Review of wetland inventory information in Western Europe

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1 Introduction

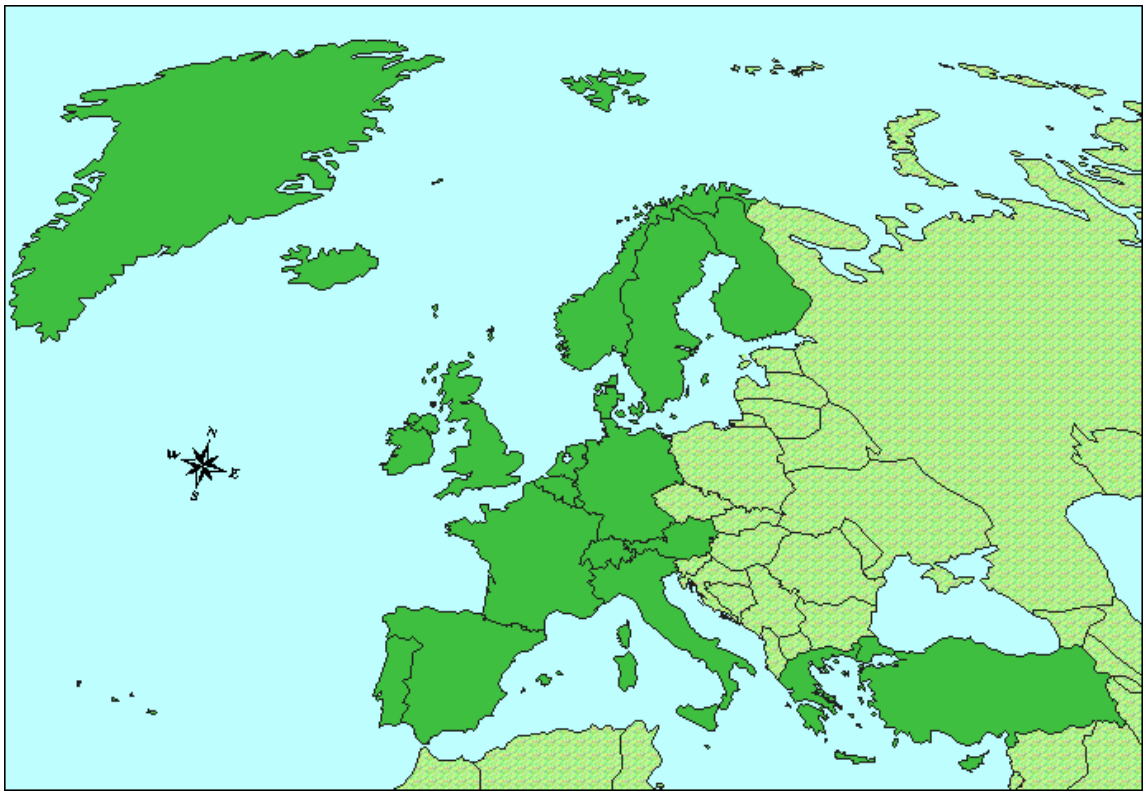
The Western European countries covered by this review are listed below in table 1.1. These countries constitute the Ramsar Region of Western Europe which encompasses some twenty-five countries. This includes the Atlantic Ocean coast countries of Portugal, Spain, France, Ireland and Iceland; the North Sea countries of the United Kingdom, Belgium, the Netherlands and Germany; the Scandinavian countries of Norway, Denmark (including Greenland), Sweden and Finland in the north. It also includes the land locked countries of Andorra, Austria, Switzerland, Liechtenstein, and Luxembourg, and the Mediterranean countries of Italy, Malta and Monaco (also Spain and France) in the south. It encompasses San Marino on the Western coast of the Adriatic, (but not the countries on the Eastern Adriatic coast), and the countries of Greece, Turkey and Cyprus in the south east.

Table 1.1 Countries included in the Ramsar region of Western Europe

Countries included in Western Europe	
Andorra	Luxembourg
Austria	Malta
Belgium	Monaco
Cyprus	Netherlands
Denmark	Norway
Finland	Portugal
France	San Marino
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	Turkey
Italy	United Kingdom
Liechtenstein	

This review was based on national datasets (including the possibility that a composite national dataset could be amalgamated by equivalent, eg provincial, data subsets). From the beginning, the assumption was made that significant (national) information on wetland extent, health, attributes and values might be found in many other information sources besides conventional wetland inventories or directories. It is believed that this constitutes a divergence from previous studies. While this broadened the scope and potential of the material examined, it also meant that all studies were effectively judged as if they were undertaken with wetland inventory objectives in mind. Often this was, of course, not the case.

Furthermore the authors acknowledge the following deficiencies in this study. The dataset is incomplete, for some countries this is more of a concern than for others. The compressed time frame and limited resourcing for a project of this nature probably promoted certain biases (for example, over-reliance on English language studies, and on the more-familiar elements of contact networks), and was likely heavily influenced by the lag time between requests for study material, and its ultimate receipt. Finally, due to time and resource constraints, spatial information datasets have not been adequately reviewed; this constitutes a large gap in this preliminary study.



Boundaries are not authoritative

Figure 1.1 Map of the Western Europe region

2 Information sources

2.1 Search strategy

This review can simply be described as an inventory of wetland inventories based on national datasets (including composite national datasets that were amalgamated from equivalent, eg 'provincial', data subsets).

Potential sources of wetland inventory data were identified through communications with an extensive network of contacts (see Annex 1), and using the World Wide Web, external (eg Wageningen Agriculture University databases) and in-house libraries, Ramsar National Reports, and IWRB National Reports. Search terms included combinations of the more obvious terms such as:

> *wetland, wetlands, inventory, extent, status, distribution, classification, directory, overview, review*

and habitat names including the following:

> *grasslands, peat, peatland, bog, marshes, swamp, lakes, water, reservoirs, pond*

and less obvious terms such as

> *survey, area, intertidal, subtidal, riparian, aquatic, coastal, evaluation, mapping, census, state, waterfowl, waterbirds*

also non-English search terms included

> *Les zones humid, Le zone umide, zones humides d'importance, Flussordnungszahlen, Le Littoral, los Humedales, resources cotieres*

Where the above terms did not prove successful for any individual country, a search by country name was conducted followed by a lengthy examination of the resulting 'hits'.

In addition, the reference lists of material obtained were scanned for possible wetland inventory sources. In many cases this proved to be more successful in identifying potential information sources than database or web searching, particularly for unpublished sources.

2.2 Evaluation of the Western Europe dataset

The methodology used to identify and evaluate material for the Western European (WEUR) dataset follows.

2.2.1 Evaluation of inventory material for inclusion in the WEUR dataset

Many potential sources were obtained, and their suitability for inclusion in the database was assessed. The decision whether to include or exclude certain sources depended on several factors. Poor quality material was not usually included except where no alternative data for a country could be obtained. Sub-national data were excluded except where no national information existed. In cases where material was encountered which contained no area data but did contain other useful information, it was considered if no other information for that country was identified.

2.2.2 Meta-data recording

Each assessed information source was evaluated using a *Wetland Inventory Assessment Sheet* (WIAS), designed to permit rapid assessment and compilation of information about each identified inventory, and to compile summary information about the wetland resource contained in each inventory. A set of guidelines for the completion of the sheet was also developed to facilitate consistent handling and coding of relevant information. Derivation of wetland coverage estimates and other wetland parameters are discussed in later sections.

A database was created to include information about each information source that was reviewed and recorded on a WIAS datasheet. Another database was also created to serve as a data dictionary of the codes (and their descriptions) which was used to represent various categories of information in the primary database.

Computer programs were written to analyse the majority of coded fields in the database. The analyses report on the presence or absence of codes or logical values (by use of a filtering system), and produced printed outputs. These outputs provide the meta-data breakdowns given in this report.

2.3 Materials sourced

Some 27 wetland inventory sources were included in the Western European dataset. The number of inventories examined per country is given in table 2.1 and graphically represented in figure 2.1.

A full reference list of materials included in the preliminary assessment is given in Annex 2. The materials examined included both published (including world wide web articles, journal articles and books) and unpublished material, academic material (including peer reviewed material, MSc and PhD theses), governmental and non-governmental material, draft reports,

newsletter articles, conference proceedings and consultancy reports (see section 2.4 for further details).

As such, conventional wetland inventories and directories were examined, also natural resource inventories or habitat surveys (which either directly or indirectly included wetlands), and also sources which contained wetland extent information merely as a by-product of some other activity (eg waterfowl counts).

Table 2.1 Numbers of material sourced per country in the Western European region

Country name	No. of materials sourced
Andorra	0
Austria	3
Belgium	1
Cyprus	0
Denmark	5
Finland	5
France	5
Germany	5
Greece	5
Iceland	2
Ireland	4
Italy	7
Liechtenstein	1
Luxembourg	1
Malta	1
Monaco	1
Netherlands	7
Norway	4
Portugal	2
San Marino	0
Spain	2
Sweden	5
Switzerland	1
Turkey	2
United Kingdom	13

Since a degree of selection occurred in choice of material included in the Western Europe (WEUR) dataset, it cannot be stated that ‘x’ countries have more wetland inventory material than ‘y’ countries. In some cases, several sources of material were required in order to make a best estimate of wetland coverage for a specific country, whereas, for other countries, one source alone was comprehensive and detailed enough to provide a best estimate of wetland coverage. An example of the former would be the United Kingdom, and an example of the latter would be Greece. Therefore, it must be noted that the graph above cannot be taken as representative of all the material available per country, simply the material which was included in the WEUR dataset.

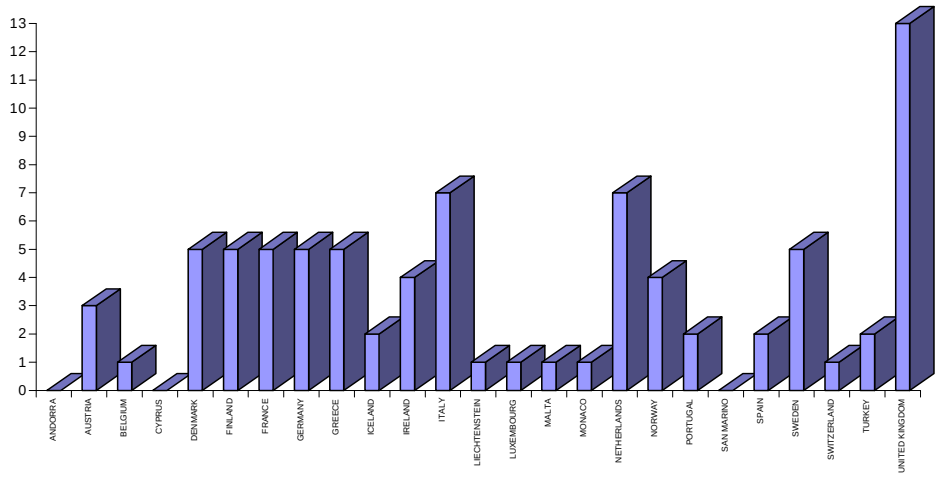


Figure 2.1 Numbers of wetland inventory material in Western European countries

2.4 Summary of information sources reviewed

The majority of materials examined (59%) for Western Europe was national level material, but sub-national level material also featured strongly (19%). The inclusion of sub-national level material indicates that there was insufficient national level material for some countries to derive best estimates, (compare this to 0% sub-national material in the Africa and Eastern European regions). Some 44% of sources examined were either inventories or directories, or their equivalent, (a value higher than that for Africa, but lower than that for Eastern Europe).

