land along the bank of river channels or in temporarily flooded areas (Picture 119). Therefore, Khuspas Rod watershed has limited agriculture significance.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	2385	23.8	0.25
Irrigated: Intermittently Cultivated	27554	275.5	2.92
Marshland Permanently inundated	3250	32.5	0.34
Marshland Seasonal	22937	229.4	2.43
Rangeland (grassland/forbs/low shrubs)	155378	1553.8	16.48
Rock Outcrop / Bare Soil	719860	7198.6	76.35
Water Bodies	11438	114.4	1.21
	942802	**9428.0**	**100.00**

TABLE 31
Landcover classification for Khuspas Rod watershed

PICTURE 119
Aerial view of intermittently irrigated land next to a myriad of seasonal streams occasionally flooding the land in Sultan-i Bakwa (Bakwa district centre). The streams originate from the Darya-i Kohistan, which takes its sources in Gulistan district of Farah province. Nimroz, 4 April 2003 (N32.17, E63.35, SW)

17. Khash Rod watershed

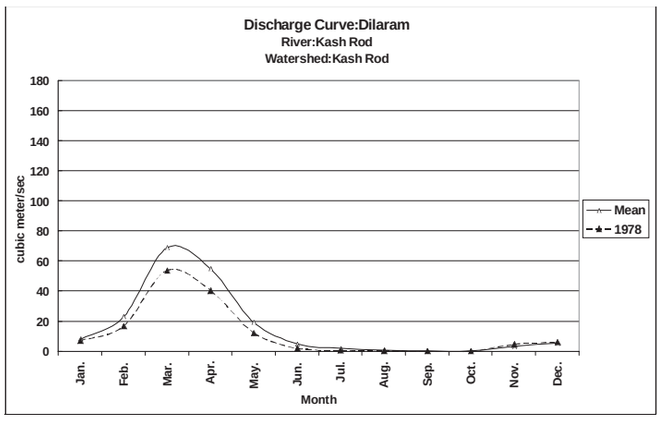
The Khash Rod watershed drains water from the Koh-i Sang in Pur Chaman district of Farah Province. From Washer district in Hilmand province, a small stream takes its source and joins the Khash Rod a few kilometres above Dilaram town. The Khash Rod watershed includes another small river, the Dor Rod (also called Tagaresh Mandeh), which flows parallel to the Khash Rod. The Khash Rod is a small watershed that irrigates the oases of Lokhi and Chakahansur (Nimroz district).

The Khash Rod (and the Khuspas Rod) ends in the marshes of Hamum-i Puzak, located mostly on the Afghanistan side of the border (part of Hamum-i Hilmand).

Table 32 shows that Khash Rod watershed is dominated by bare soil (69 percent) and rangeland (24 percent). Irrigated land represents only of 2.3 percent of the total surface to the watershed. Moreover, almost all the irrigated land (92 percent) is intermittently cultivated (called *zamin-i bawri* – see description of intermittently irrigated land under the Northern river basin section). This intermittently irrigated land is mostly concentrated in narrow strips of irrigated spots along the banks of river channels (see Picture 120) or in temporarily flooded areas. Therefore, the Khash Rod watershed has limited agriculture significance.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	68	0.7	0.00
Irrigated: Intensively Cultivated (1 Crop/Year)	2085	20.9	0.10
Irrigated: Intermittently Cultivated	48410	484.1	2.22
Marshland Permanently inundated	20534	205.3	0.94
Marshland Seasonal	7974	79.7	0.37
Rainfed Crops (flat-lying areas)	1864	18.6	0.09
Rainfed Crops (sloping areas)	87	0.9	0.00
Rangeland (grassland/forbs/low shrubs)	524262	5242.6	24.00
Rock Outcrop / Bare Soil	1513826	15138.3	69.31
Sand Dunes	4742	47.4	0.22
Water Bodies	60133	601.3	2.75
	2183987	**21839.9**	**100.00**

TABLE 32
Landcover classification for Khash Rod watershed



GRAPH 87
Discharge curves on the Farah Rod River. Farah Rod watershed

PICTURE 120
Narrow strip of cultivated land along the Khash Rod River. Khash Rod district, Nimroz province. 2 April 2003 (N32.30, E63.59, SE)

PICTURE 121
Aerial view of the Tiri Rod River joining the Hilmand River at Dehrawud district centre – north of the Kajaki dam. Uruzgan, 2 April 2003 (N33.06, E65.51, SE)

18. Upper Hilmand watershed

The Upper Hilmand watershed drains water from the Band-i Baian in the Passarband district of Ghor province up to the Parwan Mountains of Behsud II (Wardak province), located about 50 km to the west of Kabul, via the whole Koh-i Baba range in the central highlands. The Upper Hilmand takes its source from various districts belonging to five different provinces: Wardak, Ghazni, Bamyan, Ghor and Uruzgan.

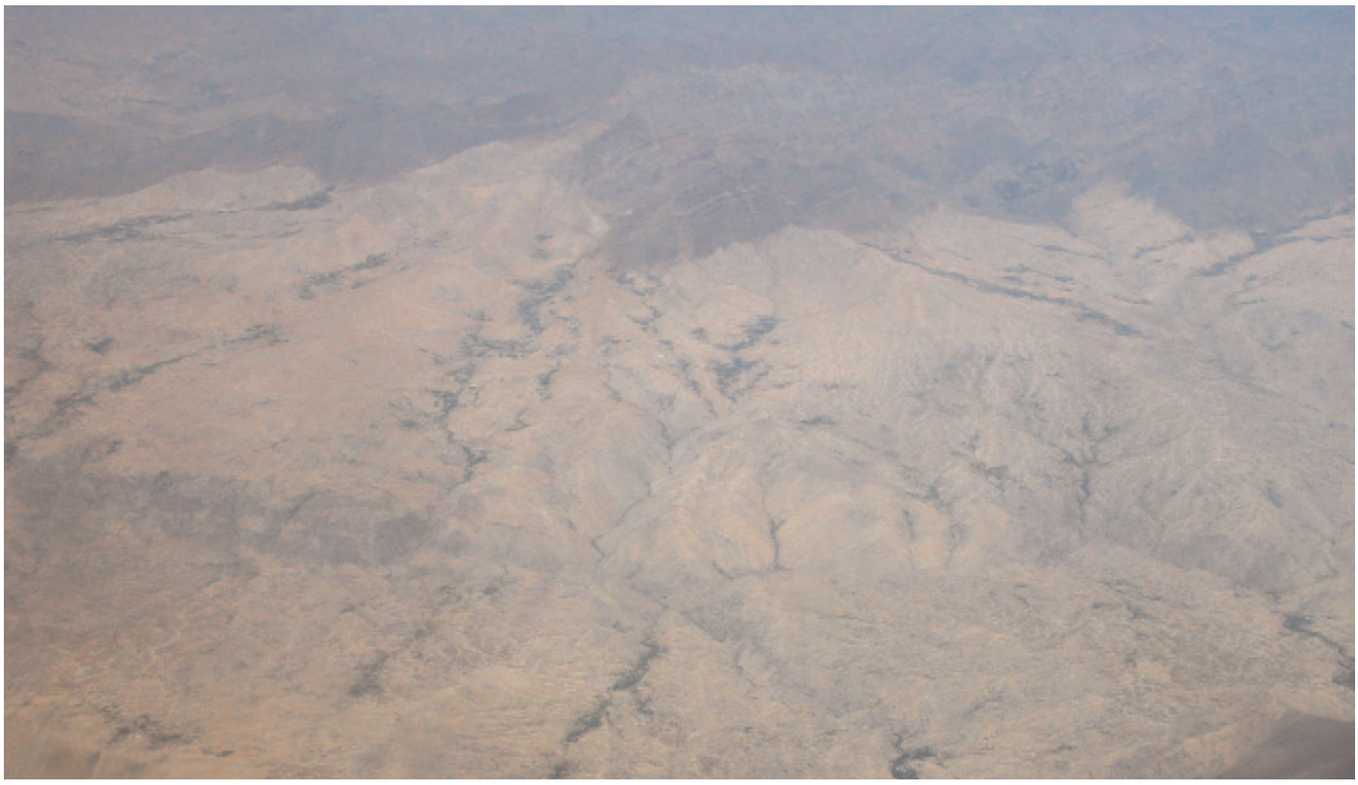
From the Parwan Mountains, the Hilmand River meets several tributaries along its course that contribute to its water flow. The first affluent is the Darrahe Karkhana (also called Darrahe Sauzak), originating from the Koh-i Baba Moutains. Below it, the Panjab River is a main affluent that also takes its source in the Koh-i Baba Mountains and joins in the Waras district of Bamyan (where its local name is Nawai Binigaw). Then the Garmab River, which takes its source from the northwestern slope of Dasht-i Nawur, joins the Hilmand in Nawur district (Ghazni province). Further, the Ajristan River, taking its source from the western slopes of Dasht-i Nawur, joins the Hilmand downstream of Shahristan district centre (Uruzgan) province. Below, the Khurdak River, which takes its source at the border between the Koh-i Baba and Koh-i Baian Mountains, joins the Hilmand in Gizab district centre. From the Band-i Baian Mountains in Day Kundi district (Uruzgan) there originates another river, the Medinaw, which joins the Khaj Rod River before reaching the Hilmand River at the border of Sahidi Hassas district of Uruzgan (Picture 122). The Khaj Rod takes its sources from Passaband district (Ghor). Finally, the Tiri Rod River is the last main tributary to the Hilmand in Upper Hilmand watershed. The Tiri Rod drains water from Khas Uruzgan district and joins the Hilmand River north of Kajaki dam at Dehrawud district centre (see Picture 121). The Upper Hilmand watershed ends at the Kajaki dams and therefore includes all the water that is collected in this dam.

PICTURE 122
Aerial view of the Hilmand River (left) in Sahidi Hassas district (Uruzgan) centre at the junction with the Khaj Rod River (right). The Tiri Rod can be seen in the top right corner. 2 April 2003 (N33.02, E65.48, SE)

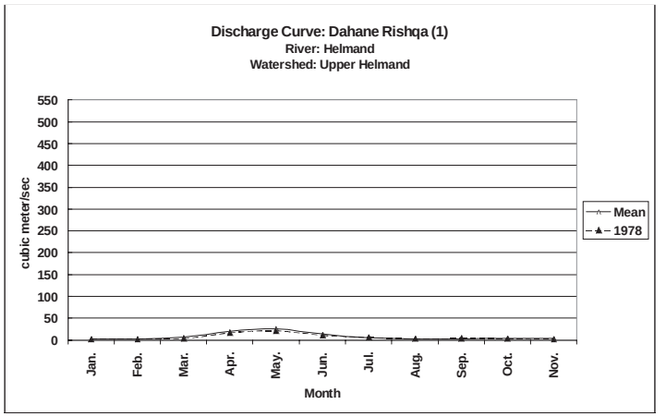
Table 33 shows that the Upper Hilmand watershed is largely dominated by rangeland (90 percent). Rainfed land represents only 2.2 percent, while irrigated land represents only 4 percent of the total surface of the watershed. Most of the irrigated land is located in narrow strips of irrigation in valley floors and a significant proportion of this land (59 percent) is intermittently cultivated. Rock outcrops are mainly located in Sharistan, but in reality these are rangelands, as the classification has been misinterpreted due to the white colour of the geological material (see Picture 123).

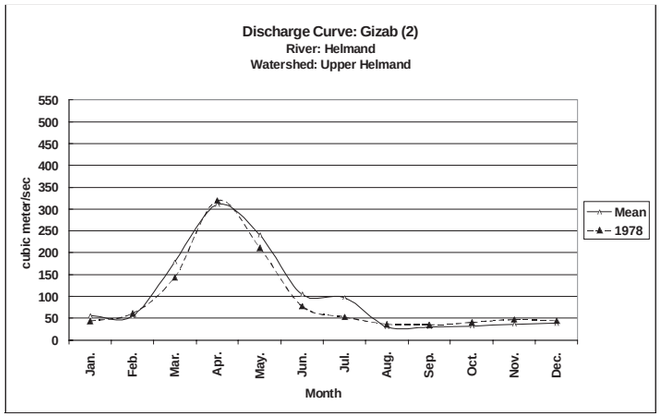
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	12891	128.9	0.27
Irrigated: Intensively Cultivated (1 Crop/Year)	76434	764.3	1.63
Irrigated: Intensively Cultivated (2 Crops/year)	441	4.4	0.01
Irrigated: Intermittently Cultivated	110728	1107.3	2.36
Marshland Permanently inundated	1236	12.4	0.03
Marshland Seasonal	37	0.4	0.00
Permanent Snow	6999	70.0	0.15
Rainfed Crops (flat-lying areas)	17284	172.8	0.37
Rainfed Crops (sloping areas)	87490	874.9	1.87
Rangeland (grassland/forbs/low shrubs)	4203525	42035.3	89.66
Rock Outcrop / Bare Soil	164842	1648.4	3.52
Settlements	53	0.5	0.00
Water Bodies	6237	62.4	0.13
	4688198	**46882.0**	**100.00**

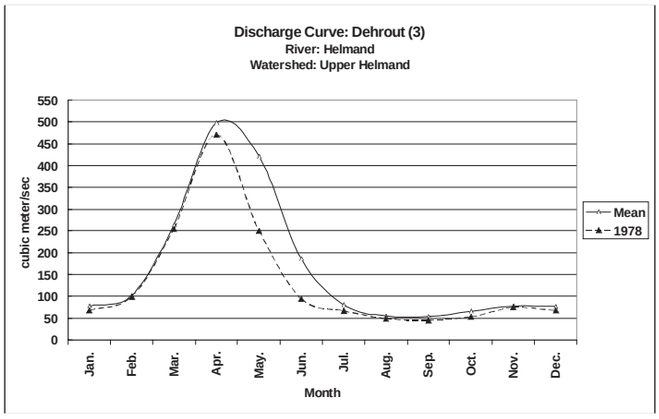
TABLE 33
Landcover classification for Upper Hilmand watershed

