

Monitoring of changes in the water surface and wetland area of the Aral Sea and the Aral Region

SIC specialists are constantly monitoring the state of the Southern Aral Sea and parts of the Greater Aral Sea by using the Landsat 8 OLI images. According to the image from October 6, 2022, the areas of wetlands and open water surface were determined

Table 1

Areas of wetlands in the Aral Region, ha

Water body	23.05.2022	24.06.2022	18.07.2022	27.08.2022	20.09.2022	06.10.2022
Sudoche	228.69	17801.2	706.3	335.16	865.98	20858.4
Mejdureche	30	330.9	21.87	21.9	47.88	2100
Rybatche	0.81	631.3	0.18	0	0	1275.39
Muynak	3.15	101.6	1.08	0.45	2.88	729
Djiltyrbas dam-terminated	42659.3	6048.45	102.96	32.22	21.69	5516.46
Djiltyrbas (together with former right and left streams)	98856.77	0	2.52	26.55	95.22	12242.25
Dumalak	0	64.44	0	0	0	481
Makpalkul	34.65	188.82	126	0	0	168.21
Mashan Karadjar	17.37	498.9	3.42	24.03	20.43	1207.35
Water surface southward of Muynak	9605	48.42	0	0	0.27	475
Water surface along Kazakhdarya river channel	4751.5	0	0	0	0	96.3
Zakirkol	2790.04	0	0	0	0	19.08
Total:	158 977.3	25 714.03	964.33	440.31	1054.35	45 168.44

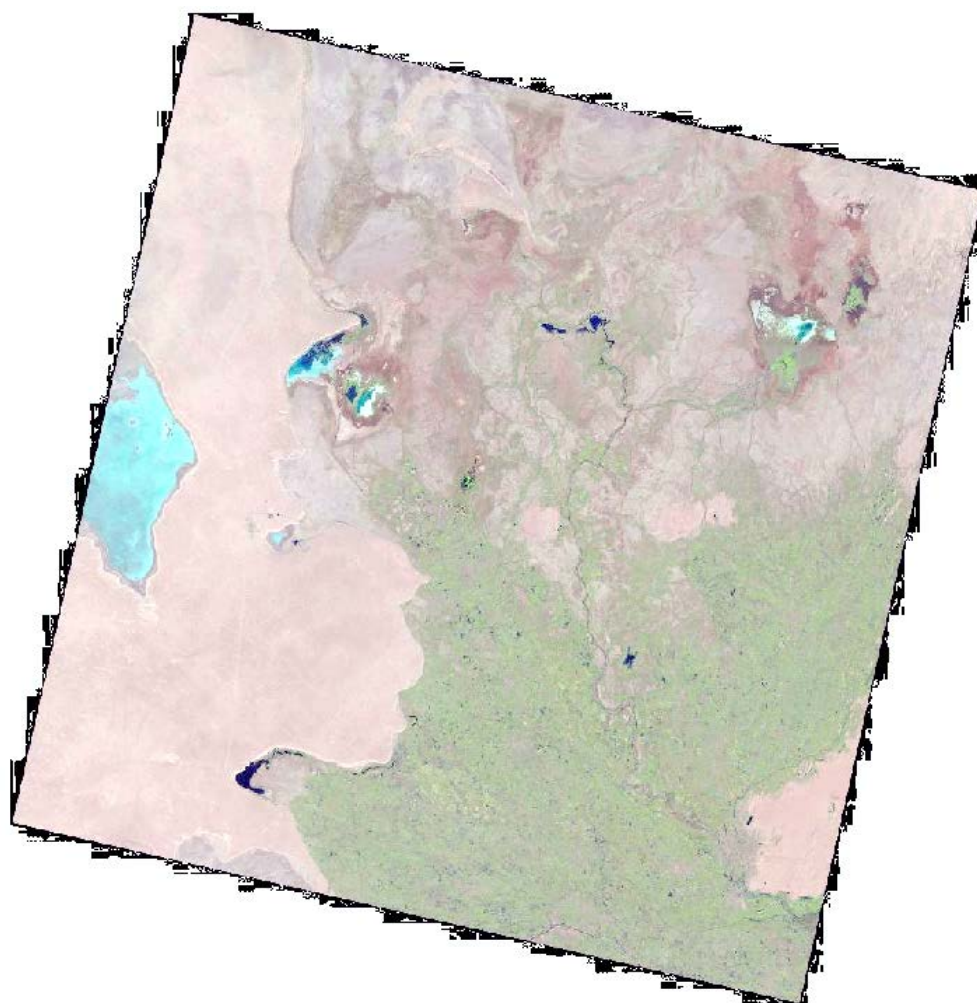


Figure 1. The Aral Region. Landsat 8 and 9.