Scale of inventory of material	
Global scale	4%
Supra-regional scale	11%
Regional scale	0%
Sub-regional scale	7%
National scale	59%
Single country studies	74%
National scale references including more than one country	4%
Sub-national scale	19%
National and other scale combination	0%

Government publications comprised 41% of material examined in the region, and NGO material comprised some 18% of material examined (comprising 11% reports and 7% formal publications). This differs from the material examined for Africa and Eastern Europe where non-governmental material formed a greater proportion of the material than governmental material. It is encouraging that governments in Western Europe seem to be playing a very active role in wetland inventory activities, and this may be linked to the fact that nearly all the

countries (22 out of 25 countries) in Western Europe are signatories to the Ramsar Convention (Source of Ramsar site Information: Ramsar Database, date of data extraction 17/8/98).

Type of source material	
Peer review journals	4%
Peer review books	4%
Chapters in books	4%
Conference or keynote presentation	0%
Article in conference proceedings	7%
Internal government reports	0%
Government formal publications	41%
Other government material	0%
NGO reports	11%
NGO formal publications	7%
Consultancy reports	4%
Newsletter articles	0%
Practitioner periodical article	0%
Database manual	0%
Electronic database	7%
World Wide Web article	7%
Thesis	0%
Other	4%
Unknown	7%

Some 44% of wetland inventory sources assessed in Western Europe were conventional wetland directories or inventories, (or equivalent), and 55% were some other kind of study. This means that the majority of information is not immediately apparent as a source of wetland inventory information; often these sources contain wetland inventory information as a by-product of other activities, such as bird surveys, or land use cover appraisals. Commonly, such studies contained scant or approximate wetland information, but for many countries no other wetland inventory information sources were identified.

Source is a directory/inventory or equivalent?	
Yes	44%
No	56%

The majority of studies were in English (81%), with the remaining sources in a variety of languages including Finnish, French, Italian, German and Spanish.

Language of study	0%
English	81%
Other	19%

Nearly all the material were in paper format (85%), although some 7% were in electronic database format and 7% of the material was available on the World Wide Web. Similarly, most information (74%) was stored in paper format, though 19% of information were stored within electronic databases.

Format of study	
Paper	85%
Electronic text	0%
Electronic database	7%
Personal communication	0%
Web presentation	7%
Part of GIS or GIS output	0%
Map based	0%
Other format	0%
More than one format	0%
Data storage media	
Paper	74%
Web (electronic)	7%
Other electronic (not web or database)	7%
Electronic database	19%
GIS	4%
Hard copy map	4%
Digitised map	4%
Other	4%
More than one medium	19%
Unknown or ambiguous	4%

The majority (78%) of material examined were published (in one form or another), which is much higher than the figure for Africa (only 43% published), and Eastern Europe (only 56% published) (Stevenson & Frazier 1999a,b). This must have repercussions for the circulation and dissemination of wetland inventory material in that published material is more likely to be held in public libraries and be listed in literature databases and therefore more readily accessible than unpublished material.

Circulation of study	
Published	78%
Interdepartmental (unpublished)	0%
Internal (unpublished)	7%
Restricted (unpublished)	0%
Unrestricted (unpublished)	7%
Other types	4%
More than one type	4%
Unknown	7%

Certainly the authors have noted that a substantial amount of NGO inventory material often comprised of draft reports and unpublished final reports (which, it was often found, had not been published due to lack of funding or proper publication budget). It is however, very likely that much unpublished *governmental* material exists, but in general, this is much harder to identify and obtain than non-governmental unpublished material. This may be the reason why *unpublished* governmental material did not feature very strongly in this review.

2.5 Reliability of data

It is difficult to make judgements on the reliability of the individual data sources examined and included in this review when much of the material did not provide basic information. For instance, basic information such as the date of survey or date ranges of material featuring in a compilation/review, methodologies used, or contact information was frequently omitted. The tendency is to judge material as unreliable if it does not contain such basic information, but this judgement is by no means certain. The variety of classification schemes and definitions of wetlands used (often not defined) serves to further hamper any attempts to judge the reliability of material. However, as material for individual countries is judged collectively, it becomes (subjectively) more clear which information sources are likely to be more reliable.

By examining the methods, the date ranges and inclusion (or exclusion) of particular wetland types it is possible to at least generate best estimates of wetland coverage for any particular country, by consolidating the estimates from several sources. For example, one source may provide an estimate of wetlands in a country comprising an estimate of coastal wetlands which appears to be accurate, but an estimate of freshwater wetlands which noticeably excludes (for example) floodplains. The estimate for coastal wetlands would then be consolidated with the estimate of freshwater wetlands provided by another source that purports to include floodplain wetlands (providing it was a greater area than the other source).

Section 3.3 provides a more detailed description of how wetland area estimates by type were generated for this review, and provides guidance for interpreting the summary sheets of wetland coverage and extent (given in Annex 2), and material reviewed. Comments on the age of data, methods used, and exclusions in coverage (eg the estimate excludes floodplain wetlands and ephemeral wetlands) are given, and these provide an assessment of data reliability.

Several generic difficulties emerged throughout the evaluation process that should be noted when judging the reliability of data. These are summarised below.

- usage of different wetland definitions/classifications and the inclusion or exclusion of some wetland types, eg lakes and open water, in inventories. See section 3.1 for a further discussion of wetland definition and classification issues;
- artificial wetlands were also often largely ignored in many national inventories and therefore national inventories are often incomplete in their coverage;
- the date of data collection and inventory productions were often not recorded, and it should be noted that review compilations, by their very nature, use different sources of widely differing ages (the dates of which are rarely stated);
- defined boundaries of wetlands were often not provided, making comparisons between different sources difficult, as did the variable treatment of individual wetlands in wetland complexes;

- many sources lacked a summary, making extracting national-level information time-consuming; some of the material which did provide a summary contained summary information that did not always match the text of the report;
- the wide variety of languages of national inventories made extraction and review of information difficult, and time consuming (and potentially expensive if translations were carried out);
- many potential wetland inventory information sources were unpublished material which proved to be difficult to obtain or access; much of the information which was accessed were also draft reports written up to 5 years ago which have never progressed beyond draft report stage;
- often the areas provided in many potential sources of information were site areas, eg national park areas and not actually wetland areas, (these sources were excluded from the analysis, with the exception of Ramsar sites);
- contradiction of information about some sites *between* different references was found to occur. With a little detective work, in most cases it was possible to identify erroneous material, but this was not always possible;
- contradictions within *one individual* source document were also noted to occur. This meant that some detective work was often required to identify errors and rectify errors, resulting in slow assessment.

This project has identified several cases where source material has quoted wetland area estimates taken from studies that had been comprehensively updated by more recent studies, and therefore their estimates were out of date, and had been supplanted by more recent and accurate data. This creates a misinformation trail, which makes it difficult to assess the accuracy of reports that yield conflicting data.

Some less accessible inventories have been missed in this review. Additional material has been identified since the analysis phase was completed and some key sources of material were therefore not incorporated in this preliminary analysis. Further additional sources may be revealed during the consultation phase and after circulation of the completed report. An update of the dataset is recommended after the consultation process has been completed.

3 Extent and distribution of wetlands

3.1 Definition and classification of wetlands

A major consequence of using the rather broad Ramsar definition (Annex 3) of wetlands in this review, is that the estimates of wetland coverage generated by this project cannot strictly be regarded as estimates of true or actual wetland cover, but are instead estimates of *described* wetland cover. Consequently the area values given in this review should be viewed as underestimates, and do not represent estimates of the entire wetlands resource, but only those for which coverage estimates already exist in their many disparate forms.

Differing wetland definitions and classification schemes were used in different studies and these definitions are not always stated, making it difficult to assess the degree of completeness of cover (and thereby the estimates of wetland extent). For instance, many inventories include or exclude some wetland types, eg open water bodies, and estuaries.

A definition of the terms ‘marine wetlands’, ‘coastal wetlands’ and ‘inland wetlands’ was almost without exception absent, and yet separate authors used them to mean different things. Extracting information on even broad wetland categories was found to be difficult. Particularly when some authors use, for example, the term ‘coastal wetlands’ to mean strictly saline and brackish habitats and others use it to mean wetlands in the coastal zone (which often for practical purposes means coastal lowlands and incorporates wetlands which experience no tidal inundation). Similarly the term ‘inland wetlands’ to some authors meant freshwater wetlands, to others it meant all wetlands except those in the coastal plain, to others it meant all wetlands except those wetlands under tidal influence.

It was apparent (though not defined) that many authors utilised a more narrow definition of wetlands than that given by the Ramsar definition. For instance, many authors may argue that wetlands must be vegetated, (therefore mudflats and sand flats and open water would be excluded). Others may argue that coral reefs, seagrass beds and subterranean karst are not wetlands, and others may also exclude artificial or created wetlands from their definition of wetlands. Similarly, forested wetlands are often regarded as forests and not wetlands, and are therefore excluded from wetland assessments (and yet may also be excluded from forestry assessments for exactly the opposite reason).

It is therefore not surprising that certain wetland types were commonly excluded from wetland assessments. These include dune slacks, humid sands, wet mesotrophic grasslands, seagrass beds, maerl beds, glacial and alpine wetlands, artificial wetlands (especially reservoirs, fish ponds, rice paddies, dams etc) and finally recent additions to the Ramsar list of wetland types such subterranean karst wetlands.

In the Western European region several terms were commonly treated differently. These included different treatment of the terms ‘coastal’, ‘marine’ and ‘inland’, and ‘peat’, ‘bog’, ‘mire’ and ‘fen’. Estuaries, open water bodies, tidal flats, riparian systems, artificial waterbodies (eg reservoirs, flooded quarries etc) also appeared to be frequently ignored, perhaps resulting from a view that these do not constitute wetlands.

A definition of wetlands was provided in only 30% of studies, and only 22% of studies used the Ramsar definition of wetlands. It was not possible to identify which definition was used for some 33% of studies, so the true value of Ramsar definition usage may be much higher. The Ramsar classification system for wetland type was used in only 7% of studies, was unknown for 30% of studies and not applicable for some 41% of studies (these were usually reviews or collations of material). It is likely that the definition of wetlands and classification of wetland types given by Ramsar are more globally applicable, and less suited to an individual country’s management requirements; hence the low usage of the Ramsar terms.

Wetland definition	
Definition provided	30%
Definition implied	15%
No definition provided or implied	52%
Unknown/ambiguous	4%
Ramsar definition	
Ramsar definition used	22%
Ramsar definition not used	44%
Use of Ramsar definition unknown	33%

Ramsar classification	
Ramsar wetland types used	7%
Other wetland classification used	22%
Wetland classification varies	0%
Unknown	30%
Not applicable	41%

3.2 Overall extent of wetlands in Western Europe

The analysis showed that in 81% of studies, only *part* of the wetland resource was examined, whereas *all* wetland resources were purportedly included in just 19% of studies. Where only part of the wetland resource was assessed by a study, the basis for selection was mainly (44%) influenced by habitat type (eg forested peat, coastal marsh) and jurisdiction (ie over a province or sub-national region). These features may be due to the prevalence of a sectoral management approach within governments, such that forested wetlands may be managed and inventoried by the forestry department, coastal wetlands by the fisheries department and inland wetlands and artificial wetlands by water quality authorities. This is also directly due to the fact that only 56% of the studies analysed were conventional directories or inventories. The remaining percentage consisted of material that reviewed wetlands in a region or country, and estimates of wetland area were based on approximations.