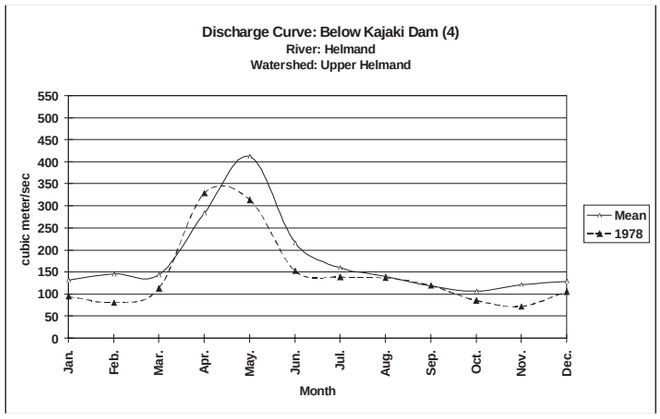


PICTURE 123
Aerial view of very narrow strips of cultivation in Shahristan district (Uruzgan). Note that the white color is due to the geological material and should fall under the category of rangeland. The Hilmand River is not visible as it flows in deep gorges.
2 April 2003 (N33.61, E66.71, W)



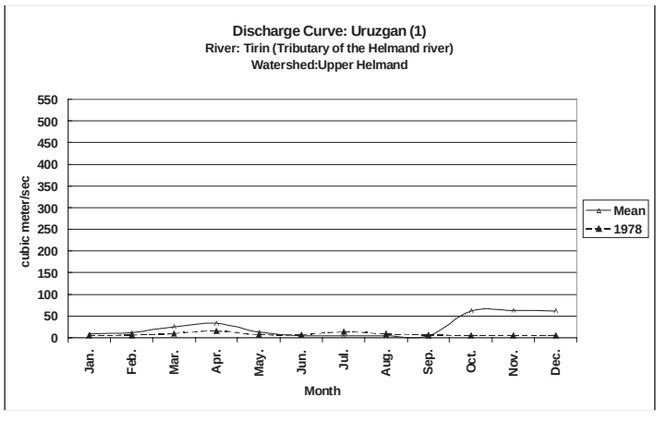


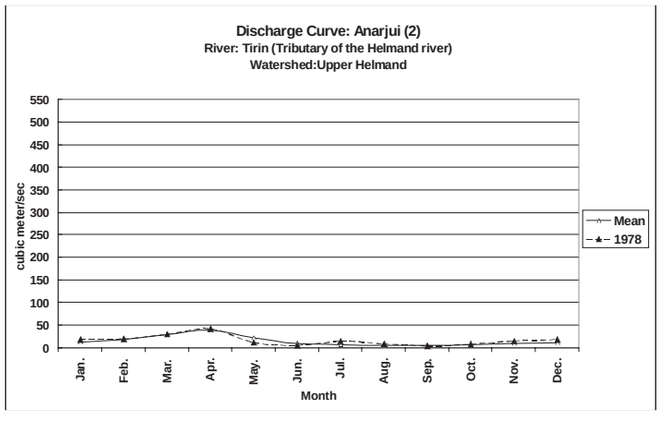


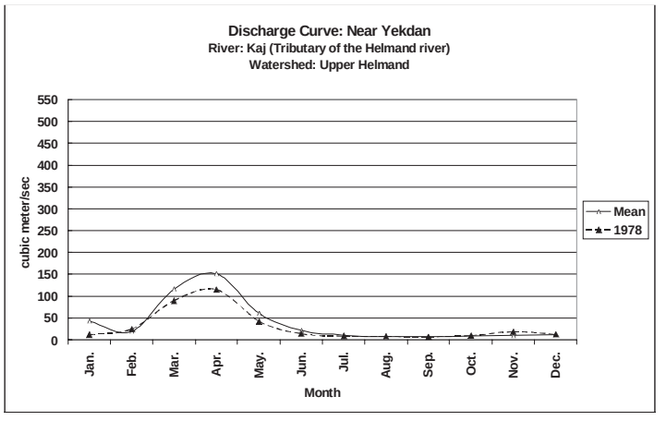


GRAPHS 88 TO 91

Discharge curves along the Hilmand River.
Upper Hilmand watershed







GRAPHS 92, 93 AND 94

Discharge curves along the Tiri and Kaj Rivers,
two tributaries of the Hilmand River.
Upper Hilmand watershed

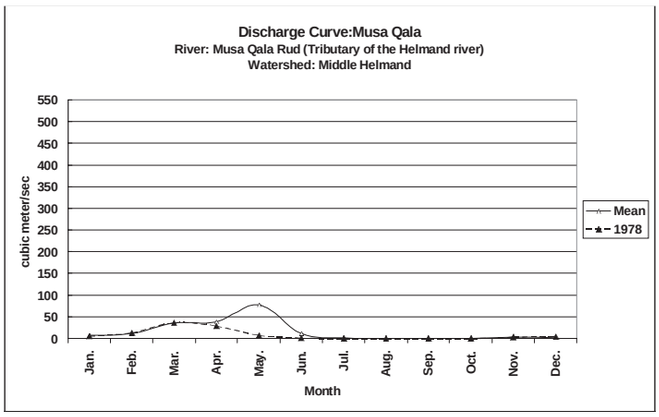
19. Middle Hilmand watershed

The Middle Hilmand watershed drains water that joins the Hilmand River below the Kajaki dam, with the exception of Argandab River, which also joins the Hilmand River below the Kajaki dam. The Middle Hilmand watershed includes water from Baghran, Naw Zad and Ghorak districts. The main river among them is the Musa Qala Rod, which takes its sources from Baghran district (Hilmand) and joins the Hilmand River at Sangin district centre. The Middle Hilmand ends at the main irrigation channels at the diversion structures in the north of Girishk (Band-i Boghra and Shamalan canal), which drain Upper Hilmand water stored in Kajaki dam to the intensively irrigated fields of Nad Ali and Marja.

Table 34 shows that the Middle Hilmand watershed is largely dominated by rangeland (49 percent) and bare soil (45 percent). Irrigated land in the valley floor represents 6.4 percent of the total surface of the watershed, but most of it (63 percent) is intermittently cultivated.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	822	8.2	0.05
Irrigated: Intensively Cultivated (1 Crop/Year)	38737	387.4	2.36
Irrigated: Intensively Cultivated (2 Crops/year)	450	4.5	0.03
Irrigated: Intermittently Cultivated	65729	657.3	4.00
Marshland Permanently inundated	1586	15.9	0.10
Marshland Seasonal	749	7.5	0.05
Permanent Snow	317	3.2	0.02
Rainfed Crops (sloping areas)	3042	30.4	0.18
Rangeland (grassland/forbs/low shrubs)	797464	7974.6	48.50
Rock Outcrop / Bare Soil	735120	7351.2	44.71
Sand Covered Areas	6	0.1	0.00
Sand Dunes	79	0.8	0.00
Water Bodies	26	0.3	0.00
	1644127	**16441.3**	**100.00**

TABLE 34
Landcover classification for Middle Hilmand watershed



GRAPH 95
Discharge curves along the Musa Qala Rod River, a tributary of the Hilmand River. The graph is at the same scale as other graphs on the Hilmand River for comparison purposes. Middle Hilmand watershed

20. Lower Hilmand watershed

The Lower Hilmand watershed starts at the Band-i Boghra dam (Grishk hydropower plant) above Grishk and ends where the Kajaki irrigation canals (Darweshan canal) end east of Khan Neshin town (district centre of Reg district). Therefore, the Lower Hilmand is mostly represented by the intensively, formally irrigated perimeters below the Kajaki dam. The Grishk hydropower plant, located on the Boghra irrigation canal, was commissioned in 1957 as the first plant on the Hilmand River. According to Norconsult-Norplant, the plant is generally in good condition[2].

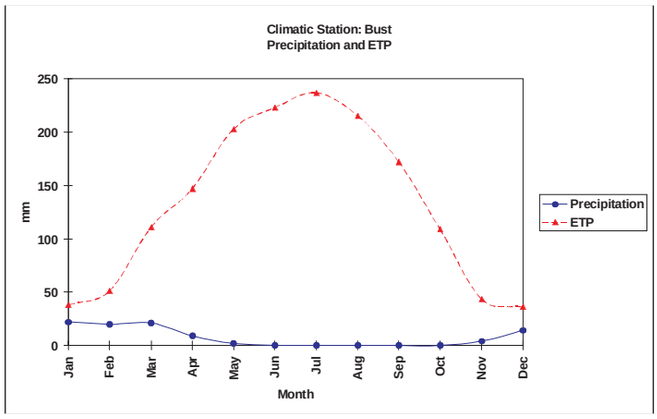
Table 35 shows that the Lower Hilmand watershed is largely dominated by bare soil (48 percent) and rangeland (33 percent). Sand dunes represent as much as 8.7 percent of the total area of the watershed. The formal irrigation scheme represents 7.4 percent of the watershed, and most of it (62 percent) is suitable for planting one crop per year.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	64956	649.6	4.59
Irrigated: Intensively Cultivated (2 Crops/year)	13012	130.1	0.92
Irrigated: Intermittently Cultivated	15490	154.9	1.09
Marshland Permanently inundated	24373	243.7	1.72
Marshland Seasonal	23501	235.0	1.66
Natural Forest (closed cover)	31	0.3	0.00
Rangeland (grassland/forbs/low shrubs)	169	1.7	0.01
Rock Outcrop / Bare Soil	684100	6841.0	48.36
Sand-Covered Areas	465934	4659.3	32.94
Sand Dunes	122480	1224.8	8.66
Settlements	393	3.9	0.03
Water Bodies	241	2.4	0.02
	1414679	**14146.8**	**100.00**

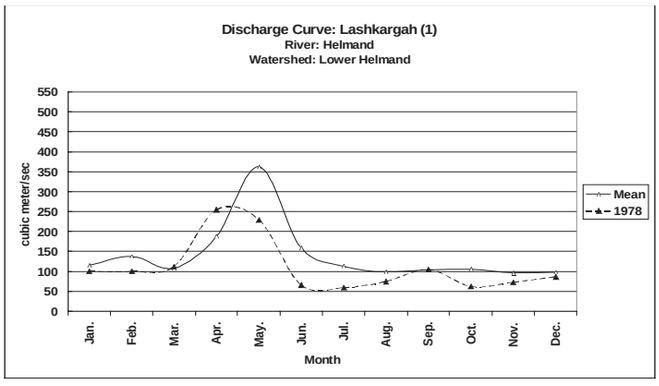
TABLE 35
Landcover classification for Lower Hilmand watershed

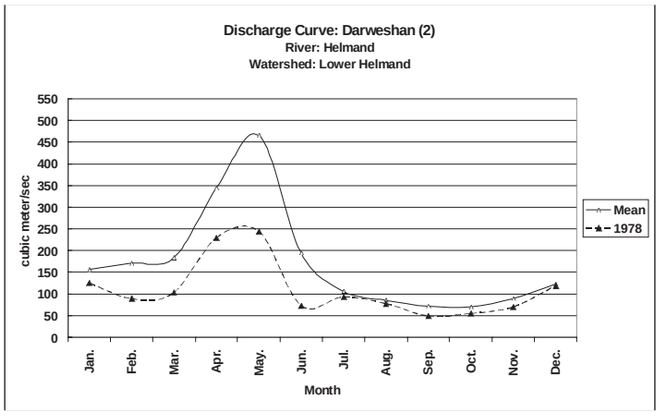
PICTURE 124
View from the Bost citadel on the junction of the Arghandab River and the Helmand River. March 2003

[2] Government of Afghanistan, Ministry of Water and Power, "*Power Sector Master Plan Update, Draft Final Report*", report prepared by Norconsult-Norplan for MWP, October 2003.



GRAPH 96
Precipitation and ETP in Bost





GRAPHS 97 AND 98
Discharge curves along the Hilmand River.
Lower Hilmand watershed

21. Sistan-Hilmand watershed

The Sistan-Hilmand watershed starts below the irrigation canals of the formal irrigation scheme in Hilmand province at Khan Neshin town (district centre of Reg district) and continues up to the Iranian border in the lagoons of the Hamum-i Hilmand. In the delta that begins at Kuhak, Hilmand divides into two main branches of Rod-i Sistan and Rod-i Parian, each subdividing into many branches and canals into the lagoons. At that point, the Hilmand River, the longest in Afghanistan, has covered about 1,300 km, which makes it the longest in Afghanistan.

Surplus water from the Hamum-i Hilmand flows out at the southern end of the lake, through the channel of Rod-i Shileh Shallaq (or Rod-i Sistan) in Iran and back into the depression of Gaod-i Zirreh inside Afghanistan. Thanks to this natural drainage, the water in the wetlands of Hamum-i Hilmand has a low salt content. However, any project reducing this natural drainage (e.g. upstream irrigation schemes and diversion dams) will create problems of salinity in the lagoons, with inevitable environmental consequences. The Gaod-i Zirreh Lake is an enormous saltpan inland lake in the southwest of the country. As the final drainage area for the Hilmand basin, it has accumulated salt deposits over the centuries.

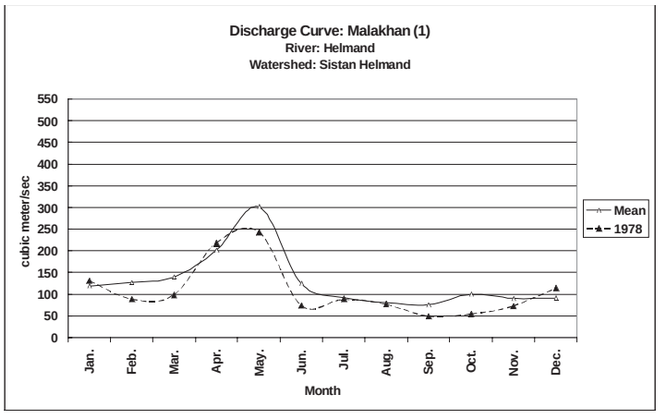
The Goad-i Zirreh Lake is now primarily refilled from a natural spillway located east of Chahar Burjak centre (Nimroz), which drains water from the Hilmand River during flood periods through the Rod-i Beyeban (or Ram Rod) and Shella-i Kushk channels. The Rod-i Beyeban joins the Rod- Shilleh Shallaq in Iran and flows back into Afghanistan, while the Shella-i Kushk channels drain water directly to the Gaod-i Zirreh. The Kamal Khan diversion dam, which was never completed, had aimed to avoid fresh water losses from the Hilmand by closing the natural spillway and redirecting floodwaters into irrigated land surrounding the lagoons.

