PART IV

DESCRIPTION OF WATERSHEDS

Picture 84
Aerial view of Panjshir valley in spring 2003. Parwan, 25 March 2003

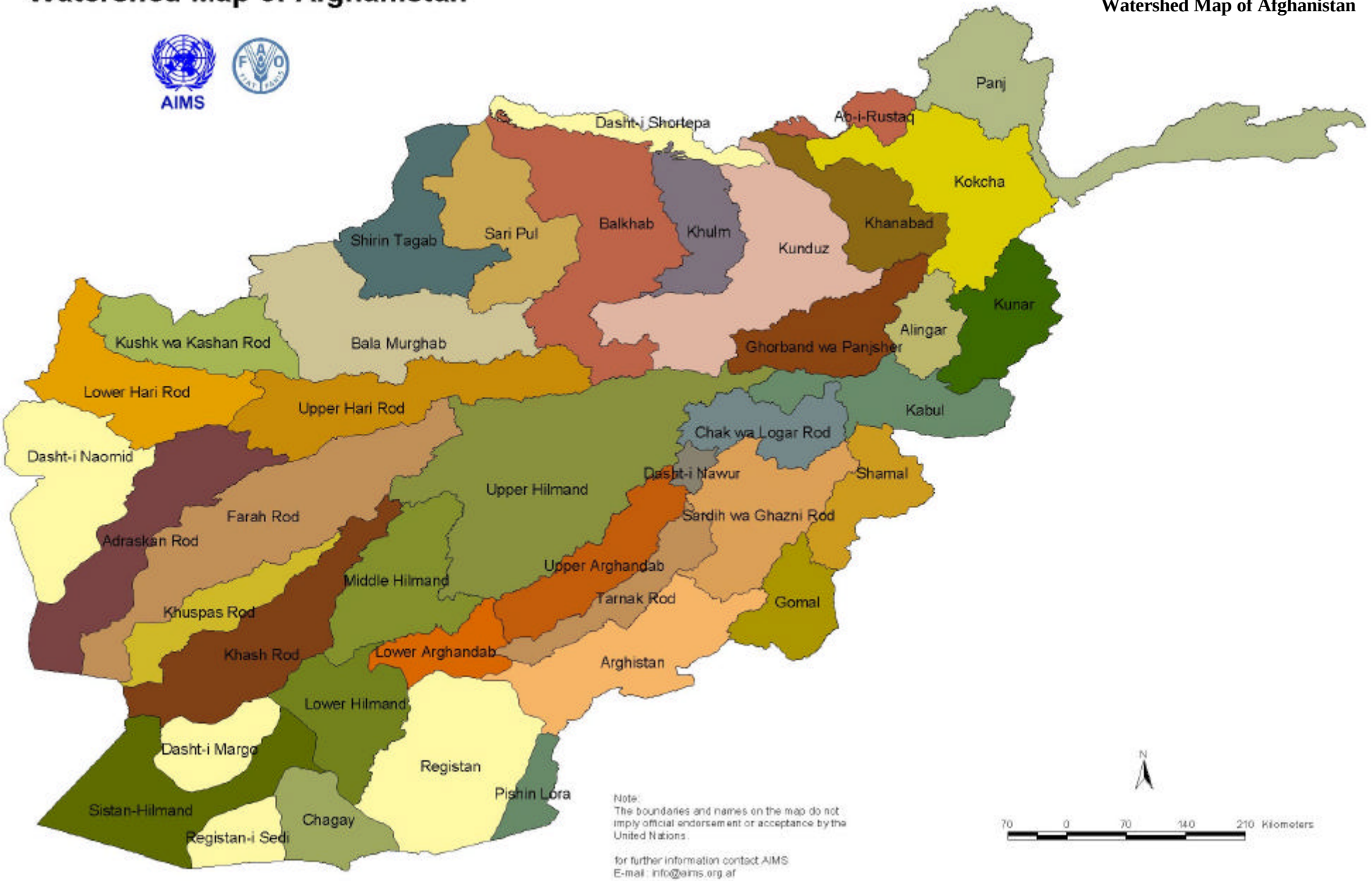
I. MAP AND STATISTICS BY WATERSHED

Part IV of the Watershed Atlas describes the 41 watersheds defined in Afghanistan, which includes 5 none-drainage areas. 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 (MIRWE). The data have been entered by ADB and kindly made available for the Atlas. The scales of the graphs for each watershed, or for different watersheds along the same river (i.e. Hilmand) are presented at the same scale for comparison purposes. Finally, where data wasavailable, graphs on rainfall and ETP have been included.

The tables 12 to 15 present statistics for each watershed and river basin on catchment areas, population, settlements, irrigated and rain-fed farming land, rangeland, lakes and wetlands, snow cover and forest. These statistics have been prepared with database available at AIMS office in Kabul and processed using Arc-View 3.2 software. This data allows comparison and classification based on major characteristics between watersheds and river basins.

The graphs 21 to 32 illustrate the main characteristics on area, population and landcover of each watershed. The graph 21 shows that the Upper Hilmand is the largest watershed in Afghanistan as it covers 46,882 sq. km, while the smallest watershed is Dasht-i Nawur which covers 1618 sq. km. The graphs 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 is by far in Kabul watershed with 276 inhabitants per Sq. km. Ab-i Rustaq, Sardih wa Ghazni, Ghorband wa Panjshir (Shomali plain) and Lower Arghandab watersheds have higher population density with about 100 inhabitants per Sq. km. The graph 25 shows that the permanent snow cover is the highest in Panj, Kokcha and Kunar watersheds. The 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.

Map 10
Watershed Map of Afghanistan



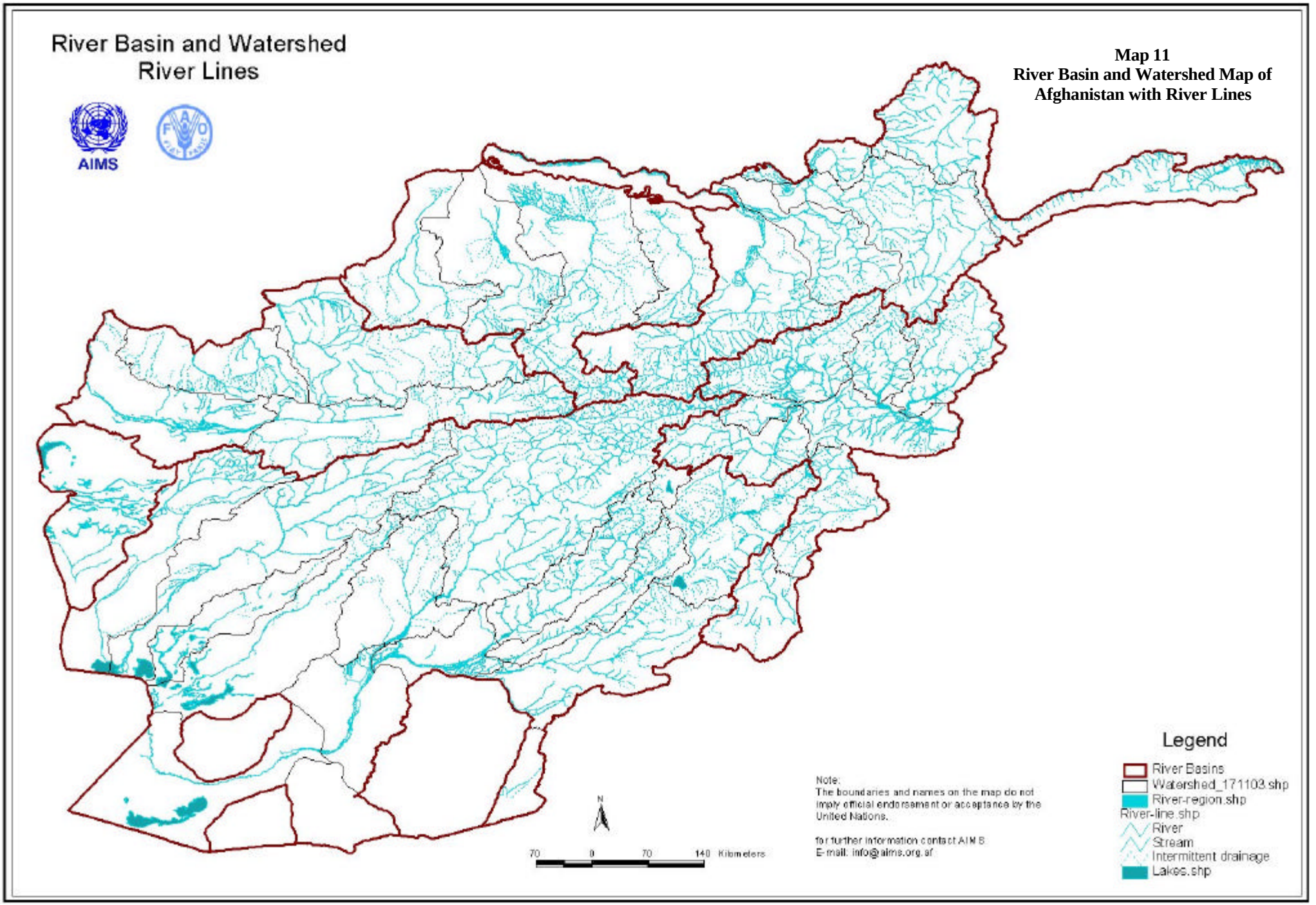

River Basin and Watershed
River Lines
AIMS
Map 11
River Basin and Watershed Map of
Afghanistan with River Lines
Legend
River Basins
Watershed_171103.shp
River-region.shp
River-line.shp
River
Stream
Intermittent drainage
Lakes.shp
Note:
The boundaries and names on the map do not imply official endorsement or acceptance by the United Nations.
for further information contact AIMS
E-mail: info@aims.org.af
70 0 70 140 Kilometers

Table 12
Area in Hectare and Square Kilometer by Watershed and Main River Names

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 (Indus)	Alingar	Alingar	623938	6239	0.97
Kabul (Indus)	Chak wa Logar Rod	Chak wa Logar Rod	996794	9968	1.54
Kabul (Indus)	Ghorband wa Panjshir	Panjshir	1296370	12964	2.01
Kabul (Indus)	Gomal	Gomal	901396	9014	1.40
Kabul (Indus)	Kabul	Kabul	1299728	12997	2.01
Kabul (Indus)	Kunar	Kunar	1166449	11664	1.81
Kabul (Indus)	Pishin Lora	Pishin Lora	420588	4206	0.65
Kabul (Indus)	Shamal	Shamal	985566	9856	1.53
Kabul (Indus) 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**
None Drainage Area	Dasht-i Margo	None Drainage Area	841352	8414	1.30
None Drainage Area	Dasht-i Naumed	None Drainage Area	2056138	20561	3.18
None Drainage Area	Dasht-i Shortepa	None Drainage Area	588028	5880	0.91
None Drainage Area	Registan	None Drainage Area	2667244	26672	4.13
None Drainage Area	Registan-i Sedi	None Drainage Area	582873	5829	0.90
None Drainage Area Total			**6735636**	**67356**	**10.43**
Grand Total			**64580283**	**645803**	**100.00**

Table 13
Population and Settlements by Watershed

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 (Indus)	Alingar	6239	465	1.49	287089	1.39	46.01
Kabul (Indus)	Chak wa Logar Rod	9968	1212	3.88	607283	2.93	60.92
Kabul (Indus)	Ghorband wa Panjshir	12964	1651	5.29	1440757	6.96	111.14
Kabul (Indus)	Gomal	9014	190	0.61	16316	0.08	1.81
Kabul (Indus)	Kabul	12997	1628	5.21	3591820	17.36	276.35
Kabul (Indus)	Kunar	11664	712	2.28	600237	2.90	51.46
Kabul (Indus)	Pishin Lora	4206	43	0.14	11320	0.05	2.69
Kabul (Indus)	Shamal	9856	1138	3.64	630152	3.05	63.94
Kabul (Indus) 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**
None Drainage Area	Dasht-i Margo	8414	0	0.00	0	0.00	0.00
None Drainage Area	Dasht-i Naumed	20561	23	0.07	17441	0.08	0.85
None Drainage Area	Dasht-i Shortepa	5880	46	0.15	134187	0.65	22.82
None Drainage Area	Registan	26672	0	0.00	0	0.00	0.00
None Drainage Area	Registan-i Sedi	5829	0.00	0.00	0.00	0.00	0.00
None 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 14
Snow Cover, Water Bodies and Marshlands 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 (Indus)	Alingar	6239	1052.48	7.20	1.4	0.06	0.0	0.00
Kabul (Indus)	Chak wa Logar Rod	9968	0.00	0.00	2.3	0.09	31.8	0.76
Kabul (Indus)	Ghorband wa Panjshir	12964	871.86	5.96	10.7	0.43	0.5	0.01
Kabul (Indus)	Gomal	9014	0.00	0.00	0.0	0.00	50.4	1.21
Kabul (Indus)	Kabul	12997	53.69	0.37	7.3	0.29	71.8	1.72
Kabul (Indus)	Kunar	11664	2096.15	14.33	1.2	0.05	48.3	1.16
Kabul (Indus)	Pishin Lora	4206	0.00	0.00	0.4	0.02	49.9	1.19
Kabul (Indus)	Shamal	9856	0.00	0.00	1.1	0.05	11.2	0.27
Kabul (Indus) 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**
None Drainage Area	Dasht-i Margo	8414	0.00	0.00	0.0	0.00	26.0	0.62
None Drainage Area	Dasht-i Naumed	20561	0.00	0.00	79.5	3.20	281.4	6.74
None Drainage Area	Dasht-i Shortepa	5880	0.00	0.00	0.0	0.00	311.7	7.46
None Drainage Area	Registan	26672	0.00	0.00	0.0	0.00	0.0	0.00
None Drainage Area	Registan-i Sedi	5829	0.00	0.00	0.0	0.00	0.0	0.00
None 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**

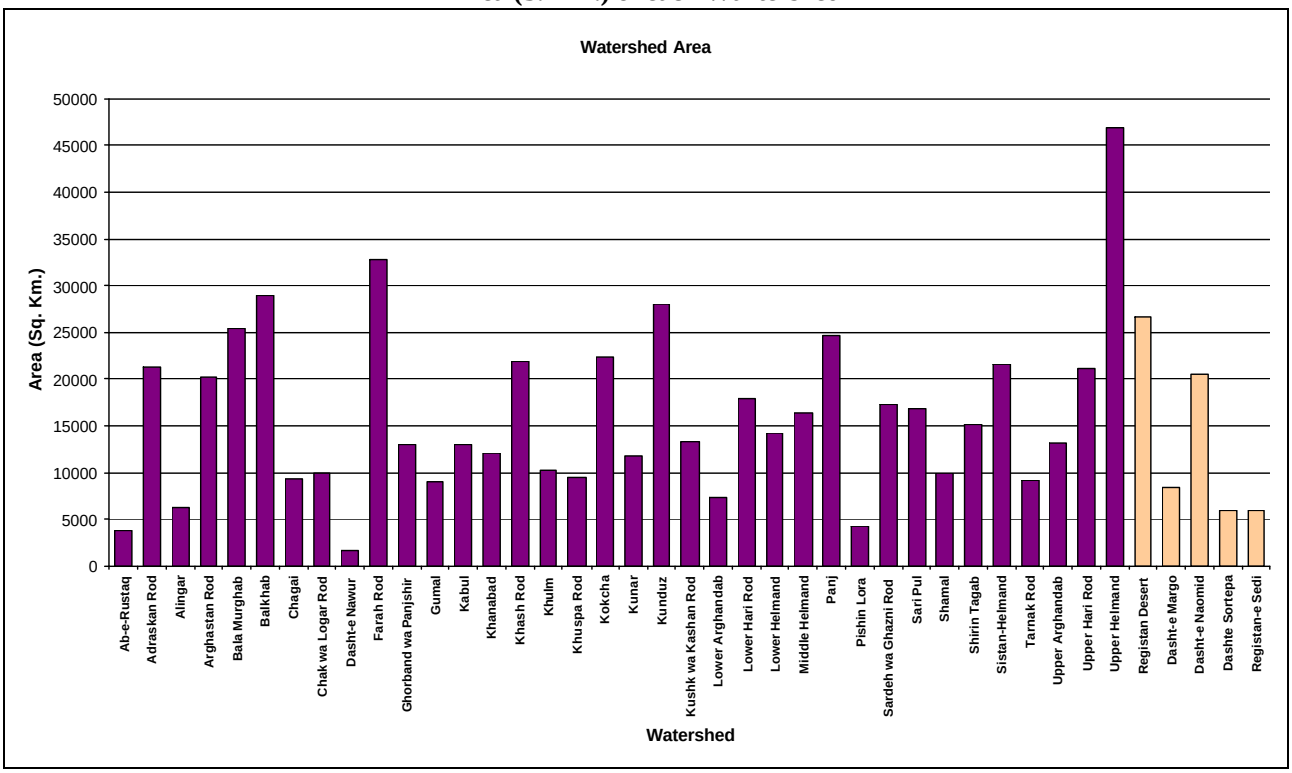
*** Permanently and Seasonally inundated**

Table 15
Agriculture Land, Rangeland and Forest Cover by Watershed

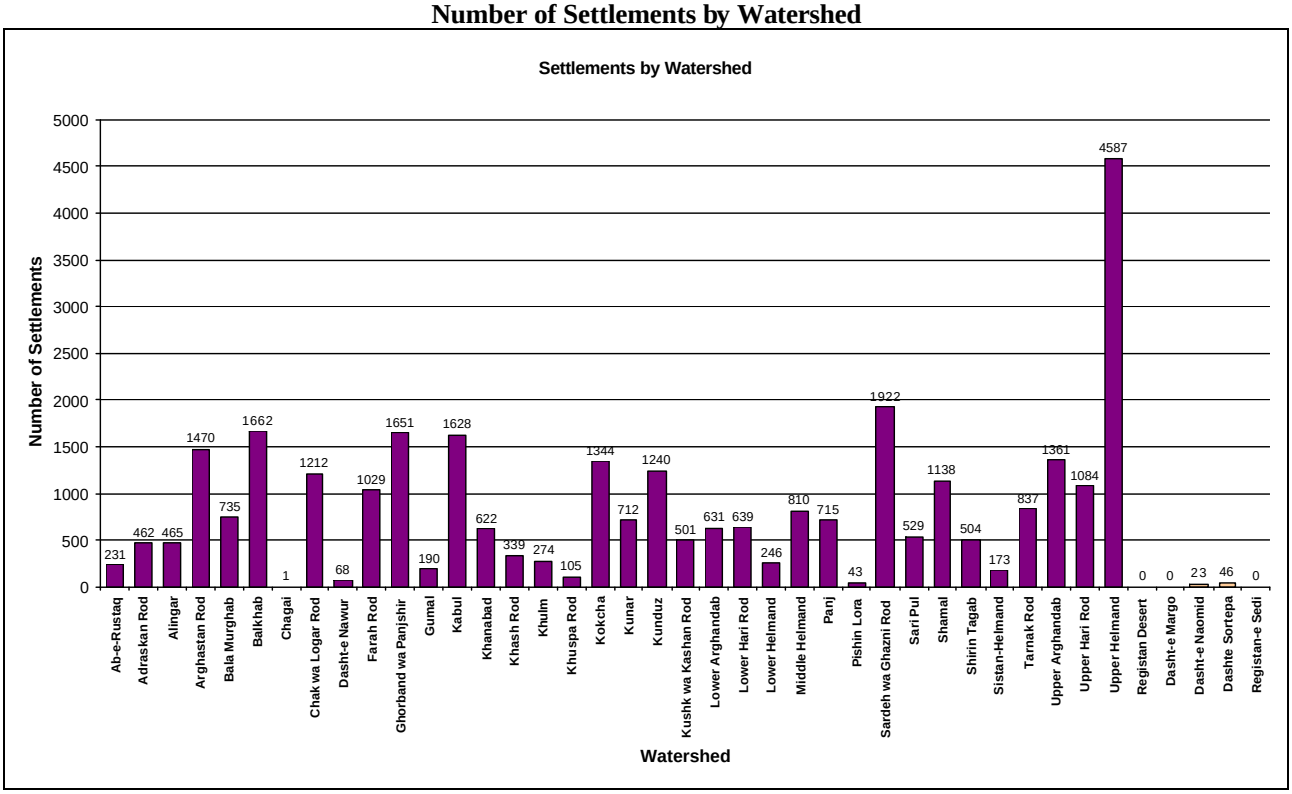
River Basin	Watershed	Irrigated land* (sq.km)	%	Intermit-tently Cultivated (sq.km)	%	Rain-fed Land ** (sq.km)	%	Range-land (sq.km)	%	Forest Cover *** (sq.km)	%
Amu Darya	Ab-i-Rustaq	644	4.13	35	0.21	1649	3.65	620	0.21		0.00
Amu Darya	Khanabad	932	5.98	25	0.15	2186	4.84	5872	2.01	331	2.54
Amu Darya	Kokcha	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 (Indus)	Alingar	161	1.03	33	0.20	1	0.00	1588	0.54	2095	16.03
Kabul (Indus)	Chak wa Logar Rod	489	3.13	235	1.43	520	1.15	8541	2.93	0	0.00
Kabul (Indus)	Ghorband wa Panjshir	895	5.74	195	1.18	188	0.42	9170	3.14	105	0.80
Kabul (Indus)	Gomal	4	0.03	56	0.34	19	0.04	3560	1.22	229	1.75
Kabul (Indus)	Kabul	934	5.99	363	2.20	44	0.10	6280	2.15	1068	8.18
Kabul (Indus)	Kunar	178	1.14	197	1.20	573	1.27	2775	0.95	5081	38.88
Kabul (Indus)	Pishin Lora		0.00	507	3.08	55	0.12	404	0.14	0	0.00
Kabul (Indus)	Shamal	399	2.56	194	1.18	154	0.34	4835	1.66	3563	27.27
Kabul (Indus) 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**
None Drainage Area	Dasht-i Margo		0.00		0.00	0	0.00		0.00	0	0.00
None Drainage Area	Dasht-i Naumed	0	0.00	17	0.10	0	0.00	75	0.03	0	0.00
None Drainage Area	Dasht-i Shortepa	137	0.88	50	0.30	0	0.00	57	0.02	1	0.01
None Drainage Area	Registan		0.00		0.00	0	0.00		0.00	0	0.00
None Drainage Area	Registan-i Sedi		0.00		0.00	0	0.00		0.00	0	0.00
None 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 (1 and 2 crops per year)**
**** Sloping and Flat Laying Areas**
***** Degenerated, Open and Closed Forest Cover**

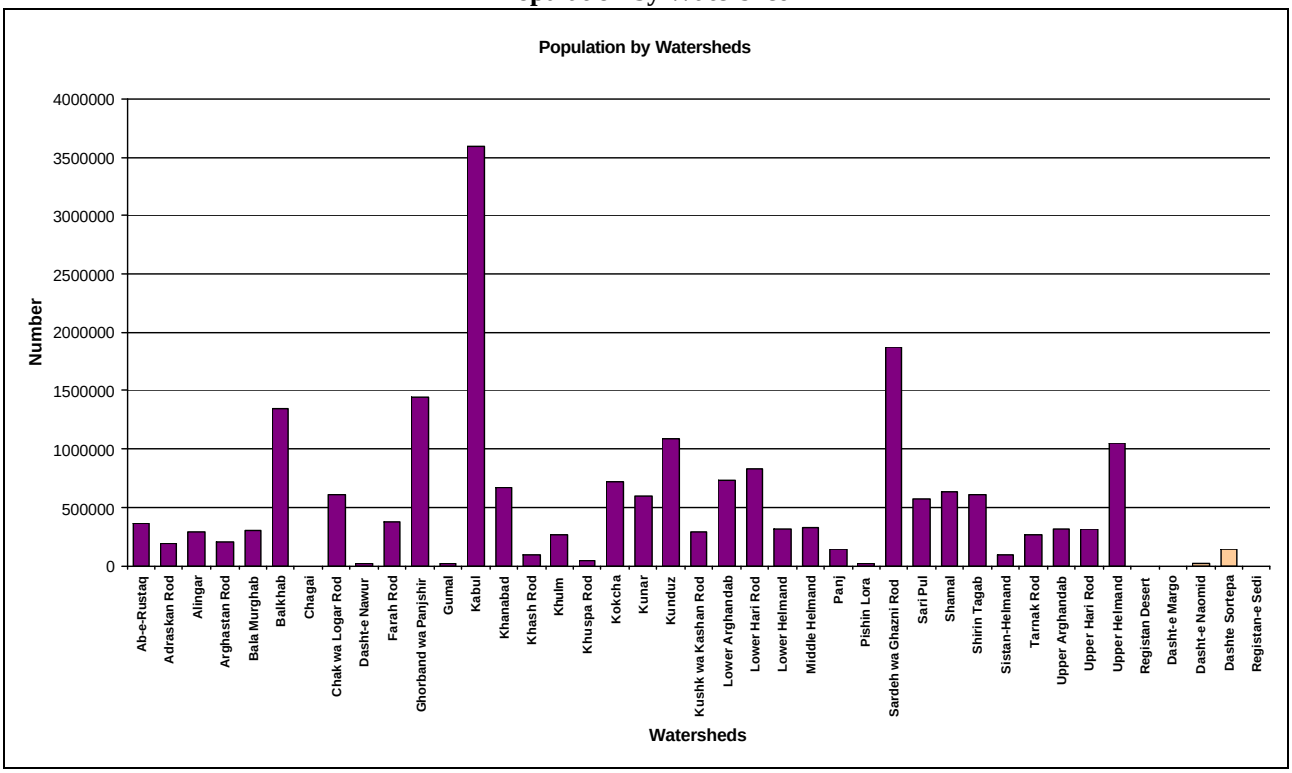
Graph 21
Area (S. Km.) of each Wartershed



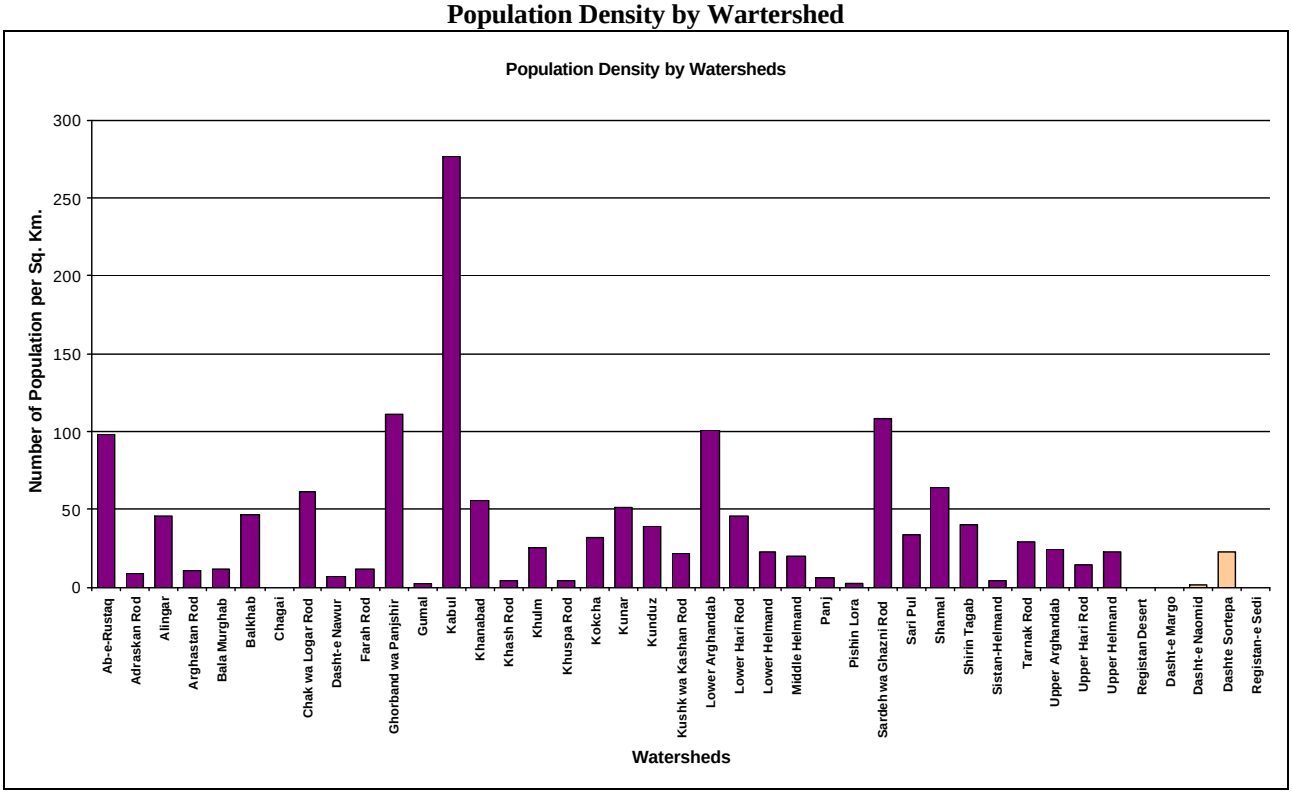
Graph 22
Number of Settlements by Watershed