Extent of coverage	
All wetlands	19%
Part of wetland resource	81%
Ambiguous	0%
Wetland type coverage	
Sources providing area values per wetland type	56%
Sources partially providing area values per wetland type	30%
Sources not providing area values per wetland type	11%
Not known	4%
Basis of selection (if not complete wetland coverage)	
Geography / jurisdiction	41%
Land cover or remotely sensed data	0%
Landform type	4%
Supra-habitat	11%
Habitat type	44%
Floral / faunal groups or species	4%
Climate	4%
Wetland function	0%
Hydrology	0%
Biodiversity value	4%
Cultural value	0%
Artefact of data collection	4%
Other basis	15%
Unknown or ambiguous	4%
More than one basis	44%

A summary of wetland coverage in Western Europe as a region is presented in tables 3.1 and 3.2. The total area calculated from the WEUR dataset amounted to some 28 822 000 ha, covering 4% of the land surface. A large percentage (62%) of the wetlands included in this estimate were not specified as either 'marine/coastal', 'inland' or 'artificial' wetlands. This is a staggering value, amounting to some 17 951 000 ha of wetlands. It would be premature to state that these wetlands are truly undescribed, but within the scope and time constraints dictated by this review project, it was not possible to uncover basic information about these 'unspecified' types of wetland in the Western European dataset. More information has been uncovered since the analysis phase of this project; however, this newly acquired data is not expected to significantly alter the proportion of unspecified wetlands.

Table 3.1 Wetland coverage in Western Europe as identified from the WEUR dataset

Western Europe	**Estimate of area in hectares (ha)**
Marine/coastal wetlands	3 571 362
Inland wetlands	7 248 283
Manmade wetlands	51 274
Area of unspecified types of wetland	17 951 060
Total area of wetands identified in this study	28 821 979
# of national datasets per region	42
# of national datasets which can be regarded as comprehensive in cover	8

Table 3.2 Wetland coverage in Western Europe as a percentage of land cover, and Ramsar site information

Western Europe	
# of Countries	26
Total land area of region (ha)	673 304 000
Total area of wetlands identified in this study (ha)	28 821 979
(median value of wetland area – ha)	–
% of land area covered by these wetlands	4.28%
Total area of Ramsar sites (ha)	5 682 196
# of Ramsar sites	469

(Source of Ramsar site information: Ramsar Database, date of data extraction 17/8/98)

The WEUR review showed that more than 25% (7 248 283 ha) of specified wetlands were inland wetlands, with less than 12% of specified wetlands described as marine/coastal wetlands (3 571 362 ha) and a further 0.2 % described as artificial wetlands (51 274 ha).

Since the scope and coverage of most inventory material did not state whether total wetland estimates included Ramsar sites, it is not possible to state whether this value includes, partially includes or excludes these sites. It must also be noted that the areas of Ramsar sites listed in table 3.2 are site areas and not wetland areas *per se.*

3.3 Wetland extent in Western European countries

Best estimates of wetland extent by broad wetland type ('inland', 'marine/coastal' and 'artificial') for the Western European countries are given in table 3.4. A description of how best estimates of wetland coverage per country were derived is outlined below.

3.3.1 Derivation of country 'best estimates' of wetland coverage

The estimates of wetland coverage cited in the material examined in this review (and included in the Western European dataset) were entered into a system of *country coverage files* (in spreadsheet format). An individual wetland coverage file for each country within the Western European region, was created to facilitate the generation of best estimates of wetland area coverage per country and to serve as a summary and provide an 'audit trial' of material included.

Each file (workbook) consisted of several components (worksheets) broken down by Ramsar wetland type and also by broad wetland category (marine/coastal, inland and artificial) as follows:

1. Sheet one contains area statistics for marine/coastal wetlands broken down by Ramsar wetland type (*types: A, B, C, D, E, F, G, H, I, J, K).*
2. Sheet two contains area statistics for inland wetlands broken down by Ramsar wetland types (*types: L, M, N, O, P,Q, R, Sp, Ss, Tp, Ts, U, Va, Vt, W, Xf, Xp, Y, Zg, Zk).*
3. Sheet three contains area statistics for artificial wetlands broken down by Ramsar wetland types (*types: 1, 2, 3, 4, 5, 6, 7, 8, 9,).*
4. Sheet four contains 'notes and comments' which provides an indication of the reliability of the data (subjective assessment), and notes about methodology and or original sources of data.
5. Sheet five 'summary' contains the *total* values for 'marine/coastal', 'inland' and 'artificial' wetlands (not broken down per Ramsar wetland type) and the 'notes and comments' sheet. This sheet is generated automatically from sheets 1–4. Changes made to sheets 1–4 will update in the summary sheet.

The summary sheet (sheet five) for each country can be found in Annex 2. Where possible, approximate estimates per Ramsar wetland type were entered in the appropriate columns (in sheets 1–3; where this was not feasible, approximate values for broad wetland type were entered, and where this was not feasible, a total value was entered. This created a hierarchical system where it was possible to examine the quality of wetland coverage and extent information per country, which was assessed in the Western European dataset.

Each file provided wetland estimates, along with brief notes as to scope, and in particular, exclusions in coverage (eg open water bodies), and gave an indication as to the reliability of the data (sheet 4). This provided a convenient means of auditing all the material included in the dataset, and provides an 'at a glance' summary of the material examined.

Once all the wetland area values had been entered into a coverage file for each country, along with the appropriate notes on method and reliability, a subjective assessment of the all material for each country was made. Best estimates were composed according to broad wetland category (marine/coastal, inland and artificial), and a justification of the rationale entered into sheet 5. Once the coverage files were completed for all the countries within a region, the estimates were compiled into a summary table (table 3.4).

It should be noted that several wetland inventories included information on more than one country, and hence these documents feature in many country coverage files. The number of materials (referred to as datasets) examined per country were totalled and also entered into the summary document for each region.

Some notes which will appear on summary sheet five, which refer to specific Ramsar wetlands or values shown on sheets 1–4 (in the individual country coverage files as described

above). In a small number of cases the notes appearing on the summary sheet are not self-explanatory when viewed independently of sheets 1–4. This is regrettable, but unavoidable given the time constraints associated with the production of national overviews.

The summaries of wetland coverage for each Western European country deemed to have sufficient material to generate a 'best estimate' of wetland coverage either in total or by category type (inland, marine/coastal, artificial) can be found in Annex 2. Notes on the reliability of the assessment are included with each summary. Countries that were omitted from the 'best estimate' and reliability assessment due to lack of data in the WEUR dataset are given below in table 3.3.

Table 3.3 Countries omitted from the 'best estimate' and reliability assessment due to lack of data in the WEUR Dataset

Western Europe	
Andorra	Luxembourg
Belgium	Malta
Cyprus	Monaco
Iceland	San Marino
Ireland*	Switzerland
Liechtenstein	

*Data was available for certain wetland types, but there was insufficient data to create a best estimate of national wetland area.

3.3.2 'Best estimates' of wetland coverage per country

'Best estimates' of wetland coverage per broad wetland category for countries in the Western Europe region are given in table 3.4.

Table 3.4 Best estimates of wetland coverage per broad wetland category for countries in the Western Europe region[1]

		BEST ESTIMATES				COVERAGE INFO		RAMSAR INFO	
WESTERN EUROPE REGION	**Marine/Coastal (ha)**	**Inland (ha)**	**Artificial (ha)**	**Unspecified Wetland Type (ha)**	**Total (ha)**	# of datasets accessed per country [2]	# of datasets which can be regarded as comprehensive in cover per country	Total area of Ramsar sites	# of Ramsar sites
ANDORRA	No data	No data	No data		**No data**			0	0
AUSTRIA	none	265 622	435		**266 057**	1	1 ?	102 772	9
BELGIUM	No data	No data	No data		**No data**			7 935	6
CYPRUS	No data	No data	No data		**No data**			0	0
DENMARK [3]	885 142	1 399 830	unknown		**2 284 972**	2	0	2 283 013	38
FINLAND	50 143	3 352 200	unknown		**3 402 343**	3	0	101 343	11
FRANCE	381 280	800 627	3 600		**1 185 507**	2	1?	579 085	15
GERMANY	680 881	427 424	unknown	158 897	**1 267 202**	3	1?	672 852	31
GREECE	105 987	65 733	35 824		**207 544**	4	2	163 501	10
ICELAND	No data	No data	No data		**No data**			58 970	3
IRELAND	Insufficient data	Insufficient data	Insufficient data		**Insufficient data**			66 994	45
ITALY	Insufficient data	Insufficient data	Insufficient data	450 563	**450 563**	4	2	56 950	46
LIECHTENSTEIN	No data	No data	No data		**No data**			101	1
LUXEMBOURG	No data	No data	No data		**No data**			313	1
MALTA	No data	No data	No data		**No data**			16	2
MONACO	No data	No data	No data		**No data**			10	1

Table 3.4 continued

WESTERN EUROPE REGION	BEST ESTIMATES					COVERAGE INFO		RAMSAR INFO	
	Marine/Coastal (ha)	**Inland (ha)**	**Artificial (ha)**	**Unspecified Wetland Type (ha)**	**Total (ha)**	# of datasets accessed per country[1]	# of datasets which can be regarded as comprehensive in cover per country	Total area of Ramsar sites	# of Ramsar sites
NETHERLANDS	404 335	391 134	Insufficient data		**795 469**	4	1?	324 918	18
NORWAY	Insufficient data	Insufficient data	Insufficient data	3 301 600	**3 301 600**	2	1	70 150	23
PORTUGAL	79 500	unknown	unknown		**79 500**	1	1	65 813	10
SAN MARINO	No data	No data	No data		**No data**			0	0
SPAIN	129 596	27 000	9 112		**165 708**	1	1	158 216	38
SWEDEN	Insufficient data	Insufficient data	Insufficient data	12 800 000	**12 800 000**	4	1	382 750	30
SWITZERLAND	No data	No data	No data		**No data**			7 049	8
TURKEY	unknown	unknown	unknown	1 240 000	**1 240 000**	1	0	159 300	9
UNITED KINGDOM	854 498	518 713	2 303		**1 375 514**	10	0	420 145	114
Total estimated wetland cover	**3 571 362**	**7 248 283**	**51 274**	**17 951 060**	**28 821 979**	**42**	**8**	5 682 196	469

1. Please consult section 3.3.1 for a description of how these estimates were generated.
2. Excluding the Ramsar sites and GLCC databases.
3. Includes sites in Greenland.

4 Rate and extent of wetland loss and degradation

The majority of sources examined (59%) did not provide any details of wetland loss and/or degradation. This does not mean that loss values do not exist, simply that the material sought for this review was wetland inventory material, which as it turned out, rarely dealt with these issues in any detail. No specific tasks were performed to identify material that specifically outlined wetland loss (in isolation of inventories/directories). Thus, wetland inventory material within the Western European region does not normally include any appreciable data on wetland loss. This may, however, be directly related to the time scale of most wetland inventory activities, which are largely discrete surveys, which have not yet been repeated.

Of the 37% of material in the Western European region which did provide some information, this was almost exclusively descriptive, rather than quantitative. Whilst wetland loss throughout Western Europe is thought to be substantial, very little quantification of loss or damage was uncovered in this review. It was therefore not possible to either refute or support other existing reported values. The following statement was published by OECD (1996):

> Some estimates show that the world may have lost 50% of the wetlands that existed since 1900; whilst much of this occurred in the northern countries during the first 50 years of the century, increasing pressure for conversion to alternative land use has been put on tropical and sub-tropical wetlands since the 1950s.

Wetland loss and degradation	
Sources providing information on wetland loss and/or degradation	37%
Sources not providing information on wetland loss and/or degradation	59%
Not known	4%

Jones and Hughes (1993) provided an overview of the extent of wetland loss in Europe. Overall wetland losses exceeding 50% of original area have been reported by the Netherlands, Germany, Spain, Greece, Italy, France and parts of Portugal (Jones & Hughes 1993, Commission of the European Communities 1995). In the United Kingdom, loss rates of 23% of estuaries and 50% of saltmarshes since Roman times (Davidson et al 1991), and 40% of wet grasslands (RSPB 1993) have been reported. The only study allowing broad comparisons for a particular wetland type across the whole of Europe is that of Immirzi et al (1992), which reports loss rates for peatlands in excess of 50% for 11 European countries.

