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Article

Prioritizing Water Resources for Conservation in a Land of Water Crisis: The Case of Protected Areas of Iran

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Abstract: This study examines the distribution of water resources in Protected Areas in Iran and their priority for conservation. The results show that most of the water resources are located in the north and northwest of Iran due to favorable climatic conditions, topography, ambient temperature, and annual rainfall levels. Conversely, the lowest amount of water resources are located in the center and southeast of the country. Water resources were prioritized based on expert ratings of indicators to determine their value for conservation. The wetland with the highest priority for conservation is the Anzali Wetland (Gilan province), which is an international Ramsar Wetland. Conversely, Namak Lake (Qom province) was deemed the least important due to its geographical location, biological sensitivity, and conservation status. Protected Areas were found to support more surface water resources and provide space for the largest percentage of water resources, demonstrating their great value for protecting water resources in Iran. However, the level of protection of these critical resources, although located in Protected Areas, was shown to be insufficient. Therefore, appropriate planning and integrated management approaches are urgently needed to protect water resources and aquatic habitats in Protected Areas in Iran to address the current water crisis.

Keywords: management effectiveness; ecohydrology; water conservation; water resources; Anzali wetland; priority

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1. Introduction

Protected Areas (PAs) serve the function of maintaining the ecological integrity of ecosystems from unregulated human activity [1–3]. PAs also conserve critical water resources to meet the water needs of the growing human population [4,5]. However, many important characteristics of water regimes, such as channel morphology, water extraction, and flood control, have suffered from structural and functional ecological disturbance [6,7]. Thus, the sustainable management of inland aquatic ecosystems, particularly streams, directly impacts human well-being [8].

In recent decades, humans have drastically altered the ecological function of streams and rivers, causing a lack in availability of water for irrigation and consumption [9,10]. Water resources and hydrological flows worldwide have been severely affected by environmental impacts, which are intensified by economic development [11,12]. The consequences are soil salinization, soil fertility loss, and water insecurity, with costs for the environment and communities and, in some cases leading to social and environmental conflicts [13,14]. Likewise, development without proper planning has hampered the sustainable use of water resources and has led to the acceleration of environmental damage [15,16]. Therefore, PAs face the complex issue of balancing community development and environmental preservation.

Previous studies emphasize the importance of protecting water resources in PAs to preserve biodiversity and their services, such as drinking water supplies [17]. On the other hand, water resources are one of the most important requirements for agricultural production [18] and food security [19] in human livelihood. However, due to increasing human demand and overexploitation, the water crisis has become one of the most important global issues, with about a quarter of the world's population facing water deficits [20,21]. Accordingly, several studies have investigated the conservation of water resources in natural ecosystems. For instance, Failler et al. [22] studied the perception of threats and related management measures in 32 Marine Protected Areas (MPAs) in West Africa. The results indicate that coastal erosion, overexploitation of natural resources, and pollution are the main threats to sustainability in these areas. Hence, management measures are needed there to prevent the overexploitation of natural resources. Caro-Borrero et al. [23] studied water resource conservation and relations between local communities and their protected rivers. According to the results, PA regulations and activities do not adequately address water use and management in this area. Consequently, water management remains a key ecological concern in these three communities due to the destruction of freshwater resources. Tyllianakis [24] studied management options for marine ecosystems in Mediterranean MPAs. The results illustrate that restrictions in these areas have decreased the economic well-being of residents because participants face more restrictions upon entering the MPAs. Cooperation between stakeholders is needed, as well as a better understanding of threats and marine resource management policies for MPAs.

According to the above studies, although water resource conservation is one of the most important goals of natural resource protection in PAs, the implemented management measures, such as control and increased monitoring of various human uses, are weak and insufficient. Hence, these areas face challenges such as biodiversity loss and unsustainable use of natural resources, leading to insecurities in water access. Therefore, it is necessary to identify approaches to conserve these resources. At the same time, the precipitation decrease, temperature increase, and rise in water use in the recent decade have caused a sharp drop in groundwater levels and dried up many wetlands and lakes in Iran. Accordingly, this study examines the ecological status of water resources within the PAs of Iran and prioritizes these valuable resources for conservation.

While the biodiversity of the PAs has been extensively and intensively surveyed, there is a recent country-wide interest in prioritizing water resources in Iran. Moreover, several studies have been conducted to conserve water resources, but no analysis has been undertaken to assess the ecological status, management, and prioritization for protecting water resources in Iran. Thus, the present study complements other studies investigating threats and challenges of water resources concerning conservation purposes and ecological sensitivities and assesses PAs' coverage of water bodies. Hence, the questions that this research aims to answer are as follows: (1) What is the ecological status of water resources in Iran?; (2) What are the priorities for protecting these resources when considering the conservation purpose and ecological sensitivities?; and (3) How much of these water resources are distributed in PAs?

