Evaluation of the Water Quality of Yıldız Lagoon (Sivas)

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Abstract

The objectives of this study are to observe the monthly and annual changes in water quality for 1 year in 3 stations determined in Yıldız Lagoon which is located in central Yıldız district of Sivas, to determine the water quality properties, to determine the suitability level in terms of aquatic life, and to classify the quality of water in accordance with Surface Water Quality Management Regulation.

The study has started in April, 2012, and the sampling has been carried out monthly in 3 stations for 12 months in order to make water analyses. The water quality parameters of temperature, dissolved oxygen, pH, saltiness, and electrical conductivity (E.C.) have been measured directly in field. For other water quality parameters, the water samples have been taken to laboratory, and analyzed in same day. It has been found that the lagoon shows I-III class water characteristic according to SWQMR. It has been determined that the Yıldız Lagoon is under the pressure of pollution and it should be continuously monitored for sustaining the ecological balance and protecting the existing water quality.

Keywords: Water Quality, Water Pollution, Sivas, Yıldız Lagoon

1. Introduction

The protection and appropriate uses of water sources vary depend on sensitivities and awareness of the societies about the water. Nowadays, the factors such as industrialization, increasing population and urbanization, global climate changes, wrong methods used in watering, illegal and unconscious uses, and excessive agricultural activities increase the pressure on protection of water sources. The water limit, which becomes more threatening in both world and Turkey, originates from insufficient amount and quality of the water [9].

The lakes, one of the most important fresh water sources, are important places with their natural beauties, biological diversity, and their role in fisheries, tourism, and hydraulic cycle. But the developing technology, rapid increase in population, global climate change, and domestic and industrial and agricultural pollution sources creates a great pressure on the lakes [24].

The dimensions of the pollution in lakes where the flow is limited in proportion to streams are different. Especially in lakes which have no streams flowing out of it, the increasing potential of pollutants such as heavy metals, agricultural pesticides and artificial fertilizer residuals indicates how sensitive we should be while protecting the lakes which are the water group most sensitive to pollution among the surficial waters [7].

As the lakes show continuous-receiver medium characteristic, they are affected from environmental pollution in first degree. The pollutants originating from domestic, industrial and agricultural activities mix into the water firstly, and the reach at the lakes and seas through the streams[22].

Increase in some of parameters leads to a part of aquatic creatures to reproduce more, and it ruins the balance. This situation leads the lake's quality to decrease and the lake to become polluted. In order to take required measures, it is required to investigate the physical and chemical actors of the lakes regularly[14].

The obvious change since early 1990s due to agricultural, domestic and mineral activities is one of the human-originated threats threatening the water and soil sources of Sivas city and its natural life.

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Water quality studies are carried out both in world and in our country in order to know the physical and chemical properties of surface waters by examining them regularly, to plan their use to be more productive and planned under the light of obtained findings, and to decrease the risk of pollution.

The reproduction, feeding, growing, and survival of the creature and fish living in the aquatic medium is in direct relationship with physical and chemical properties of the aquatic ecosystem[15].

In order to take required measures, it is required to examine the physical and chemical parameters regularly.

This study has been carried out between April 2012 and March 2013 by determining 3 sampling points representing the lake unity in annual measurements during 1 year. Through the analyses of the water samples obtained from sampling stations, it was aimed to reveal the actual water quality properties of the Yıldız Lagoon constituting the water group most sensitive to pollution, to reveal the pollution problems,to determine the aquatic life suitability status, and to classify the lagoon's water in accordance with Intra-continental Water Source Classes of Surficial Water Quality Management Regulation (SWQMR).

2. Material and Method

2.1 Study Area

The Yıldız Lagoon located in upper Kızılırmakbasin is within the borders of municipality of Yıldız district of Sivas city, and its water source is Kayalıgöl brook and Kurudere. The surface are of Yıldızlagoon is 1693 h, and its mean depth is 3.4 m.3 points have been determined to represent the characteristics of the lagoon; 1ststation: Kayalıgölbrook (the side of Yakupoğlanvillage), 2nd station: western side of the lagoon (the roadside from Yıldızdistrict), and 3rd station: northwestern part of the lagoon (Kurudere)..