It was noted that a wide diversity of methodologies are used to measure wetland loss, and the lack of co-ordination between studies in different countries or for different wetland types prohibits any overview at regional level.

More recent information on wetland loss may have emerged since the works mentioned above. However, it is important to note that, if the WEUR dataset is representative of the wetland inventory material that exists in Western Europe, then we can conclude that wetland loss is rarely measured or recorded during wetland inventory activities in the region. Studies that specifically set out to measure wetland loss may have been undertaken, but loss values do not feature in inventory assessments.

Similarly, of the material examined for Western Europe, only 33% of material included a description of overall wetland status in a country (though these descriptions were of course totally generic in nature). Overall those that did provide such information often provided detailed individual site information (often the ‘study site’ subject to scientific research), and

some studies provided an overview or summary of such information. These latter studies were generally not conventional wetland inventories or directories *per se*, and were frequently academic peer review publications, which are necessarily short in length. Where wetland loss information was provided it must be noted that the rates or amounts identified on a local scale do not necessarily reflect national trends in wetland loss. Overall it can be said that the information on wetland loss was usually lacking, but where it was included it was highly variable and inconsistent in its detail.

Wetland status description	
Overall wetland status description included	33%
Overall wetland status description not included	59%
Unknown	7%

Details of the major threats to wetlands are also lacking from most inventory material in the Western European region. Some site based studies do provide very brief descriptions of threats to individual wetlands; usually these studies are ones undertaken to designate or describe wetlands of 'international importance' (according to the Convention on Wetlands, Ramsar, 1971). Standard site descriptions are recorded on a Convention-approved form, the 'Ramsar Information Sheet' (RIS), and this *pro-forma* includes an information category called 'Adverse factors'. This subject is recorded in the Ramsar Database according to an *ad hoc* set of past (but still influential), present and/or potential wetland threats (both in and around the site). These developed based on the data that have been provided, rather than fitting incoming data to a pre-existing structured classification.

Due to this historical legacy, the urgency, extent and character of any threat at any site listed has never been codified in the current (to be supplanted) database. Such information, if it exists, might be found in individual site files that support the database. Oftentimes, the level of detail provided is very low, and example statements include 'peat cutting is common at the site' 'livestock grazing is causing physical damage to the wetland', 'water extraction for agricultural purposes is leading to a lowering of the water table'.

5 Wetland benefits and values

Wetland values as defined by the Ramsar Bureau, are 'the perceived benefits to society, either direct or indirect, that result from wetland functions. These values include human welfare, environmental quality, and wildlife support' (Ramsar Convention Bureau 1996).

A large proportion of material examined for the review was not a conventional inventory/directory (see section 2.4) and did not contain site by site information. These sources did not usually contain details of wetland values and/or benefits (other than generic statements), since they usually referred to wetlands at a national level (or at least above a local or provincial level) and would therefore not contain detailed management information. However, the inclusion of generic statements in studies which were not 'site-based' inventories (ie general overviews) was recorded, and the analysis showed that 11% of 'non-site based' studies contained 'some level' of wetland values and benefits information.

Western Europe	Inclusion of wetland values and benefits information (site based studies only)
Some level of information	11%
Always	4%
Most of the time	4%
Commonly	4%
Sometimes	0%
Rarely	4%
Never	70%
Unknown	4%

Site-based studies (usually wetland inventories *per se*) were treated differently in the evaluation process and were evaluated against Ramsar Information Sheet (RIS) categories, and the frequency (ie never, rarely, sometimes, commonly etc) of the inclusion of the RIS category was recorded. The frequency of inclusion of values and benefits information for *each and every site* described within (site based) studies were assessed. The results showed that 70% 'never' contained any values and benefits information; 'rarely' 4%; 'sometimes' 0%; 'commonly' only 4%; 'most of the time' 4%; and 'always' 4%. In the majority of non-site based studies, a paragraph or two describing values and benefits of wetlands in general was usually all that was provided. None of the material examined included any financial or economic estimates.

In the majority of site based studies (wetland inventories *per se*), values and benefits information amounted to one or two sentences per site. For example 'the site experiences pressure from artisanal fisheries', 'the wetland provides flood buffer and water storage capabilities', and 'the area is a tourist destination and the wetland provides healing muds which are used in the many health spas'. In the majority of non-site based studies, a paragraph or two describing values and benefits of wetlands in general was usually all that was provided. None of the material examined included any financial or economic estimates.

This study did not therefore reveal any new information on wetland values and benefits in Western Europe. It was therefore not possible to either refute or support any values reported elsewhere. A general (non-site specific) overview of the functions and values of Mediterranean wetlands is given by Skinner and Zalewski (1995) (though monetary values are not included).

6 Land tenure and management structures

A large proportion of material examined for the review was not a conventional inventory/directory (see section 2.4) and did not contain site by site information. These sources did not contain information on land tenure, management authority or jurisdiction, since they usually referred to wetlands at a national level (or at least above a local or provincial level) and would therefore not contain detailed management information.

When material did contain site by site information the material was evaluated against Ramsar Information Sheet (RIS) categories and the frequency (ie never, rarely, sometimes, commonly etc) of the inclusion of the RIS category was recorded. As can be seen below, for only 7% of the time, details of land tenure/ownership were recorded 'most of the time' and for some 93% of the time details were never recorded.

Western Europe	Inclusion of land tenure / ownership information (site based studies only)
Some unknown level	0%
Always included	0%
Most of the time included	7%
Commonly included	0%
Sometimes included	0%
Rarely included	0%
Never included	93%
Unknown	0%

Some 85% of the material 'never included' jurisdiction information recorded, and some 81% of the material also 'never included' any management authority information recorded. The cases where some information was included, this usually only extended to a sentence such as 'the site falls within the national park' or 'the wildlife department monitor the population of endangered species'.

Western Europe	Inclusion of jurisdiction information (site based studies only)
Some unknown level	11%
Always included	0%
Most of the time included	4%
Commonly included	0%
Sometimes included	0%
Rarely included	0%
Never included	85%
Unknown	0%

NB The Ramsar information sheet states "Jurisdiction (territorial eg state/region and functional eg Department Agriculture /Department of Environment)"

On the whole it can be said almost no sources in the Western European region contained information on land tenure, management authority or jurisdiction.

Western Europe	Inclusion of management authority information (site based studies only)
Some unknown level	11%
Always included	0%
Most of the time included	7%
Commonly included	0%
Sometimes included	0%
Rarely included	0%
Never included	81%
Unknown	0%

NB The Ramsar information sheet states 'Management authority: (name and address of local body directly responsible for managing the wetland)'

7 Extent and adequacy of updating programs

The majority (48%) of information examined in this review were published or dated between 1991 and 1995, and some 37% were published or dated after 1995. Most of the information were judged to not have a temporal scale (generally these studies were either mapping studies or reviews and collations), and only 22% had defined temporal scale (ie were discrete 'one-off' surveys, or ongoing surveys) with a further 19% unknown.

Publication date	
After 1995	37%
Between 1991-1995	48%
Between 1986-1990	7%
Between 1981-1985	4%
Unknown / ambiguous	4%
Temporal scale	
Studies with a temporal scale *	22%
Partly include a temporal scale	0%
No temporal scale (eg review)	59%
Unknown	19%
** Broken down further:*	
Discrete surveys	22%
Surveys updated on an ad-hoc basis	4%
Update purpose to add sites	4%
Update purpose to review status	0%
Update purpose to make corrections	4%
Other update purpose	0%
Unknown purpose	0%
Current /ongoing surveys	11%
Updated on ad-hoc basis	0%
Updated on annual basis	4%
Frequency of update unknown	7%

Only 37% of studies undertook ground surveys and only 15% utilised remote sensing of some type, and some 30% utilised more than one methodology (see section 8.2.3 for further details). The vast majority of studies were reviews or collations of existing material. Repetitions of the review or collation process are only useful if the information they are reviewing or compiling is up to date and/or is based on 'real' data. If no progress has been made in obtaining updated or new field data over any given period (eg 10–15 years), then the review process is meaningless (except to highlight a lack of progress!). At present there appears to be many reviews and overviews available in Western Europe, but these are based on scant and often dated field data.

It could be argued that low resolution comprehensive national field surveys should be undertaken (whether remotely or as part of ground surveys) as a priority to at least identify wetland locations for more detailed study later. However, in terms of resource conservation, repetition of detailed surveys at sites thought to be at risk should also be a priority

undertaking. One-off surveys for previously unsurveyed areas are critically important in terms of resource assessment, but few surveys examined in this review were found to be part of a long-term assessment or monitoring program. Most inventories (with the exception of the Ramsar database) have not been updated after any given time interval after the first inventory. Wetland inventories must be regularly reviewed and updated otherwise data is likely to be lost, become out of date and become of historical interest only.

Some countries (eg Sweden) have a national wetland inventory program that has been underway for 10 years or more (Lofroth 1994, Swedish EPA 1998) (Torsten Larsson pers comm). However, most of these national wetland inventory programs begin with an inventory of internationally important sites, later followed by nationally important sites, later followed by wetlands of more than 100ha in size, later followed by wetlands of between 10–100 ha. This is a logical progression, especially when funding and resources are limited. Unfortunately, even some of the most organised, long standing and well documented wetland inventory programs have not yet undertaken any updating programs since baseline data gathering is not yet complete. The cynical view is that by the time these programs are completed, the findings will have little relevance at the time of completion, or the relevant authorities will be presented with data now considered to be inappropriate or insufficient for management purposes.

The authors conclude that the updating procedures of wetland inventory in Western Europe are grossly inadequate, and that few wetland inventories have been updated since first completion.

8 Standardising of inventory approaches

This section outlines the broad types of wetland inventory that have been included in this review (see section 8.1), followed by notes on some relevant findings from the analysis of the Western European material which have bearing on wetland inventory approaches (see section 8.2). Standardisation of inventory approaches must be developed in accordance with the objectives of those organisations carrying out wetland inventory. The ‘who’, ‘how’ and ‘why’ must be examined before any attempts to standardise procedures are made. Finally, generic suggestions for the standardisation of wetland inventory approaches are outlined in section 8.3

8.1 Types of wetland inventory

As stated by Scott (1993) in his review of wetland inventories and their role in the assessment of wetland loss, there are three main types of inventory:

- comprehensive national wetland inventories
- regional or global inventories of specific wetland types
- national or international inventories of wetlands of special conservation importance

This review of wetland inventory material in Western Europe included material in each of these categories, which were defined by Scott (1993) as follows:

comprehensive national wetland inventories:

these constitute an accurate account of the location and extent of all wetland resources: they usually included detailed mapping and may or may not include an evaluation. Such inventories are time consuming and costly, and require a precise wetland classification system. However they provide and ideal basis for a comprehensive assessment of wetland loss over time.

regional or global inventories of specific wetland types:

such inventories are usually too crude and contain too many gaps in coverage to provide a baseline assessment of wetland loss.

national or international inventories of wetlands of special conservation importance:

these focus on specific sites or systems with high conservation values, rather than wetland types, and on the whole exclude wetland habitat that is too small, fragmented or degraded to merit special attention. The Ramsar Convention provides an agreed set of criteria for the identification of sites of international importance, and these have been, or are being used in the compilation of wetland inventories in most parts of the world. Inventories of this type can be carried out relatively quickly and cheaply, and are of considerable value in focusing conservation effort where it is most required. While far too superficial to be used to measure total wetland loss, they constitute a sound basis for the monitoring of rates of loss of key habitat, especially those in countries which are unable to conduct comprehensive wetland inventories in the foreseeable future.