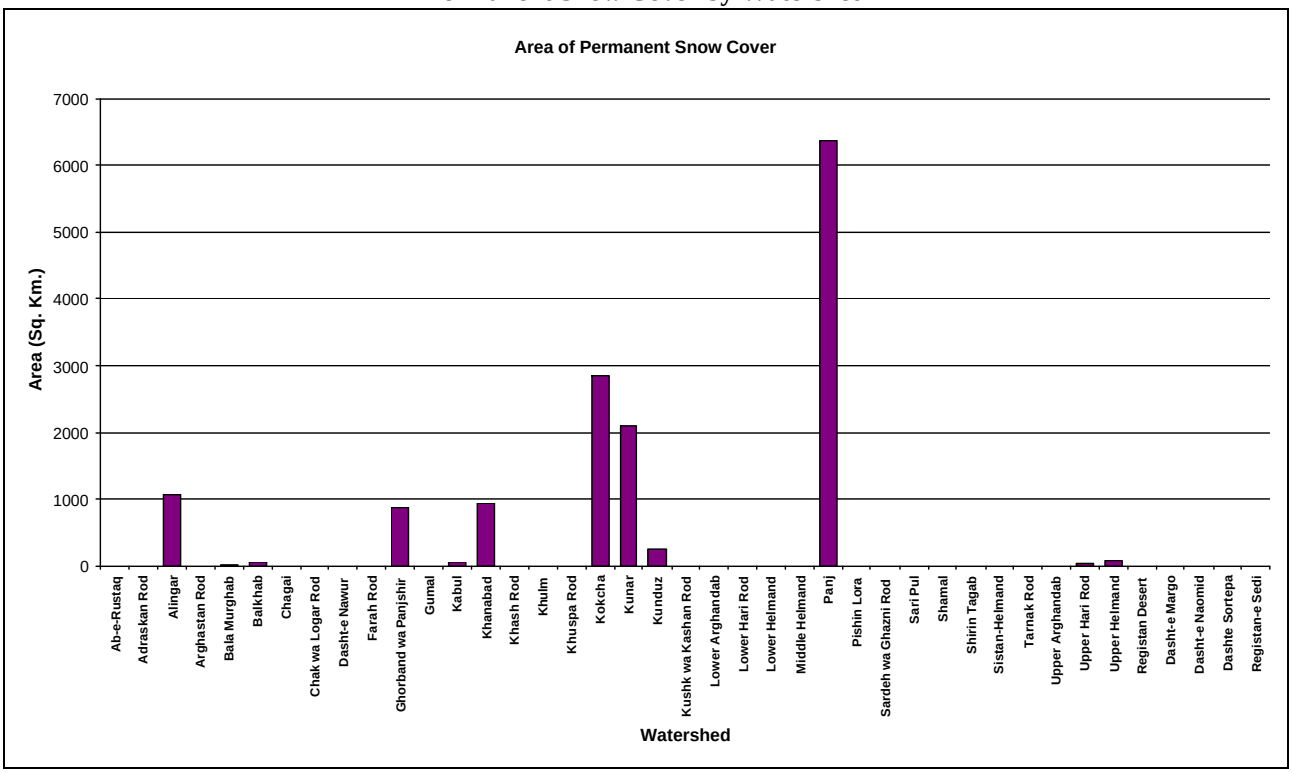
Graph 23
Population by Watershed



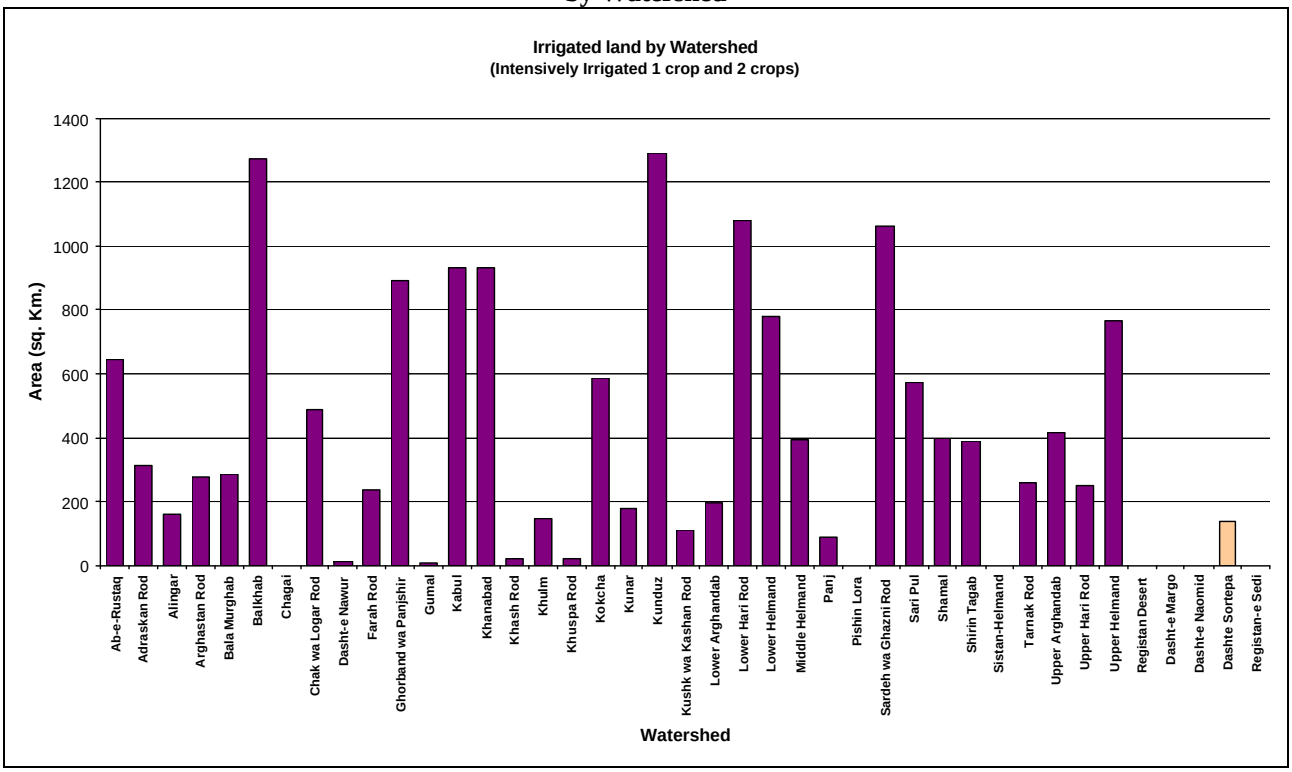
Graph 24
Population Density by Wartershed



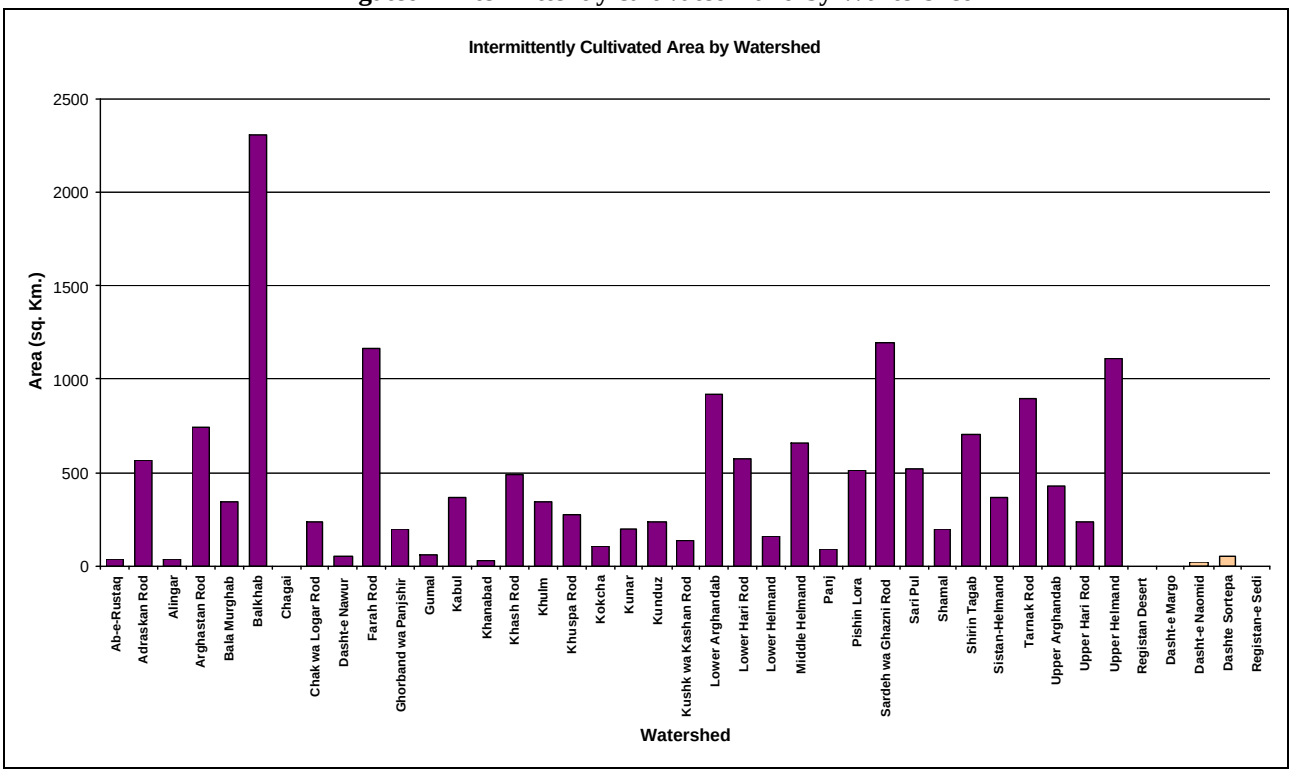
Graph 25
Permanent Snow Cover by Watershed



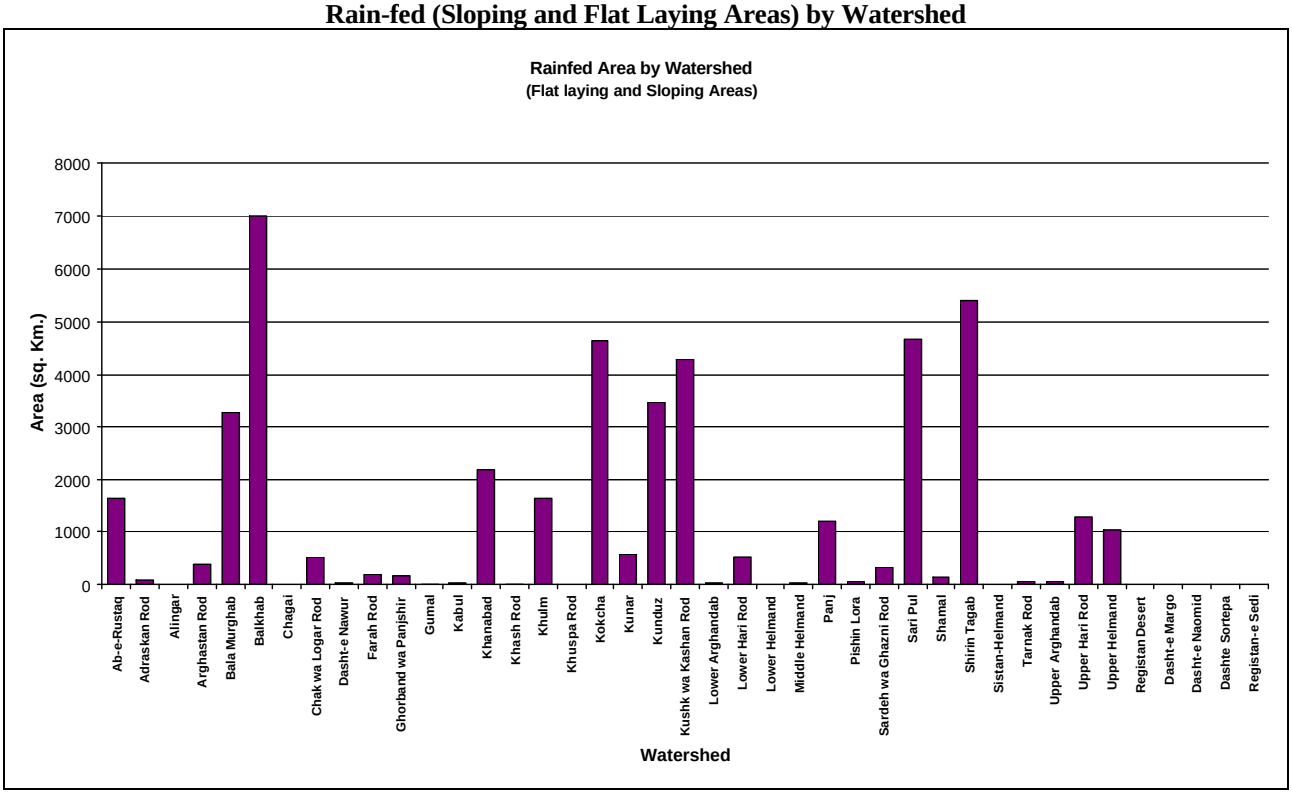
Graph 26
Irrigated Land (Intensively cultivated 1 Crop per Year and Intensively cultivated 2 Crops per Year) by Watershed



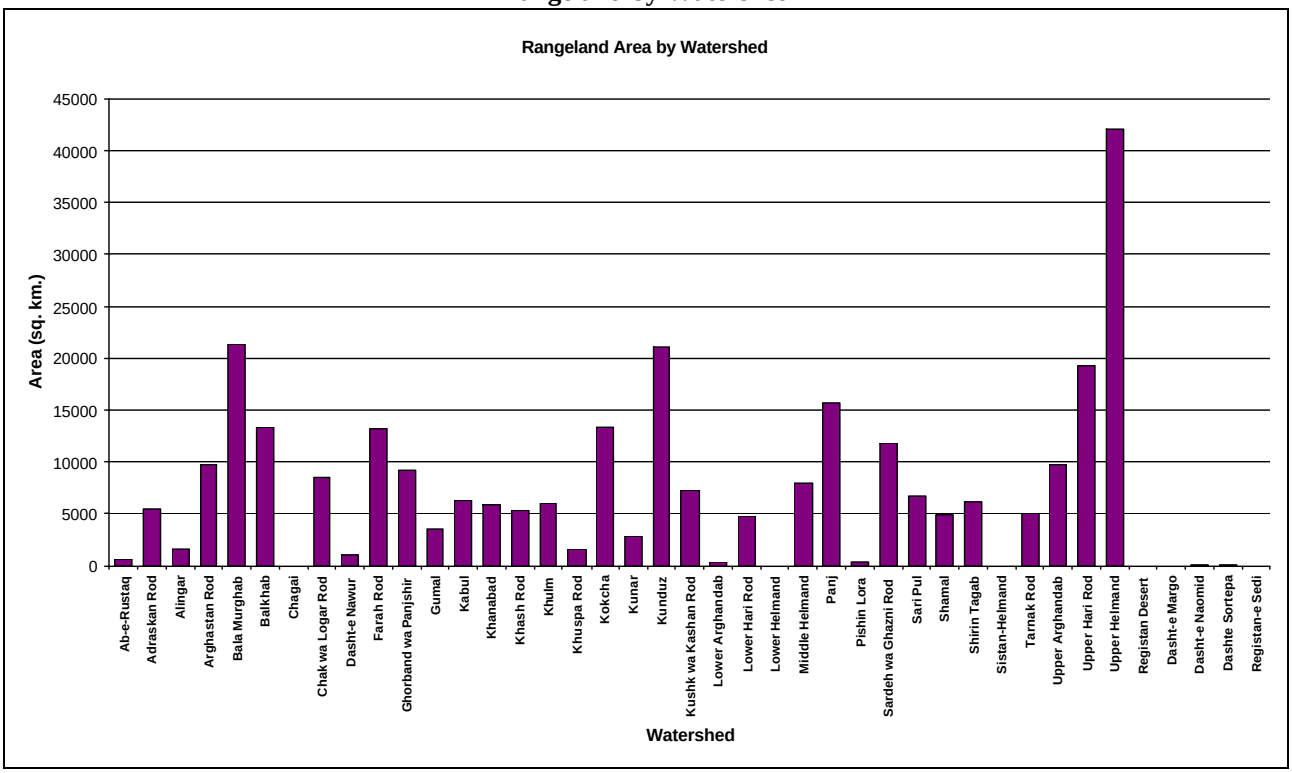
Graph 27
Irrigated – Intermittently cultivated Land by Wartershed



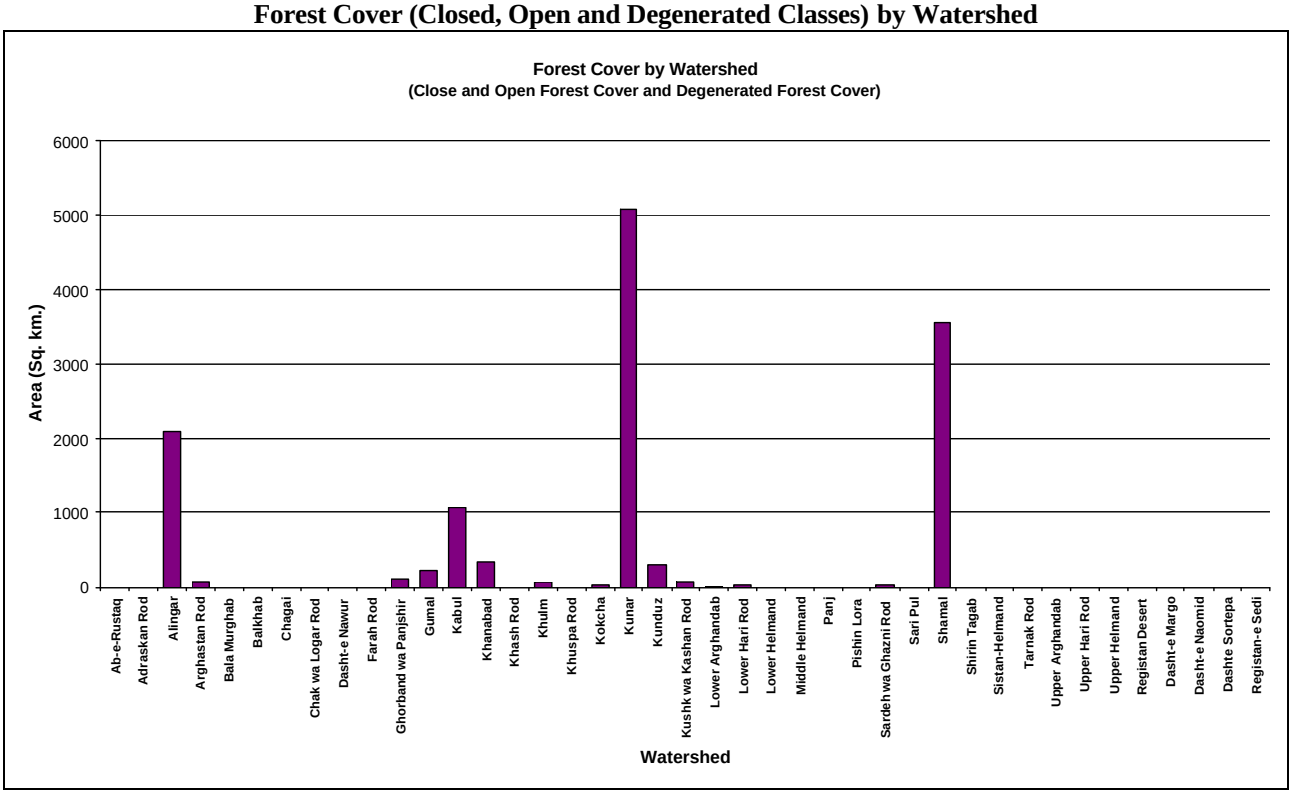
Graph 28
Rain-fed (Sloping and Flat Laying Areas) by Watershed



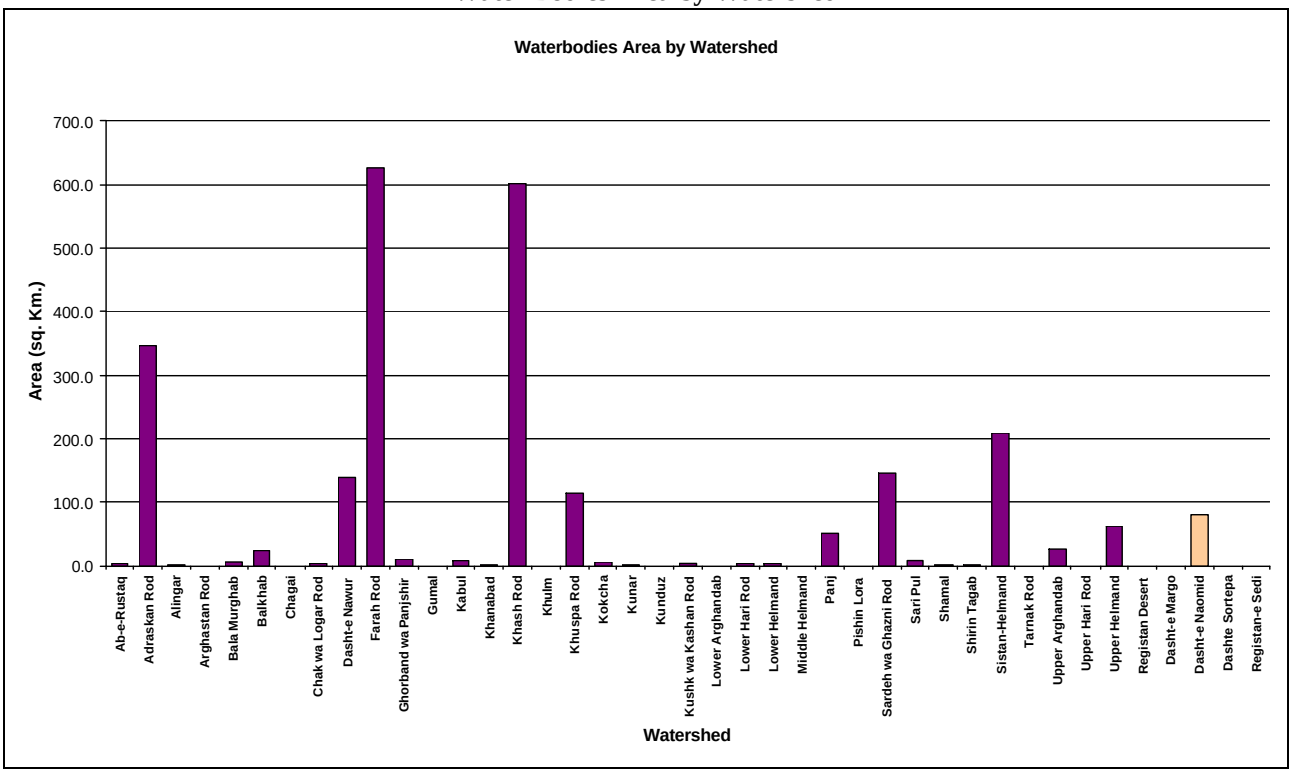
Graph 29
Rangeland by Watershed



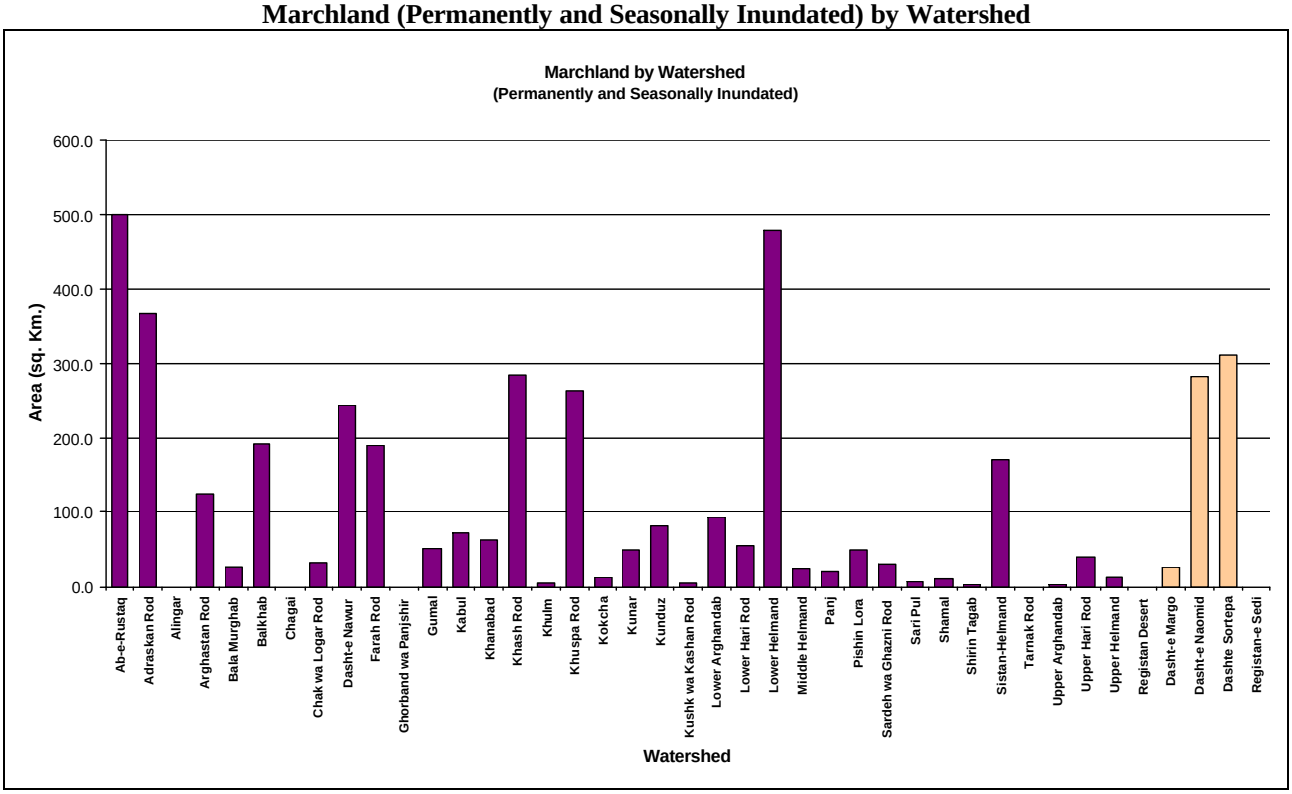
Graph 30
Forest Cover (Closed, Open and Degenerated Classes) by Watershed



Graph 31
Water Bodies Area by Watershed



Graph 32
Marchland (Permanently and Seasonally Inundated) by Watershed



II. AMU DARYA RIVER BASIN

1. Panj Watershed

The Panj watershed includes all the North-Eastern rivers, (except the Kokcha and Ab-i Rustaq rivers), that join the Amu Darya rivers in the North-East. The main rivers of the Panj watershed are the Wakhan Rod (picture 87) and Ab-i Pamir which take their source in the High Pamir of Afghanistan and Tajikistan. The Ab-i Pamir river takes its source from the Zur Kol lake, while the Wakhan Rod from Kawl-i Chaqmaqtin lake. When both rivers join, their names changes to Panj (or Ab-i Panja) river (picture 88). On the Tadjik 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 the rivers flows 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 lakes faces Tajikistan and its water flow directly to the Panj river and is not the source of Shewa river. The Shewa river takes its sources in the pastureland of Shewa West of the lake. Unfortunately, no data on river discharge in the Panj watershed is 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 (N37.41, E71.32, SE)

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

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

Table 16
Landcover classification for Panj 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
Rain-fed Crops (flat lying areas)	5094	50.9	0.21
Rain-fed 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**

Pictures 87 and 88
On the left, Wakhan Rod river at the entrance of the Afghan Pamir in the Wakhan corridor. 2 September 2003 (N37.02, E72.68, E). On the right, 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)

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) districts (Badakhshan province). The Tagab-i Anjuman and Tagab-i Munjan rivers meet east of the district center (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 and joins the later at Khwaja Ghar (Takhar province) at the feet of the Greek city of Ai Khanum, after having flown for 320 kilometers (picture 90). The high Hindu Kush oriental mountains bear glaciers that maintain the river flow in summer.