Figure 1 Location of theYıldızLagoon

2.2 Water Analysis

In this study which started in April 2012, the samples to be used in analyses of some chemical and physical parameters constituting the water quality were collected from 3 stations on monthly basis for 1 year, and it continued until March 2013. Maintenance and cleaning of all equipment to use in field, field-type measurement devices, and glass sample tubes were completed 1 day before sampling process. The sampling tubes were sunk into acid solution, and then they are washed with pure water and dried in drying oven. The water samples were taken by shaking the sampling tubes and sinking them into 15 cm depth of water surface.

The obtained water samples were taken to laboratory within 2 hours. The parameters of temperature, pH, dissolved oxygen, salinity, and electrical conductance were measured via field type devices in region. Dissolved oxygen and temperature were measured via YSI brand 52 model oxygen meter, pH measurement was conducted with Orion brand 420A model pH-meter, the electrical conductance (µs/cm) and salinity (ppt) were measured by using YSI brand 30/50 FT model conductance-meter.

Among other parameters determining water quality; total alkalinity, total hardness, ammoniac, nitrite, nitrate, ammonium azote, phosphate, sulfite, sulfate chloride, sodium, potassium suspended solid manner (SSM), chemical oxygen requirement (COR), calcium, magnesium, ferrous, lead, copper and cadmium analyses of water samples were conducted in Cumhuriyet University HafikKamerÖrnek Vocational High School Laboratory in same day.

Titration with sulfuric acid (for total alkalinity) and titration with EDTA (for total hardness) were conducted. The results were expressed in mg/L CaCO3 unit. Chemical oxygen level was calculated through titration with ferrous ammonium sulfate based on determination of amount of oxygen being used while lysing the natural and organic pollutant load by using powerful chemical oxidants. The analyses of ammoniac, nitrite, nitrate, ammonium nitrogen (NH4), phosphate, sulfate, sulfite, chloride, sodium, potassium, calcium, and magnesium were conducted with CECİL CE4003 brand spectrophotometer by using Merk photometric test kits according to standard procedures (Anonymous, 1989). The analyses of lead copper, ferrous and cadmium water samples were conducted with PERKIN ELMER brand ELMER ANALIST 800 Atomic Absorption Spectrometer in laboratory. The analysis of Suspended Solid Manner (SSM) was conducted by filtering the water through Whatman brand 42 Nr 0.45 NM membrane filters, and then keeping filter papers at 103°C for 24 hours and calculating the weight difference.

Monthly averages, standard deviations and graphics of each of parameters were prepared by using Office Excel 2007 which is a part of Microsoft Office Professional Edition.

3. Findings

Water temperatures showed variance in all the stations between seasons and months. The water temperature which was measured in 1st station to be 5.8^0C in February 2012 was measured to reach its highest value in 3rd station in September 2012 as 23.9^0C, and its annual mean value among all the stations on the lake was found to be 14.2 ^{0}C.

pH value showing the acidic and basic status of the waters showed that the Yıldız Lagoon has mildly basic characteristic. During the research, the minimum pH value in the lagoon has been determined in 1st station in February 2012 as 8.14,while the maximum value has been determined in 3rd station in September 2012 as 8.46.The annual mean pH value of the lagoon has been found to be 8.29. The seasonal mean values of the stations in lagoon were 8.2 in spring, 8.36 in summer, 8.35 in autumn, and 8.21 in winter.

The amount of dissolved oxygen in the lagoon showed variance between seasons, stations and months. Its minimum value has been found to be 6.77 mg/l (3rd station in September 2012), while its maximum value has been found to be 11.64 mg/l (1st station in May 2012), and the annual mean value has been found to be 9.75 mg/l. The seasonal mean values of the stations in lagoon were 11.54 mg/l for spring, 8.51mg/l for summer, 8.14 mg/l for autumn, and 10.81 mg/lfor winter.

