BIODIVERSITY AND ECOSYSTEM MANAGEMENT IN THE IRAQI MARSHLANDS – SCREENING STUDY ON POTENTIAL WORLD HERITAGE NOMINATION

IUCN Regional Office for Western Asia

UNEP

وزارة البيئة
MINISTRY OF ENVIRONMENT

UNESCO
United Nations Educational, Scientific and Cultural Organization

Draft Final Report

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بسم الله الرحمن الرحيم

نضع بين أيدي القارئ الكريم دراسة مرجعية عن التنوع البيولوجي في الاهوار العراقية...

ان هذه الدراسة هي أحدى فعاليات مشروع تعاون دولي ينفذ من قبل برنامج الأمم المتحدة للبيئة (يونيب) ومنظمة التربية والعلوم والثقافة(يونسكو) بهدف بناء قدرات الكوادر العراقية في تسجيل الاهوار ضمن لائحة التراث الثقافي والطبيعي العالمي

اشكر وزارة البيئة لتحملها تكاليف طباعة هذا التقرير

د. علـــي اللامـــي

مستشار وزارة البيئة

رئيس اللجنة الوطنية للمشروع

آذار 2011

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List of Acronyms

BP	British Petroleum
CBD	Convention on Biological Diversity
CIMI	Canada-Iraq Marshlands Initiative
CMS	Convention on Migratory Species
CNPC	China National Petroleum Corporation
CR	Critically endangered (IUCN Red List threat category)
CRIM	Centre for the Restoration of the Iraqi Marshlands, Ministry of Water Resources of Iraq
DAI	Development Alternatives Inc. (a US Consultancy)
DD	Data-deficient (IUCN Red List threat category)
DDT	Dichlordiphenyltrichlorethan (an insecticide)
DTIE IETC	Division of Technology, Industry and Economics, International Environmental Technology Centre
EA ITAP	Eden Again International Technical Advisory Panel
EBA	Endemic Bird Area
EN	Endangered (IUCN Red List threat category)
GIS	Geographical Information System
IBA	Important Bird Area
ICMM	International Council on Mining and Metals
IPA	Important Plant Area
IUCN	International Union for Conservation of Nature
KBA	Key Biodiversity Area
LC	Least concern (IUCN Red List threat category)
MoE	Ministry of Environment of Iraq
MMNP	Mesopotamian Marshlands National Park
NGO	Non-governmental Organization
NP	National Park
NR	Nature Reserve
NT	Near-Threatened (IUCN Red List threat category)
OUV	Outstanding Universal Value
PA	Protected Area
PEEN	Pan-European Ecological Network
SMART	Specific, measurable, attainable, realistic, timed (criteria for planning objectives)
TEMATEA	Not an abbreviation. See website for details.
TNC	The Nature Conservancy
ToR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
VU	Vulnerable (IUCN Red List threat category)
WH	World Heritage
WHC	World Heritage Convention
WWF	Worldwide Fund for Nature

Acknowledgements

This study was generously supported by a wide range of national and international experts and representatives of the Government of Iraq. The outstanding contribution of **Dr. Ali Al-Lami of the Ministry of Environment of Iraq**, who participated in a three-day discussion workshop in July 2010, provided invaluable contacts and references to important information sources, and greatly aided the overall analysis and assessment presented in this report, is particularly acknowledged.

The valuable contributions of Tamar Teneishvili (UNESCO Jordan Office), as well as Haifaa Abdulhalim and Khaldoun Al-Omari (IUCN Regional Office for Western Asia), who also participated in the discussion workshop, are gratefully acknowledged. We are also grateful to Anna Bachmann (Nature Iraq), Ryuichi Fukuhara (UNEP DTIE IETC), Richard Porter and Mike Evans (BirdLife International), Tim Badman (IUCN World Heritage Programme), Jamal Al-Abaychi and David Marshal (Canada Iraq Marshlands Initiative), for helpful written information.

Title photo: Mudhafar Salim/Nature Iraq

Spelling of geographical names

The Southern Marshes of Iraq are generally referred to as “the Marshes” in this report. The spelling of Arabic place names varies widely among authors (and often even within individual publications by one author). This report generally follows the spelling used by CIMI (2008a, b) but uses the original spelling where direct reference is made to source publications.

Disclaimer

As one of its established roles, IUCN is the advisory body on natural heritage to the UNESCO World Heritage Convention. Nothing in this report shall be taken as prejudging an IUCN evaluation of any eventual nomination of the Iraq Marshlands to the World Heritage List. The decision on any eventual nomination will be taken solely by the State Party of Iraq, based on the independent assessment and preparations of the relevant institutions of the State Party. In addition to its direct contribution to consideration of the natural values of the Southern Marshes of Iraq, this study has also provided the opportunity to for IUCN to experiment with possible methodologies to provide support to States Parties to the World Heritage Convention before they bring forward a World Heritage nomination. IUCN will review the outcomes of this report in considering its further development of such approaches, in line with Decision 34.COM 12 of the 34th Session of the World Heritage Committee (Brasilia, 2010). Thus this report should not be taken as setting a precedent for approaches that may or may not be taken in relation to other sites with potential for consideration for World Heritage nomination.

1 Executive summary

The joint UNEP-UNESCO initiative aims to use the World Heritage nomination and management planning process to ensure sustainable development of the Iraqi Marshlands, and to conserve the values inherent in the historical, cultural, environmental, and socio-economic characteristics of the area. As part of this process, UNEP has requested IUCN through its Regional Office for West Asia (ROWA) with producing

- an inventory of data and information on the Iraqi marshland ecosystem, including its biodiversity and management since the 1970s, with regard to the natural World Heritage criteria, and relevant conditions of integrity and requirements for protection and management,
- technical guidance on the existing assessment framework and tools for ecosystem management and biodiversity conservation with regard to the requirements for World Heritage nomination, including inscription criteria, necessary adaptations of assessment frameworks and management tools, and guidance on related capacity development; and
- guidance on the development of a network among academia, researchers and institutions in the field of ecosystem management and biodiversity conservation, in order to contribute to a specialist or scientific group for the planning, implementation and monitoring the long-term management of the Iraqi marshlands, in relation to possible next steps in the World Heritage nomination process.

The requested report was compiled in June and July 2010 by a team of two consultants with extensive support from the Ministry of Environment of Iraq, national and international NGOs and experts, as well as IUCN. Approximately 500 of the most relevant sources (books, peer-reviewed articles in international journals, plans and policies, reports, abstracts and electronic resources) on the biodiversity, ecosystem and management of the Marshes were screened and analyzed, based on the natural criteria of Outstanding Universal Value and the Operational Guidelines of the World Heritage Convention. A wide range of national and international experts and stakeholders were contacted directly to corroborate the findings of this literature analysis.

The general conclusion of the study is that there appears to be sufficient evidence to support further development of work towards a full World Heritage nomination of the area in relation to World Heritage natural criteria x and ix, and with some potential to consider criterion vii. However, the feasibility and success of such a nomination is not assured under any of these criteria and will depend on the confirmation of values by further analysis, the design of the nomination to meet the integrity requirements of the World Heritage Convention, and on the implementation of a strong and participatory protection and management regime that addresses the multiple existing pressures, threats and management constraints to the marsh ecosystem.

Data and information were collated and analyzed based on World Heritage criteria vii, viii, ix and x. Regarding **World Heritage criterion vii** (outstanding natural phenomena and natural beauty), available information suggests that the Marshes are most likely not an expression of superlative natural phenomena, although they do contain areas of outstanding natural beauty and have documented aesthetic importance, which dates back several millennia. However it has not been possible to determine if these values are at the level necessary to support a nomination under criterion vii. Therefore, further study would be required should this be considered, and specific questions to be addressed in the course of such studies are listed in the report.

Regarding **World Heritage criterion viii** (earth's history, record of life, ongoing geological processes and geomorphologic features), the tentative conclusion is that while the Marshes in their natural state may well have been driven and formed by outstanding geo-morphological processes, the legacy of the

Marshes' draining during the second half of the 20th Century (particularly in the 1990s) and current pressures (e.g. scarcity of water) compromise the integrity of these processes to such an extent that makes a nomination under criterion viii unfeasible.

The study identified three ecosystem level processes pertinent to the Marshes that could provide arguments in support of a nomination under **World Heritage criterion ix** (biological and ecological processes) - ecological succession of the marsh ecosystem, seasonal migration of waterbirds and other birds/vertebrates, and recent evolution/speciation of vertebrates. Available data were evaluated regarding the value and integrity of these processes. This showed that significant knowledge gaps exist regarding the value (in global comparison) and integrity of these processes. Only once these gaps are closed will it be possible to take a final decision if a nomination under criterion ix is feasible.

The greatest amount of data and information was analyzed with reference to **World Heritage criterion x** (biodiversity). It was observed that the values of the Marshes under World Heritage criteria ix and x are closely interrelated. The Marshes harbor a considerable range of endemic/near-endemic and/or globally threatened vertebrate species and subspecies. Their biodiversity (and ecosystem) also underpins the economy and culture of marsh inhabitants, which imparts to it significant indirect cultural value. These biodiversity values may well stand up in global comparative analysis, which would be needed to take a final decision on the viability of a nomination of the site under this criterion. In addition, the recent draining crisis and current pressures combine to challenge the integrity of the Marshes' biodiversity to an extent that targeted conservation management is urgently needed. The potential OUV of the Marshes under criterion x is conservation-dependent, and a successful nomination – assuming that the results of global comparative analysis will be positive - will only be possible based on a strong management framework.

Data and information for an assessment of the overall integrity of the Marshes were also collected, and **oil exploration/extraction** was identified as an emerging threat to the integrity of some specific Marsh areas.

None of the above preliminary conclusions is final, and each of them needs to be scrutinized and re-evaluated in the light of new data by national experts and stakeholders. In particular, the study identified a large number of **knowledge gaps and research needs** (listed as either pre- or post-nomination priority), which will need to be addressed before a final decision about the most relevant criteria for a nomination of the Marshes as a World Heritage Site – based on a global comparative analysis – can be taken.

The study found that while there have been a number of **management planning initiatives** aimed at ecosystem or biodiversity conservation in the Marshes, little if any planned conservation management is being carried out currently, due to security and capacity reasons. A number of existing management plans and frameworks were assessed, based on explicitly stated objective criteria, regarding their relevance to the development of a management regime that safeguards the integrity of the Marshes. While all of them contain important potential contributions to such a regime, the assessment showed that none of the existing plans could be used as the basis or a template for planning a viable management framework, mainly because of different objectives, inappropriate scope/aim and/or insufficient technical quality.

The study further examines **international best practice approaches** that may be applicable to the management planning process for the Marshes, and makes suggestions for adaptations and specific tools to be used in the upcoming process. Standards and tools for the boundary setting of a World Heritage site in the Marshes are recommended based on the WHC Operational Guidelines, and the added value of a serial nomination (either simultaneous or phased) appears considerable. The crucial issue of regional trans-boundary cooperation regarding the management of the Marshes as a whole, but particularly regarding Al-Hawizeh Marsh on the border to Iran, is also highlighted.

With the strong support of representatives of the Ministry of Environment of Iraq and other stakeholders, a list of potential members of an **expert network** was compiled. Specific steps to activate this network and initiate a participatory management planning process for the Marshes are proposed. Among these steps, additional research regarding key knowledge gaps and a **global comparative analysis** to similar sites from other regions, based on the World Heritage criteria for which a nomination is envisaged by the national expert team, should take the highest priority.

2 Introduction

The joint UNEP-UNESCO initiative in the Iraqi Marshlands (hereafter "the Marshes") aims *"to ensure sustainable development of the Iraqi Marshlands, reflecting the outstanding universal value of its historical, cultural, environmental, hydrological, and socio-economic characteristics of the area, particularly utilizing the World Heritage inscription process as a tool to develop and implement a management planning framework"* (UNEP-DTIE-IETC 2009).

The Marshes and their inhabitants have witnessed three wars, a catastrophic draining and a precarious recovery process over the last 30 years (Partow 2001, UNEP 2003). Environmental management in Iraq and particularly in the Marshes still suffers from this legacy. The nomination and inscription process is therefore not seen as an end in itself, but as a means to provide incentives and guidance for the development of a sustainable management regime for the Marshes in general. This management regime needs to integrate and build on the numerous existing initiatives for sustainable management of the Marshes, and therefore be based on an active multi-stakeholder network and strong communication and coordination mechanisms. Initial steps to achieve such mechanisms which have been taken by this study are a comprehensive account of existing information, initiatives, and gaps, as well as support to the establishment of assessment and planning methods and tools.

Although the actual nomination and inscription of the Marshes as a combined World Heritage site is beyond the scope of the UNEP-UNESCO project (UNEP-DTIE-IETC 2009), the perspective of inscription needs to be realistic for the project rationale to function: Only if inscription is generally achievable will the preparation process function as a catalyst for the development and consolidation of sustainable management initiatives for the Marshes.

The entry of the Marshes as a mixed property in the World Heritage tentative list of Iraq does not refer to any natural values or natural heritage criteria. This suggests that a rigorous assessment of the Marshes as mixed (as opposed to purely cultural) heritage has not been conducted to date. Therefore, another key objective of the present study is to collect the necessary information and prepare an appropriate methodology to initiate such an assessment, and at the same time lay the foundation for an effective management of the values identified by it. An early assessment of the Marshes against the natural heritage criteria would also avoid disappointment at a later stage if the criteria could not be met (Badman et al. 2008b).

Although primarily oriented towards the World Heritage Convention, the study will also contribute to the improved and more coherent implementation of other biodiversity-related international conventions. Both the Ramsar Convention (e.g. Ramsar Res. IX.22, 10) and the Convention on Biological Diversity (e.g. CBD Dec. VII.14, 10) explicitly mention the WHC and natural heritage. In addition, establishment of a large mixed World Heritage site in the Marshes will inevitably contribute significantly to the Iraqi PA system and hence to the improved implementation of a wide range of biodiversity related conventions (e.g. CBD, CMS, Ramsar), and the tools and methodologies introduced for World Heritage assessment and management planning will benefit the nature conservation sector of Iraq as a whole.

IUCN has published a wide range of tools and guidelines on World Heritage nominations and management in particular, as well as general protected areas and natural resources management in general (see references below). Therefore, the current study has drawn from IUCN's resource pool whenever appropriate and complemented it with additional methods developed by other organizations whenever necessary.

We hope that the current study will contribute to an assessment and management planning process that not only fulfills the technical requirements of the World Heritage Convention, but also will give new

momentum to conservation efforts in the Mesopotamian Marshes and in Iraq in general.

3 Methodology

3.1 Geographical subdivision of the southern Marshes of Iraq

The area covered by this study follows the definition of the Marshes as given by UNEP (2010). The principal Marshes are divided from each other by the Euphrates and Tigris rivers (Figure 3.1.): The **Hammar Marsh(es)** are located south of the Euphrates River, and to the west of its confluence with the Tigris. The **Central Marshes** are situated north of the Euphrates River and west of the Tigris River, and the **Al-Hawizeh Marshes** lie east of the Tigris River, straddling the border with Iran.

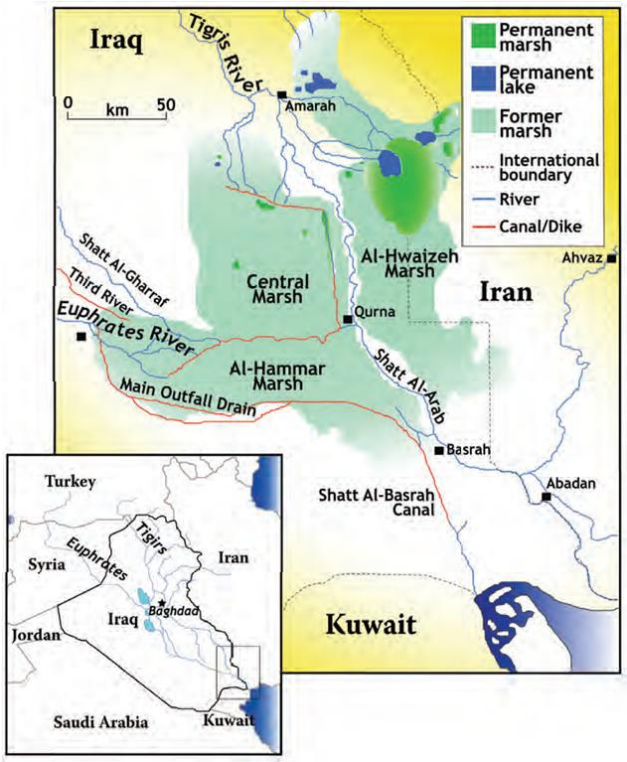

Figure 3.1.: Geographic location and general subdivision of the southern Marshes of Iraq. (Source: UNEP 2010)

Following the draining of the Marshes in the 1990s, the three major marsh complexes were subdivided into smaller marshes. Within each of the major Marsh areas, several individual marsh areas can be distinguished. These areas have not always been referred to under the same names by the various authors that have described them, which can lead to confusion when comparing results of various authors. Therefore, an effort has been made for this study to match the geographical terms of the major publications, in order to arrive at a consistent terminology. This effort was based on the subdivision into ten component marshes (Figure 3.2.), which was suggested by the CIMI Atlas of the Iraqi Marshlands (CIMI 2010a). It is presented as a table that shows an important nomenclature used by various authors for subsections for the Marshes (Table 3.1.). This list is not exhaustive. For instance, Nature Iraq's project on Key Biodiversity Areas uses another nomenclature with an even finer subdivision for its sampling stations (Salim et al. 2009a). Terminologies like the one used by BirdLife International (2010) for its IBAs confuse things further, as they are based on pre-draining surveys and may refer to features that are currently not present in their former state.

During the nomination and management planning process for a possible future World Heritage Site in the Marshes, geographical information should be processed and presented in GIS format to reduce the reliance on the sometimes inconsistently used nomenclature.

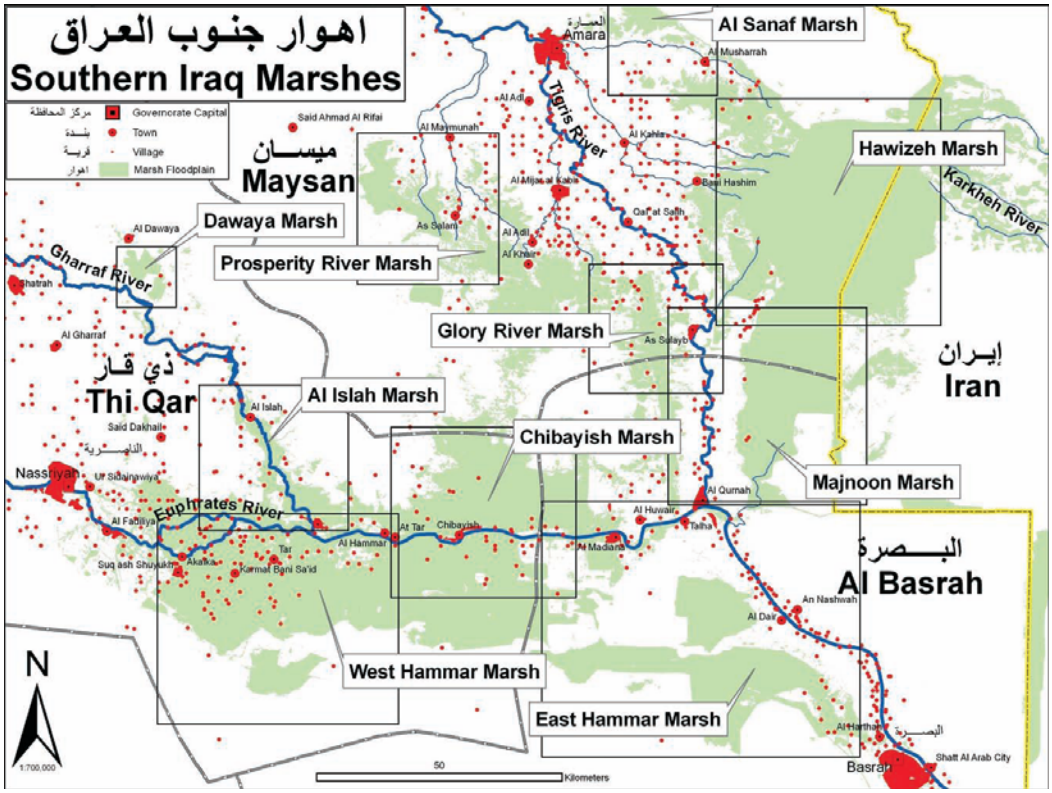

Figure 3.2. Component areas of the Marshes after draining and reflooding. Each of the Marshes is discussed in more detail in CIMI (2010a). (Source: CIMI 2010a).

Table 3.1. Geographical subdivision and terminology used by various authors. Names from the second column onwards are either subdivisions of marshes listed in fields to their left, or sampling stations within marshes listed fields to their left.

UNEP (2010)	CIMI (2010a)	New Eden Project (2010a)	Abed (2007)	BirdLife International (2010)	New Eden Group 2006	
Hammar	East Hammar	Hammar	E. Hammar	Haur Hammar	East Hammar	
	West Hammar		Suq Shuyukh		Central Hammar	
					West Hammar	
Central	Chibayish	Central			South Qurnah	
	Al-Islah	Abu-Zirig			Abu Zirig	
	Dawaya			Haur Uwainah	North Qurnah	
	Prosperity River			Haut Al Rayon & Um Osbah		
	Glory River			Haur Auda	Owdeh	
Al-Hwizeh	Hawizeh	Hawizeh	Hawizeh	Haur Al-Hawizeh	North Al-Hawizeh	
	Majnoon				South Al-Hawizeh	
	Al-Sanaaf			Haur om am Nyjah		
				Haur Chubaisah		

3.2 General approach

According to the ToR, the overall objective of this project is to assist in the preliminary process leading to a management plan for the Iraqi Marshlands (hereafter "the Marshes") consistent with management as a mixed cultural/natural World Heritage site. The development of a management plan for any World Heritage site needs to be based on the Statement of Outstanding Universal Value (OUV) for that site because

- This is required by §108 of the WHC Operational Guidelines (UNESCO, 2008), as well as further specific guidance provided by IUCN (Badman et al. 2008a, b), particularly regarding World Heritage site management planning (IUCN 2008)
- The feasibility of the nomination of a site as a mixed culture and nature site (as opposed to a purely cultural inscription, for instance as a cultural landscape) needs to be assessed early (see IUCN 2005a, Thorsell 2004), and
- An analysis of potential OUV would identify key values that will need to be protected through planned management within any management framework, irrespective of the nomination or successful inscription of the site as combined WH. Taking stock of the natural values that characterize a site is required within all general protected area management planning methodologies (e.g. Thomas and Middleton 2003).

Therefore, an important prerequisite of a management plan for the Marshes is an assessment of the degree to which they have potential to meet the relevant World Heritage natural criteria, as well as the potential to meet the integrity and management preconditions. Accordingly, the first specific objective of this study is to contribute to the information base of this assessment. The best way of achieving this is making the World Heritage criteria, conditions of integrity, and considered requirements for protection and management the backbone of the study report. This also includes an account of current ecosystem management initiatives because World Heritage site management of the Marshes will need to cooperate with, build on, and add value to them.

Since this specific project aims primarily at the management of the Natural Heritage aspect of the Marshes, it mainly focuses on natural heritage criteria and integrity/management considerations. However, links to cultural values as well as opportunities and prerequisites for integrated management of cultural and natural values have also been considered.

While the WHC Operational Guidelines (2008) are clear about the need to inform the planning process for World Heritage sites by an analysis of their OUV, they are less clear about the management planning approach to be employed for natural World Heritage sites. Therefore, the study has evaluated existing planning approaches (e.g. IUCN 2008, Thomas and Middleton 2003), based on an analysis of specific values of the Marshes and needs for their management.

Guidelines on natural World Heritage nominations emphasize that "a strong multi-disciplinary team is required to organize and manage an effective nomination process" (Badman et al. 2008b). They also identify types of experts that should be involved. Following this guidance, the present study supports the development of a network among national and international experts relevant to the assessment and management planning for the Marshes.

3.3 Collection of data and information relevant to the natural World Heritage criteria

Based on Iraq's tentative list, UNEP-DTIE-IETC (2009) appears to suggest that the natural heritage part of the World Heritage nomination of the Marshes should be based on World Heritage criterion ix alone. However, no analysis of the Marshes in relation to the other natural criteria (vii, viii and x) has been presented to support excluding those criteria. Therefore, an initial data and information collection and preliminary assessment on all four natural World Heritage criteria has been conducted as part of this study.

For each of these, the following steps were taken:

- Collection of references and documents containing information relevant to each criterion (ca. 400 sources screened in total);
- Compilation of the information contained, as far as possible;
- Identification of knowledge gaps and derivation of recommendations how they should be filled;
- Evaluation of information obtained, based on internationally established criteria and procedures;
- Preparation for global comparative analysis of the information compiled in relation to the relevant criteria, through identification of comparable sites (both World Heritage and non WH) from relevant sources (e.g. Thorsell et al. 1997, The Nature Conservancy & WWF 2008) as recommended by Badman et al. (2008a), and compilation of criteria and assessment methods for the global comparative analysis that needs to be carried out in preparation for nomination;
- General methodological recommendations for the development of management planning procedures and targets for identified natural values of the Marshes.

The Marshes have been used by Marsh inhabitants for millennia, and the specific ways of natural resource use that have formed over this history are not only a form of traditional ecosystem management. They may also constitute a key cultural value of the Marshes answering to World Heritage criterion v: *"an outstanding example of a traditional human settlement, land-use or sea-use which is representative of a culture (…) or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change"* (UNESCO 2008).

Therefore, data collected on traditional and current natural resource use in the Marshes would be relevant to future ecosystem management but may also add value to the discussion of the potential OUV of the Marshes regarding criterion v. Similarly, the natural beauty of the Marshes may be, at least in part, linked to its traditional and religious values which are relevant to criterion vi (UNESCO, 2008).

3.4 Collection of data and information relevant to marsh integrity

According to the WHC Operational Guidelines (2008), *"to be deemed of OUV, a property must also meet the condition(s) of integrity…"* Paragraph 88 of the Operational Guidelines defines integrity as a measure of the "wholeness and intactness" of the heritage and goes on to list criteria of **wholeness** (appropriate size, representation of elements to maintain OUV) and **intactness** (functioning of processes that maintain the OUV, absence of adverse effects on them from development or neglect, buffer zones).

The integrity assessment has to consider large-scale destruction of the marshes over the course of the 20th Century, and particularly since the 1990s, which has seriously compromised their integrity (e.g. Maltby 1994, Mitchell 2002, Partow 2001). Their partial recovery since 2003 has been one of the largest ecological restoration projects in history, and has had some success (e.g. Hamdan et al. 2010, Richardson et al. 2005, Salim et al. 2009b, UNEP 2010). However, the long-term integrity of the Marshes is also under pressure from current factors, such as the reduction in discharge of the Euphrates and Tigris due to the construction of dams further upstream (e.g. Coad 2008, see also Naff and Hanna 2002).

The complex recent history of the Marshes' intactness highlights the importance of the integrity precondition for their successful nomination and management as natural heritage. The precondition and its specifications for World Heritage criteria vii, xi and x will be addressed in this study by:

- compiling available information and information gaps to support identifying options for the boundary setting of the property,
- studying the consequences of the trans-boundary character of one of the largest and best preserved marshes (Al-Hawizeh Marsh) and develop possible options to deal with this fact within a management framework,

- studying current and possible future effects of oil extraction on the integrity of the Marshes, and
- compiling available information and information gaps regarding the ecological and hydrological processes governing the Marshes and factors disturbing them, as well as initiatives aimed at the sustainable management of such processes.

3.5 Collection of data and information on current and past management

A wide range of management concepts and plans have been developed for the management of various parts or aspects of the Marshes since 2003 (e.g. Development Alternatives Inc. 2004, New Eden Group 2006, Nature Iraq 2008a, b, New Eden Project 2010a, b, Stevens et al. 2003). Many of them had the support of direct collaboration of the Iraqi Government. Additional management initiatives have been implemented without a strategic planning framework. While none of these management plans were directed at the management of the Marshes as a Natural Heritage site, all of them cover important aspects of management and would certainly contribute to fulfilling the respective OUV requirement.

In order to assess the current management of the Marshes, this study includes the following information:

- Listing of past, ongoing and planned initiatives for the management of the Marshes or parts thereof (including those of the Iraqi Government, national and international NGOs, and the international development cooperation),
- Evaluation of the relevance of existing ecosystem management and biodiversity initiatives to the development of a management framework of the Marshes as WH, and
- Identification of information, methodological and resource gaps in relation to marsh management.

The account of current management that has been compiled through these activities will inform the development of an integrated management planning approach for the Marshes in line with World Heritage inscription criteria.

3.6 Support to the development of a management planning framework

Based on a general understanding of the values represented by the Marshes (particularly but not exclusively those qualifying as OUV), and of their current integrity and management, it was possible to develop a management planning framework for the property that enables long-term management as a Natural Heritage site.

In addition to the identification and possible adaptation of a general management planning methodology at the site level, § 53 of the WHC Operational Guidelines (2008) requires that an appropriate policy, legal, technical, administrative and financial framework be provided by individual WHC Parties to ensure the sustainable management of their properties. This is further underlined by the study's ToR, which list the need to develop capacity among Iraqi partners for the management of World Heritage sites. Site level management planning tools and capacity needs are therefore addressed.

IUCN has developed specific guidance on management planning for World Heritage sites (IUCN 2008), which builds on the Union's relevant general PA management guidelines (e.g. Davey 1998, Dudley 2008, Thomas and Middleton 2003). Building on these resources and the assessment of current management, the study has focused on the following prerequisites of developing a coherent and realistic management plan for the Marshes:

- Recommendations for filling identified knowledge and resource gaps regarding management of the Marshes,

- Development of options for integrated management planning framework, based on existing methodologies, including options for the boundary setting and zoning of a possible future property (including the option of a serial property encompassing several sites) that would be feasible, and at the same time in agreement with the integrity condition, and options for an eco-hydrological process management framework that safeguards the functional integrity and hence the potential OUV of the Marshes.
- Identification of national as well as international experts and resource persons on Marsh management, and recommendations for communication and coordination mechanisms for an improved collaboration among existing initiatives aimed at sustainable management of the ecosystem and/or biodiversity of the Marshes.

3.7 Support to network development

The development of an expert network on marshland conservation and management is an important prerequisite for management planning for the Marshes, and particularly in the context of the World Heritage nomination process (IUCN 2008). In addition, it will make important contributions to the development of an active and effective nature conservation sector in Iraq.

Therefore, the study has supported network development and developed recommendations how this network can be further strengthened and involved in the course of management planning. This has built on existing contacts among the conservation and academic community.

3.8 Resource compilation

The references compiled in the course of the present study and a collection of more than 100 key documents as pdf will be made available to the national planning team, as an additional output of the current study.

4 The Marshes' values in relation to the World Heritage criteria

4.1 The concept of OUV and its ramifications

The concept of Outstanding Universal Value (OUV) is defined within the Operational Guidelines to the World Heritage Convention (UNESCO 2008). Paragraph 77 of the Operational Guidelines makes clear that "The Committee considers a property as having Outstanding Universal Value [...] if the property meets one or more of the [ten] following criteria", whilst in paragraph 78 it is made clear that "To be deemed of outstanding universal value, a property must also meet the conditions of integrity and/or authenticity and must have an adequate protection and management system to ensure its safeguarding." The World Heritage criteria are thus central both to the nomination file and to the management planning process for any future World Heritage property (UNESCO 2008).

With regard to the **nomination**, the responsible agencies of the Government of Iraq would have to state in the nomination file

- under which World Heritage criterion or criteria the Marshes are nominated,
- which values inherent in the Marshes qualify them for nomination under the chosen criterion or criteria, and
- how these qualifying values pass the threshold of global comparative analysis to existing World Heritage properties and other comparable areas (Badman et al. 2008 a).

The threshold for Outstanding Universal Value is high, irrespective of the specific criterion applied. Paragraph 52 of the World Heritage Operational Guidelines (UNESCO, 2008) clarifies that "(*T)he Convention is not intended to ensure the protection of all properties of great interest, importance or value, but only for a select list of the most outstanding of these from an international viewpoint. It is not to be assumed that a property of national and/or regional importance will automatically be inscribed on the World Heritage List."*

There are four natural World Heritage criteria. In Section 4, each of them is applied to the known values of the Marshes, and a preliminary assessment is made as to which of these values might be the most likely to pass the threshold of OUV in a global comparative analysis. Knowledge gaps that may preclude a conclusive evaluation of the Marshes based on the World Heritage criteria are also identified, together with additional knowledge gaps and research needs that are not critical to the assessment and management planning process.

The final decision about applicable World Heritage criteria can only be taken by the responsible institutions of the Iraqi Government, with advice from the preparation team responsible for the nomination, after key knowledge gaps have been filled, and a global comparative analysis has been conducted.

The preparation of a statement of Outstanding Universal Value (OUV) is equally important to the management planning process because World Heritage site management aims at conserving and developing the values identified within a site, and particularly those values that are identified as OUV. The management plan submitted with the nomination file of any newly nominated site will need to show how site management meets this objective. In this respect, management planning for a World Heritage site is no different from management planning for any protected area, which is also based on a description and evaluation of the values found in an area (Thomas and Middleton 2003). The only difference is that in the case of World Heritage sites, the values that guide the management planning are mainly those that have been recognized as being of OUV. A more detailed discussion on management planning is given in Section 6.

4.2 Integrity as a cross-cutting dimension of OUV

For a successful World Heritage nomination, it is not sufficient to show that the site in question meets one or more World Heritage criteria. It also needs to be shown that the property has sufficient integrity. “To be deemed of OUV, a property must also meet the condition(s) of integrity…” (UNESCO 2008). Paragraph 88 of the WHC Operational Guidelines (2008) defines integrity as a measure of the “**wholeness and intactness**” of the heritage and goes on to list criteria of **wholeness** (appropriate size, representation of elements to maintain OUV) and **intactness** (functioning of processes that maintain the OUV, absence of adverse effects on them from development or neglect, buffer zones).

Integrity needs to be assessed at two levels: Firstly, each World Heritage criterion has its own integrity requirements. Paragraphs 92-95 of the WHC Operational Guidelines list these specific requirements for natural heritage nominated under criteria vii-x, respectively (UNESCO 2008).

Secondly, integrity needs to be assessed at the level of the site as whole. This assessment can be seen as a synthesis of the more specific integrity assessments for the four individual natural criteria. This report firstly discusses integrity at the level of each different natural World Heritage criterion, and then synthesizes this information to provide a comment on the integrity of the property as a whole.

4.3 Application of World Heritage criterion vii

Box 4.1. World Heritage Criterion vii according to the WHC Operational Guidelines (UNESCO 2008)

Nominated properties shall … contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance.

Although no less than 120 World Heritage properties had been inscribed on the World Heritage List under criterion vii by 2008, this criterion has been used less frequently in the recent past (Badman et al. 2008). It is usually applied in conjunction with one or more of the other natural World Heritage criteria. Box 4.1. shows that there are two ways to meet this criterion:

- **Superlative natural phenomena:** In order to meet this element of criterion vii, the site should represent *the* superlative example of its category on a global scale – for example, the deepest canyon, the highest mountain, the largest cave system etc. (Badman et al. 2008). Applying this to the Marshes, it would need to be determined whether they represent a global superlative of their basic category (e.g. "marshland").
- **Exceptional natural beauty and aesthetic importance:** Whether a site contains areas of exceptional natural beauty and aesthetic importance is difficult to assess objectively because there are few measurable criteria. Evaluation of this element of the criterion is therefore based on comparisons to already inscribed properties besides the use of measurable indicators of scenic value, if possible (Badman et al. 2008).

4.3.1 Do the Marshes contain or represent superlative natural phenomena?

In order to become tractable, this question needs to be replaced by more concise questions, a few of which are listed below:

- ***Are the Marshes the largest freshwater marshes worldwide, or are they superlative in another simple way (deepest, water richest, saltiest…)?*** Taking the area before 1977 as an optimistic indicator of potential area, the Marsh wetlands occupied about 10,200 km^2 (Brasington 2002). This is much smaller than the World's largest wetlands, such as the Pantanal (Brazil - 140,000-195,000 km^2), the Hudson Bay Lowlands (Canada - 373,700 km^2), or the West Siberian Lowlands (Russian Federation - 2.7 * 10^6 km^2) (Fraser & Keddy 2005). Since the Pantanal is a representative of the same wetland subcategory as the Marshes (internal river delta/freshwater marshland), the Marshes would not appear to readily qualify as a superlative representative of that subcategory. Nor do they exceed the other wetlands in any other simple way (cf. Fraser & Keddy 2005).
- ***Are the Marshes the largest waterbird wintering area worldwide?*** If positive, this question would also trigger World Heritage criterion x, and the Marshes would be more appropriately inscribed under that criterion. However, assuming the potential maximum numbers of wintering and passing waterbirds to be a few million (cf. Carp & Scott 1979), the Marshes would be in the same order of magnitude as the Wadden Sea (Germany/Netherlands - up to 6.1 million waterbirds estimated at one time) the Banc d'Arguin (Mauritania - 2.1 million wintering birds) or the Georgia Bight (USA – several million passage migrants) (CWSS-WHNPG 2008). However, potential maximum numbers are not relevant to criterion vii, and current numbers appear to be much lower (Abed 2008a, b, Salim et al. 2009a). As long as the Marshes have not returned to the pre-draining wintering waterbird abundances, they definitely do not qualify as the superlative wintering site for waterbirds.
- ***Are the Marshes the largest wetland in an arid region?*** The Marshes are special in that they represent an extensive, allochthonously fed wetland complex in a very arid area (117-302

mm annual precipitation – Naff & Hanna 2002), and it might be hypothesized that they are superlative regarding their extent/aridity ratio. However, the Volga Delta (Russian Federation) receives comparable amounts of precipitation (162 mm/a average) and is twice as large as the Marshes, at 20,000 km^2 (NHPF 2008). Although evaporation in the Marshes (open water: 2,700 - 3,250 mm/a – New Eden Group 2006c) is much higher than in the Volga Delta (average 1,177 mm/a – NHPF 2008), it would nevertheless be problematic to claim this superlative for the Marshes. There may be additional comparable wetland areas.

The preparation team may be able to formulate additional specific hypotheses regarding superlative natural phenomena represented by the Marshes which stand up in global comparison, but the preliminary conclusion of this report is that the Marshes do not clearly represent a feature that could be considered a superlative natural phenomenon.

4.3.2 Do the Marshes contain exceptional natural beauty and aesthetic importance?

Figure 4.1. In the Marshes. (Photo: Mudhafar Salim/Nature Iraq)

4.3.2.1 Exceptional natural beauty

The advisory body acknowledges that it is more difficult to assess natural beauty, because of the lack of objective indicators (Badman et al. 2008). Comparable sites should be distributed globally not regionally in order to fulfill this element of the criterion.

One way of collecting evidence of the exceptional natural beauty of the Marshes would be to compile references to it from the literature, arts, travel writing and the media. It would be beyond the scope of this report to do this in an exhaustive way but a few examples are given below to illustrate the approach. If - after consultation with UNESCO and IUCN as the relevant advisory body - it is decided to take the suggested approach for the nomination under criterion vii, additional references (including from the arts) should be compiled by the nomination team.

Literature references: The Marshes' beauty has evoked expressive descriptions by numerous outstanding travel writers of the 20th Century, and it is likely that much more descriptions can be found in the Arabic literature. Since such descriptions are not only documented from local or regional (Middle Eastern) writers, there is arguably a global interest and hence a globally significant natural beauty contained in the Marshes.

- Thesiger (1964) describes his first encounter with the Marshes in 1950 as follows: *"Memories of that first visit to the Marshes have never left me: firelight on a half-turned face, the crying of geese, duck flighting in to feed, a boy's voice singing somewhere in the dark, canoes moving in procession down a waterway, the setting sun seen in crimson through the smoke of burning reedbeds, narrow waterways that wound still deeper into the Marshes"*.
- Young (1977) was equally moved by the vast and peculiar beauty of the Marshes when first entering in 1952: *"The golden reeds shot up around us, closing up behind us like twenty-feet high sound-proof screens, shutting out all other worlds. Their dun-colored waving plumes contracted the sky into one pure blue swathe immediately overhead. Like Alice in Wonderland we had plunged into another world... The impressions of the next few days of this visit took hold of me as relentlessly as the marsh creepers that grapple those millions upon millions of reeds. Sometimes we burst out of the reed-forests into dazzling sun-lit lagoons so vast that their blue mirror-surfaces joined the sky uninterrupted by any solid skyline…"*.
- These sentiments are reflected - somewhat darker but equally intense - by those of Maxwell (1957): *"It was in some way a terrible landscape, utterly without human sympathy, more desolate and inimical than the sea itself, except, perhaps, when it breaks in winter on a long shingle beach and the land behind is flat. Here in the limitless stubble of the pale bulrush one felt that no sheltering ship could sail nor human could walk, and there seemed no refuge for any creature whose blood was warm"*.

Media reports: As a snapshot of the global media interest in the Marshes - both as an ecosystem under threat and as a scenic and evocative landscape – a few media references from the time of writing this report (July 2010) are listed below. The wide international interest in the Marshes again might be seen as testimony of their global rank.

- The British daily **The Guardian** published an article titled *Paradise found: Water and life return to Iraq's 'Garden of Eden'* on 9 July 2010 (Jowit 2010).
- The German weekly **Der Spiegel** published a multi-page article titled *Im Sumpf der Hoffnung* (*In the Marshes of Hope*) on 26 July 2010 (Shafy 2010).
- A similar article was published in **The Times**.

This short compilation of references to the Marshes from travel writing and current media reports testifies to their beauty and suggests that a nomination under the second element of criterion vii (in conjunction with other criteria) may be possible.

4.3.2.2 Aesthetic importance

In relation to aesthetic importance, aesthetic reference to the Marshes in literature or works of art, which may themselves be relevant to the cultural World Heritage criteria, needs to be distinguished from the aesthetic importance of the site as such. The Marshes are referred to in the Sumerian literature (Young 1977), the first written literature of humankind (Hallo 2009). However, this alone does not impart aesthetical importance to the Marshes themselves, and hence does not justify nomination under World Heritage criterion vii.

4.3.3 Integrity of the Marshes related to World Heritage criterion vii

Box **4.2. The integrity requirement for World Heritage Criterion vii according to the WHC Operational Guidelines (UNESCO 2008)**

Properties proposed under criterion (vii) should be of outstanding universal value and include areas that are essential for maintaining the beauty of the property. For example, a property whose scenic value depends on a waterfall, would meet the conditions of integrity if it includes adjacent catchment and downstream areas that are integrally linked to the maintenance of the aesthetic qualities of the property..

If criterion vii is indeed chosen by the planning team as one of the potential nomination criteria, then the integrity of the scenic value also needs to be addressed, i.e. the current state of the aesthetic values of the Marshes needs to be described and compared to other sites worldwide. The management plan needs to spell out how it will be maintained within the framework of a possible future World Heritage property. This would also benefit tourism development in the Marshes in the long term as intact scenic beauty would be one of the main tourist attractions of the area.

The requirements of the integrity requirement for criterion vii are essentially that all major landscape forms of the Marshes should be present, that they should combine to produce the characteristic beauty of the Marshes, and that their aesthetic qualities should not be compromised (for instance by large man-made structures such as oil rigs within the sites or within sight of the sites). A general pre-drainage list of habitats (or landscape components) that constitute the Marsh landscape was presented by Scott & Evans (1994):

- permanent freshwater lakes with a rich submergent growth of aquatic vegetation, and typically with a marginal zone of floating aquatic vegetation,
- permanent freshwater marshes dominated by tall stands of *Phragmites*, *Typha* and *Cyperus*,
- rivers, streams, canals and irrigation channels, typically with little emergent vegetation and steep earth or muddy banks,
- permanent ponds, mainly man-made irrigation ponds and duck-hunting ponds, typically with a pronounced drawdown in summer and little emergent vegetation,
- seasonal freshwater marshes dominated by rushes and sedges, typically occurring as a broad belt around the edge of the permanent marshes,
- seasonally flooded mudflats and semi-desert steppe,
- irrigated land and seasonally flooded arable land, and
- shallow, brackish to saline lagoons, mostly seasonal and often with extensive areas of *Salicornia*.

The study considers that significant areas of all the principal landscape forms would need to be included in a World Heritage site in order for it to be considered as having sufficient integrity in relation to criterion vii.

Criterion vii relates the overall values of the property as a natural landscape. Since this depends on its functional integrity and biodiversity, the specific integrity requirements listed under World Heritage criteria viii-x (if a decision is taken to nominate the site under these criteria) can be considered indirect prerequisites of the integrity of the Marshes in relation to criterion vii.

4.3.4 Summary: Applicability of World Heritage criterion vii to the Marshes

It is difficult to assess the current state of the aesthetic values of the Marshes, because of the rapid transition that the system is undergoing and because of security issues. In addition, the subjective nature of some aspects of World Heritage criterion vii means that a direct comparison to similar sites

would need to be made before a decision about the feasibility of a nomination of the Marshes under this criterion. This means that a conclusive statement about the applicability of World Heritage criterion vii to the Marshes is impossible at this stage. It is also considered that criterion vii alone would not capture the full range of natural values, and might be perceived as the least important of the natural criteria. Therefore it should only be considered in combination with other natural World Heritage criteria, if at all.

If a decision is taken to nominate the site under criterion vii, than this might also provide a bridge between the possibly application of other natural (ix, x) criteria and/or the cultural (e.g. iv, v) criteria in a mixed nomination.

4.3.5 Knowledge gaps and research needs

In order to decide whether the Marshes should be nominated under criterion vii, additional information as listed in Box 4.3. would need to be researched in preparation of the nomination. The needs for management planning specific to World Heritage criterion vii are considered further in Section 6 of this report.

Box 4.3. Priority research needs regarding application of World Heritage criterion vii to the Marshes

- **Decision on applicability of criterion vii:** Although our preliminary assessment suggests that the Marshes may have sufficient values to consider the applicability of criterion vii, this needs to be explored further with a focus on the current aesthetic values of the area.
- **Elaboration of case for superlative natural phenomena:** If nomination under the first element of criterion vii (superlative natural phenomena) is planned (which is not the recommendation of this report), further research including a global comparative analysis should be conducted to define and prove the superlative character of the property.
- **Collation of additional evidence on natural beauty:** Additional evidence on the natural beauty of the Marshes, e.g. from literature and art (e.g. references to Arab literature, systematic analysis of the role of the Marshes in Sumerian literature, existing measurable criteria for scenic value, information on comparable sites worldwide) should be collected.
- **Global comparative analysis:** Based on the research above and the identification of suitable sites for comparison a global comparative analysis - based on the qualities in which the Marshes are considered superlative and the attributes of their outstanding beauty – needs to be conducted.
- **Optimal demarcation for criterion vii:** If a nomination under criterion vii is planned, then the sites that contain the most aesthetic values need to be identified and included in the nominated property.
- **Management requirements to safeguard aesthetic values:** If a nomination under criterion vii is planned, it needs to be determined how the identified aesthetic values of the site can be protected and managed.

4.4 Application of World Heritage criterion viii

Box 4.4. World Heritage criterion viii according to the WHC Operational Guidelines (UNESCO 2008)

Nominated properties shall …be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features.

According to Badman et al. (2008b), there are four elements under criterion viii for which values have been recognized by the World Heritage Committee in the past. Two of them (examples of major stages of earth's history and the record of life) clearly do not apply to the Marshes. The other two are discussed in more detail below:

- **Significant ongoing geological processes in the development of landforms:** This element of the criterion can be applied to active geomorphologic processes in deltas and rivers, as the Tigris-Euphrates system.
- **Significant geomorphic or physiographic features:** This element of the criterion is applied to significant products of the geomorphologies processed mentioned above. This means that functional, dynamic geomorphologic systems often qualify for nomination under both this and the previous sub-category.

As one of relatively few large delta systems, the Marshes clearly displayed geological processes and their resulting landforms until the draining in the second half of the 20th Century. Sanlaville (2002) characterized the area as follows:

"But this area is also an excellent example of a very complex delta system due on one hand to the combined work of three great rivers flowing down from a range of mountains and providing large quantities of water in a desert, and on the other hand to particular structural conditions resulting in the coexistence of a double delta: an inner continental one and a marine one."

As pointed out in relation to criterion vii, the Marshes are by far not the largest complex delta system worldwide. They might still qualify under criterion viii, however, because they do not need to be the superlative expression of their category to meet this criterion. In order to decide whether this character as a complex river delta imparts OUV to the Marshes, it needs to be decided if the values relevant to criterion viii surpass the threshold of universal appeal to human understanding of the basic processes considered, or whether the Marshes are rather a specific case which is mainly interesting to specialists (Badman et al. 2008b).