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)

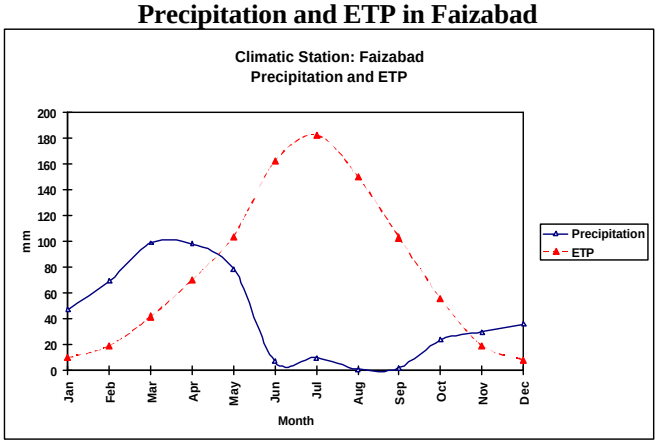
Picture 90
View of the Kokcha river at Khwaja Ghar district. On the right, the Kokcha joins the Amu Darya. The plain in Khwaja Ghar district is intensively cultivated with winter wheat as a first crop and paddy rice as a second crop. Takhar, 8 September 2003 (N37.16, E69.42, W)

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

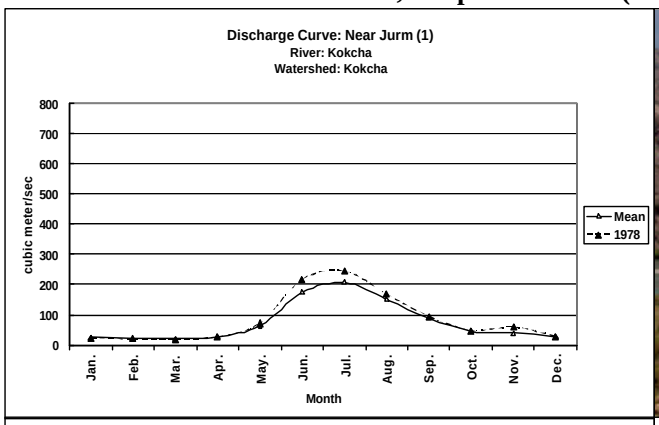
Table 17
Landcover classification for Kokcha watershed

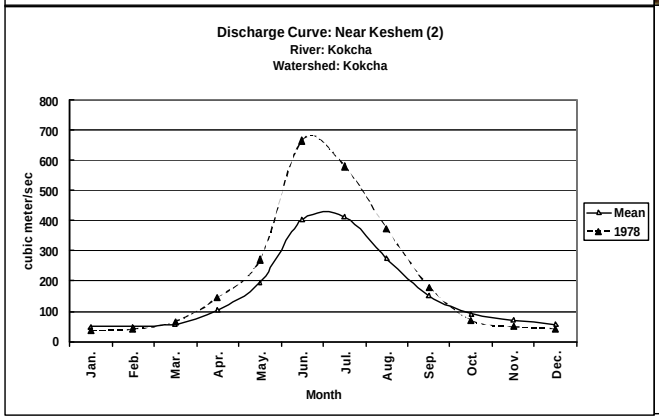
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Degenerate Forest/High Shrubs	702	7.0	0.03
Fruit Trees	4326	43.3	0.19
Irrigated: Intensively Cultivated (1 Crop/Year)	45772	457.7	2.05
Irrigated: Intensively Cultivated (2 Crops/year)	12815	128.1	0.57
Irrigated: Intermittently Cultivated	10235	102.3	0.46
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
Rain-fed Crops (flat lying areas)	54234	542.3	2.42
Rain-fed 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**

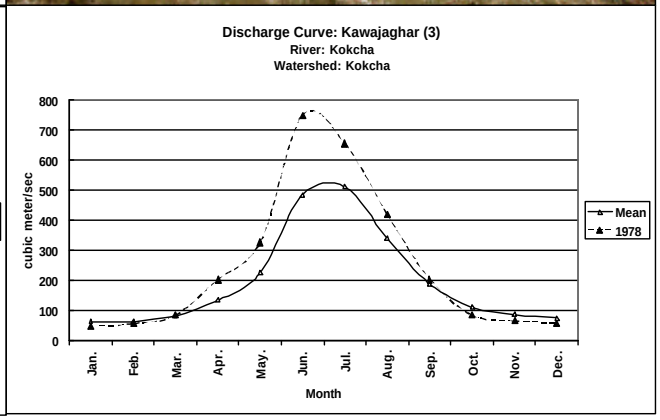
Graph 33
Precipitation and ETP in Faizabad



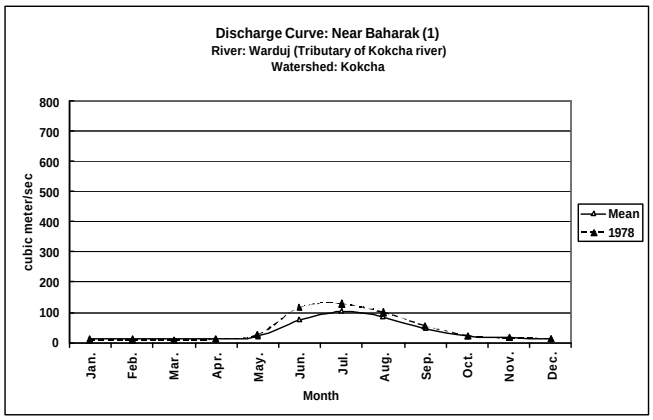
Graphs 34, 35 and 36 and Picture 91
Discharge curves along the Kokcha river and view of the Kokcha river above Jurm. Note at the back, the Ser-i Hawzde forest, 1 September 2003 (N36.04, E70.72, N). Kokcha watershed

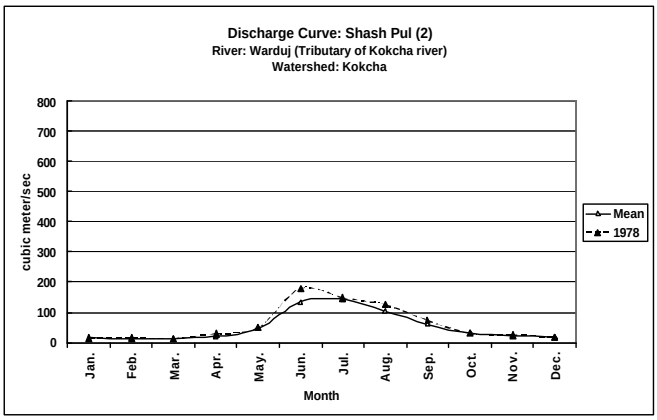




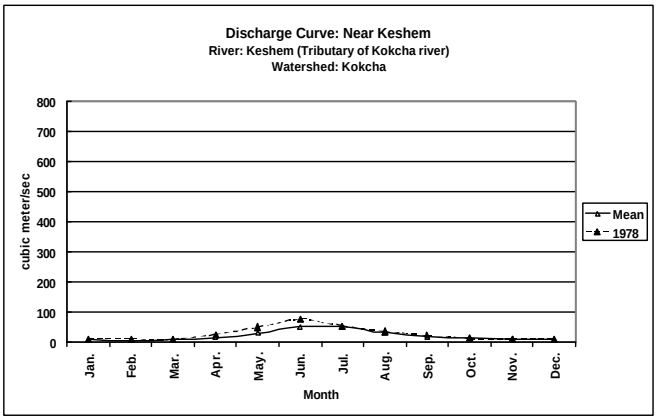


Graphs 37 and 38
Discharge curves along the Warduj river, a tributary to the Kokcha river. Kokcha watershed





Graph 39
Discharge curves along the Keshem river, a tributary to 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 (Takhar province) and Islam Qala (Kunduz province). In between -the irrigated area of Archi- is not part of this watershed as it is irrigated by the Kokcha river through the Archi canal taking its source in Khwaja Ghar (Takahr province). No hydrological stations were placed in the Ab-i Rustaq watershed. The watershed comprises an important natural resource; the *tugai* forest growing between the meanders of the Amu Darya river in Afghanistan and Tajikistan.

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

Table 18
Landcover classification for Ab-i Rustaq watershed

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
Rain-fed Crops (flat lying areas)	37271	372.7	10.16
Rain-fed 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**

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 and 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 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 hectares of the surrounding area and generate 11.9 MW hydro-power. To date, the dam was not completed.

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

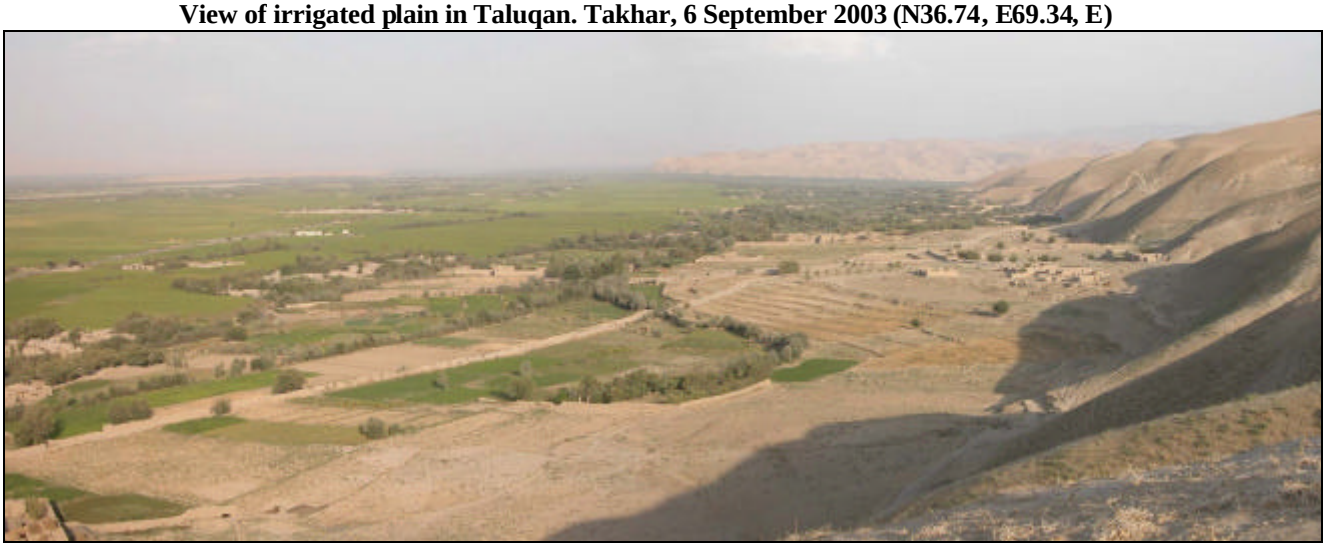


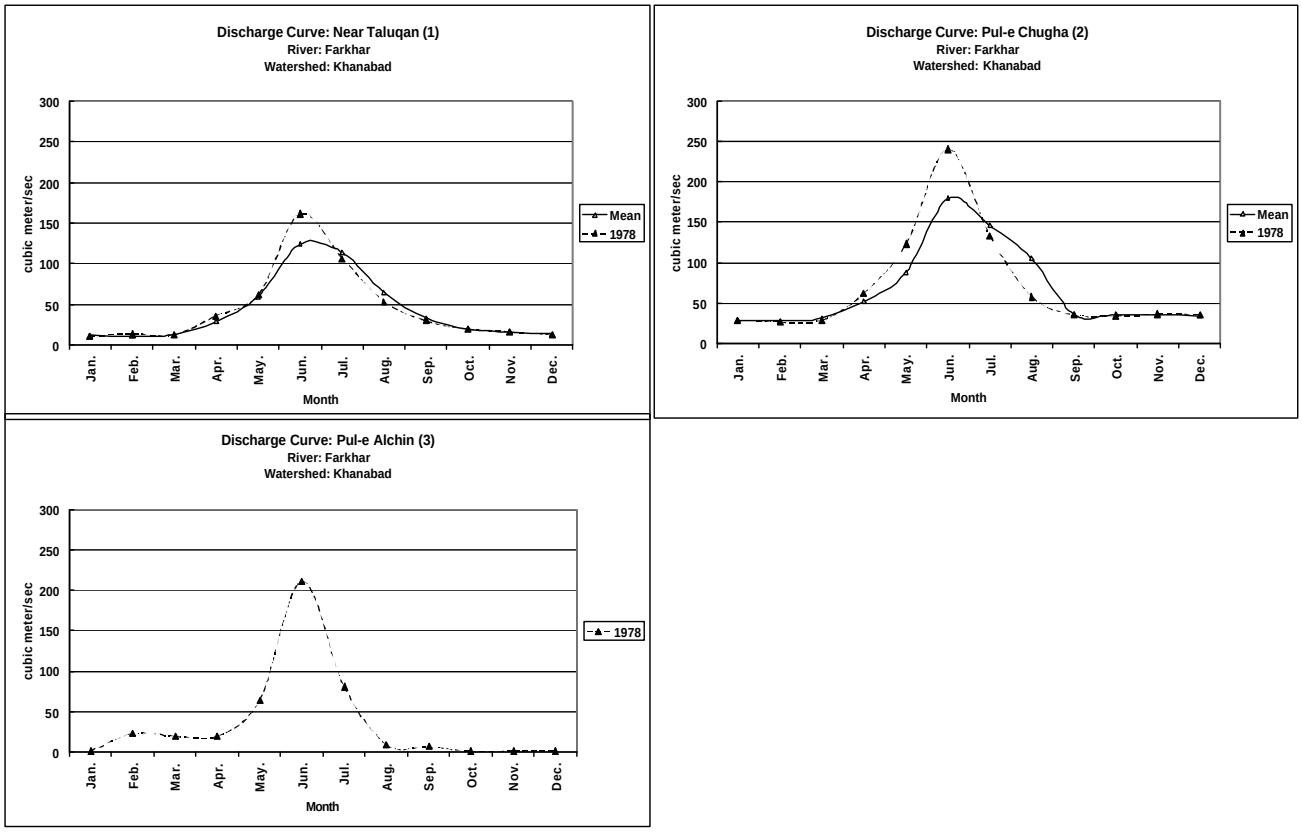
Table 19
Landcover classification for Khanabad watershed

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
Rain-fed Crops (flat lying areas)	36804	368.0	3.07
Rain-fed 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**

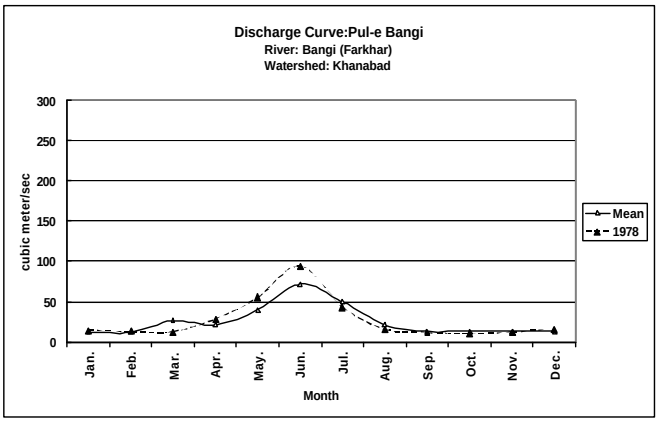
[1] WAPCOS, see Government of Afghanistan, MEA,"*Assessment Report for Rehabilitaiton fo Khanabad Irrigation Project*", submitted by Water and Power Consultancy Services, India, November 2002.

The table 19 shows that Khanabad watershed is dominated by rangeland (49%) and rain-fed land (18%) and a significant proportion of bare soil and sand covered areas (nearly 14%), mostly near the Amu Darya river. Irrigated land represent 8% of the watershed area and a significant proportion is suitable for double cropping

Graphs 40, 41 and 42
Discharge curves along the Farkhar river, Khanabad watershed



Graph 43
Discharge curves on the Bangi river, a tributary of the Farkhar river. Khanabad 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 disctricts (Payandeh river). The Bamyan Rod is originating from the Foladi valley and flows at the feet of the once standing rock Buddas 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 (eastward) to Tal wa Barfak town. The Andarab river raises 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. When the Kunduz river reaches the Amu Darya at Qala-i Zal, it has covered 480 kilometers.

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)

In Pul-i Khumri, two hydro-power dams were built. Pul-i khumri I was commissioned in the 1950s, with German/Swiss equipment (picture 94). Nortconsult-Norplan notes that the equipment is robust and certain components are in surprisingly good condition taking into account the age and poor

maintenance of the equipment. Pul-i-Khumri II was commissioned in 1962 with Russian equipment and is still functioning. Silting is a problem in both structures. The consultant inspected the plant 29 June 2003.

Picture 94

Aerial view of Pul-i Khumri. The Pul-i Khumri I Hydro-power structure is visible. On the left, the canal leading to Pul-i Khumri II hydropower station and on the right, Canal-i Gawargan which is irrigating the Sheshme Shir intensive irrigated land North of Pul-i Khumri. In the middle, the Pul-i Khumri river.

Baghlan, 25 March 2003 (N35.98, E68.68, S)

Table 20

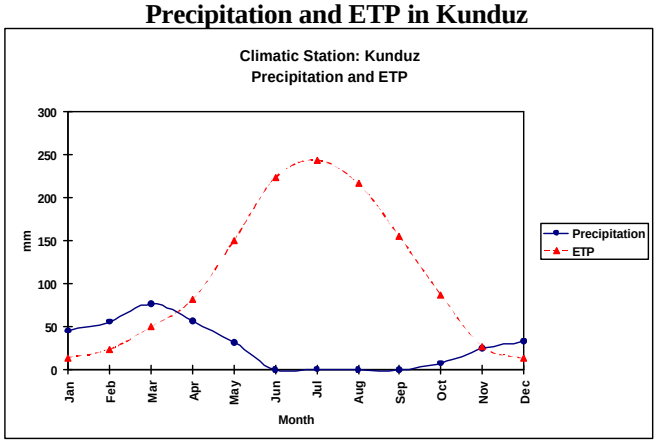
Landcover classification for Kunduz watershed

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
Rain-fed Crops (flat lying areas)	51416	514.2	1.83
Rain-fed 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**

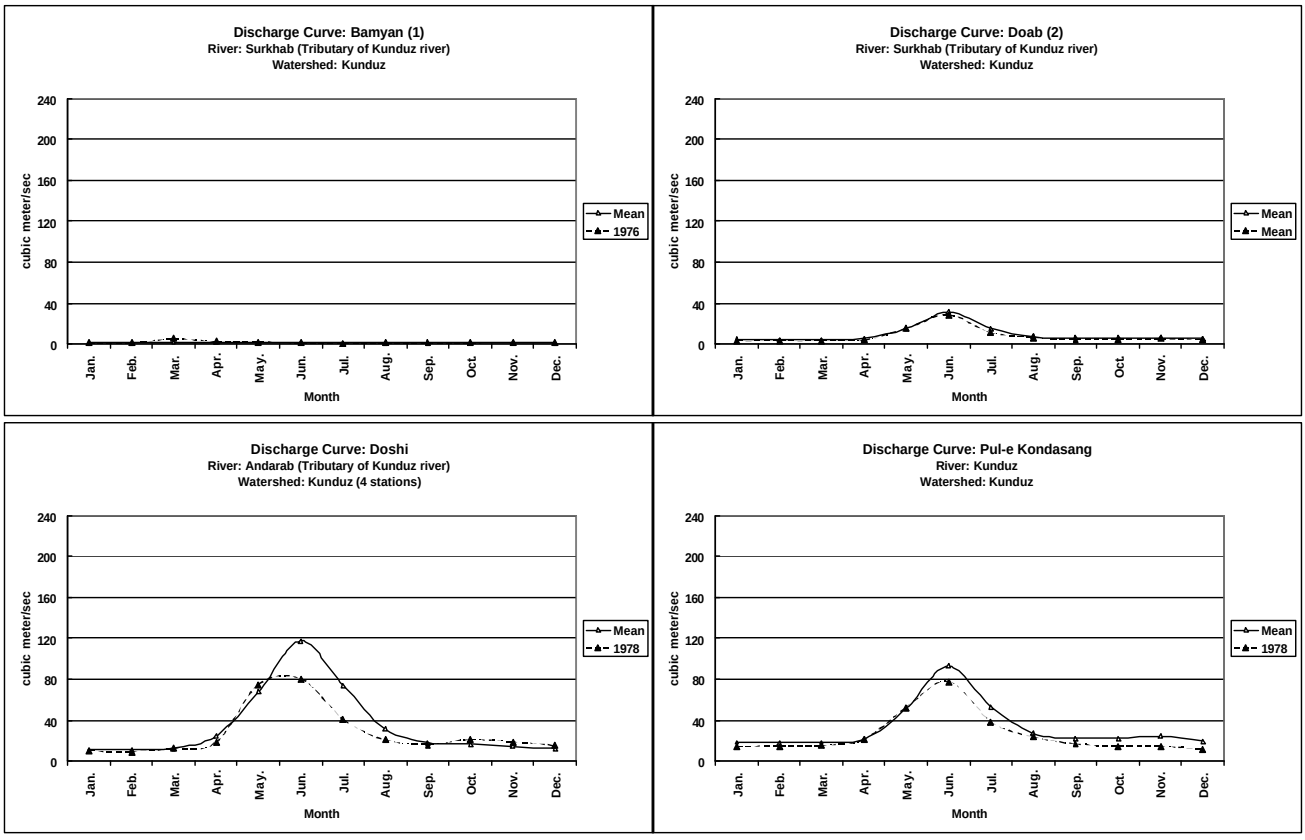
The Kunduz river, along with the Farkhar river irrigates the perimeter of the previous Qataghan province which was composed of the current Baghlan, Kunduz and Takhar provinces. The Kunduz and Khanabad rivers take their sources from among the highest mountains in Afghanistan. These mountains are generally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

The table 20 shows that Kunduz watershed is chiefly dominated by rangeland (75%). Rain-fed land represents nearly 11% and irrigated crops 5.4% of the watershed surface. Most of the irrigated land is suitable for double cropping.

Graph 44
Precipitation and ETP in Kunduz

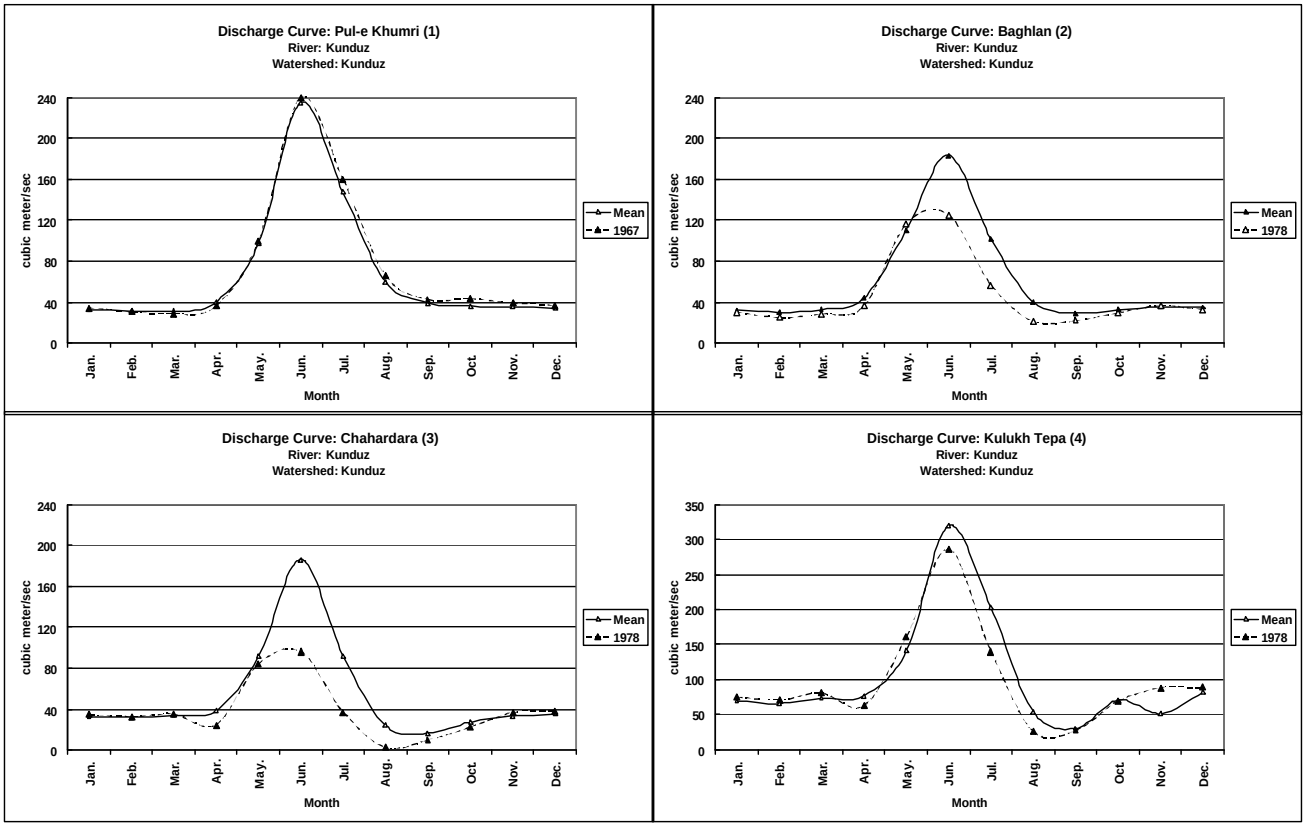


Graphs 45 to 48
Discharge curves on the Bamyan, Surkhab and Andarab rivers, main tributaries of the Kunduz river. Kunduz watershed



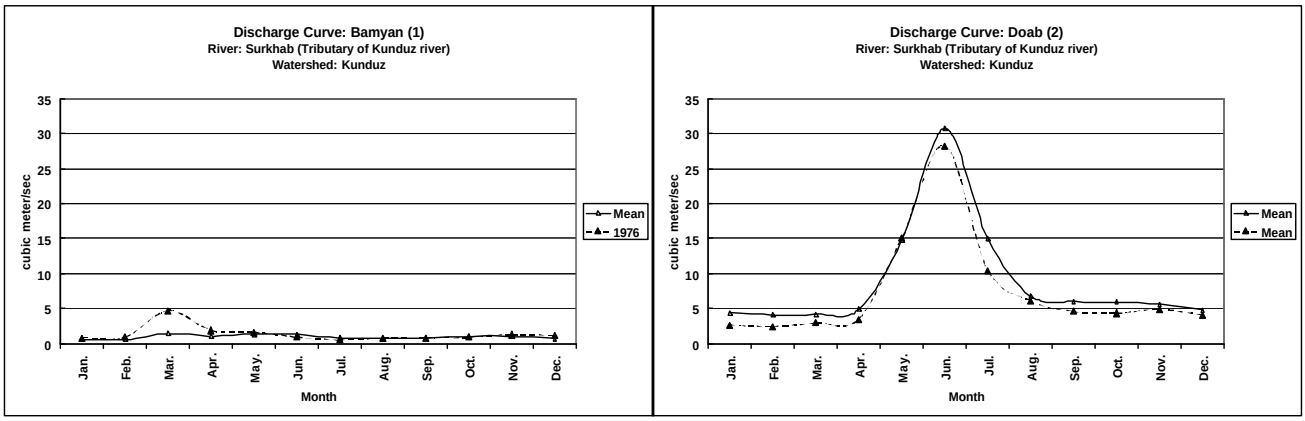
Graphs 49 to 52

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 others. The hydrological station was located too close from the Amu Darya river and thus the data were affected by the back water from the Amu Darya. Kunduz watershed



Graphs 53 and 54

Discharge curves on the Bamyan river at 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 Samangan river). In Ruyi Duab, two small torrents from Dara-i Hazarsum and Dara-i Negar forms the Darya-i Khuram river that descends the picturesque gorges of Khuran wa Munjan (see picture 96), then flows down toto 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 basin and the Tashkurgan river the shortest with 190 kilometers long.