2. Materials and Methods

2.1. Study Area

Iran is a mountainous, arid, and ethnically diverse country in southwest Asia. Most of Iran consists of a central desert plateau surrounded by high mountains. This country receives an average rainfall of 250 mm per year, which is less than a third of the global average. It contains 0.36 of the world's freshwater resources. However, the average evaporation rate is more than ten times the rainfall in this area [25]. The country encompasses five main catchments and 133 rivers. Iran is one of the countries with the largest variety of wetlands in the world: out of 42 wetlands known globally, 41 types (except for the very cold tundra wetlands) have been registered in this country. According to the World Convention for Protection of Wetlands [26], known wetlands include twelve types of coastal/marine wetlands, twenty types of inland wetlands, and ten types of artificial wetlands. Accordingly, Iran has 36 wetlands covering a total area of 1.413,040 ha that have been reported in the wetlands list of global importance by the Ramsar Convention [27]. Some of these water resources are located in the PAs network, which, according to the Department of Environment of Iran, includes 309 PAs (32 National Parks (hereafter NP), 183 Protected Areas with Sustainable Use of Natural Resource Areas (hereafter PASUNRA), 40 National Natural Monuments (hereafter NNM), and 54 Wildlife Refuges (hereafter WR) of about 110,000 ha [27]. A total of 31 catchment areas and six main basins can be found in Iran (Figure 1). The main basins are the Central Plateau (Markazi) located in the center of the country (824,400 km^2), the Lake Urmia basin in the northwest (51,800 km^2), the Persian Gulf and the Oman Gulf basin in the west and south (424,500 km^2), the Eastern Border basin in the east (known previously as Hamoun) (103,200 km^2), the Qareh Qum basin in the northeast (44,200 km^2), and the Caspian Sea basin in the north (174,000 km^2) [28].

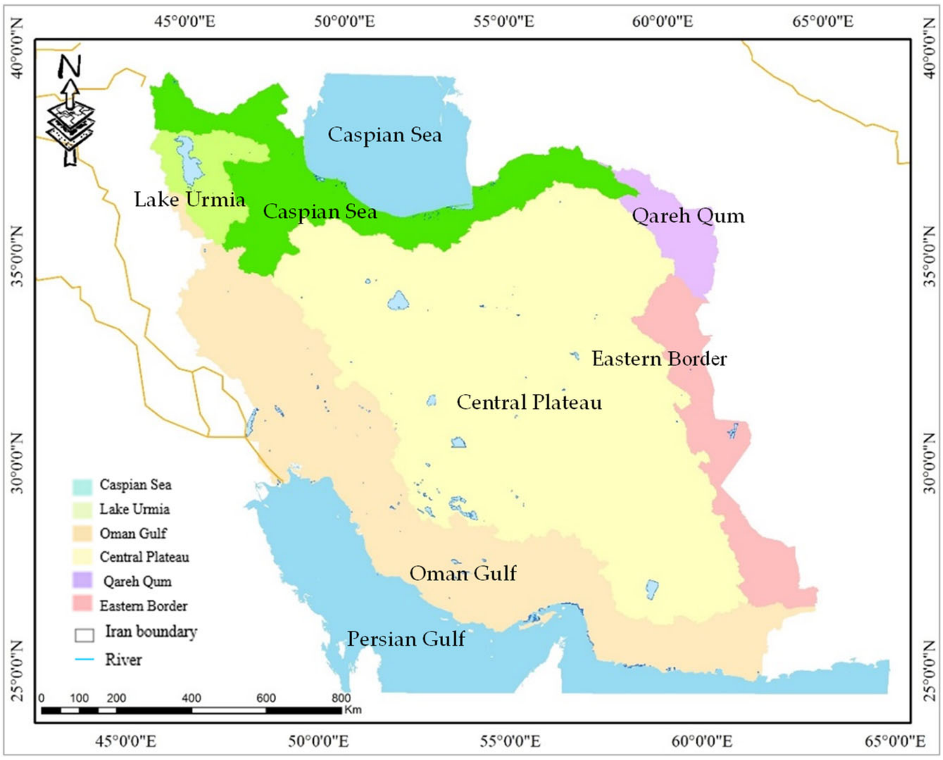

Figure 1. Location main basins in the studied area.

2.2. Data Collection

This study focuses on wetlands and permanent rivers in the country. According to the wetlands reported in the Ramsar Convention, a list of important water resources of the country was identified and prepared (Appendix A). To study spatial and temporal changes in water resources in the studied area, the satellite imagery of Landsat-5 Thematic Mapper (TM) of May 1990, Landsat-7 Enhanced Thematic Mapper (ETM$^+$) of May 2009, and Landsat-8 Operational Land Imager (OLI) of May 2021 were used with a spatial resolution of 30 m from the U.S. Geological Survey (USGS). Moreover, to assess the coverage of water bodies by PAs, the maps of these areas were classified and analyzed based on the classifications provided by the Department of Environment of Iran (including NPs, PASUNRAs, NNMs, and WRs). Hence, the percentage of water resources located in PAs was determined using overlay maps. Finally, water resources were prioritized based on a list of effective indicators and expert opinions (Table 1).

Table 1. Effective criteria and indicators to prioritize water resources.

Criteria	Indicators	Reference
Biodiversity	Animal species: Birds Mammals Fish Reptiles Amphibian Plant species: Medicinal consumption Soil protection Livestock grazing Birds feeding Industrial and commercial consumption	[26,29–39]
Natural or man-made origin	Natural source Man-made source	
Extensiveness	Area	
Flow regime	Permanent Seasonal	
Managerial classification (according to conservation goals)	NPs PASUNRAs NNMs WRs No-hunting areas	
Protective importance	Degree of animal species protection (CR-EN-VU-cd-nt-Ic) Birds list (IBA and EBA)	
Water resource state	Water quality Aquatic resource state Surface water supply Groundwater supply	
Reclamation and reconstruction	Suitability for preservation Sustainable reconstruction process Flood mitigation actions	
Habitat quality	Prominent and unique Suitable to sustain life Meeting human needs Accessibility level Population abundance	
Cultural and social values	Cultural and historical importance	
Economic value	Importance for the national economy Employment Economic benefits	
Ecological potential	Ecotourism activity development Education Research and interpretation	