More importantly, it also needs to be decided if the Marshes are likely to meet the integrity requirement for criterion viii. These decisions need to focus on to the integrity geomorphologic processes and resulting structures in question, not the historical or ecological importance of the Marshes as a whole.

4.4.1 Preliminary analysis of applicability of relevant elements of criterion viii

Regarding the first question (universal appeal vs. specialist interest only), a first analysis of the available information indicates that the Marshes exist because of a unique combination of factors (Sanlaville 2002):

- Continental water import from the humid Anatolian Plateau and Zagros Mountains into the arid and flat Mesopotamian Plain,
- Strong sedimentation rates upstream of and also within the Marshes, and

- Constriction of the plain towards the South-east by the Western Plateau (from the west) and the Batin and Karun alluvial fan (from the east), which limits drainage from the area.

Whilst in these respects the Marshes are a unique area, this peculiar and untypical combination of factors, of itself this does not necessarily provide a basis for sustaining a claim for Outstanding Universal Value. In any case, the integrity requirement, which is discussed below, is critical to the applicability of criterion viii and is not met at the present time.

4.4.2 Integrity of the Marshes related to World Heritage criterion viii

Box 4.5**. The integrity requirement for World Heritage criterion viii according to the WHC Operational Guidelines (UNESCO 2008)**

Properties proposed under criterion (viii) should contain all or most of the key interrelated and interdependent elements in their natural relationships. For example, an "ice age" area would meet the conditions of integrity if it includes the snow field, the glacier itself and samples of cutting patterns, deposition and colonization (e.g. striations, moraines, pioneer stages of plant succession, etc.); in the case of volcanoes, the magmatic series should be complete and all or most of the varieties of effusive rocks and types of eruptions be represented.

All sources agree that the Marshes as a hydrological and geomorphologic system lost most of their integrity during the extensive draining of the 1990s. Most sources also agree that the Marshes re-gained some of their integrity following the reflooding since 2003. The question with regard to criterion viii is to what extent the re-flooding has restored - or could restore - hydrological and geomorphologic functionality, relative to before the draining.

4.4.2.1 Draining of the Marshes

The draining of the Marshes in the second half of the 20th Century, and particularly in the 1990s, severely disrupted the hydrological regime of the Marshes. Large dams in the upper reaches of the Euphrates and Tigris started to change the water distribution throughout the basin since the mid 20th Century, strongly impacting downstream water use (Beaumont 1998). Flood control structures like Ramadi or Samarra, which diverted peak floods into depressions or created reservoirs, and thus changed the hydroperiod of the downstream rivers, also appeared during this period. Turkey first launched its Southeast Anatolia development project including 22l dams and 19 hydropower plants, in 1977, and rebalanced it in 1989. Iran started large-scale water management projects on the Karun and Karkeh Rivers (the latter a key tributary of the Al-Hawizeh Marshes), in the mid-1990s (Partow 2001).

On top of these projects, which alone would have threatened the integrity of the Marshes, the Iraq Government initiated a large scale hydro-engineering programme to drain the Marshes after the second Gulf War 1991 (Partow 2001). As a result, the Euphrates was to a large part diverted into the Main Outfall Drain (Naff and Hanna 2002). Following the completion of the Main Outfall Drain, Hammar Marsh including the once 120 km long Lake Hammar practically disappeared between 1992 and 1994 (Munro & Touron 1997), and a similar rate of wetland loss was observed in the Central Marshes following river engineering works on distributaries of the Tigris and the construction of the “Anfal 3” canal (Mitchell 2002). More gradual draining and degradation trends were observed in Al-Hawizeh, but they also were affected by the construction of embankments and tributary canalization (Partow 2001). Areas that had been cut off from their supply were partitioned into polders. The overall area of permanent Marsh shrunk - according to one typical estimate - by 84% and the area of open water by 90%, while seasonal marshes increased by 48% (Brasington 2002). Another estimate put the figures at 87% and 66% loss of permanent marshes and lakes, respectively, with another 87% loss in seasonal shallow lakes (Partow 2001; see Figure 4.2.). Discharge and hydroperiod of the Euphrates

and Tigris were also significantly reduced during the same period, partly due to upstream dams. Without going into the details of the draining process, which have been described extensively elsewhere (see New Eden Group 2006, Mitchell 2002, Naff & Hanna 2002, Partow 2001 and references therein), it is obvious that as a result the hydrological and geomorphologic regime of the Marshes lost most of its integrity.

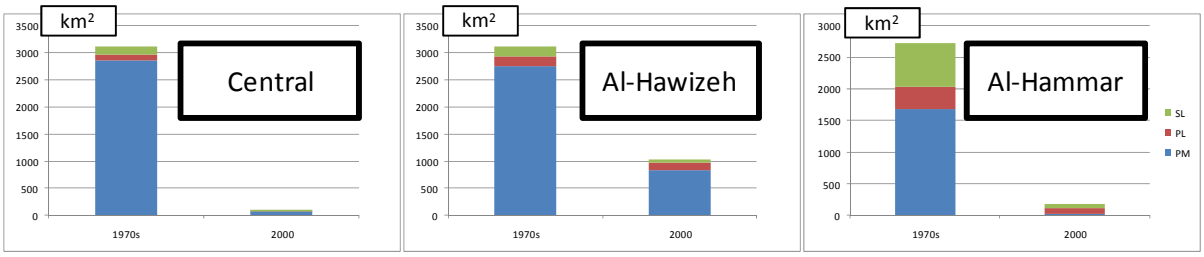

Figure 4.2. Loss of marsh area of various types in Central, Al-Hawizeh and Hammar Marshes between the 1973-76 period and 2000. The remaining Marsh areas in 2000 were 3.1%, 33.3% and 6.4% of the original extent, respectively. (SL… seasonal/shallow Lake, PL… permanent lakes, PM… permanent marsh). Source: Partow (2001)

4.4.2.2 Reflooding of the Marshes

Since 2003, local inhabitants began to reflood some of the Marshes, initially often in an uncontrolled and haphazard fashion (Lawler 2005). Because of the breaching of levees and dams and coincidental plentiful rain in the following two years, the Marshes superficially recovered and regained about 55% of their former extent (CIMI 2010b). This recovery was transient, however. Following a drought in 2008-09, marsh extent declined again and only slightly recovered in the winter 2009/10 (CIMI 2010a, see Figure 4.3. below). This suggests that the expectations of a rapid spontaneous restoration of the Marshes following re-flooding may have been overoptimistic.

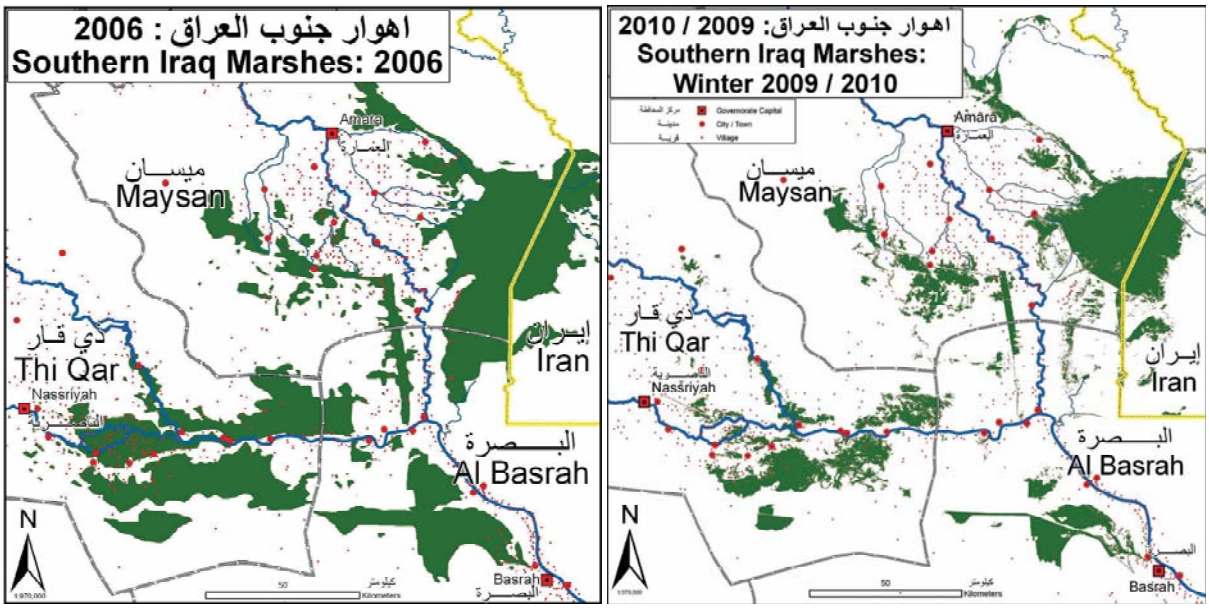

Figure 4.3. Fluctuation of marsh cover in the years following reflooding. A peak of marsh extent in 2006 was followed by a decrease in Marsh area, as a consequence of two drought years. (Source: CIMI 2010a).

In addition to the transient and limited spatial extent of marsh recovery, it is also clear that partial reflooding alone has not restored the hydrological and geomorphologic functionality of the Marshes. The following aspects of hydrological and geomorphologic Marsh function are among those which still lack integrity after reflooding:

- Level of discharge of the Euphrates and Tigris, which are now much reduced (New Eden Group 2006, Jones et al. 2008);
- Seasonal periodicity of discharge, which is now smoothed out by dams situated upstream of the Marshes, and reduces the flushing effect of seasonal floods and their impact on sediment dynamics (Aqrawi 1994, Partow 2001, UNEP 2005);
- Sediment import into the Marshes – much less sediment reaches the Marshes now because of sedimentation in reservoirs and upstream (New Eden Group 2006);
- Hydrological connectivity between individual Marsh patches, which are now very fragmented in comparison to historical connectivity levels (Richardson & Hussain 2006).

4.4.2.3 Likelihood of meeting the integrity preconditions under World Heritage criterion viii

The examples show that key elements of the functional integrity of the Marshes as a hydrological and geomorphologic system are currently missing. In addition, recent studies agree that the natural flow regime of the principal rivers feeding the Marshes – as the main driver of geomorphologic processes – will not return to its historical pattern (CIMI 2010b, New Eden Group 2006, Partow 2001, Richardson & Hussain 2006, Sanlaville 2002). It may well be possible to manage the Marsh ecosystem in a way that safeguards part of its aesthetic, ecological and economic values, but natural geomorphologic processes will most likely not return. This means it is unlikely that the Marshes – as a functional inland delta – have sufficient structural integrity to fulfill the integrity requirement of criterion viii. Since a very large part of the Marshes was drained and destroyed since the 1990s, and is in the process of being restored by human efforts at best – rather than being driven by active natural processes - it would also be problematic to prove integrity regarding the functional aspect of criterion viii.

4.4.3 Summary: Applicability of World Heritage criterion viii to the Marshes

The preliminary conclusion is that the Marshes, as a large inland delta system in an arid area, in their mid 20th Century state, might generally have qualified under criterion viii, but that the integrity of hydrologically driven geomorphologic processes and of the resulting marsh landscape has been compromised too deeply to support nomination under criterion viii at this stage. Although this reasoning may be considered further with geomorphologists and hydrologists, this study concludes that the Marshes do not present a strong basis for OUV under the relevant elements of World Heritage criterion viii, and thus should not be considered for nomination under this criterion.

4.4.4 Knowledge gaps and research needs

The preparation team for the World Heritage nomination should consult a geomorphologist to check the reasoning presented in this Section. If the argument presented above is confirmed as a result, there is no need for further action and the Marshes should not be nominated under criterion viii. If it is decided to nominate under criterion viii, further research is needed to prove the functioning of the basic natural processes, the naturalness of the resulting structures (Marsh landscape) and its integrity in spite of the disturbed hydrological regime and reduced water availability.

Box 4.6. World Heritage criterion viii according to the WHC Operational Guidelines (UNESCO 2008)

Nominated properties shall …be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals.

4.5 Application of World Heritage criterion ix

While the previous criterion concentrates on geological and geomorphologic processes and the resulting structures, criterion ix focuses specifically on biological and ecological processes. It has rarely been applied on its own, but much more frequently in combination with other natural criteria, particularly criterion x (Badman et al. 2008b). This is not surprising as the evolution and development of communities and ecosystems – the processes on which criterion ix focuses – are both driven by biodiversity, and affect biodiversity.

This also applies to the Marshes. The processes described below are closely intertwined with the biodiversity values of the Marshes. Therefore, ecological and biological processes on the one hand and biodiversity values on the other hand should be considered in conjunction during the World Heritage nomination and management planning process.

At the same time, values that may qualify for nomination under criterion ix are often based on geomorphological and other physical processes that correspond to criterion viii. However, this does not mean that the failure of a site to meet criterion viii - as shown to be likely for the Marshes in the previous section – automatically means that this site will also not be suitable for nomination under criterion ix. Targeted hydrological or other conservation management can safeguard the ecological integrity of a site even if some of the underlying physical processes are compromised.

Box 4.7. Biological and ecological processes in the Marshes that contribute to their ecological value

- The long-term **succession** as well as the seasonal periodicity of the community (flora and fauna) of the Marshes in response to its physical drivers (Evans 2002), including the natural cycle of inundation and desiccation of seasonal marshes (with its associated changes in vegetation cover) and the seasonal growth cycles of key species, such as *P. australis*.
- The seasonal **migration** of birds, but also diadromous fish and crustaceans to the Marshes.
- Medium term **evolution** processes that have led to, or are in the process of leading to, the evolution of unique species and subspecies that are adapted to this habitat (e.g. Coad 2010, Stattersfield et al. 1998, Scott & Evans 1994).

In order to guide the application of criterion ix, IUCN as the relevant advisory body to the World Heritage Committee has published a “Global study of wetland and marine protected areas on the World Heritage list” (Thorsell et al. 1997). This study distinguished between wetland World Heritage properties with major wetland values (those crucial to the nomination) and those with secondary wetland values. 39 World Heritage sites with major wetland values were identified, as of 1997. The Marshes were not included in a tentative list of potential additional wetland sites included in the 1997 report, primarily because they were considered essentially cultural landscapes then, and because it was noted that they were lacking protection and integrity (Thorsell, pers. comm.). This underlines the

need to clarify the natural values of the Marshes, to rigorously assess their integrity, and to develop a management concept in the course of the current nomination planning process.

In this report, applicability of criterion ix will be discussed based on explicitly identified biological and ecological processes. Box 4.7. lists key biological and ecological processes that contribute to Marsh function and may also contribute to possible OUV. These processes and their significance are discussed in more detail below.

4.5.1 Ecological succession in the Marshes

Having existed for about 6,000 years, the Marshes are a relatively young ecosystem. Both their long-term succession since the last glaciations and the recurrent seasonal succession of the Marsh ecosystem are essentially driven by non-biological (hydrological and geomorphologic) processes (Naff & Hanna 2002, Sanlaville 2002). Unlike, for example, forest ecosystems or coral reefs which undergo a long-term autogenic succession under constant external conditions (Sorokin 1995, West et al. 1980), the marsh ecosystem appears to reach equilibrium rather rapidly once the necessary conditions are met, and then may persist as long as external conditions remain favorable (cf. Evans 2002). The latest evidence of this highly dynamic adaptation to outside factors has been the reportedly very rapid re-establishment of key marsh vegetation types following the reflooding of the Marshes in 2003/2004 (e.g. Hamdan et al. 2010, Richardson et al. 2005). This was also supported by the exceptional productivity of the reed vegetation of the Marshes, which is among the most productive of all freshwater communities (Hamdan et al. 2010).

In order to decide if the ecological succession that characterizes the dynamics of the Marsh ecosystem could be considered as a process of potential OUV under criterion ix, its extent, rapidity and the resulting ecosystem resilience compares to that of other freshwater ecosystems worldwide. The current integrity of the process would also need to be examined. This is particularly important as the integrity of ecological succession in the ecosystem also underpins the integrity of the system as a whole.

4.5.1.1 Integrity of ecological succession in the Marsh ecosystem

Box 4.8**. The integrity requirement for World Heritage criterion ix according to the WHC Operational Guidelines (UNESCO 2008)**

Properties proposed under criterion (ix) should have sufficient size and contain the necessary elements to demonstrate the key aspects of processes that are essential for the long term conservation of the ecosystems and the biological diversity they contain. For example, an area of tropical rain forest would meet the conditions of integrity if it includes a certain amount of variation in elevation above sea level, changes in topography and soil types, patch systems and naturally regenerating patches; similarly a coral reef should include, for example, sea grass, mangrove or other adjacent ecosystems that regulate nutrient and sediment inputs into the reef.

The integrity requirement makes it clear that the processes that make the Marsh ecosystem function must be reasonably intact in order for the site to be considered a World Heritage property under criterion ix. Sufficient areas of the key elements of the habitat mosaic (as already discussed under criterion vii) would also need to be included.

As explained above, ecological succession in the Marshes is largely allogenic and depends on the hydrological regime discussed in the previous section (Maulood et a. 1981, Maulood & Hinton 1979,

Stevens 2007). Sufficient discharge and the annual seasonal dynamics of the Marshes with spring (and secondary winter) discharge maxima of the Euphrates and Tigris rivers are important to flush the Marshes, import sediments that fertilize peripheral marsh areas for subsequent recolonization by herbaceous plants, and stabilize the salinity and nutrient regimes there (Naff and Hanna 2002, Saad & Antoine 1978). The composition and biomass of vegetation as a key part of the architecture of the ecosystem was shown to be largely driven by water level and salinity before the Marshes' draining (Al-Hilli et al. 2009, Al-Abbawy and Alwan al-Mayah 2009).

However, discharge and flood pulses are now greatly reduced (New Eden Group 2006). As a result of the reflooding of soils with high salt concentration and insufficient flushing, toxic concentrations of salts, selenium and sulfides were measured in some marshes after re-flooding (Fitzpatrick 2004, Richardson et al. 2005). Increased nutrient levels in re-flooded in comparison to natural levels, and increased biological oxygen demand have also been reported (Al-Shawi 2006, Tahir et al. 2008). A study of vegetation recovery in the Central Marshes found increased salinity, lack of flushing, eutrophication, and increased accumulations of particulate organic matter in marsh sediments (Hamdan et al. 2010). Accumulation of pesticides (including DDT, endrine and dieldrine) has also been observed (New Eden Group 2006).

As a result, Hamdan et al. (2009) reported reduced overall plant diversity and biomass, shifts in species composition (including disappearance of native species and occurrence of invasive species), and a relatively low overall recovery rate. Similar observations were made in Hammar Marsh (Hussain & Alwan 2008), while Al-Abbawy and Alwan al-Mayah (2009) found reduced viability of reed there. Hashim et al (2006) reported an apparently increased frequency of algal blooms. However, part of these observations could be explained by the early stage of secondary succession in the re-flooded Marshes, and might not reflect an equilibrium stage. More research and particularly long-term monitoring is needed to find out if this is the case (cf. Kellogg & Bridgham 2002).

Peripheral parts of the Marshes currently are not seasonally inundated because of the lack of the flood pulse. As a consequence, the succession cycle of fertile sediment deposition during inundation, subsequent desiccation and growth of herbaceous vegetation in the seasonal Marshes is disrupted (Hamdan et al. 2010). This impoverishes the habitat mosaic of the Marshes, and reduces overall succession integrity.

4.5.1.2 Summary: Succession in the Marshes in relation to World Heritage criterion ix

Based on the above information, it is concluded that, although the Marsh community is extremely well-adapted to undergo secondary succession after disturbance (like the draining), process integrity is currently compromised, in spite of the partial and partially reversed reflooding of the Marshes after 2003. However, the re-flooding is very recent and the situation has clearly improved dramatically since 2003, and effective and sustained management may achieve a sustained recovery of the integrity of succession processes in at least part of the Marshes. Therefore, the Marshes might develop and sufficient integrity of the ecological succession to warrant nomination under criterion ix might be achieved, if (but only if) they are managed effectively and on a sustained basis over a sufficiently long period.

The management plan and nomination file would therefore need to demonstrate that this is the case, and the management plan for a future Marsh World Heritage property would need to include a hydrological management plan (possibly building on existing initiatives such as New Eden Group 2006) that aims at safeguarding ecological integrity. This also entails that the size of a possible future World Heritage site may need to be adapted to the amount of water available.

4.5.1.3 Knowledge gaps and research needs regarding succession in the Marshes

Key research needs that need to be fulfilled in order to address the issue of integrity of ecological succession in the Marshes and inform management planning are summarized in Box 4.9.

Box 4.9. Key research needs regarding succession in the Marshes

- **Minimum discharge and hydroperiod to maintain Marsh succession and seasonality:** The minimum water discharge and hydroperiod to maintain succession and seasonality in each of the main Marshes needs to be determined, in order to inform hydrological management and match the extent of actively managed marsh areas to the amount of water available.
- **Secondary succession of the Marsh ecosystem and multiple stable states:** trajectories and drivers of secondary succession in the Marshes and the potential for multiple stable states (e.g. transition from macrophyte to phytoplankton domination of aquatic primary production – see Sheffer 2004) need to be studied in order to inform future ecosystem management.

4.5.2 Seasonal migrations of birds and other fauna

Section 4.6.4 describes the importance of the Marshes as a wintering and resting area for migratory waterbirds and other migratory birds. Historical data on bird migration in the Marshes suggest that they were one of the largest wintering areas for migratory waterbirds in the Middle East, one of the largest wintering areas for ducks of the West Eurasia-Caspian-Nile Flyway, and a crucial resting area for shorebirds of the West Asian – East African Flyway. Thereby, they contribute significantly to intercontinental flyways of global importance and to breeding populations of migratory waterbirds across western Asia. In addition, the Marshes were described as very important wintering areas for several raptor and passerine species.

Based on this observation, the available data on the role of the Marshes in the large scale migration of birds and other fauna need to be compared to other World Heritage properties and migration sites, in order to assess whether the scale and importance of bird migration there is a sufficient level to impart OUV corresponding to criterion ix to the site.

The role of the Marshes as a bird migration hotspot could also be discussed in relation to World Heritage criterion x, and a conservation and management regime for this aspect of the Marshes' biodiversity in line with the World Heritage inscription criteria could also be developed if that criterion is chosen in any future nomination.

4.5.2.1 Integrity of the Marshes as a wintering/resting site for birds and feeding/nursing site for other fauna

The functional integrity of the Marshes as a wintering and resting area for migratory birds is currently recovering and undergoing rapid changes, making definitive statements about their "normal" integrity difficult. After a dramatic decline in marsh area and presumably wintering/resting bird numbers following the systematic draining of the Marshes in the 1990s (Partow 2001), there has been extensive reflooding and at least partial recovery of the role as a bird wintering and resting site since 2003 (e.g. Abed 2008a, b, Richardson et al. 2005, Salim et al. 2009a, b).

The above highlights the need for comprehensive and up-to date information on migratory waterbirds and other migratory fauna in the Marshes. The very high and well-documented historical data on bird migration in the 1960s and 1970s can be used as a proxy for *potential* value as a wintering and resting site only. Although there have been numerous surveys and publications on migratory birds since the reflooding of the Marshes in 2003 (e.g. Abed 2007, 2008a, b, Salim et al. 2009a, b), and although many of these data have been uploaded to the World Bird Database (BirdLife International 2010), no estimate reliable of the total migratory bird abundance in all Marshes combined has been published. Richardson (2009) commented that present individual numbers are much lower than in the past even if species numbers have shown a remarkable recovery. The most recent data, which indicate a partial recovery of the Marshes, need to be analyzed with the aim of estimating total wintering/resting bird

numbers, and augmented with further surveys. It would also need to be assessed to what extent the migratory waterbird populations that migrate through this region are adequately protected throughout their flyway. The recently developed assessment tools of the Wings over Wetlands project for flyway scale migratory waterbird conservation could be used for this purpose (Dodman & Boere 2010). These research needs are discussed in more detail in Section 4.6.4.

4.5.2.2 Summary: The Marshes as a migratory waterbird wintering and resting place in relation to World Heritage criterion ix

The Marshes have significant value as a wintering and resting area for migratory waterbirds (and a feeding/nursing area for other migratory taxa). They have clearly increased their importance in this respect since 2003, and may develop further in this direction if managed properly. Whether this qualifies them for nomination under criterion ix - either now or in the foreseeable future - needs to be ascertained through global comparative analysis and further exploration of the feasibility of sustainable management of the site as a waterbird wintering and resting area.

4.5.3 Ongoing and past evolutionary processes leading towards speciation

Section 4.6 discusses in more detail the biodiversity of the Marshes. It shows that the Marshes are home to several species of endemic or near-endemic fish, reptiles, birds and mammals (Table 4.1.). This is also reflected in the fact that the Marshes have been classified as an endemic bird area by BirdLife International.

Table 4.1. Endemic and near-endemic vertebrate species and subspecies of the Marshes.

Faunal group	Endemic/near-endemic species	Endemic/near-endemic subspecies
Fish	14[1]	-
Reptiles	1[1]	-
Birds	2	5
Mammals	3	1

[1] *Endemic to Tigris-Euphrates basin, with the Marshes as a distribution stronghold within the basin.*

Given the young age of the Marshes, the notable incidence of endemic species and subspecies testifies to intense evolutionary processes in this extensive and peculiar ecosystem. Whether these processes are sufficiently expressed in the Marshes to allow a nomination under criterion ix, needs to be shown in global comparative analysis.

The species numbers listed in Table 4.1. are also discussed in the section of this report that deals with criterion x (biodiversity), and the most of the values associated with these species could be captured by a nomination under that criterion. Criterion ix would be most relevant if it can be shown that the Marshes are an outstanding example of evolution/speciation in progress, rather than holding a concentration of endemics that have evolved though past evolution processes.

4.5.3.1 Integrity of the Marshes as a hotspot of evolution, speciation and endemism

The integrity of the Marshes as a centre of endemism is impacted by the fact that several of the species and subspecies that are restricted to the Marshes and their vicinity are currently endangered or critically endangered. The conservation status of several of the other species is unclear. Additional populations that might be at an earlier stage of speciation are also under threat. In order to make a sound case for these values of the Marshes, the preparation team will have to confirm the presence and status of several species of interest, and include specific measures aimed at their conservation in the management plan of a possible future World Heritage site in the Marshes. The specific research necessary in this context is discussed in Section 4.6, which deals with the biodiversity of the Marshes.

4.5.3.2 Summary: The Marshes as a vertebrate evolutionary hotspot in relation to World Heritage criterion ix

If the presence and positive conservation status of the majority of the key species can be confirmed, and if it can be shown that recent speciation rates there are indeed exceptionally high, then the Marshes could have sufficient integrity in this respect to warrant further consideration of a nomination as a recent/current vertebrate evolution hotspot, under criterion ix. The baseline information for this decision should be provided by the analysis of the Marshes in relation to criterion x (biodiversity), as discussed in Section 4.6.

4.5.4 Overall applicability of World Heritage criterion ix to the Marshes

The Marshes still are one of the largest wetland complexes in the Middle East, and a unique island of aquatic and semi-aquatic vegetation and biota in an otherwise extremely arid (<100 mm annual precipitation) desert environment (Al-Hilli et al. 2009). This study shows that the Marshes support at least three processes of significance in relation to the application of criterion ix (ecosystem succession, bird migration and vertebrate evolution), each to be confirmed by global comparative analysis.

Although the integrity of each of these processes is currently compromised, and possibly marginal in relation to the integrity requirement of World Heritage criterion ix, the development of the Marsh ecosystem since 2003 shows that process integrity could at least partly be restored, if the Marsh World Heritage site would be demarcated and managed in an appropriate way (see Section 6 on management). Although the natural hydrological regime which has underpinned ecosystem dynamics in the Marshes in the past cannot be fully restored (see discussion on criterion viii), targeted hydrological management may substitute part of it in the future (CIMI 2010b, New Eden Group 2006). Paragraph 90 of the WHC Operational Guidelines acknowledges that total integrity would be an unrealistic threshold for most World Heritage sites (UNESCO 2008).

Therefore, there are a number of critical questions to be answered before it can be decided if the Marshes would warrant a nomination under World Heritage criterion ix, while most of the values that could be expressed in terms of processes relevant to criterion ix could also be expressed in terms of the biodiversity that drives them, and hence under criterion x.

Apart from inclusion in the global comparative analysis and possible future nomination, the available knowledge about processes that shape the marsh ecosystem need to be fed into the management planning process for the Marshes. They will be particularly important for the development of a demarcation plan, viability preconditions (e.g. minimum discharges), and management interventions aimed at enhancing the natural functionality of the Marsh ecosystem as a whole. This will be key to overall project success because a functioning ecosystem is needed to underpin the sustainable management of the biodiversity values (see criterion x). It is also considered of high importance in supporting the cultural values of the area and aesthetic values (see discussion under criterion vii) of the Marshes.

4.6 Application of World Heritage criterion x

Box 4.10. Criterion x of OUV according to the WHC Operational Guidelines (UNESCO 2008)

Nominated properties shall … contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of outstanding universal value from the point of view of science or conservation.

Criterion x is the World Heritage criterion that is most directly important from the point of view of biodiversity, and therefore of particular relevance to this study. It is beyond doubt that the Marshes have exceptional biodiversity value: They are among WWF's Global 200 (Olson and Dinerstein 2002) and have been characterized as an Endemic Bird Area (BirdLife International 2010, Stattersfield et al. 1998). They contain a Ramsar site (Ramsar Convention Secretariat 2007d) as well as several Important Bird Areas (IBAs; BirdLife International 2010). They may also contain Important Plant Areas (Plantlife 2010).

However, designations under any of the above schemes alone are not sufficient proof of OUV under criterion x. OUV needs to be established based on global comparative analysis to similar sites. As a basis for this analysis, the below sections summarize available information on the Marshes. This information emphasizes key components of Marsh biodiversity, which could be of most relevance to the possibly application of criterion x.

4.6.1 Flora and vegetation

Box 4.11. Contribution of flora and vegetation to the biodiversity values of the Marshes

- **Structural and functional basis of the marsh ecosystem:** Aquatic and semi-aquatic plants are the structural and functional basis of the marsh community. They are the primary producers on which the marsh food web is based. They also offer habitat for resident and migratory birds, as well as other vertebrates and invertebrates. The ecological character of the Marshes builds on their flora and vegetation.
- **Key resource for Marsh dwellers' culture:** The plants of the Marshes are a basis of the well-being, economy and culture of the Marsh inhabitants. Historically, Marsh inhabitants were dependent on reeds to construct their dwellings, their sleeping utensils and their simple furniture. Most notable among these reed structures are the Mudhifs - the traditional guest houses of the Madan. Water buffalos and other domestic animals in the Marshes also use reeds for food (see Box 4.17.). Therefore, the vegetation of the Marshes is directly relevant to the cultural values of the Marshes (thus also supporting potential consideration of a nomination in relation to cultural World Heritage criteria).
- **Potential occurrence of globally threatened and endemic plant species:** Although the threat status of Marsh flora and the occurrence of endemic species are still poorly understood, there is potentially a significant reservoir of globally threatened and endemic species in the Marshes.

4.6.1.1 Flora of Iraq

Several comprehensive studies have been published on the flora of Iraq (Blakelock 1957, Rechinger 1964, Guest 1966, Guest & Al-Rawi 1966, Townsend & Guest 1966, 1974, 1980a, b, 1985, Townsend et al. 1968). It is estimated that a total of 3,300 vascular plant species occur in Iraq, and that 10% of them are endemic.

4.6.1.2 Flora and vegetation of the Marshes

Thesiger (1954) gave a general description of the vegetation cover in the Marshes. The emergent vegetation in most of the wetlands is dominated by Reed *Phragmites australis* and Reedmace *Typha angustifolia*, with interspersed patches of Bulrush *Schoenoplectus lacustris* and Giant Cane-grass *Arundo donax*. Reed was the dominant plant in permanently flooded areas, whereas Reedmace was more common in seasonally flooded areas, with low sedges and rushes (*Carex* spp., *Juncus* spp., *Scirpus brachyceras*) forming the ephemeral and salt-tolerant vegetation of temporarily flooded areas. The damp and slightly banks of marshland deltas were lined with tamarisk *Tamarix* spp. and willow *Salix* spp., with stretches of grasses, sedges and rushes (e.g. *Juncus arabicus*, *Carex divisa*, *Paspulum distichum*, *Scirpus littoralis*) in between. The nutrients supplied by inflowing river water enabled the growth of exceptionally tall (up to 8 m) and coarse reeds (Thesiger 1954).

Clear waters of deeper areas with permanent lakes supported diverse submerged aquatic vegetation including Hornwort *Ceratophyllum demersum*, Eel Grass *Vallisneria spiralis*, a number of pondweed species (*Potamogeton lucens, P. natans, P. nodosus* and *P. pectinatus*), Water Milfoil *Myriophyllum* spp., the stonewort *Chara* spp., *Ranunculus aquaticus*, Water Chestnut *Trapa natans*, *Polygonum senegalensis*, naiads *Najas marina* and *N. armata*, and water fern *Salvinia* spp.. Smaller lakes and still waters hosted several species of water-lilies (*Nymphoides peltata, N. indica, Nymphaea caerulea* and *Nuphar* spp.), Water Soldier *Pistia stratiotes*, and the duckweed *Lemna gibba* (Evans 2002).

Table 4.2. Plant species encountered in the southern Ahwar between 1972 and 1975. (Source: Al-Hilli 2009)

Category	Sub-category	Habitat				Total number[2]
		Wet[1]	Saline	Desert	Ruderal	
Trees (>120 cm)		5	0	0	0	5
Shrubs (>120 cm)		3	7	1	0	9
Low shrubs (30–120 cm)	Woody	1	1	16	2	16
	Succulents	0	7	2	0	9
Perennials	Perennial grass	7	2	2	7	13
	Herbaceous	53	4	25	18	89
	Parasites	0	0	1	0	1
Annuals	Grasses	6	9	15	25	35
	Herbs	22	11	108	70	184
	Succulents	0	4	5	3	8
	Parasites	2	0	0	0	2
Total		**99**	**45**	**175**	**125**	**371**

[1] Including aquatic, marsh, and riparian habitats; [2] Not the sum of the species from all habitats because some species occur in multiple habitats.

The only study that discussed the flora of the Marshes in details was conducted by Al-Hilli (1977). Afterwards, the flora and vegetation of the Marshes remained unstudied for over 30 years, until Alwan (2006), Richardson & Hussain (2006), Hussain & Alwan (2008), Al Hilli et al. (2009) and Hamdan et al. (2010) conducted comprehensive studies. Akbar (1985) published a book on Marsh plants. Aquatic plants were also studied by Al-Rikabi (1992) and Al-Mayah (1978, 1994).

Al-Hilli (1977) studied the vegetation of the Ahwar region in southern Iraq during 1972 and 1975. Their study area was situated between 30˚ 35' N and 32˚ 45' N and 46˚ 13' E and 48˚ E. Four main sampling stations were studied including Sahain and Surayfa areas, which are located in the southeastern Marshes between Maysan and Basrah Governorates. Two other areas were on the eastern edge of the Central Marshes, at Suq Alsh Shuyukh and Dawwaya. The vegetation zonation in the area was greatly influenced by water regime, salinity of substrate and physical and chemical properties of the water. Al-Hilli reported 371 vascular plant species in terrestrial, wetland, and aquatic habitats during this study (Table 4.2.). Almost half of the flora reported consisted of desert species, while 26% were aquatic, marsh, and riparian habitats species. Another 45 species were typical of saline habitats. More than 50 species represented the Saharo-Arabian flora, while about 40 and 20 species represented the Irano-Turanian and Mediterranean element, respectively.

The occurrence of macrophytes in East Hammar Marsh was surveyed during 2006 (Hussain & Alwan 2008). They recorded 19 species representing 11 families. Only one of them, *Hydrilla verticillata*, was considered exotic. The most frequent species was Ceratophyllum demersum (82.5%).

Cover of aquatic plants presence in East Hammar marsh was studied by (Hussain & Alwan 2008). They found that emergent plant cover was dominated by *Schoenoplectus litoralis* (49.46%), *Typha domingensis* (36%) and *Phragmites australis* (22.5%) (Appendix 4.1.), while *Ceratophyllum demersum, Najas marina* and *Potamogeton pectinatus* constituted the highest cover for submerged plants.

Figures 4.3. illustrates the dominance of emerged plant biomass in the Marshes by *Phragmites australis* (Hussain & Alwan 2008). Its biomass in East Hammar marsh was 1238 g dry weight/ m^2 during summer. This value is less than values reported by Al-Hilli (1977). *Typha domingesis* attained an even more moderate biomass of 111 g dry weight/ m^2 in summer. Submerged biomass was dominated by *Ceratophyllum demersum,* at 236 g/m^2 (Figure 4.4.). This plant is considered a stabilizer of marsh sediments. *Schoenoplectus litoralis* had a biomass reaching 91 g/m^2 during summer.

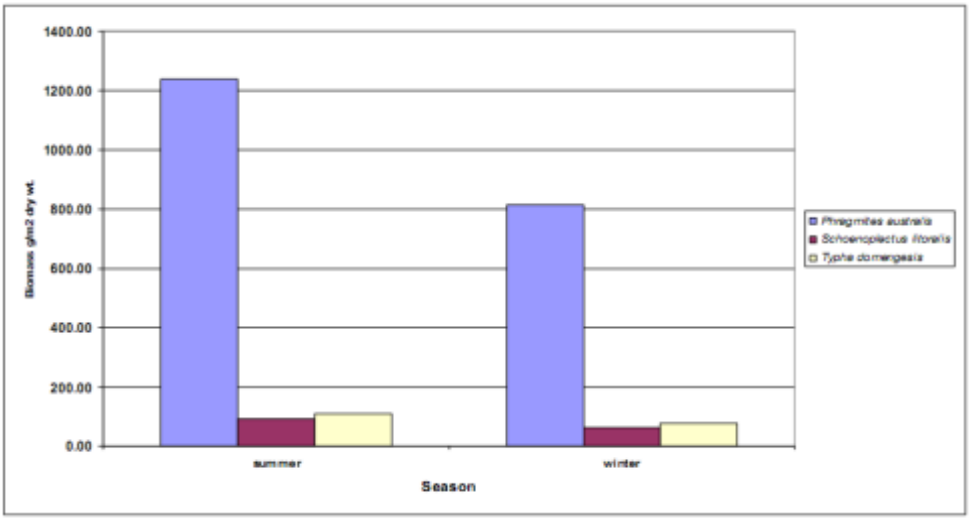

Figure 4.3. Biomass of emerged plants at East Hammar during summer and winter 2006. (Source: Hussain & Alwan 2008).

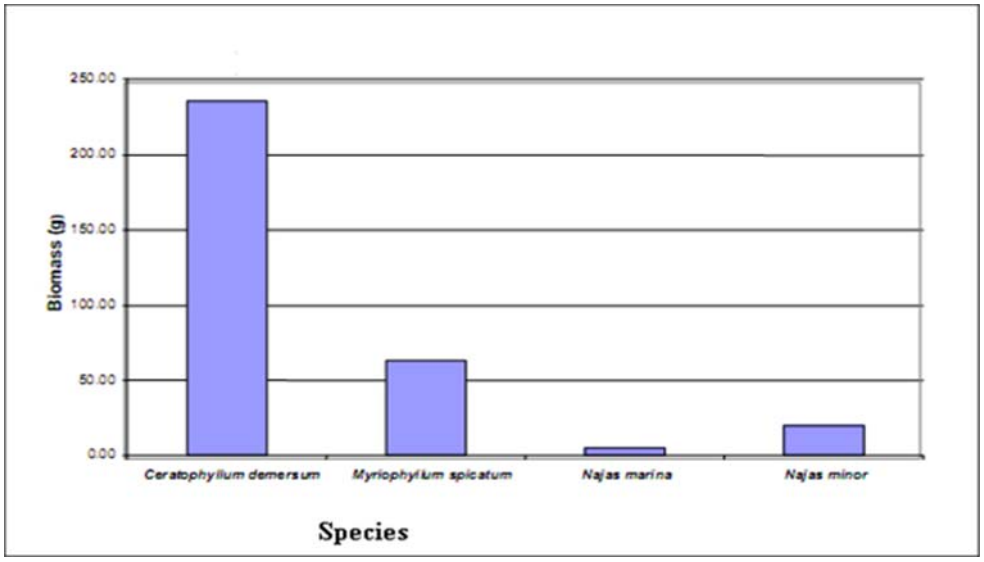

Figure 4.4. Biomass of submerged plants at East Hammar during 2006. (Source: Hussain & Alwan 2008).

4.6.1.3 Globally threatened and endemic plant species of the Marshes

The global IUCN Red List of Threatened Species merely lists five species for the entire Iraq, all as Least Concern or Lower Risk/Least Concern. Among them is *Cyperus rotundus*, which was found in the Marshes before draining but not reported afterwards (Al-Hilli 1977). However, this doesn't mean there are no plant species of conservation concern in Iraq or in the Marshes – it merely reflects the fact that plants are not covered nearly as comprehensively as animals in the global Red List (IUCN 2010).

Although the flora of Iraq is known to be species-rich, *Aeluropus lagopoides* is the only example of an endemic species found along the margins of the Marshes that came to our attention (Townsend & Guest 1968). Again, this probably reflects lack of relevant studies rather than a total lack of endemic species. This is a knowledge gap that should be filled as soon as possible during the management planning process for the Marshes, preferably in collaboration with ongoing initiatives in the region (see Section 6).

4.6.1.4 Plant Communities

Al-Hilli (1977) identified three major groups of plants in the Marshes: xerophytes, halophytes and hydrophytes. Each group of these plants is associated with defined topographic, edaphic and climatic conditions.

Xerophytic plant communities inhabit the elevated semi-desert plateau around the actual Marshes, mostly on non-saline to slightly saline soil. Xerophytes are subdivided into eight main communities named after the characteristic species *Bienertia cycloptera, Malcomia grandiflora, Salsola jordanicola, Salsola incanescens, Zygophyllum propinquum, Anabasis setifera, Hammada elegans* and *Rhanterium epapposum*, respectively.

Halophytic plant communities are confined to depressions and low lands of shallow water table around areas subjected to flooding. Six plant communities were identified, all occupying high saline (high in chloride and sodium ions) substrata. These communities are dominated by *Polygonum salicifolium, Jussiaea repens, Ranunculus aquatilis, Typha domingensis, Phragmites australis* and *Bacopa monnieri*, respectively. In well drained riparian habitats, four additional communities were

identified, which were dominated by *Alhagi mannifera, Prosopis farcta, Populus euphratica* and *Cynodon dactylon* (Al-Hilli 1977).

Hydrophyte communities were subdivided into three main categories by Al-Hilli (1977): permanently submerged, partly submerged and floating leave communities. Three communities of the permanently

Box 4.12. Wetland vegetation classification system accorder to Al-Hilli et al. (2009)

Vegetation form	Community (dominant species)	Secondary species
Submerged aquatic	*Ceratophyllum demersum*	*Najas armata*
	Najas armata	-
	Vallisneria spiralis	-
	Myriophyllum verticillatum	*Ceratophyllum demersum*
	Potamogeton crispus	*Nymphoides indica*
	Potamogeton nodosus	*Nymphoides indica*
Floating-leaved aquatic	*Nymphoides peltata*	-
	Nymphoides indica	*Potamogeton crispus*
Herbaceous tall emergent	*Scirpus litoralis*	*Ranunculus aquatilis*
	Typha domingensis	*P. australis, C. demersum*
	Phragmites australis	*Polygonum salicifolium*
Herbaceous low emergent	*Polygonum salicifolium*	*C. demersum, N. indica, T. domingensis*
	Jussiaea repens	*Polygonum salicifolium*
	Ranunculus aquatilis	*Potamogeton nodosus*
	Bacopa monnieri	*Cyperus rotundus*
	Cynodon dactylon	-
	Juncus rigidus	*Aeluropus lagopoides*
	Cressa cretica *Aeluropus lagopoides*	*A. lagopoides, A. mannifera* *Cressa cretica*
Woody low emergent	*Alhagi mannifera*	*Cressa cretica*
	Prosopis farcta	-
	Suaeda vermiculata	-
	Tamarix gallica	*Cressa cretica*
Tree	*Populus euphratica*	-

submerged plants were identified, i.e. those dominated by *Vallisneria spiralis, Najas armada* and *Ceratophyllum demersum*. Partly submerged plant communities included those characterized by *Potamogeton crisps, Potamogeton nodosus* and *Myriophyllum verticillatum*. Floating leave communities were either dominated by *Nymphoides peltata* or *Nymphoides indica* (Al-Hilli 1977).

Al-Hilli et al. (2009) presented a simplified classification system for the Marshes' vegetation: Vegetation can be classified into six categories based on the growth of the dominant species and their location in relation to the average seasonal depth of water (Box 4.12.). Herbaceous tall emergent plants constituted the main vegetation type in the majority of the Marshes, and were composed of three main communities: **(1)** *Scirpus litoralis* community (with *Ranunculus aquatilis, Nymphoides indica*, and *Cressa cretica*), **(2)** *Typha domingensis* community, with *Phragmites australis*, *Ceratophyllum demersum* and *Jussiaea repens*, and **(3)** *Phragmites australis* community, which was largely monospecific. Associated species like *Polygonum salicifolium* and *Cladium mariscus* occurred largely in transition zones to adjacent plant communities. *P. australis* reached 4–6 m height during summer (Al Hilli et al. 2009).

Abdulhasan et al. (2009) conducted ecological surveys for the purpose of the creation of the proposed Central Marshes National Park in June 2008. Six major habitat classes (inland running water, river or canal; inland standing water; marsh vegetation; desert; woodlands; and herbaceous vegetation) were proposed in the classification system, with each class further subdivided into subclasses. The dominant habitat subcategories in the Central Marshes were identified as follows: (1) rooted submerged vegetation, (2) helophytic vegetation, (3) free-floating vegetation, (4) terrestrial vegetation-shrub, (5) non-vegetated river or canal, (6) non-vegetated desert, and (7) flooded communities (Appendix 4.2.).

4.6.1.5 Historical perspective: Marsh flora and vegetation before and after the re-flooding

Richardson & Hussain (2006) studied the post-reflooding recovery of flora and vegetation in the Marshes. They reported six species of dominant macrophyte in Hawizeh Marsh, constituting the lowest number species among the studied sites. Al-Hawizeh Marsh was dominated by *Phragmites australis* and *Ceratophyllum demersum*. 10 plant species were recorded from Hammar Marsh, reflecting the higher salinity there (Box 4.13.). Altogether, the restored marshes had 15 dominant plant species, close to historic numbers. However, a number of non-dominant species found by Al-Hilli

Box 4.13. List of the five most common plant species in three different marshes.

Hawizeh	**Suq Al-Shuyukh**	**Hammar**
(Natural marsh)	(Reflooded marsh)	(Reflooded marsh)
Phragmites australis	*Phragmites australis*	*Ceratophyllum demersum*
Ceratophyllum demersum	*Ceratophyllum demersum*	*Myriophyllum verticillatum*
Salvinia natans	*Typha domingensis*	*Phragmites australis*
Lemna minor	*Panicum repens*	*Schoenoplectus littoralis*
Typha domingensis	*Schoenoplectus littoralis*	*Potamogeton pectinatus*

Source: Richardson & Hussain (2006)

(1977) in his extensive survey of the marshes were not found again in these surveys.

Alwan (2006) revised inventories and distribution for recorded plants based from previous studies (Al-Mayah 1978, 1994, Al-Saadi & Al-Mayah 1983), and on preserved herbarium materials deposited in the Basrah University Herbarium, Baghdad University Herbarium and the National Herbarium of Iraq. He recorded a total of 104 aquatic and semi aquatic that have been historically recorded in Iraq before drying (1975-1990). He then compared records from five main regions - Hammar, Central Marsh, Al-Hawizeh, and Shatt Al-Arab – as well as some additional sites. He listed 44, 40 and 37 plant species from the Central, Hammar, and Al-Hawizeh, respectively (Appendix 4.3.).

After restoration (2001-2005), the total number of plant species was 9, 14 and 22 for Al-Hawizeh, Hammar, and the Central Marshes, respectively (Table 6). Species recovered from these marshes are listed in Appendix 4.4.