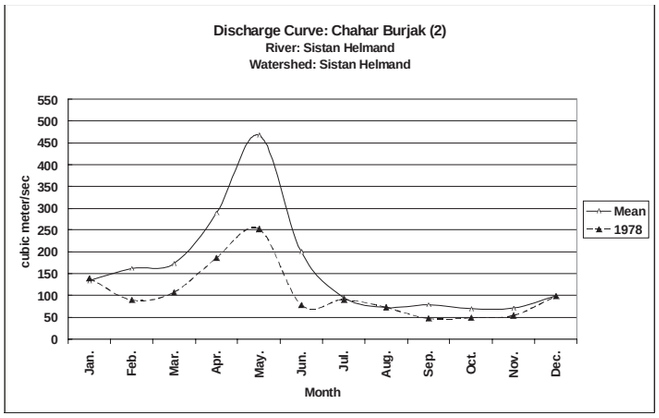
PICTURE 124 BIS
Aerial view of the Goad-i Zirreh in April 2003. The lake had completely dried during the drought. It contained some water in April 2003, but this water dried during the summer. See also the satellite images from Maps 3, 4 and 5 (Part I). 26 April 2003 (N29.88, E61.25, E)

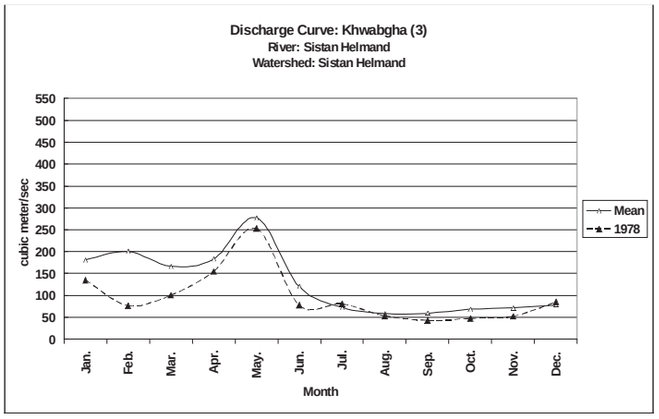
Ttable 36 shows that the Lower Hilmand watershed is largely dominated by bare soil (85 percent) and sand dunes (11 percent). Irrigated land in narrow strips along the Hilmand River represents 1.7 percent, and almost all of it is intermittently irrigated.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	90	0.9	0.00
Irrigated: Intermittently Cultivated	36643	366.4	1.70
Marshland Permanently inundated	15479	154.8	0.72
Marshland Seasonal	1527	15.3	0.07
Rock Outcrop / Bare Soil	1836193	18361.9	85.11
Sand-Covered Areas	6199	62.0	0.29
Sand Dunes	240465	2404.7	11.15
Water Bodies	20848	208.5	0.97
	2157446	21574.5	100.00

TABLE 36
Landcover classification for Sistan-Hilmand watershed







GRAPHS 99, 100 AND 101
Discharge curves along the Hilmand River. Lower Sistan-Hilmand watershed

22. Chagay watershed

Chagay watershed is a small watershed draining water on the southern slope of the Khanishin Gar volcano, located near the town of Khan Neshin (district centre of Reg district) and the northern slopes of the Chagay Mountains on the other side of the border in Pakistan. The water flows from a multitude of seasonal streams back into the Hilmand River on each side of the Khanishin Gar volcano. Table 37 shows that the Chagay watershed is composed of bare soil (rock and sand).

The table 37 shows that the Chagay watershed is composed of bare soil (rock and sand).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Rock Outcrop / Bare Soil	810594	8105.9	87.0
Sand Covered Areas	40911	409.1	4.4
Sand Dunes	80355	803.5	8.6
	931859	**9318.6**	**100.0**

TABLE 37
Landcover classification for Chagay watershed

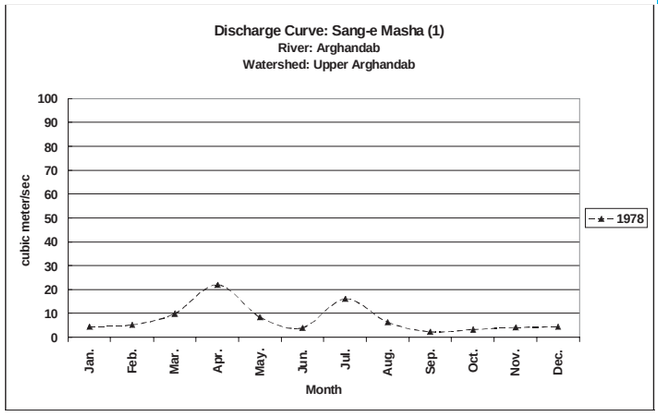
23. Upper Arghandab watershed

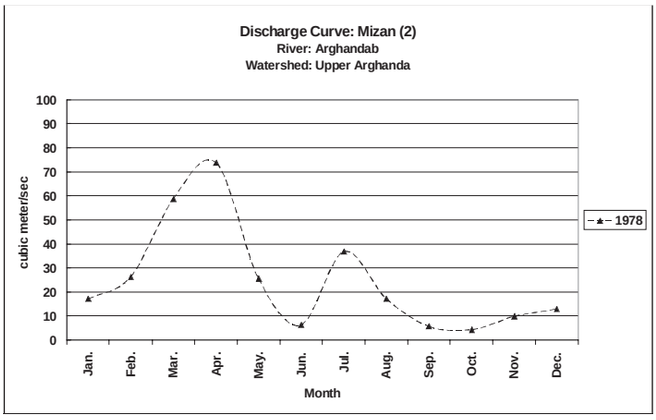
The Upper Arghandab watershed drains the water above the Band-i Dahla dam on the Arghandab River. The Upper Arghandab River takes it source from the southern slopes of Dasht-i Nawur in Ghazni province and Malistan district through a number of small streams. The streams join close to Sang-i Masha, north of the district centre of Jaghori. From Jaghori, the Arghandab flows southwestward through the Arghandab and Mirzan districts of Zabul province up to Band-i Dahla dam in the Shah Wali Kot district of Kandahar. From Day Chopan district, the Marah Rod River contributes to the Arghandab River flow. The discharge Graphs 97-99 show that the Arghandab River has a second peak of flow in July and August, when the monsoon rains in some years water the catchment area of the Upper Arghandab watershed.

Table 38 shows that the Upper Arghandab watershed is largely dominated by rangeland (74 percent) and bare soil (19 percent). Irrigated land in narrow strips along the Arghandab River represents 6.4 percent of the watershed surface. However, half of it is intermittently cultivated (51 percent).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	3038	30.4	0.23
Irrigated: Intensively Cultivated (1 Crop/Year)	41365	413.6	3.14
Irrigated: Intensively Cultivated (2 Crops/year)	162	1.6	0.01
Irrigated: Intermittently Cultivated	42773	427.7	3.25
Marshland Permanently inundated	243	2.4	0.02
Rainfed Crops (flat lying areas)	5321	53.2	0.40
Rainfed Crops (sloping areas)	519	5.2	0.04
Rangeland (grassland/forbs/low shrubs)	974592	9745.9	74.00
Rock Outcrop / Bare Soil	246179	2461.8	18.69
Vineyards	104	1.0	0.01
Water Bodies	2676	26.8	0.20
	1316972	**13169.7**	**100.00**

TABLE 38
Landcover classification for Upper Argandab watershed





GRAPHS 102 AND 103
Discharge curves along the Arghandab River.
Upper Arghandab watershed

PICTURE 124 TER
View of the Band-i Dahla dam. March 2003.

24. Lower Arghandab watershed

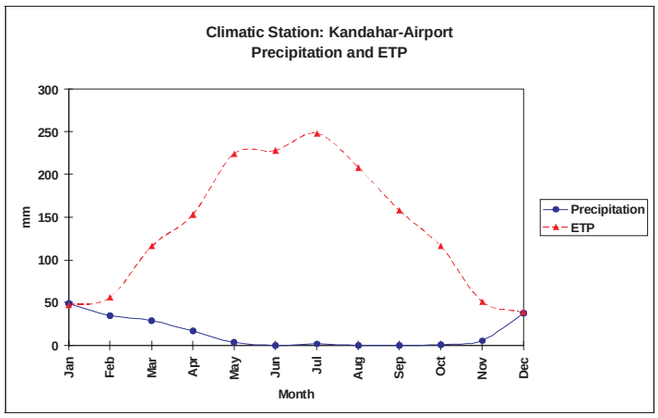
The Lower Arghandab watershed represents the irrigated perimeter below the Argandab dam. The Lower Arghandab watershed starts at the Band-i Dahla dam and ends where the Argandab River joins the Hilmand River at the foot of the historical Qala-i Bost. At that point, the Argandab River has traveled a total of 560 km. From the Band-i Dahla dam, two main canals, the Joy-i Wala (or Zaher Shahi) and the Naw Razi, irrigate orchards and vineyards in the Kandahar area.

Below the Band-i Dahla dam, a number of seasonal streams supplement the Arghandab River in the Lower Arghandab watershed. The main tributary is the Kushk-i Nakhud Rod, which originates from Khakrez district (Kandahar). It irrigates the Maywand oases and joins the Arghandab a few kilometres south of Maywand district centre. Further downstream, a second tributary, the Chakaw Mandeh stream, also contributes to the Arghandab River.

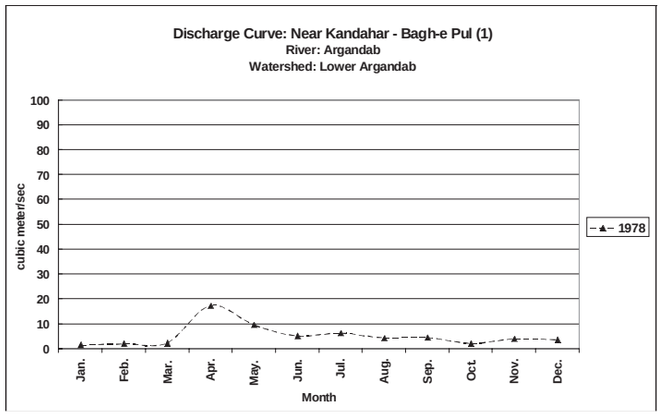
Table 39 shows that the Lower Arghandab watershed is largely dominated by bare soil (65 percent). Irrigated land represents 15.2 percent of the watershed surface, but much of it (83 percent) is intermittently cultivated. Due to sub-optimal management of the water reserves in the Band-i Dahla and erratic rainfall in the past few years, irrigation for orchards and vineyards in Kandahar is supplemented by deep wells. However, as the water table significantly dropped[3] during the past four years of drought (1998-2002), deep wells were dry and orchards and vineyards could not be irrigated. Graph 107 shows the discharge curves above and below the Band-i Dahla dam before the war.

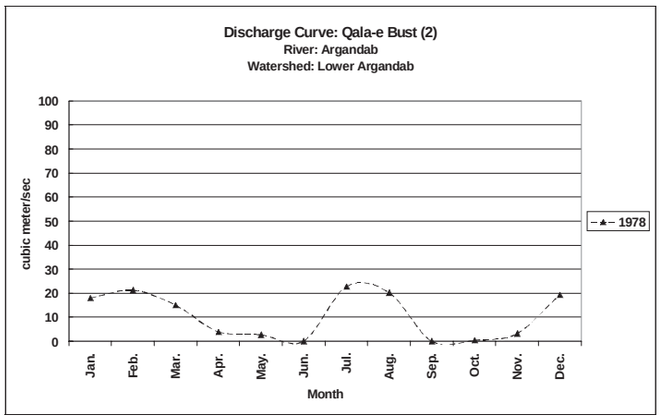
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	681	6.8	0.09
Fruit Trees	4228	42.3	0.58
Irrigated: Intensively Cultivated (1 Crop/Year)	19413	194.1	2.66
Irrigated: Intermittently Cultivated	91814	918.1	12.58
Marshland Permanently inundated	9173	91.7	1.26
Marshland Seasonal	66	0.7	0.01
Natural Forest (closed cover)	11	0.1	0.00
Rainfed Crops (flat-lying areas)	4960	49.6	0.68
Rangeland (grassland/forbs/low shrubs)	30400	304.0	4.16
Rock Outcrop / Bare Soil	477896	4779.0	65.46
Sand-Covered Areas	41957	419.6	5.75
Sand Dunes	25518	255.2	3.50
Settlements	1528	15.3	0.21
Vineyards	22372	223.7	3.06
	730017	**7300.2**	**100.00**

TABLE 39
Landcover classification for Lower Arghandab watershed

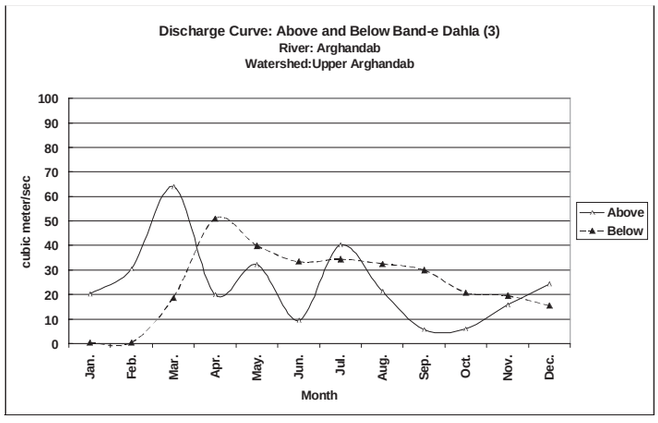


GRAPH 104
Precipitation and ETP at Kandahar Airport





GRAPHS 105 AND 106
Discharge curves along the Arghandab river. The graphs are at similar scale as for the Upper Arghandab watershed for comparison purposes.
Lower Arghandab watershed



GRAPH 107
Comparison of discharge curves above and below the Band-i Dahla dam on the Arghandab River.
Lower Arghandab watershed

[3] The provincial irrigation department reported in January 2003 that the water table in Kandahar dropped by 25 metres during the drought. See Favre, Raphy "*Monitoring of the Winter Agriculture and Food Security Survey and Field Observations on Agriculture Situation in Badakhshan, Takhar, Kunduz, Baghlan, Samangan, Balkh, Jawzjan, Sar-i Pul, Faryab, Badghis, Herat, Farah, Hilmand and Kandahar* (*Northern, Western and Southern Afghanistan*). *Field Mission Brief.* 31 *December* 2002 *to* 18 *January* 2003", FAO, Kabul 28 January 2003.