The chemical oxygen need (CON) has been measured to be at its minimum values in all the stations in February, it has shown increase in all the stations from February to September, and reached at its peak value in September. The minimum level of CON in the lagoon has been determined in 1st station in February 2013 as 4.22 mg/l while its maximum level has been determined in 3rd station in September 2012 as 13.60 mg/l.

The saltiness of the YıldızLagoon has reached at its peak values in September when the dissolved oxygen was at its lowest and the water temperature was at its highest. The highest saltiness of the lake has been found to be 0.13 ppt in 3rd station in September 2012.

Similarly with chemical oxygen need (CON), the biological oxygen need of the YıldızLagoon has shown regular increase in all the stations from February to September, and reached at its highest values in all the stations in September. The highest biological oxygen need in the lagoon has been found to be 3.18 mg/l in 3rd station in September 2012, while its lowest value has been determined in 1st station in February 2013 as 1.50 mg/l.

The electrical conductivity values have shown variance throughout the lagoon between stations, seasons, and months.The electrical conductivity values showed increase in summer months, and decrease in winter months. The lowest EC value has been found in 1st station in February 2013 as 128.12 µs/cm,while its peak value has been found in 3rd station in September 2012 as 182.78 µs/cm.

The suspended solid matter (SSM) values in the lagoon showed variance between stations, seasons, and months. Its highest value has been determined in 3rd station in September 2012 as 2.08 mg/l, while its minimum value has been determined in 1st station in February 2013 as 0.38 mg/l.

Nitrite, nitrate and ammonium nitrogen values of the YıldızLagoon were seen to be much lower in winter than other seasons. The nitrite (NO_2) value of the lagoon has been found to be at its lowest value in all 3 stations in February 2013. The nitrite values of the lagoon showed increase from February to July continuously. The lowest value of the lake has been found to be 0.0002 mg/l in 1st station in February and March 2013, and its highest value has been determined in 3rd station in July 2012 as 0.0015 mg/l.

Nitrate (NO_3) value of the YıldızLagoon has continued to increase in all the stations from February to September; its maximum value has been found to be 4.10 mg/l in 3rd station in September 2012, while its minimum value has been found to be 0.14 mg/l in 1st station in February 2013.

The ammonium nitrogen (NH_4) values of the lagoon have been found to be at lowest in all 3 stations in February 2013 similarly with nitrate (NO_3) values, and they have shown increase from February to September in all 3 stations. The lowest value in the lagoon has been found in 1st station in February 2013 as 0.0003 mg/l, while the lowest value has been found in 3rd station in September 2012 as 0.0030 mg/l.

The total alkalinity and total hardness values of Yıldız Lagoon showed parallelism in all the stations during the study, and the results were determined to be very close to each other. The total alkalinity and total hardness values of the lagoon have shown decrease in all the stations in winter, and increase in all the stations in spring season.

While the total alkalinity and total hardness values have been found to be at lowest in all the stations in February, it has been observed that they have shown increase from February to June. The lowest total alkalinity value has been found in 1st station in February 2013 as 210.14 mg/l $CaCO_3$and the highest value has been found in 3rd station in June 2012 as 238.66 mg/l $CaCO_3$.

The sulfate values of Yıldız Lagoon have shown variance between statins and seasons. The highest sulfate (SO_4) value of the lagoon has been determined in 3rd station in September 2012 as 103.28 mg/l, while the lowest value has been determined in 1st station in February 2013 as 34.12 mg/l.

The sulfite (SO_3) value of the lagoon has increased in all 3 stations continuously from February to September, and has reached at its maximum in 3rd station in September 2012 as 4.42 mg/l, while its minimum value has been found in 1st station in February 2013 as 0.80 mg/l. The sulfite value has shown variance between months and seasons. The seasonal mean values of the sulfite were 1.38 mg/l for spring, 2.97 mg/l for summer, 3.41 mg/l for autumn, and 0.95 mg/l for winter.