Table 4.5. Number of aquatic plant species recorded in the five marshes before drying (1975-1990), and after reflooding (2004-2005). (Source: Alwan 2006)

Period	Location and number of species				
	Abozereq	Kirmatia	Hammar	Hawizeh	Central
Before drying 1975-1990	32	23	40	37	44
After restoration 2001-2005	15	13	14	9	22
Restoration percentage %	46.5	56.5	35	24.3	50

Another comprehensive study addressed the vegetation response to re-flooding (Hamdan et al. 2010). The study area was that of Al Hilli (1977) including Sahain and Suryfa. They reported that 26 of the pre-existing species reappeared in the re-flooded marshes, but 21 species did not appear as of 2007 (Appendix 4.5.). Both herbaceous tall emergent species (*Phragmites australis, Typha domingensis*, and *Schoenoplectus litoralis*) and submerged aquatic and herbaceous low emergent species, (*Ceratophyllum demersum, Najas marina, Vallisneria spiralis, Potamogeton crispus, Potamogeton nodosus, Jussiaea repens, Bacopamon nieria* and *Ranunculus sphaerospermus*) that previously dominated vegetation in the Central Marshes were found again after reflooding. In addition, *Lemna minor, Salvinia natans* and *Potamogeton lucens* increased their abundance and became dominant in new communities (Hamdan et al. 2010).

At the same time, dominant plant communities reported previously (Al-Hilli 1977), such as those dominated by *Myriophyllum verticillatum, Nympha idespeltata, Nymphoides indica* and *Polygonum salicifolium*, were not found in the study area after reflooding. Herbaceous low emergent species that were reported earlier in the Marshes also did not reappear in the reflooded areas (e.g. *Butomus umbellatus, Ottelia alismoides*, and *Sagittaria sagittifolia*, ferns such as *Ceratopteris thalictroides* and *Marsilea capensis*, and the insectivorous *Utricularia* spp. (Hamdan et al. 2010).

In addition, new species that were not previously recorded in the Mashes appeared after re-flooding (particularly in the Sahain and Suryfa areas), including *Hydrilla verticillata, Spirodela polyrhiza, Ruppia maritima*, and *Cyperus laevigatus*, as well as some macrophytic algae such as *Chara* spp. and *Nitella* spp. (Hamdan et al. 2010).

Although native to Iraq, *Tamarix brachystichas* and *T. ramosissima*, which are salt-tolerant species, invaded the drained areas of the Marshes during the desiccation period. They were reportedly considered a nuisance and are still common in many reflooded parts (Alwan 2006).

4.6.1.6 Pressures and threats to Marsh flora and vegetation and their consequences for the area's integrity

Draining: Like for the overall ecosystem, the total destruction or degradation of marsh habitat as a consequence of the draining of marshes has been the main pressure on the Marshes in the past and continues to threaten them in the future. This is discussed into more detail in Section 5.

Conversion to agricultural use: Land clearing by burning reed for the purpose of agricultural use is regularly practiced in the Marshes (Al-Hilli 1977). Such practices cause replacement of the natural vegetation communities with alien species, usually early colonizers, and have caused many alterations of natural habitats during the long history of human settlements in the Marshes. In addition, agricultural crops such as wheat, barley, rice, date palms etc. in the vicinity of the Marshes produced conditions for weedy species which also invaded Marsh plant communities (Al-Hilli 1977). Al-Hilli (1987) showed vegetation changes from 1962 to 1975 in some marshes, based on aerial photographs. Areas that used to be covered by *Phragmites australis* were replaced by halophytic species such as *Suaeda vermiculata*, *Tamarix passerinoides*, and *Cressa cretica*, due to cutting and burning.

Salinization: Water level fluctuations and salinity are the major environmental factors affecting plant communities in the Marshes. Salinity factors associated with water level and evaporation evidently separated halophytic communities in Suq ash-Shuyukh from other communities in Sahain and Surayfa (Al Hilli et al. 2010). The woody low emergent *Alhagi mannifera, Suaeda vermiculata* and *Tamarix gallica* as well as the herbaceous low emergent *Aeluropus lagopoides, Cressa cretica,* and *Juncus rigidus* are the most prevalent halophytes in areas with high salinity. The high incidence of halophytic communities at Suqash-Shuyukh is perhaps due to the greater impact of Euphrates water, which contains high dissolved mineral content (Al Hilli et al. 2010).

Saltwater intrusion: Al Hilli et al. (2010) considered the likelihood that saline waters originating from the Shatt-al-Arab may intrude northwards into the Marshes as suggested by some of the salinity measurements in their study area. This may also be true for the Hammar Marshes (Richardson & Hussein 2006). Increasing salinity would eventually affect the local vegetation communities in tidally affected marshes. Ecological heterogeneity in Suq ash-Shyukh - and in the Hammar Marshes - could be explained partly by those factors (Al Hilli et al. 2010).

Box 4.14. Key pressures and threats to the flora and vegetation of the Marshes

- Destruction or degradation of vegetation due to draining, infrastructure construction or conversion to agriculture, or
- Insufficient water supply
- Salinization
- Eutrophication
- Alien and invasive plant species
- Introduced herbivorous fish (e.g. Grass Carp)
- Pollution (organics, metals)

Eutrophication: Tahir et al. (2008) reported an increase of nutrient levels in the reflooded Marshes in comparison to historical levels. A high level of eutrophication has also been noted in Auda Marsh, a key biodiversity area close to Al-Hawizeh Marsh, due to the lack of water flow-through. Direct negative effects of nutrification on submerged plants or other marsh flora have not been reported to our knowledge, suggesting that excessive nutrients currently do not exert a major pressure on macrophytes in the Marshes. However, in many shallow lakes around the world, nutrient enrichment has lead to increased phytoplankton densities, reduced light penetration and growth inhibition of

submerged macrophytes in the past, resulting in a shift from benthic macrophytes to phytoplankton (Sheffer 2004). The possible threat of similar developments in the Marshes should be studied further, as a basis for precautionary measures.

Alien and invasive plant species: Hydrilla *Hydrilla verticellata* was the only exotic species that succeeded to invade the Marshes. It was found in low percentage and frequency in one study site in East Hammar marsh (Hussain & Alwan, 2008). Although it is considered a noxious species (Alwan 2006), and has caused excessive damage in other regions, its current distribution in East Hammar suggests that it is not spreading aggressively and perhaps coexists with native aquatic macrophytes without doing excessive damage. *Hydrilla verticellata* was also found in the Central Marshes, with cover ranging between 5 and 25% (Abdulhasan et al. 2009). Hamdan et al. (2010) expressed concern about its potential negative effect on autochthonous flora in the Central Marshes.

Introduced herbivorous fish: A number of herbivorous fish species including the Grass Carp *Ctenopharyngodon idella* have been introduced to the Marshes (Hussain et al. 2008, 2009a, b). Although no direct effects of these species on submerged macrophytes have been reported from the Marshes, it is known that intensive feeding by herbivorous fish can decimate macrophyte vegetation and influence the balance between benthic and planktonic primary production in shallow lakes (Kirkagac & Demir 2004, Sheffer 2004). Potential effects of herbivorous fish on the macrophytes of the Marshes should be studied in more detail, as a basis for future ecosystem management.

Pollution: Awad et al. (2008) studied the concentrations of trace metals in aquatic plants and sediments in Al-Hawizah and Hammar marshes. They found that the region is unpolluted with trace metals. No significant differences were observed in trace metal concentrations in aquatic plants and sediment samples of Al-Hawizeh and Hammar Marshes. However, this is only a single study and clearly more research should be conducted before conclusions about metal pollution in the Marshes are drawn.

Of the pressures and threats listed above, draining clearly has affected the Marsh ecosystem most profoundly, while conversion to agricultural use and salinization also has had major effects. These pressures and threats would need to be addressed specifically in a future management framework for a possible World Heritage Site in the Marshes.

4.6.1.7 Knowledge gaps and research needs regarding flora and vegetation

There are both urgent (Box 4.15.) and secondary research needs (below) regarding the flora and vegetation of the Marshes. A sound understanding of the controls and functioning of the plant communities of the Marshes will also be an important basis for the management of the ecosystem as a whole, because of the pivotal role of vegetation in its functioning.

The following knowledge gaps are not crucial to the initiation of management of the Marshes but would nevertheless be beneficial in the long term:

Box 4.15. Key research needs regarding the flora and vegetation of the Marshes

- **Tolerance limits for key plants and vegetation:** Key environmental parameters in the Marshes are still changing, following the major draining-reflooding cycle of the last 20 years. In order to take precautionary action against catastrophic vegetation-level effects of changes in abiotic factors (salinity, nutrients, temperature), the tolerance limits of key plant species in the Marshes (e.g. *Phragmitis australis, Ceratophyllum demersum*) should be studied and included in ecosystem models of the Marshes.
- **Potential and emerging threats on marsh flora and vegetation:** While habitat loss and salinization are the main current pressures on marsh vegetation, other threats like eutrophication or alien and invasive species (be it as competitors such as *Hydrilla verticillata* or herbivores such as *Ctenopharyngodon idella*) may manifest themselves in the future. Additional research is needed in the significance and impact of these threats, as a basis for precautionary measures.
- **Occurrence and status of endemic and globally threatened plant species:** Almost nothing is currently known about the occurrence and status of endemic and globally threatened plants in the Marshes. These should be investigated, aimed at the identification of IPAs in the Marshes. Studies could build on existing initiatives (e.g. Nature Iraq's KBA project) and collaborate with related activities in the wider region (e.g. the ongoing project of the IUCN Arabian Plants Specialist Group on Important Plant Areas in Arab countries, and the activities of the Edinburgh Royal Botanic Garden's Centre for Middle Eastern Plants).
- **Economic value of plants:** The economic value of reed and its contribution to the livelihoods of Marsh dwellers should be evaluated, and reed management schemes that are sustainable both economically and ecologically should be derived.
- **Secondary succession:** Quantitative studies should address secondary succession in the Marshes, as a basis for future restoration and conservation measures.
- **Differences between the flora of individual Marshes:** Apparent differences among the flora and vegetation of individual Marshes should be studies more systematically, to gain a better understanding of the range of habitats and provided by the Marshes and the correct demarcation of a future World Heritage site.

- **Database of Marsh plants:** An electronic, geo-referenced database for the flora of the Marshes based on recent, previous and museum records should be established. This should include distribution maps showing the current and past distribution for each species, and thereby enable targeted conservation management.
- **Update of taxonomic system:** The flora of the Marshes requires a major revision based on recent taxonomic treatments. Some scientific names used in the past have been subjected to taxonomic revisions (e.g. Alhagi mannifera), and this should be reflected in future publications on Marsh flora and vegetation.
- **Re-edition or new editions of literature on Marsh flora:** Most literature on the flora of Iraq and particularly the Marshlands is out of print. Field guides and books should be produced and made available for field biologists and conservation officers.

4.6.2 Ichthyofauna

Box 4.16. Contribution of the ichthyofauna to the biodiversity value of the Marshes

- **Key habitat for numerous endemic fish species of the Tigris-Euphrates basin:** 14 species of freshwater fishes are endemic to the basin, and although only some of them have been recorded in the Marshes in recent surveys, further studies would probably confirm the key role of the Marshes for many more.
- **Important nursery and feeding grounds for diadromous fish from the Arabian Gulf:** The Marshes - particularly Hammar Marsh - play a key role not only for ichthyofauna of the Tigris-Euphrates basin but also for numerous diadromous species of the Arabian Gulf.
- **Key resource for Marsh dwellers' culture:** The ichthyofauna of the Marshes supports local fisheries, and hence forms part of the resource base of the unique lifestyle of the Marsh inhabitants. It is therefore a prerequisite for the maintenance of the Outstanding Universal Value of the property under World Heritage Criterion V.

4.6.2.1 Fishes of Iraq

Several taxonomic studies on the freshwater and marine fishes of Iraq have been published over the last 50 years (Khalaf 1961, Mahdi 1962, Al-Nasiri & Shamsul-Houda 1975, Banister 1980, Al-Daham 1982, Coad 1991, 1996a, 2010).

Coad (1996a) studied the primary division of the ichthyofauna of the Tigris-Euphrates basin. It comprises 52 species in 7 families, dominated by the Cyprinidae with 34 species. 22 species are considered endemic to the basin. As for Iraq, which occupies the lower part of this basin, the freshwater fish fauna consists of 44 native and 13 exotic freshwater species. Of the native species, 14 are considered endemic to the Tigris-Euphrates basin (Appendix 4.6.). Recently, Coad (2009) described a new species, *Aphanius mesopotamicus*, from Qarmat `Ali, Basrah area on the Shatt Al-Arab, the confluence of the Tigris and Euphrates rivers, and from Iran. This illustrates that the investigation of Iraq's ichthyofauna is still ongoing and may yield further species in the future.

4.6.2.2 Threatened and endemic freshwater fish species of the Marshes

Only two species of freshwater fish of Iraq (*Caecocypris basimi* and *Typhlogarra widdowsoni*) are listed as vulnerable according in the IUCN Red List of Threatened Species (IUCN 2010). Both are cave-dwelling species that do not occur in the Marshes.

However, according to Coad (1996a, 2010), 14 species of freshwater fishes are endemic to the Tigris-Euphrates basin (Box 4.17.). Most of these species belong to the Cyprinidae and particularly to the genus *Barbus,* and some of them are economically important. The status of most of these species in the Marshes remains unknown and they have not been evaluated for the global Red List (IUCN 2010), but it is obvious that the large number of endemic fish species may contribute considerably to the potential OUV of the Marshes. For example, the newly described species *Aphanius mesopotamicus* is known from only four localities in the Marshes and has not been collected since the 1980s.

The current distribution, trends, conservation status and threats of the endemic fish species of the Marshes needs to be studied as a basis for a refined OUV statement and for conservation and sustainable fisheries management planning. Only three of the endemic species (*Silurus triostegus*, *Barbus/ Mesopotamichtys sharpeyi* and *Barbus/Luciobarbus xanthopterus*) were recorded from the Marshes in recent studies, and the latter species was only found in Al-Hawizeh and Hammar Marshes (Hussain et al. 2008, 2009a, b, Mohamed et al. 2008, Salim et al. 2009).

Abd et al. (2009) classified the conservation status of 16 fish "Species of Special Concern" in southern Iraq including the Marshes, among them eight of the endemic species listed in Box 4.17. Their results show that many of the unique species of the Marshes are at the same time of significant conservation concern (Table 4.6.).

Box 4.17. Endemic fish species of the Tigris-Euphrates basin

Cyprinidae

Barbus (Luciobarbus) esocinus

Barbus (Kosswigobarbus) kosswigi

Barbus (Mesopotamichthys) sharpeyi

Barbus (Luciobarbus) subquincunciatus

Barbus (Luciobarbus) xanthopterus

Caecocypris basimi[1]

Cyprinion kais

Hemigrammocapoeta elegans

Typhlogarra widdowsoni[1]

Balitoridae

Barbatula frenata

Sisoridae

Glyptothorax kurdistanicus

Glyptothorax steindachneri

Siluridae

Silurus triostegus

Cyprinodontidae

Aphanius mesopotamicus

[1]globally vulnerable cave species, does not occur in the Marshes

The current status of endemic ichthyofauna is also crucial for the assessment of the integrity of the marsh ecosystem as a whole, which is further discussed in Section 6 of this report.

Table 4.6. Proposed conservation priority for 16 “Species of Special Concern” in Southern Iraq (Source: Abd et al. 2009).

Species	Proposed Conservation Priority
Tenualosa ilisha	High
Alburnoides bipunctatus	Possibly high
Barbus barbulus	Possibly high
Barbus esocinus	Possibly high
Barbus grypus	Regionally high
Barbus subquincunciatus	Possibly high
Barbus xanthopterus	High
Caecocypris basimi	None
Cyprinion kais	Moderate
Typhlogarra widdowsoni	High
Cobitis taenia	Unknown,
Glyptothorax kurdistanicus	None
Glyptothorax steindachneri	None
Liza abu	Moderate
Liza klunzingeri	Moderate
Acanthopagrus latus	Moderate

4.6.2.3 Marine and diadromous fish species in the Marshes

Several species of marine fishes regularly enter the Shatt al Arab River and have been recorded as far inland as Hammar Marsh. Some used to travel up the Tigris and Euphrates rivers to varying degrees but dams and water diversion schemes now prevent more extensive movements (Coad 2010). A total of 25 marine species have been listed for the Marshes (Table 4.7.), but only eight have been given species accounts (Coad 1996). Of these species, only the Bull Shark *Carcharhinus leucas* is listed as near-threatened on the IUCN Red List of Threatened Species (IUCN 2010), but the importance of the Marshes for diadromous species nevertheless adds to their overall biodiversity and OUV contribution.

Table 4.7. Marine and diadromous fish species known to occur in the Iraqi Marshlands (Coad 2010).

Family	Species
Carcharhinidae	*Carcharhinus leucas*
Engraulidae	*Thryssa hamiltonii*
	Thryssa whiteheadi
Clupeidae	*Tenualosa ilisha*
Ariidae	*Netuma bilineatus*
	Plicofollis layardi
Mugilidae	*Liza klunzingeri*
	Liza subviridis
Hemiramphidae	*Hemiramphus marginatus*
	Rhynchorhamphus georgii
Belonidae	*Strongylura strongylurus*
Platycephalidae	*Platycephalus indicus*
Sillaginidae	*Sillago sihama*
Sparidae	*Acanthopagrus berda*
	Acanthopagrus latus
	Sparidentex hasta
Sciaenidae	*Johnius belangerii*
	Otolithes ruber
Gobiidae	*Bathygobius fuscus*
Scatophagidae	*Scatophagus argus*
Stromateidae	*Pampus argenteus*
	Pampus chinensis
Soleidae	*Brachirus orientalis*

4.6.2.4 Exotic fish species in the Marshes

Coad (1996b) presented a comprehensive review on the exotic fishes of the Tigris-Euphrates basin. According to this analysis, 13 exotic freshwater species have been introduced to the Tigris-Euphrates basin (Box 4.18.). Hussain et al. (2009a) recorded six exotic species from Hammar Marsh. Four exotic species (*Ctenopharyngodon idella, Cyprinus carpio, Carassius carassius* and *Heteropneustus fossilis*) were found in both Hammar and Al-Hawizeh marshes in a separate study (Hussain et al. 2008).

Few but specific data are available on the effect of these exotic species on native Marsh species. The Common Carp *Cyprinus carpio* was introduced between 1960 and 1972 to Iraq. It has been threatening at least three native species (*Barbus sharpeyi, Barbus grypus* and *Barbus xanthopterus*) since the 1970s. This has reportedly been caused by a sharp increase in its number and increased benthic food competition (Al-Kanaani 1989, Jawad 2003). Native species have reportedly also become rare after being outcompeted by other introduced species, e.g. *Barbus sharpeyi* by *Ctenopharyngodon idella* (Richardson 2008, Barak & Mohamed 1983, Jasim 1988).

The Stinging Catfish *Heteropneustes fossilis* was probably introduced in the 1950s as a biological control agent against *Bulinus truncatus*, the snail that acts as intermediate host for *Schistosoma haematobium*. It competes with the endemic *Barbus sharpeyi*, but competition is not as strong as with the Common Carp. *Heteropneustes fossilis* is poisonous, with records of fatalities among inhabitants of Shatt Al-Arab (Coad 1996b).

The Mosquito Fish *Gambusia holbrooki/affinis* was introduced to Iraq at an unknown date as a biological control agent against mosquito vectors of malaria. This reportedly caused devastation among native fishes, as the species also feeds on fish eggs (Jawad 2003).

Box 4.18. Exotic fish species of the Tigris-Euphrates basin

Cyprinidae

Ctenopharyngodon idella

Cyprinus carpio

Carassius carassius

Hemiculter leucisculus

Hypophthalmichthys molitrix

Hypophthalmichthys nobilis

Heteropneustidae

Heteropneustes fossilis

Pangasiidae

Pangasius sp.

Gambusia holbrooki

Poecilia latipinna

Cichlidae

Oreochromis aureus

Oreochromis niloticus

Tilapia zillii

Coad (1996b) reported that the Gold Fish *Carassius auratus* may hybridize with the endemic *Barbus sharpeyi*. This may dilute the original gene pool of the latter species or reduce net fecundity, if sterile hybrids are produced. In addition, parasites were isolated from the introduced *Ctenopharyngodon idella* in Iraq (Ali et al. 1988, 1989), and may pose a risk to native fish species.

The above data show that alien and invasive fish species exert a significant and potentially increasing impact on the native ichthyofauna of the Marshes.

4.6.2.5 Differences in the ichthyofauna among individual marshes

In order to inform the boundary setting of a future World Heritage property in the Marshes, it is important to understand how uniform the Marshes are in their faunal composition and to what extent individual Marshes differ from each other. This will allow national experts to decide which individual marshes need to be included in the possible future property (be it serial or single) in order to capture the range of biodiversity typical of the Marshes. This is also true for their ichthyofauna.

The fish assemblage of East Hammar Marsh, which receives water from both the Euphrates and the Shatt Al-Arab rivers, differs from that of other marshes by the regular occurrence of marine and diadromous fish species, in addition to pure freshwater species both native and alien (Hussain et al. 2006). Diadromous fish species are fish species that spend part of their life cycle in freshwater and part of it in marine habitats.

The dykes between the former East Hammar Marsh and the Shatt Al-Arab River were demolished in late April 2003, and water has been flowing upstream due to the tidal action of Gulf waters forcing the waters of Shatt al-Arab back into the marsh. As a result, several diadromous species have returned to Hammar Marsh through the Shatt Al-Arab River for spawning, nursery grounds, or feeding (Richardson & Hussain 2006).

According to a recent study, the fish assemblage of East Hammar Marsh consists of 31 species belonging to 14 families (Hussain et al. 2009). This assemblage was dominated by four species (*Liza*

abu, Carassius auratus, Acanthobrama marmid, and *Tenualosa ilisha*), which constituted 80.4% of the total catch. The fish fauna was composed of 14 native freshwater, 6 alien freshwater, and 11 marine species.

The marine species belonged to eight families, namely Mugilidae (*Liza subviridis* and *L. klunzingeri*), Sparidae (*Acanthopagrus latus* and *Sparidentex hasta*), Gadidae (*Bathygobius fuscus* and *Boelophthalmus dussumieri*), Clupeidae (*Tenualosa ilisha*), Engraulidae (*Thryssa mystax*), Scatophagidae (*Scatophagus argus*), Hemiramphidae (*Rhynchorhamphus georgii*) and Soleidae (*Brachirus orientalis*). The marine species comprised 35.5% of the total number of species. The highest number of marine species was caught in July and the lowest in November and December (Table 4. 2.). One marine species (*Brachirus orientalis*) was considered as a resident species, three (*Tenualosa ilisha, Thryssa mystax* and *Bathygobius fuscus*) as seasonal species, and seven (*Acanthopagrus latus, Scatophagus argus, Sparidentex hasta, L. klunzingeri, Boelophthalmus dussumieri, Rhynchorhamphus georgii,* and *Brachirus orientalis*) were occasional species (Hussain et al. 2009, Mohamed et al. 2009).

Hussain et al. (2008) presented a comparison of fish assemblages in three marshes in southern Iraq, namely Suq Al- Shuyukh, Al-Hawizeh and East Hammar marshes (Table 4.8.). According to these authors, all marshes have similar numbers of native species, while East Hammar Marsh has the highest number of total species, because of the occurrence of marine species. This finding points to a distinctive structure and role of Hammar among the Mesopotamian Marshes.

According to Hussain et al. (2009), it appears that the restored Hammar Marsh now plays a role as a nursery ground for juveniles of marine species like *Tenualosa ilisha*, *Liza subviridis* and *Thryssa whiteheadi*, with thick submerged plants like *Ceratophyllum demersum* offering cover from predatory fishes like *Aspius vorax* and *Silurus triostegus*, and from piscivorous waterfowl.

The importance of Hammar for marine diadromous species is also reflected in its distinctive dominance ranking (Richardson & Hussain 2006). Table 4.9. shows that dominant species composition was very similar between Al-Hawizeh and Suq Al-Shuyuk (four out of five top five species shared between both marshes), but that Hammar was unique in having the marine diadromous *Liza carinata* as the second most dominant species.

It is not clear from the literature available to us to what extent East Hammar Marsh has been brackish prior to the 2003 re-flooding, but it is known that it has been used by diadromous shrimps (Salman et al. 1990), and it is likely that it has been used by diadromous fish (cf. Coad 1996a, Hussain & Ali 2006). With regard to salinity, Al-Hilli et al. (2009) reported a higher incidence of halophytic plant communities at Suq Ash-Suyuk, western Hammar, than at two other sampling stations, already during the 1970s. This could partly be attributed to seawater inflow from the Shatt Al-Arab during seiche events, but would also be consistent with a specific salinity regime at Hammar which essentially depends on the balance between flushing and evaporation (Banat et al. 2006), and may have resulted in relatively high salinities at Hammar even before draining.

This would support the notion discussed above that Hammar is naturally different from the other marshes and therefore contributes considerably to the ecosystem diversity and hence potential OUV of the Marshes.

Table 4.8. Fish species recorded at Suq Al-Shuyukh, Al-Hawizeh and East Hammar marshes (after Hussain et al. 2008, 2009). Categories: A… Alien freshwater, M… Marine, N… Native freshwater.

Species	Category	Suq Al- Shuyukh	Hawizeh	East Hammar
Acanthobrama marmid	N	+	+	+
Acanthopagrus latus	M	-	-	+
Acanthopagrus berda	M			+
Alburnus mossulensis	N	+	+	+
Alburnus sp.				+
Aphanius dispar	N	+	+	+
Aphanius mento	N			+
Aspius vorax	N	+	+	+
Baleophallalmus boddarti	M	-	-	+
Boleophthalmus dussumieri	M			+
Barbus grypus	N			+
Barbus luteus	N	+	+	+
Barbus sharpeyi	N	+	+	+
Barbus xanthopterus	N	+	+	+
Bathygobius fuscus	M	+	-	+
Brachirus orientalis	M			+
Carassius auratus	A	+	+	+
Ctenopharyngodon idella	A	+	+	+
Cyprinion macrostomum	N	+	-	+
Cyprinus carpio	A	+	+	+
Gambusia holbrooki	A	+	+	+
Garra rufa	N	-	+	-
Heteropneustus fossilis	A	-	+	+
Liza abu	N	+	+	+
Liza klunzingeri	M	-	-	+
Liza subviridis	M	-	-	+
Mastacembelus mastacembelus	N	+	+	+
Mystus pelusius	N	-	+	-
Rhynchorhampus georgii	M			+
Scatophagus argus	M			+
Silurus triostegus	N	+	+	+
Tenaulosa ilisha	M	+	-	+
Thyrssa mystax	M	-		+
Thryssa whiteheadi	M			+
Number of native freshwater species		11	12	11
Total number of species		17	17	32

Table 4.9. A list of the five most common or abundant species of fish species in three different marsh areas, based on surveys done by faculty and students at the University of Basrah, 2003–2005 (Source: Richardson & Hussain 2006).

Hawizeh	Suq Al-Shuyukh	Hammar
Barbus luteus	*Liza abu*	*Liza abu*
Aspius vorax	*Carassius carassius*	*Liza carinata*
Carassius carassius	*Barbus luteus*	*Carassius carassius*
Barbus sharpeyi	*Aspius vorax*	*Barbus luteus*
Liza abu	*Alburnus mossulensis*	*Alburnus mossulensis*

In contrast to the previous studies, Salim et al. (2009) recorded only seven fish species from Al-Hawizeh Marshes during the 2009 southern Iraq site review of Nature Iraq's Key Biodiversity Area (KBA) project - *Acanthobrama marmid* (3%), *Alburnus mossulensis* (3%), *Aspius vorax* (15%), *Barbus luteus* (25%), *Heteropneustes fossilis* (10%), *Silurus triostegus* (24%), and *Liza abu* (20%). Five fish species - again a comparatively low number - were reported from the Central Marshes: *Acanthobrama marmid, Barbus luteus, Heteropneustes fossilis, Liza abu*, and *Carassius auratus*. No data were obtained for Hammar Marsh during this survey.

Hawizeh Marshes have historically been an important spawning ground for the Bunni, *Barbus sharpeyi*, which was not found in this winter survey. The authors concluded that *B. sharpeyi* may be locally threatened (Salim et al. 2009). However, this finding and the low overall species yield may have been partly due to limited sampling effort or incomplete coverage of the seasonal cycle. The status of *Barbus sharpeyi* and the general ichthyofauna of Al-Hawizeh should hence be explored further.

There is no published information on the species composition, fish ecology, and fisheries of the Marshes before their draining, or on their historical importance for marine fish. Biological aspects of some freshwater fishes were investigated (Al-Mukhtar 1982, Barak & Mohamed 1982, 1983, Naama 1982, Al-Sayab 1988, Jasim 1988, Mohamed & Barak 1988, Al-Kanaani 1989, Al-Rudainy 1989, Mohamed & Ali 1994, Mohamed et al. 1998). Similar studies were conducted on some diadromous fish in the Shatt Al-Arab River and Shatt Al-Basrah (Al-Nasiri & Shamsul-Houda 1975, Hussain & Ali 1987, Hussain et al. 1987, 1989, 1999, Jabir & Faris 1989, Younis 1995, Al-Noor 1998), as well as Iraqi marine waters (Al-Daham et al. 1993, Mohamed et al. 1998).

Box 4.19. Economically important fish species of the Marshes

Barbus barbulus
Barbus esocinus
Barbus grypus
Barbus sharpeyi
Barbus xanthopterus
Barbus luteus

Aspius vorax
Carassius auratus
Ctenopharyngodon idella
Cyprinus carpio
Hypophthalmichthys molitrix
Tenualosa ilisha
Liza abu
Nematalosa nasus

Silurus triostegus
Alburnus mossulensis
Mugil dussumieri
Acanthopagrus latus

4.6.2.6 Fisheries in the Marshes – links between natural and cultural values

In the context of the Marshes' nomination and management planning as a purely natural World Heritage site, the economical importance of their biodiversity would be of secondary importance only (cf. Badman et al. 2008b). However, fisheries in the Marshes are crucial to the success of the overall nomination as a mixed site because fisheries are one of the main economic foundations of the

traditional culture of the Marsh Dwellers (Tkachenko 2002), which is an equally important part of the overall potential OUV of the property. Without functioning fisheries, the culture of the Marsh Dwellers and hence potential OUV under criterion V would probably cease to exist (Richardson & Hussain 2006). Therefore, the following section outlines key baseline data on fisheries in the Marshes, along with research needs and management consequences.

According to Jawad (2006), 14 fish species of occurring in the Marshes are of economic importance. Abd et al. (2009) identified an additional four species of high economic importance. A consolidated list is presented in Box 4.19. In 1990, the FAO estimated the total inland fish catch of Iraq at 23,600 t, with more than 60% coming from the Marshes (Partow 2001). It is likely that catches in the 1970s and 1980s were higher, considering the reduction in the national per capita consumption of fish from 3.3 kg to 1.5 kg between 1984 and 1986 alone (Maltby 1994).

Catches tended to decline further over the course of the 1990s, from 13.200 tons in 1989 and 12.600 tons in 1994, to 9.900 tons in 1995 and 7.000 tons in 1996 (FAO 1993-2000, cited in Tkachenko 2002). This rapid reduction in catches points to serious changes in the resource base, besides the reduced activity of marsh fisheries that was caused by the persecution of Marsh Dwellers during this phase (Mitchell 2002). A likely key factor was the significant reduction in nutrient input into the Shatt Al-Arab and northern Gulf following alteration of drainage systems in central and southern Iraq, i.e. the construction of dams, barrages, canals and irrigation channels (Tkachenko 2002).

Following the re-flooding of the Marshes since 2003, fisheries have returned to some areas but the quantity and quality of catches differ significantly from those pre-draining. Barbus sharpeyi was still caught but at much reduced numbers and size, while the introduced cyprinid *Carassius carassius* comprised 20% and up to 46% of the summer 2004 catch in Suq Al-Shuyukh and Al-Hawizeh, respectively (Richardson et al. 2006). The catfish *Silurus triostegus* also increased in relative catch (up to 60% weight) (Development Alternatives Inc. 2004). This species is not eaten by the local population because of religious reasons.

The Marshes and adjacent areas are also crucial for fisheries elsewhere. Several marine fish species of great economic importance in the Arabian Gulf are dependent on the estuarine systems and marshes, either for spawning like the Clupeidae (Hussain et al. 1994), or for feeding, such as the Mugilidae and Sparidae (Hussain et al. 1987).

Salim et al. (2009) observed fishing using fixed gill nets (mesh sizes of 0.5, 2, 3 and 4 cm) in the Central Marshes. The daily catch was approximately 5 kg/boat. Electro-fishing was also practiced, with an estimated daily catch of about 7 kg/boat.

4.6.2.7 Pressures and threats affecting the ichthyofauna of the Marshes and their effect on their integrity under World Heritage criterion x

Jawad (2003) gave a comprehensive review on the impact of environmental changes on the freshwater fish fauna of Iraq. Despite the lack of quantitative examples on these impacts, some anecdotal reports on impacts were also reported. The author stated that the Iraqi fishes were already affected by environmental change during prehistoric periods, but that current threats could be summarized as in Box 4.20. below.

Box 4.20. Key pressures and threats to the ichthyofauna of the Marshes

- Lack of water input leading to marsh desiccation and salinization
- Destruction of Marsh habitat and conversion to agricultural land
- Introduction and negative ecological effects of alien and invasive fish species
- Overfishing and use of unsustainable fishing methods (e.g. electrofishing)
- Decrease in dissolved oxygen concentrations in the water column of lakes and marshes
- Contamination of Marshes with insecticides and herbicides

The deterioration of water quality of Hammar Marsh since the 1970s and other of the abovementioned factors may have erased several native cyprinid species even before the draining of the Marshes. For example, *Barbus subquincunciatus* and *B. scheich* disappeared from Hammar reportedly owing to an increase in salinity from 0.4g/l in the 1970s (Al-Saadi et al. 1981) to 6.3g/l in the early 1990s (Al-Rikabi 1992). After reflooding in 2003, a few native species were found at substantially decreased relative abundance. For example, *Barbus xanthopterus* and *B. grypus* reached relative abundance of 0.02% and 0.05%, respectively, only. Richardson (2008) hypothesized that this was caused by increased salinity and competition for benthic food from introduced benthivores such as Common Carp *Cyprinus carpio*. The latter mechanism has been demonstrated previously (Al-Kanaani 1989).

Box 4.21. Priority research needs regarding the fish fauna of the Marshes

- **Status of key species:** The current status, trends, and distribution of fish species endemic to the Tigris-Euphrates basin in the Marshes needs to be studied further in order to clarify their current and potential OUV contribution. This could be part of a basin-wide IUCN Red List assessment of fishes (or freshwater fauna in general) to represent these species in an appropriate way in the global Red List, as well as national Red Lists of individual States within the basin.
- **Habitat requirements and life histories:** and The ecological tolerance levels (regarding salinity, oxygen, food, habitat quality, hydroperiod) and life history of fishes (particularly of endemic species and species of high economic value) need further investigation, in order to inform future ecosystem management and to assess the sustainability of restoration measures. Critical life history stages should receive particular attention.
- **Impact of introduced fish:** The impact of exotic or introduced freshwater fish onto the native ichthyofauna (e.g. through competition, predation, introduction of parasites, or hybridization) requires further study, as a basis for conservation management of the native species. Although anecdotal evidence indicates that introduced species contributed to the disappearance of some native species, these are few conclusive systematic studies.
- **Importance of some marshes for diadromous species:** The role of some marshes (particularly Hammar) as a nursery and feeding ground for diadromous species from the Arabian Gulf needs to be studied further, in order to better understand the whole range of habitats offered by the Marshes, and to plan the conservation of this function as part of World Heritage management there.
- **Role of fisheries in marsh inhabitants' livelihoods:** The contribution of fisheries to the livelihoods of Marsh inhabitants needs to be further quantified. Current fishing technologies need to be examined regarding their economic effectiveness and ecological sustainability, and technological innovations suggested with the aim to optimize livelihood contributions while minimizing the ecological footprint of fisheries in the Marshes.

Like with all Marsh biota, the destruction of the Marsh habitat is the greatest threat to the integrity of the ichthyofauna of the Marshes, and would urgently need to be addressed by the future management regime of a World Heritage Site there. Alien and invasive species and changes in community structure due to unsustainable fishing are other important pressures, which will be relatively difficult to address once they have taken effect.

4.6.2.8 Knowledge gaps and research needs

The discussion of the ichthyofauna's contribution to the potential OUV of the Marshes reveals numerous gaps and information needs. Some of them need to be addressed as a high-priority prerequisite for World Heritage nomination and management planning for the Marshes (Box 4.21.) Others could be addressed at a later stage.

Among the research needs that could be addressed at a later stage are the following:

- The feasibility of an increased use of aquaculture as a source of fish (for subsistence and trade) needs to be systematically assessed. The environmental impact of all ongoing and planned aquaculture projects within the Marshes also needs to be assessed.
- Based on the research about status and ecology above, the understanding of threats to native (particularly endemic) fish of the Marshes needs to be put onto a quantitative scientific basis.

4.6.3 Herpetofauna

Box 4.22. Contribution of the herpetofauna to the biodiversity values of the Marshes

- **Key habitat for globally endangered species:** The globally endangered Euphrates Softshell Turtle *Rafetus euphraticus* may have one of its key strongholds in the Marshes.
- **Potential for as yet unexplored amphibian diversity:** The almost complete lack of information about the amphibians of the Marshes leaves open the general possibility of the occurrence of additional species in the Marshes.

4.6.3.1 Amphibians and reptiles of Iraq

So far, about 96 species of reptiles and amphibians have been recorded from Iraq (in den Bosch 2003), but only a relatively small proportion of them occur in the Marshes. The country's herpetofauna was studied extensively during the 1920s when British troops where in Iraq (Boulenger 1918, 1919, 1920a & b, Corkill 1932, Angel 1936, Schmidt 1939). Earlier studies were summarized by Allouse (1955) and Mahdi & Georg (1969). The few scattered studied that were published in the mid-20th Century (Haas 1952, Reed & Marx 1959, Haas & Werner 1969) added little to the understanding of the herpetofauna of Iraq, but created some confusion themselves. For example, many lists included the agamid *Phrynocephalus maculatus longicaudatus* within the herpetofauna of Iraq, but without giving exact localities. Other problems include the identity of the snakes *Coluber rogersi* and *Coluber ventromaculatus*. The last significant series of articles on Iraqi herpetofauna was published in the early 1960s (Khalaf 1960, 1961), and includes a general account, again without localities (Khalaf 1959). In den Bosch (2003) derived a comprehensive list of the reptiles and amphibians of Iraq, based on older publications. A detailed bibliography is included in the comprehensive treatise on the reptiles of the Middle East by Leviton et al. (1992).

4.6.3.2 Amphibians and reptiles of the Marshes

If there is little recent information about the herpetofauna of Iraq in general, then this is particularly true for the Marshes. Maxwell (1957) commented on the extreme abundance of frogs, but did not indicate species. Haas & Werner (1969) reported six species of reptiles from areas in the vicinity of the Marshes (*Ophisops elegans, Agama* cf. *persicus, Mabuya aurata septemtaeniata, Trachylepis vittatus, Eryx jaculus, Platyceps ventromaculatus*). Nader & Jawdat (1976) reported seven gecko species from southern Iraq (see Appendix 4.7. for consolidated species list). Two of these (*Hemidactylus flaviviridis* and *H. persicus*) were also found by Al-Bawari & Saeed (2007) in the same region. To what extent any of these species occurred within the Marshes - as opposed to merely near them - was not reported.

Typical reptiles of the Marshes include the Caspian Terrapin *Mauremys caspica*, the Euphrates Soft-shelled Turtle *Rafetus euphraticus*, several geckos of the genus *Hemidactylus*, two species of skinks (*Trachylepis aurata* and *Mabuya vittata*), and a variety of snakes of the genus *Coluber*, the Sand Boa *Eryx jaculus*, the Tessellated Water Snake *Natrix tessellata* and Gray's Desert Racer *Coluber ventromaculatus*. The Desert Monitor (*Varanus griseus*) was formerly common in deserts near the Marshes, but is now rare due to heavy persecution (Scott 1995). The Spiny-tailed Lizard *Uromastyx aegyptia* probably occurs in or near the Marshes, but there are no definite records.

Despite the lack of precise localities, the Tree Frog *Hyla savignyi*, the Marsh Frog *Pelophylax ridibunda* and the Green Toad *Bufo viridis* are found in the Marshes (Leviton et al. 1992).

Since data about the amphibians of the Marshes are extremely scarce, further field studies may yield additional species. However, the few recent molecular studies on herpetofauna in the Tigris-Euphrates

basin outside the Marshes yielded exclusively species already known from other areas, rather than new species (Gvoždík et al. 2010, Stoeck et al. 2006, 2008). This would be consistent with the fact that the Marshes in their current location only formed after the last postglacial transgression (not more than 4,300 years ago – Sanlaville 2004) and hence have not offered a constant habitat for species evolution over an evolutionary significant time span.

4.6.3.3 Threatened amphibians and reptiles of the Marshes

Among herpetofauna, only the Euphrates Soft-shell Turtle *Rafetus euphraticus*, is listed (as endangered) on the IUCN Red List of Threatened Species (IUCN 2010). The Red List website mentions that there is a need for an update of the 1996 assessment for this species. The turtle is endemic to the Tigris-Euphrates basin, with the Marshes forming its southern range limit.

Salih (1965) conducted the first survey on Euphrates Soft-shelled Turtles in Iraq. He reported that the species was common throughout the Tigris-Euphrates basin. Gramentz (1992) investigated its distribution within the basin, and found it near the Marshes. Stadtlander (1992) observed the turtles in Haur Hammar in 1989. Other studies addressed parasites occurring in the species (Al-Zubaidy 1997, Molan & Saeed 1990). More recently, Nature Iraq (2008a) classified the species as common in Al-Hawizeh Marsh, but no detailed numbers were given and the status in the remaining Marshes

4.6.3.4 Pressures and threats to herpetofauna of the Marshes and their consequences for their integrity

The main pressure on aquatic and amphibious herpetofauna in the Marshes, and hence on this aspect of the Marshes' integrity, has been the loss of aquatic habitat, and this pressure is likely to persist. The magnitude of additional pressures and threats such as salinization, nutrification and pesticide contamination, as well as alien and invasive species, is poorly understood and requires further study.

Besides this, the only documented threat affecting the Euphrates Soft-shelled Turtle was reported by Stadtlander (1992). He reported that the construction of barrages on the Euphrates involved wires that prevent turtles from moving freely within the river system, and may lead to a fragmentation of the regional population. In the Marshes, *Rafetus* are frequently killed by locals because they consume fish and may bite people when they are fishing or swimming (Anna Bachmann/Nature Iraq, pers. comm.). Other reptiles (e.g. snakes, geckos and the Desert Monitors) are persecuted because of fear and superstition. These pressures and threats to the integrity of the Marshes' herpetofauna will need to be addressed along with other pressures.

4.6.3.5 Knowledge gaps and research needs

Since so little is known about the herpetofauna of the Marshes, there is a considerable need for basic research on this group. However the only endangered species known to occur there should be studied as a matter of priority, already during nomination and management planning (Box 4.23.).

Box 4.23. Priority research need regarding the herpetofauna of the Marshes

- **Conservation status of *Rafetus euphraticus*:** The status, trends and distribution of the globally endangered Euphrates Soft-shelled Turtle *Rafetus euphraticus* within the Marshes - as well as pressures and threats - require thorough investigation. This could be part of a basin-wide IUCN Red List assessment of freshwater fauna, to represent the species in the global IUCN Red List and in national Red Lists of individual States within the basin.

Besides this research priority, there are further knowledge gaps regarding this group which should be filled medium term, to improve the management of any possible World Heritage site in the Marshes:

- The herpetofauna, particularly the amphibians, are among the least known groups of the Marshes. Most records are old and lack specific localities. Herpetofauna have not been included systematically in recent biodiversity surveys. Baseline surveys and collaborations with molecular biologists are required to establish an updated list of the reptiles and amphibians of the Marshes.
- Pressures and threats affecting the herpetofauna of the Marshes such as salinization, nutrification and pesticide contamination, as well as alien and invasive species, need to be assessed as a basis for conservation management planning.

4.6.4 Avifauna

Box 4.24. Contribution of the avifauna to the biodiversity values of the Marshes

- **One of the major historical wintering sites for migratory waterbirds in Western Eurasia:** The Marshes are a major - probably the major - wintering site for migratory waterbirds of the West Siberia-Caspian-Nile flyway, an important resting site for additional migratory waterbirds on their migration to Africa, and an internationally important wintering site for numerous raptor and passerine species.
- **Key breeding and/or wintering habitat for several globally threatened bird species:** The Marshes are inhabited or regularly visited by nine species that have been assessed as globally vulnerable (7) or endangered (2) by the global IUCN Red List of Threatened Species.
- **Key breeding habitat for several endemic species and subspecies:** The Marshes are breeding habitats to two near-endemic bird species (one of them globally endangered). In addition, they hold endemic or near-endemic subspecies of at least five bird species and remote satellite populations of two waterbird species with the nearest core populations in Africa.
- **Key resource for Marsh dwellers' culture:** Hunting on birds supports local livelihoods in the Marshes, and hence forms part of the resource base of the unique lifestyle of the Marsh inhabitants. It is therefore a prerequisite for the maintenance of the OUV of the property under Criterion V.

4.6.4.1 Birds of Iraq

The birds of Iraq have been investigated relatively extensively over the past 100 years (Sharpe 1886, 1891, Sassi 1912, Tomlinson 1916, Beldi 1918, Meinertzhagen 1914, 1924a, b, Jourdain 1919, Stoneham 1919, Ticehurst 1920a, b, Ticehurst et al. 1921-1922, Hale 1932, Chapman & McGeoch 1956, Makatsch 1958, Harrison 1959, Marchant 1961, 1962, 1963a, b, c, Marchant & Macnab 1963, Georg 1967, Georg & Vielliard 1968, 1970, Georg & Savage 1970a, b, Kainady & Al-Joborae 1975, 1976, Kainady 1976a, b, Mahdi 1982). The most comprehensive accounts of Iraqi avifauna were published by Allouse (1953) and Moore & Boswell (1956, 1957). They stated that the total number of bird species recorded in Iraq was 375, of which 134 were aquatic. Recently, Salim et al. (2006) published "A Field Guide to the Birds of Iraq", which covers 387 species of birds, and Porter et al. (2010) compiled an up-to-date, critically revised checklist of the birds of Iraq.

4.6.4.2 Historical accounts of the Marshes' importance for migratory birds

A key contribution to the potential OUV of the Marshes has been their role as one of the major historical wintering, resting and staging areas for migratory waterbirds in western Eurasia. Thesiger (1954) described the huge numbers and diversity of birds observed during his stay in the Marshes:

"During the winter months the marshes are alive with wildfowl. (…) All kinds of European duck winter here, as well as the marbled duck (malha), which remains to breed. I have watched spellbound while seemingly endless skeins of geese, white-fronted and grey lag, passed overhead and the cold air rang with their calling. (…) Common cormorants, pigmy cormorants, darters, grebes, herons (including the goliath heron), spoonbills, ibis, curlews, stilts, avocets, sandpipers and snipe, gulls, terns, ospreys and harriers enliven these marshes during the colder months, and Ma'dan, armed often with primitive muzzle-loading guns, go out shooting from dawn till dusk."

The waterbirds of the Marshes have been studied more extensively since. Georg Kainady & Vielliard (1968, 1970), Koning & Dijksen (1973), Carp (1975a, b, 1980), Scott & Carp (1982) and Scott (1995) surveyed extensively the Marshes. These data were summarized and re-analyzed form a conservation point of view by Scott & Evans (1994) and Scott (1995). They provide the best information about wintering avifauna and indicate that the total wintering population of waterfowl in Iraq in the 1960s and 1970s may have been several million birds, with the southern Marshes the main centre of distribution (Table 4.3). A 1979 survey covered only a fraction of the Marshes but nevertheless recorded over 475,000 waterfowl belonging to 81 species (Scott 1995). Scott & Evans (1994) estimated the number of species recorded in the Marshes at 278 (excluding desert and coastal species).

Table 4.9. Summary of wintertime waterfowl surveys in the Marshes during the 1960s and 1970s. (Source: Scott & Evans 1994).

Data source	Year (s)	Total count	Species number
Savage & Georg Kainady	1967	69,108	9
Vielliard & Georg Kainady	1967/68	59,378	55
Koning & Dijksen	1972	152,889	57
Carp	1975	90,824	46
Carp, Georg Kainady & Scott	1979	324,602	82

Scott & Evans (1994) put the Marshes into the context of bird migration throughout western Asia, highlighting their importance as a major wintering and resting area for migrating waterbirds in western Eurasia. The area belongs to the West-Siberian-Caspian-Nile flyway, one of the three major flyways of the western Palearctic for ducks. They also belong to the West Asia-East Africa Flyway, one of eight global flyways for waders and shorebirds (Boere & Stroud 2008). The relative position of the Marshes in these flyways is illustrated in Figure 4.5. Georg and Savage (1968a) even went as far as stating that Hammar and Al-Hawizeh together “probably provide habitat for two-thirds of the wintering waterfowl of the Middle East”.