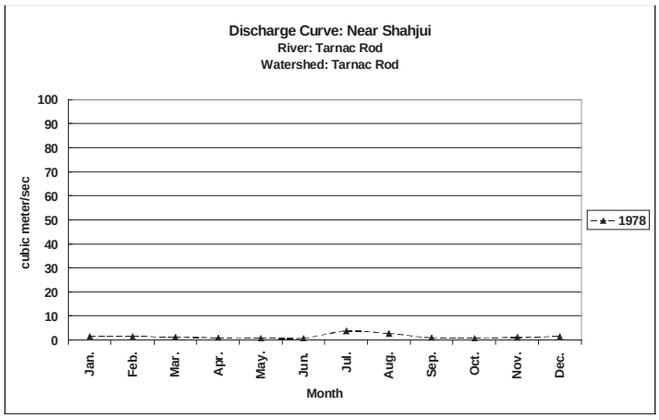
25. Tarnak Rod watershed

The Tarnac Rod watershed drains the water from the Moqur and Gelan districts of Ghazni province and goes through Zabul province (Shajoy, Qalat, Tarnak wa Jaldak districts). The Tarnac Rod watershed ends at the Joy-i Zaher Shahi canal (from the Band-i Dahlan on the Aghandab River). However, when the river flow is high, it reaches the Dori River south of Kandahar. The Tarnac River flows parallel to the Arghandab River for about 380 km, and is sandwiched between the Arghandab and Lora Rod Rivers in the Arghistan watershed.

Table 40 shows that the Lower Tarnak Rod watershed is largely dominated by rangeland (55 percent) and bare soil (31 percent). Irrigated land represents 12.9 percent of the watershed surface. However, much of it (77 percent) is intermittently cultivated.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	83	0.8	0.01
Irrigated: Intensively Cultivated (1 Crop/Year)	25947	259.5	2.86
Irrigated: Intermittently Cultivated	89765	897.6	9.89
Rainfed Crops (flat-lying areas)	6639	66.4	0.73
Rangeland (grassland/forbs/low shrubs)	500577	5005.8	55.15
Rock Outcrop / Bare Soil	284572	2845.7	31.35
Settlements	57	0.6	0.01
	907639	**9076.4**	**100.00**

TABLE 40
Landcover classification for Tarnak Rod watershed



GRAPH 108
Discharge curves along the Tarnak Rod River, a tributary of the Arghandab River. The graphs are at similar scale as for the Upper Arghandab watershed for comparison purposes. Tarnak Rod watershed

26. Arghistan Rod Watershed

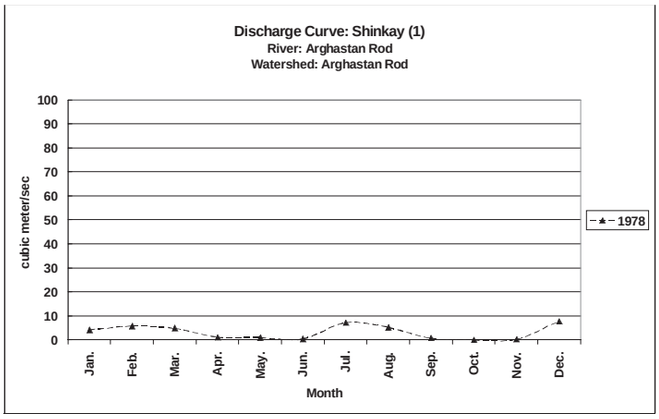
The Arghistan Rod watershed starts from the southern edge of Ab-i Istada and ends at the Arghandab irrigation scheme. The main rivers of the Arghistan Rod are the Arghasntan Rod and the Lora Rod. In good years, the Lora Rod River drains water from the Sardih wa Ghazni Rod watershed when the Ab-i Istada lake overflows in Nawa district in Ghazni province. The Arghistan Rod drains water from the Shamulzai district of Zabul province (Lwargay Rod) and the Maruf district of Kandahar province (Salesum Rod). The Lora Rod and Arghistan Rod join in Arghistan district near Kandahar. The river retains the name of Arghistan Rod. The Arghistan Rod River is to the east and flows parallel to the Argandab River. The Arghistan Rod loses its name when its reaches the Argandab River.

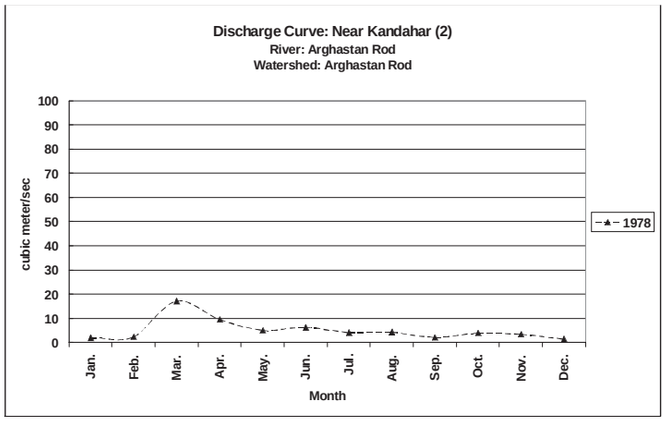
The Arghistan Rod watershed also includes the Dori River, which takes its source just across the border in Pakistan, north of Quetta. At its source in Pakistan, the river bears the name of Lora Rod; its name changes to Kadanai Rod as it enters Afghanistan. The name Dori Rod applies from the east of Spin Boldak. The Dori Rod joins the Arghistan at the southern edge of the watershed in the Daman district of Kandahar. However, irrigation largely dissipates both the Dori as well as the Arghistan before they unite.

Table 41 shows that the Arghistan Rod watershed is largely dominated by rangeland (48 percent) and bare soil (43 percent). Irrigated land represents 5 percent of the watershed surface. However, much of it (73 percent) is intermittently cultivated.

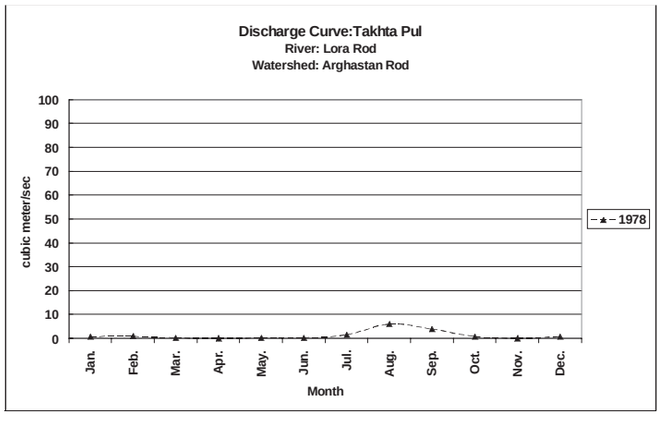
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	5081	50.8	0.25
Irrigated: Intensively Cultivated (1 Crop/Year)	27643	276.4	1.37
Irrigated: Intermittently Cultivated	74135	741.3	3.67
Marshland Permanently inundated	4473	44.7	0.22
Marshland Seasonal	8014	80.1	0.40
Rainfed Crops (flat-lying areas)	40135	401.4	1.99
Rangeland (grassland/forbs/low shrubs)	972059	9720.6	48.08
Rock Outcrop / Bare Soil	862518	8625.2	42.66
Sand Dunes	27660	276.6	1.37
Settlements	16	0.2	0.00
Vineyards	97	1.0	0.00
	2021831	**20218.3**	**100.00**

TABLE 41
Landcover classification for Arghistan Rod watershed





GRAPHS 109 AND 110
Discharge curves along the Arghistan Rod River, a tributary of the Arghandab River. The graphs are at a similar scale as for the Upper Arghandab watershed for comparison purposes. Arghistan Rod watershed



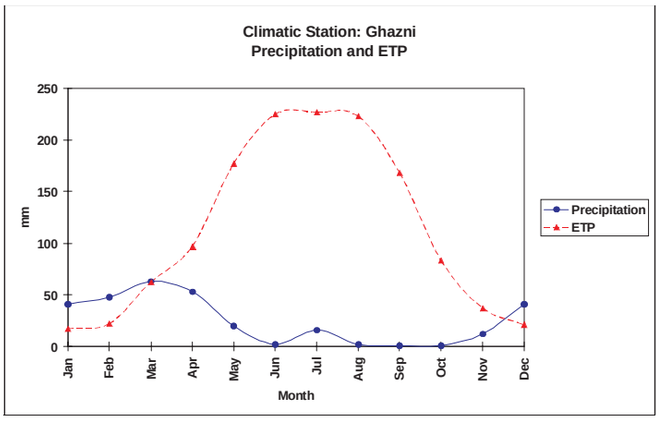
GRAPH 111
Discharge curves along the Lora Rod River, a tributary of the Arghandab River. The graphs are at a similar scale as for the Upper Arghandab watershed for comparison purposes. Arghistan Rod watershed

27. Sardih wa Ghazni Rod watershed

The Sardih wa Ghazni Rod watershed drains water from Gardez province, including the Sardeh Rod River (also called Jilga Rod River), and several districts of Ghazni province, including the Ghazni Rod River. The Ghazni Rod River drains water from the eastern side of Dasht-i Nawur Mountains. The Darya-i Payin flows below the Bandi Sultan, and a number of seasonal streams (Sela-i Gulbowri, Sela-i Qalati and Sela-i Zanakhan) converge toward Ghazni city, forming the Ghazni Rod River. The original dam of Bandi Sultan, which is located in the Jaghori/Khwaja Umuri district of Ghazni (Pictures 125 and 126), was built by Sultan Mahmood-i Ghaznavi in 1000-1033 AD. Soon after the city of Ghazni, the river forms a delta that irrigates land in Ghazni and Andar districts.

The Sardeh Rod drains water from numerous torrents originating from the extension of the Sefid Koh (or Spin Ghar) Mountains in the district of Sayid Karam in Paktya and flows through Gardez and Zurmat districts before filling the Band-i Sardeh dam in the Sharan district. Water flow in most of these small torrents (Kanay Khwa, Makawa Khwa, Mullayan, Paltu, Park, Sarab and Syahgel) has been measured. The Ghazni Rod and Sardeh Rod meet in Giro district and flow into the Ab-i Istada salty lake. Another small river, the Nahara Rod, takes its sources in the Omna and Zarghun Shahr districts of Ghazni province, and joins the Ab-i Istada on the eastern side of the lake. When the lake overflows in good rainfall years in the spring, the water drains into the Lora Rod River of the Arghistan watershed, which contributes to the Hilmand River. Therefore, the Sardih wa Ghazni Rod watershed is part of the Hilmand River basin.

The discharge Graphs 113 and 117 show that the Sardih wa Ghazni Rod rivers have a second peak of flow in summer when the monsoon rains, in good years, water the catchment area of the Sardih wa Ghazni Rod watershed.



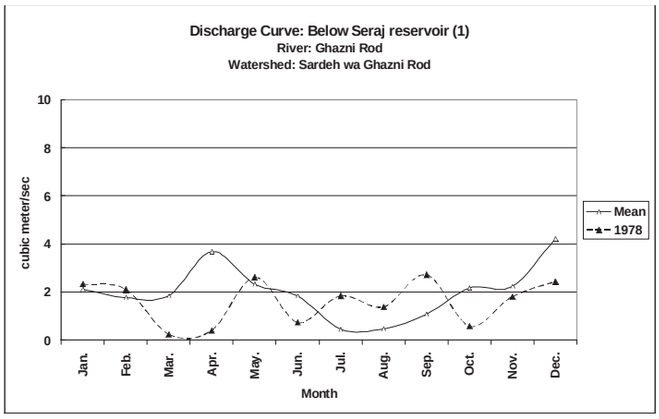
GRAPH 112
Precipitation and ETP in Ghazni

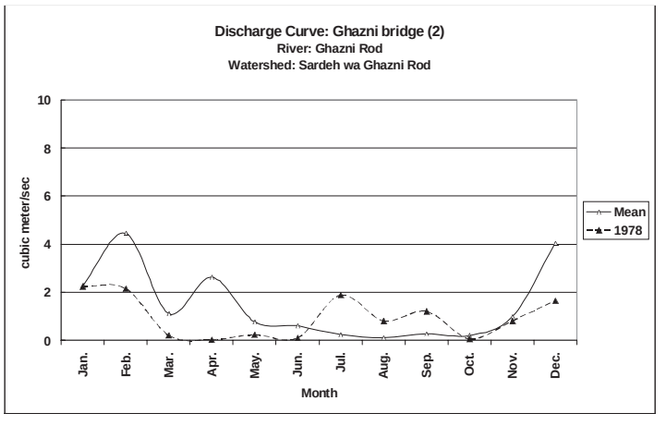
PICTURES 125 AND 126
View of Bandi Sultan dam in Jaghori/Khwaja Umuri in Ghazni province. On the right, view of the ancient wall of the first Bandi Sultan built one thousand years ago by Sultan Mahmood-i Ghaznavi (1000-1033 AD).
Ghazni, 18 March 2003 (N33.76, E68.38, W)

Table 42 shows that Sardih wa Ghazni Rod watershed is largely dominated by rangeland (68 percent) and bare soil (15 percent). Irrigated land represents 13.5 percent of the watershed surface, however, half of it (51percent) is intermittently cultivated.