2.3. Methods

2.3.1. Images Classification

In the first step, Landsat 8 OLI/TIRS Level-2 images were corrected for radiometric and atmospheric effects. We performed an atmospheric correction in this study since various atmospheric evaluations are necessary to predict the reflectance of the ground on the images during the pre-processing stage. A dark object subtraction method was used as one of the approaches for atmospheric correction based on images. Then, the Random Forest (RF) algorithm was used to classify these images from 1990 to 2021. The method of RF is commonly used in the case of land use and land cover (LULC) classification. This algorithm is implemented as a supervised classification pattern to improve LULC change classifications, consisting of many classifications and regression trees [40]. In the present study, 600 trees were classified each year using the RF algorithm, 300 samples were considered for a water body, and 300 samples were evaluated for the classification of non-water bodies. Moreover, the normalized-difference water index (NDWI) was used to extract the water body class from images in the ENVI software (Version 5.3). This index uses near-infrared (NIR) bands and visible green (G) bands to extract water bodies and remove vegetation and soil. The NDWI value varies from −1 to 1. Additionally, the higher value of this index demonstrates the abundance of water bodies in the area. On the other hand, normalized-difference vegetation indexes (NDVIs) and enhanced vegetation indexes (EVIs) are used for water resource classification because of the vegetation distribution around water resources [41–43]. Accordingly, two criteria (NDWI > NDVI and EVI < 0.1) and (NDWI > EVI and EVI < 0.1) were combined to identify water resources. In addition, to select training samples for each class, 1000 samples were examined from the sampled collection (training phase = 600 samples; validation phase = 400 samples). The overall accuracy (OA) was also used to assess the accuracy of the classification.

2.3.2. Water Resources Prioritization

According to Table 1, experts rated the effective indicators for each water resource on a scale of 1 to 5 (very low, low, moderate, high, and very high, respectively). In this study, the panel of experts comprised 40 national people, consisting of scientists specializing in water resources, ecohydrology, and PA management. Experts had at least six years of experience working or researching with or for PAs. We used the snowball sampling technique to identify qualified experts nationwide. In the end, 40 experts were selected and approached by telephone or email to ask whether they would be willing to participate in the survey. Experts who accepted the invitation received a detailed description of the research objectives and were informed that they were free to withdraw at any time.

3. Results

3.1. Assessment of Water Resources Status

The most important water resources of the country include wetlands, rivers, and lakes. Most of these resources are located in the north and northwest of Iran (including the Gilan and Mazandaran provinces). In contrast, the lowest number of water resources is located in the center and southeast of the country (such as Yazd, Sistan, and Kerman provinces). Moreover, this study monitored the status of water resources using Landsat imagery from 1990 to 2021 (Figure 2). These images were classified into two classes, namely that of water bodies and that of non-water bodies, using the RF classification system. Code zero (0) is related to the water body, and code one (1) is related to non-water bodies. In this study, the overall accuracy of the classification was 89%, 95%, and 98% for the classified images from the years 1990, 2009, and 2021, respectively. The results indicate that the overall accuracy reached a high efficiency and an acceptable level in terms of classification accuracy. According to Table 2, among the studied basins, the greatest water body in size covers 480 ha belonging to the Western basin (data from 2021), while the smallest area (i.e., 15 ha) belongs to the Eastern border basin (data from 2009). Water bodies with a large surface area are more likely to maintain a continuous surface throughout the year due to their higher water frequency. Nevertheless, water bodies with smaller areas tend to have a lower water frequency, which may be the result of evaporation, groundwater recharge, heavy irrigation, and reduced rainfall.