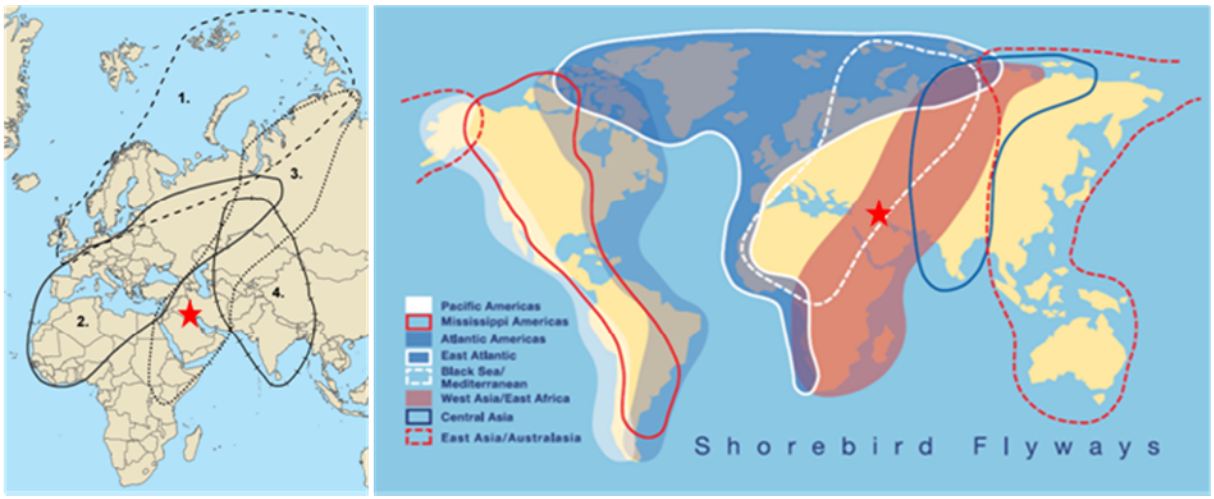

Figure 4.5. Location (asterisk) of the Marshes in relation to the West Siberian/Caspian/Nile Flyway for ducks (left-hand panel, flyway 3) and to the West Asia/East Africa Flyway for shorebirds (right-hand panel, pale red shading). (Source: Boere & Stroud 2008)

The outstanding importance of the Marshes as a wintering area for migratory waterbirds is clearly reflected at the level of individual species. Scott & Evans (1994) identified 68 waterbird species for which the Marshes have flyway-scale importance. This was defined based on the criterion of holding at least 1% of the flyway (i.e. macro-regional) population at any stage of the migration cycle. The

Marshes were estimated to exceed 10% maximum flyway population representation for 35 out of these 68 species. Some species were estimated to have up to 50% of their individuals concentrated in the Marshes at some stage of the seasonal cycle (Appendix 4.8.). Flyway scale importance for palearctic migratory waterbirds is arguably more indicative of global than of merely regional importance as there are only a few flyways, and these are mostly at a large (intercontinental) geographic scale.

With regard to migratory birds, Scott and Evans (1994) highlight the Marshes' importance for several groups in addition to wintering waterbirds. The Marshes are

- an important refuge area for migratory waterbirds wintering further North, in times of harsh weather conditions there (e.g. from the Caspian and eastern Anatolia),
- a crucial staging area for some species of waterbirds migrating from western Siberia and Central Asia to eastern and southern Africa (e.g. some herons, egrets and ducks), and
- a significant wintering area for some raptors (e.g. *Milvus migrans*, *Circus* spp., *Aquila* spp.) and passerines.

Although the abovementioned counts indicate that the Marshes were still supporting very large abundances of migratory waterbirds in the 1960s and 1970s, a tangible if unquantified decline in their numbers was already noted since the 1950s. Thesiger (1964) wrote that "throughout the Marshes, ducks and geese were becoming scarcer by the year".

During the 1990s, Al-Robaae (1986, 1994) reported abundances of water birds in the vicinity of Basrah. Salem (1995) and Al-Robaae & Salem (1996) surveyed three swamps near Basrah, as well as Razzaza Lake in the same area, for ducks during the 1993-1994 migratory season. These surveys covered only small and marginal parts of the Marshes and hence cannot be compared with the above data.

4.6.4.3 Recent accounts of Marsh avifauna

The draining of the Marshes in the 1990s led to profound changes in their ecosystem and avifauna, because of the massive destruction of habitat during this period (Mitchell 2002). Therefore, the information available from before the draining cannot be extrapolated to the situation afterwards, and a new baseline for bird monitoring had to be established after the partial marsh reflooding in 2003/04.

Salim et al. (2009b) recorded 159 species of birds from seven areas in southern Iraq (Middle Euphrates, Seasonal, Al-Hawizeh, Shatt Al Arab, Khor Al Zubayr Cental and Hammar Marshes) during surveys (both summer and winter) from 2005 to 2008 (Appendix 4.9.). 53 species were recorded as breeding with a further 10 possibly breeding. 44 species are considered to be resident. In addition, 110 species were observed as winter visitors from their European and Asian breeding areas.

Abed (2007) recorded a total of 57 species of water birds in three restored marshes during monitoring period (May 2004-May 2005). He found 54 species in Al-Hawizeh, 40 at Suq Shuyukh and 29 in East Hammar. The Pygmy Cormorant *Phalacrocorax pygmeus* was the dominant species in Al-Hawizeh Marsh, while Little Egret *Egretta garzetta* dominated in Suq Shuyukh and East Hammar marshes (together with gulls in the latter). Higher numbers of individuals were recorded in Al-Hawizeh Marsh than in other marshes (Table 4.4.). A detailed species list is included in Appendix 4.10.

Abed (2007) also compared bird abundances to those reported by earlier studies (see Table 4.10.). Taken at face value, a comparison of Table 4.10. and earlier numbers suggests that overall bird abundances and species numbers declined dramatically between the 1970s and 2007. However, such comparisons need to be interpreted with extreme caution as different study areas were covered by the individual surveys cited, and survey effort may have differed. This was already noted by Koning & Dijksen (1973) who could not say whether their counts represented 1% or 10% of the total birds present in the Marshes, and by Carp & Scott (1979), who calculated that they had perhaps only covered 10% of the suitable areas with their counts.

Table 4.10. Comparison of the number of species and individuals recorded in 2007 in different marsh areas (Source: Abed 2007).

Marsh	No. of species	No. of individuals
Hawizeh	54	9,399
Suq Shuyukh	40	1,975
East Hammar	29	1,998

In a separate paper, Abed (2008b) described earlier studies on the bird fauna of Al-Hawizeh, Suq Shuyukh (in West Hammar) and East Hammar between June 2004 and August 2006. According to this publication, 78 species were recorded in the three marshes combined. 58, 46 and 30 species were recorded in Al-Hawizeh, Suq Shuyukh and East Hammar, respectively, during the first year, while 62, 53 and 53 species, respectively, were recorded in the three marshes respectively during the second year. The author ascribed the apparent increase in species number to restoration and even calculated restoration indices, but the decline in species number the following year (Abed 2007) shows that it may have been premature to attribute the variability between these two years to long-term restoration.

Another survey during the 2005/06 and 2006/07 winters focused specifically on migratory ducks at West Hammar Marsh (Abed 2008a). The total number of birds was rather different between winters, with 68,723 and 11,044 for the first and second winter, respectively. Observed species include Mallard *Anas platyrhynchos*, Gadwall *A. streptera*, Teal *A. crecca*, Garganey *A. querquedula*, Wigeon *A. penelope*, Pintail *A. acuta*, Shoveler *A. clypeata*, Marbled Duck *Marmaronetta angustirostris*, Tufted Duck *Aythya fuligula*, Pochard *A. ferina*, Ferruginous Duck *A. nyroca* and Red-crested Pochard *Netta rufina*. One species each of shelduck (*Tadorna tadorna*) and goose (*Anser anser*) were also reported. *Anas penelope* and *A. strepera* were the most abundant species during the study. A comparison was made to total duck counts from various marshes during the 1970s and 1980s (Scott 1995, Carp 1975, Koning & Dijksen 1973, Georg & Vielliard 1970). Again, this comparison suggests that current abundances may be much lower than those reported from the 1970s and 1980s, but this trend is blurred by strong variation between historical surveys and the abovementioned inconsistencies between surveys regarding geographical scope and effort.

A particular focus of recent studies on Marsh avifauna has been the effect of the post-2003 reflooding. Richardson et al. (2005) reported species recovery/return at three former marshland sites (Abu Zarag, Hammar, and Suq Al-Shuyukh), but with varying degrees of success and at different rates (Richardson et al. 2005). Richardson & Hussain (2006) came to similar conclusions, noting reduced densities in reflooded sites in comparison with historical records. Box 4.25. lists the five dominant species found in Al-Hawizeh, Suq Al-Shuyukh and Hammar by Richardson & Hussain (2006), respectively.

Richardson & Hussain (2006) also interpreted their data in terms of habitat restoration. They noted that the Hawizeh Marsh had higher abundances than the reflooded Hammar (53 versus 29 species), and attributed the 50% proportion of breeding species among the total species count marsh recovery.

Box 4.25. List of the five most common bird species in three different marshes.

Hawizeh	**Suq Al-Shuyukh**[1]	**Hammar**
(Natural marsh)	(Reflooded marsh)	(Reflooded marsh)
Phalacrocorax pygmeus	*Egretta garzetta*	*Egretta garzetta*
Egretta garzetta	*Ceryle rudis*	*Larus ridibundus*
Tachybaptus ruficollis	*Ardeola ralloides*	*Larus genei*
Larus canus	*Ardea purpurea*	*Larus canus*
Larus ridibundus	*Vanellus leucurus*	*Sterna albifrons*

Source: Richardson & Hussain (2006)

[1]part of West Hammar

4.6.4.4 Globally threatened and endemic bird species and subspecies of the Marshes

The IUCN Red List of Threatened Species (IUCN 2010) lists as vulnerable, endangered or critically endangered 15 bird species that have been recorded in the Marshes (Box 4.26.). However, one of these is a desert species that does not depend on the marsh ecosystem, and for another four of them there have been no reliable records from the Marshes during the last 50 years.

Box 4.26. Globally threatened bird species of the Marshes (vulnerable or higher)

Regular records		
Basrah Reed-warbler (*Acrocephalus griseldis*)	breeding	EN
Lesser White-fronted Goose (*Anser erythropus*)	wintering	VU
Greater Spotted Eagle (*Aquila clanga*)	wintering	VU
Eastern Imperial Eagle (*Aquila heliaca*)	wintering	VU
Macqueen's Bustard (*Chlamydotis macqueenii*)	breeding[1]	VU
Lesser Kestrel (*Falco naumannii*)	passage	VU
Marbled Teal (*Marmaronetta angustirostris*)	breeding and wintering	VU
Egyptian Vulture (*Neophron percnopterus*)	passage	EN
Dalmatian Pelican (*Pelecanus crispus*)	wintering[2]	VU
Isolated records		
Red-breasted Goose (*Branta ruficollis*)	rare winter vagrant[3]	EN
Saker Falcon (*Falco cherrug*)	scarce winter visitor[3]	EN
Pallas's Fish-eagle (*Haliaeetus leucoryphus*)	scarce winter visitor[3]	VU
Slender-billed Curlew (*Numenius tenuirostris*)	regular winter visitor	CR
White-headed Duck (*Oxyura leucocephala*)	rare winter visitor[4]	EN
Sociable Lapwing (*Vanellus gregarious*)	passage[3]	CR

[1] desert species, not a marsh species – not truly dependent on Marshes; [2] possibly also breeding; [3] no records over the last 50 years; [4] 19 recorded in the Marshes in 2005 (Salim et al. 2009b)

The species from Box 4.26. for which regular records exist are discussed into more detail below:

- **Basra Reed Warbler** (*Acrocephalus griseldis*): Fahdel (2007) gave a short account of this endemic and globally endangered breeding bird of the Marshes. The bird was described as common in reed beds of the Marshes by Scott & Evans (1994). After a period of uncertainty about its status within the Marshes during which the species continued to be found along its African migration route, it has been regularly encountered (at 25 monitoring stations) in the Marshes between 2005 and 2008. Nature Iraq has also reported an apparent increase in the number of Basra Reed Warblers trapped in East Africa in 2005, possibly reflecting the reflooding of the Marshes in 2004/05 (Salim et al. 2009a, b). It is not known yet if this trend has persisted over subsequent years. (Figure 4.6.)
- **Lesser White-fronted Goose** (*Anser erythropus*): According to Scott & Evans (1994), this globally vulnerable species used to be a regular winter visitor in the Marshes, but has declined in abundance over the second half of the 20th Century. 70 were recorded in December 1972, but none has been found in the post-reflooding surveys (Salim et al. 2009a, b).

Figure 4.6. Basra Reed-warbler in the Marshes. (Photo: Mudhafar Salim, Nature Iraq)

Figure 4.7. Marbled Teal in the Marshes. (Photo: Mudhafar Salim, Nature Iraq)

- **Greater Spotted Eagle** (*Aquila clanga*): Scott & Evans (1994) described this globally vulnerable winter visitor to the Marshes as “fairly common” during winter and mentioned a count of 24 from January 1979. More recently, the species was found at eight different sites and during three out of four winters covered by Nature Iraq’s KBA Programme. The highest individual count was eight (Salim et al. 2009b).
- **Eastern Imperial Eagle** (*Aquila heliaca*): Another fairly common winter visitor, this globally vulnerable species was recorded 34 times in January 1979, and its wintering population in the Marshes estimated at more than 100 birds (Scott & Evans 1994). It has again been found after 2005, at eight survey stations throughout the Marshes and the largest accumulation numbering eight (Salim et al. 2009b).
- **Macqueen’s Bustard** (*Chlamydotis macqueenii*): Macqueen’s Bustard has recently been separated from the Houbara Bustard (*C. undulata*) and occupies the eastern (South-west Asian) part of the distribution range of the species pair. Although it is not listed separately in the IUCN Red List (2010), we assume that its threat category (vulnerable) is identical to that of *C. undulata*. This is a desert species, not a Marsh species in the strict sense, but should nevertheless be considered in the context of conservation management for the Marshes. Recent records form the vicinity of Al-Hawizeh Marsh indicate that the species persists there in spite of significant hunting pressure (Nature Iraq 2008a, Salim et al. 2009b).

- **Lesser Kestrel** (*Falco naumannii*): This globally vulnerable passage migrant crosses the study area in rapid non-stop flights at high altitude in autumn, while large groups migrate back at low altitudes in spring, when it used to be fairly commonly reported from the Marshes (Johnson 1958, Marchant 1961, Scott & Evans 1994). Reportedly seen at Saniya in February 2008 (Nature Iraq 2008d), but not listed by Salim et al. (2009b).
- **Marbled Teal** (*Marmaronetta angustirostris*): This globally vulnerable duck species was characterized as a widespread breeder and summer visitor, with fewer winter records in the Marshes, by Scott & Evans (1994). Since 2005, it has been found at over 30 monitoring sites of Nature Iraq's KBA project, and it has also been reported to be on sale at local markets (Salim et al. 2009a, b). Winter counts in 2009/10 were reportedly also rather high, at 41,000 (Porter, pers. comm.). Figure 4.7.
- **Egyptian Vulture** (*Neophron percnopterus*): This globally endangered species reportedly used to be fairly common on passage (Scott & Evans 1994), but has not been reported recently (Nature Iraq 2008a, Salim et al. 2009a, b). Since this is a conspicuous species, it appears unlikely that it has been overlooked in recent surveys.
- **Dalmatian Pelican** (*Pelecanus crispus*): Scott & Evans (1994) noted that this globally vulnerable species occurs in the Marshes throughout the year; they hypothesized that it might also breed there, but were not aware of definite records. The species has not been reported in the most recent publications on marsh avifauna (Nature Iraq 2008a, Salim et al. 2009a, b).

In addition to the globally vulnerable, endangered and critically endangered species, the Marshes are also used - to varying degrees - by about ten species of globally near-threatened birds, including the Cinereous Vulture *Aegypius monachus*, Ferruginous Duck *Aythya nyroca*, Pallid Harrier *Circus macrourus*, European Roller *Coracias garrulous*, Corncrake *Crex crex*, Cinereous Bunting *Emberiza cineracea*, Semi-collared Flycatcher *Ficedula semitorquata*, Great Snipe *Gallinago media*, Black-winged Pratincole *Glareola nordmanni* and Eurasian Curlew *Numenius arquata* (IUCN 2010, Salim et al. 2009b, Scott & Evans 1994). Among them, the Ferruginous Duck and the Black-tailed Godwit may have particular strongholds in the Marshes (Salim et al. 2009b).

4.6.4.5 Endemic and near-endemic species/subspecies and isolated populations of birds not listed as globally threatened

In addition to these globally threatened species, the endemic Iraq Babbler *Turdoides altirostris* (LC) and the regional endemic Grey Hypocolius *Hypocolius ampelinus* (LC), as well as five endemic subspecies (two of them of waterbirds) and two isolated populations of African waterbirds have been recorded in the Marshes (Box 4.27., Evans 2002).

The endemic subspecies and - to a lesser degree - the satellite populations of African species can be regarded as examples of "evolution in progress". These populations of Marsh birds should be considered of similar conservation value as the populations of globally threatened species because (1) the evolutionary process itself is increasingly seen as a target of conservation management (cf. Pullin 2002), and (2) the possibility that the Marshes have given rise to several examples of ongoing bird evolution highlights the unique quality of these wetlands. These species also contribute to the status of the Marshes as one of only a few global high-priority centers of bird endemism (BirdLife International 2010).

The significance of the existing endemic species and subspecies of birds and other vertebrates in relation to a possible nomination under criterion ix should be explored further in collaboration with international experts on the matter, such as those of the UNEP World Conservation Monitoring Centre (see Section 7.1 for details).

Box 4.27. Endemic subspecies and isolated waterbird populations of the Marshes

Subspecies endemic to Mesopotamia

African (Levant) Darter (*Anhinga rufa chanteri*)	species LC, subspecies possibly CR
Little Grebe (*Tachybaptus ruficollis iraqensis*)	species LC, subspecies possibly VU
Black Francolin (*Francolinus francolinus arabistanicus*)	species LC, subspecies possibly NT
White-eared Bulbul (*Pycnotus leucotis mesopotamiae*)	species LC, subspecies possibly LC
Hooded Crow (*Corvus corone capellanus*)	species LC, subspecies possibly LC

Isolated populations of African species

African Sacred Ibis (*Threskiornis aethiopicus*)	species LC, local population possibly CR
Goliath Heron (*Ardea goliath*)	species LC, local population possibly CR

Source: Evans (2002)

The Little Grebe subspecies is reportedly common and widespread throughout the Marshes (Scott & Evans 1994) and the African (Levant) Darter as well as the Sacred Ibis have been encountered recently there, if at low numbers (Salim et al. 2009b). The Levant Darter may have its last populations in the marsh area, but has seen declines there during the 1980s and 1990s (EA ITAP 2003). In contrast, the Goliath Heron has been described as “elusive” and its presence only suspected based on personal communications by Salim et al. (2009a, b). However, the species was reported in low numbers by Abed (2008b). The status, trends and distribution of all waterbird subspecies and satellite populations need further investigation, as a basis for conservation management.

Finally, two additional subspecies, Zitting Cisticola *Cisticola juncidis neurotica*, and Graceful Prinia *Prinia gracilis irakensis*, are near-endemic to Mesopotamia, occurring elsewhere only in the Levant (Evans 2002).

4.6.4.6 Important Bird Areas (IBAs) in the Marshes

Because of their quantitative importance as breeding and particularly wintering areas for waterfowl (see 4.3.3.2) and because of the threatened and endemic species and subspecies they harbor (see 4.3.3.4, 4.3.3.5), the Marshes include an exceptionally high density of Important Bird Areas (IBAs). The relevance of this density to the World Heritage nomination and management planning process is twofold: On the one hand, it highlights the importance of the Marshes for birds, on an international scale, and on the other hand, it provides a tool for the comparison and prioritization of individual sites

Various authors have attempted to provide lists of the principal wetlands of Iraq, from an avifauna point of view. Savage (1968) compiled a preliminary list of wetlands of special importance for wildfowl (ducks, geese, swans and coots), and identified 27 wetlands in Iraq as being of international importance. Georg & Savage (19768b) provided a revised version of this list and reported on the status of the sites. Carp (1980), reviewing all information available up to 1979, produced a list of 19 wetlands in Iraq which could be considered to be of international importance on the basis of Ramsar criteria. This list was further revised by Scott and Carp (1982), who also provided a list of all the wetlands in Iraq which were known or thought to have been of some importance for waterfowl (32 sites).

Finally, Scott (1993) included a total of 33 Iraqi wetlands in his provisional list of wetlands of international importance in the Middle East. In a recent inventory of globally and regionally important sites for the conservation of birds in the Middle East, BirdLife International identified 42 sites in Iraq as being "Important Bird Areas" (Evans 1994, BirdLife International 2010). At least seven are located

within the Marshes (Figure 4.8., Table 4.11.). An update publication on the IBAs of Iraq including the Marshes is scheduled for publication by Nature Iraq early in 2011. Additional information about each of the seven IBAs is included in Appendix 4.11.

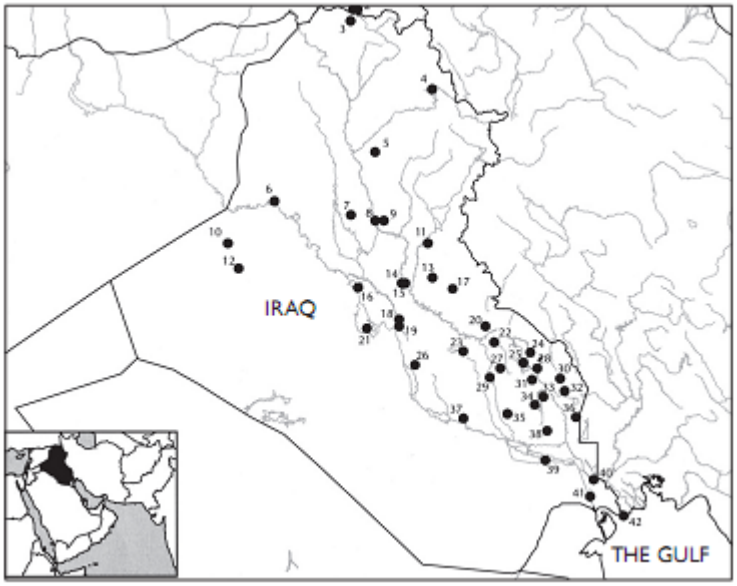

Figure 4.8. IBAs in Iraq. (Source: Evans 1994)

Table 4.11. Major IBAs in the Marshes (BirdLife International 2010).

No.	Site name and code*	Area (ha)	Latitude/longitude	Habitat type	Governorate
IQ030	Haur Chubaisah	42,500	31° 56' N, 47° 20' E	Wetlands	Maysan
IQ032	Haur Om am Nyaj	15,000	31° 45' N, 47° 25' E	Wetlands	Maysan
IQ033	Haur Al Rayan and Umm Osbah	25,000	31° 40' N, 47° 1' E	Wetlands	Maysan
IQ 034	Haur Auda	7,500	31° 33' N, 46° 51' E	Wetlands	Maysan
IQ 036	Hor Al-Hawizeh	220,000	31° 22’ N, 47° 38’ E	Freshwater marshes	Maysan, Basra
IQ 038	Central Marshes - Amara Marshes	300,000	31° 10’ N, 47° 05’ E	Open water, freshwater marshes	Maysan, Thi Qar, Basrah
IQ 039	Hor Hammar	350,000	30° 44’ N, 47° 03’ E	Marshes and lakes	Thi Qar, Basrah

Important bird areas are defined based on either global (A) or regional (in this case Middle East) IBA criteria. According to BirdLife International (2010), all of the abovementioned IBAs fulfill global criteria of importance for birds. A geographically more refined and updated tentative IBA classification of sites included in Nature Iraq’s KBA project was presented by Salim et al. (2009a).

In addition, the criteria that apply to a given site give information about the types of conservation targets present at these sites (e.g. breeding endemic species vs. large accumulations during migration). This information can be used for the management planning at the individual IBA as well as at larger scales (e.g. Natural Heritage sites). This possibility should be explored further during World Heritage management planning.

4.6.4.7 Pressures and threats to the avifauna of the Marshes and their consequences for the integrity of the area's avifauna

The key pressures and threats on avifauna in the Marshes are summarized in Box 4.28. and discussed into more detail below.

Box 4.28. Key pressures and threats to the avifauna of the Marshes

- Habitat loss due to draining, infrastructure construction, or insufficient water supply
- Unsustainable hunting
- Contamination of Marshes with insecticides and herbicides. Indirect negative effects of change in the prey community (e.g. declining fish stocks)

Like with all other groups of the Marshes, the most important pressure on the avifauna has been the loss of habitat due to marsh draining, infrastructure construction, lack of water input, or direct conversion to agricultural use (cf. Partow 2001). In spite of the partial recovery of the Marshes following the re-flooding since 2003, recovery has only been partial, the pressure of habitat loss persists, and lack of suitable habitat may be aggravated by additional losses, for instance to oil exploitation, in the future.

Several additional pressures contribute to the decline of the bird fauna in the Marshes. Salim et al. (2009a) present a matrix of threats to the marshes (not only to avifauna) included in Nature Iraq's KBA project. It includes several pressures relevant to avifauna, including drainage/lack of water, oil pollution, hunting, removal of plant cover through overgrazing, and overfishing. Unsustainable hunting and drainage/lack of water affected most areas (34 and 29 sites, respectively), followed by removal of vegetation (25 sites), overfishing (17 sites), and road construction (16 sites). However, this approach measured merely the extent and not the severity and persistence of pressures.

Birds are the most susceptible to hunting of all Marsh fauna. Hunting and duck netting is part of the livelihood of Marsh inhabitants and has been practiced extensively there for a long time (Alnoori 1976, Maxwell 1957, Thesiger 1964). We did not find reports of historic species extinctions due to hunting, probably because of limitations of earlier hunting technology. Hunting as such is therefore not a pressure on Marsh avifauna – unsustainable hunting levels and techniques are.

Bird hunting occurs almost exclusively in winter (Salim 1962). It is possible that hunting levels are currently unsustainable, particularly in combination with other pressures. Maxwell (1957) estimated that up to a million birds were killed by shotguns every season, and Scott (1995) reported that in the winter of 1991/92, over 40,000 ducks and 40,000 coots were estimated to have been sold in the markets of Karbala and Najaf. Box 4.29. lists species that were mentioned as hunting targets for food or other purposes by Maxwell (1957) and Thesiger (1964). Scott and Evans (1994) and Evans (2002) summarize further information on the importance of hunting as part of the local culture and economy in the Marshes.

Box 4.29. Traditionally hunted bird species

- Ducks (*Anas* spp. and others)
- Coot (*Fulica atra*)
- Little Grebe (*Tachybaptus ruficollis*)
- Pygmy Cormorant (*Phalacrocorax pygmaeus*)
- African Darter (*Anhinga rufa*)
- Goliath Heron (*Ardea goliath*)
- African Sacred Ibis (*Threskiornis aethiopicus*)
- Eurasian Crane (*Grus grus*)
- Purple Swamphen (*Porphyrio porphyrio*)
- Godwits (*Limosa* spp.)
- Pelicans (*Pelecanus* spp.) – for drum making
- Greylag Geese (*Anser anser*) – egg collection

Northern Pintail, Eurasian Wigeon, and Mallard have recently been found on sale at Amara market, Maysan Governorate (Nature Iraq 2010). The globally vulnerable Marbled Duck *Marmaronetta angustirostis* was also found on sale near the Marshes in 2007 (Salim et al. 2009b).

Although not strictly a Marsh species, it has also been reported that Macqueen's Bustard *Chlamydotis macqueenii* is being caught alive in southern Iraq and exported to the Gulf states, where it is presumably used for falconry (Nature Iraq 2010).

Other pressures and threats are less well documented. Insecticides such as Chloridrin are used extensively within the Marshes (apparently also for fishing – Scott 1995) but their effect on birds has not been studied to our knowledge. Insecticides may be enriched along the food web and accumulate in top predators among the birds (e.g. piscivorous species, raptors), leading to various defects including increased egg mortality.

In conclusion, and similar to the other faunal groups, the main pressure to the integrity of the avifauna has been habitat loss due to Marsh draining in the recent past, with hunting also being a significant pressure. These challenges to the overall integrity of the system and the resulting specific management needs are discussed into more detail in Sections 5 and 6 below.

4.6.4.8 Knowledge gaps and research needs

Despite the fact that birds are by far the best studied faunal group of the marshlands, some aspects require further studies as a prerequisite for successful nomination and management planning. Box 4.30. lists particularly urgent research needs.

Box 4.30. Priority research needs regarding the avifauna of the Marshes

- **Conservation status of globally threatened species, endemic subspecies and isolated waterbird populations:** The current status, trends and distribution (within the Marshes) of bird species, subspecies and populations of conservation importance (Box 4.13., 4.14.) - as well as pressures and threats to them - need to be studied further, building on existing initiatives like Nature Iraq's KBA project.
- **Quantitative importance of the Marshes as a wintering area:** It is currently still unclear to what extent the Marshes have returned to their pre-drainage function as a major wintering area within the West Siberia-Caspian-Nile flyway, and hence to what extent they are fulfilling their potential OUV. Coordinated winter surveys - possibly within the framework of the International Waterbird Census (Wetlands International 2010) - should be arranged to address this issue, to the extent permitted by the security situation, and results should continue to be uploaded to the World Bird Database (BirdLife International 2010).
- **Improved understanding of hunting pressure and sustainable hunting thresholds:** As a prerequisite for sustainable hunting management in a mixed World Heritage site in the Marshes, the current hunting impact on avifauna (particularly migratory waterbirds) should be assessed and possible sustainable harvest rates and procedures derived, jointly with local resource users.

In addition, the following knowledge gaps should be closed during the further development of the mixed World Heritage site in the Marshes:

- **Avifauna data management:** A geo-referenced database for important bird species should be established, indicating historical and recent records, and based on existing databases. The full version could be used as a management planning and monitoring tool, while a simpler version without exact locations could be made publicly available.
- **Improved understanding of endemic subspecies and isolated populations:** Molecular studies are required to gain a better understanding of the distinctness of endemic subspecies

and isolated populations inhabiting the Marshes, and hence of their contribution to the unique biodiversity which could be recognised in any future nomination.

4.6.5 Mammals

Box 4.31. Contribution of the mammals to the biodiversity values of the Marshes

- **Key habitat for globally threatened endemic species and subspecies:** The Marshes are the main stronghold for a globally endangered endemic bandicoot species and for the endemic subspecies of a globally vulnerable otter species. The latter subspecies itself appears to be critically endangered. In addition, the Marshes hold populations of a near-threatened, near-endemic jerboa species and of a near-endemic gerbil species.
- **Isolated occurrence of globally threatened aquatic and semi-aquatic mammals:** The Marshes are an island of occurrence of aquatic and semi-aquatic mammals in an arid ecoregion. They hold populations of several globally threatened species of bats, carnivores and rodents.

4.6.5.1 Mammals of Iraq

The mammalian fauna of Iraq consists of 74 species, including insectivores (6), bats (15), carnivores (19), artiodactyls (8) and rodents (25). The taxonomic and conservation status of some of them (particularly carnivores and artiodactyls) requires further confirmation. An updated list of the mammals of Iraq was prepared by Amr (2008). It was based on several resources that were updated to the present taxonomic standards, mainly Harrison (1956a b, c), Hatt (1959), Harrison (1964, 1968, 1971), Nader (1971), Kock & Nader (1983), Harrison & Bates (1991), and Al Robaae & Kingswood (2001). Allouse (1955) gave a comprehensive list of the pre-1950 literature on the mammals of Iraq.

Several species that were listed previously with the mammals of Iraq were withdrawn following re-examination of specimens. For example, Hatt (1959) recorded the bat *Eptesicus nilssoni*, which was reassigned later to *Eptesicus bottae*. All records of another bat species, *Vespertilio matcschiei pellucens* Thomas, 1906 and *Eptesicus walli* Thomas 1919 from Iraq are now considered as *Eptiscus nasutus*.

Among the rodents, Khajuria (1981) described the bandicoot rat *Erythronesokia bunnii* from Iraq which was considered doubtful and tentatively assigned under *Nesokia indica* by Harrison & Bates (1991). However, this report follows Khajuria (1981) and the IUCN Red List in considering the genus invalid but accepting the species as *Nesokia bunnii* (IUCN 2010).

4.6.5.2 Mammals of the Marshes: historical perspective

The Marshes used to be home to several prominent mammal species. For example, Thesiger (1954) told of killing 488 wild pigs *Sus scrofa* in two years around Hor Hammar. Drower (1949) recorded that wild boars lived in the marshes of Haur Al-Hawizeh and that they occasionally attack boats or even automobiles.

In total, 38 species of mammals have been recorded from the Marshes and their immediate vicinity (Appendix 4.12.), records mainly from Harrison & Bates 1991 and Scott 1995). Insectivora are represented by five species, and bats are represented by eight species (including the globally vulnerable Long-fingered Bat *Myotis capaccinii*).

Two otter species have been reported from the marshlands; the Common Otter *Lutra lutra* and the Smooth-coated Otter (or Maxwell's Smooth-coated Otter) *Lutrogale perspicillata maxwelli*. Both Maxwell (1957) and Thesiger (1964) saw otters on a number of occasions, and describe them as common around Haur Az Zikri in the Central Marshes and at Al-Hawizeh. However, both species were

heavily persecuted for their skins in the 1950s already (Thesiger 1964), and are now considered extremely rare in the Marshes.

The Lion *Panthera leo* survived in thickets of the marshlands into the 20th Century, but was finally exterminated when the Marsh Dwellers acquired modern rifles during the First World War. The Leopard *Panthera pardus* is also extinct in lower Mesopotamia; there is only one record from the Marshes - an individual shot in 1945 just above Kut by the River Tigris. Additional historical data are summarized by Hatt (1959). Kock (1990) presented a comprehensive review on the Tiger *Panthera tigris* in Iraq.

Box 4.32. Domestic mammalian fauna of the Marshes: The Water Buffalo

Although not part of the wild biodiversity of the Marshes, the Asian Water Buffalo *Bubalus bubalis* is a common and characteristic domestic animal there. There are several theories about its introduction to the area. Hatt (1959) suggested, based on archaeological evidence, that the wild water buffalo *Bubalus arnee*, which is now extinct in Mesopotamia, already occurred wild in the Marshes before domestication. Others believe that they were introduced to the marshes of southern Iraq from India thirteen centuries ago (Abid & Fazaa 2007). Both theories would be consistent with general available information on the paleaozoogeography of *B. arnee* (IUCN 2010). According to Maxwell (1957), there is evidence to suggest that these animals were first introduced into Mesopotamia in about 3500 BC.

About 40,000 water buffalos occur in the southern marshes (Abid & Fazaa, 2007). This in turn affects the local economy for the local communities. Water buffalo are kept for their milk and meat and are considered an important economical mainstay of the Marsh inhabitants. They have been described as cultural flagship species of the Marshes. This means they are an important part of their natural resource based traditional economy and culture, which should be considered further in relation to the cultural World Heritage Criterion V.

Other large mammals which are still regularly encountered in the Marshes include the Golden Jackal *Canis aureus,* the Red Fox *Vulpes vulpes* and the Small Indian Mongoose *Herpestes auropunctatus*. Various other mammals, notably the Grey Wolf *Canis lupus*, the Honey Badger *Mellivora capensis*, the Striped Hyaena *Hyaena hyaena*, the Jungle Cat *Felis chaus*, the Goitred Gazelle *Gazella subgutturosa* and the Indian Crested Porcupine *Hystrix indica* have been recorded in and around the Marshes in the past, but had become rare by the 1980s. It is thought likely that most of these species are now extinct in the area (Scott 1995).

Small mammals recorded in and around the Marshes include the above mentioned species of bandicoot rat *Nesokia bunnii* (=*Erythronesokia bunnii*), the near-endemic Harrison's Gerbil *Gerbillus mesopotamiae*, a hedgehog, three species of shrews, between 8 and 11 species of insectivorous bats, the near-endemic Euphrates Jerboa *Allactanga euphratica*, four other species of rats and mice, and three other species of gerbils and jirds (Scott 1995). The most common rodent in the area is the Short-tailed Bandicoot *Nesokia indica*, a species which is particularly associated with the banks of wetlands.

Over the last 30 years, there have only been scattered publications about the mammals of Iraq. Most notably, Al Robaae (1977) and Khadim (1981) studied the distribution of *N. indica* and *Tatera indica*. Both species are associated with river banks and wetlands. Also, the distribution of the Indian Crested Porcupine *Hystrix indica* (Kadhim 1997), the Indian Gerbil *Tatera indica* (Kadhim 1998), the Euphrates Jerboa *Allactaga euphratica* and the Lesser Egyptian Jerboa *Jaculus jaculus* (Kadhim et al. 1979) were studied, with records from the Marshes. Thalen (1975) gave an account on the distribution of the Caracal (*Caracal caracal*) in the area. Other reports include distributional records for rodents.

4.6.5.3 Current status of mammals in the Marshes

There have been no systematic field studies on the mammals of the Marshes since 2003. The latest revision of the Iraqi mammals was published by Kadhim et al. (1977). During a recent programme on Key Biodiversity Areas in the Iraqi marshlands (Abdulhasan & Salim 2008, Salim et al. 2009), mammals were only covered on an anecdotal and opportunistic basis. None of the reports discussed the status of the wild mammals in the Marshes. The same is true for the New Eden Project. However, the latter project produced a list of mammals believed to occur in the Central, Al-Hawizeh and Hammar Marshes (EA ITAP 2003). Similarly, Maltby (1994), Scott (1995) and Evans (2002) merely cited older references on the occurrence of mammals. Scott & Evans (1993) concluded that drainage of the wetlands of Lower Mesopotamia on the scale observed in the 1990s would almost certainly result in the global extinction of *Nesokia bunnii* and the endemic subspecies *Lutrogale perspicillata maxwelli*, and would cause perhaps as much as a 50% reduction in the world populations of *Gerbillus mesopotamiae*.

Recently, Haba (2009) investigated the mammals of the Marshes, particularly Hammar and the Central Marshes. He recorded the Golden Jackal *Canis aureus*, the Wild Boar *Sus scrofa*, the introduced Cape Hare *Lepus capensis*, an unidentified wild cat and the Brown Rat *Rattus norvegicus*.

4.6.5.4 Globally threatened mammal species in the Marshes

Six species that are known to occur in the Marshes are globally threatened, according to the IUCN Red List of Threatened Species (Box 4.33.). Three of them are near-threatened, one is endangered and two are vulnerable. The occurrence of Goitered Gazelle *Gazella subguttorosa* has not been confirmed recently, but its presence is possible.

Box 4.33. Globally threatened mammal species of the Marshes (near-threatened or higher)

Bats (Chiroptera)	
Long-fingered Bat (*Myotis capaccinii*)	VU
Carnivora (Carnivora)	
Smooth-coated Otter (*Lutrogale perspicillata maxwelli*)[1]	VU
Eurasian Otter (*Lutra lutra*)	NT
Striped Hyena (*Hyaena hyaena*)	NT
Ungulates (Artiodactyla)	
Goitered Gazelle (*Gazella subgutturosa*)[2]	VU
Rodents (Rodentia)	
Euphrates Jerboa (*Allactaga euphratica*)	NT
Bunn's Short-tailed Bandicoot Rat (*Nesokia bunnii*)	EN

[1] The endemic subspecies is likely to be critically endangered or extinct; [2] Not a marsh species – not truly dependent on Marshes, and possibly locally extinct

The *Lutrogale perspicillata* occurring in the Mesopotamian marshes has been described as a distinct subspecies *maxwelli* by Hayman (1957). It was discovered in 1956 at Al-Hawizeh Marsh by Maxwell

(1957), who obtained a live otter cub. There have been only two further records of *L. perspicillata* in Iraq, both in the late 1950s from the region of Al Azair in the Central Marshes (Scott 1995), and it is possible that the endemic subspecies *maxwelli* is now extinct. However, recent (2008) collections from southern Iraq suggest that the Smooth-coated Otter may still be present there. These reports are awaiting confirmation (A. Bachmann/Nature Iraq, pers. comm.).

Bunn's Short-tailed Bandicoot Rat *Nesokia bunnii* was discovered in late 1970s in the Central Marshes at Qurna (Khajuria 1980). Little is known about the species, but it appears to be confined to the Marshes. Nader (1989) highlighted the urgent need to protect this rare and endemic species. Notable among the bats is the rare and declining Long-fingered Bat *Myotis capaccinii*, which has been recorded at Kish on the edge of the Marshes (Scott 1995).

In addition to the globally threatened species, Harrison's Gerbil *Gerbillus mesopotamiae* is known only from the vicinity of wetlands in lower Mesopotamia and adjacent Khuzestan in southwestern Iran. It is classified as least concern but declining by the IUCN Red List and its status and trends in the Marshes should be monitored further.

4.6.5.5 Pressures and threats affecting mammals in the Marshes and their consequences for integrity

Box 4.34. Key pressures and threats to the mammals of the Marshes

- Habitat loss due to draining, infrastructure construction or conversion to agriculture, or insufficient water supply
- Unsustainable hunting and poisoning, including for trade
- Contamination of Marshes with insecticides and herbicides
- Indirect negative effects of change in the prey community (e.g. declining fish stocks)

Drainage of the marshland, the expansion of agricultural and other economic use and the resulting habitat destruction/degradation are the paramount general threats to all mammal species in the Marshes.

Hunting is the major secondary threat, but no quantitative data have become available on specific threats since Thesiger (1954) told of killing 488 wild pigs there. Hunting appears to be the main cause for the decline or extension of several species such as the Goitered Gazelle *Gazella subgutturosa*. All carnivores (such as the Common Otter *Lutra lutra* and Smooth-coated Otter *Lutrogale perspicillata*) are under severe pressure from persecution as piscivores (and competitors to fisheries) and hunting for their skin. A recent report draws the attention to links between hunting and the international wildlife trade (Nature Iraq 2010). According to this report, hunted specimens of otters have been exported to Turkey.

Canids and other carnivores are also persecuted - shot or poisoned - in the Marshes (Haba 2009). While most of them are globally least concern or near-threatened only (IUCN 2010), the status in Iraq may be very different as many are probably declining. Species such as the *Canis aureus*, *C. lupus*, *Lutra lutra*, *Hyaena hyaena*, *Caracal caracal* and *Felis* spp. require immediate field assessment and conservation measures throughout the country.

The Euphrates Jerboa *Allactanga euphratica* may be netted or hunted for consumption as a delicacy. Also, Indian Crested Porcupines are widely hunted and trapped in central Iraq, along the Tigris, and the same may be true in the Marshes. These are exported to Kuwait, UAE, and Saudi Arabia in addition to being sold in Iraqi markets for local use (Nature Iraq 2010).

A publication on animal (including mammal) trade in Iraq is scheduled for publication by Nature Iraq in the near future. The consequences of the main pressures and threats to Marsh mammals, as well as needs for targeted conservation management that arise from them, are discussed into further detail in Sections 5 and 6 of this report.

4.6.5.6 Knowledge gaps and research needs regarding the mammals of the Marshes

The mammalian fauna of the marshes is not as well-studied as their avifauna or ichthyofauna. Some key knowledge gaps and research needs that should be addressed during the World Heritage nomination and planning process remain, particularly regarding the current status of some of the globally threatened and endangered species in the Marshes.

Box 4.35. Key research needs regarding the mammal fauna of the Marshes

- **Current status of endemic and globally threatened species:** The current status, distribution, and trends of mammals of global conservation status (principally *Lutrogale perspicillata*, *Allactagus euphraticus*, *Nesokia bunnii* and *Myotis cappacinii*), as well as the main pressures and threats, need to be studied to facilitate an up-to date assessment of the mammals' contribution to the OUV of the Marshes, and as a prerequisite for the demarcation of protected areas and conservation management planning.
- **Current impact of hunting and persecution on mammals:** The current impact of hunting and persecution of mammals (particularly carnivores), as well as root causes for hunting pressure need to be studied, in preparation for management interventions aimed at reducing hunting pressure. This could be integrated into national assessment and conservation programmes for carnivores in Iraq.
- **Assessment of insectivorous bats in the Marshes:** The Marshes are important habitats for numerous insectivorous bats, which need to be assessed further. The European Bats Agreement has recently increased its none-party range to include Iraq, which may present an opportunity to initiate such assessments.

4.6.6 Invertebrates

Box 4.36. Contribution of the invertebrates to the biodiversity values of the Marshes

- **Key habitat for endemic species and subspecies:** The Marshes are an important habitat for several globally threatened dragonfly species and may be home to additional globally threatened butterfly species.
- **Crucial nursing ground for diadromous shrimps from the Arabian Gulf:** The Marshes are used as nursing grounds by diadromous populations of penaeid shrimps, which are commercially harvested in the Arabian Gulf.
- **Poorly studied and untapped reservoir of invertebrate biodiversity:** The invertebrate fauna, which tends to be the most species rich of all faunal groups in most ecosystems, has been studied incompletely in the Marshes. It represents a poorly understood but potentially huge reservoir of biological diversity.

4.6.6.1 Invertebrates of Iraq

Invertebrates are the most species-rich group among the fauna and play a pivotal role in most ecosystems, including wetland ecosystems. It would be beyond the scope of this report to give an overview of the invertebrates of the whole range of habitats in Iraq, and even the discussion of Marsh invertebrates has to rely on fragmentary information because information about the invertebrates of this area is very incomplete. However, some key groups cans be put into the wider faunistic context.

Dragonflies: Dragonflies are an important component of freshwater ecosystems and excellent indicators of habitat changes (Schneider 1982, Van Straalen 1997). With about 40 species, the Iraqi dragonfly fauna is rich. It has been investigated by several authors (Morton 1919, 1920, 1921, Sage 1960a-c, St. Quentin 1964, Asahina 1973, 1974). Recent studies since the 1990s have been carried out by Iraqi entomologists (Abdul-Karim 1994, Hassan et al. 2000, Ali et al. 2002). Asahina (1973, 1974) recorded 41 species from Iraq, including the South. He included some 1970 records from Basrah. Species recorded during this period included *Orthetrum sabina*, *Crocothemis servilia*, *Crocothemis erythraea*, *Diplacodes lefebvrii*, *Brachythemis fuscopalliata*, *Trithemis annulata* and *Selysiothemis nigra* (Asahina 1974).

4.6.6.2 Invertebrates of the Marshes

The invertebrate fauna of the Marshes is reviewed based on fragmentary information only as it has not been studied extensively. Mollusks (including gastropods and bivalves) as well as arthropods (including isopods, amphipods and insects –particularly the dragonflies and beetles) are discussed.

Mollusks: The Mesopotamian freshwater malacofauna was first described by Mousson (1874). Subsequent studies on their ecology included misinterpretations (Annandale 1918). Earlier systematic misunderstandings and errors were partly corrected by Annandale (1918, 1920), Annandale & Prashad (1919), Germain (1924), and Haas (1969). Al-Dabbagh & Daod (1985) studied the ecology of three species near Shatt Al-Arab, southern Iraq. Abdul-Saheb (1989) studied the life history and productivity of two species of freshwater mussels in the Marshes. Al-Qarooni (2005) recorded five species of snails (*Lymnaea auricularia, Physa acuta, Bellamya bengalensis* and *Gyraulus* sp.) in three restored marshes. More recently, Plaziat & Younis (2005) reviewed the mollusks of southern Mesopotamia (see Appendix 4.13.), while Ali et al. (2007) compared mollusks in three restored marshes, including 15 gastropod and three bivalve species (Appendix 4. 14.).

Crustaceans: Two subspecies of shrimps, *Atyaephyra desmarestii mesopotamica* and *Caridinia baboulti basrensis*, were described from Shatt Al-Arab region (Al-Adhub 1987). Three species of crabs (*Elamenopsis kempi*, *Sesarma boulengeri*, *Sesarma* sp.) where recorded from Al-Hawizeh and Al-Hammar Marshes (Ali et al. 2007). Naser (2009) recorded *Potamon mesopotamicum* from the Al-Hawizeh Marshes.

The penaeid shrimp *Metapenaeus affinis*, undertakes seasonal migrations between spawning grounds in the gulf and nursery and feeding grounds in the East Hammar (Mathews et al. 1986, Salman et al. 1990). This species has considerable economic importance, which imparts indirect economic value to the Marshes as well. According to a recent account by Ali et al. (2007), dominant species among the freshwater shrimps (Atyidae) in the restored Marshes include *Caridina b. basrensis* and *Ataephyra desmarestii mesopotamica*.