The chloride values of Yıldız Lagoon have shown variance between seasons and months. The highest value has been found in 3rd station in September 2012 as 18.24 mg/l, while the lowest value has been found in 1st station in February 2013 as 9.18 mg/l.

The phosphate (PO_4) value of the YıldızLagoon has been found to be at lowest in 1st station in February 2013 as 0.004 mg/l, while its maximum value has been found in 3rd station in April 2012 as 0.45 mg/l.

The magnesium and calcium values measured in stations on YıldızLagoon have shown parallelism. Magnesium and calcium values have increased in spring season, and shown decrease in autumn season. The highest magnesium value has been found in 3rd station in June 2012 as 28.14 mg/l, while the lowest value has been found in 1st station in February 2013 as 19.34 mg/l.

The seasonal mean values of calcium (Ca) were determined to be 26.48 mg/l for spring, 28.1 mg/l for summer, 26.42 mg/l for autumn, and 24.23 mg/l for winter. The lowest calcium value of the YıldızLagoon has been found in 1st station in February 2013 as 21.18 mg/l, while the highest value has been found in June 2012 as 31.22 mg/l.

The sodium (Na) and potassium (K) values of the lagoon have changed in parallel with each other.The highest sodium value in the lagoon has been found in 3rd station in May 2012 as 75.36 mg/l, while the lowest value has been found in 1st station in February 2013 as 45.10 mg/l. The annual mean value of the potassium in YıldızLagoon was 6.14 mg/l. The highest potassium value in the lagoon has been found in 3rd station in May 2012 as 8.01 mg/l, while the lowest value has been found in 1st station in February 2013 as 3.80 mg/l.

Ferrous, lead, copper and cadmium values in YıldızLagoon have shown variance between months. The lowest ferrous (Fe) amount in the lagoon has been found in 1st station in December 2012 as 0.002 mg/l, while the highest value has been determined in 3rd station in May 2012 as 0,037 mg/l.

The highest lead (Pb) level in the lagoon has been found in 3rd station in May 2012 as 0.012 mg/l, while the highest value of copper (Cu) has been found in 3rd station in September 2012 as 0.010 mg/l and highest cadmium (Cd) value has been found in 3rd station in September 2012 as 0.008 mg/l.

4. Results and Discussion

The seasonal mean values of the water quality parameters examined in 1-year study in YıldızLagoon are presented in Table 1.

Table 1 Seasonal Values of Water Quality Parameters Measured in YıldızLagoon

Mean Values of Measured Water Quality Parameters	Spring	Summer	Autumn	Winter
Dissolved Oxygen (mg/L)	11.513	8.516	8.141	10.607
Saltiness (‰)	0.078	0.098	0.097	0.059
pH	8.284	7.477	7.467	7.332
Temperature (°C)	10.102	18.356	20.352	9.808
Electrical Conductivity	156.399	173.054	170.304	141.736
Suspended Solid Matter (mg/L)	0.769	1.549	1.897	0.657
Chemical Oxygen Need (mg/L)	4.974	8.429	10.122	4.612
Biological Oxygen Need (mg/L)	2.000	2.649	2.484	1.596
Chloride (Cl) (mg/L)	9.723	14.149	14.898	10.201
Phosphate (PO_4)(mg/L)	0.020	0.009	0.011	0.009
Sulfate (mg/L)	54.418	83.256	84.616	44.689
Sulfide(mg/L)	1.381	2.976	3.416	1.272