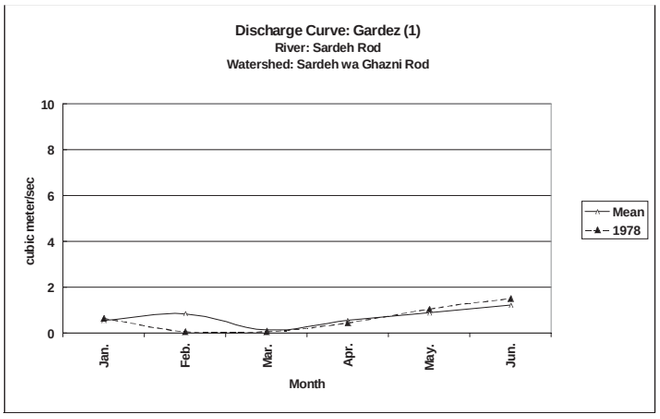
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	960	9.6	0.06
Fruit Trees	927	9.3	0.05
Irrigated: Intensively Cultivated (1 Crop/Year)	105835	1058.3	6.13
Irrigated: Intensively Cultivated (2 Crops/year)	665	6.7	0.04
Irrigated: Intermittently Cultivated	119575	1195.8	6.93
Marshland Permanently inundated	2999	30.0	0.17
Natural Forest (closed cover)	3	0.0	0.00
Natural Forest (open cover)	2510	25.1	0.15
Rainfed Crops (flat-lying areas)	31299	313.0	1.81
Rainfed Crops (sloping areas)	2362	23.6	0.14
Rangeland (grassland/forbs/low shrubs)	1179059	11790.6	68.34
Rock Outcrop / Bare Soil	263893	2638.9	15.30
Settlements	495	5.0	0.03
Water Bodies	14619	146.2	0.85
	1725200	17252.0	100.00

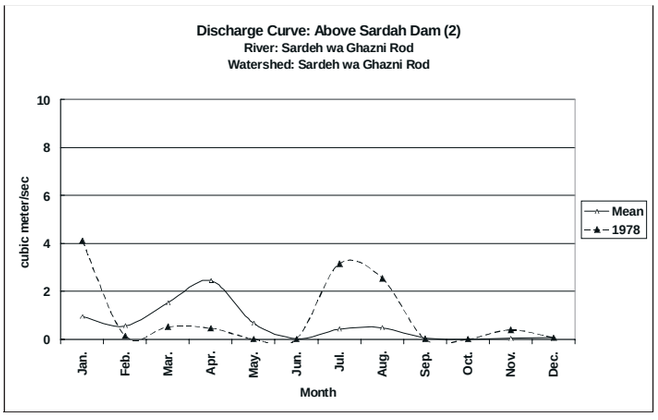
TABLE 42
Landcover classification for Sardih wa Ghazni Rod watershed



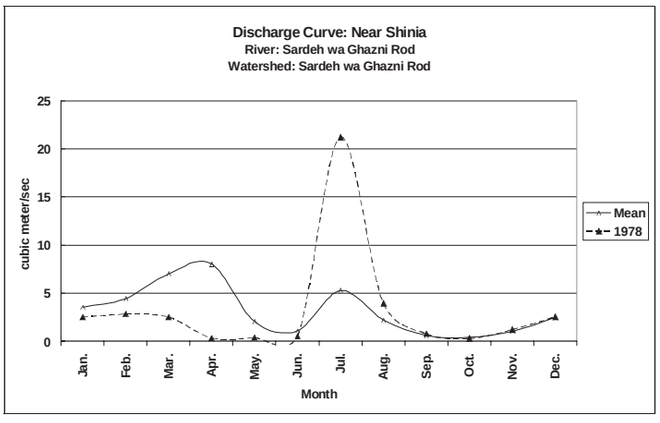


GRAPHS 113 AND 114
Discharge curves along the Ghazni Rod River. Ghazni wa Sardeh Rod watershed





GRAPHS 115 AND 116
Discharge curves along the Sardeh Rod River. Ghazni wa Sardeh Rod watershed



GRAPH 117
Discharge curves along the Ghazni wa Sardeh Rod River near Ab-i Istada. Ghazni wa Sardeh Rod watershed

28. Dasht-i Nawur watershed

The Dasht-i Nawur watershed is the smallest of all the watersheds in Afghanistan. The Dasth-i Nawur is an extensive high-altitude plain in the southeast of the country (Picture 127). Surrounded by peaks and ancient volcanos, it drains water into a lake and wetland. The lake is located at approximately 3,160 m above sea level. No water flow data are available for Dasht-i Nawur, as no hydrological station was placed in the watershed. Dasht-i Nawur wetland was declared a National Waterflow and Flamingo Sanctuary in 1974.

Table 43 shows that the Dasth-i Nawur watershed is largely dominated by rangeland (68 percent) and marshland (15 percent). Some agriculture is practiced in irrigated lands, which represents 3.7 percent of the watershed surface, but most of it (84 percent) is intermittently cultivated.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	963	9.6	0.60
Irrigated: Intermittently Cultivated	5081	50.8	3.14
Marshland Permanently inundated	24357	243.6	15.05
Rainfed Crops (flat-lying areas)	2481	24.8	1.53
Rangeland (grassland/forbs/low shrubs)	110325	1103.3	68.17
Rock Outcrop / Bare Soil	4783	47.8	2.96
Water Bodies	13839	138.4	8.55
	161830	**1618.3**	**100.00**

TABLE 43
Landcover classification for Dasht-i Nawur watershed

PICTURE 127
Aerial view of the Dasht-i Nawur high elevation plain surrounded by mountains. Nawur district, Ghazni province, 26 April 2003 (N33.87, E67.63, W)

VI. KABUL (INDUS) RIVER BASIN

29. Kabul watershed

The Kabul River originates from the eastern side of the Paghman Mountains from the Jalrez district of Wardak province and Paghman district of Kabul province. From Jalrez, the Darya-i Maidan takes its source from Kotal-i Onay Pass and is supplemented by Darra-i Sanglakh water at Jarlez district centre, Darra-i Jabor and finally the Darra-i Sadmardah water from Nirkh district in Maidan Shar. The Darya-i Maidan changes its name to Kabul River after Tangi Lalandar southwest of Kabul before it flows below Darulaman Palace in Kabul. From Paghman district, numerous small streams gather west of Kabul and join the Kabul River near Deh Mazang. Some of these streams refill the Qargha reservoir, supplying part of the water to Kabul city (Picture 128). However, due to a limited catchment area, the Qargha reservoir (14 million m^3) was built at the bottom of the Paghman Valley above Kabul city for water supply during the drought years of 1999 and 2001.

When the Kabul River reaches Kabul city it has little or no water. Indeed, when surface water is not stored in Qargah dam, much of the water is milked away to irrigate orchards in Paghman and the Jalrez Valley. The water level in Kabul is low and bazaars have spread across the river bed, with stalls selling their wares where water once ran. In Pul-i Bagh-i Omumi, the bazaar is called 'Titanic' bazaar (Picture 129), as it often sinks in spring when the river flow rises. *Bazaar-i Titanic* reportedly did not sink throughout the drought (1999-2001), but it did in 2002.

The Kabul River flows mainly from the contributions of other rivers. The most important are the Logar Rod, the Panjshir, the Alingar and the Kunar Rivers. Each of these rivers form separate watersheds that are described below. Enlarged by its various tributaries, the Kabul River is a major tributary to the Indus River, joining it at Attack in Pakistan. There are numerous dams constructed along the Kabul River. See section on Kabul river basin.

The Kabul watershed also drains numerous torrents from the Spinghar (or Sefid Koh) range, which lies immediately south of Jalalabad and forms a mountain frontier with Pakistan, where the well known Tora Bora caves are located. The most important of these torrents is the Surkh Ab (not to be confused with the Surkhab River of the Kunduz watershed) taking its source from Azra (Paktia) and Hesarak (Nangarhar) districts and joining the Kabul River below the Darunta dam in Sorkh Rod district (Nangarhar). Other small tributaries include the Khazan Rod, the Kharasu Rod, the Baghgay Khwar, the Rod Khwar, the Spin Khwar and the Pishe Khwar. The volume of Kabul River water flow along its course in Afghanistan is reflected in the hydrological Graphs 116-119 below. The scale of all graphs is the same to allow comparison.

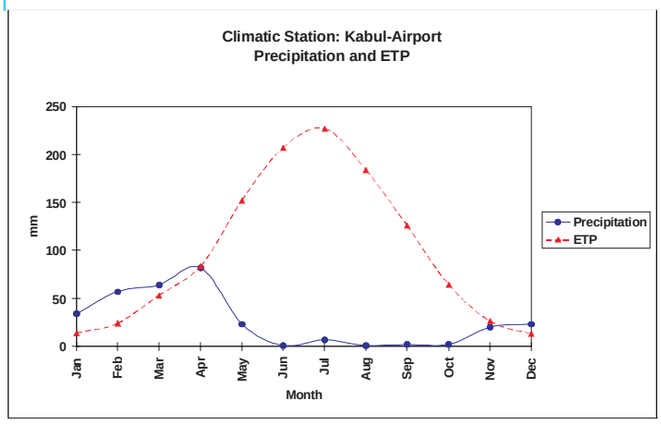
PICTURE 128
View of Qargah dam. In November 2003, the water in Qargha dam was at a very low level.
Kabul, 10 November 2003 (N34.55, E69.04, NE)

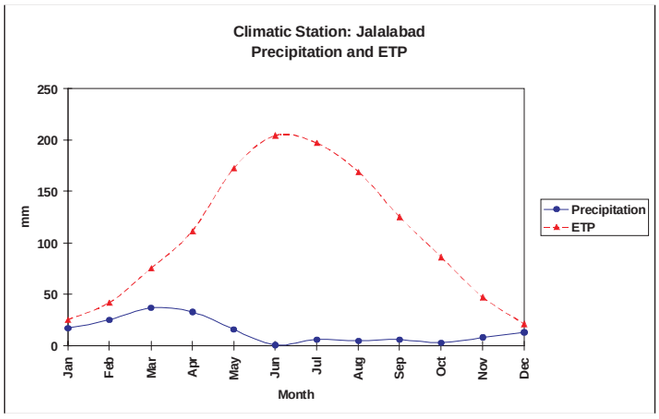
Table 44 shows that Kabul watershed is largely dominated by rangeland (48 percent) and bare soil (31 percent). Irrigated land represents 10 percent of the total surface of the watershed, out of which more than half is suitable for double cropping, mostly in Nangarhar province. Limited rainfed cultivation (0.3 percent) is also practised in a few locations, e.g. near Kotal-i Khaikhana pass.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	5520	55.2	0.42
Fruit Trees	2502	25.0	0.19
Gardens	881	8.8	0.07
Irrigated: Intensively Cultivated (1 Crop/Year)	67276	672.8	5.18
Irrigated: Intensively Cultivated (2 Crops/year)	26109	261.1	2.01
Irrigated: Intermittently Cultivated	36314	363.1	2.79
Marshland Permanently inundated	7185	71.8	0.55
Natural Forest (closed cover)	75643	756.4	5.82
Natural Forest (open cover)	25667	256.7	1.97
Permanent Snow	5369	53.7	0.41
Rainfed Crops (flat-lying areas)	3027	30.3	0.23
Rainfed Crops (sloping areas)	1360	13.6	0.10
Rangeland (grassland/forbs/low shrubs)	627968	6279.7	48.32
Rock Outcrop / Bare Soil	400975	4009.8	30.85
Settlements	12747	127.5	0.98
Vineyards	398	4.0	0.03
Water Bodies	732	7.3	0.06
	1299673	**12996.7**	**100.00**

TABLE 44
Landcover classification for Kabul watershed

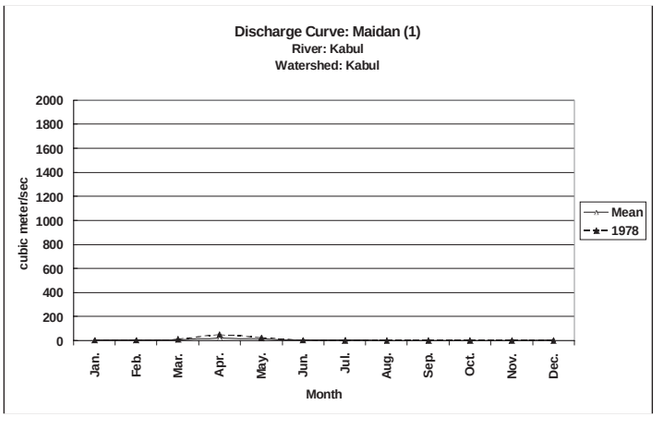
PICTURE 129
View of the 'Titanic' bazaar creeping back into the Kabul River on 10 November 2003 (N34.52, E69.19, E)

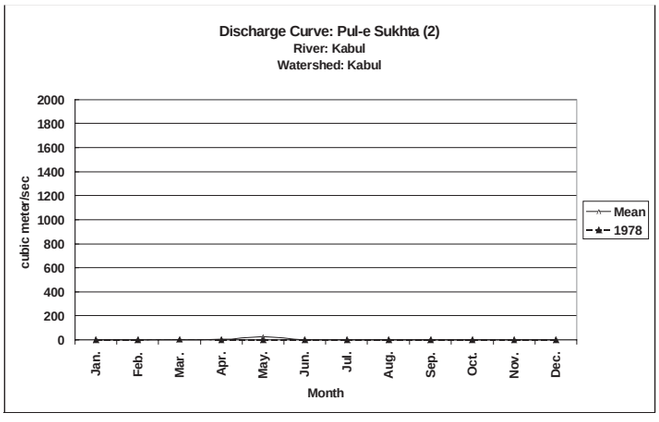


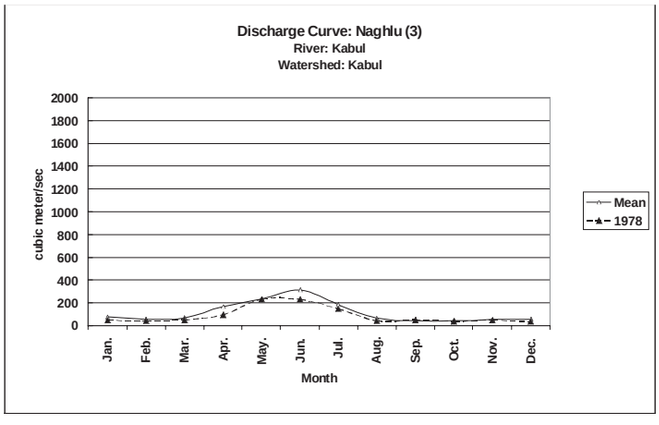


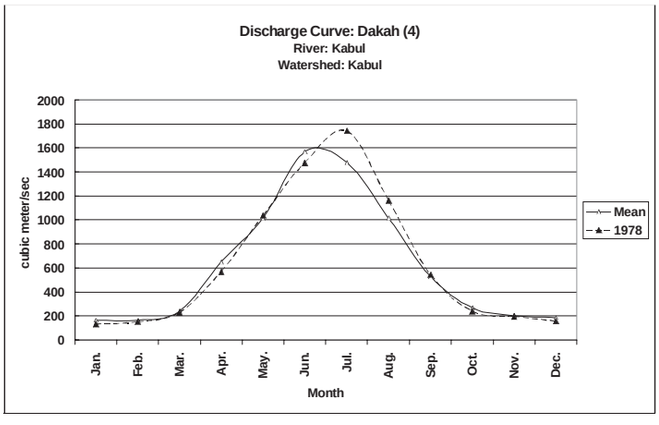
GRAPHS 118 AND 119

Precipitation and ETP at Kabul Airport (left) and Jalalabad (right)