The calanoid copepod fauna of the Iraqi Marshes is poorly documented. Gurney (1921) noted *Canthocamptus staphylinus*, *Diaptomus vulgaris*, *Diaptomus blanci* and *Diaptomus chevreuxi*. Recently, Khalaf (2008) described the new species *Phyllodiaptomus irakiensis* from the River Shatt Al-Arab at Al-Fao. Mohamed and Salman (2009) found this and three species of calanoid copepods in the Marshes: *P. irakiensis*, *Acanthodiaptomus denticornis* and *A. salinus* were found in Hammar and Al-Hawizeh Marshes, while *Eudiaptomus vulgaris* was only recoded in Al-Hawizeh. The amphipod *Paryhale basrensis* has also been found in the Marshes (Ali et al. 2007).

Dragonflies: 25 dragonfly species are known to occur in the central and southern Iraqi Marshlands (Boudot et al. 2009). This list is based on records before and after 1980s (Appendix 4.15.). Hassan et al. (2000) reported *Anax* spp. and *Ischnura evansi* from several stations along Shatt al-Arab. Ali et al. (2002) studied the seasonal abundances of *Ischnura evansi* and *Brachythemis fuscopalliata* in the Qarmat Ali region near Basrah. *B. fuscopalliata* has in recent times been limited to a few areas of preferred habitat, including southern Iraq (Dumont 1972). Salinity of the Marsh water probably is an important factor determining dragonfly distribution. Dragonflies inhabiting rivers and marshes in arid regions such as southern Iraq (e.g. *Hemianax ephippiger*, *Ischnura evansi* and *Lindenia tetraphylla*) are tolerant of high salinity (Corbet 1999).

Beetles: The aquatic coleopterans of Iraq have been studied by Ali (1976, 1978a, b), but we were unable to list recorded species due to lack of access to the sources. Although it is unlikely that beetles will contribute dramatically to the overall OUV assessment of the Marshes, the abovementioned publications should be acquired and consulted in the course of further management planning for the area. At least 55 species of water beetles of the family Dytiscidae and 15 species of the family Gyrinidae occurred in the Shatt Al-Arab and Marshes (Ali 1978a, b).

Other invertebrates: Among the Annelids, *Lumbricus sp.* and two unidentified species were reported from the Marshes (Ali et al. 2007), and other oligochaets like *Stylaria* spp. and *Tubifex* spp. are also known to occur there, if at low densities (Evans 2002). In addition, Ali et al. (2007) reported about 40 insect species including Odonata, Coleoptera, Neuroptera and others in the Marshes.

4.6.6.3 Differences between the invertebrate fauna of individual Marshes

There is only limited information about the distribution of invertebrates between the individual Marshes, but some interesting data for the mollusks have been published by Ali at al. (2007) and New Eden Group (2006). These data show that the more brackish Hammar Marsh tended to comprise a higher snail biodiversity as two other Marshes (Table 4.12.). This gives rise to the hypothesis that Hammar provides different habitats to mollusks and possibly other fauna than the other Marshes (possibly related to its salinity or habitat links to coastal areas), which would emphasize its importance within the range of habitats provided by the Marshes. However, this is only a hypothesis at this stage, which needs to be tested further.

4.6.6.4 Endemic and globally threatened invertebrates of the Marshes

According to IUCN (2010), four species of dragonflies occurring in Iraq are globally near-threatened, vulnerable or data deficient (Box 4.37.). In an assessment focused on the Mediterranean region, Boudot et al. (2009) considered *Sympecma paedisca* as endangered, *Lindenia tetraphylla* as near-threatened and *Onychogomphus flexuosus* and *Brachythemis fuscopalliata* as vulnerable (Appendix 4.15.). All these species also occur in the Marshes.

Gomphus kinzelbachi was originally described by Schneider (1984) from Khanagin on the Alwand River (northern Iraq) and from eastern Iraq close to the Iranian border. This globally data deficient species is only known from Iraq and Iran and considered a regional endemic. Its distribution in the Marshlands and southern Iraq is not known and needs to be ascertained.

Table 4.12. Occurrence of snail species in Suq Shuyukh, Al-Hawizeh, and Hammar (Source: Ali et al. 2007).

	Hammar	Hawizeh	Suq Shuyukh
Bellamya bengalensis	+	+	+
Bellamya unicolor	+	+	+
Bulinus truncatus	+	+	-
Gyraulus costulatus	+	+	+
Lymnaea auricularia	+	+	+
Lymnaea gedrosiana	+	+	-
Lymnaea natalensis	+	+	+
Melanoides nodosum	+	-	-
Melanoides tuberculata	+	+	+
Melanopsis nodosa	+	+	+
Melanopsis praemorsa	+	-	+
Physa acuta	+	+	+
Pila ovatus	+	-	-
Theodoxus jordani	+	+	+
Gyraulus convexiusclus	-	+	-
Corbicula fluminea	+	-	+
Corbicula fluminalis	+	-	+
Unio tigridis	+	-	+
Total No. of species	17	12	12

Apart from the abovementioned dragonflies, no invertebrate species of global conservation status is known to occur in the Marshes. This is not surprising as invertebrates have been assessed to a much lesser degree in the global IUCN Red List of Threatened Species than vertebrates. However, the summary of available information above suggests that some species and subspecies were described

from the Tigris-Euphrates basin including the Marshes. These species should be considered as endemics to this ecosystem and investigated further. It appears likely that there are many additional, as yet undiscovered invertebrate species in the Marshes, particularly among the flightless groups. With the near-complete destruction of the marshes, any such species would now be critically endangered (Evans 2002).

The IUCN Red List of Threatened Species (IUCN 2010) also lists four butterfly species for Iraq (*Archon apollinus* NT, *Parnassius apollo* VU, *Proserpinus proserpina* DD, *Hyles hippophaes* DD), but nothing is known about their occurrence in the Marshes.

Box 4.37. Endemic and globally threatened invertebrates of the Marshes

Gomphus kinzelbachi	DD	Endemic
Brachythemis fuscopalliata	VU	Endemic
Libellula pontica	NT	Occurrence unclear
Anormogomphus kiritshenkoi	NT	Historically common

4.6.6.5 Pressures and threats affecting invertebrates in the Marshes and their consequences for integrity

Aquatic invertebrates are generally vulnerable to fluctuations of water level, changes in salinity and prolonged dryness of the substratum. Dragonflies require water for most of the year. Therefore, drainage and habitat alteration are the main threats to them. The Marshes have been affected by all of them and it is therefore likely that their invertebrate fauna was equally affected by these changes. Extensive use of insecticides and fertilizers, as well as electrofishing and the introduction of alien invasive species, could likewise affect or have affected the Marshes' invertebrate fauna.

Box 4.38. Key pressures and threats to the invertebrates in the Marshes

- Habitat loss due to draining, infrastructure construction or conversion to agriculture, or insufficient water supply
- Contamination of Marshes with insecticides and herbicides
- Electrofishing and fishing with poisoned bait
- Alien invasive species

The dramatic destruction of marsh habitat since the 1990s may already have changed species composition in the Marshes, but this has not been systematically documented. Extensive use of insecticides and fertilizers may also impact dragonflies, particularly their larvae, but their specific effects in the Marshes have not been studied.

The multiple consequences of recent changes of the Marsh ecosystem for the integrity of their invertebrate fauna clearly deserve further investigation. However, habitat loss due to Marsh draining has been the main pressure in the recent past. Its consequences for the overall integrity of the Marsh system and necessary management action are described in Sections 5 and 6 of this report.

4.6.6.6 Knowledge gaps and research needs regarding the invertebrates of the Marshes

The mammal fauna of the marshes is not as well-studied as their avifauna or ichthyofauna. Some key knowledge gaps and research needs that should be addressed during the World Heritage nomination

and planning process remain, particularly regarding the current status of some of the globally threatened and endangered species in the Marshes (Box 4.39.).

In addition to these high-priority research needs, there are additional studies that will also contribute to an increased understanding and improved management of the Marshes in the long term. The invertebrate fauna of the marshlands are poorly known and their ecology poorly studied. In-depth studies to reveal key species and their ecological role within the Marshes - including their role as a trophic link in the food web – would therefore be useful.

Box 4.39. Key research needs regarding the invertebrate fauna of the Marshes

- **Current status of endemic and globally threatened dragonfly and butterfly species:** The current status, distribution, and trends of these relatively easily studied groups in the Marshes should be investigated further, together with the main pressures and threats, as a basis for their use as bioindicators and prerequisite for conservation management planning.
- **Trends of economically important crustaceans:** The status, trends, pressures and threats to economically important shrimps in the Marshes needs to be evaluated as a basis for management planning.
- **Differences of invertebrate fauna between individual Marshes:** Apparent differences among the invertebrate fauna of individual Marshes should be studies more systematically, to gain a better understanding of the range of habitats and provided by the Marshes and the correct demarcation of a future World Heritage site.
- **Effects of salinization and pesticides on dragonflies and butterflies:** Salinization and pesticide contamination of invertebrate habitats are likely to put pressure on many invertebrate populations throughout the Marshes. The more easily studied iconic insect groups should be used as examples to study such effects.

4.6.7 Integrity of the Marshes related to World Heritage criterion x

Box 4.40. The integrity requirement for World Heritage Criterion x **according to the WHC Operational Guidelines (UNESCO 2008)**

Properties proposed under criterion (x) should be the most important properties for the conservation of biological diversity. Only those properties which are the most biologically diverse and/or representative are likely to meet this criterion. The properties should contain habitats for maintaining the most diverse fauna and flora characteristic of the bio-geographic province and ecosystems under consideration. For example, a tropical savannah would meet the conditions of integrity if it includes a complete assemblage of co-evolved herbivores and plants; an island ecosystem should include habitats for maintaining endemic biota; a property containing wide ranging species should be large enough to include the most critical habitats essential to ensure the survival of viable populations of those species; for an area containing migratory species, seasonal breeding and nesting sites, and migratory routes, wherever they are located, should be adequately protected.

Section 4.6 discusses in detail the status, trends, pressures and threats in relation to the most important elements of the biodiversity of the Marshes, according to available information. This discussion also shows how the integrity of specific elements of the Marshes' biodiversity is

compromised by various pressures and makes clear that the biodiversity of the Marshes is far from a pristine state. Many species have declined dramatically during the desiccation crisis of the 1990s and early 2000s, and some may actually be extinct. A wide range of pressures and threats continue to affect most biota of the Marshes, and there is currently no operational management regime to control these pressures and threats.

On the other hand, some key elements of the biodiversity of the Marshes have shown an unexpected recovery since the uncontrolled re-flooding of the Marshes in 2003, and this trend could be continued and enhanced through targeted hydrological and conservation management in the framework of a World Heritage property. Such a management is currently completely absent, which means that there is considerable room for improvement. Marsh vegetation, as a key part of the architecture of the ecosystem there, is already recovering. Propagules for the re-colonization and continued recovery of important parts of the biodiversity are available from the air (e.g. plants, invertebrates, birds) and/or water (plants, invertebrates, fish, amphibians and aquatic reptiles), and some of the mammal species may have survived in Al-Hawizeh Marshes, the only refuge that remained during the desiccation crisis.

The key conclusion from Section 4.6 is that sufficient integrity of the biodiversity of the Marshes (in relation to criterion x) can be achieved, and can only be achieved, through appropriate boundary setting and management of a World Heritage site there. Similar to some species, which are now considered “conservation dependant” by conservationists (cf. IUCN 2010), the Marshes can be considered a management-dependant ecosystem. Management dependency does not reduce their OUV, as generally acknowledged by Paragraph 90 of the World Heritage Operational Guidelines (UNESCO 2008). To the contrary, anthropogenic pressure on most ecosystems globally, including natural World Heritage sites and wetlands in particular, is likely to increase in the future. Management dependency will increase with it, and the Marshes could become a precedent for many more management-dependant properties in the future. This reasoning is further supported by the fact that there is even an artificial natural wetland site (Keoladeo National Park in India) inscribed in the World Heritage list (UNESCO World Heritage Centre 2010).

Additional aspects of structural integrity of the Marshes can be achieved through appropriate boundary setting and zoning, which is described in Section 6.5 below. With appropriate boundaries, zoning and management in place, the integrity of the Marshes may be sufficient to meet the integrity requirement of World Heritage criterion x.

4.6.8 Summary: Applicability of World Heritage criterion x to the Marshes

Section 4.6 takes a detailed look at the diversity and peculiarities of specific taxonomic groups in the Marshes. In combination, the information compiled in this section shows that the Marshes represent an island of exceptionally rich biodiversity in a biogeographic zone that is otherwise characterized by highly arid conditions, desert ecosystems and generally impoverished biodiversity. The key findings of this section across all taxonomic groups, which reflect the unique location and character of the Marsh ecosystem, can be summarized as follows:

- **The Marshes offer habitat to a wide range of recently evolved or evolving endemic species and subspecies, including many vertebrates:** The Marshes, although they are a relatively young ecosystem, are home to 26 vertebrate species and subspecies that are either endemic to the Marshes themselves, or (fishes) to the Euphrates-Tigris system. This is particularly well-illustrated in by the Marshes’ community of breeding birds: Two near-endemic bird passerine bird species breed in the Marshes, but in addition, there are five subspecies of waterbirds that only occur there, and an additional two remote satellite populations of species that have their centre of distribution in Africa, and may hence also be on a trajectory towards speciation. A similarly high incidence of endemic and near-endemic species has been observed in the mammals, while the ichthyofauna of the Marshes is a stronghold for 14 fish species that are endemic to the Euphrates-Tigris basin. A number of endemic dragonfly species have also been reported, and there may be an additional pool of endemic species

among the less conspicuous invertebrate species. However, several of the endemic species and subspecies that constitute this aspect of the biodiversity value of the region are either endangered or critically endangered at the moment, and that the conservation status of many others needs to be studies further.

- **The Marshes are inhabited by 18 globally threatened animal species:** The conservation significance of the Marshes goes beyond the endemic species and subspecies that live there because the Marshes also give shelter to 18 globally threatened (vulnerable, endangered or critically endangered) species. These species include representative of various taxa, such as the endangered White-headed Duck *Oxyura leucocephala*, the endangered Bunn's Short-tailed Bandicoot Rat *Nesokia bunnii* and the vulnerable dragonfly *Brachythemis fuscopalliata*. The contribution of globally threatened plant species to the flora of the Marshes is poorly understood but may be equally high. As with the endemic species, there are major concerns about the conservation status of many of the globally threatened species in the Marshes which urgently need to be addressed through conservation management.
- **The Marshes are one of the most important wintering and resting areas for migratory waterbirds in the Middle East and western Eurasia:** About 278 bird species have been recorded in the Marshes. The area is a crucial part of two major migratory bird flyways, and has had flyway-scale importance for at least 68 bird species in the recent past. For some species, such as White Pelican, Night Heron and Avocet, the Marshes were reported to hold as much as half of the flyway population during parts of the seasonal cycle. The Marshes also are a crucial feeding and nursing area for diadromous fish and crustaceans, including many economically important species.

Section 4.6 shows that the Marshes hold multiple additional biodiversity values. Even if those additional values would probably not provide the basis for a nomination of the area under criterion x in their own right, they are closely linked to the key potential biodiversity values of potential OUV as listed above, and would also benefit from conservation management that is directed at these key values. In addition, the biodiversity of the marshes (e.g. in the form of reed, fish, and waterbirds) is the most important resource for the economy, and hence culture, of the Marsh inhabitants, and therefore underpins the cultural values inherent in the Marshes.

At the same time, significant knowledge gaps regarding the current status of key elements of the biodiversity of the Marshes remain. Only if these knowledge gaps, which are also identified in detail in Section 4.6, are filled, can a detailed global comparative analysis be carried out to determine if a nomination of the area under World Heritage criterion x would be likely to be successful. The results of this study suggest that nomination under criterion x appears promising at the current stage and that additional research to answer existing questions about the current status of the biodiversity of the Marshes will definitely be worthwhile.

4.7 Global comparative analysis

The global comparative analysis is a key requirement not only of the management planning process but also of the Statement of Outstanding Universal Values that needs to be submitted with the nomination file (UNESCO, 2008). The analysis is conducted in order to demonstrate that the values pertinent to the nominated property indeed fulfill the requirement of OUV, in comparison to other sites that are inscribed on the World Heritage list already, or otherwise relevant.

The preparation of such an analysis was not part of the brief of this preparatory study, but the conclusions of this study prepare the ground for such an analysis, by proposing relevant factors and possible comparative sites for the global comparative analysis. The analysis for the identified values of the Marshes should be conducted once all the critical knowledge gaps have been filled.

Box 4.41. Possible factors for global comparative analysis of the Marshes

World Heritage criterion vii (outstanding natural beauty and aesthetic importance)

- Extent and state of the landscape forms considered most relevant to Criterion vii
- Quantity and quality of pieces of art and literature inspired by the site

World Heritage criterion ix (ecological and biological processes)

- Mean annual precipitation and evapotranspiration
- Annual range of water temperature, water depth and inundated area
- Size of the Marshes connectivity among individual marshes
- Major habitat types and their extent
- Annual productivity (g m^{-2} a^{-1}) of reed beds and overall vegetation
- Annual growth rate of reed and recolonization rate since 2003
- Number of wintering and resting waterbirds (individuals) [1],
- Number of migratory bird species and percentage of global population that relies on the Marshes as a breeding, wintering or resting site[1]
- Number of endemic subspecies and species with satellite populations in the Marshes[1]

World Heritage criterion x (biodiversity)

- Number of endemic species
- Number of globally threatened species
- Number of endemic subspecies and African species with satellite[1]
- Number of wintering and resting waterbirds (individuals) [1],
- Number of migratory bird species and % of global population that relies on the Marshes as a breeding, wintering or resting site[1]

General integrity

- Protection status
- Component sites under relevant international designations
- Participation in international conservation schemes and programmes

[1] These criteria are relevant both to World Heritage criterion ix and World Heritage criterion x

4.7.1 Criteria for the global comparative analysis

The criteria chosen for global comparison should be the most relevant to the proposed OUV of the site under the chosen World Heritage criteria, but should also allow a sound comparison between the

nominated site and the other sites to which it is compared. For the Marshes, this means that specific criteria relevant to World Heritage criteria vii, ix and x should be chosen. Possible criteria are summarized in Box 4.41.

4.7.2 Possible sites for global comparative analysis

The global comparative analysis should generally be to comparable sites which have been (or could be) nominated under the same World Heritage criteria as the site in question, do generally belong to a comparable ecosystem type of relevant habitat classification systems (e.g. Abell et al. 2008, Ramsar Convention Secretariat 2008), but are from a different biogeographical realm (Udvardy 1977) and region than the nominated site. As part of IUCN's support to the development of the global network of natural World Heritage sites, Thorsell et al. (1997) provided an analysis of marine and wetland World Heritage sites and including potential additional sites, and Smith et al. (2000) compiled a similar analysis of sites which are of particular importance to biodiversity. These studies were also screened for relevant sites during this study.

Applying this general guidance to the Marshes, they should be compared to other permanent inland deltas (Ramsar Convention Secretariat 2008), or river deltas in general, that have been inscribed or have been recommended for inscription under World Heritage criteria vii, ix and/or x, and that are not located in the Middle East. Table 6.2. lists a number of sites that fit this profile.

Table 4.13. Possible sites for global comparative analysis with the Marshes. (Source: UNESCO 2010b)

Site	Country	Type	Criteria	Precipitation
Danube Delta	Romania	Coastal delta	vii, x	>250 mm
Everglades NP	USA	Various	viii, ix, x	>1,250 mm
Doñana NP	Spain	Coastal marshland	vii, ix, x	>250 mm
Volga Delta	Russia	Coastal delta	Not inscribed	ca. 100 mm
Srebarna NR	Bulgaria	Freshwater lake	x	>500 mm
Djoudj	Senegal	Inland delta	vii, x	>250 mm

Table 4.13. shows that there are no sites that share all properties and criteria with the Marshes, and that there is only one site that is located in an area as arid as the Marshes (the Volga delta). The fact that the Danube and Volga Deltas are coastal deltas (as opposed to the inland delta of the Marshes) is not particularly relevant as these are non-tidal areas that open into a brackish sea/lake. All of the sites listed are important wintering/resting areas for migratory water birds.

Only one to three of the above sites need to be chosen for global comparative analysis by the national preparation team. However, if the case for the potential OUV of the Marshes can be made more convincingly through a comparison to a greater number of sites, than this should be considered. Generally, The Danube Delta and Djoudj (plus the Volga Delta as an uninscribed site), appear to have the greatest relevance to the Marshes, but Doñana National Park is the only site that was inscribed based on World Heritage criterion ix. However, according to the IUCN Evaluation of the nomination of Doñana, the values described under criterion ix are essentially geological and geomorphologic, should more appropriately have been inscribed under criterion viii, and are not relevant if - as recommended by this report – criterion viii is not used for nomination of the Marshes. The Everglades are a rather diverse mosaic of landscapes, including coastal and brackish areas, in an area much more humid then the Marshes, which reduces their comparability. Finally, Srebarna Nature Reserve in Bulgaria is a small lake (<700ha) which may be relevant to any wetland World Heritage site because it illustrates the lower threshold of OUV under criterion x. Considering that Srebarna was granted World Heritage

status, it should be no problem even for a part of the Marshes (e.g. Al-Hawizeh) to prove its OUV under criterion x.

As a preliminary conclusion, suitable comparable sites to the Marshes include the Danube Delta, Djoudj and the Volga Delta as a non-inscribed site, while reference to Srebarna could be made if the current criterion x values, which are still recovering from the draining crisis of the 1990s, appear to compare unfavorably to the other three sites.

The global comparative analysis is essentially a table with the criteria listed in Box 4.41. (plus any additional criteria the national preparation team may chose) as the lines and the sites chosen for comparison representing the columns, with the Marshes occupying the left-hand column next to the criteria. The values of the Marshes will then need to be discussed, demonstrating how the Marshes are at least equal to the sites already inscribed according to the criteria chosen. The uniqueness of the Marshes (particularly regarding its extremely arid environment and exceptionally low precipitation/evapotranspiration ratio) should also be highlighted in this discussion.

5 Overall integrity of the Marshes

The Marshes' integrity with particular regard to the possibly application of World Heritage criteria vii-x is discussed in Sections 4.4 – 4.7 above. A possible World Heritage nomination, and specifically the proposed Statement of OUV, also requires a general statement of integrity that synthesizes these specific statements, and formulates management (including boundary setting) needs to overcome the most important integrity challenges. Based on the specific discussion of integrity under World Heritage criteria vii-x, this statement would need to address the following issues:

Box 5.1. General definition of integrity in Paragraph 88 of the World Heritage Operational Guidelines (UNESCO 2008)

Integrity is a measure of the wholeness and intactness of the natural and/or cultural heritage and its attributes. Examining the conditions of integrity, therefore requires assessing the extent to which the property:

a) includes all elements necessary to express its outstanding universal value;

b) is of adequate size to ensure the complete representation of the features and processes which convey the property's significance;

c) suffers from adverse effects of development and/or neglect.

This should be presented in a statement of integrity.

- **Integrity of the Marshes as a hydrological system:** It needs to be demonstrated that, even if the natural hydrological regime of the Marshes is not fully functional anymore, the hydrological functionality of the Marshes is sufficient to support identified values nominated under the selected World Heritage criteria (and, indirectly, the cultural values of the Marsh inhabitants' culture). Since the current "natural" hydrological regime alone does not fully support these values, this is an essential management issue: The hydrological management plan of the possible future property needs to show how environmental factors on which its potential OUV depends (extent of inundation and water depth, hydroperiod, hydropattern, water quality including salinity, nutrient concentrations and concentrations of pesticides and other toxins, etc.) will be kept within a favorable range for the maintenance of ecosystem and biodiversity values, through targeted hydrological management.
- **Integrity of ecosystem and biodiversity values:** The integrity of the ecosystem and biodiversity values of the Marshes is not only threatened by the compromised hydrological regime but also by other factors, such as hunting, alien and invasive species, habitat destruction through conversion to agricultural areas, eutrophication due to agricultural runoff and other factors. The nomination file needs to explain how the values of the Marshes would be safeguarded through conservation and ecosystem management, in the course of management of the site. Therefore, this is also a management issue, to which generic tools of ecosystem and protected areas management are applicable.
- **Structural integrity:** It needs to be demonstrated that the area or areas chosen for any future nomation of a Marshes World Heritage property contain and support the values identified in the criteria selected for the nomination. Since the exact location of a possible future site within the Marshes is not decided yet, this is essentially a boundary definition issue: The management plan would need to identify and confirm boundaries in such a way that all

identified values (or at least enough of them to still warrant nomination) are contained, and can be subject to hydrological management. Specific issues to address in this context are the possibility of establishing a serial site and the possible need to coordinate management of Al-Hawizeh Marsh (if included) with the management of the Hawr Al Azim on the Iranian side, in order to achieve structural integrity.

- **Aesthetic integrity:** If, as suggested for further consideration in this report, the Marshes were also nominated under World Heritage criterion vii, then the integrity statement would also need to describe how the integrity of the aesthetic values of the Marshes will be safeguarded, including the maintenance of its aesthetic characteristics. This would need to include protection against deterioration of the values of the property from nearby infrastructure (e.g. oil infrastructure).

In conclusion, the general integrity statement of the Marshes would on the one hand demonstrate that integrity of the identified values already exists or can be achieved through management, and will yield general management targets around which the management plan for the possible property could be built.

5.1 Oil development as an emerging threat to the integrity of the Marshes

Iraq strongly depends on revenues from oil export. There are several contracted areas for oil exploration inside and in the immediate vicinity of the Marshes (Figure 5.1.), including **North Rumaila** in the East Hammar area (contracted to BP/CNPC), **West Qurna** in the Central Marshes (contracted to Lukoil/Statoil), **Majnoon** in the South Al-Hawizeh/Majnoon area (contracted to Shell/Petronas), and **Halfaya**, which infringes on North Al-Hawizeh (contracted to CNPC/Petronas/Total). Oil exploration in these areas poses a threat not only to the general ecological integrity, but also specifically to the success chances of a mixed or natural World Heritage nomination of the Marshes.

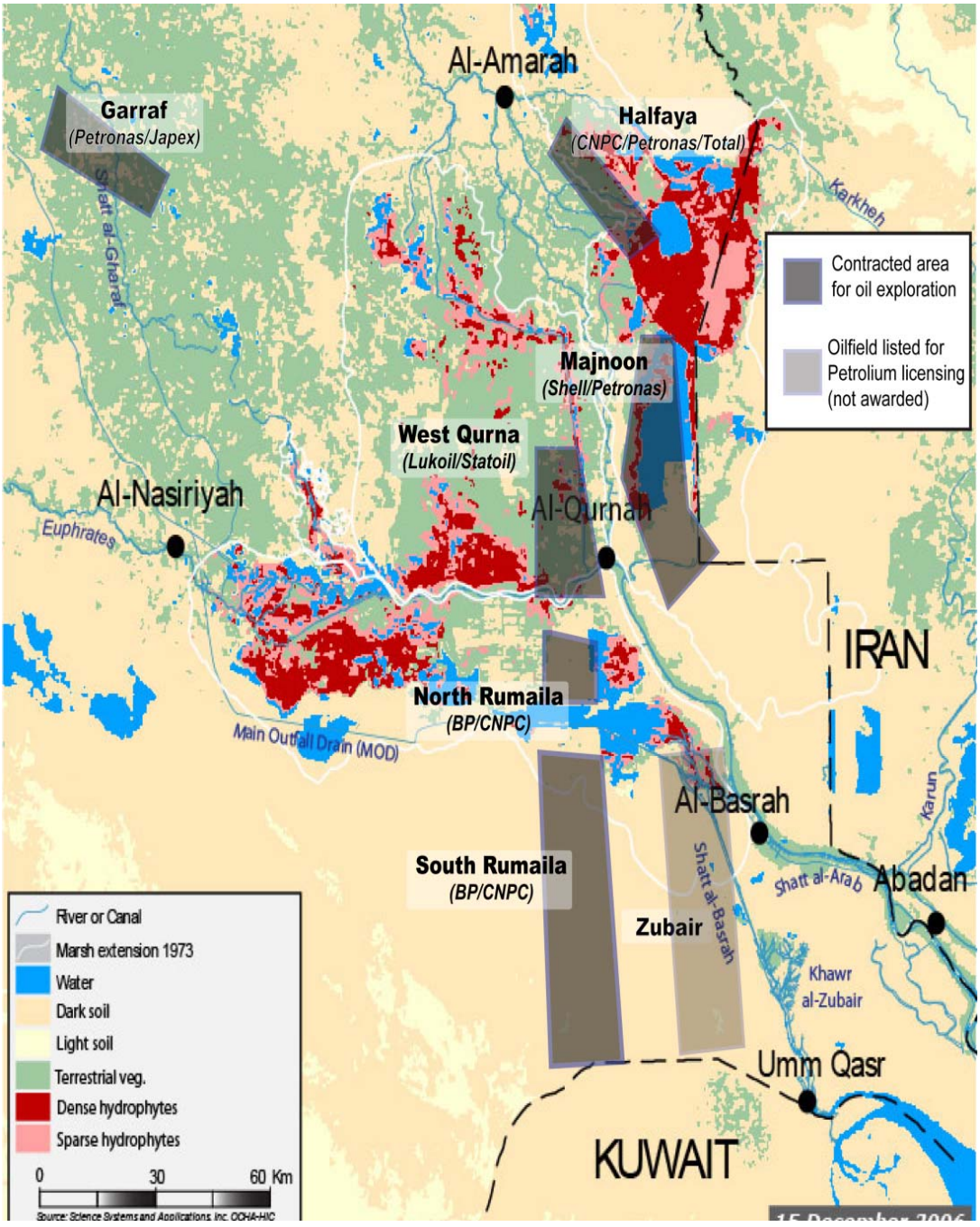

Figure 5.1. Contract areas for oil exploration in the Marsh area. (Source: UNEP-DTIE-IETC 2010a)

Oil exploration (and subsequent extraction) could threaten the ecological integrity of the Marsh ecosystem in a number of direct and indirect ways (Box 5.2.). The most important of these issues is the direct spatial overlap between potential and actual areas for oil exploration or production and the zones that are included in a possible world heritage nomination.

Box 5.2. Direct and indirect threats from oil exploration/extraction to the integrity of the ecosystem of the Marshes

- Habitat destruction and fragmentation for oil infrastructure (access roads, oil installations, pipelines),
- Freshwater consumption during oil extraction - 4-15% of the oil volume extracted in freshwater are needed. This might create yet another demand on the scarce water resources available in the Marshes unless freshwater is imported from elsewhere,
- Accidental pollution with crude oil or chemicals used in the extraction process,
- Disturbance and potentially increased hunting pressure because of easier access to marsh areas via oil transport infrastructure, and
- Deterioration of the aesthetic values of the area, decrease of attractiveness to future tourists (once security situation has improved), and loss of tourism income, and hence incentives for local resource users to switch from non-sustainable to sustainable ways of natural resource use.

This and the other issues mentioned above are a particular concern as the environmental governance framework and law enforcement in Iraq still are relatively weak - implementing regulations, procedures and/or institutions as well as the necessary institutional capacity are often still missing (cf. UNEP-DTIE-IETC 2010a).

Beyond these general threats to the ecological integrity of the Marshes, oil exploration and potential extraction in the above areas threatens their planned World Heritage nomination as a whole. Several enterprises and organizations including the International Council on Mining and Metals (ICMM), Royal Dutch Shell and Goldman Sachs have acknowledged the incompatibility of extractive activities with the goals of World Heritage sites, and have committed to refrain from extractive activities inside them (UNESCO World Heritage Centre 2010). Several decisions of the World Heritage Committee (e.g. 31COM 7B.37) have since reiterated the policy of the Commission not to tolerate oil extraction inside World Heritage properties.

This means that in any case of conflicting demands for areas inside the Marshes, the oil extraction area or the World Heritage site would have to be moved, and the specific threats to the management of the site (see above) would need to be mitigated through management. Moving the World Heritage site would be almost impossible, however, because according to the WHC Operational Guidelines (UNESCO 2008), its boundaries will need to follow the distribution of its identified OUV.

If the national preparation team decides to pursue nomination under World Heritage criterion vii, oil infrastructure might become an integrity threat even if it is located outside the actual site. It would be enough if oil installations near the site would compromise its aesthetic (i.e. visual, olfactory) integrity. In order to keep such visual disturbance at a tolerable distance, a buffer zone would need to be established around the property. Its size would depend on the size and visibility of the oil installations.

In order to deal with the impending integrity threat from oil extraction, a number of steps should be taken by the Ministry of Environment and other stakeholders involved in the planning process (Box 5.3.). These will need to be embedded in the general management framework for the Marshes, which is explained in more detail in the next section.

Box 5.3**. Potential measures to minimize threats to the integrity of the Marshes' OUV according to World Heritage criteria vii, ix and x from oil exploration/extraction**

- Use the World Heritage nomination process to draw attention to the unique natural values of the Marshes, raise their profile in relation to the national development agenda and leverage support for an environmentally sustainable policy to oil extraction from international organizations and MEA implementation mechanisms.
- Engage the Ministry of Oil in the World Heritage planning process and ensure that planned exploration/extraction activities in the project area are communicated and coordinated with the Ministry of Environment.
- Promote robust legislation (including implementing regulations) and clear institutional responsibilities (including the necessary institutional capacity) to monitor and regulate oil development.
- Include technical capacity building and training on biodiversity-inclusive Environmental Impact Assessment, Strategic Impact Assessment and impact monitoring in the project portfolio.
- Use the provisions of the WHC Operational Guidelines (UNESCO World Heritage Centre 2008) to minimize negative impacts of oil development on the planned site(s) (e.g. buffer zones).
- Build local and national stakeholder support for the establishment and sound management of the planned World Heritage site.

6 Protection and management of the Marshes

Both the World Heritage Convention and general conservation interest suggest that in order to regain and retain at least part of their ecological functionality, the Marshes need to be managed actively, and based on clearly identified management targets. This section explains into more detail the management requirements of the WHC, takes stock of past and existing management initiatives in the Marshes, and develops a management planning and boundary setting approach that can then be taken by the management planning team. Some important specific issues such as the participation of local communities

6.1 Protection and management requirements according to the World Heritage Convention

Box 6.1. spells out the most important requirements of the WHC Operational Guidelines with regard to the protection and management of World Heritage sites.

Box 6.1. Protection and management requirement for World Heritage Sites according to the World Heritage Operational Guidelines (UNESCO 2008)

96. Protection and management of World Heritage properties should ensure that the outstanding universal value, the conditions of integrity and/or authenticity at the time of inscription are maintained or enhanced in the future.

97. All properties inscribed on the World Heritage list must have adequate long-term legislative, regulatory, institutional and/or traditional protection and management to ensure their safeguarding. This protection should include adequately delineated boundaries. Similarly States Parties should demonstrate adequate protection at the national, regional, municipal, and/or traditional level for the nominated property. They should append appropriate texts to the nomination with a clear explanation of the way this protection operates to protect the property.

…

108. Each nominated property should have an appropriate management plan or other documented management system which should specify how the outstanding universal value of a property should be preserved, preferably through participatory means.

109. The purpose of a management system is to ensure the effective protection of the nominated property for present and future generations.

This means that the management plan for any future Marshes World Heritage site should specifically refer to the potential OUV under the natural criteria vii, ix and x as identified in Section 4 of this report and spell out how the pressures and threats identified in this Section, as well as the general integrity challenges as identified in Section 6 of the report, will be controlled through planned management. Authenticity (cf. Paragraph 96 above) does not need to be addressed as it does not apply to natural properties.

Paragraph 96 allows for either preserving the current integrity of the property through management, or developing a management regime that aims at enhancing the property's integrity in the future. This means that generally, the management plan of any future World Heritage property could address marsh restoration as one of its subjects.

Paragraph 97 makes clear that it is not enough to write a management plan and demarcate the property, but that it must be shown how this plan will be enacted, by demonstrating the necessary

legislative or regulatory approval, political support, institutional capacity for management, and integration of existing traditional management activities.

6.2 Existing and past management initiatives for the Marshes

Based on the management requirements of the WHC Operational Guidelines and the analysis of the challenges presented in Sections 4 and 5, this Section aims at assessing existing and past initiatives in the field of biodiversity and ecosystem management in the Marshes. The overall guiding question is to what extent and in which ways these initiatives with their resulting plans could contribute to a World Heritage management regime for the Marshes.

6.2.1 Criteria for the assessment of existing and past management initiatives and plans

More specifically, existing plans and initiatives have been assessed based on the following criteria, which in turn are based on generic management planning guidelines for protected areas (e.g. Thomas & Middleton 2003), and specific guidelines for management planning for natural World Heritage sites (IUCN 2008):

1. **Description of the target area's values:** Are the values of the target area (including aesthetic, ecosystem and biodiversity values) appropriately described, based on best available knowledge?
2. **Vision and management objectives:** Is the plan based on an explicitly stated vision and management objectives, which are informed by an analysis of the values in need of protection of the Marshes, and the pressures and threats affecting them? Is that value and pressure/threat analysis in agreement with the OUV analysis presented in Section 4?
3. **Stakeholder support:** Who has agreed on the management objectives of the plan? Do they represent a documented consensus of relevant stakeholders or merely the opinion of the plan's authors?
4. **Logical framework of plan:** Do the management interventions proposed by the plan explicitly refer to management objectives, values, pressures and threats?
5. **Quality of objectives:** Are the management objectives proposed by the plan *SMART* (specific, measurable, attainable, relevant, and time-oriented)? Is there a monitoring plan included?
6. **Best practice:** Are the tools and methods employed or proposed by the plan in line with international best practice?
7. **Boundary setting:** How are management units proposed by the plan demarcated and zoned, and what is the relevance of the geographical scope of the plan or initiative to a possible future World Heritage site?
8. **Framework awareness:** Is the plan in agreement with current Iraqi law? Does the plan include objectives addressing the legal, institutional, financial and capacity requirements of its own implementation? Is it integrated with other existing plans or strategies? Does the plan consider political feasibility and recommend action to ensure it?
9. **Implementation:** Is the plan being implemented, and if yes, with what success?

6.2.2 Existing and past management initiatives

With the exception of some very small Wildlife Parks of unclear function and status under the Ministry of Agriculture (e.g. Assafia Wildlife Park in southern Al-Hawizeh Marsh), no planned management initiatives aimed at the integrity of the ecosystem or its biodiversity is documented for any part of the Marshes from before 2003. Iraq's first report to CBD (in preparation) states that there are no PAs of any IUCN Category in the country. The draining of the Marshes in the second half of the 20th Century, and particularly in the 1990s, could be termed management, but it was clearly not aimed at ecosystem or biodiversity conservation.

Several initiatives aimed at environmental management of the Marshes have been conducted since 2003, and several management plans have been elaborated for all or parts of the Marshes since their reflooding in 2003, but at the same time there has been little if any planned ecosystem and conservation management to date.

UNEP has supported environmental management in the Marshes since 2004: *"The UNEP "Support for Environmental Management of the Iraqi Marshlands" project commenced in August 2004, in order to respond to the Iraqi priorities in the Marshland area in an environmentally sound manner in the post-conflict period. The priorities included addressing marshland water quality and management needs to protect human health, livelihood and the ecosystem, and providing safe drinking water and sanitation. Environmentally sound interventions were required to meet the needs of the inhabitants and returning displaced persons in this area of damaged ecosystems. The UNEP project therefore had the aim of supporting the sustainable management and restoration of the Iraqi Marshlands by facilitating strategy formulation, monitoring marsh conditions, raising the capacity of Iraqi decision makers, and providing water, sanitation and wetland management options on a pilot basis utilizing Environmentally Sound Technologies (ESTs)"* (UNEP 2010).

With particular regard to ecosystem and biodiversity management, the UNEP project included activities aimed at improved data management and exchange on water quality and biodiversity, satellite image analysis, the analysis of marshland management options, all in support of management plan development but not with the aim of formulating specific management plans. An important platform in this regard was the Marshlands Information Network (MIN) and Iraqi Marshlands Observation System (IMOS), as well as several international workshops and meetings (UNEP 2010). A joint wetland restoration pilot project at Al-Jeweber Marsh (with the Centre for Restoration of the Iraqi Marshlands CRIM) and a pilot project to assess the feasibility of using water from the Main Drain was also implemented. The outcomes of all these activities will be instrumental in informing the management planning process for the Marshes.

The USAID-funded Iraq Marshland Restoration Program (IMRP) 2003-2006 included activities related to hydrological management, environmental monitoring, national and local planning frameworks and capacity building. The follow-up USAID Agriculture Restoration Program for Iraq (ARDI) focused on planning, animal health and production, crop production and irrigation (ARDI 2006). A component on biological monitoring was also included, but no management plan was elaborated as a result. However, only the four above plans were deemed sufficiently relevant to be assessed in detail. They are assessed below, with a particular focus on biodiversity and ecosystem management.

The above initiatives did not produce specific management plans like the one that would be needed to manage a protected area, or even a future World Heritage site in the Marshes. The following specific management planning initiatives for the Marshes did produce management plans, and are therefore particularly relevant to the current study:

- **New Eden Master Plan for Integrated Water Resources Management in the Marshlands Area** (New Eden Group 2006).
- **Management Plan for the Al-Hawizeh Marsh Ramsar Site of Iraq** (Nature Iraq 2008a, b).
- **Mesopotamia Marshland National Park Management Plan** (New Eden Project for Integrated Water Resources 2010a, b), and
- **Managing for Change. The Presence and Future of the Marshes of Southern Iraq** (Canada-Iraq Marshlands Initiative 2010a, b).

It is important to note that none of these plans was developed for the specific purpose of managing a World Heritage Site aimed at safeguarding and presenting the potential OUVof the Marshes as a whole. To the contrary, the plans aimed at a wide range of objectives and had varying geographical focuses. Therefore, it would be unrealistic to assume that any of the plans listed above could be used as the management plan for a future World Heritage site. The objective of the below analysis therefore is to identify possible contributions of the individual plans to the management of the Marshes and to

gain a general understanding of the current state of the art of conservation management in this area, rather than identifying shortcuts to simplify the necessary management planning process there.

6.2.2.1 New Eden Master Plan

The "New Eden Master Plan or Integrated Water Resources Management in the Marshlands Area" has been developed on behalf of the Iraqi Ministries of Environment, Water Resources and Municipalities and Public Works by a team of national and international consultants affiliated with the Iraq Foundation/Nature Iraq, the New Eden Team, as well as individual consultants. Its purpose "is to assist Iraqi policy makers by providing sound information and analytical tools with which to make reasoned choices regarding water resource allocation and environmental management decisions." It should be noted that the New Eden Master Plan does not aim to be a development or management plan in itself. Book 6 of Volume 2 of the plan clarifies that *"the New Eden Master Plan for Integrated Water Resource Development in Southern Iraq has focused on providing the technical information and decision-making tools to enable development of a restoration and development plan for the study area. The vital critical elements related to environmental restoration and water allocation are provided within this book. However, the New Eden Team cannot actually write the development plan itself; beyond the process of technical analysis is required a political and participatory decision-making process. Only the Iraqi government decision makers can implement this process."*

The master plan is hence not a plan in the general sense but rather a decision making and planning tool. It is not exclusively aimed at ecosystem or biodiversity management, but *"pursues a holistic and integrated approach to address multiple issues simultaneously. The issues addressed include improvement in water utilization efficiency, environmental restoration, economic enhancement, flood control, and community building for returning peoples."*

The plan consists of four volumes (numbered 0-3): A summary (Volume 0), an overview of present conditions and current use of water in the marshlands area (Volume I), a discussion of future water requirements (Volume II), and a set of implementation plans (Volume III). Of particular relevance to the current project are Book 1 (Water Resources) and Book 4 (Marshlands including flora and fauna) of Volume I, Book 5 (Modeling of future water resource requirements) of Volume II. The New Eden Master Plan does not include a specific plan on ecosystem or biodiversity management in any particular area of the Marshes, but analyses the context framework in which a future World Heritage site within the Marshes would have to function. Therefore, not all of the criteria developed above are applicable to this plan.

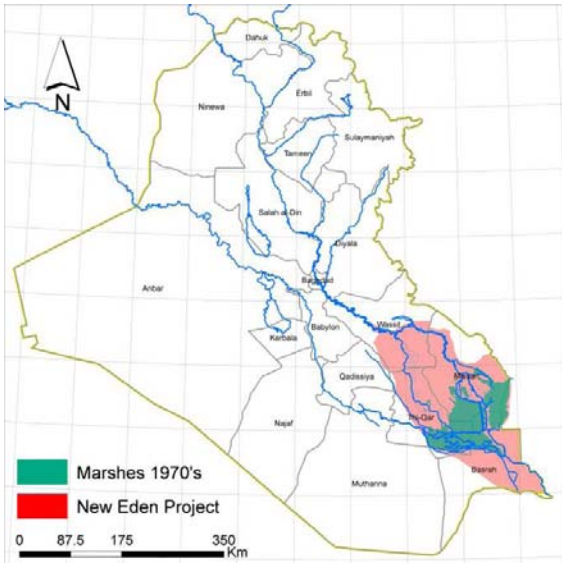

Figure 6.1. Study area of the New Eden Master Plan. (Source: New Eden Group 2006)

1. **Description of the target area and its values:** The New Eden Project's study area encompasses 40,000 km^2 of former and current Marshes in the Basrah, Maysan and Thi Qar Governorates of Iraq. Book 1 of Volume I of the New Eden Master Plan describes water resources, and climatology, geology and hydrology of this area including the lower Tigris, Euphrates and Kharkeh watersheds. Book 4 of the same volume describes the Marshes regarding their former and current (pre-2006) state. This book the ecosystem and biodiversity values which are most relevant to the potential natural OUV of the Marshes in any future World Heritage nomination. The book provides post-reflooding data on abiotic water parameters and Chlorophyll *a* concentrations from some Marshes. It reports species and gives a snapshot of the distribution of vegetation and habitats mainly between 2004 and early 2006, gives sporadic information on pressures and threats, but does not evaluate them in terms of conservation priority. The same is true for species information (mainly from the earlier Key Biodiversity Area surveys and the author's own surveys) that is given for the invertebrates, fish, birds, mammals, amphibians and reptiles. The introduction to the section on birds discusses their importance as a protein source for local hunters and as a future attraction for ecotourists, but does not mention any inherent biodiversity value of the Marshes' avifauna. A discussion of the conservation status of marsh birds is general and inaccurate (e.g. implying that there are or were 11 species of endemic breeding birds in the Marshes). Information on mammals was mainly excerpted from Scott (1995), and the post-reflooding status of mammals, amphibians and reptiles was not studied. Al-Hawizeh Marsh was identified as a potential mammal refuge, however. Some possible interactions that stabilize the low relative abundance of fish species of high conservation and economic value (e.g. *Barbus sharpeyi*) are discussed in the section on fishes and fish restocking. A significant part of the sections on biota is taken up by statistical analyses on community ordination (which describes how the occurrence of individual species is correlated with that of others and with abiotic factors), and by charts that plot two diversity measures (log species number and Shannon diversity) against each other, and are interpreted by the authors in terms of community recovery over the 2005-2006 period. It is not clear from the plan whether these statistical analyses are aimed at answering specific questions relevant to conservation management of the Marshes, and in which way the outputs of the analysis could be used for management priority setting or action planning. In conclusion, the New Eden Master Plan provides some but limited new information on the ecosystem and biota of the Marshes and does not provide an evaluation of biodiversity or ecosystem values that could reliably inform a management planning process for any future World Heritage site. This is not surprising as the main focus of the plan is integrated water resource management.
2. **Vision and management objectives:** There is no explicit vision expressed by the New Eden Master Plan since its objective is supporting policy makers manage the southern Marshes region in general. However, the fact that four out of six conclusions presented in the Executive Summary of Volume 0 emphasize the feasibility and benefits of Marsh restoration, suggests that the overall goal of the report is to promote marsh restoration. From Volumes 0, 1 and 2 of the New Eden Master Plan, it appears that Marsh reflooding is seen not so much as a means of achieving other socio-economic or environmental goals as pre-defined by national policy, but rather as an end in itself. This means that the plan is not driven by specific conservation or socio-economic management objectives. Book 6, which deals with the benefits of Marsh restoration, contains sections on benefits related to hydrology, nutrient, soil and pollution management, as well as very a short and very general section on benefits to habitat regeneration. No specific ecosystem or biodiversity related objectives are presented in this context, and it was noted that two fish families predicted in the plan to return to the Marshes (Cichlidae and Sisoridae) have not occurred there historically.
3. **Stakeholder support:** Since the "New Eden Master Plan" is meant to be a technical decision making tool and not an actual plan of site management, an extensive consultation was not

needed for its drafting. However, a considerable range of national experts from ministries, NGOs and Academia was involved in its elaboration.