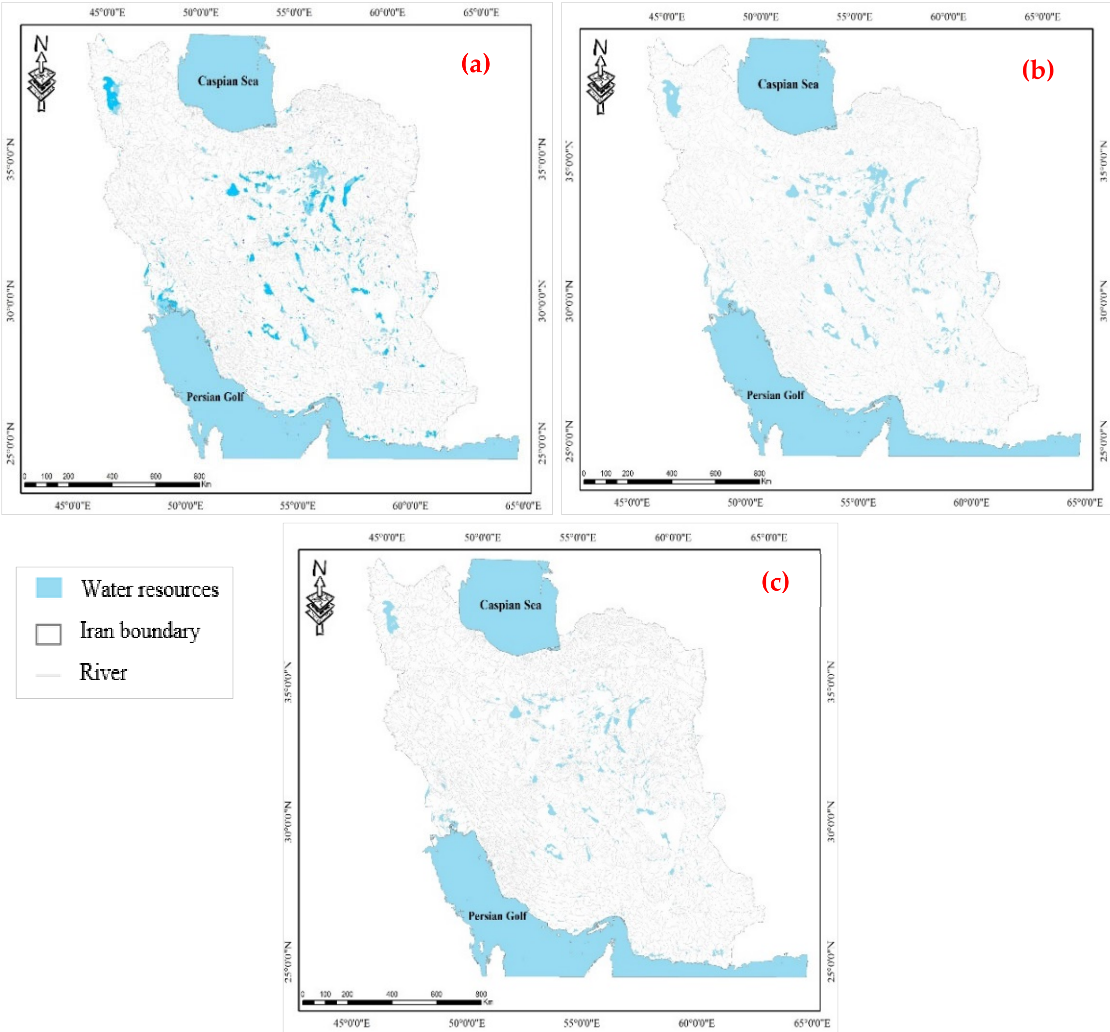

Figure 2. Changes in water resources in Iran: (**a**) 1990, (**b**) 2009, and (**c**) 2021.

Table 2. Changes in water resources in the studied basins in Iran from 1990 to 2021.

Basin/Year	**1990**	**2009**	**2021**
		Area (ha)	
Central Plateau	80	130	180
Oman Gulf	24	78	140
Lake Urmia	110	220	480
Eastern Border	15	68	95
Qareh Qum	18	45	48
Caspian Sea	110	240	270

The results demonstrate that the air temperature has increased over the last few years, and over 1990–2021, Iran's average air temperature increased by half a centigrade degree (Figure 3). According to Figure 4, the greatest rainfall percentage in the country was noted for the Gulf of Oman basin, with a value of 32.3%. In contrast, the lowest percentage was noted for the Eastern Border basin, with a value of 7.7%. Figure 5 shows the time series of seasonal water resource changes, which include seasonal, seasonal to permanent, seasonal lost, and new season. The results indicate that about 64.2% of the earth's area comprises new seasonal water bodies (Figure 5). Consequently, seasonal water bodies have increased significantly in the country, and during the studied years, so have artificial dams and reservoirs. Most of the rainfall in the country has occurred in the form of floods. These sudden rains have less ability to feed and store water in aquifers (Figure 5).

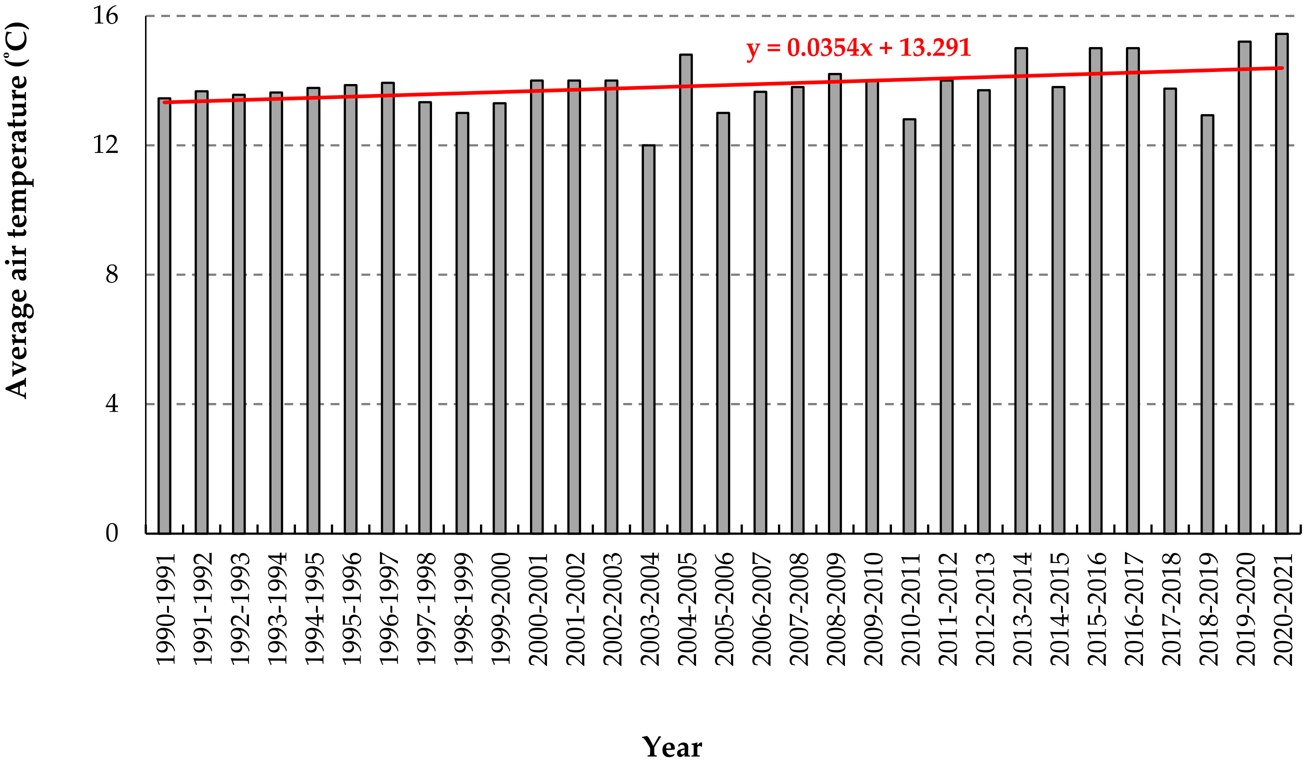

Figure 3. Average air temperature in Iran (1990–2021).