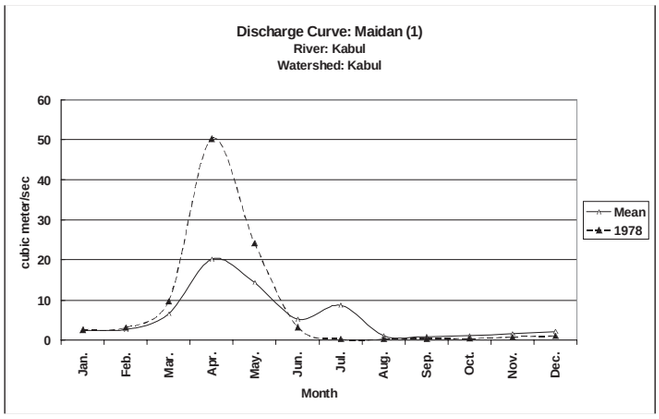


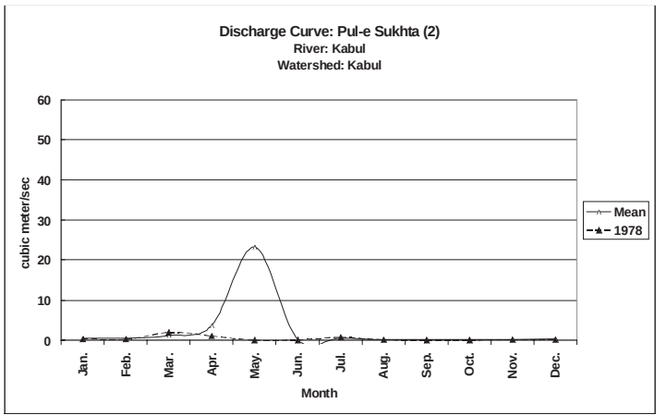




GRAPHS 120 TO 123 AND PICTURES 130 AND 131

Discharge curves along the Kabul River. Kabul watershed.
Below left, view of Kabul at Tangi Lalandar (N34.57, E69.40, w) and below right, at Band-i Naghul dam downstream of the Panjshir and Tagab Rivers (N34.63, E69.72, N). Kabul, 5 December 2003





GRAPHS 124 AND 125
Discharge curves along the Kabul River west of Kabul with normal scale. Kabul watershed

30. Chak wa Logar Rod watershed

The Chak wa Logar Rod watershed drains water from the northern slopes of the Dasht-i Nawur mountains in Nawur district of Ghazni and from the Day Mirdad district of Wardak province. The main river in Chak wa logar Rod watershed is the Chak Rod, which changes its name to Logar Rod in Baraki Barak in Logar province after the Pengram stream joins from Charkh district. The Logar Rod flows toward Kabul. South of the city, the river forms a delta that irrigates Bagrami district in Kabul province. One channel of the Logar Rod waters the Kole Hashmat Khan wetland south of Kabul city. The main channel of the Logar Rod joins the Kabul River east of Kabul, close to Pule Charki, where the Chack wa Logar Rod ends. In Chak-i Wardak, there is a small hydopower dam, commissioned by Bandi Chak and constructed in 1938 with German equipment (Pictures 132 and 133). Bandi Chak was the first station to supply power to Kabul. According to Norconsult-Norplan, the structure appears robust and in relatively good condition, considering its age[4].

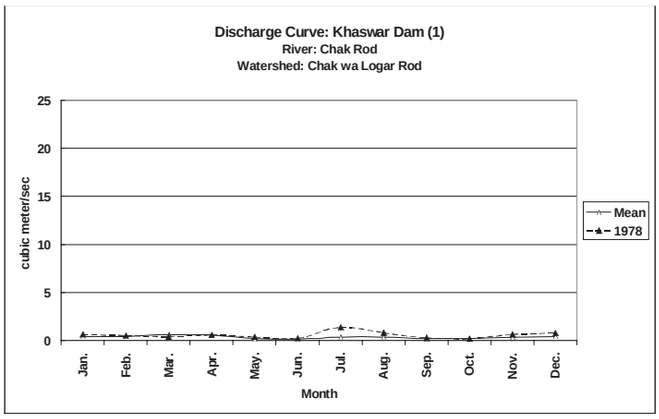
Table 45 shows that the Chak wa Logar Rod watershed is largely dominated by rangeland (86 percent). Irrigated land is found in narrow strips on valley floors and represents 7.4 percent of the total surface of the watershed, out of which 32 percent is intermittently irrigated. Some rainfed cultivation (5.2 percent) is also practiced.

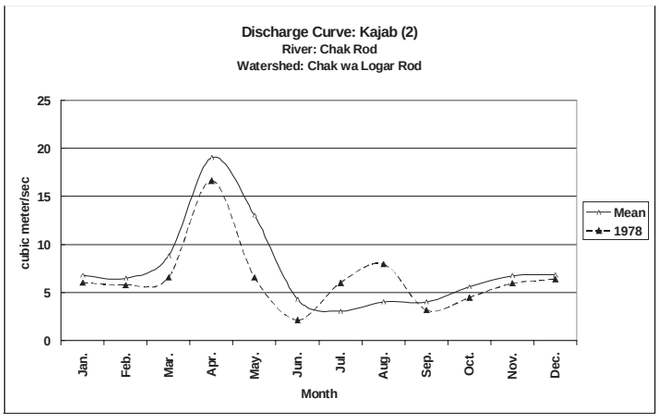
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Fruit Trees	68	0.7	0.01
Gardens	1639	16.4	0.16
Irrigated: Intensively Cultivated (1 Crop/Year)	48877	488.8	4.90
Irrigated: Intermittently Cultivated	23503	235.0	2.36
Marshland Permanently inundated	3175	31.8	0.32
Rainfed Crops (flat-lying areas)	32714	327.1	3.28
Rainfed Crops (sloping areas)	19285	192.9	1.93
Rangeland (grassland/forbs/low shrubs)	854057	8540.6	85.68
Rock Outcrop / Bare Soil	12164	121.6	1.22
Settlements	1084	10.8	0.11
Water Bodies	228	2.3	0.02
	996794	**9967.9**	**100.00**

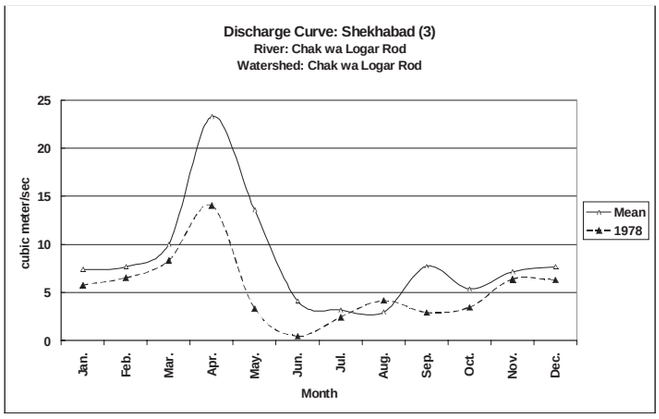
TABLE 45
Landcover classification for Chak wa Logar Rod watershed

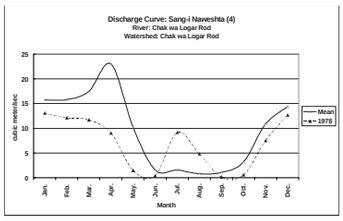
PICTURES 132 AND 133
Aerial view of Bandi Chak. 30 December 2003 (Picture 132: N34.11, E68.58, W; Picture 133: N34.11, E68.58, SW)

[4] Government of Afghanistan, Ministry of Water and Power, "*Power Sector Master Plan Update, Draft Final Report*", report prepared by Norconsult-Norplan for MWP, October 2003.









GRAPHS 126 TO 129

Discharge curves along the Chack wa Logar Rod River.
Chack wa Logar Rod watershed

[5] Government of Afghanistan, Ministry of Water and Power, "*Power Sector Master Plan Update, Draft Final Report*", report prepared by Norconsult-Norplan for MWP, October 2003.

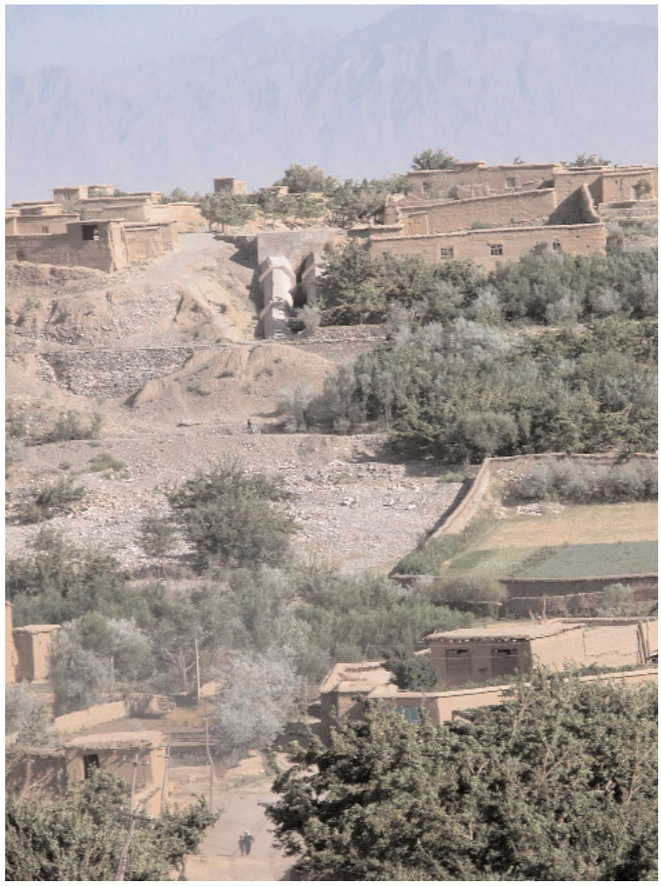
31. Ghorband wa Panjshir watershed

The Ghorband wa Panjshir watershed drains water from two east-west oriented valleys south of the high central Hindu Kush Mountains. These two valleys were formed along the Hari Rod geological fault. The Ghorband and Panjshir watershed ends at the Naghul dam in Surobi district in Kabul. The catchment area is defined by all the water collected in that dam.

The Ghorband River takes its source around the Shibar Pass, 2,900 m above sea level. It has an important tributary from the Turkman River in Turkman Valley, which flows parallel to the Ghorband and joins at Doab-i Ghorband. Lower, the Dahane Kafshan also contributes to the Ghorband flow. The Panjshir River takes its source around the Anjuman Pass (4500 m asl) and numerous streams complement its flow all along the Panjshir Valley. The main tributaries to the Panjshir River are (from the top) the Darra-i Khawak River (from Aw Kotal Pass leading to Anjuman Valley), Darra-i Hazara River and Kole Hessarak. When the Panjshir River reaches Gulbahar, it gently irrigates the wide Shomali plain (Pictures 81 and 134) through a network of irrigation canals. West of the Panjshir Valley, descending a steep and narrow valley, the Shotul River contributes to the Panjshir River at their junction in Gulbahar.

Between the Panjshir and the Ghorband Valley, another valley oriented north-south, the Salang Valley, also drains water from the central Hindu Kush Mountains. The Salang River joins the Ghorband Valley in Jabulussaraj district (Picture 136). In Jabulussaraj, the first hydropower plant was constructed in Afghanistan after it was commissioned in 1920. Nortconsult-Norplan notes that the equipment is lacking maintenance and is generally in poor condition[5].

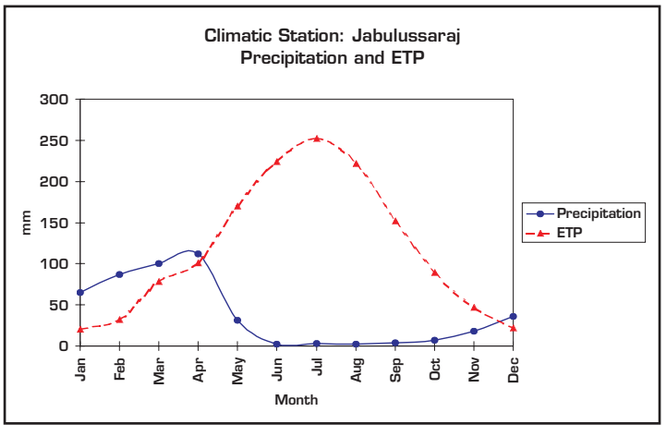
From the Panjshir River, the canal Nahr-i Parwan drains irrigation water to the left bank river of the Shomali plain through a siphon passing under the Ghorband River and leading to the Charikar hydropower plant. Charikar was commissioned in 1974 with Chinese equipment (Picture 135). Picture 81 illustrates the river systems in the Shomali plain.



PICTURE 135
View of the Nahr-i Parwan canal siphon passing under the Ghorband River (near Pul-i Matak). Jabulussaraj district, Parwan,17 June 2003 (N35.09, E69.19, S)

PICTURE 134
View of the Shomali plain irrigated by the Panjshir River in the area of Gulbahar. Parwan, 11 May 2003 (N35.13, E69.26, SE)

The Ghorband River joins the Panjshir River in Bagram district of Parwan province. The river maintains the name of Panjshir River until Bandi Naghlu. The Ghorband and Panjshir watershed also drains water that originates from Koh-i Daman (literally, 'Skirts of the Hills'), which includes Shakar Dara, Guldara and Istalif districts of Kabul province (Koh-i Daman). This water joins the Panjshir River at Bagram district (Parwan province). Finally, the Tagab River, which takes it source from the high mountains of Kapisa province, drains separately into the Bandi Naghlu dam.



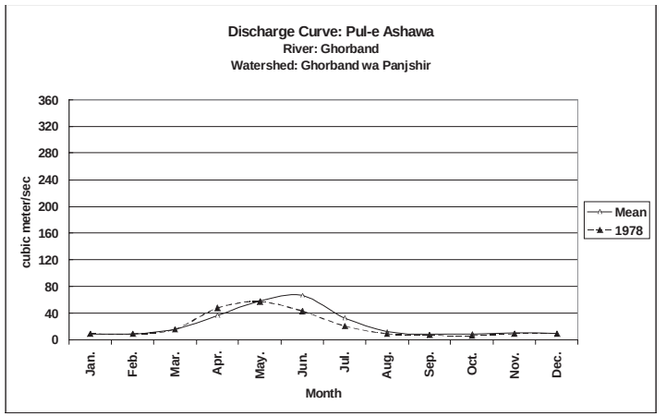
GRAPH 130
Precipitation and ETP in Jabulussaraj

Table 46 shows that Ghorband and Panjshir watershed is largely dominated by rangeland (71 percent) and bare soil (10 percent). Irrigated land represents 8.4 percent of the total surface of the watershed and some rainfed cultivation (1.5 percent) is also practiced. Based on the FAO 1990/93 landcover data, the permanent snow-covered areas represent 6.7 percent of the watershed.