4. **Logical framework of plan:** Since this is not a management or development plan, it does not set out goals and objectives and does not follow a logical framework approach.
5. **Quality of objectives:** The "New Eden Master Plan" is not based on explicitly stated objectives although an implicit objective appears to be promoting marsh restoration.
6. **Best practice:** The executive summary included in Volume 0 of the plan contains a clear commitment to international best practice: *"All models were generated using proven statistical approaches that are commonly accepted by the professional and academic communities in the appropriate disciplines of engineering, economics, and ecology. In order to assure ease of use, project members used "off the shelf" technologies that are widely available. As a result, Iraqi officials and scholars can collect additional data and use the analyses described to create new results under changing conditions without difficulty"*. Although the relevance of the statistical community analyses of fauna and flora employed by the plan to conservation management appears debatable (see above), the plan appears generally in accordance with international best practice.
7. **Boundary setting:** The New Eden Master Plan does not propose a specific area for the introduction of management approaches, but simply has defined a study area to which its findings apply.
8. **Framework awareness:** The New Eden Master Plan is essentially a technical document which is not concerned with the legislative, political or institutional aspects of Marsh management. However, some of the discussions on infrastructure also contain information on budgets and costs, and Book 6 of Volume II of the Plan includes a discussion on possible international conventions that Iraq could join to promote the management of the Marshes.
9. **Implementation:** According to what the New Eden Plan says itself, it merely is a decision making tool that needs to be followed up, not implemented. Following this logic, the next step would be the development of a restoration and development plan for the study area. Such a plan has not been published to date but may be in preparation. However, it appears the New Eden Master Plan itself "has been adopted by the Ministry of Water Resources and the regulators are being built with the last one scheduled to be finished in June 2011" (A. Al-Lami, pers. comm.)

The New Eden Master Plan is a technical decision support tool that also promotes Marsh reflooding and restoration. It would be beyond the scope of this report to assess the correctness of the hydrological models and predictions included in the plan, although such an independent hydrological review would certainly be warranted by the considerable investment needed for its follow-up (development and implementation of a Marsh restoration and development plan). Such a review would be made easier by the now longer post-reflooding history of the Marshes, which could be used to check the plan's predictions.

The specific contribution of the New Eden Master Plan to the management planning process for a possible future World Heritage site in the Marshes is that it provides hydrological scenarios for marsh reflooding and restoration, which may help to demarcate the property/properties based on hydrological feasibility, and to inform restoration efforts in the context of a future World Heritage nomination. However, the predictions of the plan need to be critically re-assessed in the light of the years after 2006, in order not to invest management resources in areas where sustainable marsh management is hydrologically or ecologically unfeasible.

6.2.2.2 Management Plan for the Al-Hawizeh Marsh Ramsar Site 2008

Hawizeh Marsh is Iraq's first Ramsar site and was inscribed in 2007. It was put onto the Montreux Record of sites "where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference" in April 2010 (Ramsar Convention Secretariat 2010), suggesting that it is currently not managed effectively. The

Management Plan for the Site was developed by Nature Iraq for the Iraq National Marshes and Wetlands Committee, with funding from the Italian Ministry of the Environment, Land and Sea. The report consists of two volumes, one on “Background, Vision and Principles” and one on “Management Issues and Recommendation”. The second draft of December 2008 was analyzed for this report.

Figure 6.2. Proposed Al-Hawizeh Marshes Ramsar Site. (Source: Nature Iraq 2008a).

1. **Description of the target area and its values:** The first volume of the plan includes information on location and extent of Al-Hawizeh Marsh, land cover, habitat distribution, flora, vegetation, fauna, and hydrology as well as water management. The plan also identifies 22 “Key Biodiversity Areas” within Al-Hawizeh Marsh, but it should be noted that these are merely sampling stations of a “Key Biodiversity Area” project of Nature Iraq and not Key Biodiversity Areas in the sense of Langhammer et al. (2007). Among the birds, the plan distinguishes between species of conservation concern and globally threatened species, without reporting IUCN threat categories. No quantitative analysis of the current importance of Al-Hawizeh for migratory birds is presented. The concept of “species of conservation concern” is still under development (R. Porter, pers. comm.), and overlaps with that of “globally threatened species” (cf. Section 4.6.4 of this report). Among the mammals, *Lutrogale perspicillata* is listed as “reported”, but without further record details. No specific ecosystem values, pressures and threats are identified, and the description of biota is not complemented by a clear evaluation of the biodiversity values encountered in the Marshes. While a lot of useful baseline research is

therefore reported in the first volume of the plan, its systematic evaluation as a link between descriptive study and the formulation of specific management objectives is missing.

2. **Vision and management objectives:** The plan contains a very general **vision** statement and five **strategic goals** (maintain the ecological character of the Marsh including its ecosystem and biodiversity values, maintain biological diversity, restore wildlife populations and habitats, establish a safe environment for people, and promotion of economic development based on sustainable natural resource use). It also contains 14 **management objectives** which are not specifically linked to individual strategic goals, and 93 **recommendations for specific actions** to meet the individual management objectives. Ten of them are identified as first-step projects. The management objectives are organized into four groups (environmental management, water resources management, management of cultural and social issues, and management of economic opportunities). The most relevant to the future management of natural values in the framework of a World Heritage site are Objectives 2 (nature conservation and sustainable use), 3 (monitoring and PA establishment), 4 (water management), 7 (promoting a land tenure system), 8 (creating the legislative, policy and planning framework), 9 (trans-boundary management) and 10 (participation). Somewhat oddly, the plan also includes as its Objective 14 "Facilitating Oil Development"; this objective aims at engaging with the operators of Majnoon Oilfield to ensure environmental sustainability of their operations. The relevant management objectives are very general, and are hence in agreement with the more specific values identified in Section 4 of this report.
3. **Stakeholder support:** According to the Section "Mandate of this plan" this plan was developed by Nature Iraq in concert with Iraqi Ministries and international assistance from the government of Italy, and also discussed with them throughout the preparation process. Local Tribes and Councils as well as NGOs were identified as stakeholders of the management of Al-Hawizeh Marsh in the stakeholder analysis. Local stakeholders were involved in the planning process through stakeholder meetings and the opportunity to comment on the draft plan during two phases. Because of the difficulty of arranging a proper stakeholder consultation under the conditions faced during the management planning process, the plan itself suggests that further consultation with local tribes and municipal councils is necessary, and recommendations 71-73 specifically deal with local stakeholder participation during the implementation of the plan. Therefore, we conclude that the plan represents a consensus of Nature Iraq, part or all of the relevant Iraqi Ministries, some local stakeholders and the international donor, but that consultations on specific management actions and further consensus building among local stakeholders will have to continue throughout the implementation of the plan.
4. **Logical framework of plan:** While the management objectives are not linked to specific strategic goals, the recommendations for actions are linked to specific management objectives. As the name suggests, the recommendations are not specific actions to be taken by the Ramsar site management authority or a similar designated actor, but rather are directed at a wide range of actors and stakeholders, which are not always identified explicitly. In this respect, the plan is not focused on the implementation by a designated management authority (and could not be monitored accordingly), but is more similar to a general wish list. The plan would greatly benefit from a differentiation of clear-cut management actions to be implemented (and monitored) by a management authority on the one hand, and recommendations to specified outside actors on the other hand. In conclusion, the logical framework of the Al-Hawizeh Marsh management plan in its current form is not conducive to successful implementation, and its structure would not be sufficient to safeguard the ecosystem and biodiversity values of the Marshes.
5. **Quality of objectives:** The implementation period of the plan is not defined although the Executive Summary appears to imply an initial lifespan of five years. While none of the seven most relevant management objectives are *SMART* (see above), the analysis of the recommendations under these objectives gives a differentiated picture: Of the 54

recommendations most relevant to ecosystem management, 34 were assessed as specific, 48 as measurable in the widest sense (this criterion was only applied rather loosely), 28 as attainable (with some additional objectives possibly attainable), 40 as relevant and none as time-specific (Appendix 6.1.). The low attainability rate was caused by the wide range of outside actors that would be needed to implement the objectives. Some recommendations (e.g. 21, 61) are not objectives at all but general statements. Because of the general quality of objectives it would be challenging to implement and monitor their implementation even if the wide range of actors to whom they are addressed would all adopt these recommendations.

6. **Best practice:** In relation to tourism management, the management plan refers to a Ramsar publication (Davies 1993), and general guidance from the Ramsar Secretariat as well as specific examples from existing management plans were used to inform its elaboration. At the same time, no explicit reference is made to the comprehensive guidance on sustainable wetlands management that is available from the Ramsar Convention Secretariat, including guidance specifically on Ramsar site inventory, assessment and monitoring, and on management planning for Ramsar sites (Chatterjee et al. 2008, Ramsar Convention Secretariat 2007a, b), or other international best practice approaches for protected area management planning (e.g. Thomas and Middleton 2003). In terms of the overall structure of the plan, the quality and structure of the objectives, and the lack of a detailed monitoring plan, the second draft of the Management Plan for the Al-Hawizeh Marsh Ramsar Site of Iraq does not fully meet the relevant best practice recommendations of the Ramsar Convention (Ramsar Convention Secretariat 2007b). At the same time, it should be noted that this plan was drawn up under exceptionally difficult conditions and in a very short time, and clearly offers a basis for further alignment with international best practice in the course of future development and implementation.
7. **Boundary setting:** The proposed border of the Al-Hawizeh Marsh Ramsar Site encloses essentially the entire remaining marsh area, which appears appropriate. The site borders to Hor al Azim in Iran. No further efforts to inform boundary setting were made, according to the plan, probably because the site is quite clearly delineated.
8. **Framework awareness:** The Al-Hawizeh Marsh management plan does not state on which legislation it is based, or which legal status it will assume once approved. The first volume of the management plan includes a list of the major institutional stakeholders of the Al-Hawizeh Marsh Ramsar side, along with a description of their key responsibilities. Management objective 8 (“Create a legislative, policy and planning framework”) appears to address key framework aspects but the specific recommendations listed under this objective only deal with planning, and not with policy or legislation. There is no specific list of Iraqi laws infringing on management of Al-Hawizeh Marsh as a Ramsar site. The plan does not include a budget estimate or information about the infrastructure, and staff needed for its implementation, but a general list of training needs is included.
9. **Implementation:** The management plan for the Al-Hawizeh Marsh Ramsar Site is not being implemented thus far. The authors present a list of factors that make implementation difficult (or impossible) currently.

In conclusion, the Management Plan for the Al-Hawizeh Marsh Ramsar Site of Iraq contains some extremely valuable baseline information, including on hydrological issues, and was developed with considerable stakeholder participation (particularly considering the security situation when it was drafted), but fails to evaluate this information sufficiently. At the immediate implementation level, the management plan formulates recommendations to a wide range of stakeholders, rather than specific management prescriptions to a defined management authority that can be implemented and monitored. This deteriorates the plan’s implementation outlook. The plan offers a basis for further alignment with international best practice in the course of implementation (to the extent this is possible under the specific security and governance conditions in Iraq). It does not specifically address its legal framework, and - according to the section of the Plan on constraints - cannot be implemented currently. It should be noted that a large part of these shortcomings are not caused by the plan itself,

but by the framework conditions that make the establishment of a managed wetland site in Haiwzeh Marsh in line with international best practice very difficult.

6.2.2.3 Mesopotamia Marshland National Park Management Plan 2010

This plan was developed by the Italian Ministry of Environment, Land and Sea and Nature Iraq and had not been officially approved by 1 July 2010 (A. Bachmann, pers. comm.). The version assessed was a draft version of February 2010. It was the product of a four-year planning process starting with a feasibility study in 2007 and consists of two volumes, one dedicated to site description and one to strategies and objectives.

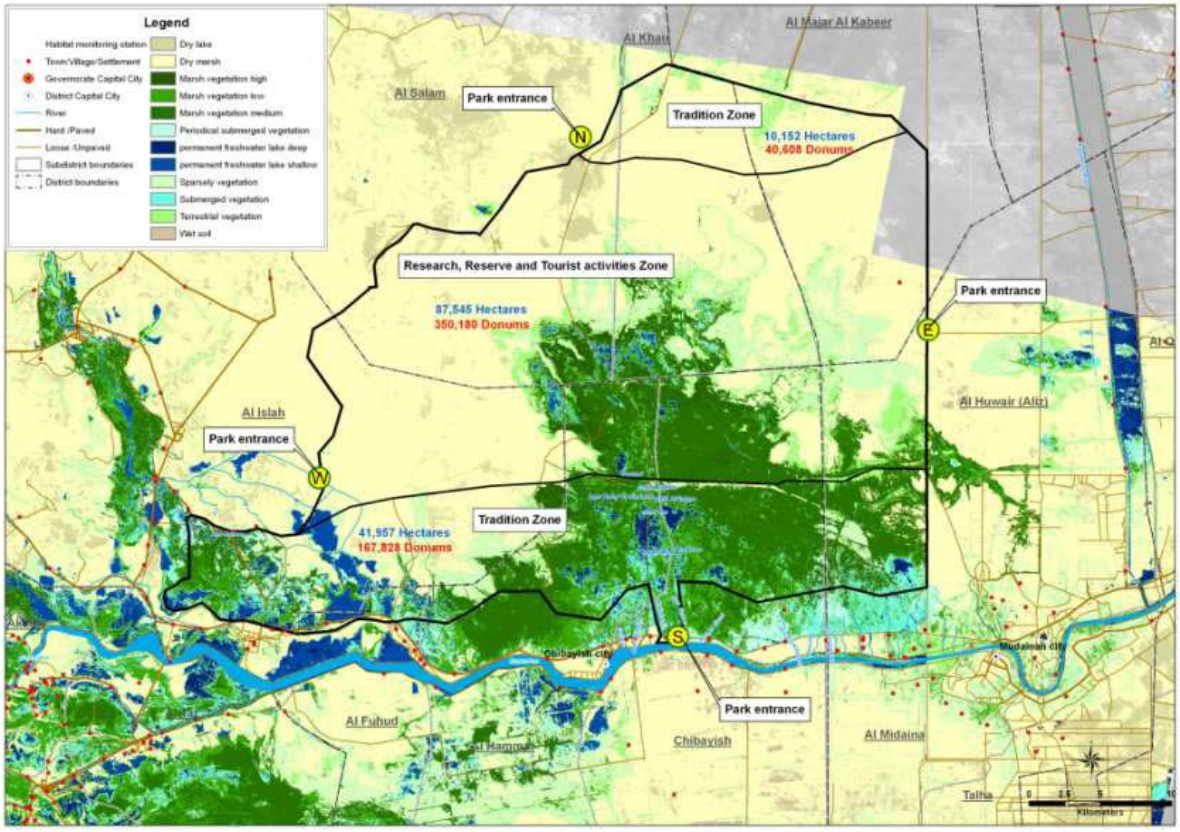

Figure 6.3. Demarcation and zoning of the planned MMNP. (Source: New Eden Project 2010b).

1. **Description of the target area and its values:** The ecosystem and biodiversity values of the planned National Park are described in the first part of the plan and partly evaluated in the second part. The first part includes a discussion of the hydrological system as well as water quality, vegetation and habitats of the Central Marshes and species lists of fish and birds, plus a discussion on marsh mammals. Other animal groups are not discussed. Information on natural resource use (particularly fishing, hunting and reed utilization) is also given. The list of "most endangered bird species" that is presented in the first part appears not to be based on primary research. It is partly incorrect, incomplete, and incorrectly evaluated. Several species that have not been recorded in the Central Marshes in the last 50 years are listed (e.g. *Geronticus eremita, Vanellus gregarius, Numenius tenuirostris*), while others that have been reported (see Section 4.6.4 of this report) are not listed. IUCN Red List categories are not given for several species, and the analysis of conservation value is spurious as if is based on a number of international conventions that all take scientific information from one source (the IUCN Red List of Threatened Species), and as this list includes European agreements that focus on European not Middle Eastern avifauna (Bern Convention, EU Birds Directive). The section "The Park and its Values" of the second part contains a list of some ecosystem (incl.

hydrological) values and a discussion of "Wildlife Recovery and Habitat Restoration". The latter section discusses the lack of recent records of some of the key species from the Central Marshes (e.g. *Lutrogale perspicillata, Nesokia bunnii, Gerbillus mesopotamicus*), and speculates that they may have been overlooked or may return once the Marshes have recovered further. However, it is obvious form the draft that these species are not known to exist in the Marshes currently, and that they are therefore incorrectly included in the descriptive and evaluation sections. Another issue of concern are potentially unrealistic assumptions about long-term water availability for the park's proposed area. The feasibility study and initial demarcation/zoning plan were based on monitoring surveys conducted in the period 2004-2005, when water supply was exceptionally good, and zonation already had to be revised following two drought years. In conclusion, the description and evaluation of the ecosystem and biodiversity values presented in the Mesopotamian Marshland National Park Management Plan is incomplete, partly incorrect, and possibly based on incorrect assumptions about long-term water availability. It would hence not be a sufficient basis for developing a World Heritage management regime in this area.

2. **Vision and management objectives:** The plan contains a **vision** statement but this statement does not describe a desired state of the ecosystem and natural biodiversity. About half of the text actually describing the vision deals with tourism development. The plan further states three **overall purposes** (nature restoration and conservation, sustainable development and cultural heritage conservation, ecotourism development). It also lists 14 long-term **broad objectives** under four themes, which in turn are broken down to 54 **specific objectives** to be achieved during the duration of the plan, which is not specified (first review possible after three or five years). The broad objectives are not specifically linked to individual overall purposes, although one of them (protection of wildlife of the Marshes) is very similar to the first overall purpose. This and another six broad objectives (water quality, water flow/circulation, connectivity, flora/vegetation studies, land tenure regulation, and cultural landscape promotion) are directly relevant to ecosystem and biodiversity management. The directly biodiversity related objectives (D and E) are phrased in a general way and make no reference to specific ecosystem values as identified in Part One of the plan. 11 out of 14 specific objectives under Broad Objectives D and E address research, monitoring and mapping, rather than conservation management, suggesting that the baseline information compiled in Part One of the plan is insufficient to inform conservation management. The three objectives explicitly addressing conservation management focus on education (Objective 27), sustainable hunting management (Objective 28) and the ***"Establishment of biological reserves for the most endangered species"*** (Objective 25). The latter suggests that this national park as a whole is not meant to be a protected area in the sense of the IUCN definition (see Dudley et al. 2008), because in a protected area, the establishment of "biological reserves" for endangered species would be the principal objective, rather than one of 54 objectives.
3. **Stakeholder support:** According to the information provided in the Section "The MMNP Planning Process" of Part Two of the Plan, the objectives and actions of the draft were largely developed by the drafting team and discussed with Iraqi Government representatives. Communication with local communities was apparently mainly one-way, according to the relevant objective: *"Demonstrate to the local population features and function of the Park and involve them through communication and examples of practical activities"*. This is further illustrated by other quotations: *"During the OP period a series of meetings have been organized to explain the significance of the project. Furthermore, small projects have been carried out to practical (sic) demonstrate how the park staff could bring benefits to local communities"*. Local tribe representatives were reportedly present at a presentation of the draft management plan in April 2008, and subsequent seminars with locals in the park area addressed conservation hydrological management, besides buffalo management and fisheries. No report on the locals' submissions and their integration in the plan is included in

the current draft. In conclusion, the management planning process was certainly not driven by local communities and it appears locals were informed about the draft plan and invited to give feedback, but not involved in decision making.

4. **Logical framework of plan:** While the abovementioned fact that the broad objectives are not linked to the overall purposes of the Park, there is a clear hierarchy between broad and specific objectives. However, since the broad objectives are not meant to be met within the lifespan of the plan (which, to complicate things further, is not specified), the plan does not set itself an impact target above the level of the specific objectives, to be met during its implementation phase. This compromises the logical framework of the plan and will complicate monitoring. Focusing on Broad Objective E - the most relevant to biodiversity conservation - the specific objectives (20-28) listed with it would not be sufficient to achieve protection of wildlife of the Marshlands because key pressures and threats (cf. Objective 24) are not addressed through management.
5. **Quality of objectives:** Of the 31 objectives that belong to the broad objectives particularly relevant to biodiversity conservation, 24 have been assessed as specific, 24 as measurable, 22 as attainable (with additional objectives possibly attainable), 23 as relevant and none as time-specific (Appendix 6.2.). No detailed monitoring plan for implementation monitoring of the management plan is included. This means the objectives of the plan would need much improvement to make the plan fully operational.
6. **Best practice:** The reference list of the draft management plan does not include international best practice approaches to protected area boundary setting (e.g. Langhammer et al. 2007), management planning (e.g. Thomas & Middleton 2003), or the application of IUCN PA categories (e.g. Dudley et al. 2008). Some recommendations of the plan clearly deviate from international best practice. For instance, the overall purpose, broad objectives and initially proposed zonation of the park would be most consistent with IUCN PA Category II (the usual category for national parks), but the authors propose to designate the area using IUCN PA Categories IV, V and VI. Another example is the zoning of the park which appears to have been mapped without reference to international best practice (e.g. Langhammer et al. 2007). An initially planned core zone was deleted from the plan altogether when it became obvious that its original delineation was based on unrealistic assumptions about long-term water availability in the Central Marshes. In conclusion, there are several ways in which the MMNP management plan does not meet the standards of international best practice.
7. **Boundary setting:** According to the draft plan's section "The Park Features", boundary setting was based on 17 criteria, including territorial/hydrological, socio-economic, infrastructural and strategic restoration-related criteria. The spatial distribution of biota and ecosystems was not among them, but reportedly was considered for zonation. This means that the boundary setting of the park as proposed by the management plan is not informed by the distribution of its key ecosystem and biodiversity values, the conservation of which would be the objective of a possible future Word Heritage site in the Marshes.
8. **Framework awareness:** The plan considers other land uses and interests in the vicinity of the planned park but does not explicitly address the political feasibility of its implementation in the face of those interests. It is unclear from the management plan whether the legal feasibility and possible legislative needs for its establishment were addressed by the feasibility study that was conducted in preparation of the plan. There is currently no protected area law in Iraq although a draft is under consideration. It is therefore unclear if the park as proposed by the draft management plan could be established in accordance with Iraqi law - it would definitely be a challenging undertaking. Other laws that infringe on the parks area are not listed in the plan. The plan does not include information on the necessary finances, and technical capacity/expertise needed for its implementation, although a possible organization chart and short job descriptions for seven park staff (two of them dedicated to research and nature conservation) are included. Regarding the overall political feasibility of the plan, it is not clear if the necessary consensus of all stakeholders affecting long-term water supply to the Park (both

in Iraq and upstream) can be ensured for the foreseeable future. Summarizing this analysis of the framework awareness of the plan, it considers basic surrounding interests and institutional aspects but is weakened by its failure to address crucial legal, financial and political feasibility questions.

9. **Implementation:** The MMNP Management Plan is at the draft stage and not being implemented thus far.

The above analysis shows that the MMNP Management Plan is an important contribution to nature conservation in the Marshes, but that the current draft is too flawed technically to provide a significant basis for a future management plan for any World Heritage Site. The plan neither describes the ecosystem and biodiversity values of the Park clearly enough to inform an OUV statement under criterion ix or x, nor does it demonstrate convincingly how an effective conservation management aimed at safeguarding the integrity of these values could be established in the Marshes. Therefore, it would probably not be accepted by the Work Heritage Commission if submitted with a World Heritage nomination for the Marshes. Additional concerns include the criteria for the park's location, which do not include biodiversity and ecosystem values, the lack of a clear documented commitment of local stakeholders to establish the park, and the strong reliance of the vision, overall purpose and objectives on tourism development, which appears unrealistic for the foreseeable future.

However, the baseline study for the park includes a highly valuable analysis of the hydrology of the Central Marshes, as well as hydrological scenarios for Marsh reflooding, which may be useful for the hydrological management of the Central Marshes in the context of any World Heritage nomination in the future.

6.2.2.4 Managing for Change 2010

The report "Managing for Change - The Presence and Future of the Marshes of Southern Iraq" of the Canada-Iraq Marshlands Initiative is not intended as a concise management plan for a specific site within the Marshes, but rather as an action-oriented analysis of recent marsh development. On the basis of this analysis, key factors that affect the environmental state of the Marshes are identified, and strategic recommendations for supporting sustainable marsh management on a general level are derived. Three alternative scenarios for the future development of the Marshes are also developed. Therefore, the document could not be a suitable template for a possible future World Heritage management plan for the Marshes, but the factors identified and recommendations may serve as key criteria to check the relevance and soundness of a more specific future management plan. The document was developed by a roster of national and international experts and institutions and was published jointly with an Atlas of the Iraqi Marshlands (Canada-Iraq Marshlands Initiative 2010a), which adds detail and spatial resolution to its analysis.

Since the document is not a management plan, not all criteria of the general scheme can be applied to it. The publication is evaluated based on what it aims to be, rather than applying generic criteria only.

1. **Description of the target area's values:** The target area of "Managing for Change" are the Marshes as a whole. The biodiversity and ecosystem values of the area are described on a very general level in the section "The Marshes: a Unique Area of the World", together with other values of the area. According to the marsh classification system which forms part of the report, general **ecosystem values** are water quality, possibility of fishing and hunting, suitability for agriculture, quality of vegetation cover and domestic animal production rates. Desirable ranges are defined for each of these values, and an assessment of the healthiness of specific marsh areas based on the classification system is possible. Biodiversity values are not described in detail as biodiversity conservation is not the central goal of the report.
2. **Vision and management objectives:** The plan does not have an explicit, time-specific vision statement, but a list of **guiding principles** that set out the overall strategic direction of the individual management objectives. This list consists of eight principles, including "Quality of life is improved and basic services are provided", "Restoration and management are based

upon best scientific and traditional knowledge", "Ecological integrity is healthy and maintained" and "Coordinated and collaborative decision-making processes are respected and applied". The plan further identifies eight **key factors** (one with three sub-factors) on which the size and health of the Marshes depends, and derives **management objectives** for each factor or sub-factor (ten objectives in total). In addition, 37 **recommended actions** are listed, each of them specific to a management objective.

Figure 6.4. Key factors affecting the size and health of the Marshes. (Source: CIMI 2010b)

3. **Stakeholder support:** The report "Management for Change" was developed jointly by representatives of 15 institutions and three tribal leaders. Among Iraqi Government organizations, the Governorates of Basrah, Maysan and Thi Qar, two Ministries and the Centre for the restoration of the Iraqi Marshlands of the Ministry of Water Resources were involved. Three Iraqi and three Canadian academic/conservation institutions also participated in the elaboration of the planning framework. This appears to be a comprehensive level of stakeholder support for such a general planning document, but does not diminish the need for additional extensive stakeholder participation whenever the principles developed by the plan are applied in specific movement projects in the Marshes.

4. **Logical framework of plan:** The management objectives are indirectly linked (via the key factors) to the guiding principles of the "managing for Change" approach. All recommended actions refer specifically to individual management objectives. Since this is not a site specific management plan with a designated management authority, it is understandable that the specific actions are merely phrased as recommendations. By being tied directly to the key factors that influence marsh extent and health (as defined by the Marsh classification system), the management objectives are designed for maximum impact on the physical drivers of the Marsh ecosystem, and action planning is hence well-informed by the situation analysis. This leads to an exceptionally strong logical framework.
5. **Quality of objectives:** The management approach developed by the "Management for Change" document is not intended to be implemented directly, but to be incorporated into other, site specific management plans. Since incorporation is beyond the control of the plan's authors, the management objectives are not time-specific. While the management objectives are of varying conciseness, 36 of the 37 recommended actions are relevant and measurable, 30 are attainable (with some others possibly attainable), 27 are specific, and none is time-specific (Appendix 6.3.). The low number of specific recommendations may have to do with the general character of the plan as a whole. In general, the management objectives and specific recommendations listed in "Management for Change" are highly relevant to sustainable marsh management in general and address important framework conditions for their further restoration.
6. **Best practice:** The planning approach of "Management for Change" does not aim at a management plan, but recommends using international best practice methodologies and frameworks for five specific actions (2.1, 6.1, 7.2, 10.1, 10.2), including IUCN and WCPA guidelines for protected areas planning.
7. **Boundary setting:** This criterion does not apply because the "Management for Change" approach is not site-specific. However, the plan includes a proposal for the establishment of IUCN Category IV protected areas in Al-Hawizeh, Hammar Marsh and Al-Islah Marshes in the Central Marshes, in addition to the already identified Ramsar site.
8. **Framework awareness:** The planning approach pays considerable attention to the legal, policy and institutional framework of sustainable development in the Marshes. Four of the 37 specific recommendations deal with legislation, seven with policies and politics, and two with institutional innovation. The approach is also strongly focused on capacity building and awareness raising among local inhabitants and marsh managers. The actions have no specified budget, and since the plan is not site specific, no provisions for a dedicated site management authority are made.
9. **Implementation:** The principles, objectives and recommendations of the publication "Management for change" are not designed to be implemented directly by one designated institution, but are rather offered as a general planning framework to the various institutions of the Government of Iraq and other stakeholders to be implemented in the course of ongoing and planned specific projects. None of the other management planning initiatives analyzed for this report has explicitly referred to the report thus far, and no other efforts towards implementation of individual recommendations have been documented.

"Managing for Change – The Present and Future State of the Marshes of Southern Iraq" sets out the framework conditions that need to be met for any successful sustainable development or conservation project to be implemented in the Marshes. These conditions are presented in a logical and clear way, and are complemented by more specific recommendations to be implemented in specific projects, and by three restoration scenarios for the future of the Marshes. The general management objectives and future restoration scenarios are highly relevant to the management of the Marshes in the context of a future World Heritage site and should be considered throughout the nomination and management planning process. The Marsh classification system could also be adapted to serve as an integrity indicator for the Marshes.

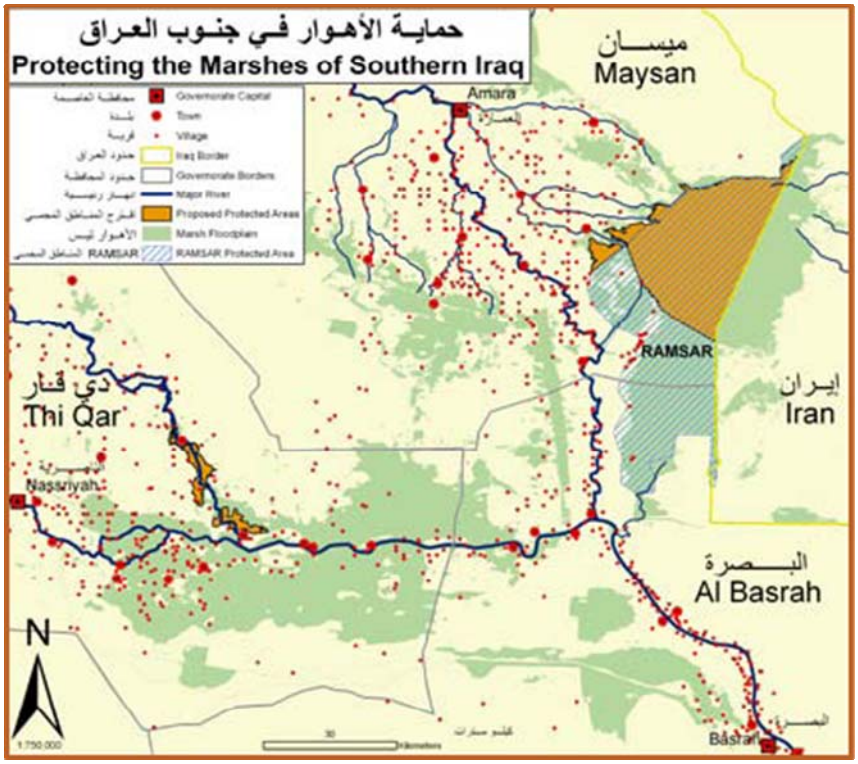

Figure 6.5. Potential protected areas recommended by the Canada-Iraq Marsh Initiatives Marsh Classification System. (Source: CIMI 2010b)

6.2.2.5 Conclusion: Contribution of existing management plans and past initiatives to the development of a management regime for a possible future World Heritage nomination in the Marshes

A considerable amount of work on sustainable management of the Marshes has been done by various actors since 2003, and will be instrumental in supporting the management planning process for a World Heritage site in the Marshes. The existing management plans and frameworks that were assessed into more detail have the potential to contribute to developing a management plan for a future World Heritage nomination. As expected, however, none of them would be a suitable template or basis that could be adapted and used for this purpose.

The New Eden Master Plan is not intended as a management plan, but as a decision support tool for integrated water resource management. Its analyses and models should be used in the World Heritage planning process as appropriate, after careful review in the light of the post-2006 development of the Marshes.

Two existing site-based plans, which were elaborated under extremely difficult circumstances, had other purposes than being the basis of managing a World Heritage site, were based on incomplete or partly incorrect descriptions/evaluations of the areas in question, formulated objectives that were only partly realistic, relevant and attainable, did not take into account international best practice sufficiently, and/or were only put to local stakeholders when they were essentially finished.

The management framework “Managing for Change” of the Canada-Iraq Marshlands Initiative is not site specific and has a wider focus than a World Heritage management plan would have (sustainable development of the Marshes in general) but offers a valuable set of management objectives and recommendations for actions that should be considered as far as relevant at the level of the World Heritage site.

A major concern regarding all existing management plans for the Marshes is that none of them is being implemented currently. The possibility and capacity for implementation of any future

management plan for the Marshes, including a management plan for a possible future World Heritage site, should be assessed and developed during and through the management planning process already, in order to avoid investing resources into yet another plan that then remains without implementation. Institutional setups should be clarified early, in order to provide a basis for institutional capacity development for implementation. Sufficient time needs to be allowed during the management planning process to allow for active and early participation of local stakeholders and the development of implementation capacity. This is discussed in further detail in Section 6.4.5 below.

6.3 Management planning for a possible future World Heritage site

This section deals with a possible approach to the management planning for a possible future World Heritage nomination in the Marshes that is in accordance with international best practice for the management planning of natural and mixed World Heritage sites (IUCN 2008), as well as general protected areas and wetland management guidance (Ramsar Convention Secretariat 2007, Thomas & Middleton 2003).

6.3.1 Meeting the standards of a good management plan

In Section 6.2, existing management plans were evaluated based on a series of indicators. As an introduction to the management planning methodology, Table 6.1. shows how these standards could generally be met during the elaboration of a management plan for the World Heritage site. The steps identified are discussed in more detail below.

It is important to note that the management planning process is already an important part of the future management of the site. This is particularly relevant to stakeholder participation. If a draft management plan is produced without significant stakeholder support and input and only then submitted for public consultation, an important opportunity of informing the management plan is missed, and local stakeholder ownership may be reduced considerably.

An important goal of the management planning process for the site will be developing a planning framework that integrates management strategies for both the natural and the cultural values which may form the basis of an eventual World Heritage nomination of the Marshes. An integrated management planning framework and institutional setup for both the cultural and the natural values of the Marshes will need to be developed.

6.3.2 The management planning process

6.3.2.1 International best practice approaches to World Heritage management planning

Guidance on management planning for natural World Heritage properties has been published by IUCN (2008). This resource mentions some specific planning needs for World Heritage sites but generally states that planning for a natural World Heritage site is not much different from planning for any other protected area. This means that the generic advice on international best practice in protected areas management can be applied to a World Heritage site in the Marshes, including the principal guidelines on management planning (Thomas and Middleton 2003), Local participation (Borrini-Feyerabend et al. 2004), application of IUCN Categories (Dudley et al. 2007) and KBA analysis (Langhammer et al. 2008). An additional approach to wetlands is that of the Ramsar Secretariat (2007b).

Based on the worldwide successful application of the “Guidelines for Management Planning of Protected Areas (Thomas & Middleton 2003), this study recommends to use these guidelines as the backbone for management planning for any future World Heritage site in the Marshes, to adapt them to the specific needs of this planning process as necessary and to complement them with other more specific guidelines wherever appropriate. While some key points from these guidelines are listed below for general information, it is recommended that the guidelines in their entirety are consulted by the national planning team.

Table 6.1. Meeting the criteria of a sound management plan in the planning process for any future World Heritage Site in the Marshes

Criterion	Steps to meet criterion
1. Description and evaluation of area and its values	- Section 4 of this report describes and evaluates relevant values of Marshes in relation to natural World Heritage criteria. Once the identified knowledge gaps are closed, this information can be used as the descriptive/evaluation MP section
2. Vision and management objectives	- The vision should describe, in general terms, the state of the identified potential OUV and other values at a specified time (e.g. in 20-30 years) - Objectives (for implementation during the plan's duration, e.g. within 5 or 10 years) should be deduced from the current state of the identified values, the pressures/threats that effect them, and their desired state
3. Stakeholder support during planning phase	- A stakeholder analysis (including the mandate, role, interest and capacity of key stakeholders in relation to the site) should be conducted early during the planning process, with a particular focus on local stakeholders - Participatory planning techniques should be employed throughout the planning process, if possible - A formal local citizen advisory panel or similar structure should be involved throughout the planning process - International best practice guidelines on stakeholder participation should be followed (see criterion 6)
4. Logical framework	- MP Objectives should have a clear hierarchical logic, i.e. concrete management activities should combine to meet management objectives and management objectives should combine to meet overall goals. Generally, each activity should be specific to a management objective (cross-cutting activities are possible)
5. Quality of objectives	- Objectives should be SMART and designed in a way that they can be monitored - An explicit monitoring plan should be included
6. Best practice	- The MP planning process should be based on the general guidance of IUCN (2008), Thomas & Middleton (2003) and possibly Ramsar Convention Secretariat (2007b), as well as related more specific guidelines if appropriate
7. Boundary setting	- Boundary setting should be based on the spatial distribution of features that are of potential OUV (consider application of KBA analysis – Langhammer et al. 2008), the hydrologically sustainable marshland size, and the feasibility/manageability of candidate areas - If necessary for the safeguarding of the integrity of OUV, buffer zones should be planned
8. Framework awareness	- Legal implications and legislation needs as well as jurisdictions and competencies related to the establishment of a World Heritage site need to be assessed and decided early during the planning process

	- The political feasibility of proposed boundary setting and management interventions (e.g. water allocation) needs to be assessed early during the planning process - Land tenure issues including traditional use rights need to be clarified and solutions that maximize community stewardship identified during the planning process - The consistency of the plan with other plans relevant to the area and the possible need of coordination mechanisms need to be assessed - Financial needs and the possible packaging of the management plan implementation into donor funded projects should be assessed during planning - Options for the institutional setup of a management authority for the property should be developed early, and discussed with all stakeholders - An institutional capacity development plan for the management authority should be developed
9. Implementation	- If Criteria 1-8 are met and implementation funding is sourced successfully, then the implementation outlook of the plan will be significantly improved.

6.3.2.2 Stages of the management planning process

Thomas and Middleton (2003) distinguish 13 stages of the management planning process (Box 6.2.). It is important to proceed through these stages in a sequential manner as each stage provides the information that is necessary to take the next. The only exceptions are the initial stages (data gathering and evaluation), during which it is sometimes necessary to work in parallel, for practical reasons.

Box 6.2. Key stages of the protected area management planning process (adapted from Thomas and Middleton 2003)

1. Pre-planning: decision to prepare a management plan, appointment of planning team, scoping of the task, defining the process to be used
2. Data gathering: identification of features, pressures, threats; consultation
3. Evaluation of data and information
4. Identification of constraints and opportunities
5. Development of management vision and objectives
6. Development of options for achieving the vision and objectives, including zoning
7. Preparation of draft management plan
8. Public consultation of draft management plan
9. Assessment of submissions, revision of draft management plan, production of final plan, submission; analysis and reporting on the results of the consultation process
10. Approval and endorsement of management plan
11. Implementation
12. Monitoring and evaluation
13. Decision to review and update the management plan; accountability considerations

Referring the above sequence of stages to the specific situation in the Marshes, it becomes obvious that Stages 1-4 have already been initiated through the decision to work towards a World Heritage nomination, and through this study. The global comparative analysis and the final OUV assessment that is based on it would take the place of the evaluation (Stage 3) in this case. Once the network of experts for the drafting of the plan is established (see Section 6 of this report), and the identified knowledge gaps have been filled (see Section 4), the management planning process for the Marshes could continue from Stage 5. More detailed guidance is available in Thomas & Middleton (2003).

6.3.2.3 Duration of the management planning process

Even the simplest PA management planning processes require at least 12 months to accomplish the sequence of Stages 1-10. If there are crucial baseline data missing and/or difficult to obtain, or if the area where the protected area is large or complicated, or if extensive public consultations and/or framework adjustments are needed to produce a viable plan, this time can easily multiply. Since all of these factors apply to the Marshes, the national planning team should give itself at the very least 24 months to produce the final nomination file and management plan. If the nomination needs to be submitted at an earlier date due to political or other considerations, then Paragraph 115 of the Operational Guidelines of the WHC allows for this (UNESCO 2008). In this case, an interim management plan should be submitted, to be succeeded within two years by the definite comprehensive management plan for the property (IUCN 2008).

6.3.3 The contents of the management plan

The minimum requirements for the contents of a management plan for a natural World Heritage property are listed in Box 6.3. However, these are merely minimum requirements that are necessary for nomination of the property. It is in the interest of developing a functional management regime for the Marshes that additional aspects (e.g. the framework aspects listed under the condition 8 of Table 6.1., or sustainable natural resource use by local Marsh inhabitants) are also addressed by the plan.

Box 6.3. Minimum requirements of a management plan for a natural and mixed World Heritage site (Source: IUCN 2008)

- A commitment to implementing the plan to fulfill the obligations of the Convention.
- An initial assessment and factual statement of the condition of the property's natural values, including its features of Outstanding Universal Value, and an indication of their relationship to its other characteristics.
- The issues and challenges facing the property.
- The long term ambition for the property, i.e. its vision and objectives.
- The means of delivering the ambition, i.e. the range of management policies and associated actions for the property, including the spatial expression of these policies through, for instance, zoning plans or spatial analysis of natural and cultural factors within and surrounding the property.
- In addition, the legal status of the property and the legal framework for its management and administration need to be explained in the nomination file.

The list in Box 6.3. appears short, but if item on the list is applied to each value identified in the Marshes (e.g. issues and challenges facing the various species that constitute their biodiversity value, issues and challenges related to water availability, and long term target ranges as well as management actions for each of these etc.), even fulfilling these minimum requirements will produce a complex management plan.

Additional detailed guidance on the contents of a management plan for natural and mixed World Heritage sites and protected areas in general can be found in IUCN (2008) and Thomas & Middleton (2003), respectively. In addition, Appendix 6.4. contains two checklists that should be consulted during management planning for the Marshes – one for the initiation of the management planning process, and one for the final plan itself. Reference to international best practice in relation to World Heritage lists and nominations is made in Box 6.4.

6.4 Critical aspects of management planning for a World Heritage site in the Marshes

Apart from the generic requirements that would also apply to protected area management planning, the planning process for a possible future mixed World Heritage nomination in the Marshes has to address some specific issues unique to the Marshes. The most important of them are discussed in this section.

Box 6.4. Examples of best practice during the World Heritage nomination process…

…regarding nominations: Norway, Japan

…regarding tentative lists: Madagascar, New Zealand, Canada

6.4.1 Water management

The analysis of ecosystem and biodiversity values of the Marshes (Section 4) has shown that essentially all of them have been severely affected by the draining of the Marshes in the 1990s (c.f. Partow 2001, Richardson et al. 2005 and additional publications referenced in Section 3). The partial reflooding of the Marshes since 2003, has not led to a restoration of their ecological integrity to pre-draining levels to date (CIMI 2010b, Hamdan et al. 2010, Richardson & Hussain 2006, Salim et al. 2009a).

Which of the Marshes are on a trajectory towards full ecological restoration will need long-term monitoring programmes to determine. Some authors concluded as early as 2006 that large-scale marsh restoration is technically feasible (e.g. New Eden Group 2006), but the data and models presented by these authors merely show that marsh reflooding may be technically feasible, and do not give conclusive evidence regarding the sustainability and preconditions of a long-term restoration of ecological and biodiversity values according to World Heritage criteria ix and x. Instead, the authors gave detailed advice regarding the elaboration of an ecological restoration plan including ecologically informed flow pulse recommendations (New Eden Group 2006).

Recent reports also confirm earlier studies in that there are other water-related factors besides the legacy of the draining period that continue to put pressure on water availability to the Marshes. These include decreasing discharge due to upstream dams and water use along the Tigris and Euphrates, and the bisection of the Al-Hawizeh Marsh/Hawr Al-Azim by a dam constructed on the Iranian side, combined with reduced water input from the Kharkhe River (see Naff & Hanna 2002, CIMI 2010b and references therein).

Both the legacy of the Marshes' draining, the still precarious state of the limited part of the Marshes that has since entered a recovery process, and the increasing pressures caused by upstream water withdrawal mean that the hydrological functioning of any future World Heritage site within the Marshes will need to be actively managed. It would be beyond the scope of this report to develop this management plan in detail but a few key corollaries of the need for active management are listed:

- **Realistic boundary setting:** Any future World Heritage site should be demarcated in such a way that the available water volume is sufficient to ensure not only partial reflooding but a fully functional hydrological regime including an appropriate (managed) hydroperiod, hydropattern, flushing effect and overall water quality. Since the OUV statement for the site will need to be

Box 6.5. Using keystone species to define the envelope for favorable hydrological status of the marsh ecosystem.

Keystone species are species that have pivotal function in the ecosystems of which they are part. The rationale of the keystone species approach is that by keeping environmental conditions favorable for these species, the functionality of the system as a whole can be maintained. Keystone species approaches should be used in conjunction with system-based approaches to stay aware of the overall system.

1. Define species (e.g. *Phragmitis australis, Polygonum salicifolium, Barbus sharpeyi*).
2. Determine the optimal range of key environmental factors (e.g. water depth and temperature, hydroperiod, salinity, nutrient concentrations, dissolved oxygen concentrations, pesticides) for the growth and reproduction of these species.
3. Determine the hydrological regime (e.g. water quantity, quality, periodicity, spatial flow patterns) that is needed to keep environmental factors in the optimal range.
4. Assess boundary conditions (e.g. costs, safe water allocation) to determine if the favorable hydrological regime can be achieved technologically
5. If assessment is positive, develop technical solutions that can achieve the favorable hydrological regime
6. Monitor and adjust technology if favorable hydrological regime/environmental conditions/species targets are not met.

The above approach can also be applied to focal species, i.e. species that are deemed conservation targets not because of their role in the ecosystem but because of societal choice (Lambeck 1997).

based on the actual integrity of biodiversity and ecosystem values in the nominated area, rather than the level of integrity expected following restoration, the site should be centered around the most functional marshes in the first instance (see boundary setting section below). Reflooded sites could be added (e.g. in the process of a phased serial nomination) once long-term monitoring shows they are on a robust restoration trajectory.

- **Integrated water management framework:** The water input into the Marshes needs to be managed as part of a wider integrated water management scheme that includes water users in Iraq, as well as in upstream countries around the basin (Iran, Syria and Turkey). CIMI (2010a) gives more detailed suggestions on seeking agreements with Turkey, Syria and Iran aimed at ensuring adequate flow, as well as developing a national consensus to balance the growing water demands inside Iraq. The World Heritage nomination of the Marches can be used to raise the profile of the issues and to leverage international support to an equitable regional framework for water management.
- **Favorable hydrological conditions for ecosystem recovery:** More research and monitoring is needed to determine the hydrological characteristics (quantity, quality, hydroperiod) that are needed to achieve functional integrity of the marsh ecosystem. These characteristics need to be deduced form a defined favorable range of ecosystem descriptors (c.f. Richardson 2001, Richarson & Hussain 2007) and/or from a defined favorable range of environmental factors for specific keystone species within the Marshes' ecosystem (Box 6.5.).
- **Technical solutions to meet favorable hydrological conditions:** Technical solutions to achieve favorable hydrological conditions need to be developed, based on existing approaches such as those developed by New Eden Group (2006). Technical solutions for water management in the Marshes need to be based on a reliably agreed minimum water allocation and need to be informed by explicit goals and target ranges of key environmental variables, in order to be effective. Investment made into technical restoration solutions may be lost if these preconditions are not met.
- **Ensuring water quality:** The quality of the water reaching the Marshes needs to be improved through measures aimed at a minimization of salt, nutrient and pollutant influxes throughout the Tigris-Euphrates basin. CIMI (2010b) lists specific measures to achieve this goal. The practice to use waters from the Main Outfall Drain for marsh restoration could be re-assessed based on a clearer definition of ecological targets for marsh restoration, in view of water quality concerns about these waters.

