

Astrakhan Initiative Group 2003 Report

**Public Environmental Water Monitoring
in the City of Astrakhan and the Volga Delta**

Anthropogenic pollution is the primary cause of the degradation of our natural water supplies. The main sources of this pollution include: industrial drainage; municipal waste; agricultural runoff; and atmospheric emissions.

The city of Astrakhan and its environs boast a large number of rivers, channels, canals and lakes that have economic and social significance, cultural and historical value, and serve as a favorite recreational location for city residents and tourists.

As a result, monitoring began with research on the chemical and hydro-biological composition of several water bodies in the city of Astrakhan and the lower Delta of the Volga River in different hydrological seasons.

The Astrakhan State Biosphere Reserve completed the technical portion of the research. The chemical analysis of the water was conducted with portable microprocessing DR/2010 Spectrophotometers, acquired by Crude Accountability. Fifth year students majoring in bioecology at Astrakhan State Technical University's Hydrobiology and Ecology Department were trained to utilize this monitoring equipment.

The following urban sites were selected for monitoring:

- The Kazachii channel—a region known for fishing net production;
- The spit of land between the Volga and Tsarev rivers, which serves as a docking location for small boats; and
- The nature reserve—the western portion of the Volga delta within the Damchikskii area. In particular, the marshlands in the area of the Damchik 1 cordon (Station #1 – marshlands in which the grasses burned during the fire season; Station #2 – marshlands not affected by fire), from the Kolbin channel to the reed zone and the lower delta zone bordering the sea, which follows the reed zone – in the region of the Turganovskii swath.

The monitoring was conducted from May (the start of the high water season) until October (the summer/autumn low water season). Samples were taken at a depth of 0.4 meters below surface level. At these sites, tests determined the water temperature, depth, pH levels, and the oxygen restoration potential (ORP). With the aid of the DR/2010 Spectrophotometers, the volunteers monitored ammonium and nitrite levels, and reactive phosphorus. In addition, they took samples to analyze aquatic organisms.

The 2003 research was not conducted in full due to an unusually late and shallow high water period. In the Damchikskii portion of the Astrakhan Biosphere Nature Reserve, the meadows that were untouched by the spring fires were not filled completely with water (Station #2), and therefore material collection starting dates had to be changed.

Analysis of the water on the content of dissolvable oxygen was not conducted as the digital titrator data was not received in time.

The monitoring data is presented in table 1.1 and in figures 1.1-1.4.

Hydrogen Indicators (maximum allowable concentrations $<8.5> 6.5$)

As a result of direct changes to the pH levels, it is clear that the levels of a given indicator did not fall below 7.2 or above 8.39 pH.

The highest hydrogen indicator values, characteristic of water from the Turganovskii swath, were taken in region 1 of the Damchikskii cordon of the Astrakhan nature preserve and urban areas near the docking areas around Volga and Tsarev River spit.

Redox Potential

The value of redox-potential from the studied water changed in limits from 037 to 149mB.

The highest redox-potential values in water areas within the nature reserve occurred most often during the flood season (from 108 to 149 mB). In the following samples this potential vacillates from 037 to 107 mB.

In urban areas low oxidation-restoration values occurred a high water recession in early October. During the summer and fall seasons the redox-potential of the lowest water levels are fairly high: 120-134 mB (Table 1.1).

Nitrates

During the analysis period, the concentration of nitrates in the urban sample water sources and water bodies in the nature reserve did not exceed the maximum allowable concentrations (40 mg/L) and changed within 0.1 to 2.2 mg/L. The maximum value of nitrates was observed in the water samples from urban sources (the Kazachii channel). The concentration of nitrates in the water bodies on the nature reserve was found to be lower than urban water sources, not exceeding 0.1-0.9 mg/L. The maximum concentrations were observed during the recession of the high water period (the third 10-day period in June) (Figure 1.2).

Ammonium

The concentration of ammonium was found to be at a low level, indicating a more complete consumption from compound nitrogen. The exceptions to this were the sample taken at the Kazachii channel on May 17th and the sample taken in the Turganovskii swath on July 29 (Figure 1.3). The concentration of ammonium during the first sampling was 6.34 maximum allowable concentration, and during the second sampling was 2.86 maximum allowable concentration (maximum allowable concentration=0.5 mg/L).

Maximum concentrations of ammonium nitrate in a majority of sample sites were found in July and August in the Kolbin region. The minimum concentration of ammonium nitrate were detected during the spring flood recession in region 1 of the Damchik cordon, Kolbin region, Turganovskii swath, Tsarev River, and the Kazachii region; in August at the Turganovskii swath, Volga River, and the Kazachii region; in October at the Kolbin region and the Tsarev River.

Concentrations of materials analyzed during this period were at levels of 0.00-3.17 mg/L.

Reactive Phosphorus

Concentrations of phosphor-reactivity in water bodies at the nature preserve and in urban areas over the entire analysis period did not exceed permissible concentrations (0.6 mg/L) and ranged from levels of 0.01 to 0.35 mg/L. (Table 1.4)

Peak concentrations of phosphate ions were observed either in surface water samples in the Turganovskii swath in August or in the Kazachii region in early October. For all other bodies of water, concentrations of materials analyzed during this time existed at a stable, low level.

Considering the data gathered throughout this study, there was no reason to mention biogenic pollution in these bodies of water.

Data on concentrations of aquatic organisms is currently being processed.

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