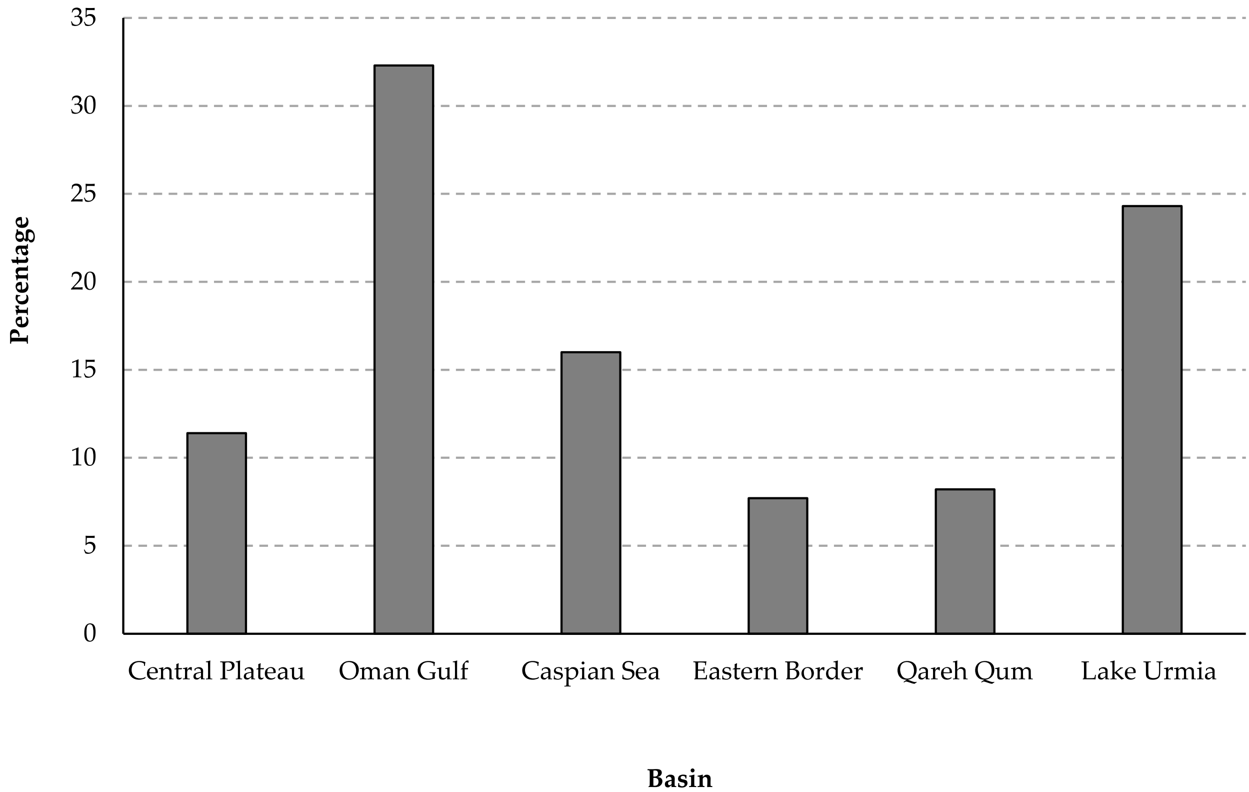

Figure 4. Percentage of rainfall in Iran by basin (1990–2021).

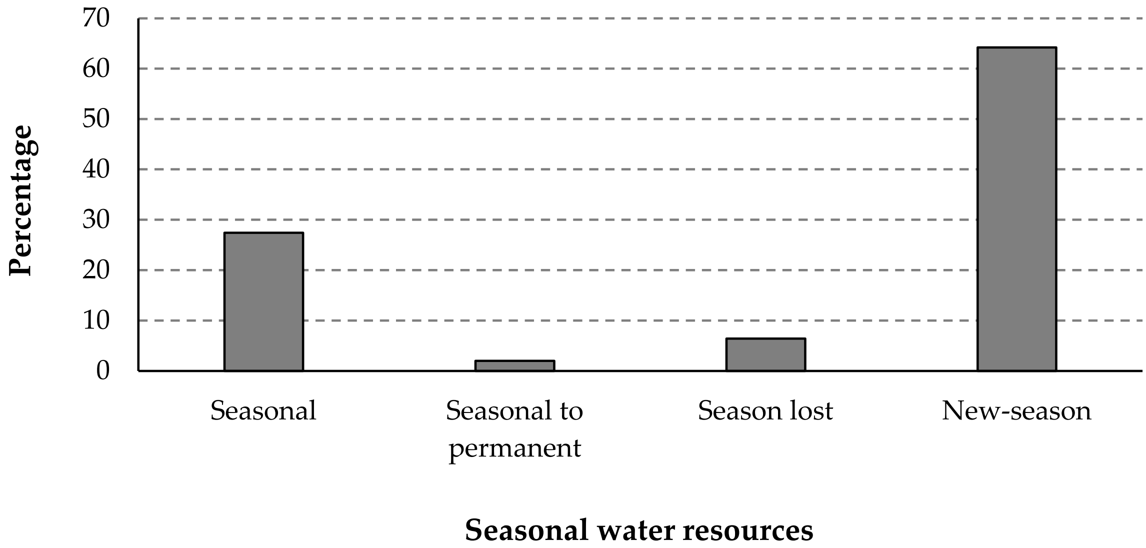

Figure 5. Percentage of seasonal water resources in Iran (1990–2021).