As part of the management planning process for a possible future World Heritage site in the Marshes, a water management plan should be developed that addresses each of the above issues into more detail. This plan should take into account guidance on water allocation that is available from the Ramsar Convention Secretariat (2007c), as well as the recommendations on flood pulse management of New Eden Group (2006). Specific research needs to support this process are listed in Box 6.6.

Box 6.6. Key research needs in preparation for a water management plan for a future World Heritage site in the Marshes

- Estimation of a minimum available water quantity for the Marshes over the next ten years,
- Definition of target ranges of key environmental parameters for marsh restoration, as informed by ecosystem approaches and keystone species approaches,
- Determination of the necessary hydrological regime (quantity, flow rate, hydroperiod, water quality) and the resulting necessary water input per unit area to achieve defined target range of environmental parameters, taking into account economic water management technology,
- Estimation of the manageable area, from available water quantity and water need per area,
- Choice of area(s) to be managed and development of technology for water management (taking into account general OUV management objectives of the future site)
- Feasibility study about removal of flood protection dams in target area(s) (c.f. Partow 2001)

6.4.2 Marsh restoration and Paragraph 116 of the WHC Operational Guidelines

Box 6.7. Paragraph 116 of the WHC Operational Guidelines (UNESCO 2008)

Where the intrinsic qualities of a property nominated are threatened by action of man and yet meet the criteria and the conditions of authenticity or integrity set out in paragraphs 78- 95, an action plan outlining the corrective measures required should be submitted with the nomination file.

Should the corrective measures submitted by the nominating State Party not be taken within the time proposed by the State Party, the property will be considered by the Committee for delisting in accordance with the procedure adopted by the Committee (see Chapter IV.C).

The analysis of values under criteria ix and x has shown that after a significant part of the Marshes' values was lost during the second half of the 20th Century, particularly during the 1990s, their partial reflooding since 2003 set into motion a recovery process that is expected to continue, if sufficient water is provided and the hydrology and other ecosystem parameters of the Marshes are managed properly (c.f. the previous section).

The necessary process of continued restoration management of the Marshes could be integrated into the World Heritage management process by submitting the above-mentioned specific hydrological restoration plan (or plans for component sites) with the nomination and management plan, with reference to Paragraph 116. This would on the one hand increase the chances of the nomination being accepted in spite of remaining integrity concerns on the part of the World Heritage Commission and its Advisory Body, and would on the other hand create a clear commitment to focused restoration efforts in the designated sites, on the part of the Iraqi Government.

6.4.3 Conservation and ecosystem management

Box 6.8. Conservation of ecosystem values through the management of nutrient concentrations

Increased concentrations of nutrients like nitrate and phosphate (eutrophication) and an increased frequency of algal blooms have been reported from some marshes following reflooding. Eutrophication is a pressure on the integrity of the Marshes' ecosystem values because

- it can lead to algal blooms and hence to an increased biological oxygen demand in the water column, which in extreme cases may suffocate fish and other fauna,
- it can lead to increased water column Chlorophyll *a* concentrations and hence to insufficient light penetration to benthic macrophytes, thereby inhibiting macrophyte growth and weakening its habitat and food resource role for other biota, and
- it can support the growth of toxic cyanobacteria and dinoflagellates (the latter were already observed in the Marshes).

Therefore, nutrient input into the Marshes needs to be reduced, nutrients need to be immobilized within the Marshes and/or the flushing of nutrients from the Marshes through seasonal flood pulses needs to be enhanced through hydrological management. While flushing as part of hydrological management is discussed elsewhere, and nutrient immobilization in biomass (e.g. in reed, which could then be removed from the system by harvesting) could be achieved simply by keeping other environmental parameters (e.g. salinity and water depth) within the range favorable for reed growth, there are several potential ways of reducing nutrient input into the Marshes:

- Establishment of wastewater treatment facilities on major upstream point sources (including phosphate precipitation and nitrification/denitrification)
- Reduction of non-point sources of nutrients around the Marshes and upstream by promoting sound agricultural management (e.g. responsible use of fertilizer)
- Establishment of vegetated buffer zones between the Marshes and intensively used agricultural areas, which act as a nutrient filter

The effectiveness and feasibility of each of these management options would need to be assessed jointly during the management planning process, in order to arrive at the best possible solution to control eutrophication and maintain the ecosystem values of the Marshes.

Conservation management aimed at conserving the values identified in the Marshes under criteria ix and x should particularly focus on the pressures and threats to the various faunal groups that have been identified in Section 4 of this report, using international best practice approaches. The overall status of the marsh ecosystem (particularly in terms of water quantity and quality) clearly is the major pressure in this regard, but there are other pressures and threats that might jeopardize ecosystem and biodiversity values even if sound hydrological management is established. While it is beyond the scope of this report to spell out all of these measures in detail, two examples (one regarding a criterion ix value and one a criterion x value) are presented in Boxes 6.8. - 6.9., to illustrate what is meant with conservation and ecosystem management in this context, and how specific interventions can be derived.

Box 6.9. Conservation of biodiversity values through community hunting management

The Marshes used to be one of the largest wintering site for migratory waterbirds in western Eurasia. While species numbers have increased quite dramatically since Marsh reflooding, the numbers of individual birds appear to be much lower now than before the draining of the Marshes.

Birds have always been hunted in the Marshes and significant percentages of the standing stock have been removed during the 70s already, but at the current reduced numbers, migratory bird populations are more sensitive to hunting pressure. At the same time, the reduced overall area of the Marshes has reportedly lead to the occurrence of dense congregations of wintering or resting birds in the Marshes, which make them particularly susceptible to hunting.

In order to reduce hunting pressure, it would either be possible to ban hunting, depriving the generally poor Marsh inhabitants of an important protein source (to the extent that such a ban could be enforced in the current situation), an alienating them from the World Heritage project, or local resource users could be given incentives to use hunting resources more sustainably.

The latter approach could be taken by establishing community-based hunting schemes, which grant long-term hunting rights to community-based organizations, hunting associations or individuals, combined with rules about sustainable bagging numbers, species and zones banned from hunting, etc. As the owners of long-term hunting rights which can be used or traded, local hunters would have an interest in using resources more wisely, and complying with regulations. Involvement of hunting associations has also been suggested for the Mesopotamian Marshlands National Park (New Eden Project 2010b), and the overall approach has been implemented successfully in other parts of the world (e.g. Shackleton 2001).

Additional tools for the conservation of migratory waterbirds could be adapted from the “Flyway approach to the conservation and wise use of waterbirds and wetlands” (Dodman & Boere 2010).

6.4.4 Participation of local stakeholders

Since one of the overarching goals of the Word Heritage nomination process is to support the livelihoods and sustainable development of the Marsh inhabitants and their culture (including those that are still to return), it is imperative to plan the management of the Marshes as a mixed World Heritage site jointly with them. This is also very much in line with the requirements of the WHC Operational Guidelines, particularly Paragraph 108, which emphasize the need for true empowerment (and not merely post-hoc information or consultation) in the course of World Heritage Management Planning.

6.4.4.1 Participation during management planning

While Thomas and Middleton (2003) foresee major public consultations only at the stage of the draft management plan, IUCN (2008) spells out in which ways local communities and tribes could and should be involved earlier during the process. Since successful management as a World Heritage site particularly depends on local support, this guidance should be followed, and the following should be ensured:

- Active participation by all key stakeholders and the wider community (during the management planning process).
- That all stakeholders understand the characteristics, natural values, integrity and functioning of the property and its surroundings.
- Shared information on the information, agendas and expectations of all the different stakeholders as a basis for a shared vision and objectives, before actions are determined.

- Shared ownership and support exists for the approaches and actions required to safeguard the property.
- Delivery of the plan is shared as necessary between all the relevant authorities and stakeholders.

An additional way of enhancing local participation already during the management planning process would be to establish citizen advisory boards or using existing tribal structures as a regular platform to seek consensus about the best management objectives and specific strategies, throughout the management planning process.

Implementing large-scale public participation processes in the Marshes may be difficult, because of the security situation and possibly because of the preoccupation of the often very poor local inhabitants with their day-to-day survival. While the security situation may necessitate extensive collaboration with local government and tribal representatives and additional time allocation, the second issue could be addressed by taking into account the immediate livelihood needs of local inhabitants (e.g. safe water, sanitation, schools, support to agriculture and fisheries) during the project planning phase already, by implementing a series of trust-building projects addressing such issues (cf. UNEP 2010, lessons learned).

Another possible example of practical participation of local resource users in the management of a possible future World Heritage site in the Marshes is community hunting management (Box 6.9.). Additional guidance on local stakeholder participation and empowerment during the management planning process can be found in Borrini-Feyerabend et al. (2004).

6.4.4.2 Local participation in relation to the mixed nomination

The general goal of the UNEP-UNESCO World Heritage Initiative for the Marshes is the promotion of sound environmental management and sustainable development in the context of a mixed World Heritage nomination and management planning process in the Marshes. Since there are apparently no archaeological or artistic monuments of potential OUV within the Marshes, a nomination of the Marshes as a mixed site would have to rely on World Heritage criterion v (potentially complemented by criterion vi). Criterion V is defined as follows:

"be an outstanding example of a traditional human settlement, land-use, or sea-use which is representative of a culture (or cultures), or human interaction with the environment especially when it has become vulnerable under the impact of irreversible change"

This means that a nomination under criterion v and hence a mixed nomination as recommended by UNESCO and UNEP depends on the continued existence of the Marsh Dwellers' culture and specific interaction with the environment. Participatory planning for the World Heritage management regime will therefore only be possible if a sufficient number of Marsh Dwellers, the majority of which were displaced from the Marshes during the 1990s, is willing to stay or return to the Marshes and continue or resume their unique way of life. Evidence regarding the determination of Marsh dwellers to do so currently appears inconclusive. No systematic large-scale sociological surveys regarding this question have been published. However, a socio-economic village survey by Thi Qar University (Ibrahim 2007) came to the following results:

- Most of the villages surveyed (108 out of 199) were classified as bordering the Marshes while 84 were classified as being situated in the vicinity but not directly bordering the Marshes. Only seven out of 199 villages were located inside the Marshes, and only 2% of the surveyed population lived there.
- The fact that there are so few villages inside the Marshes where the inhabitants have returned indicates that there are many villages inside the Marshes that disappeared after 1993 and to which inhabitants have not yet returned.

- The Survey Team believed that a change in the life of marsh population had taken place from “Ma'adan” life style to “country” life style, because they hoped that service access would be better in the periphery of the Marshes.

While this is only a snapshot and not indicative of a general unwillingness of Marsh inhabitants to resume at least aspects of the traditional culture of the Marsh dwellers (which would be possible from settlements at the Marshes’ periphery), it shows that the traditional Ma’adan lifestyle is practiced by a decreasing proportion of inhabitants of the region and that this may partly be by choice not by necessity. Therefore, the lifestyle preferences of Marsh inhabitants should be studied more comprehensively before specific management actions to safeguard the integrity of a particular lifestyle are taken. For example, construction of new villages inside the Marshes, as has been suggested by some plans (e.g. New Eden Group 2006), should only commence if there is a clearly expressed interest by local inhabitants to live there. The dire state of public services in the Marsh region, which was also highlighted by Ibrahim (2007), should have absolute priority, as has been the guiding principle of previous efforts of UNEP and UNESCO in the region (e.g. UNEP 2010).

In addition, it might be beneficial for the integrity of natural values to reserve some areas inside the Marshes for biodiversity conservation, if there is only limited interest among local communities to use them.

6.5 Definition of the boundaries of the possible nominated area

The paragraphs of the WHC Operational Guidelines show that careful boundary setting is an important part of the overall management planning process for any natural or mixed World Heritage site. To put it simply, the boundaries of a property should enclose the sites where its key OUV is located. It would not be acceptable to the World Heritage Committee if, for example, a species that occurs in the general area where a property is to be established is identified as part of its OUV under criterion x, but is not proven to live actually within the nominated site rather than somewhere in its vicinity.

Box 6.10. Paragraphs 99, 101 and 102 of WHC Operational Guidelines on the boundaries of natural and mixed World Heritage sites (UNESCO 2008)

99. *The delineation of boundaries is an essential requirement in the establishment of effective protection of nominated properties. Boundaries should be drawn to ensure the full expression of the outstanding universal value and the integrity and/or authenticity of the property.*

101. *For properties nominated under criteria (vii) - (x), boundaries should reflect the spatial requirements of habitats, species, processes or phenomena that provide the basis for their inscription on the World Heritage List. The boundaries should include sufficient areas immediately adjacent to the area of outstanding universal value in order to protect the property's heritage values from direct effect of human encroachments and impacts of resource use outside of the nominated area.*

102. *The boundaries of the nominated property may coincide with one or more existing or proposed protected areas, such as national parks or nature reserves, biosphere reserves or protected historic districts. While such established areas for protection may contain several management zones, only some of those zones may satisfy criteria for inscription.*

These general criteria are applied to the Marshes in the following section.

6.5.1 Application of general WHC boundary setting principles to the Marshes

Considering World Heritage criteria ix and x the most important requirements for Marsh boundary setting, the requirement expressed in Paragraph 101 can be broken down to two simple questions:

1. Criterion ix: How are the three key ecosystem level processes of potential OUV as identified in Section 4.5 (succession, bird and other animal migrations, and vertebrate evolution) distributed throughout the Marshes?
2. Criterion x: How are the abundances of endemic/near-endemic and globally threatened species and subspecies distributed throughout the Marshes?

Criterion vii largely depends on criteria ix and x and is therefore not discussed separately. Because two of the three processes discussed under criterion ix depend on biodiversity, the second question is discussed first.

6.5.1.1 Distribution of biodiversity of potential OUV (criterion x) throughout the Marshes

This question can be answered based on the synthesis of data provided by Section 4 of this report, and for some groups (e.g. fishes, birds) based on the results of the recent surveys of Nature Iraq's KBA project (Salim et al. 2009a, b). It would be beyond the scope of this report to conduct this analysis in detail, but a few clear trends can be listed:

- **Most of the bird and mammal species of potential OUV are concentrated in Al-Hawizeh Marsh.** The local sub-species of African Darter as well as the isolated populations of African Sacred Ibis and Goliath Heron all have their strongholds in Al-Hawizeh Marshes, and additional threatened bird species such as the White-headed Duck have only been reported from there. The Smooth-coated Otter was also first described from Al-Hawizeh and the potential specimen that has been obtained by Nature Iraq is from this Marsh. Although no post- flooding information is available for Bunn's Short-tailed Bandicoot Rat or the Euphrates Jerboa, it is also most likely that these species have survived marsh draining in Al-Hawizeh. The importance of Al-Hawizeh is further confirmed by the absolute species and individual numbers found there. While species numbers in Al-Hawizeh were 35% and 86% higher than in West and East Hammar, respectively, absolute bird numbers exceeded those of the Hammar sites by almost a factor of five (Abed 2007).
- **Fish and invertebrate diversity appears to be highest in East Hammar:** Recent studies of Hussain et al. (2008, 2009) showed that the species richness of fish in East Hammar is almost twice as high as in Al-Hawizeh and West Hammar Marshes (32 compared to 17 species). Among the invertebrates, snail species richness was 42% higher in East Hammar than in Al-Hawizeh and West Hammar (Ali et al. 2007). While additional work is necessary on the invertebrates, these data suggest that East Hammar supports higher species numbers of aquatic organisms, possibly owing to its increased salinity, connection to the Shatt-Al-Arab, and resulting higher proportion of brackish and diadromous species.
- **Further research is needed regarding the distribution of target species among the individual marshes.** The results of recent KBA surveys of Nature Iraq should be analyzed quantitatively to understand the spatial distribution of high conservation priority species even better.

Although the picture regarding the fine scale distribution of biota in the Marshes is far from complete, it is obvious that a successful nomination under World Heritage criterion x will not be possible without inclusion of Al-Hawizeh Marsh. This is also understandable from a historical point of view as Al-Hawizeh was affected least in the 1990s, and may have acted as a refuge for species and populations that became extinct in other Marshes during this period.

The fact that East Hammar scores high regarding fish and invertebrate species number does not necessarily mean it is as relevant to criterion x as Al-Hawizeh Marsh. This would only be the case if the species that contribute to this score are both typical of the Marshes (e.g. endemic) and of high conservation priority. It appears unlikely that this is the case.

6.5.1.2 Distribution of natural values relevant to criterion ix within the Marshes

Of the three potential processes of potential OUV identified in Section 4, two (bird migration and vertebrate evolution) depend on biodiversity and would hence show a similar spatial distribution as the underlying biodiversity values, and once more underline the importance of Al-Hawizeh Marsh as the most intact section of the Marshes. The hypothesis that East Hammar may be more important than for diadromous fish and invertebrates than the other Marshes is also based on the biodiversity encountered there, besides the location of this marsh. This trend is of limited but significant importance for the potential OUV of the Marshes under criterion ix and also indicates that East Hammar represents an extreme of the range of environmental actors found in the Marshes (cf. Banat et al. 2006).

Regarding the third process (succession) it is more difficult to define indicators based on which spatial trends of ecological functionality could be detected. Two possible indicators would be the presence of the full mosaic of succession stages in a Marsh area and the general healthiness of vegetation. Although these indicators have not been used for comparisons between individual Marsh areas, the study of Hamdan et al. (2009) gives an insight into the disturbed health of vegetation and the shifted succession pattern in the reflooded Central Marshes. In comparison to 1973, their 2006 study found

shifted community structure, increased prevalence of invasive species, reduced productivity of native species including reed, and reduced standing crop of reed beds. This suggests that the same as for the two other processes holds true for ecological succession, and that again Al-Hawizeh is the richest site in terms of potential OUV according to criterion ix, followed by the Central Marshes and the probably equally disturbed Hammar Marshes. A possible exception might be Abu Zirig, which represents the only relatively undisturbed marshland area apart from Al-Hawizeh.

To conclude this preliminary evaluation of the best general location(s) for a possible future World Heritage site in the Marshes, Al-Hawizeh Marsh ranks clearly higher than all other marshes, with East Hammar potentially ranking second because of its increased – if not necessarily typical - fish and invertebrate diversity.

The exact boundary setting of a World Heritage site in Al-Hawizeh could follow the boundaries of the Ramsar site there (Nature Iraq 2008a), or the smaller demarcation as proposed by CIMI (2010b). The fact that Al-Hawizeh Marsh is already declared as a Ramsar site does not pose a problem in this regard. Most wetland World Heritage sites are also Ramsar sites.

The fact that Al-Hawizeh appears to be the only marsh that might potentially meet World Heritage criteria ix and x on its own at the moment does not mean that the other sites need to be excluded from a potential future World Heritage site once and for all. The possibility of a (synchronous or phased) serial nomination means that other Marshes could be included into a serial property in addition to Al-Hawizeh if it were demonstrated that they add to the overall potential OUV or integrity of the serial site.

6.5.2 Buffer zones

The Operational Guidelines also foresee the creation of buffer zones around World Heritage properties where necessary (Box 6.11.).

Box 6.11. Paragraphs 103, 104 and 105 of WHC Operational Guidelines on buffer zones of World Heritage sites (UNESCO 2008)

103. *Wherever necessary for the proper conservation of the property, an adequate buffer zone should be provided.*

104. *For the purposes of effective protection of the nominated property, a buffer zone is an area surrounding the nominated property which has complementary legal and/or customary restrictions placed on its use and development to give an added layer of protection to the property. This should include the immediate setting of the nominated property, important views and other areas or attributes that are functionally important as a support to the property and its protection. The area constituting the buffer zone should be determined in each case through appropriate mechanisms…*

105. *A clear explanation of how the buffer zone protects the property should also be provided.*

This should be considered when the boundaries of a new World Heritage property in the Marshes are planned. It is important that buffer zones are not simply designated, but that they also have a clear legal basis, clear regulations as to what activities are permitted or prohibited there, and effective management to ensure meaningful links with the management of the nominated area.

If the national preparation team decides to develop an application for a serial site, then buffer zones could serve a second function as corridors between individual component core sites of the property. This is discussed in more detail in the next section.

6.5.3 Possible consideration of a nomination of the Marshes as a serial site

The World Heritage Convention foresees the possible establishment of serial World Heritage sites if the conditions of Paragraph 137 of the Operational Guidelines are met. There is also the possibility of phased serial nominations (nominating one site first and adding additional sites later. Engels et al. (2009) provided a global overview of serial natural World Heritage sites, showing that there are 34 serial natural and two serial mixed properties worldwide. The trend of serial site inscriptions has been increasing since the early 1990s.

Box 6.12. Paragraph 137 of the WHC Operational Guidelines (UNESCO 2008)

Serial properties will include component parts related because they belong to:

a) the same historico – cultural group;

b) the same type of property which is characteristic of the geographical zone;

c) the same geological, geomorphological formation, the same biogeographic province, or the same ecosystem type;

and provided it is the series as a whole – and not necessarily the individual parts of it – which are of outstanding universal value.

Engels (2009) gives further criteria for the establishment of natural or mixed serial sites, using the metaphor of "telling a story" – does a single site tell the whole story of the values to be protected by the sites, or is there a need for several "chapters" in the story? Examples included islands within an archipelago or different vegetations of an ecosystem/vegetation type. It was emphasized that in the case of a serial nomination, all component sites need to be managed by one management framework.

Applying these criteria to the Marshes, it becomes obvious that there is potentially a strong case to nominate the Marshes as a serial site, if the spatial analysis of the potential OUV according to selected criteria for nomination actually yields a discontinuous distribution, as appears likely.

6.5.3.1 Considerations regarding the potential for a serial World Heritage nomination in the Marshes

The following specific arguments could be made in favor of nominating the Marshes as a serial World Heritage property:

Historical links

- The Marshes are relicts of a more extended marsh area that used to be continuous. They might partly grow together again to form one continuous area in the future if managed appropriately.
- The Marshes belong to the same ecoregion and in fact the same archipelago of aquatic and semi-aquatic habitats in a surrounding ocean of desert; if the marshes are to play their former role as wintering and staging area along the Eurasian-African flyway again, the whole archipelago and not just a single island will need to be included in a conservation regime.
- The Marshes are similar but slightly different expressions of the same ecosystem type. They represent a range of salinities and other environmental factors, as well as corresponding communities, which need to be captured entirely in order to represent the whole potential OUV of the marshes ("whole story" argument).

- There may be additional arguments in relation to cultural criteria, and the spatial distribution of potential OUV according to cultural criteria may further complicate the serial character of the property.

Functional links

- Hydrological: If it can be shown that water flows from one of the three core Marsh areas to the other, thus making hydrological health of one Marsh the prerequisite of that of another, then there is a strong functional link that needs to inform management. This needs detailed technical evaluation. It appears that Hammar is not hydrologically connected to the two other marsh areas and that Al-Hawizeh Marsh and the Central Marshes may in the future actually compete for Tigris water.
- Ecological: Some of the ecosystem properties and ecosystem services which contribute to potential OUV under criterion ix may only emerge above a certain threshold size of the overall Marsh area, which may only be reached if the three remaining areas are taken together (e.g. effects on regional climate, aerial propagule density).
- Biological: Migratory water birds, which may represent a key argument for OUV under criterion x, can fly between geographically distinct sites and may hence perceive a serial site as one. Each of the three main Marshes may harbor relict populations of criterion x species. These populations may act as recolonization source areas for the other marshes after successful restoration/recovery there.

Thus there are a number of positive reasons to consider nominating a serial World Heritage site encompassing more than just a single site. Therefore, this study recommends exploring further the establishment of a serial site.

6.5.3.2 Management of the Marshes as a serial site

If this recommendation is followed, an integrated management framework would need to be established for all component sites. This could either have the shape of

- one joint management plan for all component sites, and site-specific action plans flowing from this action plan, or
- individual but uniformly structured management plans for the individual sites, with an overarching management framework to join them.

Which of the two is chosen will depend on how similar the identified management actions in each of the Marshes will be. For instance, Hammar Marsh may need to require more targeted management of salinity than the other main Marshes, and some larger bird species that apparently only occur in Al-Hawizeh would only need to have conservation management there, at least in the first instance. The general guidance on management planning would not be affected by this modification – only the necessary effort for study, consultation and action planning would be multiplied.

In order to safeguard the functional integrity of individual Marshes within the framework of a serial World Heritage site, an **ecological network** consisting of corridors and buffer zones to link the individual core sites should be established. A similar network has been proposed in the draft management plan for the Mesopotamian Marshland National Park, and elsewhere (New Eden Project 2010b, Richardson 2009). It could build on European best practice examples, such as the Pan-European Ecological Network (PEEN – e.g. Biro et al. 2006).

6.5.4 Need for trans-boundary cooperation regarding Al-Hawizeh Marsh

It is generally accepted that only regional cooperation throughout the Tigris-Euphrates Basin (including Turkey, Syria, Iran and Iraq) will safeguard sustainable water management of the Marshes in the long-term (Beaumont 1978, 1996, 1998, CIMI 2010b, Dellapenna 2002, Gruen 2000, Partow 2001, UNEP

2003). Al-Hawizeh Marsh presents a special, even more obvious case of the need for international trans-boundary cooperation because it forms a spatial and functional unit with Hawr Al-Azim in Iran (Nature Iraq 2008a, b, Richardson 2009, Stevens 2007).

Both areas used to be a continuous water body and may need to be restored to this situation in order to safeguard their integrity, and Al-Hawizeh receives, or used to receive, at least 20% of its water from the Kharkhe River in Iran. There may be additional hydrological, biological and ecological linkages which need to be explored further. Therefore, the integrity of the Iraqi part of the Al-Hawizeh/al-Azim system can probably not be safeguarded without managing the part in Iran, in a coordinated way.

The close interdependence of both sides is highlighted by the fact that the Al-Hawizeh Ramsar site was placed on the Montreux Record of Ramsar sites "where changes in ecological character have occurred, are occurring, or are likely to occur as a result of technological developments, pollution or other human interference" in April 2010 (Ramsar Convention Secretariat 2010), at least partly because of actions of serious ecological concern on the Iranian side. These actions include the damming of the Kharkhe River and the diversion of part of its water away from the Marshes, and the construction of a dam that bisects the marsh complex along the Iranian/Iraqi border, blocking access of Kharkhe River water to the Iraqi side of the system (CIMI 2010b, Nature Iraq 2008b).

At the same time, Al-Hawizeh Marsh is the marsh that has been preserved best until recently and that functions as a stronghold and potential recolonization source area of most biota that constitute the proposed OUV of the Marshes under World Heritage criterion x. In other words, it is difficult to imagine a successful natural or mixed nomination of the Marshes that excludes Al-Hawizeh (be it as the only site within the Marshes or as part of a serial nomination).

In combination, these two factors mean that a possible future World Heritage nomination in the Marshes would only be feasible if it can be demonstrated in the nomination file that some kind of cooperative management is established in Hawr al-Azim, and that the worst effects of recent construction works are reversed. While a mitigation of the effects of the dams through the construction of culverts or partial demolition of the dam appears technically feasible, in general terms (Nature Iraq 2008a, CIMI 2010), such a cooperation would at first need to be agreed between Iraq and Iran (and the bordering provinces/governorates) on the political level. Such an agreement might build on earlier discussions about collaborative management, such as the 2005 Conference "Environment, peace and the dialogue among civilizations and cultures" which also addressed the issue (Stevens 2007).

CIMI (2010b) has made specific suggestions how this issue could be addressed by international organizations and the Government of Iraq (Box 6.13.). A management support agreement along these lines that secures integrity of Al-Hawizeh without formal recognition as trans-boundary property should be explored to lower the political hurdles. UNEP's experience with facilitating environmental dialogue between both countries (including a bilateral workshop on Al-Hawizeh in 2004) may be particularly useful in this regard.

Box 6.13. Actions recommended by the Canada-Iraq Marshlands Initiative to ensure sustainable management of the Al-Hawizeh Marsh – Hawr Al-Azim complex (CIMI 2010b)

1. Reach agreement with Iran on the joint management of Al-Hawizeh Marsh (Iraq) and Hawr Al-Azim Marsh (Iran) by using the provisions of the Ramsar Convention.
2. Identify the short- and long-term impacts of new dams and impoundments on tributaries feeding Al-Hawizeh Marsh.
3. Request Iran pursue options to allow for water to flow freely between Hawr Al-Azim Marsh and Al-Hawizeh Marsh by, for example, placing culverts in the Iranian dyke or demolishing all or part of the dyke.
4. Support and assist the governorates of Maysan and Basrah in their discussions with the neighboring Iranian province on trans-boundary water issues.

7 Network development

The activities of various actors in relation to the Marshes have already produced a multifaceted network of national and international experts relevant to the nomination and management of the Marshes as a World Heritage site (CIMI 2010b, EA-ITAP 2003, New Eden Group 2006a-d, UNEP 2010). This study – with decisive support from representatives of the MoE of Iraq (A. Al-Lami, pers. comm.) - has updated and filtered information about earlier networks and extracted a list of specialists that are particularly relevant to the upcoming process. It has also identified expertise gaps and elaborated steps for further network development; based on the generic guidance on natural World Heritage planning that is available from the WHC Operational Guidelines (UNESCO 2008) and IUCN (2008).

7.1 Identification of key experts

Table 7.1. lists key experts and active stakeholders for the upcoming management planning process for a World Heritage site in the Marshes. A more comprehensive version of the same list is included as Appendix **7.1**.

Table 7.1. Key national and international experts relevant to Marsh assessment and management.

	Affiliation	
Name	**Institution**	**Position**
	GOVERNMENT INSTITUTIONS	
Dr. Ali A. Al Lami	Ministry of Environment	Minister Advisor, CBD FP
Mr. Kadhum Lahmod	Ministry of Water Resources - CRIM	Director General
Dr. Abbas Balasm	State Ministry for Marshlands	Consultant
Mr. Wadah	Ministry of Oil - Environmental Department	D. G. Planning and Studies Dir.
Ms. Ikram Kassim	General Secretariat of the Council of Ministers	Ramsar FP
	REPRESENTATIVES OF MARSH GOVERNORATES	
Mr. Fatah Al-Mousawi	Marshlands Committee in Basrah Governorate Council	Head
Mr. Jasb K. Hamdan	Marshlands Committee in Maysan Governorate Council	Head
Mr. Hassan Werewish	Marshlands Committee in Thi Qar Governorate Council	Head
	TRIBAL REPRESENTATIVES FROM THE MARSH REGION	
Shikh Abass Ebadi	Tribe leader in Thi Qar Marshlands	
Shikh Mohammed Ebadi	Tribe leader in Maysan Marshlands	
Shikh Badea Kheoon	Tribe leader in Thi Qar Marshlands	
	ACADEMIC INSTITUTIONS	
Dr. Malik Ali	University of Basrah-Marine Science Center	Director General
Dr. Talib A Hussein	University of Thi Qar-Marsh Research Center	Director General
Dr. Azzam Alwash	Twin River Research Institute	

Dr. Kadhum Hassan	Natural History Museum	

Table 7.1. (continued).

	Affiliation	
Name	**Institution**	**Position**
	GOVERNMENT INSTITUTIONS	
	INDIVIDUAL EXPERTS FROM IRAQ	
	Ichthyologists	
Dr. Nader Abed Salaman	Basrah University-Agriculture college	
Dr. Abdul-Mutalib Rudainy	Baghdad University- Veternary college	
Dr. Najah A. Hussien	Basrah University-Agriculture college	
	Ornithologists	
Mr. Mudhfer Salim	Nature Iraq Organisation	
Mr. Jassim M. Abd	Basrah University - Agriculture college	
	Mammalogists	
Dr. Abdul-Hussein Kadhum	Baghdad University - Education college	
Dr. Khalaf H. Rubaiy	Basrah University - Natural Histroy	
	Limnologists (general)	
Dr. Ali A. Allami	Ministry of Environment	
Dr. Thaer I Kassim	University of Baghdad	
Dr. Adel Handal	University of Basrah	
	Botanists	
Dr. Abdul-Reda Alwan	University of Basrah	
	National NGOs	
Dr. Azzam Alwash	Nature Iraq Organisation	Director
Ms. Anna S. Bachmann	Nature Iraq Organisation	Project Manager
	INTERNATIONAL ORGANIZATIONS	
Mr. Ryuichi Fukuhara	UNEP	Programme Manager
Tamar Teneishvili	UNESCO Culture Programme (Iraq, Jordan and Syria)	Culture Programme Specialist
Dr. Jamal Al Abaychi	Canada-Iraq Marshlands Initiative	
Mr. Khaldoun Alomari	IUCN (Regional Office for Western Asia)	PA Programme Officer
Ms. Haifaa Abdulhalim	IUCN (Regional Office for Western Asia)	PA Programme Assistant
Mr. Howard Batson	USAID Iraq Office	Project Officer
	INTERNATIONAL EXPERTS	
Prof. Edward Maltby	University of Liverpool, School of Environmental Science	Prof. of Wetland Science, Water and Ecosystem Management
Mr. Mike Evans	BirdLife International	Conservatoin Data Manager
Mr. Richard Porter	BirdLife International	Middle East Advisor
Prof. Zuhair Amr	Jordan University of Science & Technology, Dep. Of Biology	Professor
Prof. Curtis Richardson	Duke University Wetland Center	Director

Bastian Bomhard	UNEP World Conservation Monitoring Centre	Senior Programme Officer

7.2 Gaps in the existing capacity and expertise

The preliminary capacity/expertise needs assessment conducted for this study showed that most of the biological expertise needed for the World Heritage management planning and nomination process is readily available within Iraq. The only obvious exception in this regard was herpetological expertise. It also appears that many of the national specialists have working relationships with international experts, including leading experts in their respective fields.

Whereas the scientific expertise needed for the upcoming process hence appears to be available in-county, there are capacity development needs in the fields of data synthesis and assessment, as well as conservation management planning and the facilitation of community based planning exercises. It also appears that there are hydrologists and hydraulics engineers among the NGO representatives and academics listed, but it was not immediately obvious which experts would be suitable to be tasked with the necessary hydrological evaluations and management planning processes (e.g. ecologically informed flood pulse management). Capacity development needs and possible ways of fulfilling these needs are listed in Table 7.2.

Table 7.2. Capacity/expertise gaps and possible actions to fill gaps.

Capacity/expertise gap	Possible action
Red list assessments of fauna and flora	Conduct national Red List assessment with local experts, based on generic IUCN methodology for national red lists, and facilitated by IUCN Red List Unit or other suitable experts, and aimed at a National Red List of Iraq
GIS-based species mapping and GIS-based gap analysis for key biodiversity areas	Identify national GIS experts willing to apply their skills in conservation management and train in GIS-based version of Langhammer et al. (2008) methodology; aim: KBA conservation priority profile of the Marshes, to inform boundary setting
Protected area management planning and species conservation action planning (including costing/budgeting)	Adapt and translate generic management planning guidelines (e.g. IUCN 2008, Thomas and Middleton 2003, Ramsar Secretariat 2007b) and conduct training with expert network. Use as basis for a “learning by doing” process during World Heritage management planning
Nature conservation management (e.g. rangers, monitoring and conservation officers, nature based tourism experts)	Establish a course on nature conservation management on an existing university within Iraq, in collaboration with academic institutions abroad that already have such a course
Community mobilization and participatory development planning	Identify NGOs/national consultants that are already involved in participatory community development planning processes outside the conservation field, and develop learning partnership
Environmental law (drafting/editing of supplementary laws and regulations relevant to ecosystem and biodiversity management)	Identify national legal experts outside the conservation filed and arrange training in collaboration with the IUCN Environmental Law Centre (Bonn, Germany)
Conservation orientated water management planning	Liaise with the Ministry for Water and CRIM to identify potential experts and arrange training of a few experts in collaboration with international partners

Additional capacity needs may arise during the course of management planning and solutions based on international best practice should be sought in collaboration with international partners.

7.3 Further steps in network development and planning preparation

IUCN (2008) sets out further steps to be implemented in the course of a management plan, including the development of the network responsible for the production of the plan.

7.3.1 Stakeholder representatives in the planning team and citizen advisory board(s)

Table 7.1. lists a number of local tribal representatives that might join the network responsible for the assessment of the Marshes and the initiation of management planning. However, additional local representatives might be identified for participation in the citizen/community advisory boards, based on a refined local stakeholder analysis. While a clear distinction should be made between participation in the management planning team and general stakeholder participation (e.g. through advisory boards), the inclusion of knowledgeable local resource persons who reflect the potentially complex social fabric of rural communities in the vicinity of the Marshes in the planning team would certainly benefit the assessment and management planning process. A non-exclusive list of potential stakeholder representatives during the planning process includes

- local sheikhs,
- municipality representatives,
- representatives of local community-based organizations, and community based development projects,
- representatives of local and governorate level environmental NGOs,
- business representatives of relevance to the World Heritage assessment and planning process, etc.

At the initial stage of this process, it will be important to clarify the roles of the planning team, advisory board(s) and other structures involved in the assessment and management planning process.

7.3.2 Convening the stakeholder and expert network

Once all essential members of a national expert and stakeholder network are identified and invited to participate, they need to be convened to initiate the process of the assessment of the Marshes' values, and of management planning. This should ideally proceed in the form of a participatory planning workshop which is facilitated by a respected, impartial convener. At this workshop,

- the general baseline proposal for the establishment of the World Heritage will be put to the members of the planning network,
- the findings of this baseline study and other studies about the framework conditions, opportunities and threats related to the nomination will be presented and discussed,
- a shared understanding about the scope of the assessment and management planning process will be produced,
- possible planning and assessment tools will be proposed to the national planning team,
- a prioritization of tasks will be attempted, based on facilitated participatory planning
- responsibilities and tasks of subgroups within the network will be identified and distributed (e.g. biological assessment, stakeholder liaison, legal framework analysis)
- an immediate way forward is agreed among all stakeholders.

The first stages of assessment and planning will be initiated at the participatory planning workshop. Box 7.1. includes advice on this initial phase.

The nomination and management planning process for World Heritage sites can generally be supported through the World Heritage Fund. Details of eligibility and procedure should be discussed with the relevant UNESCO representatives.

Box 7.1. The pre-planning phase for management plan development – key principles (source: Thomas & Middletion 2003)

The pre-planning phase is one of the most important steps in the planning process. This stage defines what the process will achieve, how it will be carried out, timing considerations and who is to be involved. These decisions need to be made at the highest possible management level and are critical to starting the planning process on the right footing. This pre-planning phase generally includes the following steps:

1. Clearly identify the purpose and management objectives of the protected area – and ensure that they are understood by all involved. These broad objectives should have been set out in the legislation (or formal agreements designating the area), but it may be necessary to re-examine them and confirm their meaning, as they will set the direction of the plan from the start. The purposes should of course be reflected in the categorization of the site within the IUCN protected area management categories system.

2. Identify the steps to be followed in applying the planning process, their sequence and the methods to be used. ... an approach should be designed which will best suit the protected area and its management context, but containing the basic stages of management planning (common to all planning processes). …

3. Determine who are the audiences for the plan. Management Plans are prepared mainly for regular use by protected area managers, but they are not intended as detailed work programmes. Members of the public, the bureaucracy, commercial interests and neighbors are also important users. In some situations, traditional owners, local government and commercial operators can also be key users. The style of presentation adopted should reflect the most important user groups…

5. Use an inter-disciplinary approach – bringing experts and interested parties together to discuss the future management of the protected area. “In this approach, a problem is not disassembled (which is what happens in a multi-disciplinary approach). It is treated as a whole by representation of different disciplines working the solution out together. This brings synthesis of knowledge in the sciences, technologies and humanities. Integration of disciplines yields broader synthesis of methods and know ledge and usually results in more complete and workable solutions”.

6. Identify a ‘planning team’. Management planning should be a ‘team effort’, but within this, one person should be given responsibility for production of the plan. This individual should be accountable to a clearly defined manager. If preparation is contracted out, decisions should be made as to how the contract will be managed to ensure that the plan delivers the requirements effectively. In such cases, it is essential to agree a ‘brief’ between the contractor and the organization responsible for the management of the protected area before planning work commences. NB: The Appendix provides information on the skills required within a planning team.

7. Prepare and follow a well-laid out work schedule for the management planning process. Project management techniques are often used to carry out this task. They help to organize and control the production of the Management Plan. The ‘project’ is defined as ‘production of the plan’ and a ‘project manager’ is identified to co-ordinate and oversee completion of the project.

8. Identify a process for involving people (other than the planning team) in preparing the plan. These will include other staff, experts, government officials, local communities and other affected parties. It should be clear to these and other interested parties when and how participation will take place.

9. Clarify and agree a procedure with senior management for the approval of the final Management Plan. If the approval of external parties (e.g. funding bodies, advisory committees and government departments) is required, the procedures to be followed in achieving this should be identified and a timetable agreed to for the submission of a final version for approval.

8 References

This reference list contains all references that are cited in this report. An additional collection of references will be made available with the resource collection for the report.

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9 Appendices

Appendix 4.1.

Community structure and species prevalence of marsh vegetation

Floristic list of aquatic plants presence in East Hammar marsh during 2006 (after Hussain & Alwan, 2008).

Emergent	*Phragmites australis*
	Schoenoplectus litoralis
	Typha domingensis
	Paspalum paspaloides
	Panicum repens
	Diplachne fusca
	Ceratophyllum demersum
	Myriophyllum spicatum
	Najas marina
	Najas minor
Submerged	*Potamogeton crispus*
	Potamogeton lucens
	Potamogeton pectinatus
	Potamogeton perfoliatus
	Vallisneria spiralis
	Chara vulgaris
	Hydrilla verticillata
Floating	*Salvinia natans*
	Lemna minor

Mean % cover of aquatic plants presence in East Hammar marsh during 2006 in two stations (after Hussain & Alwan, 2008)

Group	Species	S1	S2
Emergent	*Typha domingensis*	37.57	34.55
	Schoenoplectus litoralis	49.46	34.97
	Phragmites australis	21.00	24.57
Floating	*Lemna minor*	5.00	_
	Salvinia natans	6.67	5.00
Submerged	*Ceratophyllum demersum*	57.48	55.25
	Vallisneria spiralis	11.84	25.00
	Chara vulgaris	14.70	26.67
	Hydrilla verticellata	5.00	_
	Myriophyllum spicatum	15.67	18.67
	Najas marina	37.71	16.92
	Najas minor	15.00	_
	Potamogeton crispus	5.00	6.00
	Potamogeton lucens	7.00	5.50
	Potamogeton pectinatus	27.35	11.14
	Potamogeton perfoliatus	5.00	10.28

Appendix 4.2.

Provisional "Marshes Habitat Classification System" (After Abdulhasan and Salim, 2009).

WATER

1. Inland running water, river or canal

    1.1 Unvegetated rivers and canals

    1.2 Submerged river and canal vegetation

    1.3 Riparian vegetation

2. Inland standing water

    2.1 Pond or lake – Unvegetated standing water

    2.2 Unvegetated mudflat – Unvegetated mud, temporarily submerged and subject to water level fluctuations

    2.3 Flooded communities – Periodically or occasionally flooded land with phanerogamic communities adapted to aquatic environments that are subjected to water level fluctuations and temporary desiccation (*Cyperus difformis, C. michelianus, C. laevigatus*)

    2.4 Aquatic communities – With aquatic vegetation communities formed by free floating vegetation, rooted submerged vegetation or rooted fl oating vegetation

        2.4.1 Free-floating vegetation –– With floating vegetation communities (*Lemna sp. pl., Salvinia natans, Spirodela polyrhiza*) and Ceratophyllum demersum and Hydrocharis morsus- ranae communities.

        2.4.2 Rooted, submerged vegetation – Rooted submerged communities (*Potamogeton sp.pl.,Vallisneria spiralis, Myriophyllum sp., Najas sp. pl., Hydrilla verticillata*)

        2.4.3 Rooted, fl oating vegetation – Rooted formations with fl oating leaves (*Nymphaea sp. pl., Nuphar luteum, Nymphoides indica*)

    2.5 Salt water –Saline ponds and lakes with phanerogamic communities

MARSH

3. Marsh Vegetation

3.1 Permanent Marsh

    3.1.1 Helophytic vegetation

        3.1.1.1 Reed bed (*Phragmites australis* beds)

        3.1.1.2 Reed mace bed (*Typha domingensis* beds)

        3.1.1.3 Schoenoplectus litoralis bed

        3.1.1.4 *Cladium mariscus* vegetation –*Cladium mariscus* bed

3.1.2 Woody vegetation – Tree size formations with willow (*Salix* sp.) and poplars (*Populus* sp.) within the marsh, excluding riparian treed formations having a linear structure

3.1.2.1 Riparian willow – Dominated by willow formations (*Salix* sp.)

3.1.2.2 Riparian poplar – Dominated by poplar formations (*Populus* sp.)

3.2 Brackish or saltwater marsh vegetation – Brackish or saline marshes with halophytic vegetation

3.2.1 Salt pioneer swards – Pioneer communities growing on salt or brackish mudfl at (Salicornia sp. pl. community)

TERRESTRIAL HABITATS

4. Desert

4.1 Desert shrub

4.2 Unvegetated desert

4.3 Unvegetated saline lands

5. Woodlands

5.1 Woodland, forest and other wooded area

5.2 Shrub

6. Herbaceous vegetation

6.1 Grassland

6.2 Steppe

6.3 Sparsely vegetated land

Appendix 4.3.

List of aquatic and semi aquatic vascular plants historically recorded during 1975-1990. (Alwan 2006).

Scientific name	HM	C	HZ	O	SA	
Alisma laniceolatum	+			+		
Alisma plantago-aquatica		+			+	
Alternanthera sessilis		+	+	+	+	
Arundo donax				+	+	
Aster tripolium					+	
Baccapa monniera	+	+	+	+	+	
Bergia ammannioides				+		
Bergia capensis					+	
Bolboschoenus maritimus				+	+	
Butomus umbelllatus		+		+		
Ceratophyllum demersum		+	+	+	+	+
Ceratopteris thalicroides			+	+		
Cladium mariscus		+	+			
Cynancum acutum			+	+	+	
Cyperus difformis			+	+	+	
Cyperus lavegatus	+					
Cyperus longus					+	
Cyperus malaccensis					+	
Cyperus iria			+			
Cyperus corymbosus					+	
Cyperus michelians		+	+			
Cyperus rotundus	+	+	+	+	+	
Damasonium alisma				+		
Diplachne fusca		+	+	+	+	+
Echinoeloa crass-zalli			+	+		
Eclipta alba	+	+		+		
Fimbristylis bisumbillata				+	+	+
Fimbristylis littoralis			+			
Fimbristylis sieberiana		+	+			
Juncus acutus					+	

Juncus articulatus					+	
Juncus rigidus	+				+	
Lemna gibba	+	+	+	+	+	
Lemna minor	+	+				
Lemna perpusilla				+		
Lemna trisulca				+		
Limnophiia indica	+					
Ludwigia repens		+	+	+		+
Lycopus europaeus			+			
Marsilea capensis	+	+				
Mentha aquatica			+			
Myriophyllum spicatum	+	+				
Myriophyllum verticillatum		+				
Najas marina		+				
Najas minor		+				
Nastutium officenale				+		
Nymphaea alba		+	+			
Nymphoides indica	+	+	+			
Nymphoides petata	+	+				
Ottelia alismoides	+	+				
Oxystelma esculentum	+					
Paniam repens		+		+	+	
Paspalum paspaloides	+					
Peplidium maritimum	+					
Phragmites australis	+	+	+	+	+	
Phyla nodiflora	+	+			+	
Polygonum amphibium				+		
Polygonum lapathifolium				+		
Polygonum persicaria				+	+	
Polygonum salicifolium	+	+	+			
Polypogon monspeliensis		+				
Potamogeton berchteldii					+	+
Potamogeton crispus	+	+	+		+	
Potamogeton lucens	+	+	+		+	
Potamogeton nodosus		+			+	
Potamogeton pectenatus		+	+			+

Potamogeton perfoliatua		+	+			
Potamogeton pusillus				+	+	
Rannunculus sphaerospermus	+	+	+	+		
Rannunculus trichuphyllus		+				
Rorippa amphibian	+	+	+			
Ruppia maritima		+			+	
Sagittaria sagitifolia		+				
Salvinia natans	+	+	+	+	+	
Samolus valerandi			+	+		
Schenoplectus litoralis	+	+	+	+	+	
Schenoplectus maritimus				+	+	
Schenoplectus triquater						+
Sonchus maritimus			+			
Sparganium erectum	+			+		
Thelypteris palustris			+			
Typha domingensis	+	+	+	+	+	
Typha lugdunensis				+		
Typha minina			+	+		
Utriculaia australis		+		+		
Utriculaia gibba			+			
Utriculaia minor			+			
Vallisneria spiralis	+	+	+	+	+	
Verbana officinalis						
Veronica beccabunga				+		
Veronica aquatica				+		
Zannichellia palustris	+					

HM: Al Hammar, C: Central, HZ: Hewaiza, O: Other places, SA: Shatt Al-Arab.