Sodium (Na) (mg/L)	67.804	67.764	62.670	49.360
Potassium (K) (mg/L)	6.917	6.880	6.638	4.639
Total Hardness ($CaCO_3$)(mg/L)	227.450	231.570	226.743	219.023
Total Alkalinity ($CaCO_3$) (mg/L)	228.168	233.071	227.339	219.489
Magnesium (Mg) (mg/L)	23.340	25.262	24.516	21.412
Calcium (Ca) (mg/L)	26.489	28.156	26.429	24.118
Nitrite (NO_2) (mg/L)	0.000	0.001	0.001	0.000
Nitrate (NO_3) (mg/L)	0.972	3.016	2.973	0.714
Ammonium Nitrogen (NH_4)(mg/L)	0.001	0.002	0.002	0.001
Ferrous (Fe) (mg/L)	0.019	0.017	0.006	0.004
Lead (mg/L)	0.007	0.007	0.006	0.003
Copper (Cu) (mg/L)	0.004	0.006	0.007	0.004
Cadmium (mg/L)	0.002	0.005	0.005	0.001

Water temperature is the most important factor affecting the biological activities of aquatic creatures and fish. The changes in water temperature originate from seasonal temperature changes[18].Yıldızlagoon is located in a position where the continental climate is observed. The water temperature differences measures monthly during 12 months from 3 stations indicated that the change was not at the level affecting the aquatic life in barrage lagoon negatively. According to the Surficial Water Quality Management Regulation (SWQMR), the quality of the lagoon is 1st class.

The pH indicating the balance between acids and bases in water is an important to be measured in any water chemistry and pollution study. As well as they play role in some chemical reactions in living organisms, acidic waters has the characteristic of increasing the toxic effect of those chemicals when they are combined with some chemicals and metals[4].In order to an aquatic environment to not be threatening the aquatic life and to be useful in fisheries, its pH value must not exceed the limit of 6.5-8.5 [13].

The highest pH value in the lagoon has been determined in September 2012 as 8.46, and the mean value of samples collected monthly from 3 stations for 1 year has been found to be 8.29indicating that the lake is mildly basic. The water quality of the lagoon varies between 1st and 2nd class according to SWQMR.

The amount of dissolved oxygen is an important factor limiting the lives of aquatic creatures[16].There must be at least 5 mg/l dissolved oxygen in fresh waters for aquatic life[3].

The amount of dissolved oxygen in YıldızLagoon has increased in all stations in winter months, and decreased in all the stations in summer months. The water of YıldızLagoon is 1st class according to SWQMR standards.

Chemical oxygen need (CON) is an important parameter used in determining the pollution level of waters and waste waters. The presence of CON in waters more than 25mg/L is a pollution indicator, and its presence more than 50 mg/L indicates that water is severely polluted, and it may show toxic effect to aquatic creatures living within it[11]. The highest CON value in YıldızLagoon has been found to be 13.60 mg/L in 3rd station in September 2012, and the water of lagoon is 1st class according to SWQMR.

Biological oxygen need (BON) is the amount of oxygen required by bacteria for digesting the organic matters under oxygenic conditions (ATAY and PULATSU, 2000). BON measurement is an indicator of organic pollution from the aspect of water qualification [8]. The BON value in clean waters is 2mg/L at maximum, and it can exceed 10 mg/L in polluted waters. It has shown increase in all the stations on YıldızLagoon from February to September, and it has peaked in 3rd station in September

2012 with value of 3.18 mg/L. The reason of increase in BON in lagoon is thought to be the mix of domestic or animal wastes from residential areas through which the Kayalıgöl and Kurudere brooks, the water sources of lagoon, pass. The water of the lagoon is 1st class according to SWQMR.

The suspended solid matter (SSM) may exist in waters due to erosion, pollution, phytoplankton explosion, and rock abrasions into water[16].The concentration of suspended solids in water higher than 2mg/L leads to physical pollution of the water[17].The highest SSM amount in lagoon has been found to be 2.08 mg/L in 3rd station in September 2012. The water of the lagoon is 2nd class according to SWQMR

Saltiness is the expression of the amount of salt in gram per liter of water, and it has no unit [26].Saltiness is in close relationship with temperature and electrical conductivity[17].The saltiness in stations on YıldızLagoon has shown parallelism with temperature and electrical conductivity values. The saltiness rate in lagoon has decreased in winter months, and increased in summer months when the temperature, electrical conductivity, and vaporization were high.