To this list, a further group could be added

landscape level mapping of land use and land cover:

these focus on the landscape from an anthropogenic perspective, and provide information on land use and land cover. They usually utilise satellite remote sensing technologies in combination with topographic maps and soil maps. The resolution is frequently low (100 x 100 ha) and does not distinguish between many wetland types, (this can be due to limitations in the spectral capabilities of the sensor, or may be due to operator preference). Wetlands are usually lumped into very broad generic categories. These may be categories such as 'open water', 'forested wetlands', and 'agriculturally improved wetlands', or may simply be one very broad category 'wetlands'. In such inventories wetland habitat is quantified in terms of approximate area, and the distribution mapped. There is potential for monitoring total national wetland loss or change if the spatial resolution of the satellite sensor is high, or if rates of loss or change are very high. Assessments of wetland quality do not feature in these landscape maps.

8.2 Wetland inventory approaches in Western Europe – results from the analysis of the dataset

8.2.1 Who is conducting wetland inventory and who is funding it?

Governmental organisations (GOs) were responsible for implementing 60% of studies in Western Europe and non-governmental organisations (NGOs) were responsible for implementing a much smaller percentage (30%). Compare this with the figures in Africa and Eastern Europe where NGOs implement a much greater proportion of wetland inventory activities (Stevenson & Frazier 1999a,b). Similarly, 45% of studies were funded by GOs, and 19% by NGOs. In Western Europe at least, GOs appear to conducting, implementing, and funding more wetland inventory activities than NGOs.

Study implementation	
International NGO	15%
National NGO	15%
Sub-National NGO	0%
Local NGO	0%
International GO	4%
National GO	56%
Sub-National GO	0%
Local GO	0%

Private agency/individual	4%
Consultancy agency	0%
Academic institution	4%
Other body	0%
Unknown	11%
More than one agency or body	7%
Study funding	
International NGO	15%
National NGO	4%
Sub National NGO	0%
Local NGO	0%
International GO	4%
National GO	41%
Sub-National GO	0%
Local GO	0%
Private agency/individual	0%
Consultancy agency	0%
Academic institution	4%
Other body	7%
More than one agency or body	4%
Unknown	30%

8.2.2 Why is wetland inventory being carried out?

Considering the wide variety of organisations (NGOs, GOs, academics, consultants etc) undertaking wetland inventories in Western Europe, there is likely to be a variety of purposes for inventory to be conducted. This study examined the objectives of wetland inventory activities. The objectives were explicitly stated in only 59% of studies. The most common objectives (including those explicitly stated and surmised) were for baseline inventory purposes (67%), land use planning (33%), public education (19%), and international site designation (15%). Note that most studies had several objectives.

Statement of objectives	
Objectives explicitly stated	59%
Objectives not explicitly stated	33%
Unknown	7%

Main objectives of study	
General biodiversity	26%
Biodiversity research	0%
Baseline biodiversity	0%
Repeat survey/surveillance	0%
Management tool for biodiversity	0%
Biodiversity monitoring	0%

Wetland products	0%
Geographical	0%
International designation	15%
Baseline inventory	67%
Academic research	7%
Land use planning	33%
Wetland services	7%
Public education	19%
Other research	4%
Other	48%

Baseline studies are likely to include different information fields than studies carried out for international designation purposes. In Western Europe there are already 469 designated Ramsar sites distributed through 25 countries (Source of Ramsar site Information: Ramsar Database, date of data extraction 17/8/98) producing an average of 21.3 Ramsar sites per country (if the United Kingdom, which has 114 Ramsar sites, is removed from this calculation, the average remains high at 14.2 sites per country). This is much higher than either Africa or Eastern Europe (Stevenson & Frazier 1999a,b). Perhaps Western European governments are now shifting focus to the management of all their wetland resources, rather than concentrating on international designation. The data fields required for baseline inventories, and the methods employed are likely to be very different to those required and utilised for international designation.

8.2.3 How are wetland inventory studies conducted?

Some 56% of studies examined for the Western European dataset were either mapping studies or reviews and collations). Of the studies which were not reviews or collations, 37% undertook ground surveys, and 15% utilised remote sensing techniques, which were largely dependant on aerial photography (somewhat surprisingly, none of those examined utilised satellite imagery). Of those studies that did conduct ground surveys, 11% of these were total or near comprehensive in their coverage, and 22% undertook ground surveys which were partial in their coverage.

Data collection methodology	
Collation or review	56%
Ground survey	37%
Remote sensing	15%
Questionnaire survey	0%
More than one methodology	30%
Unknown methodology	30%
Extent of ground survey	
Total	11%
Partial	22%
Unknown	4%
Type of remote sensing	
Satellite imagery	0%
Aerial photography	11%
Videography	0%

Radar imagery	0%
Lidar imagery	0%
Map product	4%
Unknown	4%

8.2.4 What definitions and classifications are used?

There are many definitions of wetlands and as others have noted (eg Davies & Claridge 1993). Dugan (1990) stated that over 50 separate wetland definitions were (even then) currently in use. Differing wetland definitions and classification schemes were used in different studies in Western Europe, and these definitions were not always stated, making it difficult to assess the degree of completeness of cover (and thereby the estimates of wetland extent).

For example, the term 'coastal wetlands' can mean strictly saline and brackish habitats, or to mean wetlands in the coastal zone (which often for practical purposes means coastal lowlands and incorporates wetlands which experience no tidal inundation). Sorensen (1997) provides six different and commonly used definitions for the term 'coastal area' which demonstrate the enormous difference between various meanings. Great improvements in the efficiency and accuracy of wetland evaluation could be achieved if common but imprecise terms were more precisely defined.

A definition of wetlands was provided in only 30% of studies, and only 22% of studies used the Ramsar definition of wetlands (though it was unknown for 33% of studies, so the true value may be much higher). The Ramsar classification system for wetland type was used in only 7% of studies, was unknown for 30% of studies and not applicable for some 41% of studies (these were usually reviews or collations of material). It is likely that the definition of wetlands and classification of wetland types given by Ramsar are more globally applicable, and less suited to an individual country's management requirements; hence the low usage of the Ramsar terms.

See section 3.1 for further details.

8.3 Generic suggestions for the standardisation of inventory approaches

- Mechanisms to develop indices and scorecards of wetland value/benefits and site quality (status) should be developed to enable easy communication of information to be made to the decision-makers and the public.
- The presentation of data in wetland inventories should become more accessible by inclusion of summaries and the avoidance of poorly organised, bulky text descriptions in favour of tabulated results.
- The scope of data coverage in wetland inventory activities should attempt to incorporate the information fields used in Ramsar Information sheets. This would aid management of trans-boundary wetlands and would facilitate regional and international wetland assessments, which can be utilised in European (and global) policy and planning initiatives.
- Every effort should be made to cover all wetland types, particularly those types which are currently under-represented in wetland inventories. This includes artificial wetlands, dune slacks, wet mesotrophic grasslands, seagrass beds, maerl beds, and glacial and alpine wetlands. An attempt to systematically collect information on current extent of different wetland types in different countries in the region should be carried out as a priority.

- A program should be established to monitor changes in the areal extent of rare and threatened wetland types once a baseline of the original or current extent has been determined.
- Standardised methodologies should be developed, and linked to the objectives of wetland inventory studies, such that for any given objective, standard information fields should be gathered using standard methodologies.
- A standardised (generic) database format (and software) should be developed for storage and extraction of local, national, and international wetland information which can be applied throughout the Western European region.
- More effort should be made to integrate wildlife surveys (especially waterfowl) and wetland surveys to avoid duplication of effort and to increase the wider applicability of information.
- Regional and national inventories should be made available in digital form as CD-ROMs or down-loadable files from the Internet to enhance the access to the information and encourage greater levels of feedback on changes at the sites.
- A review should be undertaken on the applicability of land use and land cover mapping information for the monitoring of changes in wetland extent in the region.

9 Priority areas for wetland inventory

9.1 Status of national level wetland inventory information in Western European countries

Although it was possible to generate estimates of the national wetland resource in all but a few Western European countries, much of the data were noted to be of poor quality, and likely to be currently out of date. The majority of values examined by this report were approximations (often based on dated material and limited field studies). The resulting best estimates must therefore be viewed with caution since accurate results cannot be generated from inaccurate data.

Of the 25 countries in the Western European region examined in this review, only four of these can be said to have quasi-adequate inventory data on wetlands. These are Greece, the United Kingdom, France and Turkey, though it must be noted that even these countries do not have inventory material which covers the entire national wetland resource, and all possible wetland types.

Countries which (on the basis of the WEUR dataset) have less detailed national wetland inventory material, or material which is less comprehensive in scope and coverage, are listed in column two (labelled ‘some but inadequate national wetland inventory information’) of table 9.1. These are Austria, Denmark, Finland, Germany, Italy, Norway, Portugal, Spain, Sweden and Switzerland.

There was a noticeable lack of wetland inventory information for several countries listed in column one (labelled ‘little or no national wetland inventory information’) of table 9.1. These are Andorra, Belgium, Cyprus, Iceland, Ireland, Liechtenstein, Luxembourg, Malta, Monaco, the Netherlands and San Marino.

It should be noted that additional material for Western Europe has been identified since the analysis stage of this review, and it is likely that these will reveal new information. Our findings must therefore be viewed as preliminary.

Many specific types of wetlands are frequently ignored in wetland inventory activities. Common exclusions were seagrass beds, subtidal reefs, maerl beds, tidal flats, dune slacks, and wet grasslands. Wetlands of less than 10 ha (and in some cases 100 ha) in size were also excluded in many inventories. By comparison, the United Kingdom has (disparate) wetland

inventory material, which in some cases is very detailed (down to tenths of hectares), particularly its estimates of wet dune slacks and lowland wet grasslands (Dargie 1993a,b, 1995). Artificial wetlands are also frequently ignored in wetland inventories, except in a few cases where they are of importance to waterbirds. These gaps should receive attention in future wetlands inventory activities in Western Europe.

It should be noted that at the time of this review, the Ramsar Bureau was collating National Reports from Contracting Parties in preparation for COP7, Costa Rica, May 1999. This review examined previous national reports, but the information gathered in these forthcoming reports should be reviewed in any future update of the WEUR dataset.

Table 9.1 Status of national wetland inventory information in European Countries based on the WEUR dataset

Little or no national wetland inventory information	Some, but inadequate national wetland inventory information	Adequate information available, but requires updating and more detailed surveys
Andorra	Austria [1]	Greece
Belgium [2]	Denmark [3]	United Kingdom
Cyprus	Finland [4]	France [5]
Iceland	Germany [6]	Turkey
Ireland	Italy [7]	
Liechtenstein	Portugal	
Luxembourg	Spain	
Malta	Sweden [8]	
Monaco	Switzerland [9]	
The Netherlands [10]	Norway [11]	
San Marino		

Note: these are preliminary assessments only

1. Austria completed a wetland inventory in 1996 which aimed 'to give a preliminary overview of Austrian wetlands whose importance goes beyond the regional level' (Federal Environment Agency 1997). A copy of the report has been requested but has not yet been obtained; at present it is assumed that the inventory is still preliminary.
2. IWRB (1995) national reports state that information on major wetlands only is available as part of other related activities such as the National Biological Evaluation Map. No other recent information has been identified.
3. IWRB (1995) states that 'detailed national wetland inventory information is available' for Denmark and yet states that there are 'no comprehensive sources of wetland inventory information in general' and that 'figures exist on a regional level but have never been summarised'.
4. IWRB (1995) states that 'detailed national wetland inventory information is available' in Haapanen & Rassi (1982), however, this article covers national and internationally important wetlands only (totalling 91,300ha), and focuses largely on peatlands and lakes.
5. A considerable amount of additional data have been obtained or come to light since the conduct of the analysis stage of this project. Some of these data suggest that France has substantial wetland inventory material. Therefore France has been provisionally listed in this table as having 'adequate information but requires updating and more detailed surveys', even though this material has not been analysed as part of the preliminary GRoWI-WEUR dataset.
6. IWRB (1995) states that "a preliminary inventory of major wetlands only' has been completed. No recent additional information has been identified by this report.
7. Italy has completed an inventory of wetlands of national and international importance (De Maria 1992). A report by WWF-Italie states that 'a complete list of all the Italian wetland areas does not yet exist' (Bardi & Fraticelli 1996). No recent additional information has been identified by this review.
8. Sweden is finalising a national wetland inventory, which covers wetlands over 50 ha in some counties, and over 10 in other counties (and including wetlands of less than 10 ha in a few counties).
9. Switzerland was noted by Hughes (1995) as having some wetland inventory information, but as yet this has not been identified, nor included in this preliminary analysis. IWRB (1995) states that 'detailed national wetland inventory information is available' from several different national wetland habitat inventories, but that the data has yet to be extracted from these sources to generate a national overview.
10. The most recent and comprehensive source of information is Eekhout & Van den Tempel (1998) which lists and briefly describes wetlands of importance to birds, but does not provide estimates of wetland area.
11. Norway has completed a national wetlands inventory, however, detailed outputs or reports pertaining to wetland status and extent have been requested but have not yet been obtained.