Appendix 4.4.

List of aquatic plants collected in 2004-2005 from the reflooded marshes (After Alwan, 2006).

	Hammar	Hawizeh	Central
Alternanthera sessilis			+
Baccapa monniera			+
Bolboschoenus maritimus			
Ceratophyllum demersum	+	+	+
Cladium mariscus	+		
Cyperus rotundus	+		
Lemna minor	+	+	+
Myriophyllum spicatum		+	+
Najas marina			+
Najas minor			
Nymphaea alba			
Phragmites australis	+	+	+
Potamogeton crispus	+		+
Potamogeton lucens	+		+
Potamogeton nodosus			+
Potamogeton pectenatus	+	+	+
Potamogeton perfoliatua	+		+
Rannunculus sphaerospermus		+	+
Rannunculus trichophyllus			+
Ruppia maritima			+
Salvinia natans	+	+	+
Schenoplectus litoratis	+	+	+
Typha domingensis	+		+
Vallisneria spiralis	+		+
Zannichellia palustris			+
Chara	+	+	+

Nitella +

Appendix 4.5.

List of Wetland Plant Species Observed in the Central Marsh (After Hamdan 2010)

Found before drainage, but not after re-flooding

Butomus umbellatus

Ceratopteris thalictroides

Cladium mariscus

Cyperus rotundus

Fimbristylis sieberiana

Lemna gibba

Ludwigi arepens

Marsilea capensis

Mentha aquatica

Myriophyllum verticillatum

Nympha eaalba

Nymphoides indica

Nymphoides peltata

Ottelia alismoides

Panicum repens

Polygonum salicifolium

Rorippa amphibia

Sagittaria sagittifolia

Utricularia australis

Utricularia gibba

Utricularia minor

Found after re-flooding, not before drainage

Amaranthus sp.

Arundo donax

Chara sp.

Chenopodium murale

Cyperus difformis

Cyperus laevigatus

Hydrilla sp.

Hydrilla verticillata

Nitella sp.

Ruppia maritima

Spirodela polyrhiza

Zannichellia palustris

Found both before drainage and after re-flooding

Alternant herasessilis

Bacopa monnieria

Ceratophyllum demersum

Cyperus michelianus

Diplachne fusca

Eclipta alba

Jussiaea repens

Lemna minor

Myriophyllum spicatum

Najas marina

Najas minor

Paspalum paspaloides

Phragmites australis

Phyla nodiflora

Potamogeton crispus

Potamogeton lucens

Potamogeton nodosus

Potamogeton pectinatus

Potamogeton perfoliatus

Ranunculus sphaerospermus

Ranunculus trichophyllus

Salvinia natans

Schoenoplectus litoralis

Tamarix sp.

Typha domingensis

Vallisneria spiralis

Appendix 4.6.

Freshwater fishes of Iraq (Coad 1996 a) with their local and IUCN status (IUCN 2010).

Family Cyprinidae	**Local status**	**IUCN status**
Acanthobrama marmid		NE
Alburnoides bipunctatus		LC
Alburnus caeruleus		NE
Alburnus mossulensis		NE
Aspius vorax		NE
Barbus (*Luciobarbus*) *barbulus*		NE
Barbus (Luciobarbus) esocinus	Endemic	NE
Barbus (Tor) grypus		NE
Barbus (Luciobarbus) kersin		NE
Barbus (Kosswigobarbus) kosswigi	Endemic	NE
Barbus (Barbus) lacerta		NE
Barbus (Carasobarbus) luteus		NE
Barbus (Luciobarbus) pectoralis		NE
Barbus (Mesopotamichthys) sharpeyi	Endemic	NE
Barbus (Luciobarbus) subquincunciatus	Endemic	NE
Barbus (Luciobarbus) xanthopterus	Endemic	NE
Barilius mesopotamicus		NE
Caecocypris basimi	Endemic	VU
Capoeta aculeata		NE
Capoeta barroisi		NE
Capoeta damascina		NE
Capoeta trutta		NE
Carassius auratus	Exotic	NE
Chondrostoma regium		NE
Ctenopharyngodon idella	Exotic	NE
Cyprinion kais	Endemic	NE
Cyprinion macrostomum		NE
Cyprinus carpio	Exotic	NE
Garra rufa		NE
Garra variabilis		NE

Hemiculter leucisculus	Exotic	NE
Hemigrammocapoeta elegans	Endemic	NE
Hypophthalmichthys molitrix	Exotic	NE
Hypophthalmichthys nobilis	Exotic	NE
Squalius cephalus		LC
Squalius lepidus		NE
Typhlogarra widdowsoni	Endemic	VU
Cobitidae		NE
Cobitis taenia		LC
Balitoridae		NE
Barbatula argyrogramma		NE
Barbatula frenata	Endemic	NE
Paracobitis malapterura		NE
Sisoridae		NE
Glyptothorax kurdistanicus	Endemic	NE
Glyptothorax steindachneri	Endemic	NE
Siluridae		NE
Silurus triostegus	Endemic	NE
Heteropneustidae		NE
Heteropneustes fossilis	Exotic	NE
Pangasiidae		NE
Pangasius sp.	Exotic	NE
Bagridae		NE
Mystus pelusius		NE
Mugilidae		
Liza abu		NE
Cyprinodontidae		
Aphanius dispar		NE
Aphanius mento		NE
Aphanius mesopotamicus	Endemic	NE
Poeciliidae		
Gambusia holbrooki	Exotic	NE
Poecilia latipinna	Exotic	NE
Mastacembelidae		
Mastacembelus mastacembelus		NE

Cichlidae		
Oreochromis aureus	Exotic	NE
Oreochromis niloticus	Exotic	NE
Tilapia zillii	Exotic	NE

Appendix 4.7.

Reptiles recorded from the vicinity of the southern mrshes of Iraq (Haas & Werner 1969, Nader & Jawdat 1976, Scott, 1995)

Common name	Species
Family Bufonidae	
The Green Toad	*Bufo viridis*
Family Hylidae	
The Tree Frog	*Hyla savignyi*
Family Ranidae	
The Green Frog	*Pelophylax ridibunda*
Family Gekkonidae	
Keeled Rock Gecko	*Cyrtopodion scaber*
Asia Minor Thin-toed Gecko	*Cyrtopodion heterocercum*
Doria's Thin-toad Gecko	*Stenodactylus doriae*
Slevin's sand gecko	*Stenodactylus sleveni*
Branford's Rock Gecko	*Bunopus tuberculatus*
Persian Gecko	*Asaccus elisae*
Yellow-bellied House Gecko	*Hemidactylus flaviviridis*
Persian Leaf-toed Gecko	*Hemidactylus persicus*
Family Lacertidae	
Snake-eyed Lizard	*Ophisops elegans*
Family Scincidae	
Golden Grass Mabuya	*Mabuya aurata septemtaeniata*
The Bridled Mabuya	*Trachylepis vittata*
Family Boidae	
Javelin sand boa	*Eryx jaculus*
Family Colubirdae	
Glossy-bellied Racer	*Platyceps ventromaculatus*
Tessellated Water Snake	*Natrix tessellata*
Family Trionychidae	
Euphrates Soft-shelled Turtle	*Rafetus euphraticus*
Family Bataguridae	
Caspian Terrapin	*Mauremys caspica*
Family Varanidae	
Desert Monitor	*Varanus griseus*

Appendix 4.8.

International significance of the Marshes for waterfowl and raptors (Scott & Evans 1994)

Key to symbols

Figures indicate the proportion (%) of the relevant flyway or regional population which utilizes the wetlands of Mesopotamia.

+ - proportion believed to exceed 1% but no count data available

++ - proportion believed to exceed 10% but no count data available

	Wintering	Migration seasons	Breeding season
Tachybaptus ruficollis	>50		>50
Pelecanus onocrotalus	30-60	++	
Pelecanus crispus	20-30	++	+
Phalacrocorax pygmaeus	10-20		+
Anhinga rufa	>90		100
Egretta garzetta	3-5	++	
Ardea cinerea	15-30	+	
Ardea goliath	>90		>90
Ardea purpurea	+	++	++
Casmerodius albus	3-6		
Bubulcus ibis	+	++	
Ardeola ralloides		++	
Nycticorax nycticorax	30-50	++	+
Ixobrychus minutes		++	++
Ciconia ciconia	5-10	++	
Plegadis falcinellus	1-2	++	+
Threskiornis aethiopicus	50		100
Platalea leucorodia	1-2	++	+
Phoenicopterus ruber	1-2	+	
Anser albifrons	3-5		
Anser erythropus	+		
Anser anser	3-5		
Tadorna ferruginea	7-10		

Tadorna tadorna	1-2		
Anas penelope	5-10		
Anas strepera	15-20		
Anas crecca	5-10		
Anas platyrhynchos	2-5		
Anas acuta	3-6	++	
Anas querquedula		++	
Anas clypeata	8-15	++	
Marmaronetta angustirostris		++	40-60
Aythya ferina	1-2		
Aythya nyroca	1-2	++	
Aythya fuligula	>20		
Pandion haliaetus	+		
Milvus migrans	++		
Haliaeetus albicilla	+		
Circus aeruginosus	++	+	+
Circus macrourus	+		
Buteo rufinus	+		
Aquila clanga	+		
Aquila heliaca	+		
Falco peregrinus	+		
Grus grus	15-20		
Porphyrio porphyrio	>50		>50
Fulica atra	10-20		
Himantopus himantopus	5-10	+	+
Recurvirostra avosetta	20-40	++	+
Glareola pratincola		+	+
Charadrius dubius		+	
Charadrius alexandrinus	15-25	+	+
Vanellus indicus	+		+
Vanellus leucurus	10-20	++	++
Gallinago gallinago	+	+	
Limosa limosa	8-15		
Numenius tenuirostris	++		
Tringa erythropus	5-10	+	
Tringa totanus	2-5	+	
Tringa stagnatilis	2-5	+	
Tringa nebularia	+	+	
Tringa ochropus	+		

Tringa glareola			+	
Calidris minuta	5-10		++	
Calidris temminckii	+			
Calidris alpina	10-15			
Calidris ferruginea		+		
Philomachus pugnax	+		++	
Larus cachinnans/armenicus	5-10			
Larus ichthyaetus	1-2			
Larus ridibundus	5-10			
Larus genei	1-2			+
Sterna nilotica	1-2		+	+
Sterna caspia	2-5		+	+
Sterna hirundo			+	+
Sterna albifrons			+	+
Chlidonias hybridus	2-5		+	

Appendix 4.9.

Birds recorded during KBA surveys of the southern marshes of Iraq in winter and summer 2005 to 2008 (Salim et al. 2009).

(*: globally threatened, **: conservation concern, **E:** Endemic)

Common name (English)	Scientific name	Summer	Winter	Status
Black Francolin	*Francolinus francolinus*	+	+	Resident breeder
Common Quail	*Coturnix coturnix*	+	+	Passage migrant and winter visitor
Greylag Goose	*Anser anser*	-	+	Winter visitor
Whooper Swan	*Cygnus cygnus*	-	+	Rare winter visitor
Greater White-fronted Goose	*Anser albifrons*	-	+	Winter visitor
Common Shelduck	*Tadorna tadorna*	-	+	Winter visitor
Ruddy Shelduck	*Tadorna ferruginea*	-	+	Winter visitor
Gadwall	*Anas strepera*	-	+	Winter visitor
Eurasian Wigeon	*Anas penelope*	-	+	Winter visitor
Mallard	*Anas platyrhynchos*	+	+	Winter visitor; some in summer
Northern Shoveler	*Anas clypeata*	+	+	Winter visitor; some in summer
Northern Pintail	*Anas acuta*	-	+	Winter visitor
Garganey	*Anas querquedula*	+	+	Winter visitor; also breed
Eurasian Teal	*Anas crecca*	-	+	Winter visitor
Marbled Duck***.****	*M. angustirostris*	+	+	Resident breeder and winter visitor
Red-crested Pochard *	*Netta rufina*	-	+	Winter visitor
Common Pochard	*Aythya ferina*	-	+	Winter visitor
Ferruginous Duck*, **	*Aythya nyroca*	+	+	Winter visitor; may remain to breed
Tufted Duck	*Aythya fuligula*	-	+	Winter visitor
White-headed Duck *. **	*Oxyura leucocephala*	-	+	Winter visitor
Little Grebe (Dabchick)	*Tachybaptus rufi collis*	+	+	Resident breeder, winter visitor
Great Crested Grebe	*Podiceps cristatus*	+	+	Resident breeder, winter visitor
Black-necked Grebe	*Podiceps nigricollis*	-	+	Winter visitor
Greater Flamingo *	*Phoenicopterus roseus*	+		Passage migrant, winter visitor
Western White Stork	*Ciconia ciconia*	+	+	Winter visitor; some may breed
Sacred Ibis *	*Threskiornis aethiopicus*	+	+	Resident breeder
Glossy Ibis	*Plegadis falcinellus*	+	+	Winter visitor; may also breed
Eurasian Spoonbill*	*Platalea leucorodia*	+	+	Breeding summer visitor
Eurasian Bittern*	*Botaurus stellaris*	+	+	Resident breeder, winter visitor
Little Bittern	*Ixobrychus minutus*	+	+	Resident breeder, winter visitor
Black-crowned Night Heron	*Nycticorax nycticorax*	+	+	Resident breeder, winter visitor
Squacco Heron	*Ardeola ralloides*	+	+	Resident breeder, winter visitor
Cattle Egret	*Bubulcus ibis*	+	+	Resident breeder, winter visitor

Grey Heron	*Ardea cinerea*	+	+	Resident breeder, winter visitor
Goliath Heron*	*Ardea goliath*	+	+	Reported to breed
Purple Heron	*Ardea purpurea*	+	+	Resident breeder, winter visitor
Great Egret	*Ardea [Egretta] alba*	-	+	Winter visitor
Little Egret	*Egretta garzetta*	+	+	Winter visitor; remain in summer
Western Reef Heron	*Pelecanus onocrotalus*	-	+	Winter visitor
Pygmy Cormorant*	*Phalacrocorax pygmaeus*	+	+	Resident breeder, winter visitor
Great Cormorant	*Phalacrocorax carbo*	-	+	Winter visitor
Darter (African Darter)*	*Anhinga [rufa]*	+	+	Resident breeder
Common Kestrel	*Falco tinnunculus*	-	+	Winter visitor
Western Marsh Harrier	*Circus aeruginosus*	-	+	Winter visitor
Black-winged Kite	*Elanus caeruleus*	+	+	Rare resident
Long-legged Buzzard	*Buteo rufi nus*	-	+	Winter visitor
Hen Harrier	*Circus cyaneus*	-	+	Winter visitor
Eurasian Sparrowhawk	*Accipiter nisus*	-	+	Winter visitor
Greater Spotted Eagle	*Aquila clanga*	-	+	Winter visitor
Steppe Eagle*****	*Aquila nipalensis*	-	+	Winter visitor
Asian Imperial Eagle	*Aquila heliaca*	-	-	
Macqueen's Bustard***. ****	*Chlamydotis macqueenii*		+	Winter visitor
Water Rail	*Rallus aquaticus*	-	+	Winter visitor
Little Crake	*Porzana parva*	-	+	Winter visitor
Spotted Crake	*Porzana porzana*	-	+	Winter visitor
Purple Swamphen*	*Porphyrio porphyrio*	+	+	Resident breeder
Common Moorhen	*Gallinulua chloropus*	+	+	Resident breeder, winter visitor
Eurasian Coot	*Fulica atra*	+	+	Resident breeder, winter visitor
Crab-plover*	*Dromas ardeola*	+	-	Possibly resident, also in summer
Black-winged Stilt	*Himantopus himantopus*	+	+	Resident breeder, winter visitor
Pied Avocet (Avocet)	*Recurvirostra avosetta*	+	+	Resident breeder, winter visitor
Northern Lapwing	*Vanellus vanellus*	-	+	Winter visitor
Spur-winged Lapwing*	*Vanellus spinosus*	+	+	Resident breeder, winter visitor
Red-wattled Lapwing	*Vanellus indicus*	+	+	Resident breeder, winter visitor
White-tailed Lapwing*	*Vanellus leucurus*	+	+	Resident breeder, winter visitor
Common Ringed Plover	*Charadrius hiaticula*	-	+	Winter visitor
Little Ringed Plover	*Charadrius dubius*	+	+	Winter visitor; some may breed
Kentish Plover	*Charadrius alexandrinus*	+	+	Resident breeder, winter visitor
Common Snipe	*Gallinago gallinago*	-	+	Winter visitor
Black-tailed Godwit*, **	*Limosa limosa*	-	+	Winter visitor
Bar-tailed Godwit	*Limosa lapponica*	-	+	Winter visitor
Whimbrel	*Numenius phaeopus*	+	+	Winter visitor; remain in summer.

Eurasian Curlew*	*Numenius arquata*	+	+	Winter/summer visitor
Spotted Redshank	*Tringa erythropus*	-	+	Winter visitor
Common Redshank	*Tringa totanus*	+	+	Winter visitor; remain in summer
Marsh Sandpiper	*Tringa stagnatilis*	-	+	Winter visitor
Common Greenshank	*Tringa nebularia*	+	+	Winter visitor; remain in summer
Green Sandpiper	*Tringa ochropus*	-	+	Winter visitor
Wood Sandpiper	*Tringa glareola*	-	+	Winter visitor
Common Sandpiper	*Actitis hypoleucos*	+	+	Winter visitor; remain in summer
Ruddy Turnstone	*Arenaria interpres*	+	-	Recorded in winter/summer
Little Stint	*Calidris minuta*	+	+	Winter visitor; remain in summer
Temminck's Stint	*Calidris temminckii*	-	+	Winter visitor
Curlew Sandpiper	*Calidris ferruginea*	+	+	Winter visitor; remain in summer
Dunlin	*Calidris alpina*	-	+	Winter visitor
Ruff	*Philomachus pugnax*	-	+	Winter visitor
Collared Pratincole*	*Glareola pratincola*	+	-	Breeding summer visitor
Yellow-legged Gull	*Larus michahellis*	?	?	Status uncertain
Armenian Gull*	*Larus armenicus*	+	+	Winter visitor; remain in summer
Lesser Black-backed Gull	*Larus fuscus graellsii/ intermedius/ fuscus*	+		Winter visitor
White-headed Gull sp.	*Larus sp*		+	
Great Black-headed Gull	*Larus ichthyaetus*	-	+	Winter visitor Common
Black-headed Gull	*Larus ridibundus*	+	+	Winter visitor; remain in summer
Slender-billed Gull*	*Larus genei*	+	+	Resident breeder, winter visitor
Little Gull	*Larus minutus*	-	+	Winter visitor
Gull-billed Tern	*Gelochelidon nilotica*	+	+	Winter visitor, resident
Caspian Tern *	*Hydroprogne caspia*	+	+	Winter visitor, also in summer
Common Tern	*Sterna hirundo*	+	-	Breeding summer visitor
White-cheeked Tern	*Sterna repressa*	+	-	Status uncertain
Little Tern	*Sternula albifrons*	+	-	Breeding summer visitor
Whiskered Tern	*Chlidonias hybrida*	+	+	Breeding resident, winter visitor
Black Tern	*Chlidonias niger*	+	-	Vagrant
Pin-tailed Sandgrouse*	*Pterocles alchata*	+	-	Breeding resident
Spotted Sandgrouse*	*Pterocles senegallus*	+	-	Breeding resident
Rock Dove	*Columba livia*	+	-	Probably a breeding resident
Stock Dove	*Columba oenas*	-	+	Winter visitor
Common Woodpigeon	*Columba palumbus*	-	+	Winter visitor
Eurasian Collared Dove	*Streptopelia decaocto*	-	+	Probably a breeding
resident Laughing Dove	*Streptopelia senegalensis*	-	+	Probably a breeding
resident Egyptian Nightjar	*Caprimulgus aegyptius*	+	-	Breeding summer visitor
Indian Roller	*Coracias benghalensis*	+	-	Breeding summer visitor

White-throated Kingfisher	*Halcyon smyrnensis*	+	+	Breeding resident
Common Kingfisher	*Alcedo atthis*	+	+	Winter visitor; also summer
Pied Kingfisher	*Ceryle rudis*	+	+	Breeding resident
Blue-cheeked Bee-eater	*Merops persicus*	+	-	Breeding summer visitor
Eurasian Hoopoe	*Upupa epops*	+	-	Status uncertain
Daurian/Turkestan Shrike	*Lanius isabellinus*	-	+	Winter visitor
Great Grey Shrike	*Lanius excubitor*	-	+	Winter visitor
Eurasian Magpie	*Pica pica*	-	+	Winter visitor
Rook	*Corvus frugilegus*		+	Winter visitor
Hooded Crow*** E**	*Corvus cornix*	+	+	Probably a breeding resident
Grey Hypocolius	*Hypocolius ampelinus*	+	+	Breeding resident, winter visitor
Sand Martin	*Riparia riparia*	+	-	Breeding summer visitor
Barn Swallow	*Hirundo rustica*	+	-	Probably breeding
Greater Hoopoe-Lark	*Alaemon alaudipes*	+	-	Probably a breeding resident
Desert Lark	*Ammomanes deserti*	-	+	Probably a breeding resident
Crested Lark	*Galerida cristata*	+	+	Breeding resident
Eurasian Skylark	*Alauda arvensis*	+	-	Status uncertain
Zitting Cisticola	*Cisticola juncidis*	-	+	Probably a breeding resident
Graceful Prinia	*Prinia gracilis*	+	+	Breeding resident
White-cheeked Bulbul*	*Pycnonotus leucogenys*	+	+	Breeding resident
Cetti's Warbler	*Cettia cetti*	-	+	Winter visitor
Basra Reed Warbler***,**, E**	*Acrocephalus griseldis*	+	-	Breeding summer visitor
Great Reed Warbler	*A. arundinaceus*	+	-	Breeding summer visitor
Clamorous Reed Warbler	*Acrocephalus stentoreus*	+	-	Breeding summer visitor
Eurasian Reed Warbler	*Acrocephalus scirpaceus*	+	-	Breeding summer visitor
Chiffchaff	*Phylloscopus collybita*	-	+	Winter visitor
Iraq Babbler***, E**	*Turdoides altirostris*	+	+	Breeding resident
Common Babbler	*Turdoides caudata*	+	+	Breeding resident
Common Starling	*Sturnus vulgaris*	-	+	Winter visitor
Common Blackbird	*Turdus merulus*	-	+	Winter visitor
European Robin	*Erithacus rubecula*	-	+	Winter visitor
Bluethroat	*Luscinia svecica*	-	+	Winter visitor
Rufous-tailed Scrub Robin	*Cercotrichas galactotes*	+	-	Breeding summer visitor
Black Redstart	*Phoenicurus ochruros*	-	+	Winter visitor
Eurasian Stonechat	*Saxicola torquatus*	-	+	Winter visitor
Isabelline Wheatear	*Oenanthe isabellina*	+	+	Winter visitor: some may breed
Desert Wheatear	*Oenanthe deserti*	-	+	Winter visitor
House Sparrow	*Passer domesticus*	+	+	Breeding resident
Spanish Sparrow	*Passer hispaniolensis*	-	+	Winter visitor

Dead Sea Sparrow*	*Passer moabiticus*	+	+	Breeding resident
Chestnut-shouldered Petronia	*Gymnoris xanthocollis*	+	-	Breeding summer visitor
Western Yellow Wagtail	*Motacilla flava*	+	-	Status uncertain
White Wagtail	*Motacilla alba*	-	+	Winter visitor
Tawny Pipit	*Anthus campestris*	-	+	Winter visitor
Water Pipit	*Anthus spinoletta*	+	+	Winter visitor; also summer
Reed Bunting	*Emberiza aureala*	+		Winter visitor
Corn Bunting	*Emberiza calandra*	-	+	Winter visitor

Appendix 4.10.

Water birds recorded in the three marshes in southern Iraq. (Source: Abed, 2007).

English name	Scientific name	Al-Hawizeh	S. Shuyukh	E. Hammar
Little Grebe	*Tachybaptus ruficollis*	+	+	
Crested Grebe	*Podiceps cristatus*		+	
Cormorant	*Phalacrocorax carbo sinensis*	+		
Pygmy Cormorant	*Phalacrocorax pygmeus*	+	+	+
Darter	*Anhinga rufa*	+		
Bittern	*Botaurus stellaris*	+	+	+
Little Bittern	*Ixobrychus minutus*	+	+	+
Night Heron	*Nycticorax nycticorax*	+	+	
Squacco Heron	*Ardeola ralloides*	+	+	+
Cattle Egret	*Bubulcus ibis*	+	+	+
Little Egret	*Egretta garzetta*	+	+	+
Great White Heron	*Egretta alba*	+	+	+
Grey Heron	*Ardea cinerea*	+	+	+
Purple Heron	*Ardea purpurea*	+	+	+
White Stork	*Ciconia ciconia*	+		+
Glossy Ibis	*Plegadis falcinellus*	+	+	
Sacred Ibis	*Threskiornis aethiopicus*	+		
Spoonbill	*Platalea leucorodia*	+	+	
Greylag Goose	*Anser anser*	+		
Wigeon	*Anas penelope*	+	+	
Teal	*Anas crecca*	+	+	
Mallard	*Anas platyrhynchos*	+	+	
Gargany	*Anas querquedulla*	+		
Shoveler	*Anas clypeata*		+	
Marbled Teal	*Marmaronetta angustirostris*	+	+	
Tufted Duck	*Aythya fuligula*	+		
Spotted Crake	*Porzana porzana*	+	+	
Moorhen	*Gallinula chloropus*	+	+	
Coot	*Fulica atra*	+	+	
Purple Gallinule	*Porophyrio porphyrio*		+	
Black-winged Stilt	*Himantopus himantopus*	+	+	+
Avocet	*Recurvirostra avosetta*	+	+	

Kentish Plover	*Charadrius alexandrinus*	+		
Red-wattled Plover	*Vanellus indicus*	+	+	+
White-tailed Plover	*Chetusia leucura*	+	+	+
Little Stint	*Calidris minuta*	+		
Dunlin	*Calidris alpina*	+	+	
Common Snipe	*Gallinago gallinago*	+	+	
Black-tailed Godwit	*Limosa limosa*	+		
Redshank	*Tringa totanus*	+	+	+
Marsh Sandpiper	*Tringa stagnatilis*	+	+	
Greenshank	*Tringa nebularia*	+		+
Green Sandpiper	*Tringa ochropus*	+		
Little Gull	*Larus minutus*	+	+	+
Black-headed Gull	*Larus ridibundus*	+	+	+
Slender-billed Gull	*Larus genei*	+	+	+
Common Gull	*Larus canus*	+	+	+
Great-black Headed Gull	*Larus ichthyaetus*	+		+
Herring Gull	*Larus argentatus*	+		+
Common Tern	*Sterna hirundo*	+		+
Whitecheeked Tern	*Sterna repressa*	+		+
Little Tern	*Sterna albifrons*	+	+	+
Whiskered Tern	*Chlidonias hybridus*	+	+	+
White-winged Black Tern	*Chlidonias leucopterus*	+		+
Common Kingfisher	*Alcedo atthis*	+	+	+
White-breasted Kingfisher	*Halcyon smyrnensis*	+	+	+
Pied Kingfisher	*Ceryle rudis*	+	+	+

Appendix 4.11.

Important IBAs within the Marshes

IQ 30 Haur Chubaisah area

A complex of large haurs with extensive marshes on the plains to the east of the River Tigris, north of Haur Om Am Nyaj. The three main haurs, Haur Jazrah in the west, Haur Chubaisah in the centre and Haur Sanaf in the east, lie close together and merge into one another at high water levels. They are bordered on the south by the Musharra Canal. Haur Sanaf (between Amara and Al Halfaya) is about 20 km long and consists mainly of open water with a few reeds and extensive fringing grasslands. Haur Chubaisah includes the Bani Lam Marshes described by Savage (1968).

IQ 32 Haur Om am Nyaj

Haur Om Am Nyaj is a large wetland about 20 km south-east of Amara. It comprises extensive Typha beds with many areas of open water and fast-running creeks, and is partly permanent and partly seasonal. The haur lies at the north-western extremity of Haur Al Al-Hawizeh and is fed by the Al Kahala (Chahala) river, a distributary of the Tigris. The Qalit Salih ponds lie at the southern end of Haur Om Am Nyaj, and are a group of fresh to brackish impoundments used for duck-netting, on the east bank of the River Tigris near the town of Qalit Salih, west of the Haur Al Al-Hawizeh marshes.

IQ033 Haur Al Rayan and Umm Osbah

A complex of shallow lagoons and vast reedbeds with some areas of sedge marsh between the villages of Maymund and Salam, about 20 km south-west of Amara. The southern end of these marshes lies a few kilometres to the north of the Feraigat Marshes at the extreme northern end of the main Haur Al Hammar marshes.

IQ 34 Haur Auda

One of the chain of haurs stretching from Haur Al Sa'adiyah in the north to Haur Al Hammar in the south, situated about 40 km south-west of Amara town (Georg and Savage 1970a). The haur overflows into the extreme north-western portion of the main marshes north of Haur Al Hammar.

Haur Al Al-Hawizeh (IBA036)

Situated to the east of the River Tigris, Haur Al Al-Hawizeh (Hawaizah) and its associated marshes cover an area of approximately 2,200 km2 between Amara and Basrah. A small portion of the haur extends over the border into Iranian territory, where it is known as the Hoor Al Azim. The wetland is fed by floodwaters from the River Tigris and from the Karkheh river in the east (in Iran); it is bordered in the north by the Musharra Canal and in the south by the Shatt Al Arab. The marsh is partly seasonal and partly permanent. The latter area has extensive Phragmites reedbeds alternating with open sheets of water. The Nahrsabla Marshes are an area of predominantly seasonal marsh in the north-eastern portion of the haur, near the Iranian border (Evans, 1994).

The Central Marsh (IBA 038):

The Central Marshes comprise a vast complex of mostly permanent freshwater marshes with scattered areas of open water, to the west of the River Tigris and to the north of the River Euphrates. The marshes are fed by both rivers, and at maximum flooding in late spring they cover an area of about 3,000 km2. Almost the entire area is covered in tall reedbeds of Phragmites and Typha (Evans, 1994).

Al Hammar (IBA 039)

The Haur Al Hammar, its surrounding marshes and neighbouring haurs and areas of temporary inundation comprise some 3,500 km2 of almost contiguous wetland habitat. The haur itself is the largest lake in the lower Euphrates, approximately 120 km long by up to 25 km wide. It is bordered in the north by the River Euphrates, in the west by the Southern Desert and in the east by the Shatt Al Arab. The lake is eutrophic, and generally shallow with a maximum depth of about 1.8 m at low-water levels in early winter and about 3.0 m at high-water levels in late spring. Large parts of the littoral zone dry out during periods of low water and banks and islands appear in many places. The Euphrates flows through the marshes and joins the Tigris at Qarmat Ali, where the combined flow becomes the Shatt Al Arab. Habitats include open, fairly shallow water, vast reedbeds, broad muddy shores, sedge marsh and marsh-edge vegetation, moist arable land, irrigation ponds, rainwater pools, communication dams, artificial islands with villages, rice and sugar-cane polders and date-palm groves. Emergent vegetation is dominated by beds of Phragmites and Typha with some Cyperus papyrus and Arundo, as well as many other aquatics, both floating (Nymphoides, Nymphaea, Nuphar, Pistia, Lemna) and submerged (Vallisneria, Potamogeton, Myriophyllum, Ceratophyllum, Chara, Najas, Salvinia) (Evans, 1994).

Appendix 4.12.

Mammals recorded from the Iraqi Marshlands and their vicinity (various authors)

Species	Common name	IUCN Status
Order Insectivora		
Hemiechinus auritus	Long-eared Hedgehog	LC
Paraechinus aethiopicus	Ethiopian Hedgehog	LC
Crocidura suaveolens	Lesser white-toothed shrew	LC
Suncus murinus	Asian House Shrew	LC
Suncus etruscus	Pygmy White-toothed Shrew	LC
Order Chiroptera		
Rhinopoma hardwickei	Lesser Mouse-tailed Bat	LC
Taphozous nudiventris	Naked-rumped Tomb Bat	LC
Eptesicus bottae	Botta's Serotine	LC
Eptesicus nasutus	Sind Serotine Bat	LC
Pipistrellus kuhlii	Kuhl's Pipistrelle	LC
Pipistrellus rueppellii	Rüppel's Pipistrelle	LC
Otonycteris hemprichii	Desert Long-eared Bat	LC
Myotis capaccinii	Long-fingered Bat	VU
Order Carnivora		
Canis aureus	Golden Jackal	LC
Canis lupus	Grey Wolf	LC
Vulpes vulpes	Red Fox	LC
Lutrogale *perspicillata maxwelli*	Smooth-coated Otter	VU
Lutra lutra	Eurasian Otter	NT
Herpestes javanicus	Small Indian Mongoose	LC
Mellivora capensis	Honey badger	LC
Hyaena hyaena	Striped Hyaena	NT
Felis silvestris	Wild Cat	LC
Felis chaus	Jungle Cat	LC
Caracal caracal	Caracal	LC
Order Artiodactyla		
Gazella subgutturosa	Goitered Gazelle	VU
Sus scrofa	Eurasian Wild Pig	LC

Order Lagomorpha		
Lepus capensis	Cape Hare	LC
Order Rodentia		
Hystrix indica	Indian Crested Porcupine	LC
Allactaga euphratica	Euphrates Jerboa	NT
Jaculus jaculus	Lesser Egyptian Jerboa	LC
Gerbillus mesopotamicus	Harrison’s Gerbil	NE
Gerbillus cheesmani	Cheesman's Gerbil	LC
Tatera indica	Indian Gerbil	LC
Meriones crassus	Sundevall's Jird	LC
Nesokia bunnii	Bunn's Short-tailed Bandicoot Rat	EN
Nesokia indica	Short-tailed Bandicoot Rat	LC
Rattus rattus	Black Rat	LC
Rattus norvegicus	Brown Rat	LC

Appendix 4.13.

List of freshwater snails known to occur in the southern marshes of Iraq (Plaziat & Younis 2005)

Gastropoda

Neritina (*Dostia*) *violacea*

Neritina (*D.*) *schlaeflii*

Theodoxus (*Neritaea*) *jordani*

Theodoxus (*N.*) *mesopotamicus*

Theodoxus (*N.*) *euphraticus*

Theodoxus (*N.*) *macrii*

Bellamya bengalensis

Bellamya unicolor

Valvata sp.

Amnicola (*Alocinna*) *ejecta*

Tricula palmyrae

Stenothyra iraqensis

Bithynia badiella

Melanoides tuberculata

Cleopatra bulimoides

Melanopsis (*Melanopsis*) *praemorsum*

Cerithidea (*Cerithideopsilla*) *cingulata*

Potamides conicus

Lymnaea (*Radix*) *auricularia*

Lymnaea (*R.*) *tenera*

Lymnaea (*R.*) *canalifera*

Lymnaea (*R.*) *lagotis*

Gyraulus albus

Gyraulus convexiusculus

Gyraulus intermixtus

Bulinus contortus

Bivalvia

Saccostrea cucullata

Unio tigridis

Pseudodontopsis euphraticus

Anodonta (*Anodonta*) *vescoiana*

Corbicula cor

Corbicula fluminalis

Corbicula tigridis

Theora mesopotamica

Appendix 4.14.

Occurrence of snail species in Suq Shuyukh, Al-Hawizeh, and Hammar (Ali *et al.* 2007).

	Hammar	Huwayzah	Suq Shuyukh
Bellamya bengalensis	+	+	+
Bellamya unicolor	+	+	+
Bulinus truncatus	+	+	-
Gyraulus costulatus	+	+	+
Lymnaea auricularia	+	+	+
Lymnaea gedrosiana	+	+	-
Lymnaea natalensis	+	+	+
Melanoides nodosum	+	-	-
Melanoides tuberculata	+	+	+
Melanopsis nodosa	+	+	+
Melanopsis praemorsa	+		+
Physa acuta	+	+	+
Pila ovatus	+	-	-
Theodoxus jordani	+	+	+
Gyraulus convexiusclus	-	+	-
Corbicula fluminea	+	-	+
Corbicula fluminalis	+	-	+
Unio tigrids	+		
Total No. of species	17	12	12

Appendix 4.15.

Odonata species recorded from the Iraqi Marshlands prior to 1980 and 1980 and onwards and their IUCN status (Boudot *et al.* 2009)

Species	G	M	before 1980	after 1980
Calopteryx splendes	NE	LC	+	-
Sympecma paedisca	NE	EN	+	-
Ischnura evansi	NE	LC	+	+
Ischnura fountaineae	NE	LC	+	-
Ischnura senegalensis	LC	LC	+	-
Aeshna mixta	NE	LC	+	-
Anax ephippiger	LC	LC	+	-
Anax parthenope	NE	LC	+	-
Anormagomphus kiritshenkoi	NE	LC	+	-
Lindenia tetraphylla	NE	NT	+	-
Onychogomphus flexuosus	NE	VU	*	*
*Brachythemis fuscopalliata***	VU	VU	+	+
Crocothemis erythraea	LC	LC	+	-
Crocothemis servilia	NE	LC	+	-
Diplacodes lefebvrii	LC	LC	+	-
Orthetrum sabina	NE	LC	+	-
Orthetrum taeniolatum	NE	LC	+	-
Orthetrum trinacria	LC	LC	+	-
Pantala flavescens	LC	NE	+	-
Selysiothemis nigra	NE	LC	+	-
Sympetrum arenicolo	NE	?	+	-
Sympetrum fonscolombii	LC	LC	+	-
Sympetrum striolatum	NE	LC	+	-
Trithemis annulata	LC	LC	+	-
Trithemis festiva	NE	LC	+	-

* Record with unknown date.

** The records of Ali *et al*. (2002) are included.

LC: least concern. NE: not evaluated. NT: Near threatened. VU: vulnerable.

Appendix 6.1.

***SMART* analysis of the most relevant recommendations of the Management Plan for the Al-Hawizeh Marsh Ramsar Site of Iraq (Nature Iraq 2008b).**

Recc.	Specific	Measurable	Attainable	Relevant	Timed	Remarks
16	-	1	1	?	-	Species not identified, limited relevance
17	-	?	?	?	-	Species not identified, reestablishment difficult, limited relevance
18	1	1	1	1	-	
19	1	1	1	1	-	Evaluation of future threats most important
20	1	1	?	1	-	Where in Al-Hawizeh should this be studied, and how?
21	-	-	-	-	-	This is a statement not an objective
22	1	1	1	1	-	
23	1	1	1	1	-	
24	1	1	?	?	-	General information about habitat needs is available already
25	1	1	1	1	-	
26	1	1	?	?	-	High cost/benefit ratio, Avian flu less of a threat now
27	1	1	-	1	-	Only attainable based on sound population estimates, which do not exist and are not among the recommendations
28	1	1	1	1	-	
29	1	1	1	1	-	
30	1	1	?	?	-	High cost/benefit ratio, trophic ecology of mammals difficult to study
31	-	1	1	1	-	Species not specified
32	-	1	-	1	-	General; Behaviour of locals only partly influenced by information
33	-	1	?	1	-	General; transboundary corridors depend on general political situation
34	-	1	1	1	-	General
35	1	1	1	?	-	Cat VI may need to be supplemented by core areas of higher conservation categories in order to meet management objective
36	1	1	1	1	-	
37	1	1	?	1	-	Collaboration with Iran depends on general political situation
38	1	1	1	1	-	
39	1	1	1	1	-	
40	1	1	1	1	-	
41	1	1	1	1	-	
42	1	1	?	1	-	Consensus on water allocation in Iraq and with upstream neighbours unclear
43	1	1	?	1	-	Collaboration with Iran depends on general political situation
44	-	1	1	1	-	Unclear "target curves"
45	1	1	1	1	-	
46	1	1	1	-	-	It seems key treats are identified already
47	-	1	?	?	-	General; needs transboundary cooperation; actions should already be defined in this management plan
48	1	1	1	?	-	Iran water input cannot be measured with this exqipment
49	1	1	-	1	-	Activities on Iranian side impiossble to "ensure"
50	1	1	1	1	-	

58	1	1	1	1	-	
59	1	1	1	1	-	
60	-	1	-	1	-	General; land tenure regulation not the mandate of conservation authority
61	-	-	-	-	-	This is a statement not an objective
62	-	1	?	1	-	General; Needs support of local land users, which was apparently not ascertained during planning process
63	-	-	?	-	-	General, beyond control of plan, not directly relevant to management objective 8
64	-	1	1	-	-	General, does not address framework
65	-	-	-	-	-	This is a rather complex statement, not an objective
66	1	1	?	1	-	General; Needs support of local land users, which was apparently not ascertained during planning process
67	-	1	?	1	-	General; depends of interest of organizations and beyond control of management authority
68	-	1	?	1	-	As above, depnds on general political situation
69	-	1	?	1	-	As above
70	-	1	?	1	-	Asa above
71	1	1	1	1	-	
72	-	-	?	1	-	General, no target defined, no source of funds defined
73	1	1	1	1	-	
74	1	1	1	1	-	
75	1	1	1	1	-	
89	1	1	?	1	-	Cooperation and support of Oil Ministry not secured
Sum	34	48	28	40	0	

Appendix 6.2.

***SMART* assessment of biodiversity relevant specific objectives of the MMNP draft management plan (New Eden Project 2010a, b)**

Objective	Specific	Measurable	Attainable	Relevant	Timed	Remarks
1	-	-	-	1	-	General, no target range for water quality parameters defined, partly depends on factors beyond scope of project
2	1	1	1	1	-	
3	1	1	?	1	-	Proof of cause-effect relationship difficult
4	1	1	1	1	-	
5	1	1	1	1	-	
6	1	1	1	1	-	
7	-	-	-	1	-	General, no target range for water quantity defined, partly depends on factors beyond scope of project
8	-	-	1	1	-	Not clear what obstacles are meant, no target defined
9	1	-	1	1	-	No target defined
10	1	1	1	-	-	Road maintenance not directly relevant to water flow
11	1	1	1	1	-	
12	1	1	1	1	-	
13	-	1	?	1	-	General, depends on factors beyond control of project
14	-	1	?	1	-	General, depends on factors beyond control of project
15	1	1	1	?	-	High cost/benefit ratio
16	1	1	1	1	-	
17	1	1	1	1	-	
18	1	1	1	?	-	High cost/benefit ratio
19	1	1	1	1	-	
20	1	1	1	1	-	
21	1	1	1	?	-	High cost/benefit ratio
22	1	1	1	1	-	
23	-	-	-	-	-	Which species? Extremely high cost/benefit ration, particularly before ecosystem recovery is completed
24	1	1	1	1	-	
25	-	-	1	1	-	General, no target defined
26	1	1	1	-	-	High cost/benefit ratio, support to existing institutions more effective
27	1	1	1	1	-	
28	1	1	1	1	-	
29	1	1	?	1	-	Needs strong ownership of local population, which apparently has not been involved strongly thus far
30	1	1	?	1	-	Needs strong ownership of local population, which apparently has not been involved strongly thus far
31	1	?	?	?	-	Needs strong ownership of local population, which apparently has not been involved strongly thus far; no targets defined
Sum	24	24	22	23	0	

Appendix 6.3.

SMART analysis of the specific recommendations for action of the plan "Managing for Change. The present and future state of the Marshes of southern Iraq" (CIMI 2010b)

Objective	Specific	Measurable	Attainable	Relevant	Timed	Remarks
1.1.	1	1	1	1	-	
1.2.	1	1	1	?	-	Collaboration of existing institutions might be more effective
1.3.	1	1	1	1	-	
2.1.	1	1	?	1	-	Agreement with Iran depends on general political situation
2.2.	1	1	1	1	-	
2.3.	1	1	?	1	-	Success of request depends on general political situation
2.4.	1	1	1	1	-	
3.1.	1	1	?	1	-	Legislation requires national consensus on water allocation, which may not consist
3.2.	-	1	1	1	-	General
3.3.	-	-	1	1	-	General; no target defined
3.4.	1	1	?	1	-	Wide political support needed
3.5.	1	1	1	1	-	
3.6.	1	1	1	1	-	
3.7.	1	1	1	1	-	
4.1.	-	1	1	1	-	General
4.2.	-	1	1	1	-	General
4.3.	1	1	?	1	-	Flow release of Karun River depends on Iranian political will
5.1.	1	1	1	1	-	
5.2.	1	1	?	1	-	Reduction of agricultural no-point sources costly
5.3.	-	1	1	1	-	General
5.4.	-	1	1	1	-	General
5.5.	1	1	1	1	-	
5.6.	-	1	1	1	-	General
6.1.	1	1	1	1	-	
6.2.	1	1	1	1	-	
6.3.	1	1	?	1	-	National consensus on water use missing
6.4.	-	1	1	1	-	General
7.1.	1	1	1	1	-	
7.2.	1	1	1	1	-	
8.1.	1	1	1	1	-	
8.2.	1	1	1	1	-	
8.3.	-	1	1	1	-	General
9.1.	1	1	1	1	-	
9.2.	1	1	1	1	-	
9.3.	1	1	1	1	-	
10.1.	-	1	1	1	-	General
10.2.	1	1	1	1	-	
Sum	27	36	30	36	-	

Appendix 6.4.

Checklists for World Heritage Management Planning (IUCN 2008)

PLANNING CHECKLIST FOR THE PREPARATION OF WORLD HERITAGE MANAGEMENT PLANS

- Do you have a strategy outlining the process for agreeing the scope, content, detail and timetable of the management plan?
- Is this statement in a form which others can see and share?
- Does your team have the correct combination of skills and adequate resources to do the job?
- Have you defined a lead officer responsible for managing the work?
- Have you decided which stakeholders should help prepare the plan and how and when they will be involved?
- Has the process for ratifying the plan been agreed by the relevant State and local authority/ies?
- Does everyone understand how they can participate in the process of planning and the delivery that will follow it?
- Do you have a plan and system to monitor the effectiveness of the outcomes of the management plan?
- How do you intend to keep IUCN and UNESCO informed about progress with the preparation of the management plan, its implementation and its review?

CHECKLIST FOR PREPARING WORLD HERITAGE MANAGEMENT PLANS

- Does the management plan cover the correct area?
- Is it clear who the plan is aimed at?
- Is it clear who should take part in its preparation and how?
- Does the information about the property exist that is required to understand the key issues?
- Does the plan focus on the key issues and conservation challenges and solve local problems?
- Has involvement of all stakeholders been achieved and proper consultation been carried out?
- Does the plan address all international, national and other legal obligations?
- Have you established a Statement of Outstanding Universal Value for the property?
- Does the plan seek to effectively protect the values for which the property was inscribed on the World Heritage List?
- Does the plan speak to all of the relevant values of the property, whether the basis of World Heritage listing or not?
- Does the plan address the requirements of the Operational Guidelines and take account of decisions taken by the World Heritage Committee regarding the property?
- Does the plan consider the presentation of the property in line with best practice for visitor management and the use of the World Heritage Emblem?
- Does the plan link with the Periodic Reporting Process for World Heritage properties?
- Are the plan's principles recognised in other (legal) documents affecting the area?
- Does the plan contain all the elements to make good management decisions?
- Are the strategic and operational elements clearly distinguished?
- Is the reason for using different management zones clear?
- Is the process for formally approving the plan clear?
- Is the plan flexible enough to respond to change?
- Is the presentation of the plan appealing?

- **Finally: Are you confident that the management plan will be accepted and implemented by all those concerned with the property?**

Appendix 7.1.

Names and contact details of key stakeholders and experts for the further nomination and managemenent planning process of the Marshes

		Affiliation			Contact	
Name	**Name (Arabic)**	**Institution**	**Position**		**Email**	**Phone**
		GOVERNMENT INSTITUTIONS				
Dr. Ali A. Allami	د علي عبدالزهرة اللامي	Ministry of Environment	Minister Advisor, CBD FP	Iraq	aaza59@yahoo.com	00964-7901232413
Mr. Kadhum Lahmod	السيد كاظم لهمود	Ministry of Water Resources - CRIM	Director General	Iraq	crimbag2004@yahoo.com	00964-7901944936
Dr. Abbas Balasm	د عباس ناجي بلاسم	State Ministry for Marshlands	Consultant	Iraq	balasem.a@gmail.com	00964-7804697170
Mr. Wadah	السيد وضاح	Ministry of Oil - Environmental Department	D. G. Planning and Studies Dir.	Iraq	environment@oil.gov.iq	00964-7901103699
Ms. Ikram Kassim	الست اكرام قاسم ناصر	General Secretariat of the Council of Ministers	Ramsar FP	Iraq	ikramkasim@gmail.com	00964-7708284272
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