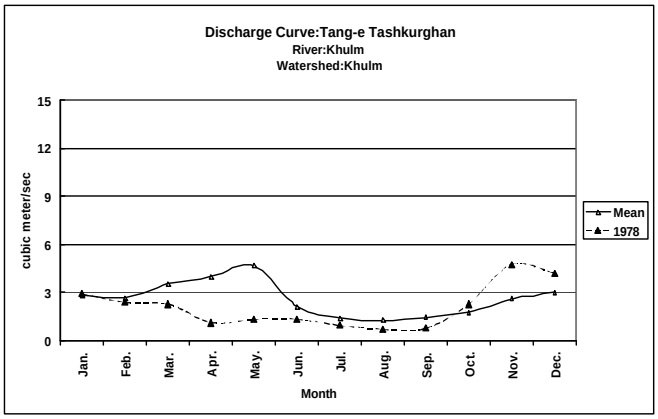
The table 21 shows that Khulm watershed is dominated by rangeland (58%) and sand covered areas (13%) mainly in the Turkistan plain. Rain-fed land represents as much as 16% (picture 95) and irrigated land 4.8% of the watershed surface. However much of the irrigated land (approximately 64%) is intermittently 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.

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

Table 21
Landcover classification for Khulm or Tashkurgan 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
Rain-fed Crops (flat lying areas)	31517	315.2	3.08
Rain-fed 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**

Graph 55
Discharge curve on the Khulm river. Khulm watershed



Picture 96
Aerial view of Khuram wa Sarbagh gorges in Samangan. The catchment area of the Central Hindu Kush Mountains are visible in the left background. The Khulm river, while descending carved spectacular gorges (harrow) before the valley open near Aibak. Outlines of plowed rain-fed farming are visible on both sides of the gorges. Samangan province, 25 March 2003 (N36.24, E68.08, S)

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 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 (Sari Pul province) or from Kotal-i Sat Barg (see picture 97) in Yakaolang district. Below, in Kohistanat and Balkhab districts, the river now bears the name of Balkhab river while further downstream as from Keshindi district (Balkh province), the river is also simply called Balkh. Between Keshindi and Sholgara district centers, the Balkh river is supplemented with a tributary, the Dara-i Suf river which takes its source from Samangan province highlands. Balkh river open 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 kilometers.

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

Picture 99
Panoramic view of rain-fed hills between Keshindi and Sholgara. 14 May 2003 (N36.12, E66.88, N)

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

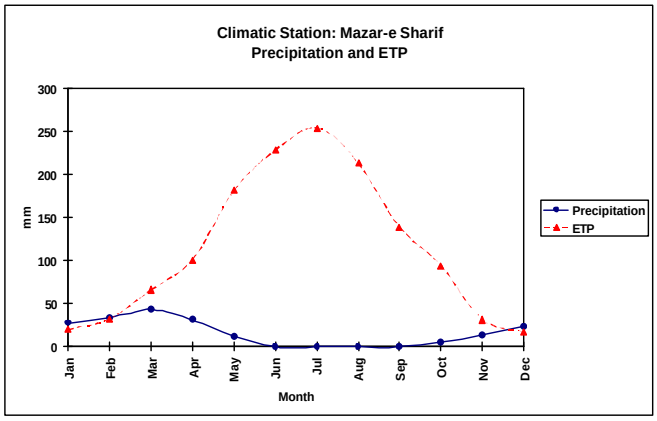
Picture 100
Balkh river in Dehdadi district. Note the irrigation canal intake (right).

3 March 2003 (N36.65, E66.92, N)

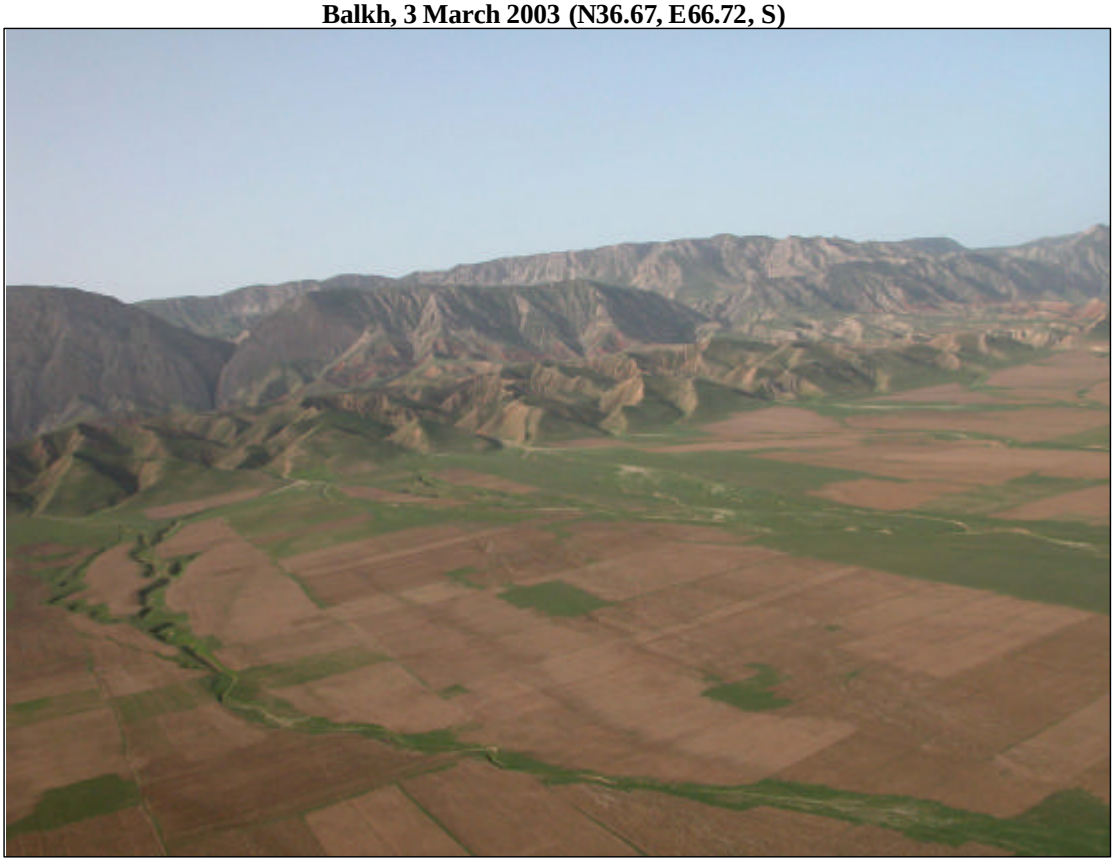
Table 22
Landcover classification for Balkhab watershed

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
Rain-fed Crops (flat lying areas)	25310	253.1	0.88
Rain-fed 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**

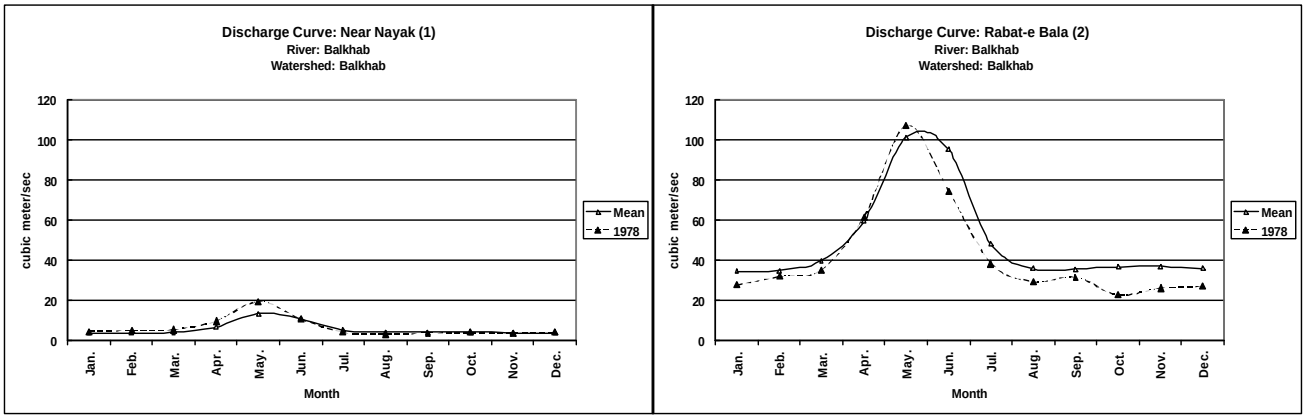
Graph 56
Precipitation and ETP in Mazar-i Sharif



Picture 101
Rain-fed cultivation on the Northern foot hills which were traditionally used as pastureland.
Balkh, 3 March 2003 (N36.67, E66.72, S)



Graphs 57 and 58
Discharge curves along the Balkh river. Balkhab watershed

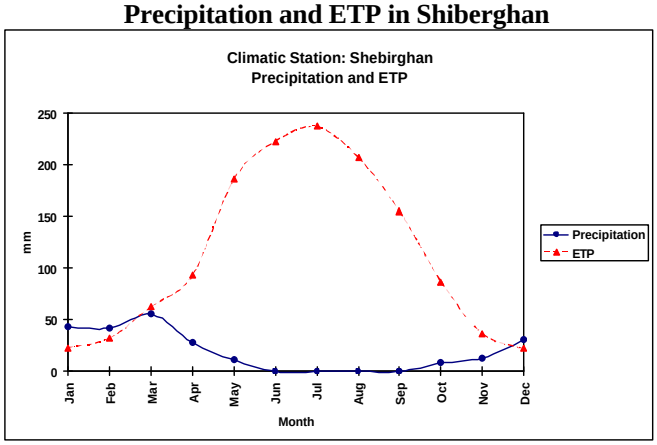


8. Sari Pul Watershed

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 4 parallel valleys part of Sangcharak district. These 4 rivers (Jifan, Lar-i Badamak, Lar-i Surkh and Kashan) meet in the region of Sabz-i Kalan is 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 splitting the river into natural channels: Darya-i Syah (East side) irrigating the area of Yangi Aregh and Darya-i Safid (west side) irrigating Khwaja du Koh district (see picture 102).

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)

Graph 59
Precipitation and ETP in Shiberghan



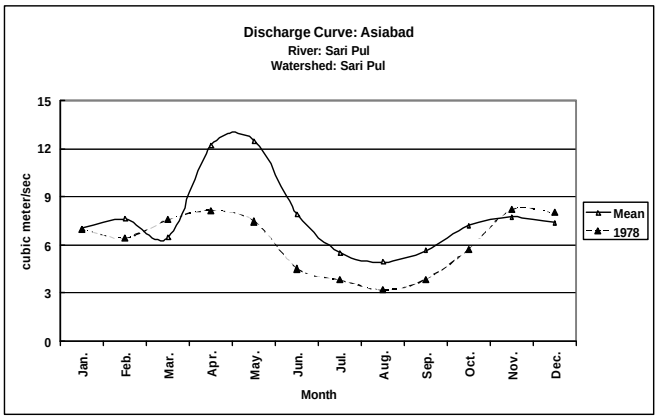
Picture 103
Panoramic view of the Kashan valley between Khwaja Qala and Qata Qala. Sari Pul, Sozma Qala province, 16 May 2003 (N36.00, E66.22, SE)

The table 23 shows that Sari Pul watershed is dominated by rangeland (40%) and sand covered areas (25%) mainly in the Turkistan plain (Jawzjan province). Rain-fed land represents as much as 28% and irrigated land 6.5% of the watershed surface (picture 103). However, much of the irrigated land (approximately 48%) 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.

Table 23
Landcover classification for Sari Pul 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
Rain-fed Crops (flat lying areas)	15544	155.4	0.93
Rain-fed 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**

Graph 60
Discharge curves along the Sari Pul river. Sari Pul watershed



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 few kilometers below Dawlatabad. The river then maintains the name of Shirin Tagab and dries in the irrigation canals of Andkhoi, after having traveled 320 kilometers.

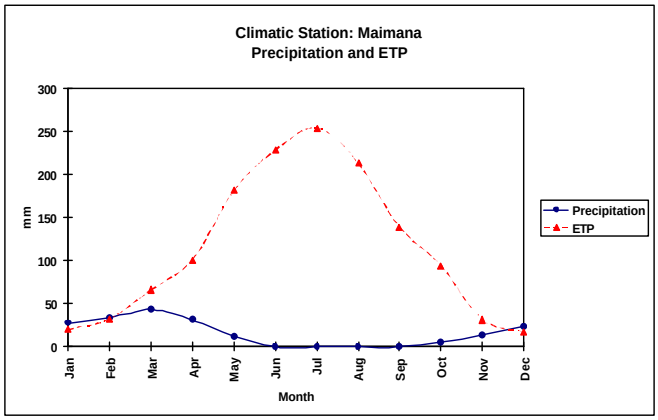
The Shiring Tagab river takes its sources from Kohistan district. In Belcherak, the Cheshma-i Khwab river joins the Shiring Tagab river just after a passing through scenic rapids South of Belcherak town. Up stream, the Cheshma-i Khwab is dividing in to 5 small gorgeous valleys; Darra-i Khwaja Ghar, Darra-i Sakh, Darra-i Zang, Darra-i Takhra and Darra-i Rabat. These scenic valleys have good tourism potential and in particular Darra-i Zang for its beautiful waterfalls.

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

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

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

Graph 61
Precipitation and ETP in Shiberghan



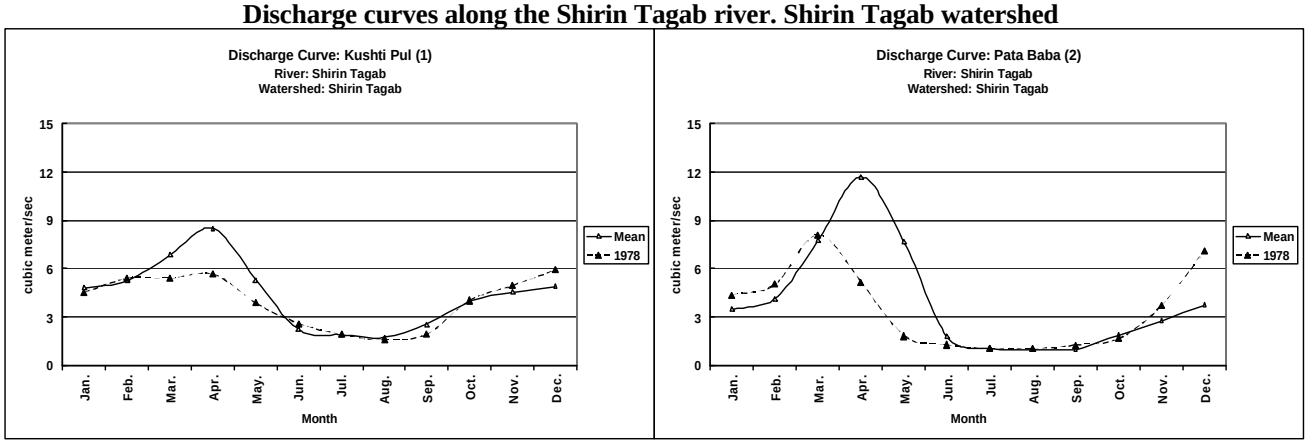
Picture 106
View of Qaisar area above the Qaisar Rod river. Faryab, 19 May 2003 (N35.69, E64.31, W)

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

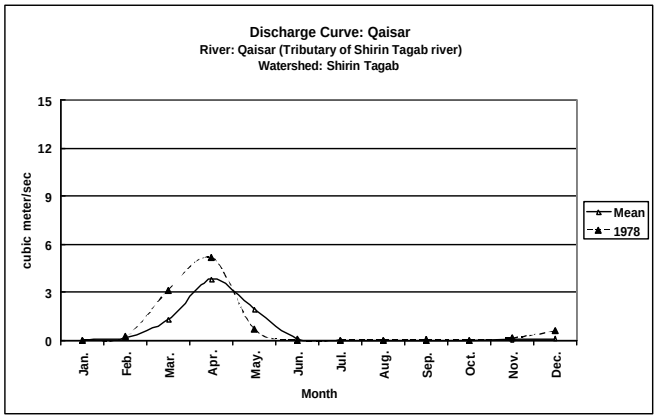
Table 24
Landcover classification for Shirin Tagab watershed

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
Rain-fed Crops (flat lying areas)	5417	54.2	0.36
Rain-fed 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**

Graphs 62 and 63
Discharge curves along the Shirin Tagab river. Shirin Tagab watershed



Graph 64
Discharge curves along the Qaisar river, a tributary to the Shirin Tagab river. Shiring Tagab watershed

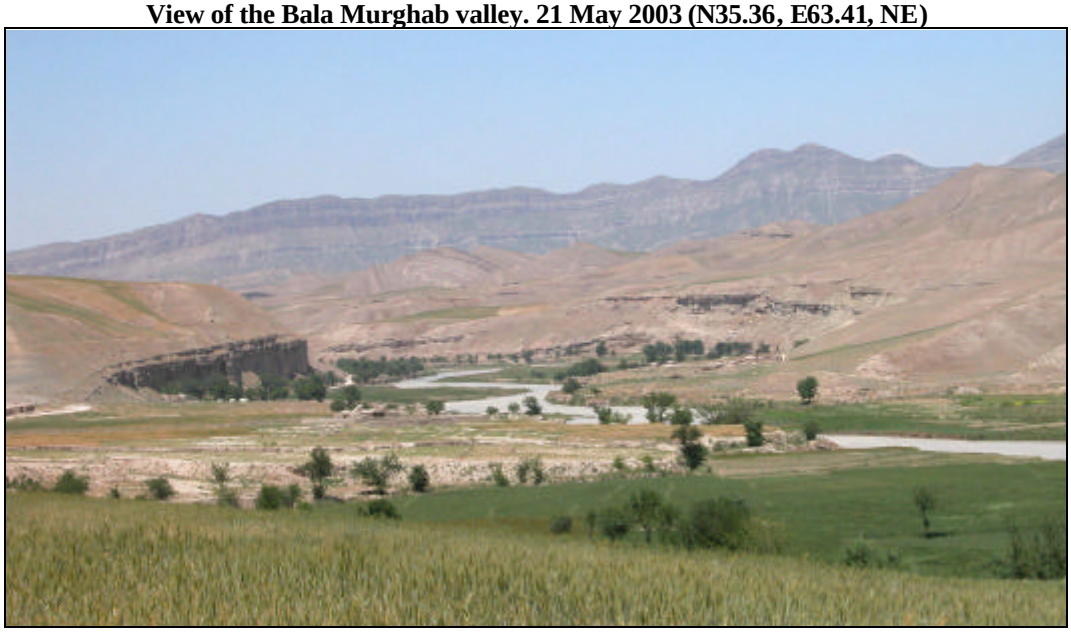


IV. HARIROD-MURGHAB RIVER BASIN

10. Bala Murghab Watershed

The Bala Murghab watershed includes the Bala Murghab river (picture 107) and the Ghormach river (eastern tributary). Bala Murghab watershed drains water from Chaghcharan (Ghor province), Kohistan (Faryab province) and Jawand (Badghis province). The Bala Murghab river takes it 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; Rod-i Murghab, Darya-i Jawand, Ab-i Puda, Darya-i Anarak and Rod-i Gazestan joins 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.

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



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 Qaisar district (Faryab province) and Ghormach district (Badghis province). The Ghormach river joins the Murghab river at the border between Afghan-Turkmen border (picture 108). Beyond the Afghan border, the Murghab irrigates the oasis of Merv in Turkmenistan, 750 kilometers from its source.

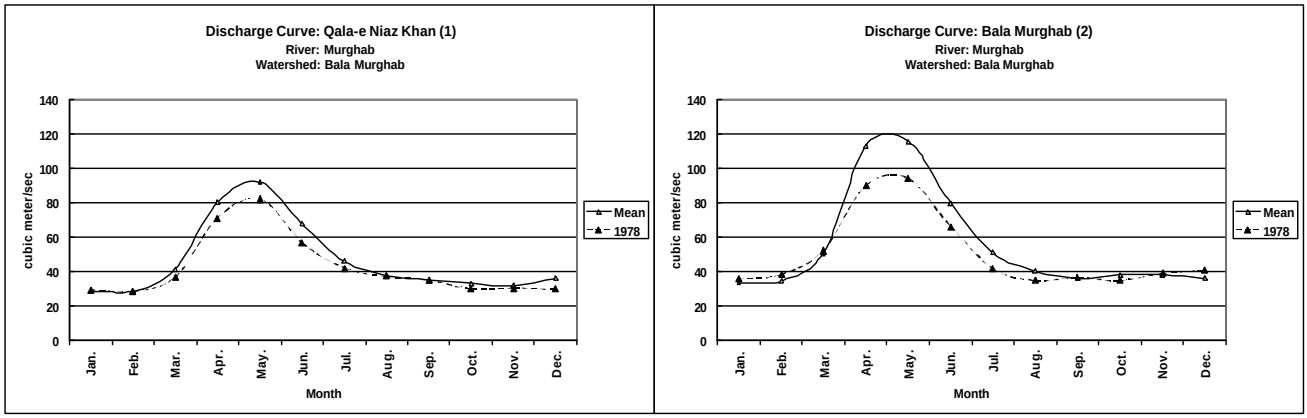
Picture 108
View of Ghormach (right) and Murghab river joining along the border. The Murghab river marks the border between the two countries. Badghis, 21 May 2003 (N35.71, E63.22, N)

The table 25 shows that Bala Murghab watershed is largely dominated by rangeland (84%). Rain-fed land represents 13% and irrigated land only of 2.5%, out of which 55% is intermittently cultivated, expressing 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 areas in the Bala Murghab watershed.

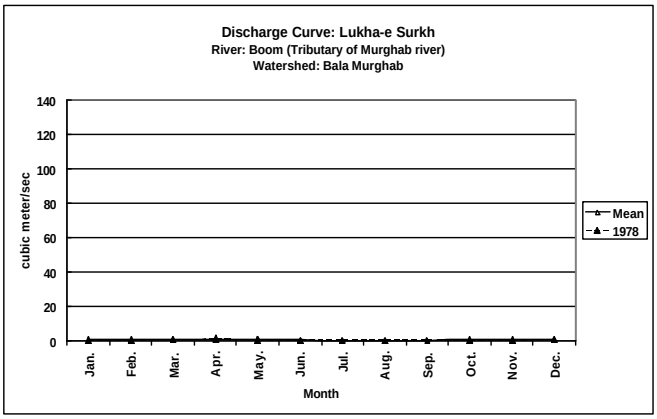
Table 25
Landcover classification for Bala Murghab watershed

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
Rain-fed Crops (flat lying areas)	25833	258.3	1.02
Rain-fed 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**

Graphs 65 and 66
Discharge curves along the Murghab river. Bala Murghab watershed



Graph 67
Discharge curves on the Boom river, a tributary to the Murghab river. Bala Murghab watershed



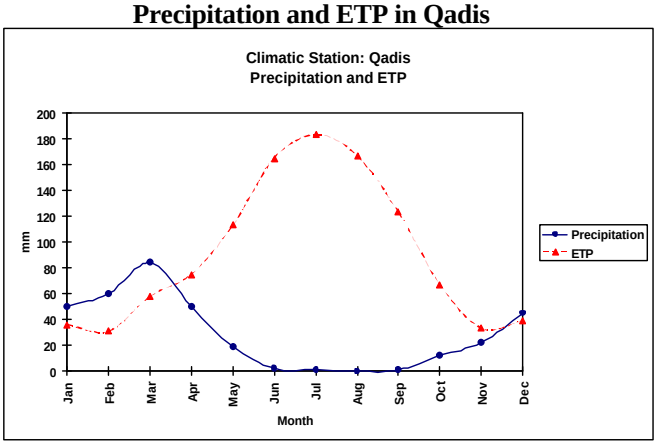
11. Khushk wa Kashan Rod Watershed

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 (2390 m) - linking Herat to Badghis - in the Paropamisus Mountains is renowned for its Juniperus 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 flow North-West and forms the border between Afghanistan and Turkmenistan for a distance of approximately 13 Km up to Turkhundi border point. The Kushk river is supplemented by ephemeral streams such as the Darye-i Dukhi, or the Darya-i Moqur at Tukhundi. Finally, on the Western part of the watershed, the Rod-i Gulran drain seasonal water that joins the Murghab river downstream in Turkmenistan

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

Graph 68
Precipitation and ETP in Qadis

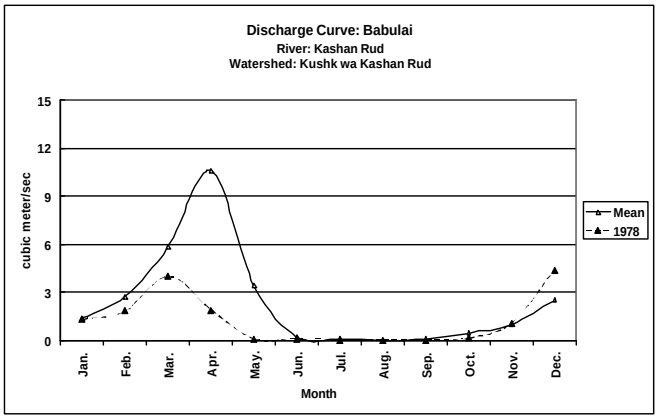


The table 26 shows that Kashan wa Kushk watershed is dominated by rangeland (54%) and rain-fed land (40%). Irrigated land represents only of 1.8% out of which 55% is intermittently cultivated. The FAO 1990/93 landcover data records a very small amount of double cropping areas in the Kashan wa Kushk watershed.

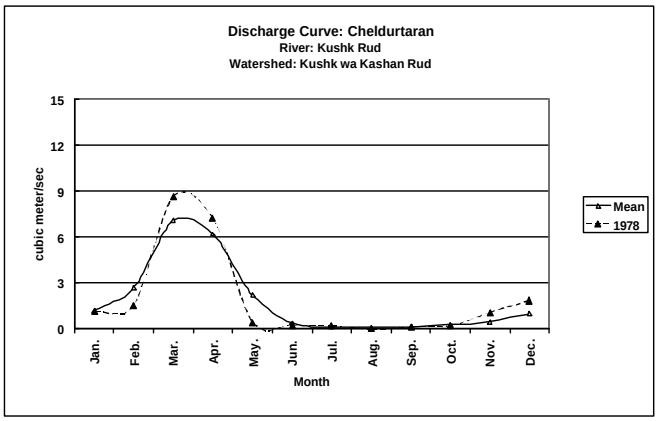
Table 26
Landcover classification for Khushk wa Kashan Rod watershed

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
Rain-fed Crops (flat lying areas)	95681	956.8	7.26
Rain-fed 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**

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



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



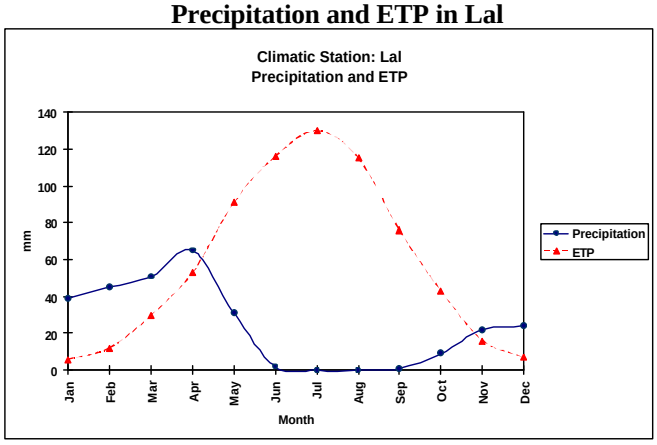
12. Upper Hari Rod Watershed

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 3000 meters above sea level that were formed on the side of the Hari Rod geological fault. The Southern slope of the Sefid Koh (also called Firuz Koh in the Eastern part) Mountains, the Northern slope of the Band-i Baian and Kasa Murgh Mountains and the Western slope of the Koh-i Babar Mountains. Numerous valley systems contributing to the Hari Rod river generally 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).