3.2. Assessment of Water Resource Status

The present study prioritized water resources (Appendix A) based on expert opinion rating indicators from Table 1. The following wetlands were rated have the top five priorities for conservation: Anzali (4.36), Bakhtegan (4.28), Arjan (4.18), Miankaleh (4.00), and Choghakhor (3.96; Table 3). Consequently, the highest-priority rating was assigned to the Anzali Wetland with a value of 4.36, while the conservation of the Gomishan Wetland was thought to be the lowest priority (rated as 1.55) among the studied wetlands. Likewise, among other water resources, the highest priority was afforded to Lake Urmia, with a score of 3.88, and the lowest was Namak Lake, with a score of 1.33. In addition, high-sensitivity rivers such as the Karaj, Sardabroud, Sefidrud, Korr, and Ab Koohrang rivers were found to be mostly dispersed in the western areas, while other water resources are dispersed in the north, northwest, and west of the country.

Table 3. Prioritization of the main water resources in Iran based on 5-point expert ratings (1 = very low to 5 = very high) of indicators (see Table 1).

Water Resources	Value	Water Resources	Value	Water Resources	Value
Anzali Wetland	4.36	Hamoun Wetland	3.11	Hara East Gabrik	2.52
Bakhtegan Wetland	4.28	Hashilan Wetland	3.05	Aq Ziarat Wetland	2.48
Arjan Wetland	4.18	Bazangan Lake	3.02	Gandoman Wetland	2.46
Miankaleh Wetland	4.00	Ovan Lake	3.00	Bojagh Wetland	2.45
Choghakhor Wetland	3.96	Kaftar Wetland	2.96	Shorgol, Yadegarloo and Dargeh Sangi Wetland	2.44
Deir- Nakhilo Marine National Park	3.95	Barm Firooz Lake	2.94	Cham Shor Wetland	2.38
Aq Gheshlagh Wetland	3.88	Khorbahoo Wetland and Gowatr Bay	2.90	Incheh Wetland	2.38
Urmia Lake	3.88	Shimbar Wetland	2.85	Pirsalman Wetland	2.36
Hamoun Helmand Wetland	3.82	Zarivar Wetland	2.84	Hamoun Pozak Wetland	2.36
Shadegan Wetland	3.76	Golpayegan Shor Wetland	2.82	Shidvar Wetland	2.33
Nayband Marine National Park	3.70	Meighan Wetland	2.81	Fereydunkenar Wteland	2.28
Alagol-Ulmagol-Ajigol Wetland Complex	3.64	Mor Zard Zeilaei Wetland	2.78	Jokandan Talesh Wetland	2.26
Khorkhoran Wetland	3.48	Central Jask Estuary	2.77	Bamdej Wetland	2.23
Nayband Wetland	3.44	Kaji Namakzar Wetland	2.77	Soldoz Wetland	2.23

Table 3. *Cont.*

Water Resources	Value	Water Resources	Value	Water Resources	Value
Mand Wetland	3.43	Salehieh Wetland	2.76	Astara Steel Wetland	2.18
Amirkalayeh Wetland	3.38	Sulagan Wetland	2.74	Shurmast Lake	2.14
Hoze Soltan Wetland	3.34	Ghorigol Wetland	2.76	Aliabad Wetland	2.00
Gaz and Hara Wetland	3.32	Bishe Dalan Wetland	2.73	Niloofar Mirage Lake	1.92
Miangaran Wetland	3.26	Hele Wetland	2.68	Delta of Shor, Shirin and Minab Rivers	1.85
Haft Barm Wetland	3.24	Haram and Karion Wetland	2.66	Qareh Gheshlagh Wetland	1.76
Aqgol wetland	3.23	Kamjan Wetland	2.64	Barmeshor Lake	1.76
Gavkhoni Wetland	3.22	Jazmourian Wetland	2.64	Qopi Baba Ali Lake	1.73
Hur al-Azim Wetland	3.20	Shahreno Estuary and Khore Khalasi	2.63	Garde Gheit and Meymand Wetland	1.68
Pir Ahmad Kandi Wetland	3.20	Gahar Lake	2.63	Mountain Gol Lake	1.55
Parishan Wetland	3.14	Kani Barazan Wetland	2.54	Gomishan Wetland	1.55
Khor Musa and Khor Al-Umayya Wetland	3.13	Maharloo Lake	2.54	Namak Lake	1.33

3.3. Water Resources Covered by PAs in Iran

The water resource levels covered by PAs in Iran were investigated (Figure 6). According to the results, 13.7% of the water resources are located in PAs, particularly surface water resources, which are more supported by PAs than any other water resource type. It should be noted that although some rivers' branches are located in PAs, only seven rivers (i.e., Karaj, Chalous, Jajrud, Kashfarud, Tajan, Sard Abroad, and Haraz) are fully protected by PAs. These include the four international wetlands of Choghakhor, Anzali, Alagol-Ulmagol-Ajigol, and Dorage Sangi.