The electrical conductivity (EC) value is very important in water quality studies, and it exceeds the 1000 µsx10cm^{-1}line as the pollution increases[20]. As the saltiness of water increases, its capacity of conducting the electrical current also increases. For this reason, the electrical conductivity value changes depending on the water temperature and the amount of dissolved materials (such as salt). The electrical conductivity value in YıldızLagoon has shown parallelism with temperature and saltiness value, and has shown increase in all the stations during summer months. The highest EC value in the lagoon has been found in 3rd station in September 2012 as 182.78 µs/cm, and the water of the lagoon is pretty good according to SWQMR.

The most common nitrogenous compound existing in natural waters are nitrite, nitrate, and ammonium nitrogen. These compounds may determine the water quality by combining. The source of these nitrogenous matters are waters flooding through soils during agricultural activities and the compounds mixing into waters from domestic and industrial wastes, as well as they can be atmospheric nitrogen conveyed by rain water, and the nitrate salts existing in structure of the soil[23].The high concentrations of nitrite (NO_2), nitrate (NO_3) and ammonium nitrogen (NH_4) may have toxic effect on aquatic creatures. In this case, the effects of the nitrogenous compounds increase with increases in pH and water temperature[17]. Nitrate (NO_3) toxicity is less than that of nitrite and ammonium nitrogen[25].

Among the nitrogenous compounds, the nitrite, nitrate, and ammonium nitrogen have been found in our study to be in trace amounts, and the lagoon's water is 1st quality according to SWQMR in terms of these values.

In limy soils, the total hardness and total alkalinity values are generally very close or equal to each other[6].

Total hardness is one of the most important parameters in fresh water analyses. Hard waters are not suitable for aquaculture, because the hard waters play role increasing the toxic effect of toxic materials which may exist in waters[10].

In this study, the total hardness and total alkalinity values have been found to be close or equal to each other in all the stations during the study. The highest total alkalinity and total hardness values have been found in 3rd station in June 2012 as 238.66 mg/l $CaCO_3$and 236.08mg/l $CaCO_3$, respectively. It is concluded that the water of Yıldız lagoon is hard, and is not suitable for aquaculture activities.

The mean of sulfate in water is high hardness, high sodium salt, and high acidity. The concentration of sulfate (SO_4) in natural sources varies between 5 and 100 mg/L. Its concentration higher than 250 mg/L indicates the severe pollution[16].The highest sulfate value in the lagoon has been found in 3rd station in September 2012 as 103.28 mg/L. Accordingly, the lagoon is suitable for aquaculture, and its water is 1st quality according to SWQMR.

The sulfite (SO_3) compounds are important pollutants with the taste, odor, and toxicity problems they create as a result of various reactions. The concentration of sulfite higher than 10 mg/L in water creates danger. The sulfate (SO_3) measured in study is sodium sulfate (Na_2SO_4), and its highest concentration in water has been found in 3rd station in September 2012 as 4.42. As the highest sulfite concentration in the water doesn't exceed the limit of 10 mg/L, the water is decided to be suitable for aquaculture.

The chloride ions being an indicator of healthy water can exist in natural waters up to concentration of 30 mg/L [24]. The highest chloride value in the lagoon has been found to be 18.24 mg/L in 3rd station in September 2012, and even this value is within the limits.

The concentrations of calcium (Ca) and magnesium (Mg) in normal waters between 5 and 60 mg/L are accepted to be normal. In our study, the highest concentrations of calcium and magnesium have been found in 3rd station in June 2012 as 28.14 mg/l and 31.22 mg/l. The values determined in lagoon are within the acceptable limits, and it has been concluded that the water of lagoon is suitable for aquaculture from the aspect of calcium and magnesium.