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

On the Southern slope of the Kassa Murgh Mountains, the Kawgan Rod river flows and joins the Hari Rod river at 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.

Graph 71
Precipitation and ETP in Lal



The table 27 shows that Upper Hari Rod watershed is largely dominated by rangeland (91%). Rain-fed land represents 6% (picture 111) and irrigated land on the valley floors represents only of 2.3% out of which 49% is intermittently cultivated. Rain-fed land is practiced in high elevation with low yield. The FAO 1990/93 landcover data records a very small amount of double cropping areas in the Upper Hari Rod watershed.

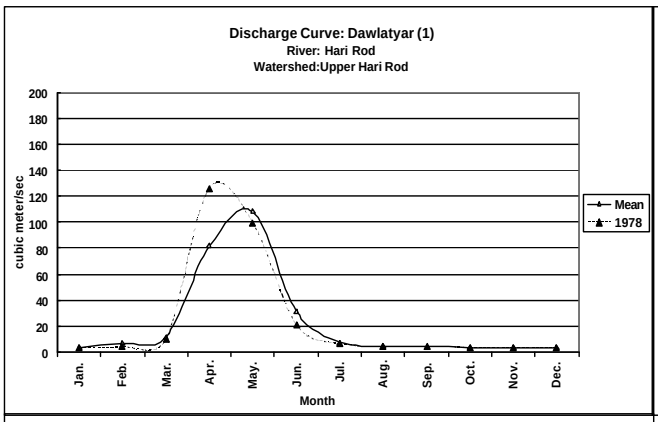
Picture 111
Rain-fed planted at high elevation in Lal district. 3 June 2003 (N34.51, E66.37, S)

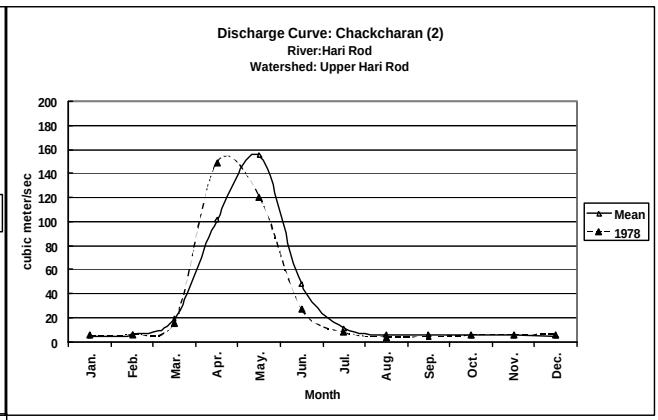
Table 27
Landcover classification for Upper Hari Rod watershed

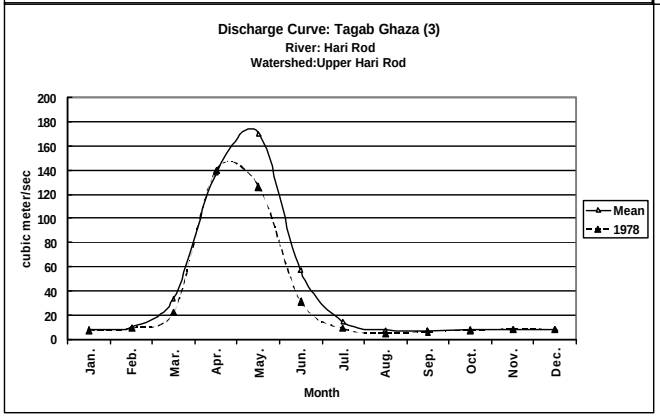
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Fruit Trees	366	3.7	0.02
Irrigated: Intensively Cultivated (1 Crop/Year)	24978	249.8	1.18
Irrigated: Intensively Cultivated (2 Crops/year)	76	0.8	0.00
Irrigated: Intermittently Cultivated	23837	238.4	1.13
Marshland Permanently inundated	3944	39.4	0.19
Marshland Seasonal	91	0.9	0.00
Permanent Snow	4140	41.4	0.20
Rain-fed Crops (flat lying areas)	66068	660.7	3.13
Rain-fed 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**

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

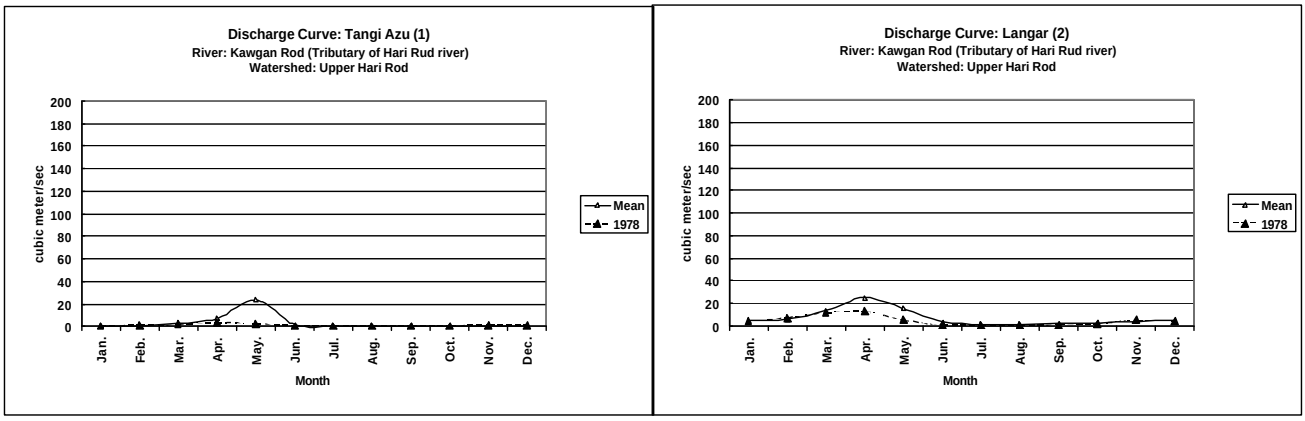
Graphs 72, 73 and 74
Discharge curves along the Hari Rod river. Upper Hari Rod watershed







Graphs 75 and 76
Discharge curves along the Kawgan river, a tributary to the Hari Rod river. Upper Hari Rod watershed



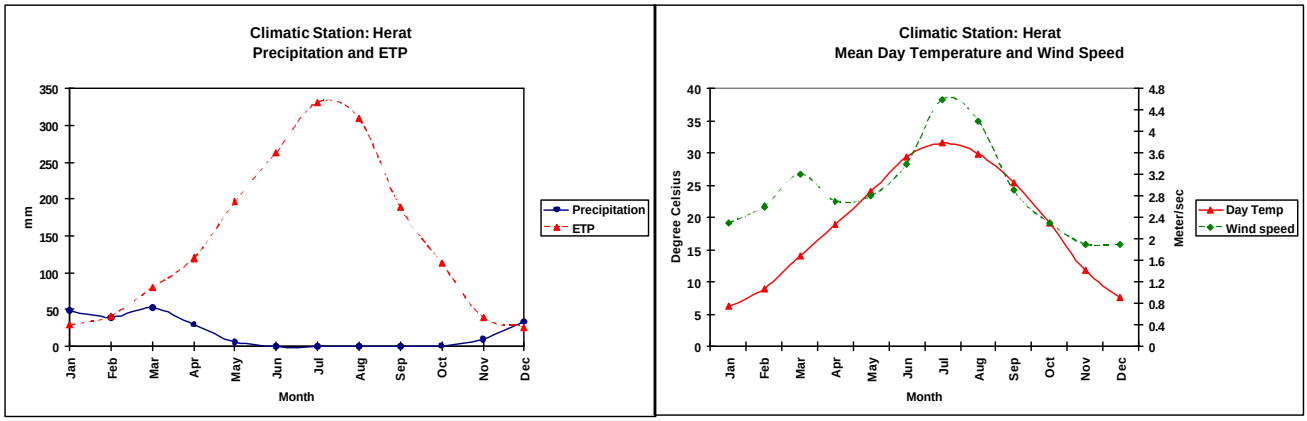
Picture 113
Aimaq (semi-nomadic) settlement along the Hari Rod river. Shahrak, 1 June 2003 (N34.36, E64.15, N)

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, E)

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 and 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.

Graphs 77 and 78
On the Left, Precipitation and ETP and on the Right, Wind Speed and Temperature

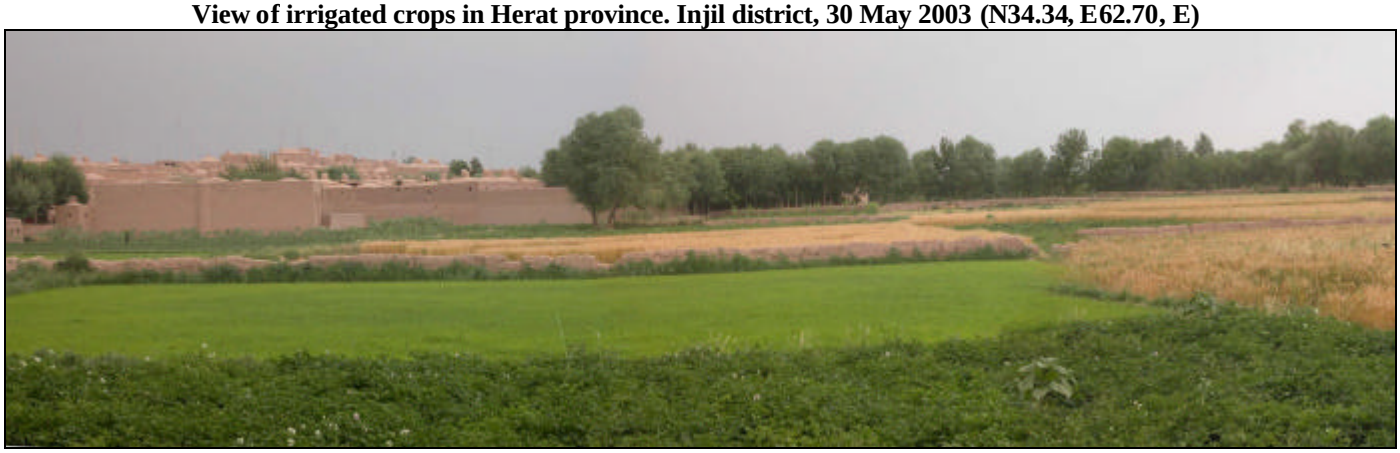


The table 28 shows that Lower Hari Rod watershed is largely dominated by bare soil (61%) and rangeland (26%). Rain-fed land represents (2%) and irrigated land represents only of 3.6% - which is the traditional irrigated perimeter of Herat - of the total surface to the watershed. The area cultivated with second crops (chiefly pulses and rice) varies significantly from one year to the other 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.

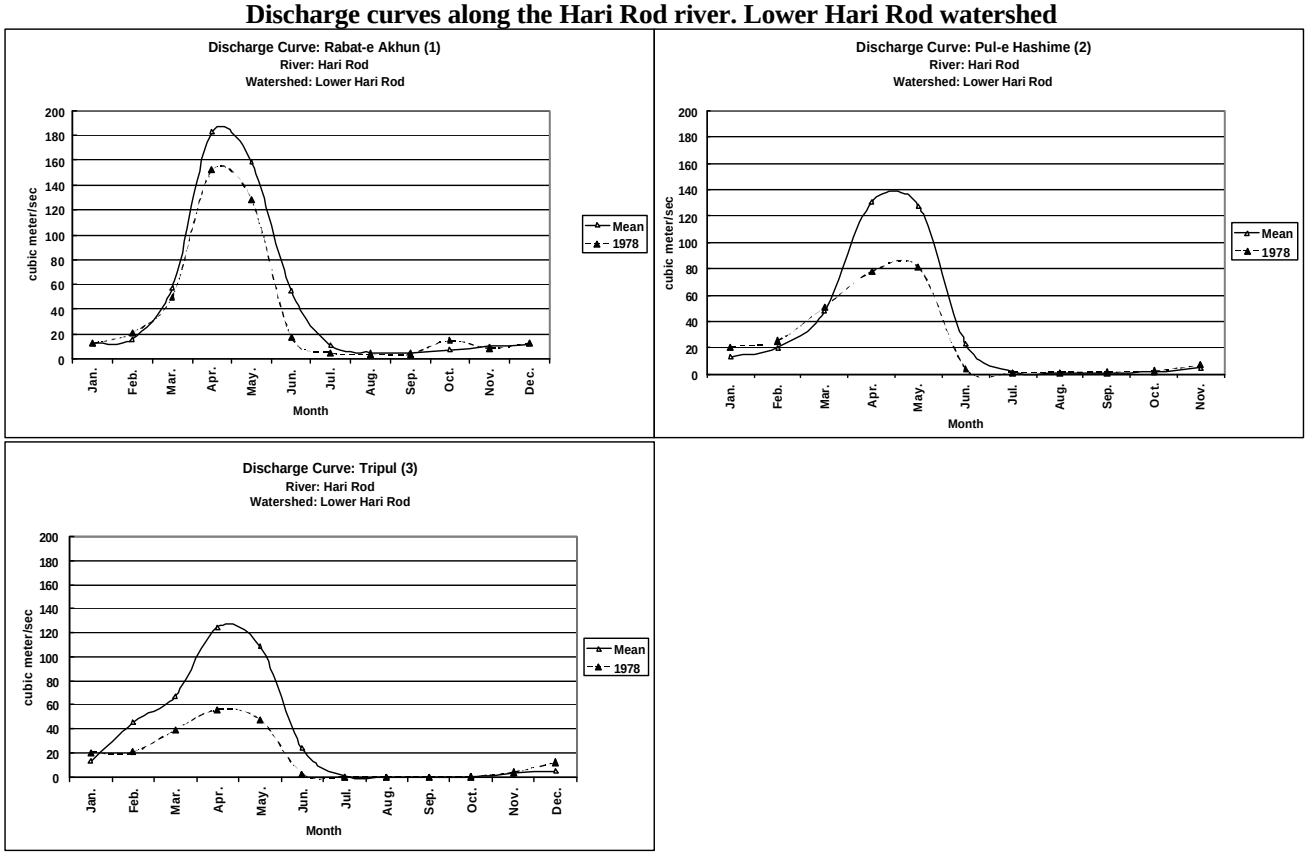
Table 28
Landcover classification for Lower Hari Rod watershed

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
Rain-fed Crops (flat lying areas)	26317	263.2	1.47
Rain-fed 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**

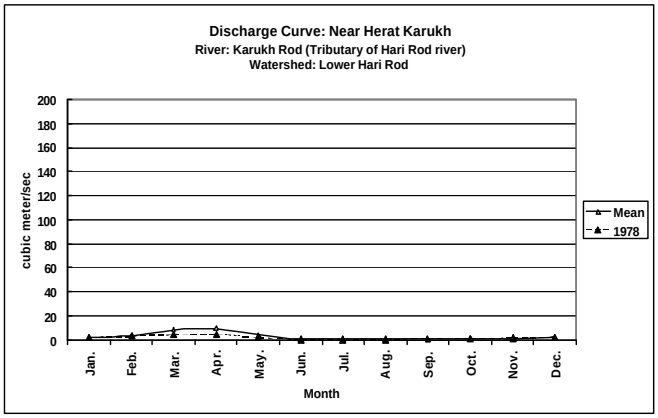
Picture 115
View of irrigated crops in Herat province. Injil district, 30 May 2003 (N34.34, E62.70, E)



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 (meaning 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 joins the river; the and Darya-i Anar Dara. The Adraskan Rod (as well as the Farah Rod end in the marches of Hamum-i Sabiri (part of Hamum-i Hilmand). However, intensive use of the water for irrigation milks out these rivers and meager tributaries and it is only during flood periods that the rivers refill the Hamum. The Adraskan Rod is bordered in the West by a zone of none drainage; Dasth-i Naomid.

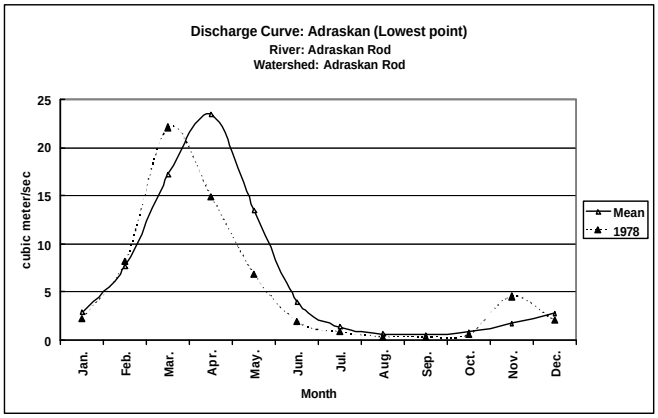
Picture 116
View of the Adraskan Rod near Adraskan district center. Herat, 25 May 2003 (N33.64, E62.26, NE)

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

Table 29
Landcover classification for Adraskan Rod watershed

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
Rain-fed Crops (flat lying areas)	6861	68.6	0.32
Rain-fed 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**

Graph 83
Discharge curves on the Adraskan Rod river. Adraskan Rod watershed



15. Farah Rod Watershed

The Farah Rod watershed drains the water from the Siah Koh and Tshalap Dalan Mountains of Sharak and Saghar districts (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 Herat-Kandahar, the Farah Rod is supplemented by the Rod-i Zar Mardan (in Bala Buluk district). The Farah Rod (as well as the Adraskand Rod) ends in the marches of Hamum-i Sabiri (part of Hamum-i Hilmand). A number of small seasonal streams are flowing into the Farah Rod, such as the Takhe Ghale Kaftar, Takhe Nalak or Rod-i Salagh. Wits 320 kilometers, 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).

Picture 117
View of Farah Rod river from bridge near Farah Rod district center. Farah, 25 May 2003 (N32.75, E62.62, SW)

Graph 84
Precipitation and ETP in Farah Province center

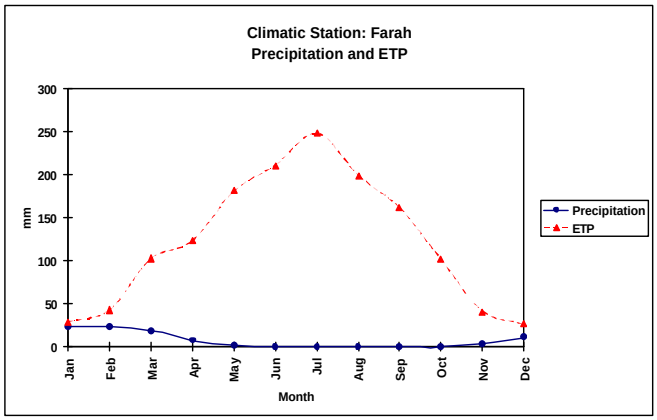
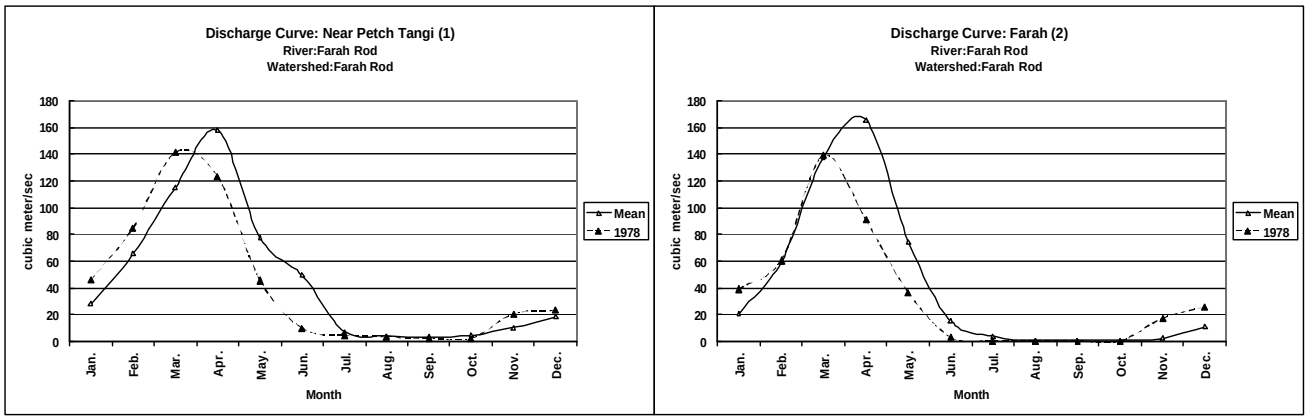


Table 30
Landcover classification for Farah Rod watershed

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
Rain-fed Crops (flat lying areas)	6239	62.4	0.19
Rain-fed 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**

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

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

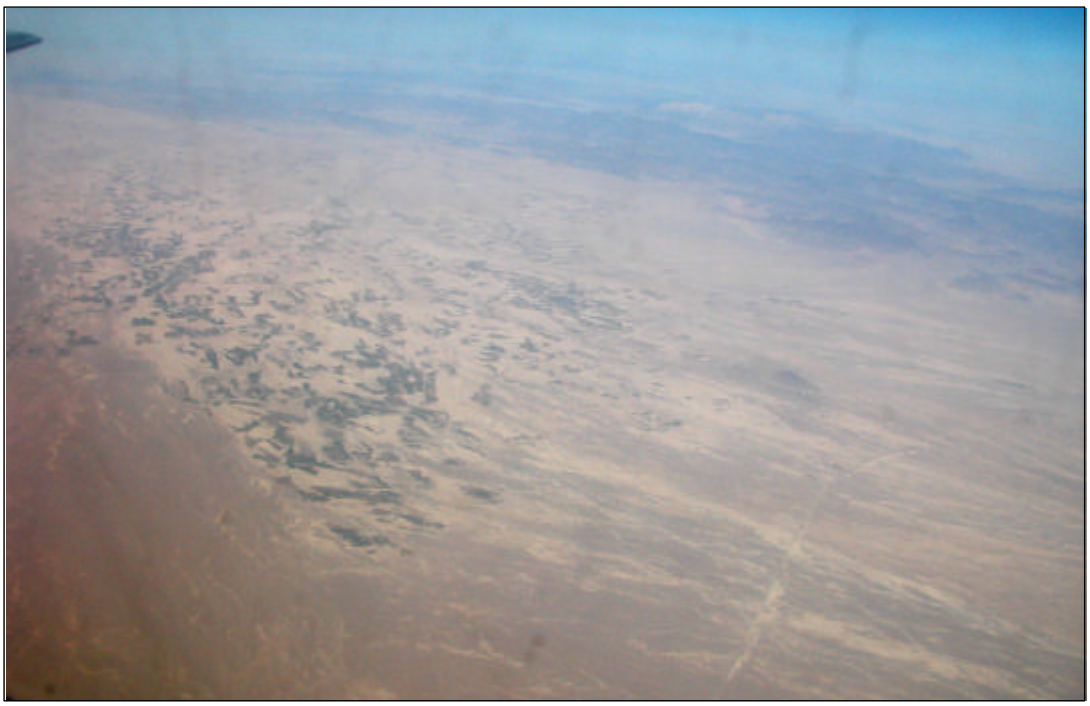
The Khuspas Rod watershed drains water from the Siah Band Mountains in Gulistan (Farah). In the upper part of the watershed (Gulistan district), the river is called Darye-i Kohistan. The Darya-i Kohistan the lowest part of the district, the Darya-i Kohistan is forming a delta composed of several streams where limited land is cultivated. It is only in the South-West of Sultan-i Bawka that a myriad of seasonal stream beds rejoin 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 exists for the Khuspas Rod watershed.

The table 31 shows that Khuspas Rod watershed is dominated by bare soil (76%) which is mostly located in the Bakwa desert (Dasht-i Bakwa) and rangeland (16%). Irrigated land represents only of 3.2% of the total surface to the watershed. Morevoer, almost all the irrigated land (92%) 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 strip of irrigated spots along the bank of river channels or in temporary flooded areas (picture 119). Therefore, Khuspas Rod watershed has limited agriculture significance.

Table 31
Landcover classification for Khuspas Rod watershed

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**

Picture 119
Aerial view of intermittently irrigated by a myriad of seasonal stream occasionally flooding the land in Sultan-i Bakwa (Bakwa district center). The streams are originating from the Darya-i Kohistan that 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 few kilometers above Dilaram town. The Khash Rod watershed includes another small river, the Dor Rod (also called Tagaresh Mandeh), which is flowing parallel to the Khash Rod. The Khash Rod is a small watershed that irrigates the oases of Lokhi and Chakahansur (Nimroz district).

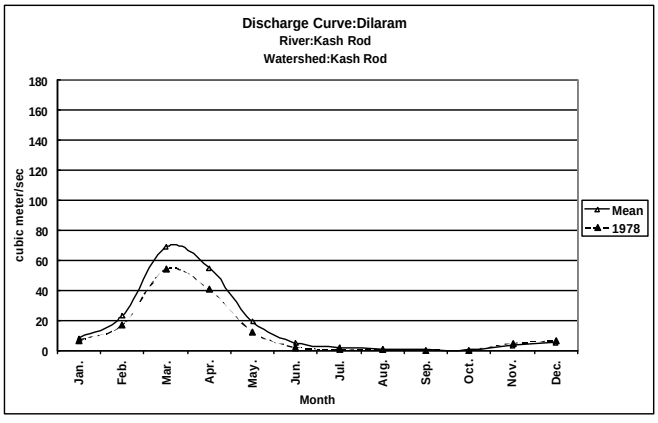
The Khash Rod (and the Khuspas Rod) ends in the marches of Hamum-i Puzak located mostly on the Afghanistan side of the border (part of Hamum-i Hilmand).

The table 32 shows that Khash Rod watershed is dominated by bare soil (69%) and rangeland (24%). Irrigated land represents only of 2.3% of the total surface to the watershed. Moreover, almost all the irrigated land (92%) 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 strip of irrigated spots along the bank of river channels (see picture 120) or in temporary flooded areas. Therefore, Khash Rod watershed has limited agriculture significance.