9.2 Relevance to previous studies

In 1995, Hughes (1995) produced a review of the status of wetland inventories in Europe (encompassing some countries in both Eastern and Western Europe). Hughes (1995) did not provide estimates of wetland area, but did provide a brief description of wetland inventories per country, and noted whether a national wetland inventory program was underway, planned or completed (table 9.3).

Table 9.2 Comparison of wetland sites in Europe listed by the MAR Project, and by Scott and Jones (1995) and those designated as Ramsar sites in 1998

Country	# of sites on MAR list published 1965	# of Ramsar sites designated by July 1993	# of Ramsar Sites designated by August 1998
Andorra	0	Not a Ramsar party	Not a Ramsar party
Austria	3	7	9
Belgium	2	6	6
Denmark	4	3	38
Finland	3	11	11
France	21	8	15
Germany	16	31	31
Greece	7	11 [1]	10
Iceland	0	2	3
Italy	7	46	46
Liechtenstein	0	1	1
Luxembourg	0	Not a Ramsar party	1
Malta	0	1	2
Monaco	0	Not a Ramsar party	1
Netherlands	10	21 [2]	18
Norway	7	14	23
Portugal	4	2	10
Spain	10	26	38
Sweden	17	30	30
Turkey	8	Not a Ramsar party	9
United Kingdom	20	62	114

(adapted from Scott and Jones 1995)

1. The former Lake Vistonis and Lake Mitrikou sites were combined into the 'Lake Vistonis, Porto Lagos, Lake Ismaris & adjoining lagoons' site, leaving Greece with 10 instead of 11 sites in total.
2. This figure includes the six Netherlands dependant territory sites in the Caribbean. Three additional sites were designated in 1995, taking the total to 18 as shown by the 1998 data (excluding the dependant territories).

Scott and Jones (1995) made a comparison between wetland sites within countries identified in the 1965 MAR project and those designated as Ramsar sites in the same countries by July 1993. This demonstrated that there had been significant progress in the wetland inventory of potential internationally important wetlands over a 30-year period. Table 9.2 takes this comparison one step further by the addition of Ramsar site information as of August 1998.

Whilst the WEUR dataset cannot claim to be totally comprehensive in its coverage, it is interesting to note that many of the countries which Hughes (1995) noted to have little wetland inventory material in 1995 (table 9.3) still appear to have little wetland inventory

material. These countries include Andorra, Liechtenstein, Luxembourg; Malta, Cyprus, Iceland, Ireland, and Belgium. She also described Austria, Germany, and the Netherlands as having poor wetland inventory information (with the exception of Ramsar sites and some sites of importance to waterfowl), which now appear by the GRoWI-WEUR assessment to have improved their wetland inventory information.

If we examine the information given by Scott and Jones (1995) (table 9.2) in 1993, four countries were not contracting parties to the Ramsar Convention (Andorra, Luxembourg, Liechtenstein and Turkey) in 1998; only Andorra still remains to become a signatory to the Ramsar Convention. Six countries have not designated any further Ramsar sites; these are Belgium, Finland, Germany, Italy, Liechtenstein and Sweden. However, Austria, Iceland and Malta have added one or two more sites, and Denmark, the United Kingdom, Norway, Portugal, and Spain have substantially increased the number of wetland sites designated as internationally important wetlands.

It is difficult to comment on which occurs first – a national wetland inventory that serves to identify internationally important wetlands, or the designation of internationally important wetlands which stimulates national wetland inventory activity. Whichever it is, the countries which have substantially added to their list of Ramsar sites in the five year period since 1993, were also those noted by Hughes (1995) to be undertaking national wetland inventory activities at that time. These include Denmark, Spain, the United Kingdom, and Portugal, which are listed in column two of table 9.1 (labelled 'some, but inadequate national wetland inventory information').

With the exception of Italy and Sweden, countries that have not added any new Ramsar sites to their lists between 1993 and 1998, and those that have added only one or two more sites since 1993 were noted by Hughes (1995) to be generally lacking in wetland inventory information. The WEUR dataset includes very little wetland inventory information on these very same countries, which are listed in column one of table 9.1 (labelled 'little or no national wetland inventory information'). It is disappointing to note that little progress seems to have been made in these countries since 1993, although it is possible that the inevitable time lag which occurs between inventory activities and the publication and dissemination of results is responsible for this apparent lack of progress.

Although Sweden and Italy have not added any new Ramsar sites since 1993, this may be due to the fact that they already have a substantial number of sites (30 and 46 respectively). It may also be possible that having already completed preliminary national wetland inventories, less attention is currently being given to wetland inventory. However, in 1993 the United Kingdom had 62 designated Ramsar sites, and five years later this has increased to 114 sites. In 1995, the United Kingdom was described by Hughes (1995) as having incomplete wetland inventory information (Table 9.3), but the situation has improved somewhat over the last few years with the publication of various documents which detail specific wetland types such as estuaries, lowland raised bog and dunes.

France, Spain, Italy, Greece and Turkey were all identified by Hughes (1995) as having produced national wetland inventory information, and these countries were identified as having adequate national wetland inventory information in this review. However, some key references for France were not obtained within the time frame needed to conduct the preliminary analysis of data. Likewise, Norway and Sweden were identified by Hughes (1995) as having national wetland inventories (table 9.3), but despite this, and despite contact with the relevant authorities, it has not been possible to obtain enough detailed national information or information covering specific wetland types and approximate areas of coverage.

Table 9.3 Status of wetland inventories in Western Europe described by Hughes (1995)

Omitted due to 'lack of data'	Noted as poor wetland inventory information	Wetland inventory material exists but incomplete coverage
Andorra	Cyprus	Germany
Austria	Iceland	Denmark
Liechtenstein	Ireland	United Kingdom
Luxembourg	Germany	Switzerland
Malta	Netherlands	
	Belgium	
Noted as having some national wetland inventory information	Notes on national wetland inventory (NWI)	Reference for NWI (full citation given in Hughes 1995)
Norway	NWI underway	–
Sweden	NWI underway	–
Finland	National wetland conservation program but no NWI	–
France	2 different NWI produced 1991-1992	Secretariat de la Faune et de la Flore (1992), Lierdeman & Mermet (1994)
Spain	NWI produced 1992	Ministerio de Obras Publicas y Transportes (1991)
Portugal	Preliminary NWI	Farinha & Trindade (1994)
Italy	NWI produced 1992	De Maria (1992)
Greece	NWI produced 1993	Zalidis (1993), Zalidis & Mantzavelas (1994)
Turkey	preliminary NWI completed 1989 & updated 1993	TÇV (1993)

(compiled from textual information in Hughes 1995)

10 Priority processes

This section provides brief recommendations pertaining to wetlands inventory activities as a whole. It proved beyond the scope of this study to recommend particular field survey methods, or to provide instructions for wetland inventory activities. Taylor et al (1995) covers the relative merits and disadvantages of wetland inventory methods used in southern Africa and these are equally applicable in other regions.

Similarly, it would not be appropriate to enter the debate on traditional field survey techniques versus remote sensing techniques (again these are discussed admirably by Taylor et al 1995, and Grainger 1993, from analogous forestry studies). However, the process of extracting and analysing data from the sources examined in this review has revealed common problems which could be easily avoided if wetland inventory data were presented in a particular fashion, and if certain specific data were routinely recorded for the benefit of the reader (such as date of survey, objectives, and wetland definition and coverage).

10.1 Establishing inventories

10.1.1 Preparatory activities

- A thorough review of previous studies and surveys undertaken should be conducted prior to any wetland inventory activity, to delineate gaps and to benefit from lessons learned or

mistakes made. This should also include less obvious sources such as academic material and conference material, as well as conventional wetland inventories.

- Adequate time and resources should be allocated (by funding bodies and implementing agencies) to review and obtain existing wetland inventory material for any given region or country. As stated by Taylor et al (1995), it requires time and effort to establish the existence of sources of information already available, and often there is repetition of previous survey work because adequate efforts to assess the existing information base have not been undertaken. This project has identified several cases where source material has quoted wetland area estimates taken from studies which had been comprehensively updated by more recent studies, and therefore their estimates were out of date, and had been supplanted by more recent and accurate data.

10.1.2 Background and setting to wetland inventory activities

- Information such as the history, development, and rationale of wetland inventories are crucial elements for understanding the context of these studies, and this information should be described briefly within reports. Information detailing contact persons and addresses is very helpful to successive workers, as are plans for future activities. If the surveys are part of a longer-term study, this should also be stated.

10.1.3 Objectives

- The objectives of wetland inventories should be identified prior to the commencement of wetland inventory activities (particularly those involving field work). The objectives of wetland inventory activities should play a key role in choice of the most suitable wetland inventory methodology to be used in any given particular inventory program.
- Wetland inventory activities should aim to make provision for regular updating of wetland information, and where appropriate should make provision for monitoring changes in extent, distribution and loss of wetlands.
- The objectives should be clearly stated in wetland inventory reporting and published material.
- Those coordinating wetland inventory activities should specifically aim to widely disseminate wetland inventory material, and should aim to permit ready access to wetland inventory information. This objective should feature in all future wetland inventory activities.

10.2 Updating or extending inventories

10.2.1 Wetland coverage

- Certain wetland types were commonly excluded from wetland assessments and these included artificial wetlands (eg fish ponds, rice paddy, reservoirs, and dams) and natural wetlands including dune slacks, humid sands, dambos, wet mesotrophic grasslands, seagrass beds, maerl beds, coral reefs, glacial and alpine wetlands. More attention should be paid to these and similarly overlooked wetland types in future inventory studies.

10.2.2 Wetland definitions and classification of wetlands

- Clear distinction should be made between the description of ‘marine wetlands’ and ‘coastal wetlands’, and ‘inland wetlands’. Extracting information on even broad wetland categories is difficult when different definitions of habitats are used. Some authors use, for example, the term ‘coastal wetlands’ to mean strictly saline and brackish habitats and

others use it to mean wetlands in the coastal zone (which often for practical purposes means coastal lowlands and incorporates wetlands which experience no tidal inundation).

- A definition of wetlands should be always be given, and it should be expressly stated whether habitats such as floodplains and open water bodies have been included in the definition, and whether they have been included in a wetland survey.
- Where wetland classification systems are used, these should be stated and adequately referenced.

10.3 Inventory content

10.3.1 Minimum information fields

- Wetland area estimates, and identification of whether wetland area estimates are minimal, maximal, or average values (stating number of years and which years the average value is based on).
- The geographical coordinates and general location of wetlands should always be included, so that discrepancies involving the names of wetlands can be identified by location. (For countries which are newly-independent, it is very difficult identifying wetlands which have been renamed, and adequate geo-referencing may reduce this difficulty.)