Phosphor is a multi-dimensional, complex, and key-for-biochemical-balances metabolic nutrient element arranging the productivity in natural waters[16]. Phosphor in water sources is the fundamental element of the eutrophication[12]. According to Nisbet and Verneaux(1970), the concentration of phosphate in waters between 0.15 and 0.30 mg/L indicates the high productivity, while the concentrations higher than 0.30 mg/L indicate the pollution in water. The highest vale in our study has been found to be 0.45 mg/L in 3rd station in April 2012, and it has been concluded that this value was very dangerous for aquaculture and aquatic life, and it might lead to sudden deaths. The reason of rapid increase in all the stations on YıldızLagoon is thought to be mix of phosphatic fertilizers into the water or the increase of spirulinawhich can bind the phosphate in air.

Sodium (Na) exists in waters most commonly in NaCIform, and is an element required for development of phytoplanktons and herbal organisms in water[5]. Sodium salt shows variation between 2 and 100 mg/L in natural waters, and its concentration higher than 100 mg/L may lead to pollution[25]. The highest sodium value in the study has been determined in 3rd station in May 2012 as 75.36 mg/l. Under the light of this value, it was concluded that the water of the lagoon is 1st class according to SWQMR, and is suitable for aquaculture activities.

Potassium (K) is one of the inorganic salts giving water its taste, and its concentration in waters varies between 1 and 10 mg/L [25]. The highest potassium value in YıldızLagoon has been found to be 8.01 mg/L in 3rd station in May 2012, and even this value doesn't pose any danger for aquaculture.

Among the elements researched on Yıldız Lagoon for 1 year, ferrous (Fe), lead (Pb), cadmium (Cd) and copper (Cu) have shown decrease in all stations during winter, and increase in some months.

The highest ferrous concentration in the lagoon has been found in 3rd station in May 2012 as 0.037 mg/l. According to the SWQMR, the water of Yıldız Lagoon is 2nd quality in terms of measured parameter.The reason of the determination of the highest ferrous (Fe) level in the lagoon in May and June is thought to be leakage of ferrous-containing waters and particles into the lagoon through rain water of water leakage because the ferrous-containing fertilizers are used in May and June in this region via spraying method.

From the aspect of lead (Pb) element, the water of Yıldız Lagoon is 1st quality according to SWQMR.

The highest cadmium (Cd) amount in the lagoon has been found in 3rd station in September 2012 as 0.008 mg/L. Accordingly, the water of lagoon is 3rd quality according to SWQMR in terms of cadmium content.

The highest copper content in Yıldız Lagoon has been found in 3rd station in October 2012 as 0.010 mg/l. According to SWQMR, the water of the lagoon is 3rd class in terms of copper element. The

copper element has been detected in very low concentrations in winter months, but it rapidly increased in May, June, and October and November. The reason of this increase is thought to be the leakage of copper-containing agricultural pesticides used widely in apple gardens near the lagoon.

Finally; besides the Yıldız Lagoon, which is located within the borders of Yıldız district of Sivas city, is the haunt of daily picnickers and amateur fishermen, it is very important because it provides the water for watering the agricultural lands around it. From the aspect of actual water quality, the lagoon shows variance between 1st and 3rd quality according to the SWQMR.It has been concluded that the lake is not suitable for aquaculture because of its low depth, suspended solid matter and total phosphate content higher than desired, its hard water, and higher concentrations of ferrous, cadmium, and copper among heavy metals.The attention must be paid for implementing the laws about protecting YıldızLagoon, the pressure on the lagoon must be decreased, and the water level of the lagoon must be kept in the way not ruining the ecological balances. Also for this water source not to be polluted more, and in order to sustain the natural ecological balance established by other aquatic creatures and natural fish stocks, the water quality must be protected and improved, the required measures must be taken, and the lagoon must be followed-up regularly.

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