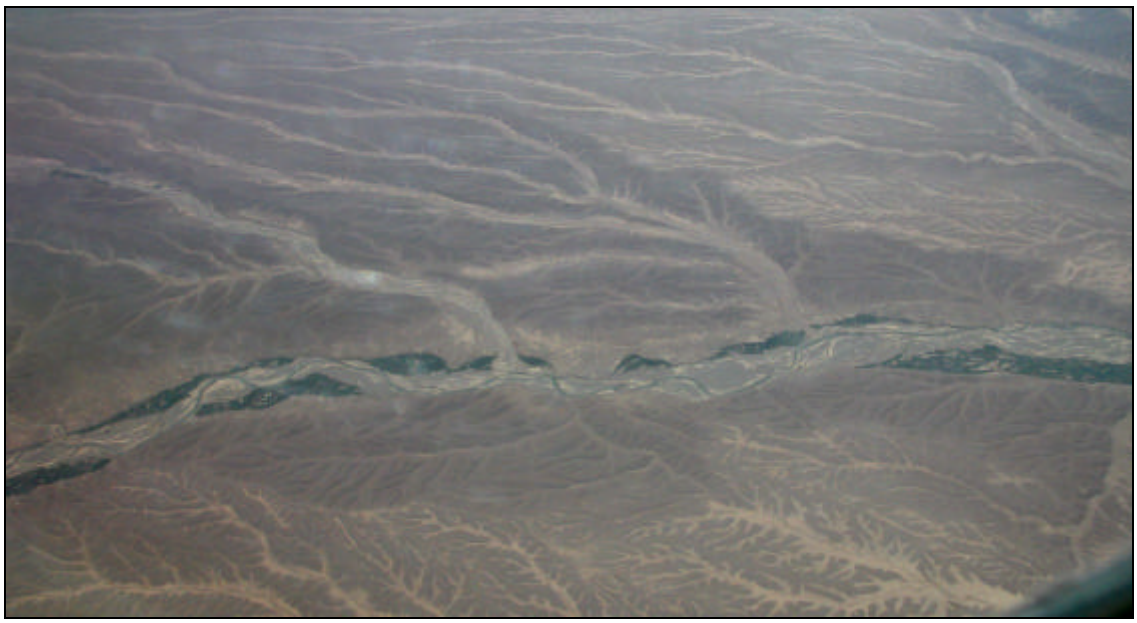
Table 32
Landcover classification for Khash Rod watershed

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
Rain-fed Crops (flat lying areas)	1864	18.6	0.09
Rain-fed 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**

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)



18. Upper Hilmand Watershed

The Upper Hilmand watershed drains water from the Band-i Baian on Passarband district of Ghor province up to the Parwan mountains of Behsud II (Wardak province) located about 50 Km in 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 5 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, the Panjab river is a main affluent that also takes its source in the Koh-i Baba mountains and joins in Waras district of Bamyan (where its local name is Nawai Binigaw). Then the Garmab river which is taking its source from the North western slope of Dasht-i Nawur joins the Hilmand in Nawur district (Ghazni province). Further, the Ajristan river that takes its sources from the western slopes of Dasht-i Nawur joins the Hilmand downstream of Shahristan district center (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 center. From the Band-i Baian Mountains in Day Kundi district (Uruzgan) originates another river called Medinaw and joins the Khaj Rod river before reaching the Hilmand river at the border of Sahidi Hassas district of Uruzgan (picture 122). The Khaj Rod is taking 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 121
Aerial view of the Tiri Rod river joining the Hilmand River at Dehrawud district center – North of the Kajaki dam. Uruzgan, 2 April 2003 (N33.06, E65.51, SE)

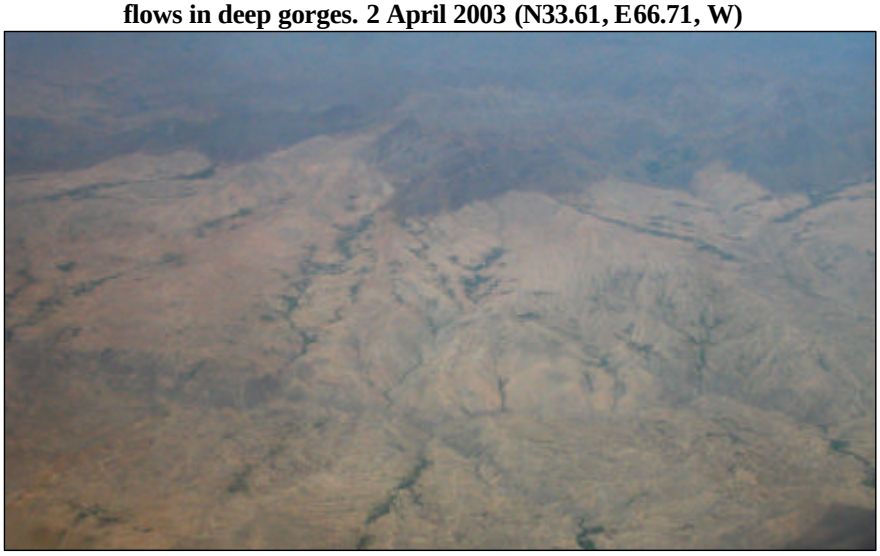
The table 33 shows that Upper Hilmand watershed is largely dominated by rangeland (90%). Rain-fed land represents only 2.2% while irrigated land represents only of 4% of the total surface to the watershed. Most of the irrigated land is located in narrow strip of irrigation in valley floors and a significant proportion of this land (59%) is intermittently cultivated. Rock Outcrop is mainly located in Sharistan, but in reality these are rangeland as the classification has been misinterpreted due to the white color of the geological material (see picture 123).

Table 33
Landcover classification for Upper Hilmand watershed

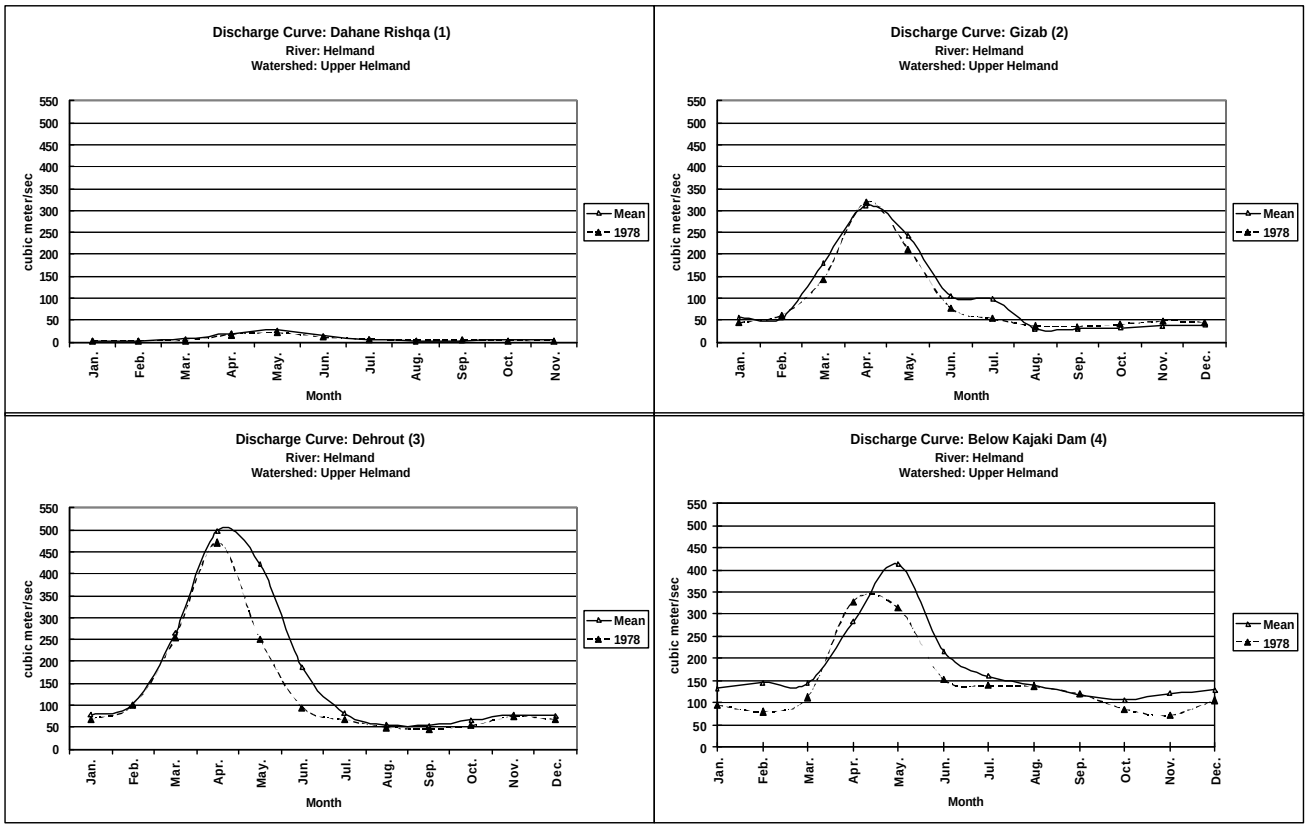
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Fruit Trees	12891	128.9	0.27
Irrigated: Intensively Cultivated (1 Crop/Year)	76434	764.3	1.63
Irrigated: Intensively Cultivated (2 Crops/year)	441	4.4	0.01
Irrigated: Intermittently Cultivated	110728	1107.3	2.36
Marshland Permanently inundated	1236	12.4	0.03
Marshland Seasonal	37	0.4	0.00
Permanent Snow	6999	70.0	0.15
Rain-fed Crops (flat lying areas)	17284	172.8	0.37
Rain-fed 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**

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

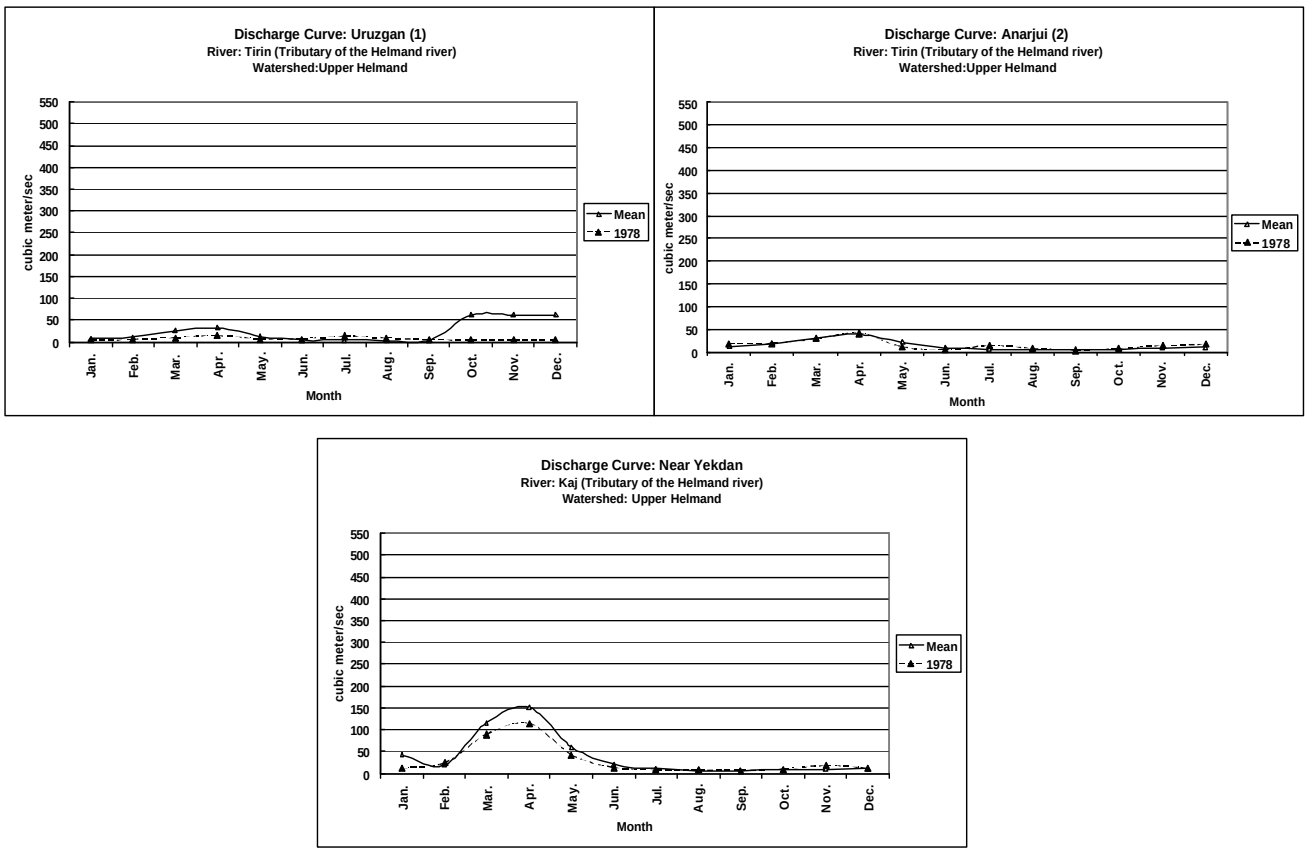
Picture 123
Aerial view of very narrow strip of cultivation in Shahristan district (Uruzgan). Note that the white color is due to the geological material and should fall under the category of rangeland. The Helamnd river is not visible as it flows in deep gorges. 2 April 2003 (N33.61, E66.71, W)



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

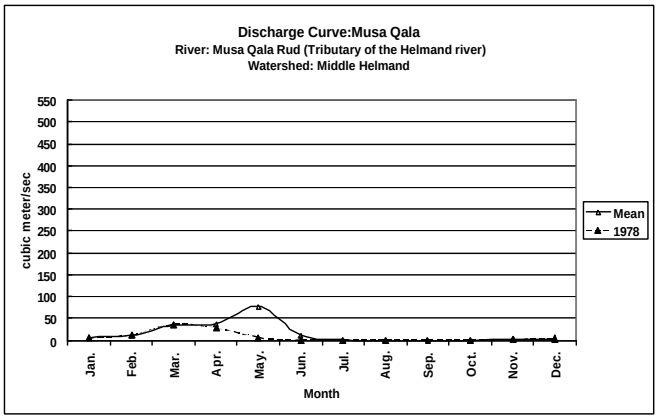
The Middle Hilmand watershed drains water that join the Hilmand river below the Kajaki dam except the Argandab river (which also joins the Hilmand river below the Kajaki dam). The Middle Hilmand watershed includes water from Baghran, Naw Zad and Ghorak districts. The main river amongst them is the Musa Qala Rod which is taking its sources from Baghran district (Hilmand) and joining the Hilmand River at Sangin district center. 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 are draining Upper Hilmand water stored in Kajaki dam to the intensively irrigated fields of Nad Ali and Marja.

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

Table 34
Landcover classification for Middle Hilmand watershed

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
Rain-fed 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**

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 to allow comparison.
Middle Hilmand watershed



20. Lower Hilmand Watershed

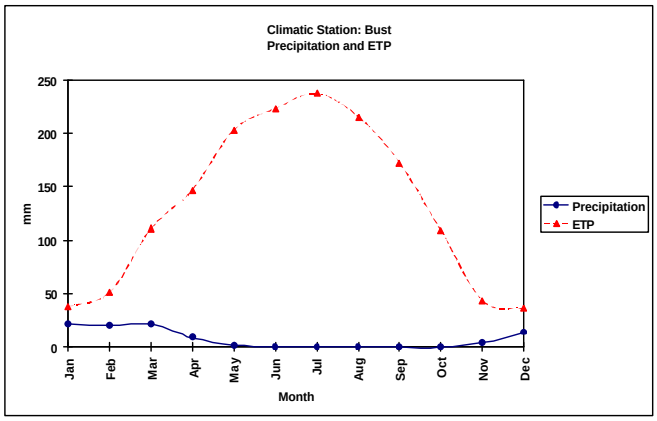
The Lower Hilmand watershed starts at the Band-i Boghra dam (Grishk hydropower plant) above Grishk and ends were the Kajaki irrigation canals (Darweshan canal) end east of Khan Neshin town (district center of Reg district). Therefore, the Lower Hilmand is mostly represented by the intensively formal 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 a good condition[2].

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

Table 35
Landcover classification for Lower Hilmand watershed

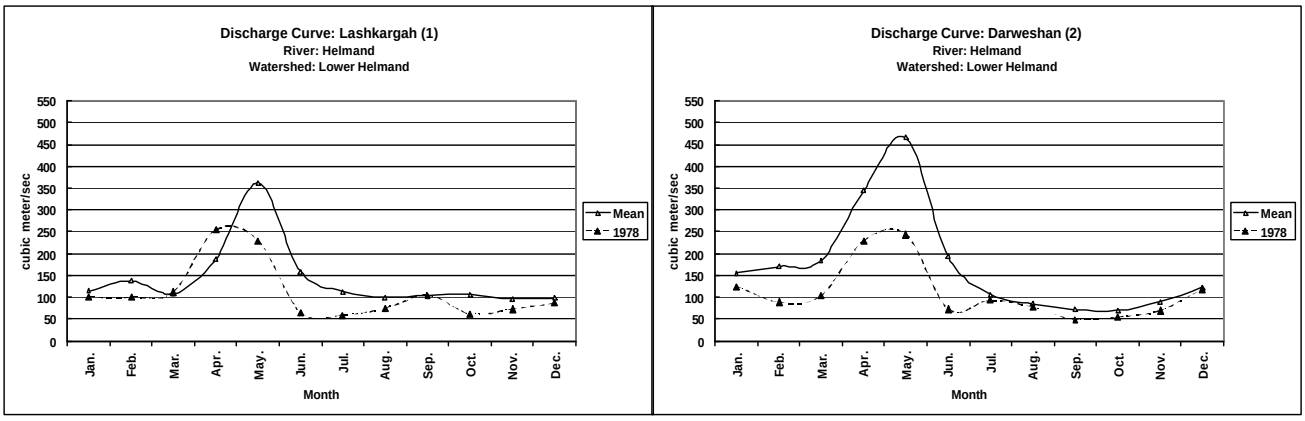
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Irrigated: Intensively Cultivated (1 Crop/Year)	64956	649.6	4.59
Irrigated: Intensively Cultivated (2 Crops/year)	13012	130.1	0.92
Irrigated: Intermittently Cultivated	15490	154.9	1.09
Marshland Permanently inundated	24373	243.7	1.72
Marshland Seasonal	23501	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**

Graph 96
Precipitation and ETP in Bost



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

Graphs 97 and 98
Discharge curves along the Hilmand river. Lower Hilmand watershed



21. Sistan-Hilmand Watershed

Sistan-Hilmand watershed starts below the irrigation canals of the formal irrigation scheme in Hilmand province at Khan Neshin town (district center of Reg district) and continues up to the Iranian border in the lagoons of the Hamum-i Hilmand. In the delta which 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 1300 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 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 content of salt. However, any project reducing this natural drainage (for example 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. Being the final drainage area for the Hilmand basin, it has accumulated salt over the centuries.

The Goad-i Zirreh lake is now mostly refilled from a natural spillway located east of Chahar Burjak center (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 drains water directly to the Gaod-i Zirreh. The Kamal Khan diversion dam, which was not completed, had aimed to avoid fresh water losses from the Hilmand by closing the natural spillway and redirecing flood water into irrigated land surrounding the lagoons.

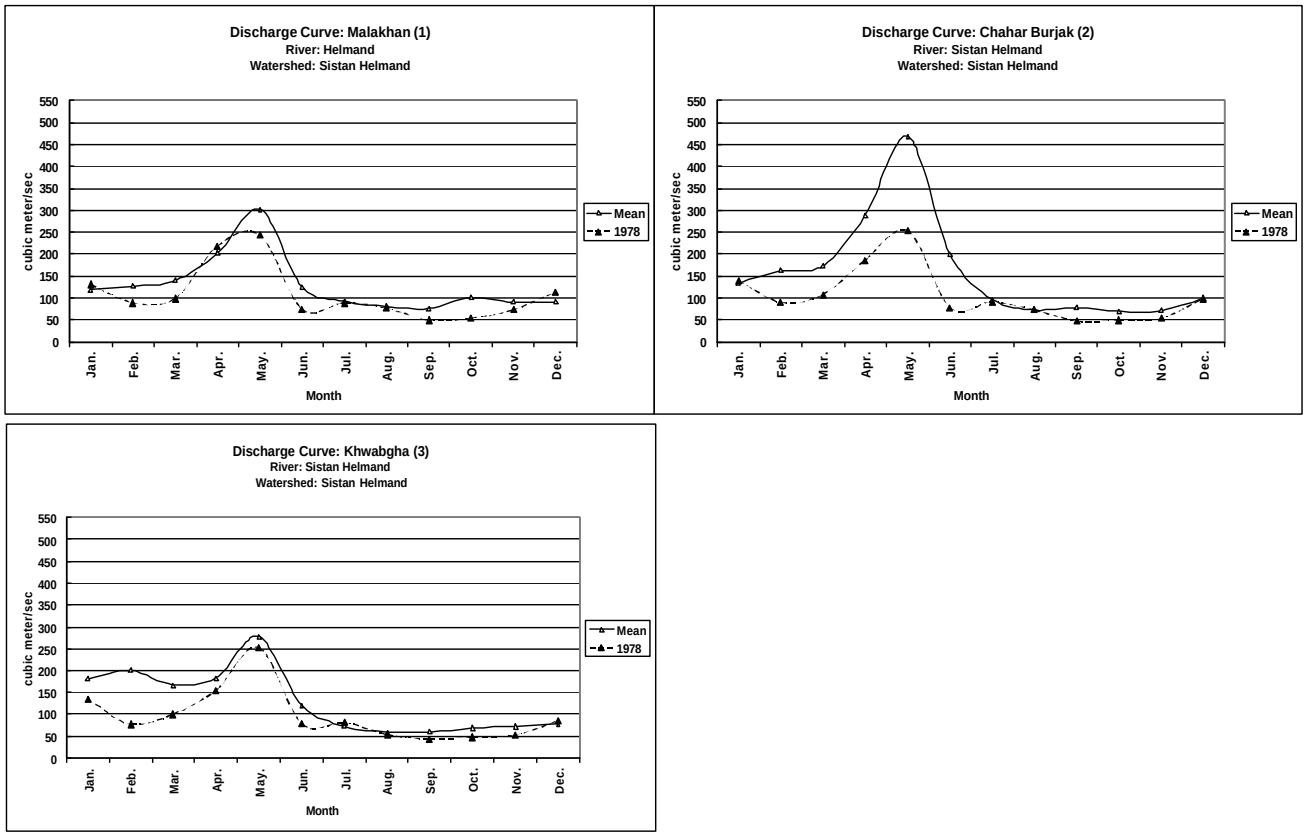
Table 36
Landcover classification for Sistan-Hilmand watershed

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

Picture 124
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 the map 3, 4 and 5 (Part I). 26 April 2003 (N29.88, E61.25, E)

The table 36 shows that Lower Hilmand watershed is largely dominated by bare soil (85%) and sand dunes (11%). Irrigated land in narrow strips along the Hilmand river represents 1.7% and almost the totality is intermittently irrigated.

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

Table 37
Landcover classification for Chagay watershed

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**

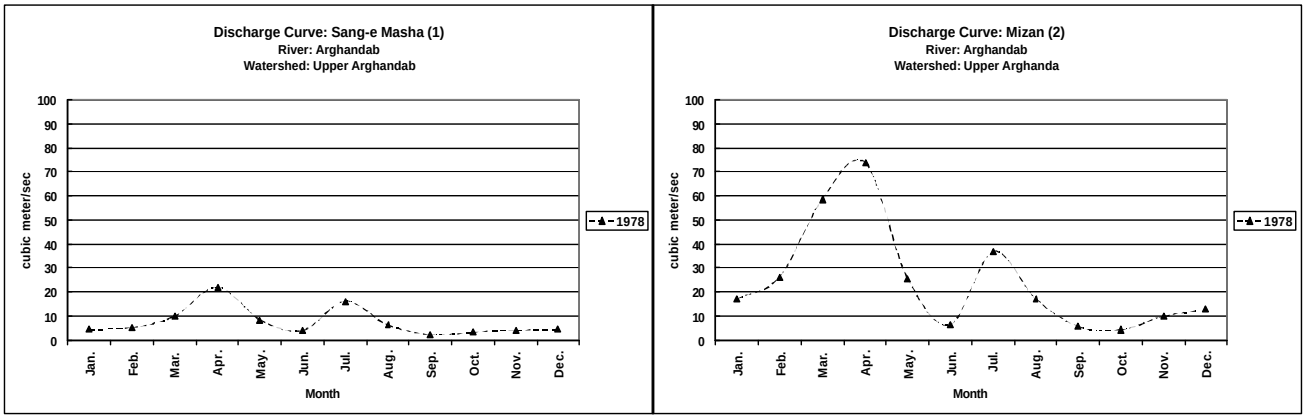
23. Upper Arghandab Watershed

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 which water joins close to Sang-i Masha, district center of Jaghori (North of the district center). From Jaghori, the Arghandab flows south-westward through Arghandab and Mirzan districts of Zabul province up to Band-i Dahla dam in Shah Wali Kot district of Kandahar. From Day Chopan district, the Marah Rod river contribute to the Arghandab river flow. The discharge graphs 97 to 99 show that the Arghandab river have a second peak of flow in July/August when the monsoon rains in some years waters the catchment area of the Upper Arghandab watershed. The table 38 shows that the Upper Arghandab watershed is largely dominated by rangeland (74%) and bare soil (19%). Irrigated land in narrow strips along the Arghandab river represents 6.4% of the watershed surface. However, half of it is intermittently cultivated (51%).

Table 38
Landcover classification for Upper Argandab watershed

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
Rain-fed Crops (flat lying areas)	5321	53.2	0.40
Rain-fed 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**

Graphs 102 and 103
Discharge curves along the Arghandab river. Upper Arghandab watershed



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 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 are irrigating mostly orchards and vineyard in Kandahar area; the Joy-i Wala or Zaher Shahi canal and the Naw Razi canal.

Below the Band-i Dahla dam, a number of seasonal streams are supplementing 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 few kilometers south of Maywand district center. Further down a second tributary, the Chakaw Mandeh stream contributes to the Arghandab river.

Graph 104
Precipitation and ETP in Kandahar Airport

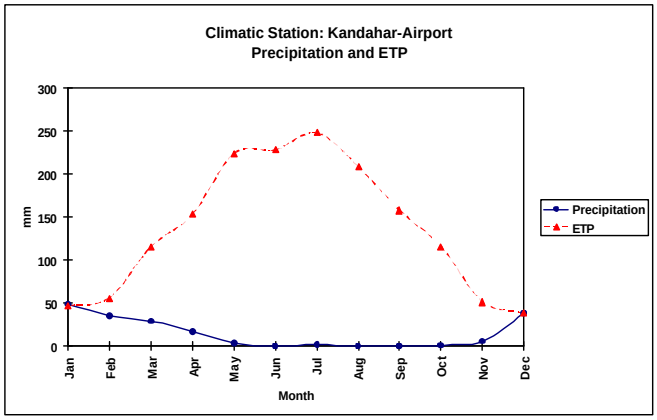


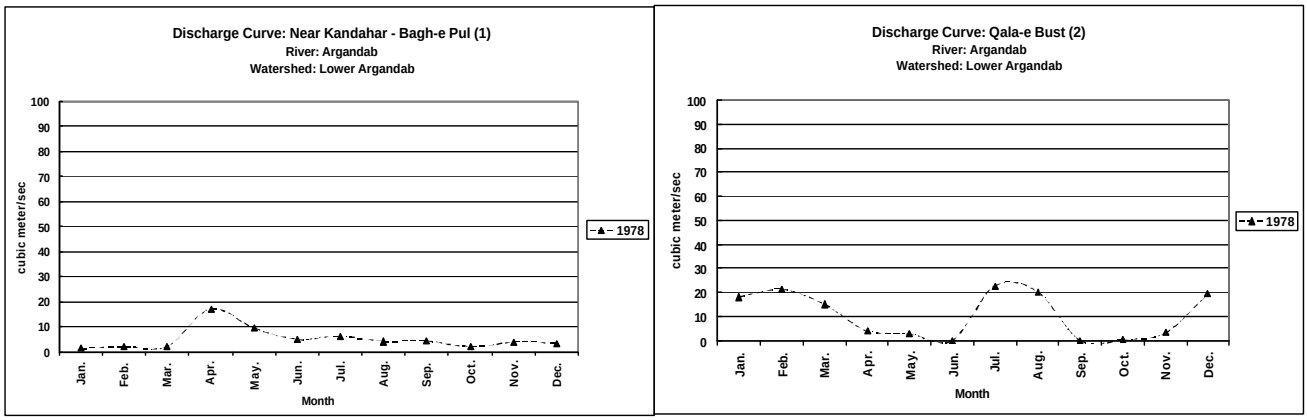
Table 39
Landcover classification for Lower Arghandab watershed

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
Rain-fed 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**

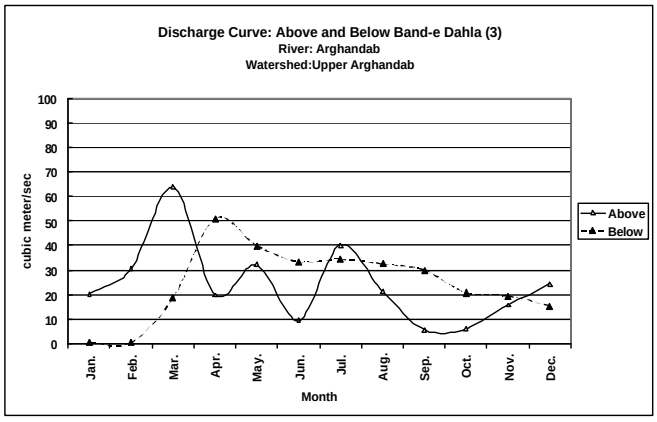
The table 39 shows that Lower Arghandab watershed is largely dominated by bare soil (65%). Irrigated land represents 15.2% of the watershed surface however, much of it (83%) is intermittently cultivated. Due to sub-optimal management of the water reserves in the Band-i Dahla

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 4 years of drought (1998-2002) deep wells were dry and orchards and vineyards could not be irrigated. The graph 107 shows the discharged curves above and below the Band-i Dahla dam before the war.