10.3.2 Recommended information fields

- Objectives of study
- Dates of field work (including season) and collation should always be included, as well as the known dates of any compiled information.
- Description of methodologies used in field work.
- Resolution capabilities of remotely sensed data.
- Definition of wetland used.
- Classification scheme used (eg Ramsar, Cowardin, Corine etc).
- Inclusions/exclusions in coverage (eg excluding wetlands of less than 100 ha, or excluding open water bodies etc).
- A *summary* of the coverage and characteristics of the wetland resource including tabulations where possible.
- Contact points for data custodians or publishers and their institutional details.
- Contact details of persons undertaking field work should always be provided.
- Full referencing of primary source material should always be provided in reviews/collations.
- Ramsar Information Sheet data fields.

10.4 Wetland values and benefits

- Information on wetland values and benefits should be included in wetland inventories. As a minimum this should constitute a textual description of benefits, but preferably should indicate the economic values of wetland goods and services.

- A structure to aid the assessment of wetland benefits and values using simple means and local knowledge of wetland sites should be developed for use in conjunction with wetland inventories. This could take the form of a key or questionnaire which could be spilt into sections under the headings of fisheries, water supply, tourism, education, hydrological functions etc, and the assessor answer general questions under the appropriate headings. Alternatively, it could take the form of a table that should be completed, with sections containing questions such as 'approximately how many artisanal fishermen use this site? Is this seasonal? Approximately what is their daily/weekly catch?' Alternatively, this could take the form of a matrix, in which the assessor simply adds tick marks where a particular good or service is important. More effort should be put into developing simple ways of calculating the approximate total economic value of a wetland site in a standardised manner.
- The findings of wetland inventories that complete preliminary assessments of the values and benefits of a particular wetland site should be widely disseminated in order to demonstrate the values and benefits to policy makers and management authorities.

10.5 Temporal scale/updating programs

- It could be argued that low resolution, comprehensive national surveys should be undertaken as a priority to at least identify wetland locations for more detailed study later. However, in terms of resource conservation, repetition of detailed surveys at sites thought to be at risk should also be a priority undertaking.
- Wetland inventories must be regularly reviewed and updated, otherwise data are likely to be lost, become out of date and become of historical interest only.

10.6 Presentation of data

- A summary of the coverage and characteristics of the wetland resource, should preferably be included in all wetland inventory reference material. It is exceedingly difficult to construct a useful overview of an inventory reference by extracting values and statistics from reams of text entries.
- Local naming conventions of wetlands or locations are often ignored, and authors may use their own 'version' of a local name for a particular wetland. There are obviously difficulties in translation, but more efforts should be made to ensure that the local and English (and French, or Spanish as appropriate) version names are included in inventory material if it is intended for use beyond the local area. A guide to the pronunciation of local names may also be useful (particularly where these names have not previously been recorded, and are perhaps only known by local names), although this may not be practicable for directory type inventories.
- Key quantitative wetland inventory information should preferably not be presented in block text format (where data such as coverage and loss estimates lay hidden in sentences, perhaps with imprecise wording leading to an ambiguous interpretation). This would aid the input of existing and future inventory information into database format.
- Maps of habitats (eg Wadden Sea islands and mainland coastal areas, Dijkema & Wolff 1982) and atlases (eg colour atlas of the Rhine, Commission Internationale pour la Protection du Rhin 1998) should also present summary area and type by area information. Many maps examined did not contain a scale and/or other fundamental spatial reference information such as geographic co-ordinates. It is very difficult to manually extract useful

inventory or management information from the majority of the maps examined for potential inclusion in the Western European dataset.

10.7 Handling and storage of wetland inventory information

- Every effort should be made to store both the paper and electronic versions of wetland inventory information with those coordinating or conducting wetland inventory, and also with international organisations such as the Ramsar Bureau and Wetlands International or a central clearing house (if one is developed).
- Electronic forms should preferably be stored in some format that is readily translatable into either word processing packages or commonly used databases.
- A standardised (generic) database format (and software) should be developed for storage and extraction of local, national, and international wetland information that can be applied throughout the Western European region.

10.8 Availability and dissemination of inventories

- Much material is currently available in draft format, remains unpublished or has a limited distribution. Considerably more effort should be devoted to ensuring that existing draft reports are finalised and, resources permitting, published, preferably with some or all of the information made available on the World Wide Web.
- Those undertaking to produce national bibliographic databases should also be aware that the usefulness of such information is severely limited if there is no provision for supplying the references to those who need them. Funding should be made available to ensure that national bibliographic databases don't simply supply a list of references, but can also provide copies of the material upon request. The existence of such databases should also be more widely advertised.
- More emphasis should be directed toward publishing electronic format material (eg World Wide Web presentations) in addition to any paper versions of reports.
- A central clearinghouse or structured information retrieval system for wetland inventory material should be established. It should be noted that identifying and obtaining wetland inventory material for a particular country may be largely dependent on a network of contacts and may chiefly rely on key individuals and/or organisations to supply or provide access to data. It is likely that these persons and organisations receive repeated requests for information and a positive result often depends on the goodwill and resources of these key individuals and organisations. The current situation is that a person or agency seeking information must first identify the ‘key players’, which in itself is often a time consuming process. The retrieval of information can occasionally be restricted due to deliberate actions on the part of some individuals who see a request for information as an opportunity to offer their services for substantial fee rates, and who it appears deliberately withhold information to increase their bargaining power.

11 Specific recommendations

The reader should also consult sections 8 and 10 for more detailed recommendations.

- Every effort should be made to complete existing preliminary national wetland inventories. Based on the WEUR dataset this includes the following countries: Austria, Belgium, Portugal, Finland, Germany, and Italy. Every effort should be made to

consolidate information, ie where regional level information exists but has not yet been brought together at the national level (eg Denmark) and where different wetland habitat level information exists but has not yet been brought together at the national level (eg Switzerland).

- Wetland inventories should be undertaken (whether as part of a national wetland inventory program or not) in those countries which, based on the WEUR dataset, currently have little national wetland inventory information. These include Andorra, Austria, Cyprus, Iceland, Ireland, Liechtenstein, Luxembourg, Malta, Monaco, the Netherlands and San Marino.
- Existing national wetland inventories should updated and, where necessary, the coverage extended to include all wetlands, not just those which are of national or international importance, or those above a particular size. For example, where wetlands less than 50 ha or 100 ha are currently excluded in wetland inventories, these should now be included.
- Every effort should be made to incorporate all wetland types into wetland inventories, particularly those types which are currently under-represented. This includes artificial wetlands, dune slacks, wet mesotrophic grasslands, seagrass beds, maerl beds, and glacial and alpine wetlands.
- The presentation of data should become more accessible by inclusion of summaries and the avoidance of poorly organised, bulky text descriptions in favour of tabulated results.
- The scope of data coverage in wetland inventory activities should attempt to incorporate the information fields used in Ramsar Information. This would aid management of trans-boundary wetlands and would facilitate regional and international wetland assessments that can be utilised in European (and global) policy and planning initiatives.
- Wetland inventories which are not part of an ongoing national wetland inventory program should also be captured or updated to ensure that data does not become static or out of date.
- Studies should aim to incorporate summaries in languages such as English or French and Spanish (as appropriate).

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Our sincerest apologies to any person or institute we may have inadvertently omitted from this list.

Annex 2 Best estimates of wetland coverage

(see section 3.3 for a list of countries omitted from this section)

	Country name (& Code)						
	AUSTRIA			***Area (ha) Wetland***			
	AUT		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	0	102,337	435	102,772	Date of data extraction August 14 1998; although many sites have a small man-made part, they are usually classified as totally inland
2	Fed. Envt. Agency www 96/97	206	0	0	0	266,057	Value is for total area of wetlands, (357 sites). No further information given.
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			0	265,622	435	266,057	

Notes/comments on best estimate

The best estimate for inland is total wetland area minus total known man-made area.

No other information for Austria was identified in this first preliminary survey of wetland inventory material

Date of best estimate 26-Aug-98

	Country name (& Code)						
	DENMARK			***Area (ha) Wetland***			
	DNK		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	883,183	1,399,830	0	2,283,013	Date of data extraction 14 August 1998; area for man-made types is very limited, and included in inland area (could not be separated).
2	Schultink & Van Vliet 1997	211	885,142	64,399	0	949,541	Figures are for "important wetlands". No further description was given. No wetland types are identified. Figures based on a 1991 report.
3	de Vlas	210	8,050	0	0	8,050	Value is for salt marsh only
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			885,142	1,399,830	?	2,284,972	

Notes/comments on best estimate

For marine/coastal, the best estimate is probabaly an underestimate since the values identified so far are for important marine wetlands only.

For inland, the only value that can be extracted from these data is clearly a large underestimation, but is the only area estimate we have identified in this first prelimina estimate of wetland inventory material in Denmark

Date of best estimate 26-Aug-98

	Country name (& Code)						
	FINLAND		Area (ha) Wetland				
	FIN		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	50,143	51,200	0	101,343	Date of data extraction August 14th 1998
2	Schultink & Van Vliet 1997	211	0	3,352,200	0	3,352,200	Values are for "important wetlands". No further description was given. Figures based on a 1991 report.
3	National Peatland Preservation Programme 1981	212	0	448,537	0	448,537	Value is for peatlands only.
4	IWRB Natnl. Reports 93-95	504	0	3,270,000	0	3,270,000	Value is for lakes only. Estimate should be reliable.
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			50,143?	3,352,200	?	3,352,200	

Notes/comments on best estimate

It is not known whether the wetland area estimate provided by Schultink & van Vliet encompasses water bodies (eg lakes) if not, then it would seem appropriate to add this figure to the area for lakes provided by IWRB National Reports. However, since it is uncertain, it has been assumed that these values overlap and only the Schultink & van Vliet values have been used for the best estimate for inland wetlands, (though this is likely to be an underestinmate since it covers only 'important wetlands'). The value for marine wetlands provided by the Ramsar database has been used for the best estimate of marine wetlands since it is the only information identified to date for marine wetlands,though it must be noted that this is 'site area, and not necessarily wetland area.

Date of best estimate 27-Aug-98

	Country name (& Code)						
	FRANCE			***Area (ha) Wetland***			
	FRA		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	241,550	337,535	?	579,085	Date of data extraction August 14th 1998
2	Schultink & Van Vliet 1997	211	381,280	800,627	0	1,181,907	Figures are for "important wetlands". No further description was given. Figures based on a 1991 report.
3	Britton & Crivelli 1993	505	70,100	66,300	3,600	140,000	Values are likely to be reliable
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			381,280	800,627	3,600	1,185,507	

Notes/comments on best estimate

The value for marine wetlands provided by Schultink & Van Vliet has been used for the best estimate. Note that the value for marine wetlands from the Ramsar database is a value for Ramsar site area, not wetland area, and therefore cannot be used for a best estimate.

The value for inland wetland area given by Schultink & Van Vliet has been used for the best estimate since it is the most recent data. The discrepancy between this value and that provided by Britton & Crivelli probably results from differences in wetland definition

No data for manmade wetlands was identified except for Britton & Crivelli and therefore their estimate has been used.