6 October 2022

Table 2

**The area of open water surface
in the Aral region, ha**

Water body	23.05. 2022	24.06. 2022	18.07. 2022	27.08. 2022	20.09. 2022	06.10. 2022
Sudoche	9009.99	6374.5	4270.9	1756.7	3239.37	4325.49
Mejdureche	1389	898.9	596.97	1501.2	1784.61	1528
Rybache	628.92	44.19	0	0	0.36	0.18
Muynak	23.76	7.2	2.7	2.52	5.31	5.31
Djiltyrbas dam-terminated	4813.02	1617.9	1286.1	844.56	322.29	213.3
Djiltyrbas (to- gether with former right and left streams)	94.23	0	8.19	6.84	7.38	15.3
Dumalak	0	0	0	0	0	0
Makpalkul	401.58	0	573.3	0	0.09	0
Mashan Karadjar	33.57	0.36	7.65	63	152.64	210.2
Water surface southward of Muynak	0	0	0	0	0	0
Water surface along Kazakhdarya river channel	0	0	0	0	0	0
Zakirkol	1.26	0	0	0	0	0
Total	16 395.33	8 943.05	6 745.81	4 174.82	5 512.05	6 297.78

Table 3**Dried ground area* in the Aral Region, ha**

Water body	23.05.2022	24.06.2022	18.07.2022	27.08.2022	20.09.2022	06.10.2022
Sudoche	63458.32	48521.3	67719.8	70605.14	68591.65	47513.11
Mejdureche	36365	36554.2	37165.16	36260.9	35951.51	34156
Rybatche	10863.27	10817.51	11492.82	11493	11492.64	10217.43
Muynak	16137.09	16055.2	16160.22	16161.03	16155.81	15429.69
Djiltyrbas dam-terminated	401.58	39806.04	46083.33	46595.61	47128.41	41742.63493
Djiltyrbas (together with former right and left streams)	5.76	98951	98940.29	98917.61	98848.4	86693.45
Dumalak	16050	15985.56	16050	16050	16050	15569
Makpalkul	8247.77	8495.18	7984.7	8684	8683.91	8515.79
Mashan Karadjar	27150.06	26701.74	27189.93	27113.97	27027.93	25783.45
Water surface southward of Muynak	0	9556.58	9605	9605	9604.73	9130
Water surface along Kazakhdarya river channel	0	4751.5	4751.5	4751.5	4751.5	4655.2
Zakirkol	0.81	2791.3	2791.3	2791.3	2791.3	2772.22
Total	178 679.6	318 987.1	345 934.0	349 029.0	347 077.7	302 177.9

* bare soil, dense or rare vegetation

Notes: From 2012 to 2019, to determine the area of the water surface and wetlands, satellite image data were digitized manually with a comparison of the NDVI index (Normalized Difference Vegetation Index/ Standardized Index of differences in vegetation Cover). Since 2019 SIC ICWC has started using the methodology of water surface and wetlands recognition based on a controlled AWEI pixel value classification (Automated Water Extraction Index). At the beginning of 2022, it was decided to return to the use of the NDVI index, but according to the specified threshold values. The main provisions of past and new approaches are presented below so that users can correctly interpret and compare data from different years.

Until 2022, the total area of the reservoir was defined as the sum of the area of open water surface and the area of wetlands. However, the question of the exact division of the wetlands area in order to distinguish it from the land (dry, degraded lands) remained open. Therefore, since 2022, the use of the NDVI index with refined threshold values has been started, which allow recognizing three categories of surfaces: 1) open water surface, 2) wetlands, 3) land. Their descriptions and threshold values for the NDVI index are given in the table below. In order to further classify water bodies based on the results of the study, NDVI thresholds were selected: < -0.001 for open water, $-0.001-0.05$ for wetland and > 0.05 for other Earth surface coverings. Currently, the materials (2021 and 2022) on the site have been updated according to an improved methodology. In this regard, there may be some discrepancies when compared with data from previous years.

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