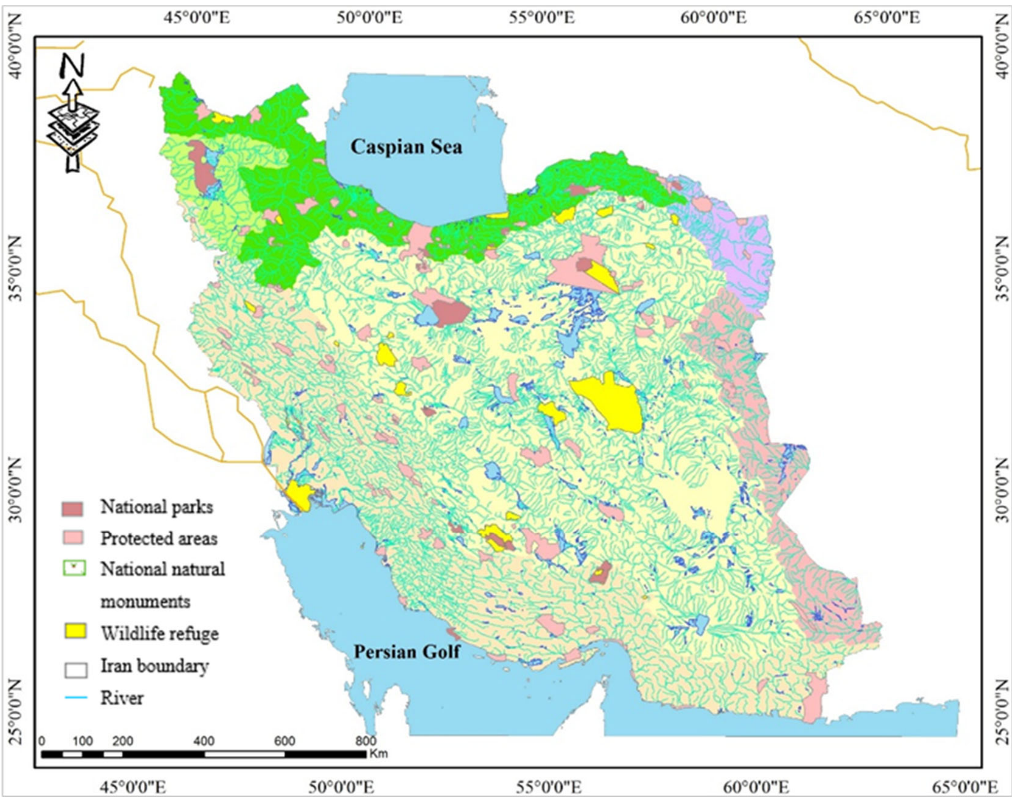

Figure 6. Water bodies located in the Protected Areas (PAs) of Iran.

4. Discussion

Understanding changes in water resources and controlling for influential factors can help implement sustainable water resource management to sustain agricultural, industrial, and domestic activities [44,45]. The present study examined the status of water resources in Iran using Landsat imagery from 1990 to 2021. The conservation of these resources was prioritized based on expert ratings. Finally, this study investigated the extent to which water resources are located in PAs. The results revealed that most of the water resources in Iran are located in the north and northwest due to climatic conditions, topography, ambient temperature, and annual rainfall. Conversely, the lowest amount of water resources is located in the center and southeast of the country due to the high ambient temperature and evaporation and the lower rainfall levels. It should be highlighted that the central parts of the country, which are covered by deserts, are largely uninhabited [46]. A geographical imbalance also exists in water demand. Iran has an uneven population distribution, with most people living in the north and west [46].

The assessment of a time series of the country's water resources from 1990 to 2021 indicates a decrease in groundwater aquifer levels due to population growth, urbanization, increasing industrialization, uncontrolled exploitation of these resources, and neglect of participatory management [47]. In line with this result, Ashraf et al. [48] reported that Iran's groundwater had been depleted by around ~74 km^3 during 2002–2015. Additionally, from three decades ago to the past decade (2011–2021), the average long-term rainfall has decreased from 254 mm to about 240 mm per year [47]. Moreover, in recent years, rainfall in the country has been in the form of floods [49], which are less likely to feed and store aquifers due to the sudden rainfall. The development of dams is another reason for the decrease in water resources in the country, which according to the report by the Statistical Centre of Iran [50], leads to an increase in water stress due to water retention. The consequence of reduced availability of water resources are droughts, loss of vegetation, increasing salinity of water resources, land subsidence, creation of pits in the plains, a water stress crisis, food insecurity, and increasing levels of dust. These findings have been confirmed by other studies [45,51], which have illustrated that surface water resources have decreased in recent years, leading to numerous detrimental effects.

In this study, the Anzali Wetland, as one of the international Ramsar Conventions (registered in June 1975), was considered a top conservation priority. The Anzali Wetlands are located in northern Iran and southwest of the Caspian Sea. As a coastal wetland, it provides important habitat for birds (the wintering habitat for a variety of waterbird species; [52]) and constitutes a source of fish production in the Caspian Sea. However, in recent decades, Anzali Wetland has been subjected to environmental issues such as urban sprawl and gradual land degradation [53], and biological organisms in the Anzali Wetland are also threatened by toxic substances [54]. Additionally, past research indicated that the agricultural sector could be considered the most important cause of Anzali Wetland degradation [55,56]. In contrast, Gomishan Wetland was found to be of the lowest priority for conservation due to its geographical location (located in Golestan province, northern Iran), less biological sensitivity (mean depth of wetland is 1.5 m [57]; moderate risk of heavy metal contamination [58]), and high conservation status (due to strict environmental regulations in this area [59]).

Among the lakes, as another type of surface water resource studied, the highest value for the conservation priority was ascribed to Lake Urmia (located in West Azerbaijan province, northwestern Iran) due to its conservation status, high biological sensitivity, and habitat threat to the area. Additionally, agriculture, farmer behavior, and excessive groundwater consumption must be considered [60]. Since 2005, this hypersaline lake in northwestern Iran began to dry up [61]. It should be noted that, in the Urmia lake basin, more than 36 cities and 3150 villages [62] have more than 6 million inhabitants existing [63]. In contrast, the lowest value was ascribed to Namak Lake because of the lower value for species life and overall lower conservation priority. Other literature supports these findings [52,64].

