

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

SIC ICWC made monitoring of changes in the Aral Sea and the Aral Region by using the Landsat 8 OLI images. The images got on 14 September 2020 allowed having wetland and open water surface areas within the boundaries of the Aral Region and the Aral Sea.



**Figure 1. Western and Eastern parts of the Aral Sea.  
Landsat 8, 14 September 2020**

**Table 1**

**The area of wetlands and open water surfaces in the Western and Eastern parts of the Aral Sea**

	<b>22.03.2020</b>	<b>25.05.2020</b>	<b>10.06.2020</b>	<b>28.07.2020</b>	<b>20.08.2020</b>	<b>14.09.2020</b>
	<i>Western part of the Aral Sea, ha</i>					
Wetland	<b>312 526</b>	<b>312 359</b>	<b>314 138</b>	<b>317 639</b>	<b>320543,7</b>	<b>318 593</b>
Water surface	<b>248 823</b>	<b>248 993</b>	<b>247 212</b>	<b>243 710</b>	<b>240806,5</b>	<b>242 757</b>
	<i>Eastern part of the Aral Sea, ha</i>					
Wetland	<b>1 402136</b>	<b>1 431 090</b>	<b>1 44 5300</b>	<b>1 462 442</b>	<b>1 474628</b>	<b>1 478 120</b>
Water surface	<b>94 688</b>	<b>65 733</b>	<b>51 523</b>	<b>34 381</b>	<b>22 195</b>	<b>18 703</b>
	February	April	May	June	July	August
Water quota	<b>520</b>	<b>594</b>	<b>181</b>	<b>337</b>	<b>480</b>	<b>391</b>
Inflow to the Aral Region, Mm <sup>3</sup> /month	<b>210</b>	<b>217</b>	<b>210</b>	<b>193</b>	<b>187</b>	<b>126</b>



**Figure 2 The Aral Region, Landsat 8, 14 September 2020**

**Table 2****Areas of wetlands in the Aral Region, ha**

<b>Water body</b>	<b>22.03.2020</b>	<b>25.05.2020</b>	<b>10.06.2020</b>	<b>28.07.2020</b>	<b>20.08.2020</b>	<b>14.09.2020</b>
Sudoche	34828,1	47471,64	51796,53	60811,51	62688,82	63465,16
Mejdureche	24402,4	32105,02	34195,34	35012,09	36047,27	36777,53
Rybatche	9341,7	8874,27	9087,16	9547,38	9727,92	9662,22
Muynak	13251	15151,95	15559,56	15935,52	15944,85	15981,84
Djiltyrbas dam-terminated	38644,3	42580,52	42792,12	42816,06	42630,3	42742,08
Djiltyrbas (together with former right and left streams)	92720,3	97239,29	98263,85	98843,05	98876,3	98873,33
Dumalak	15614,8	15978,9	16031,46	16048,38	16049,19	16050
Makpalkul	7873,4	8282,22	8550,71	8408,69	8456,21	8633,42
Mashan Karadjar	25972,5	26539,18	26861,97	29976,45	27046,65	27021,63
Water surface southward of Muynak	9509,3	9605	9605	9605	9605	9605
Water surface along Kazakhdarya river channel	4751,5	4751	4751,5	4751,5	4751,5	4751,5
Zakirkol	2251,7	2783,17	2788,24	2788,3	2791,3	2791,3
<b>Total:</b>	<b>282 961,3</b>	<b>311862,7</b>	<b>320283,4</b>	<b>331540,9</b>	<b>334615,3</b>	<b>336 355,01</b>

**Table 3**

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

<b>Водоём</b>	<b>22.03.2020</b>	<b>25.05.2020</b>	<b>10.06.2020</b>	<b>28.07.2020</b>	<b>20.08.2020</b>	<b>14.09.2020</b>
<b>Water body</b>	36724,9	24725,4	20900,5	11885,5	10008,2	9231,84
Sudoche	9381,6	5678,98	3588,66	2771,91	1736,73	1006,47
Mejdureche	2151	2618,73	2405,84	1945,62	1765,08	1830,78
Rybatche	2913,0	1012,05	604,44	231,48	219,15	182,16
Djiltyrbas dam-terminated	8828	4891,87	4680,27	4656,33	4842,09	4730,31
Djiltyrbas (to- gether with former right and left streams)	6230,7	1711,71	687,15	107,95	74,7	77,67
Dumalak	435,15	71,1	18,54	1,62	0,81	0
Makpalkul	1010,5	401,78	133,29	275,31	227,79	50,58
Mashan Karadjar	1228,5	661,82	339,03	224,55	154,35	179,37
Water surface southward of Muynak	95,68	0	0	0	0	0
Water surface along Kazakhdarya riv- er channel	0	0	0	0	0	0
Zakirkol	593,5	8,13	3,06	3	0	0
<b>Total</b>	<b>70 682,8</b>	<b>41 781,53</b>	<b>33 360,75</b>	<b>22103,5</b>	<b>19028,88</b>	<b>17 289,18</b>

Since 2019, SIC ICWC has been using a new methodology for detection of water surfaces and wetlands through the controlled classification (Automated Water Extraction Index, AWEI).

The boundaries of water bodies and wetlands (i.e. Sudoche lake system, Mejdureche reservoir, Makpalkul, Djiltyrbas reservoirs, etc.) digitized manually in 2016 were used as a 'conditional design' boundaries for statistics on the total open water surface and wetland area of these water bodies (i.e. total water body area = open water area + wetland area).

Such a method minimizes erroneous interpretation/digitization of an area under consideration as the water or land surface (e.g. if plants cover the water's surface). However, the problem of detecting wetlands, i.e. the possibility to distinguish them from land (dry, degraded land) remained open. Moreover, the wetland areas within the 2016 boundaries have changed considerably over the last years, mainly, towards shrinkage/drying (dry, degraded land replaced wetlands).

Therefore, in early 2022, we undertook a research to improve the 2019 methodology. To this end, we determined the threshold values of open water surface (water depth of 5-25 cm, depending on the rise or fall of water), wetlands (water depth of up to 5 cm, wet and moist soil), and non-water sites (all other land surfaces, except for open water and wetlands) for 10 spectral indices (including NDVI and AWEI).

Based on the research results, we selected the threshold values for NDVI ( $< -0.001$  for open water,  $-0.001 \div 0.05$  for wetland, and  $> 0.05$  for other land surfaces) for further classification of water sites.

By present, the information for 2020 and 2021 have been updated on the base of the improved methodology. In this context, differences can be found when making comparison with the data for the past years.

**Prepared by:**

Sh. Zaitov

I. Ruziev