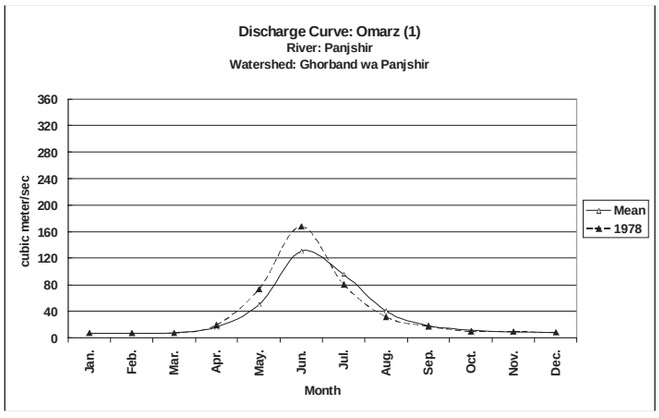
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	485	4.8	0.04
Fruit Trees	6367	63.7	0.49
Irrigated: Intensively Cultivated (1 Crop/Year)	87796	878.0	6.77
Irrigated: Intensively Cultivated (2 Crops/year)	1704	17.0	0.13
Irrigated: Intermittently Cultivated	19530	195.3	1.51
Marshland Permanently inundated	47	0.5	0.00
Natural Forest (closed cover)	4888	48.9	0.38
Natural Forest (open cover)	5123	51.2	0.40
Permanent Snow	87186	871.9	6.73
Rainfed Crops (flat-lying areas)	12938	129.4	1.00
Rainfed Crops (sloping areas)	5887	58.9	0.45
Rangeland (grassland/forbs/low shrubs)	916978	9169.8	70.73
Rock Outcrop / Bare Soil	133904	1339.0	10.33
Settlements	2233	22.3	0.17
Vineyards	10230	102.3	0.79
Water Bodies	1074	10.7	0.08
	1296370	**12963.7**	**100.00**

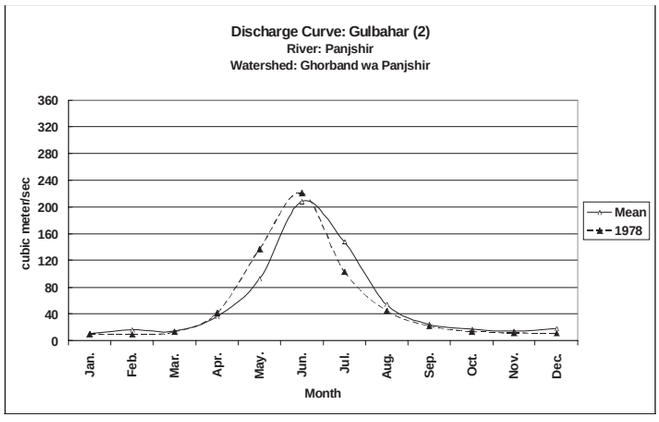
TABLE 46
Landcover classification for Ghorband wa Panjshir watershed

PICTURE 136
Junction between the Ghorband River (left) and the Salang River (right) in Jabulussaraj district.
Parwan, 17 June 2003 (N35.07, E69.23, N)

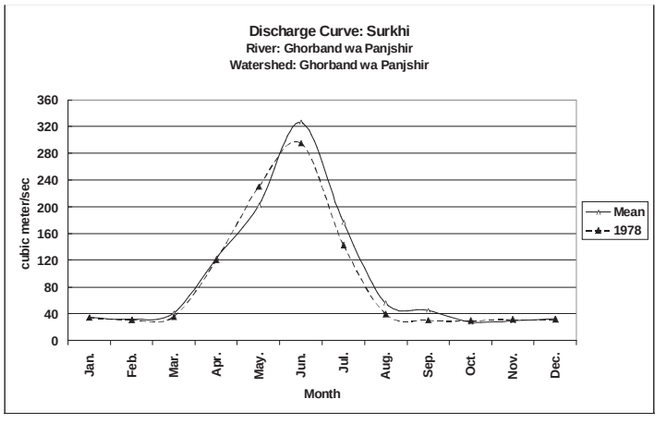


GRAPH 131
Discharge curves along the Ghorband River.
Ghorband wa Panjshir watershed

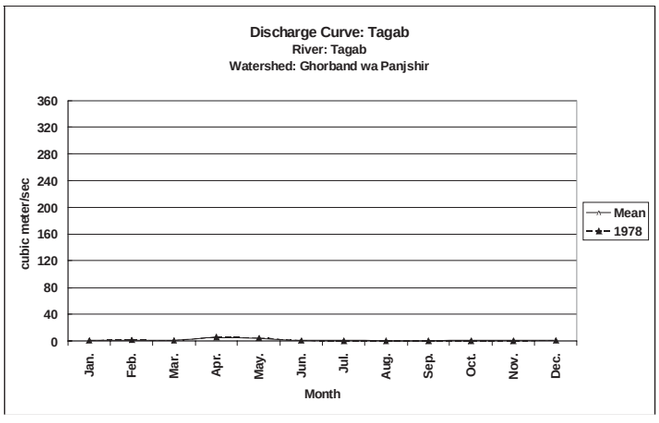




GRAPHS 132 AND 133
Discharge curves along the Panjshir River.
Ghorband wa Panjshir watershed



GRAPH 134
Discharge curves along the Ghorband wa Panjshir River in the Shomali plain. Ghorband wa Panjshir watershed



GRAPH 135
Discharge curves along the Tagab River in the Shomali plain. Ghorband wa Panjshir watershed

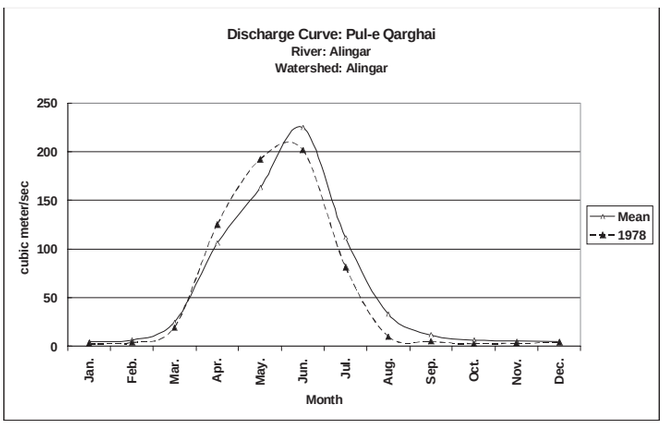
32. Alingar watershed

The Alingar watershed drains water from the southern slope of the high mountains of the Hindu Kush oriental. These high mountains bear glaciers that maintain the river flow in summer. There are two valleys and rivers in Alingar watershed; the largest one is Alingar and the smallest Alishang. The Alingar River, on the east side, takes its source from Mandol and Nuristan districts in Nuristan province, where it is called Darya-i Nuristan or Darra-i Poshal. The river takes the name of Alingar in Alingar district of Laghman province. The Alishang River takes it source from Dawlatshah district where it bears the name of Darya-i Farazghan. The Alingar and Alishang join at Mehtarlam town and downstream the river takes the name of Laghman River before reaching the Kabul River at the Darunta dam.

Table 47 shows that the Alingar watershed is roughly divided in four quarters: rangeland (25 percent), natural forest (24 percent in 1993), bare soil (21 percent) and others that account for approximately 30 percent, but out of which 17 percent is permanent snow. Irrigated land in found in narrow strips on valley floors, and it represents approximately 1.7 percent of the watershed area, out of which more than half (53 percent) is suitable for double cropping.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	10154	101.5	1.63
Irrigated: Intensively Cultivated (1 Crop/Year)	5806	58.1	0.93
Irrigated: Intensively Cultivated (2 Crops/year)	10335	103.4	1.66
Irrigated: Intermittently Cultivated	3292	32.9	0.53
Natural Forest (closed cover)	148410	1484.1	23.79
Natural Forest (open cover)	50944	509.4	8.16
Permanent Snow	105248	1052.5	16.87
Rainfed Crops (sloping areas)	87	0.9	0.01
Rangeland (grassland/forbs/low shrubs)	158771	1587.7	25.45
Rock Outcrop / Bare Soil	130746	1307.5	20.96
Water Bodies	143	1.4	0.02
	623938	**6239.4**	**100**

TABLE 47
Landcover classification for Alingar watershed



GRAPH 136
Discharge curves on the Alingar River.
Alingar watershed

33. Kunar watershed

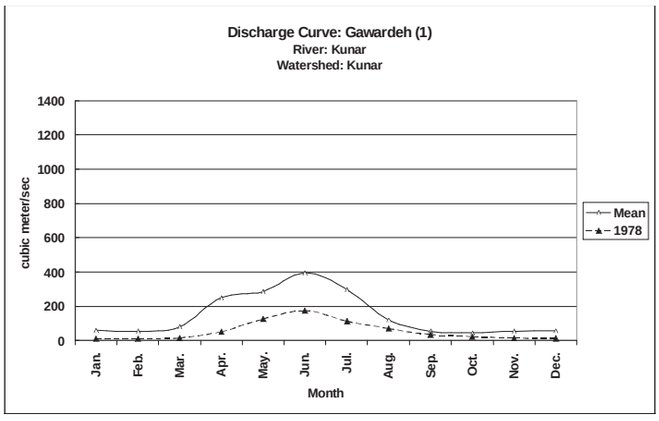
The Kunar watershed drains water from the Karakoram range south of the Wakhan corridor in Pakistan and from the southern slopes of the Hindu Kush range in Nuristan province. The Kunar River takes its source from glaciers in the region of the Teraj Mir Mountains (7,750 m asl) and bears the name of Yarkhun River, which in turn becomes Chitral River once it enters the Chitral Valley in Pakistan. These high mountains bear glaciers that maintain or increase the river flow in summer. The Yarkhun/Chitral River takes the name Kunar River when it crosses the border into Afghanistan in Nari district of Kunar province. The Kunar River has two main tributaries, the Bashgal (also called Landaisin) and Pech Rivers, which take their sources from the high mountains of the Hindu Kush. The Bashgal River is fed by numerous streams in Bargi Matal and Kamdesh district (Nuristan) and joins the Kunar River in Nari district, close to the Pakistan border. Further downstream, the Pech River and its main tributary, the Waigal Rod, join the Kunar River at the centre of Marawara district (Kunar province). In Nagarhar province, just after the gorge of Tangi Tokchi, the Kunar River forms a delta and irrigates the agricultural land of Kama on the left bank and Jalalabad districts on the right bank. The Kunar watershed ends when the Kunar River joins the Kabul River east of Jalalabad town.

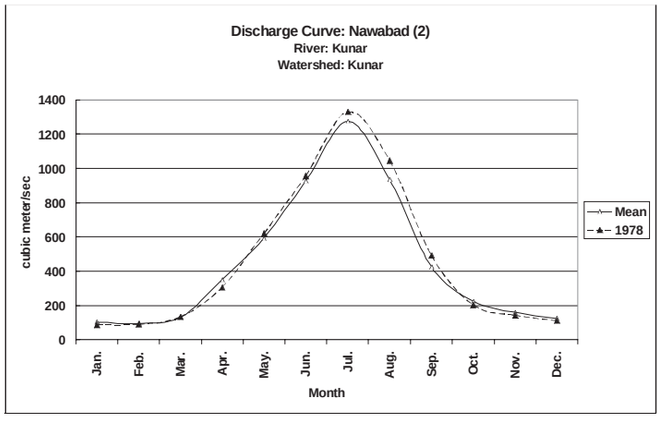
Table 48 shows that Kunar watershed is roughly dominated by natural forests (38 percent in 1993), rangeland (24 percent), permanent snow (18 percent) and bare soil (11 percent). Irrigated land is found in narrow strips on valley floors and represents approximately 3.2 percent of the watershed area. Some rainfed cultivation is also practiced (0.5 percent).

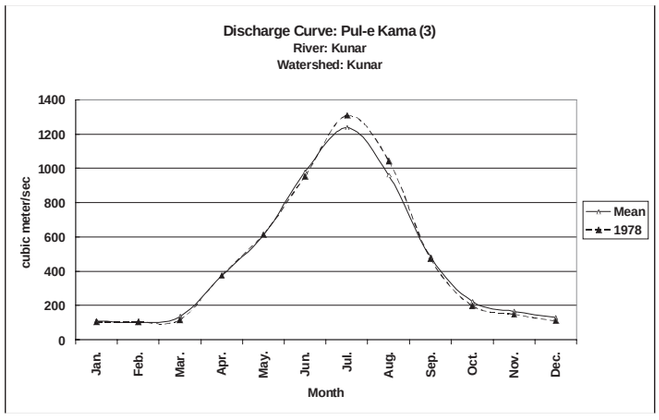
LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	16183	161.8	1.39
Irrigated: Intensively Cultivated (1 Crop/Year)	11863	118.6	1.02
Irrigated: Intensively Cultivated (2 Crops/year)	5897	59.0	0.51
Irrigated: Intermittently Cultivated	19708	197.1	1.69
Marshland Permanently inundated	4829	48.3	0.41
Natural Forest (closed cover)	443677	4436.8	38.04
Natural Forest (open cover)	48246	482.5	4.14
Permanent Snow	209615	2096.1	17.97
Rainfed Crops (sloping areas)	5902	59.0	0.51
Rangeland (grassland/forbs/low shrubs)	277520	2775.2	23.79
Rock Outcrop / Bare Soil	122800	1228.0	10.53
Water Bodies	122	1.2	0.01
	1166362	**11663.6**	**100.00**