Finally, our analysis of the distribution of water resources across Pas demonstrated that Pas support more surface water resources than any other LULC type in Iran. Of the Anzali Wetland, 7238 ha are in the Pas network, including the Siahkeshim PA, Selke, Sorkhankol, and Chokam WRs. Thus, although PAs in Iran are critical and should be prioritized for conservation, water resources in these areas are currently not adequately protected. According to Azizi Jalilian et al. [17], for example, the conservation status of water resources in two management classes of PAs, namely PASUNRA and NNMs, is weak, and planning and decision-making are needed to address this issue.

5. Conclusions

Considering the many pressures on water resources, dedicated efforts are urgently needed to achieve effective conservation and sustainable management. The present study has examined water resources in the PAs of Iran and prioritized these valuable resources for conservation. According to the results, the mismatch between ecological significance and the protection of water resources in PAs needs to be addressed. These problems are exacerbated because of the current water crisis in Iran and the country's water scarcity problem. To control water resources for various uses, the percentage of allocated water supplies should be kept to a minimum. Conserving water resources in PAs with different management goals can be a practical and useful measure. The present study offers planners guidance on prioritizing the conservation of varying water resources using effective criteria and indicators. Identifying water resources of great conservation value constitutes the first and critical step in planning the sustainable use of these resources, which, if appropriately implemented, will lead to the conservation of these resources.

In future research, water resources should be assessed according to social, economic, and environmental parameters. The conditions of the water crisis need to be analyzed further in light of management requirements. Simulations of changing water resources are needed to predict future levels and distributions to equip Iran against the detrimental effects of the water crisis.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. List of the most important water resources in the studied area.

Province	Water Resources (Area in ha)
Alborz	Salehieh Wetland (150)
Bushehr	Mand Wetland (2000)
	Hele Wetland (2000)
	Nayband Wetland (4000) Nayband Marine National Park (19,500)
	Deir- Nakhilo Marine National Park (20,000)
Chaharmahal and Bakhtiari	Gandoman Wetland (700)
	Solagan Wetland (3000) Aliabad Wetland (140)
	Choghakhor Wetland (2300)
East Azerbaijan	Qareh Gheshlagh Wetland (57,000)
	Ghorigol Wetland (120)
Esfahan	Gavkhoni Wetland (47,000)
	Golpayegan Shor Wetland (7628)
Fars	Maharloo Lake (60,000)
	Barm Firooz Lake (283,200)
	Barmeshor Lake (30) Kamjan Wetland (10,000)
	Kaftar Wetland (4800)
	Haft Barm Wetland (20,000)
	Bakhtegan Wetland (350,000)
	Haram and Karion Wetland (10,000) Parishan Wetland (4300)
Ghazvin	Ovan Lake (7)
Gilan	Astara Steel Wetland (56)
	Jokandan Talesh Wetland (238)

Province	Water Resources (Area in ha)
Gilan	Anzali Wetland (19,000)
	Bojagh Wetland (160)
	Amirkalayeh Wetland (458)
Golestan	Incheh Wetland (1250) Alagol-Ulmagol-Ajigol Wetlands Complex (3027)
	Gomishan Wetland (17,700)
Hamedan	Pirsalman Wetland (3)
	Aqgol Wetland (3000) Cham Shor Wetland (500)
Hormozgan	Shahreno Estuary and Khore Khalasi *
	Central Jask Estuary *
	Delta of Shor, Shirin and Minab Rivers (31,606)
	Hara East Gabrik (5519)
	Khorkhoran Wetland (102,000)
	Shidvar Wetland (98)
Kerman	Jazmourian Wetland (330,000)
Kermanshah	Hashilan Wetland (450) Niloofar Lake (1331)
Khorasan Razavi	Bazangan Lake (80)
Khuzestan	Gaz and Hara Wetland (27,830)
	Khor Musa and Khor Al-Umayya Wetland *
	Shadegan Wetland (328,500)
	Bamdej Wetland (4000)
	Shimbar Wetland (15,000)
	Hur al-Azim Wetland (120,000)
	Miangaran Wetland (2500)

Province	Water Resources (Area in ha)
Kohgiluyeh and Boyer Ahmad	Mor Zard Zeilaei Wetland (35)
	Brom Alwan Wetland (15)
	Mountain Gol Lake (1)
Kordestan	Zarivar Wetland (2403)
Lorestan	Gahar Lake (85)
	Bishe Dalan Wetland (913)
Markazi	Meighan Wetland (25,000)
Mazandaran	Miankaleh Wetland (40,000) Fereydunkenar Wteland (4500) Shurmast Lake (1.5)
North Khorasan	Aq Gheshlagh Wetland (800)
Qom	Namak Lake (180,000)
	Hoze Soltan Wetland (37,075)
Sistan and Baluchestan	Hamoun Wetland (60,000)
	Khorbahoo Wetland and Gowatr Bay (29,500)
	Hamoun Helmand Wetland (150,000)
	Hamoun Pozak Wetland (160,000)
South Khorasan	Kaji Namkzar Wetland (22,000)
West Azerbaijan	Pir Ahmad Kandi Wetland (100) Garde Gheit and Meymand Wetland (800) Shorgol, Yadegarloo and Dargeh Sangi Wetlands Complex (2494)
	Soldoz Wetland (375)
	Aq Ziarat Wetland (10)
	Kani Barazan Wetland (907)
	Urmia Lake (521,000)
	Qopi Baba Ali Lake (500)

Note: * No reliable information was found.

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