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 meters 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

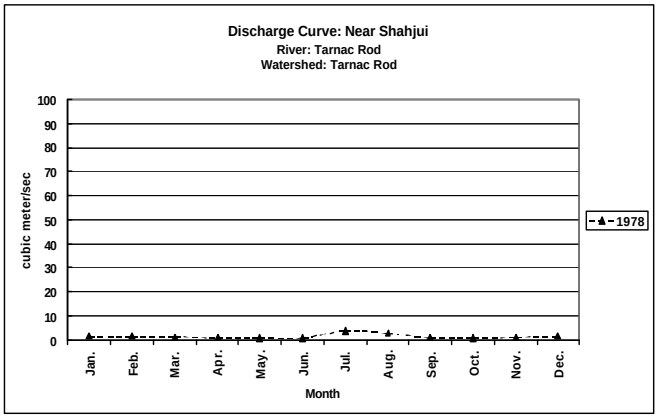
The Tarnac Rod watershed drains the water from Moqur and Gelan districts of Ghazni province and goes through Zabul province (Shajoy, Qalat, Tarnak wa Jaldak districts). The Tarnac Rod watershed ends at the Joy-i Zaher Shahi canal (from the Band-i Dahlan on the Aghandab river). However, when the river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

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

Table 40
Landcover classification for Tarnak Rod watershed

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
Rain-fed 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**

Graph 108
Discharge curves along the Tarnac Rod river, a tributary of the Arghandab river. The graphs are at similar scale as for the Upper Arghandab watershed for comparison purposes. Tarnac 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 (Ghazni province). The Arghistan Rod drains water from Shamulzai district of Zabul province (Lwargay Rod) and Maruf district of Kandahar province (Salesum Rod). The Lora Rod and Arghistan Rod join in Arghistan district near Kandahar. The river then retains the name of Arghistan Rod. The Arghistan Rod river sits east and parallel to the Argandab river. The Arghistan Rod loses its name when its reaches the Argandab river.

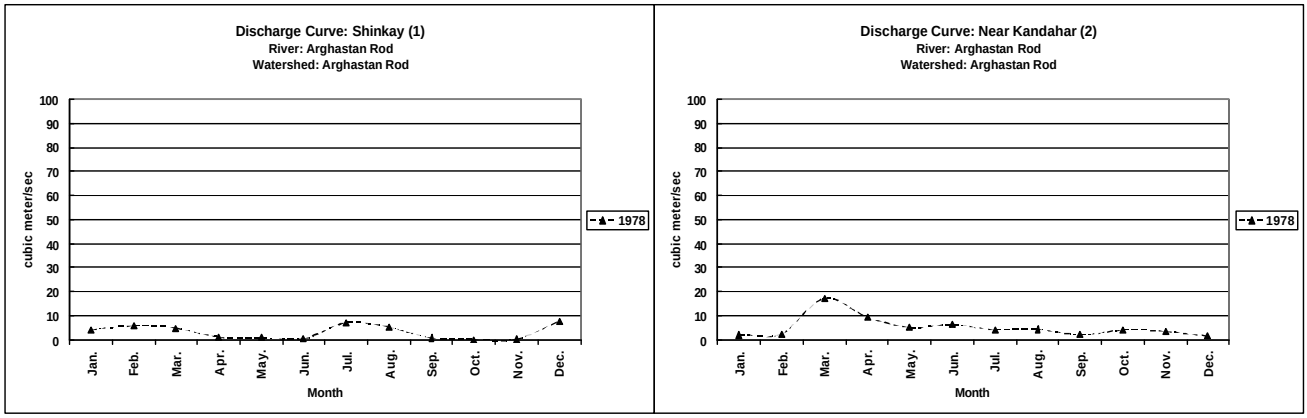
The Arghistan Rod watershed also includes the Dori river which takes its source just across the border in Pakistan (North of Quetta). At its source in Pakistan, the river bears the name of Lora Rod N°2 and its name changes to Kadanai Rod as it enters Afghanistan. The name Dori Rod applies as from the East of Spin Boldak. The Dori Rod joins the Arghistan at the southern edge of the watershed in Daman district of Kandahar. However, irrigation largely dissipates both the Dori and Arghistan before they unite.

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

Table 41
Landcover classification for Arghistan Rod watershed

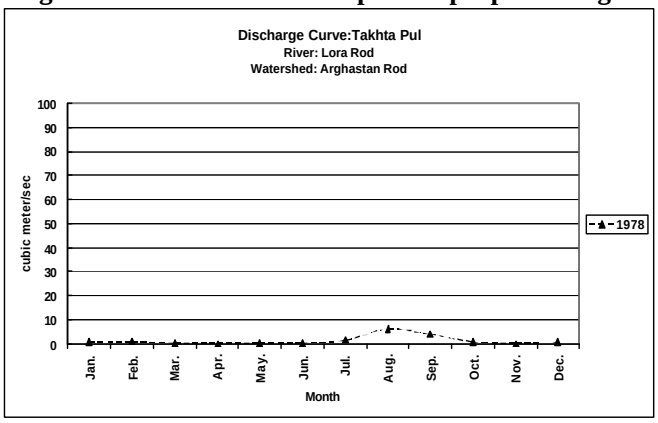
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Degenerate Forest/High Shrubs	5081	50.8	0.25
Irrigated: Intensively Cultivated (1 Crop/Year)	27643	276.4	1.37
Irrigated: Intermittently Cultivated	74135	741.3	3.67
Marshland Permanently inundated	4473	44.7	0.22
Marshland Seasonal	8014	80.1	0.40
Rain-fed 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**

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



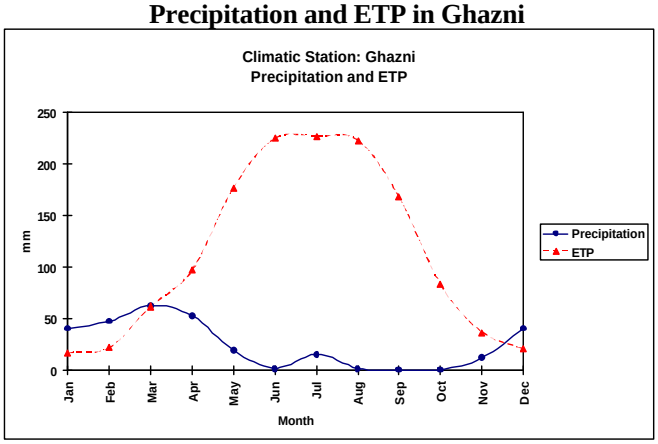
27. Sardih wa Ghazni Rod Watershed

The Sardih wa Ghazni Rod watershed drains water from Gardez province; Sardeh Rod river (also called Jilga Rod river) and several districts of Ghazni province; Ghazni Rod river. The Ghazni Rod river drains water from the Eastern side of Dasht-i Nawur Mountains. The Darya-i Payin that flows below the Bandi Sultan and a number of seasonal streams (i.e Sela-i Gulbowri, Sela-i Qalati, Sela-i Zanakhan) converge toward Ghazni city forming the Ghazni Rod river. The original dam of Bandi Sultan was built by Sultan Mahmood-i Ghaznavi (1000-1033 AD) which is located in Jaghori/Khwaja Umuri district of Ghazni (pictures 125 and 126). 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 (Sharan district). Water flow in most of these small torrents (Kanay Khwa, Makawa Khwa, Mullayan, Paltu, Park, Sarab, Syahgel) has been measured. The Ghazni Rod and Sardeh Rod meet in Giro district and flows into the Ab-i Istada salty lake. Another small river, the Nahara Rod has its sources in Omna and Zarghun Shahr districts of Ghazni province joins the Ab-i Istada on the Eastern side of the lake. When the lake overflows in good rainfall years (in spring) the water drains into the Lora Rod river (Arghistan watershed) which contributes to the Hilmand river. Therefore, the Sardih wa Ghazni Rod watershed is part of the Hilmand river basin.

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 build one thousand years ago by Sultan Mahmood-i Ghaznavi (1000-1033 AD). Ghazni, 18 March 2003 (N33.76, E68.38, W)

Graph 112
Precipitation and ETP in Ghazni



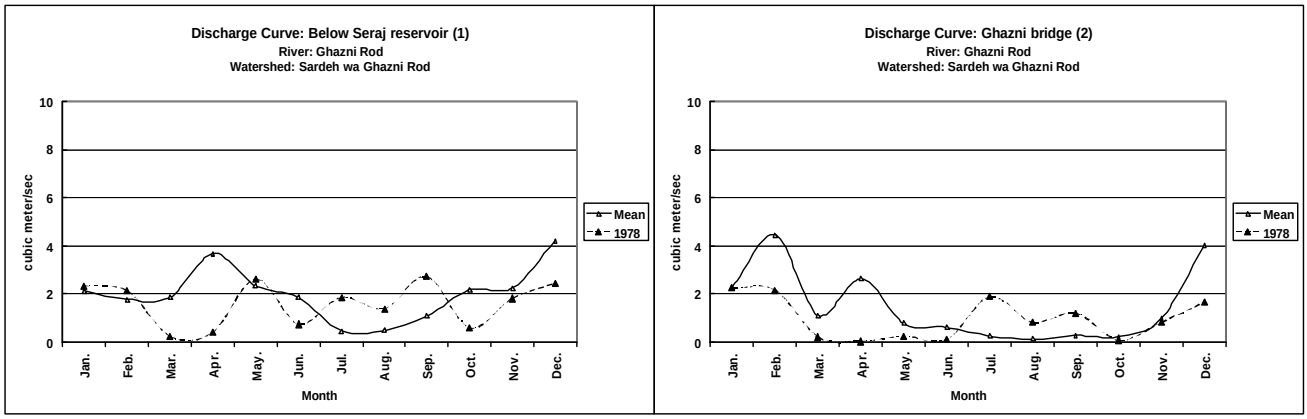
The table 42 shows that Sardih wa Ghazni Rod watershed is largely dominated by rangeland (68%) and bare soil (15%). Irrigated land represents 13.5% of the watershed surface, however, half of it (51%) is intermittently cultivated.

Table 42
Landcover classification for Sardih wa Ghazni Rod watershed

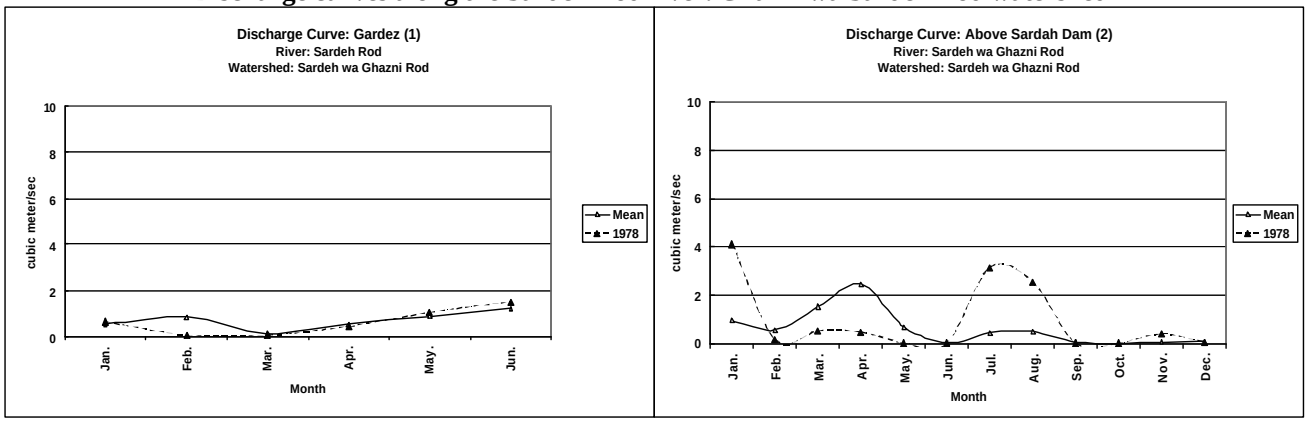
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Degenerate Forest/High Shrubs	960	9.6	0.06
Fruit Trees	927	9.3	0.05
Irrigated: Intensively Cultivated (1 Crop/Year)	105835	1058.3	6.13
Irrigated: Intensively Cultivated (2 Crops/year)	665	6.7	0.04
Irrigated: Intermittently Cultivated	119575	1195.8	6.93
Marshland 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
Rain-fed Crops (flat lying areas)	31299	313.0	1.81
Rain-fed 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**

The discharge graphs 109 and 110 show that the Sardih wa Ghazni Rod rivers have a second peak of flow in summer when the monsoon rains in good years waters the catchment area of the Sardih wa Ghazni Rod watershed.

Graphs 113 and 114
Discharge curves along the Ghazni Rod river. Ghazni wa Sardeh Rod watershed

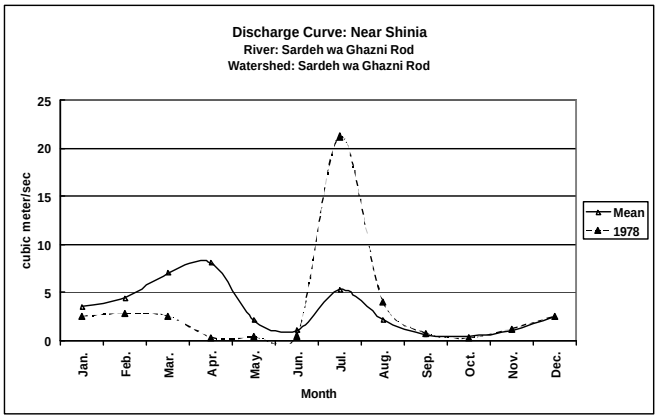


Graphs 115 and 116
Discharge curves along the Sardeh Rod river. Ghazni wa Sardeh Rod watershed



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 South-east of the country (picture 127). Surrounded with peaks and ancient volcanos, it drains water into a lake and wetland. The lake is located at approximately 3160 meters absl. No water flow data isavailable 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.

The table 43 shows that Dasth-i Nawur watershed is largely dominated by rangeland (68%) and marchland (15%). Some agriculture is practiced in irrigated land which represents 3.7% of the watershed surface, however most of it (84%) is intermittently cultivated.

Table 43
Landcover classification for Dasht-i Nawur watershed

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
Rain-fed 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**

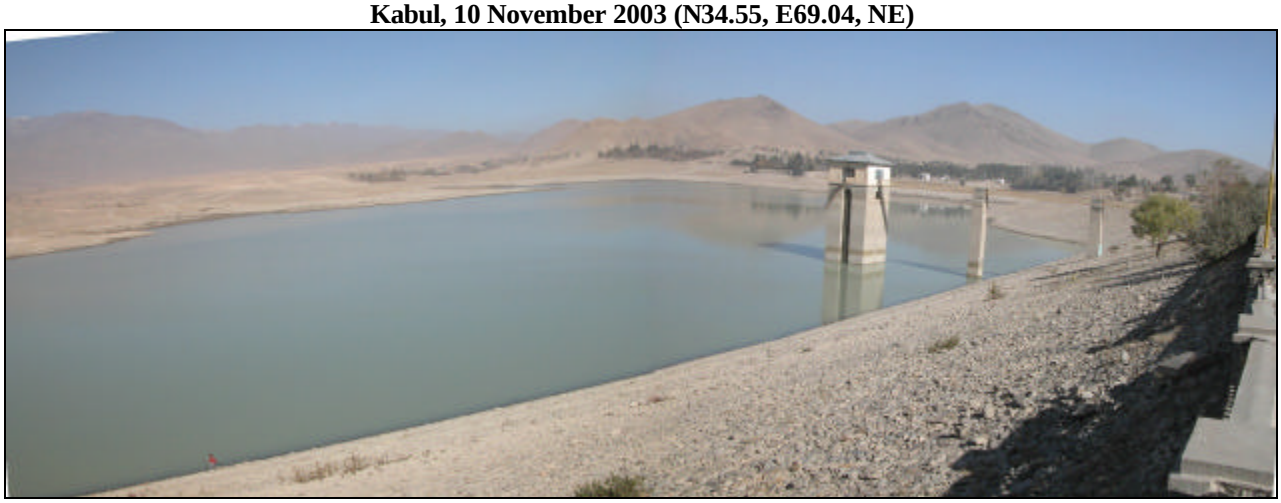
Picture 127
Aerial view of the Dasht-i Nawur high elevation plain surrounded by mountains. Nawur district, Ghazni province, 26 April 2003 (N33.87, E67.63, W)

VI. KABUL (INDUS) RIVER BASIN

29. Kabul Watershed

The Kabul river originates from the Eastern side of the Paghman mountains (Koh-i Paghman) from 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 center then, Darra-i Jabor and finally the Darra-i Sadmardah water from Nirkh district in Maidan Shar. The Darya-i Maidan changes its name for Kabul river after Tangi Lalandar south-west of Kabul before it flows below the Darulaman palace (Kabul). From Paghman district, numerous small streams are gathering West of Kabul and joins the Kabul river near Deh Mazang. Some of these streams are refilling Qargha reservoir supplying part of the water to Kabul city (picture 128). However, due to limited catchment area, the Qargha reservoir (14 million m3 build at the bottom of the Paghman valley above Kabul city for water supply was dry between the drought years (1999 and 2001).

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



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 spread inside the river bed, with stalls selling their wares where water once ran. In Pul-i Bagh-i Omumi, the bazaar in the Kabul river bed is called 'Titanic' bazaar (picture 129), as it is often sinks in spring when the river flow raises. '*Bazaar-i Titanic*' reportedly did not sink throughout the drought (1999-2001), but it did in 2002.

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

The Kabul river flows mainly from the contribution 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. Inflated 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 (Indus) river basin description.

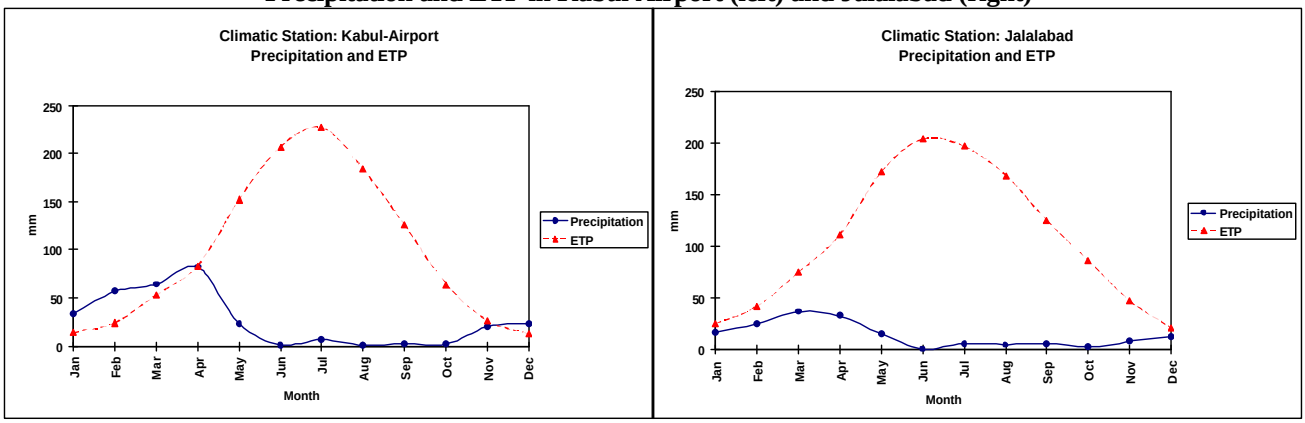
The Kabul watershed also drains numerous torrents from the Spinghar (or Sefid Koh) range which lies immediately south of Jalalabad and forms a mountain frontier with Pakistan (where the well known Tora Bora cavesare located). The most important of these torrents is the Surkh Ab (not to be confused with 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 or the Pishe Khwar. The volume of Kabul river water flow along its course in Afghanistan is reflected in the hydrological graphs 116 to 119 below. The scale of all graphs is the same to allow comparison.

The table 44 shows that Kabul watershed is largely dominated by rangeland (48%) and bare soil (31%). Irrigated land however represents 10% of the total surface of the watershed, out of which more than half is suitable for double cropping (mostly located in Nangarhar province). A very limited rain-fed cultivation (0.3%) is also practiced in few locations (i.e. near Kotal-i Khaikhana pass).

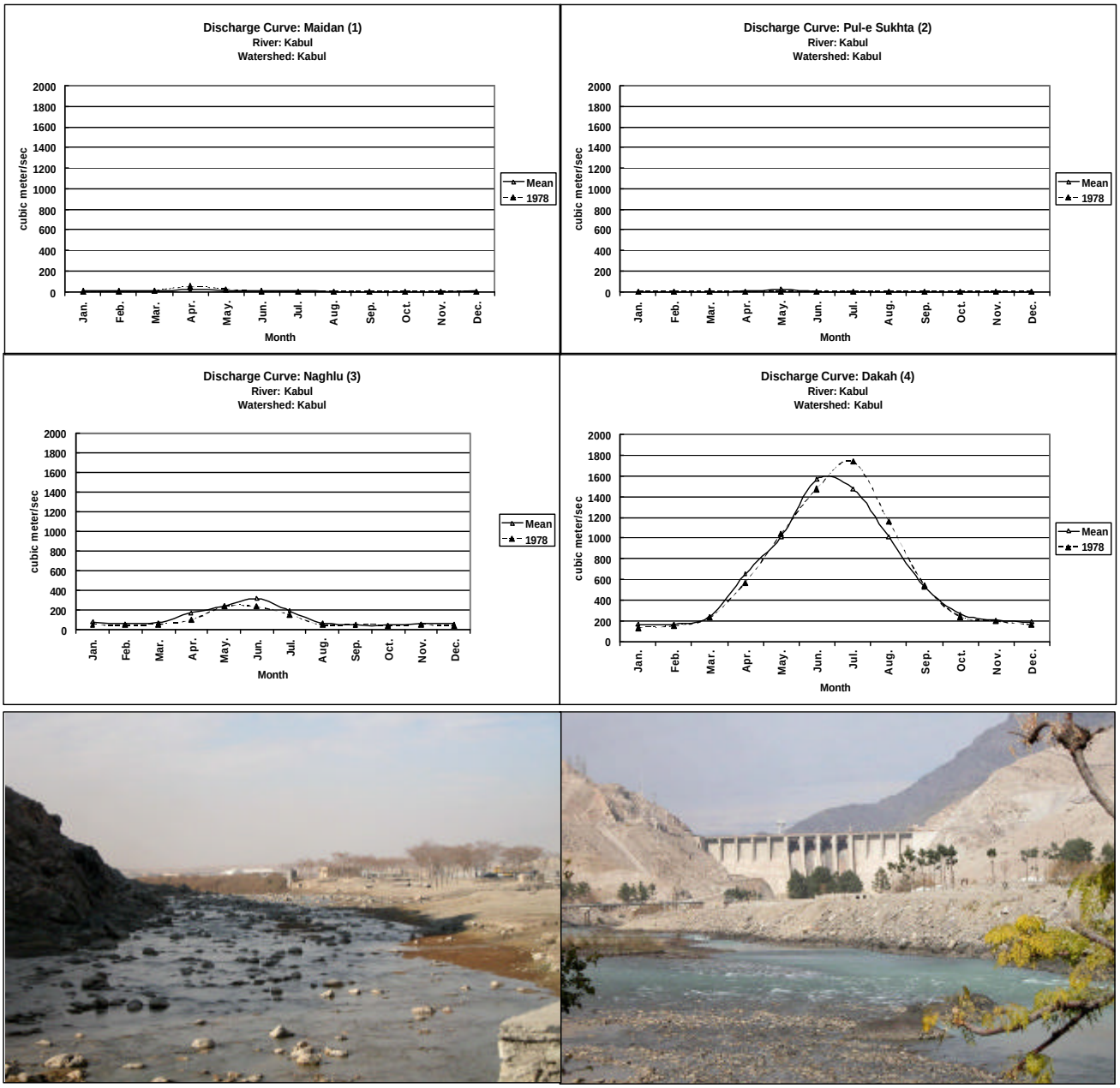
Table 44
Landcover classification for Kabul watershed

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
Rain-fed Crops (flat lying areas)	3027	30.3	0.23
Rain-fed 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**

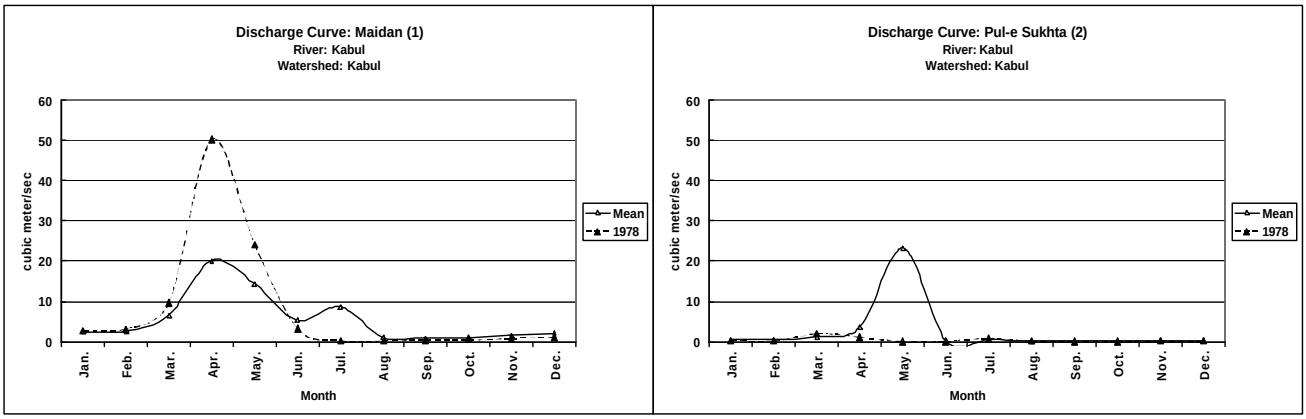
Graphs 118 and 119
Precipitation and ETP in Kabul Airport (left) and Jalalabad (right)



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 below after downstream of the Panjshir and Tagab river (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 Day Mirdad district of Wardak province. The main river in Chak wa logar Rod watershed is the Chak Rod which name changes in Baraki Barak (Logar province) for Logar Rod after the Pengram stream joins from Charkh district. The logar Rod flows toward Kabul and south of the city the river form a delta that irrigates Bagrami district (Kabul province). One channel of the Logar Rod waters 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, a small hydo-power dam, Bandi Chak commissioned in 1938 with German equipment (pictures 132 and 133). Bandi Chak was the first station supplying power to Kabul. According to Norconsult-Norplan, the structure appears robust and in relatively good condition, considering its age[4].