Date of best estimate 21-Aug-98

	Country name (& Code)						
	GERMANY			***Area (ha) Wetland***			
	DEU		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	558,505	107,017	7,330	672,852	Date of extraction 14 August 1998
2	Schultink & Van Vliet 1997	211	680,881	427,424	0	1,108,305	Figures are for "important wetlands". No further description was given. Figures based on a 1991 report.
3	de Vlas 1990	210	18,940	0	0	18,940	Value is for salt marsh only
4	IWRB Natnl. Reports 93-95	504	0	0	0	1,267,202	Total value given comprises 2.2% of land area (approx 785,202) of inland waters (presumably manmade as well as natural) and 482,000 ha of peatlands.
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			680,881	427,424	?	1,267,202	

Notes/comments on best estimate

Figures estimated are an underestimation, since only "important wetlands" are included by Schultink & Van Vliet.
The Ramsar database area cannot be used, since Ramsar also includes non-wetland area, and does not cover the entire country.
The total area figure is from IWRB national reports, therefore not the sum of inland and coastal estimates
Therefore some 158897 ha are included in the best estimate total,but not in the wetland type estimates

Date of best estimate 26-Aug-98

	Country name (& Code)						
	GREECE		***Area (ha) Wetland***				
	GRC		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar Database	none	131,039	24,765	7,697	163,501	Date of data extraction August 14th 1998
2	Zalidis & Mant-zavelas 1994a	218	105,687	52,093	31,408	189,188	These figures were generated by examining every site record within the inventory & summing the area of each site having a particular dominant wetland type. So values are areas of wetland with a dominant wetland type, not areas per se.
3	Zalidis & Mant-zavelas 1994b	218	101,061	65,733	35,824	202,618	The inventory used a simplified definition of Ramsar types. which resulted in the following summary of types: deltas-68030; marshes 5832.6; lakes-59767.3; lagoons-28766; springs 133.1; estuaries-4264.6; reservoirs-35823.5 ha River length-4268km
4	IWRB Natnl. Reports 93-95	504	0	0	0	202,618	Value quoted is from Zalidis and Mantzavelas 1994.
5	Britton & Crivelli 1993	505	29,200	179,100	12,500	220,800	Estimates likely to be reasonably reliable, though the source of data is not stated
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			105,987	65,733	35,824	207,544	

Notes/comments on best estimate

Zalidis & Mantzavelas 1994 is the most recent and comprehensive study of Greek wetlands identified and so these values are used for all best estimates
This is despite the fact that the value for inland given by Britton and Crivelli is much higher. It is likely that differences in the definition of marine/coastal & inland wetlands have led to the lower value for marine wetlands and the higher value for inland suggested by Britton & Crivelli

Date of best estimate 21-Aug-98

	Country name (& Code)						
	REPUBLIC OF IRELAND		Area (ha) Wetland				
	IRE		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	33,299	33,695	?	66,994	Date of data extraction August 14th 1998
2	Foss (in O'Leary & Gormley 1998)	208	0	220,902	0	220,902	Value is for Republic of Ireland only, for 'Intact raised bogs'-23628 ha: 'intact blanket bogs' 143248 ha : fens 54026 ha. note figures are for intact peatlands, not comprehensive
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)							

Notes/comments on best estimate

There is insufficient data to make best estimates of wetland coverage. No other data was identified in this first survey of wetlands in the Republic of Ireland.

Date of best estimate 28-Aug-98

	Country name (& Code)						
	ITALY		Area (ha) Wetland				
	ITA		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	44,934	7,616	4,400	56,950	Date of data extraction August 14th 1998
2	Schultink & Van Vliet 1997	211	165,070	107,742	?	272,812	Figures are for "important wetlands". No further description was given. Figures based on a 1991 report.
3	Britton & Crivelli 1993	505	11,500	4,900	?	16,400	Estimates likely to be reasonably reliable
4	WWF- Italie	221	?	?	?	450,563	Includes 244 sites. Estimates based on Min of Environment wetland inventory plus additonal recent information. Estimate should be reliable. estimates per wetland type not available.
5	De Maria 1992	223	?	?	?	176,278	104 sites of national and international importance are listed and categorised as natural or artificial. Document in italian and therefore not possible to extract further details at this stage
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			?	?	?	450,563	

Notes/comments on best estimate

From the data available it is not possible to identify wetland area per type, though it would appear that the total value is likely to be the most accurate.

Date of best estimate 29th August 1998

	Country name (& Code)						
	NETHERLANDS		***Area (ha) Wetland***				
	NLD		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	302,971	21,947	0	324,918	Date of data extraction 14th August 1998
2	Eekout & van den Tempel 1997	tba	?	?	?	?	This annual publication provides a variety of useful information, but no estimates of coverage are included.
3	Schultink & Van Vliet 1997	211	404,335	391,134	0	795,469	Figures are for "important wetlands". No further description was given. Figures based on a 1991 report.
4	de Vlas 1990	210	8,240	0	0	8,240	Total value is for saltmarsh only
5	Bakker et al 1993	207	7,300	0	0	7,300	Total value is for saltmarsh only
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			404,335	391,134	?	795,469	

Notes/comments on best estimate

The estimates of Schultink & Van Vliet 1997are used for the best estimates, however this covers important wetlands only and therefore must be an underestimate Though there is detailed information about salt marshes, sources which assess area of other specific wetland types were not identified in this preliminary assessment. It is possible that the area given for inland by Schultink & Van Vliet 1997 incorporates the many manmade wetlands in the Netherlands, though this was not stated. The best estimate is likely to be very approximate

Date of best estimate 29-Aug-98

	Country name (& Code)						
	NORWAY		Area (ha) Wetland				
	NOR		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	59,796	10,354	?	70,150	Date of data extraction August 14th 1998
2	Norwegian Mapping Authority 1995	205	0	3,301,600?	0	3,301,600	Total value is derived as follows: 'freshwater'-1,747,900 ha (which presumably means open water bodies and rivers) and 'bogs and marshes'- 1,553,700 ha, (which presumably means inland bogs and marshes, though this may also include coastal areas).
3	IWRB Natnl. Reports 93-95	504	0	0	0	2,030,000	Total value is for "mires and other wetlands". Estimate should be reliable.
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			?	?	?	3,301,600	

Notes/comments on best estimate

The estimates of the Norwegian Mapping Authority are used for the best estimates, and is comprehenisive in its cover (NMA pers comm). However, it is unclear about the wetland coverage per type. The area given for bogs and marshes incorporates coastal wetlands, but it is not known how much of the value is coastal.

Date of best estimate 28-Aug-98

	Country name (& Code)						
	PORTUGAL		Area (ha) Wetland				
	POR		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	64,249	1,340	224	65,813	Date of data extraction : August 14th 1998
2	Britton & Crivelli 1993	505	79,500	0	0	79,500	non tidal saltmarsh, freshwater lakes & marshes, reservoirs, salt pans, & forested wetlands are also noted as present, but no values are provided.
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			79,500	0	0	79,500	

Notes/comments on best estimate

No other estimates were identified and therefore Britton & Crivelli 1993 estimates were used for best estimate

Date of best estimate 22-Jul-98

	Country name (& Code)						
	SPAIN		Area (ha) Wetland				
	ESP		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	129,596	19,508	9,112	158,216	Date of data extraction : August 14th 1998
2	Britton & Crivelli 1993	505	20,400	27,000	0	47,400	Values are likely to be reliable
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			129,596 ?	27,000	9,112 ?	165,708	

Notes/comments on best estimate

No other estimates of wetland cover were identified & therefore Britton & Crivelli 1993 values were used for best estimates for inland & manmade wetlands
The value for marine Ramsar wetlands was used instead of Britton & Crivellii since it was clearly much higher (despite only being internationally important wetlands)

Date of best estimate 21-Aug-98

	Country name (& Code)						
	SWEDEN			***Area (ha) Wetland***			
	SWE		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	49,120	332,850	780	382,750	Date of data extraction August 14th 1998
2	Schultink & Van Vliet 1997	211	0	0	0	9,500,000	Figures given were 'wet forest'- 5m ha: 'open mires' 3.6 m ha: 'other' approx 0.9m ha.
3	IWRB Natnl. Reports 93-95	504	0	?	0	12,800,000	Total value is derived from '3.6m ha mire's + '5m ha of wet forests',' 3.9m ha of lakes/watercourses', and '0.3 m ha of other wetlands'. Estimates should be reliable.
4	National Wetland Inventory (VMI)	217	0	0	0	9,300,000	Estimate includes wetlands over 10 ha only, and in some counties over 50 ha only. Torsten larsson (SEPA) pers comm estimates.
5	Lofroth 1991	220	?	approx 8,600,000	?	9,300,000	Estimate includes 3.6m ha of open mires & 5 m ha of wet forests.
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			?	?	?	12,800,000	

Notes/comments on best estimate

The estimates of the National Wetland Inventory are not used even though they are recent since they cover wetlands of over 10 ha and 50 ha only.

The estimates of the IWRB National Reports 1995 are used since the estimate seems to include all wetlands. It is unclear about the wetland coverage per type.

Date of best estimate 29 Aug 1998

	Country name (& Code)						
	TURKEY		Area (ha) Wetland				
	TUR		MARINE/COASTAL	INLAND	MANMADE	TOTAL	NOTES
	Reference author	**Reference code**					
1	Ramsar database	none	66,300	93,000	0	159,300	Date of data extraction : August 14th 1998
2	Magnin & Yarar 1997	222	?	?	?	1,240,000	This source examines wetlands which are important bird areas in Turkey, & states " we are relatively confident that the current inventory included most of the important wetlands in Turkey"
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0
Best estimates (ha)			?	?	?	1,240,000	

Notes/comments on best estimate

No other estimates were available for the preparation of the preliminary report, and therefore thes estimate of Magnin & Yarar has been used.

Date of best estimate 29-Aug-98

10	Lindsay & Immirzi 1996	219	0	3,836	0	3,836	Value is for lowland raised bog in England, Scotland and Wales only (not Northern Ireland)
Best estimates (ha)			854,498	518,713	2,303	1,375,514	

Notes/comments on best estimate

The best estimate for marine has been calculated from summing the values from refs 3,4, & 6-9. In the UK coastal inventory is well covered by this material.
The best estimate for inland has been calculated from Schultink & Van Vliet, which may be an underestimate, but is more comprehensive than a total value which can be calculated by summing the inland areas from reference 5 and 10.
The only information which has been identified for manmade wetlands is that covered by Ramsar sites: note this area is site area, not necessarily wetland area.

Date of best estimate 21-Aug-98

Annex 3 Definitions and abbreviations

Ramsar Region The Ramsar Bureau has adopted a system whereby countries are assigned to one of the following administrative and reporting regions: Africa, Asia, Eastern Europe, Neotropics, North America, Oceania, and Western Europe.

Regional Scale A scale which encompasses all, or the vast majority of countries within one Ramsar region.

Supra-regional Scale A scale which is greater than the Regional scale which normally encompasses several countries within any *two or more* Ramsar regions but not covering each and every country within those Ramsar regions.

Sub-regional Scale A scale which is greater than the national scale which normally encompasses several countries within any *one* Ramsar region but not covering each and every country within that Ramsar region

Wetland Inventory Assessment Sheet

This consists of a series of sheets designed to evaluate and summarise wetland inventory material. These are completed for each and every inventory source which contains useful coverage and attribute data. The details from these sheets are then entered into the GRoWI database. Wetland Inventory Assessment Sheets are not completed for sources which are deemed to be of little use for inventory purposes.

Wetland According to the Ramsar Convention, wetlands are areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres. In addition, the Ramsar Convention (Article 2.1) provides that wetlands: 'may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six metres at low tide lying within the wetlands'.

Wetland Inventory For the purposes of this project the definition of 'wetland inventory material' is necessarily broad, and encompasses standard wetland inventories carried out specifically for this purpose, but also includes material, which does not constitute a wetland inventory *per se* (eg Hughes et al 1994, A Preliminary Inventory of Tunisian Wetlands). Relevant NGO material, GO material, conference proceedings, workshop material and academic/research material were also considered as wetland inventory material.

eriss Environmental Research Institute of the Supervising Scientist

GO Governmental organisation

NGO Non-governmental organisation

WI-A	Wetlands International–Americas
WI-AEME	Wetlands International–Africa, Europe, Middle East
WI-AP	Wetlands International–Asia Pacific
WIAS	see *Wetland Inventory Assessment Sheet*
GRoWI	Global Review of Wetland Resources and Priorities for Wetland Inventory