TABLE 48
Landcover classification for Kunar watershed

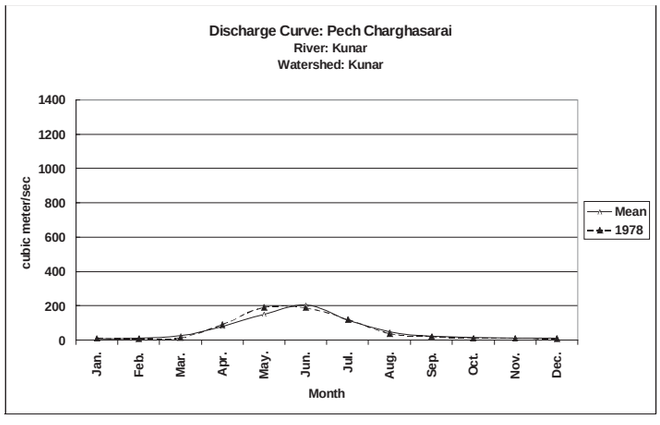
PICTURE 137
View of Kunar River in Asmar. Kunar, July 2003







GRAPHS 137, 138 AND 139
Discharge curves along the Kunar River. Kunar watershed



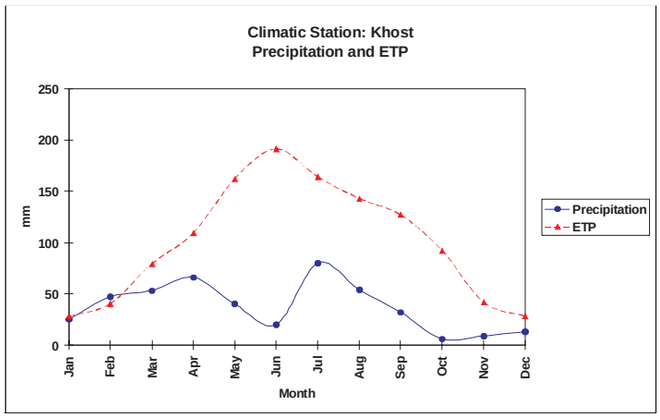
GRAPH 140
Discharge curves along the Pech River, a tributary of the Kunar River. Kunar watershed

34. Shamal watershed

The Shamal watershed drains water from the Sulaiman Mounts in Paktika and Khost provinces. The Shamal River takes its source from a multitude of streams that join near Khost province centre. The main tributary of the Shamal River is the Tangay or Spera River, taking its source from Surobi and Urgun districts of Paktika province and flowing northeast toward Khost. The Tangay meets the Shamal River in the Nadir Shah Kot district of Khost. Other tributaries include the Ghorumbay, Pir Jani Khwara, Matun or Khost Sin and Kerkin Khwar. Hydrographic data from a total of sixteen hydrological stations exist for most of the small torrents in the Shamal watersheds.

The Shamal watershed includes two other rivers, the Gabertoy (also Gaber or Kurram) and Bermal, which join the Shamal River in Pakistan. The Gabertoy River originates from the Spin Ghar Mountains in the district of Azra and Jaji district of Paktia province, where a number of torrents flow south and meet at Lija Mangal district centre. Here the river takes the name of Gabertoy and changes its direction eastward. The Gabertoy is called Kurram River in Pakistan. The Bermal River originates and flows in Barmal district in Paktika. The river flows directly into Pakistan.

The Shomal watershed faces toward the Indian sub-continent and is influenced by the monsoon season, thus benefiting from the heavy rainfalls in summer (see Graph 137). Graphs 138 and 139 show that the Shomal River has a first peak of water flow in the winter months of February-April and a second peak in summer, in July and August.

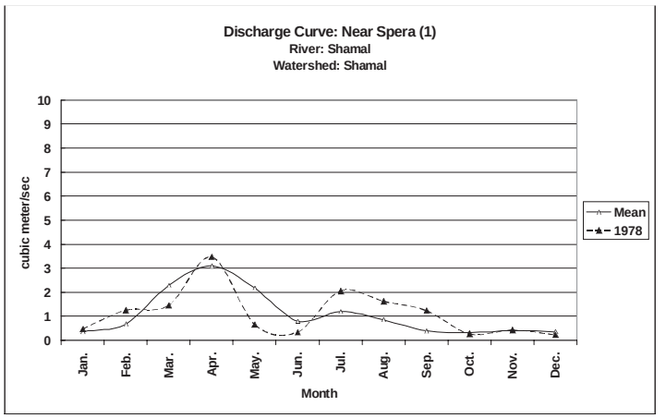


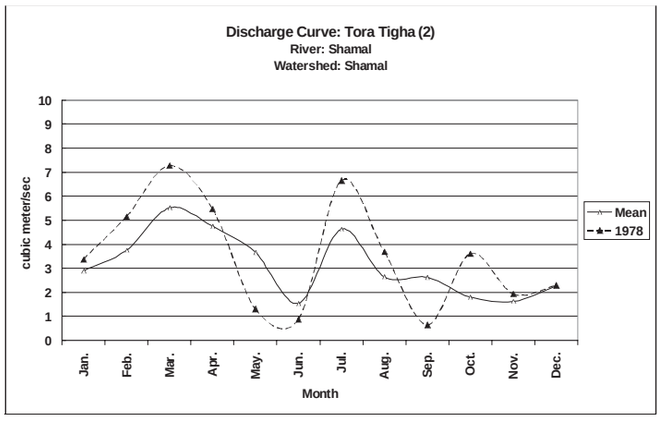
GRAPH 141
Precipitation and ETP in Khost

Table 49 shows that Shamal watershed is dominated by rangeland (49 percent) and natural forest (33 percent). Irrigated land is found in narrow strips on valley floors and represents approximately 6 percent of the watershed area. Some rainfed cultivation is also practised (1.6 percent).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	35365	353.6	3.59
Irrigated: Intensively Cultivated (1 Crop/Year)	39859	398.6	4.04
Irrigated: Intermittently Cultivated	19411	194.1	1.97
Marshland Permanently inundated	1119	11.2	0.11
Natural Forest (closed cover)	261575	2615.7	26.54
Natural Forest (open cover)	59344	593.4	6.02
Rainfed Crops (flat-lying areas)	12955	129.5	1.31
Rainfed Crops (sloping areas)	2400	24.0	0.24
Rangeland (grassland/forbs/low shrubs)	483493	4834.9	49.06
Rock Outcrop / Bare Soil	69718	697.2	7.07
Settlements	152	1.5	0.02
Water Bodies	113	1.1	0.01
	985504	**9855.0**	**100.00**

TABLE 49
Landcover classification for Shamal watershed





GRAPHS 142 AND 143
Discharge curves along the Shamal River. Shamal watershed

35. Gomal watershed

The Gomal Rod River drains water from numerous streams from the Sulaiman Mounts of Gomal district in Paktika province. A small tributary to the Gomal Rod, the Kundur Mandeh (or Kundar Rod) takes it source from Waza Kama and Wor Mamay district of Paktika and joins the Gomal River just on the border with Pakistan. There is no hydrological data for the Gomal Rod watershed.

Table 50 shows that Gomal watershed is dominated by bare soil (57 percent) and rangeland (40 percent). Irrigated land is found in narrow strips on valley floors and represents approximately 0.7 percent of the watershed area. Some rainfed cultivation is also practised (0.2 percent).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Degenerate Forest/High Shrubs	13556	135.6	1.50
Irrigated: Intensively Cultivated (1 Crop/Year)	438	4.4	0.05
Irrigated: Intermittently Cultivated	5607	56.1	0.62
Marshland Permanently inundated	139	1.4	0.02
Marshland Seasonal	4904	49.0	0.54
Natural Forest (open cover)	9303	93.0	1.03
Rainfed Crops (flat-lying areas)	1852	18.5	0.21
Rainfed Crops (sloping areas)	47	0.5	0.01
Rangeland (grassland/forbs/low shrubs)	356022	3560.2	39.50
Rock Outcrop / Bare Soil	509461	5094.6	56.52
Settlements	24	0.2	0.00
	901352	**9013.5**	**100.00**

TABLE 50
Landcover classification for Gomal watershed

36. Pishin Lora watershed

The Pishin Lora watershed is located in the southeastern corner of Kandahar province in the Shorabak district, at the edge of the sand dunes of Registan. The Pishin Lora River originates from small mountain ranges on both sides of the Afghan-Pakistan border. The Pishin Lora forms a small lake, the Hamum-i Lora, which then flows into Shorabak district in Afghanistan. When it carries water the Pishin Lora Rod flows into Pakistan to the north of Quetta along the Khwadja Mountains. There are no hydrological and climatic data available for Pishin Lora watershed.

Table 51 shows that the Pishin Lora watershed is largely dominated by bare land, 76 percent of which is rock and sand. Irrigated land represents 12.1 percent of the total surface of the watershed, but most of it is intermittently cultivated, as crops are planted only when rainfall is sufficient to create overflow of the Pishin Lora into multitudes of small canals. Rainfed cultivation (10.9 percent) is also practiced.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intermittently Cultivated	50694	506.9	12.1
Marshland Permanently inundated	2531	25.3	0.6
Marshland Seasonal	2457	24.6	0.6
Rainfed Crops (flat-lying areas)	5480	54.8	1.3
Rangeland (grassland/forbs/low shrubs)	40374	403.7	9.6
Rock Outcrop / Bare Soil	239010	2390.1	56.8
Sand Covered Areas	501	5.0	0.1
Sand Dunes	79306	793.1	18.9
Settlements	172	1.7	0.0
Water Bodies	38	0.4	0.0
	420563	**4205.6**	**100.0**

TABLE 51
Landcover classification for Pishin Lora watershed

VII. NON-DRAINAGE AREAS

37. Dasht-i Margo

Dahst-i Margo ('Desert of Death') is a non-drainage area north of the Sistan-Hilmand watershed. Dasht-i Margo is covered with sand dunes and bare land (Picture 139) and some seasonal marshland. There are some small land depressions that accumulate occasional water from rainfall, and where some reeds and grasses grow (Picture 138).

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Marshland Seasonal	2600	26.0	0.31
Rock Outcrop / Bare Soil	736907	7369.1	87.59
Sand Dunes	101846	1018.5	12.11
	841352	**8413.5**	**100.00**

TABLE 52
Landcover classification for Dasht-i Margo non- drainage area

38. Registan-i Sedi

Registan-i Sedi is a small non-drainage area to the east of Gaod-i Zirreh Lake in the Sistan-Hilmand watershed. Registan-i Sedi is covered with sand dunes and bare land.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Rock Outcrop / Bare Soil	157030	1570.3	26.9
Sand-Covered Areas	108812	1088.1	18.7
Sand Dunes	317028	3170.3	54.4
	582870	**5828.7**	**100.0**

TABLE 53
Landcover classification for Registan-i Sedi non-drainage area

39. Dasht-i Naumed

Dasht-i Naumed is not linked to any river system in Afghanistan, as its water accumulates in a number of depressions forming few lakes and wetlands. The area contains the second-largest lake in Afghanistan, Namaksar. Namakasar is a salt lake that covers nearly 80 sq. km in Afghanistan, and the lake extends to Iran. The lake produces most of the salt for the region and was officially linked to the Ministry of Mines and Industries in 1963. Extraction and collection of salt from this lake is seasonal. After the flood and rainwater have accumulated over spring, mid-June is the usual time at which the salt slabs and grains will have hardened enough and the water may have dried out. This process of extraction progresses until the first major rainfall in October or November, after which the lakeland is back under water.

Table 54 shows that Dasht-i Naumed is chiefly composed of bare soil (98 percent), while the rest includes marshland/water bodies and some intermittently irrigated land.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	31	0.3	0.00
Irrigated: Intermittently Cultivated	1724	17.2	0.08
Marshland Permanently inundated	70	0.7	0.00
Marshland Seasonal	28073	280.7	1.37
Rangeland (grassland/forbs/low shrubs)	7466	74.7	0.36
Rock Outcrop / Bare Soil	2010814	20108.1	97.80
Water Bodies	7947	79.5	0.39
	2056126	**20561.3**	**100.00**

TABLE 54
Landcover classification for Dasht-i Naumed non-drainage area

PICTURE 138
View of a depression in the desert which accumulates rainfall water and allows reeds and some other grasses to grow. Here, along the main road between Farah and Adraskan, 25 May 2003 (N33.30, E62.33, W)

40. Registan

Registan ('Place of Sand') is, as the name indicates, dominated by sand dunes and sand-covered areas (98 percent). In Registan, there are plenty of small depressions that accumulate rare water from rainfall, and where small amounts of reeds and grasses grow (Picture 138). Nomads (Registan kuchi) have made this area their winter quarters for the livestock. There are numerous deep wells out of which water is extracted for both livestock as well as human consumption.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Rock Outcrop / Bare Soil	57743	577.4	2.16
Sand-Covered Areas	847096	8471.0	31.76
Sand Dunes	1762400	17624.0	66.08
	2667239	**26672.4**	**100.00**

TABLE 55
Landcover classification for Registan none drainage area

41. Dasht-i Shortepa

The rivers from the Northern river basin dry up in irrigation canals or desert sands long before reaching the Afghan border and the Amu Darya River. Historically, in the northern Turkistan plain, the river's deltas were close to the Amu Darya. With the development of traditional irrigation schemes centuries ago, these rivers no longer contribute to the Amu Darya, instead drying in canals 50-100 km long[6]. Therefore, a non-drainage area, the Dasth-i Shortepa, exists between the Turkistan basin rivers (Shirin Tagab, Sare Pul, Balkhab and Tashkurghan) and the Amu Darya River.

Dasht-i Shortepa is a narrow strip composed primarily of sand dunes following the Amu Darya River between the Khamyab district in Jawzjan and Qala-i Zal district of Kunduz. However, unlike other non-drainage areas, in Dasht-i Shortepa some irrigated land is practiced along the Amu Darya River. These irrigated lands represent 3.2 percent of the total surface of the non-drainage area. Dasht-i Shortepa also includes some marshland located between the meanders of the Amu Darya River.

LANDCOVER	Area (ha)	Area (sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	13146	131.5	2.24
Irrigated: Intensively Cultivated (2 Crops/year)	585	5.9	0.10
Irrigated: Intermittently Cultivated	4995	50.0	0.85
Marshland Permanently inundated	31170	311.7	5.30
Natural Forest (open cover)	100	1.0	0.02
Rangeland (grassland/forbs/low shrubs)	5676	56.8	0.97
Rock Outcrop / Bare Soil	25128	251.3	4.27
Sand-Covered Areas	133140	1331.4	22.64
Sand Dunes	373699	3737.0	63.56
Settlements	329	3.3	0.06
	587968	**5879.7**	**100.00**

TABLE 56
Landcover classification for Dasht-i Shortepa non-drainage area

PICTURE 139
View of desert that makes up most of the landscape in southern Afghanistan. Here in Farah province.
26 May 2003

[6] J. Humlum, *Ibid.*, 1959.