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)

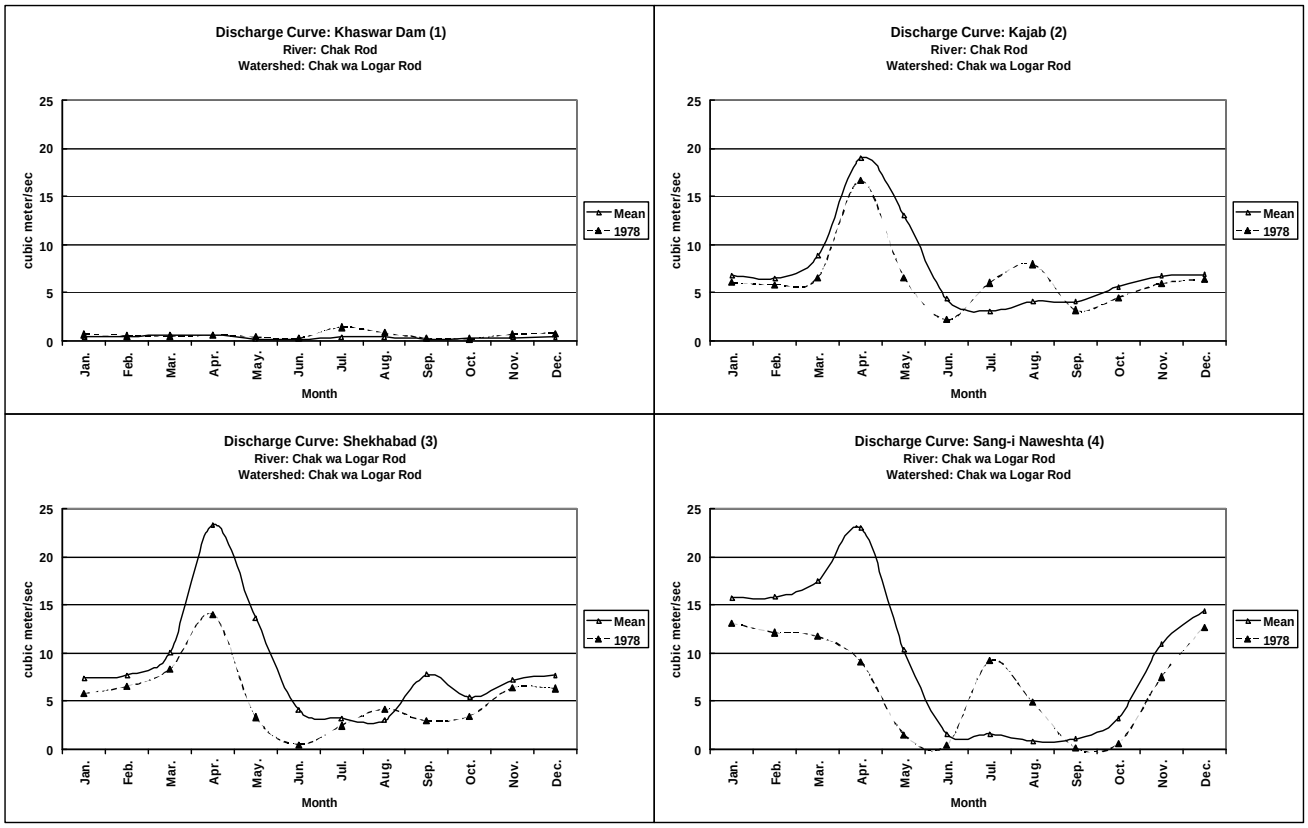
The table 45 shows that Chak wa Logar Rod watershed is largely dominated by rangeland (86%). Irrigated land is found in narrow strips on valley floors and represents 7.4% (out of which 32% is intermittently irrigated) of the total surface of the watershed. Some rain-fed cultivation (5.2%) is also practiced.

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

Table 45
Landcover classification for Chak wa Logar Rod watershed

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
Rain-fed Crops (flat lying areas)	32714	327.1	3.28
Rain-fed 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**

Graphs 126 to 129
Discharge curves along the Chack wa Logar Rod river. Chack wa Logar Rod watershed



31. Ghorband wa Panjshir Watershed

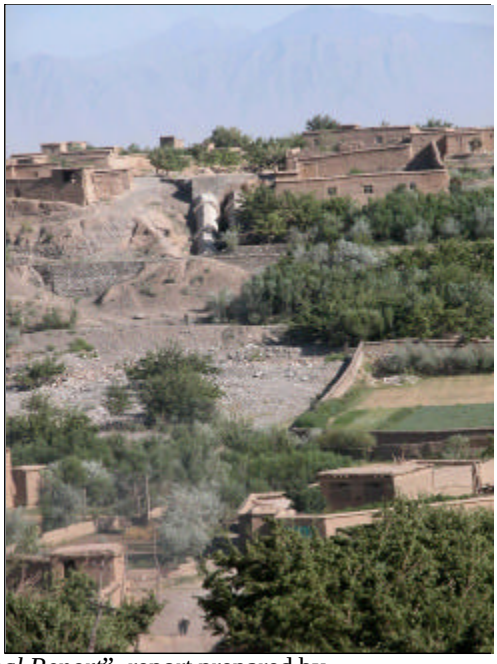
The Ghorband wa Panjshir watershed drains water from two east-west oriented valleys South of the high Central Hindu Kush Mountains. These two valleys were formed along the Hari Rod geological fault. The Ghorband and Panjshir watershed ends at the Naghul dam in Surobi district (Kabul). The catchment area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

The Ghorband river takes its source around the Shibar pass (2900 m asl). It has an important tributary from the Turkman valley (Turkman river) that 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 reach 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 step and narrow valley, the Shotul river contributes to the Panjshir river from their junction in Gulbahar.

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)

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 hydro-power plan was constructed in Afghanistan as it was commissioned in 1920. Nortconsult-Norplan estimates that the equipment is lacking maintenance and is generally in a poor condition[5].

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

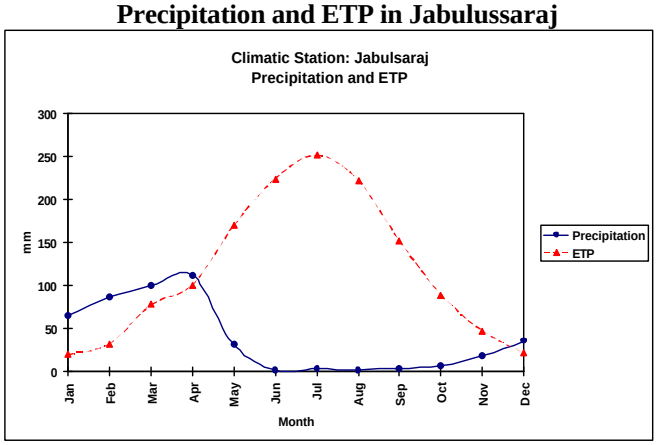


Picture 135
View of the Nahr-i Parwan canal siphon passing under the Ghorband river (near Pul-i Matak). Jabulussaraj district, Parwan, 17 June 2003 (N35.09, E69.19, S)

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

The Ghorband river joins the Panjshir river in Bagram district (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 means 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, another river drains separately into the Bandi Naghlu dam; the Tagab river which takes it source from the high Moutains of Kapisa province.

Graph 130
Precipitation and ETP in Jabulussaraj



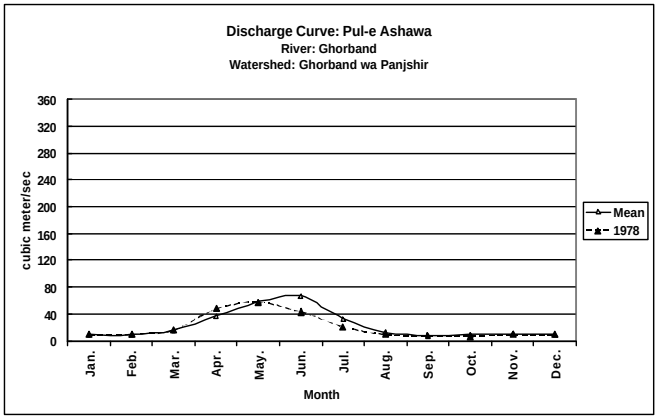
Picture 136
Jonction between the Ghorband river (left) and the Salang river (right) in Jabulussaraj district. Parwan, 17 June 2003 (N35.07, E69.23, N)

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

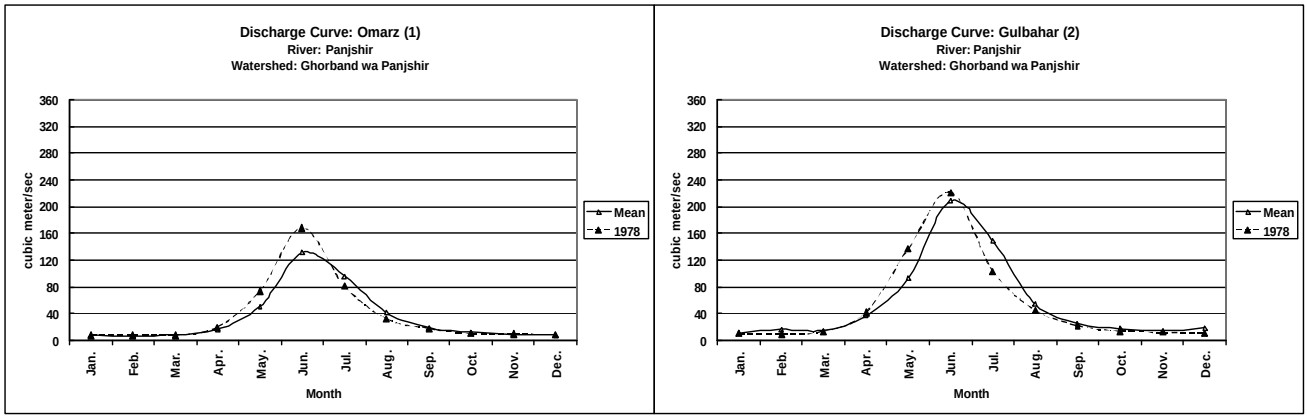
Table 46
Landcover classification for Ghorband wa Panjshir watershed

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
Rain-fed Crops (flat lying areas)	12938	129.4	1.00
Rain-fed 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**

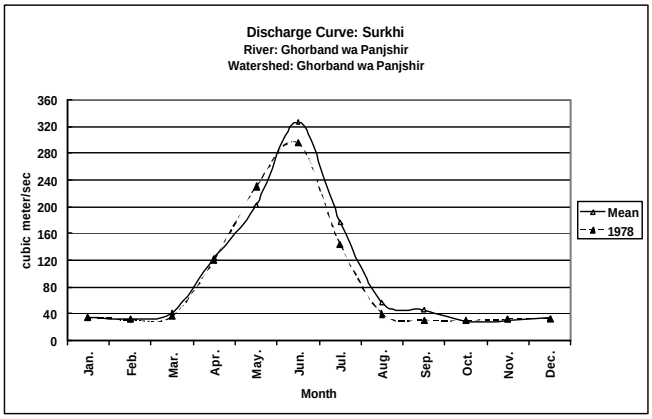
Graph 131
Discharge curves along the Ghorband river. Ghorband wa Panjshir watershed



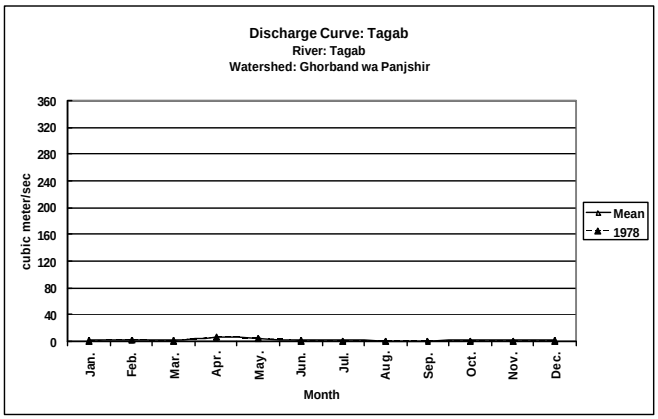
Graphs 132 and 133
Discharge curves along the Panjshir river. Ghorband wa Panjshir watershed



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

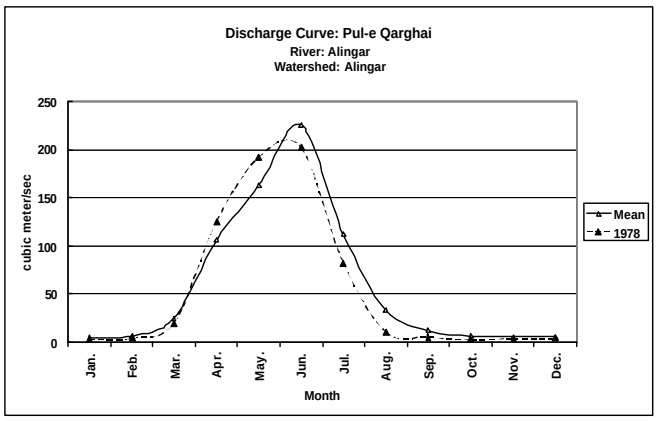
The Alingar watershed drains water from the southern slope of the high mountains of the Hindu Kush oriental. These high mountains bear glaciers that maintain the river flow in summer. There are two valleys and rivers in Alingar watershed; the largest one is Alingar and the smallest Alishang. The Alingar river (east side) takes its source from Mandol and Nuristan districts (Nuristan province) where it is called Darya-i Nuristan or Darra-i Poshal. The river takes the name of Alingar in Alingar district (Laghman province). The Alishang river takes it source from Dawlatshah district where is 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.

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

Table 47
Landcover classification for Alingar watershed

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
Rain-fed 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**

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 Hindou Kush oriental range in Nuristan province. The Kunar river takes its source from glaciers in the region of the Teraj Mir mountain (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/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 are taking their source from the high mountains of the Hindu Kush oriental. 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 center of Marawara district (Kunar province). In Nagarhar province, just after the gorge of Tangi Tokchi, the Kunar river forms a delta and irrigates agricultural land of Kama (left bank) and Jalalabad districts (right bank). The Kunar watershed ends when the Kunar river joins the Kabul river East of Jalalabad town.

Picture 137
View of Kunar river in Asmar. Kunar, July 2003

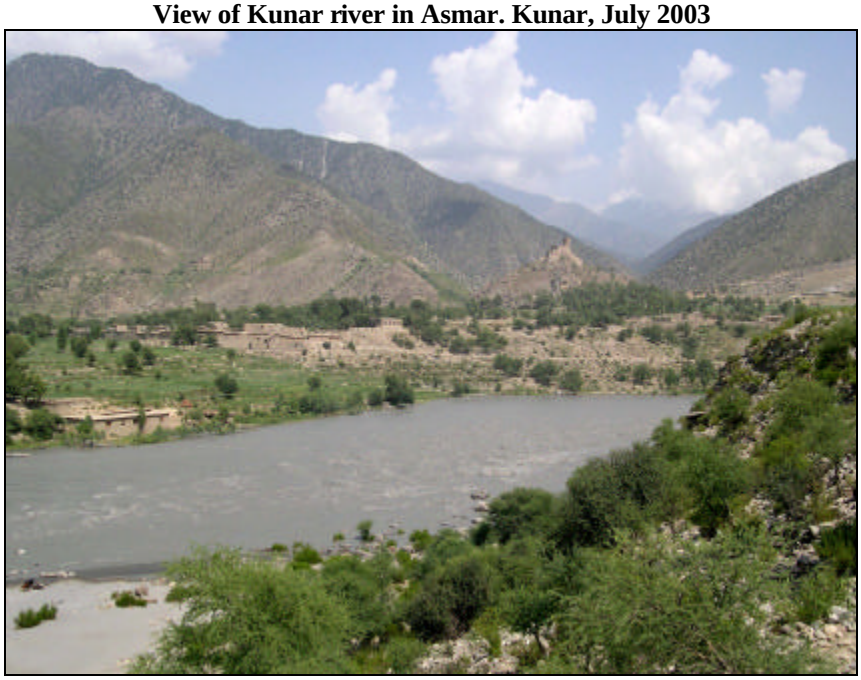
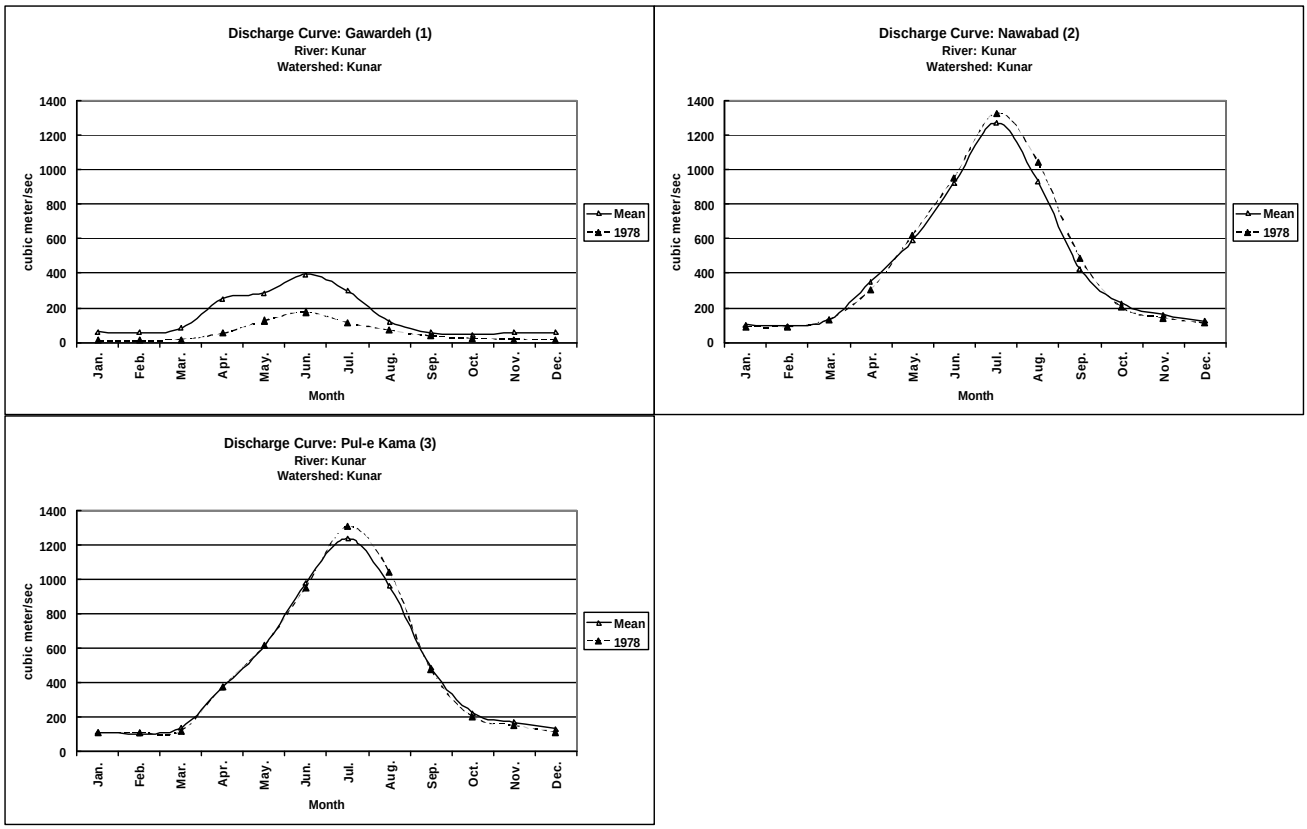


Table 48
Landcover classification for Kunar watershed

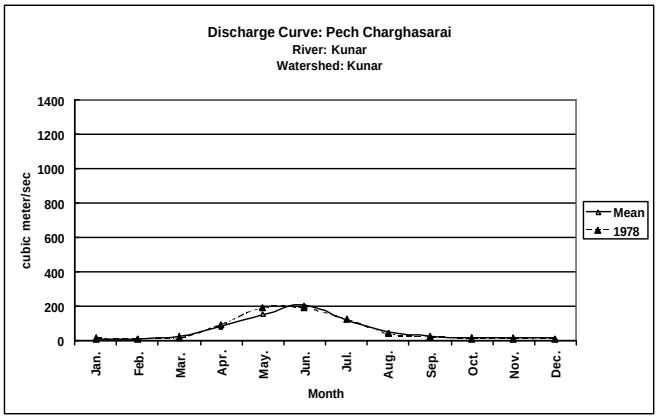
LANDCOVER	Area (Ha)	Area (Sq. km.)	% Watershed
Degenerate Forest/High Shrubs	16183	161.8	1.39
Irrigated: Intensively Cultivated (1 Crop/Year)	11863	118.6	1.02
Irrigated: Intensively Cultivated (2 Crops/year)	5897	59.0	0.51
Irrigated: Intermittently Cultivated	19708	197.1	1.69
Marshland Permanently inundated	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
Rain-fed 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**

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

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 multitudes of streams that join near Khost province center. The main tributary of the Shamal river is the Tangay or Spera river, taking its source from Surobi and Urgun district of Paktika province and flow north-eastward toward Khost. The Tangay meets the Shamal river in Nadir Shah Kot district of Khost. Other tributaries include the Ghorumbay, Pir Jani Khwara, Matun or Khost Sin or Kerkin Khwar. Hydrographic data exists for most of the small torrents in the Shamal watersheds (total of 16 hydrological stations).

The Shamal watershed includes two other rivers; the Gabertoy (also Gaber or Kurram) and Bermal rivers 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 it 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 is facing toward the Indian sub-continent and is therefore under the influence of the monsoon rainy season and hence benefit from rainfall in summer too (see graph 137). The graphs 138 and 139 show that the Shomal river have a first peak of water flow in the winter months (February to April) and a second peak in summer (July- August).

Graph 141
Precipitation and ETP in Khost

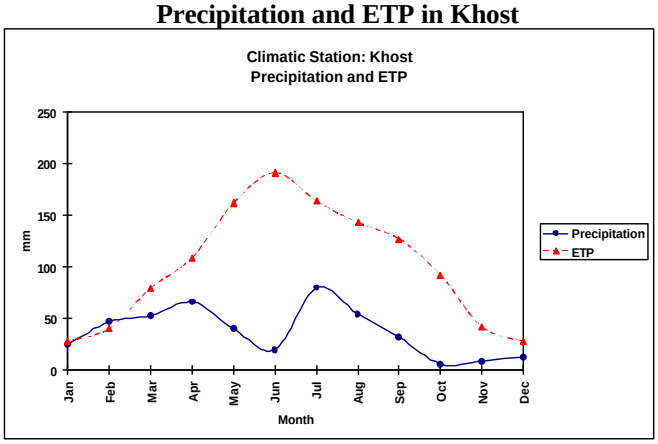
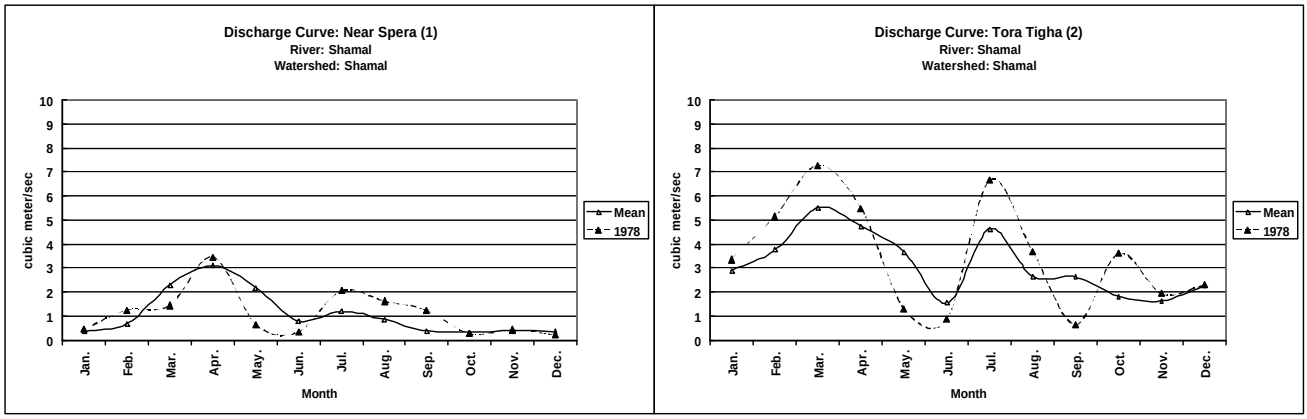


Table 49
Landcover classification for Shamal watershed

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
Rain-fed Crops (flat lying areas)	12955	129.5	1.31
Rain-fed 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**

The table 49 shows that Shamal watershed is dominated by rangeland (49%) and natural forest (33%). Irrigated land is found in narrow strips on valley floors and represents approximately 6% of the watershed area. Some rain-fed cultivation is also practiced (1.6%).

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 Suleiman 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 (Paktika) and joins the Gomal river just on the border with Pakistan. There is no hydrological data for the Gomal Rod watershed.

The table 50 shows that Gomal watershed is dominated by bare soil (57%) and rangeland (40%). Irrigated land is found in narrow strips on valley floors and represents approximately 0.7% of the watershed area. Some rain-fed cultivation is also practiced (0.2%).

Table 50
Landcover classification for Gomal watershed

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
Rain-fed Crops (flat lying areas)	1852	18.5	0.21
Rain-fed 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**

36. Pishin Lora Watershed

The Pishin Lora watershed is located in the south-eastern corner of Kandahar province (Shorabak district) at the edge of the sand dunes of Registan. The Pishin Lora river originates from small mountain ranges on both side to 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 flow into Pakistan in the North of Quetta along the Khwadja Mountains. There is no hydrological and climatic data available for Pishin Lora watershed.

The table 51 shows that Pishin Lora watershed is largely dominated by bare land (76% of rock and sand). Irrigated land however represents 12.1% of the total surface of the watershed but the totality is intermittently cultivated as crops are planted only when rainfall are sufficient to create overflow of the Pishin Lora into a multitudes of small canals. Rain-fed cultivation (10.9%) is also practiced.

Table 51
Landcover classification for Pishin Lora watershed

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
Rain-fed 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**

VII. NONE -DRAINAGE AREAS

37. Dasht-i Margo

Dahst-i Margo (which means 'Desert of Death') is a none- drainage area north of the Sistan-Hilmand watershed. Dasht-i Margo is covered with sand dunes and bare land (rock and sand, picture 139) and some seasonal marchland. There are some small land depressions which accumulate occasional water from rainfall, and where some reeds and grasses are growing (picture 138).

Table 52
Landcover classification for Dasht-i Margo none drainage area

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**

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

38. Registan-i Sedi

Registan-i Sedi is a small none drainage area on the East of Gaod-i Zirreh lake (Sistan-Hilmand watershed. Registan-i Sedi is covered with sand dunes and bare land (rock and sand).

Table 53
Landcover classification for Registan-i Sedi none drainage area

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**

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. on the Afghan side and the lake extend on the Iranian side. Namakasar is a salt lake which produces most of the salt production for the entire region and was officially linked to the MoM in 1963. Extraction and collection of salt from this lake is seasonal. After the flood and rain water 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 Oct/Nov after which the Lakeland is back under water.

The table 54 shows that Dasht-i Naumed is chiefly composed of bare soil (98%) and the rest with marchland/water bodies and some intermittently irrigated land.

Table 54
Landcover classification for Dasht-i Naumed none drainage area

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**

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

40. Registan

Registan (place of sand) is, as the name gives away, dominated by sand dunes and sand covered areas (98%). In Registan, there are plenty of some small depression that accumulate rare water from rainfall, and where small amounts of reeds and grasses are growing (picture 138). Nomads ('*Registan kuchi*') have made their winter quarter for the livestock. There are numerous deep wells, out of which water is extracted for livestock and human consumption.

Table 55
Landcover classification for Registan none drainage area

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**

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. Withith the development of traditional irrigation schemes centuries ago, these rivers are no longer contributing to the Amu Darya, insteaddrying in canals 50 to 100 km afar[6]. Therefore, an area of none-drainage exists between the Turkistan basin rivers (Shirin Tagab, Sare Pul, Balkhab and Tashkurghan rivers) and the Amu Darya river; Dasth-i Shortepa none drainage area.

Dasht-i Shortepa is a narrow strip composed mostly of sand dunes following the Amu Darya river between Khamyab district in Jawzjan and Qala-i Zal district of Kunduz. However, unlike other none drainage area, in Dasht-i Shortepa some irrigated land is practiced along the Amu Darya river. These irrigated land represents 3.2% of the total surface of the none drainage area. Dasht-i Shortepa also includes some marchland located between the meanders of the Amu Darya river.

Table 56
Landcover classification for Dasht-i Shortepa none drainage area

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**

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