internal report 456

Wetland inventory – training course, Cali, Colombia, 6–15 March 2002

CM Finlayson

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Supervising Scientist

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Contents

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Introduction

Powerpoint presentations on wetland inventory used during a wetland training course organised by the Colombian Ministry of Environment, in Cali, Colombia. Participants included representatives from governmental agencies, non-governmental organisations and academic institutions.

The course focussed on local community involvement, management planning and inventory approaches. Three presentations covering the latter were made and are reproduced below.

Cali workshop outline

A FRAMEWORK FOR WETLAND INVENTORY

Max Finlayson

Director, National Centre for Tropical Wetland Research, Darwin, Australia

&

Oceania representative

Ramsar Scientific and Technical Review Panel

Contents

1. **Introduction and background to wetland inventory - current international practice - Sunday 10 March**

2. **Assess two inventory methods - Mediterranean and Asian methods - Monday 11 March**

3. **Assess the Ramsar Convention's framework for wetland inventory - Monday 11 March**

Outcomes

1. **Provide you with updated information on approaches to wetland inventory and the Ramsar recommended approach**

2. **Provide you with information on two methods for wetland inventory - Mediterranean and Asia**

3. **Assist you to draft a protocol for wetland inventory in Colombia - you decide what you need to do**

Process - what we will do

- **Initially I will talk and you will listen carefully with the translation from Australian (a dialect of English) to Colombian (and I hope you will stay awake)**

- **Then I will ask some questions and you will hopefully provide (intelligent) answers (you will need to be awake)**

- **You will develop a draft inventory protocol for Colombia and discuss how *you* could undertake further inventory (and I will go home)**

Some background information

Who am I? Why am I here?

1. *Profession* - wetland ecologist and currently director of an Australian government research institute in tropical Australia; eco-bureaucrat and research manager (I study wetlands from my desk and laptop)

2. *Experience* - research projects in Australia, Asia, Africa and Europe (Mediterranean and eastern Europe); tropical wetlands and large rivers and deltas

3. *Current role* - provide *advice* and *training* locally, nationally and internationally; Ramsar, Wetlands International, Intergovernmental Panel on Climate Change, Millennium Ecosystem Assessment

Some more background information

4. *Expertise* - applied management & wetland survey

- **management of wetland weeds**
- **assessment of nutrient and heavy metal pollution**
- **floodplain vegetation surveys**
- **conservation planning**
- **training wetland managers and researchers**
- **involving local people in wetland management**
- **assessment of climate change effects on wetlands**
- **techniques for wetland inventory, assessment and monitoring**

Main reference sources

♦**Finlayson, Davidson & Stevenson (eds) (2001). Wetland inventory, assessment and monitoring: practical techniques and identification of major issues.** ***Supervising Scientist Report 161,*** **Darwin Australia**

(available on the web at www.wetlands.org)

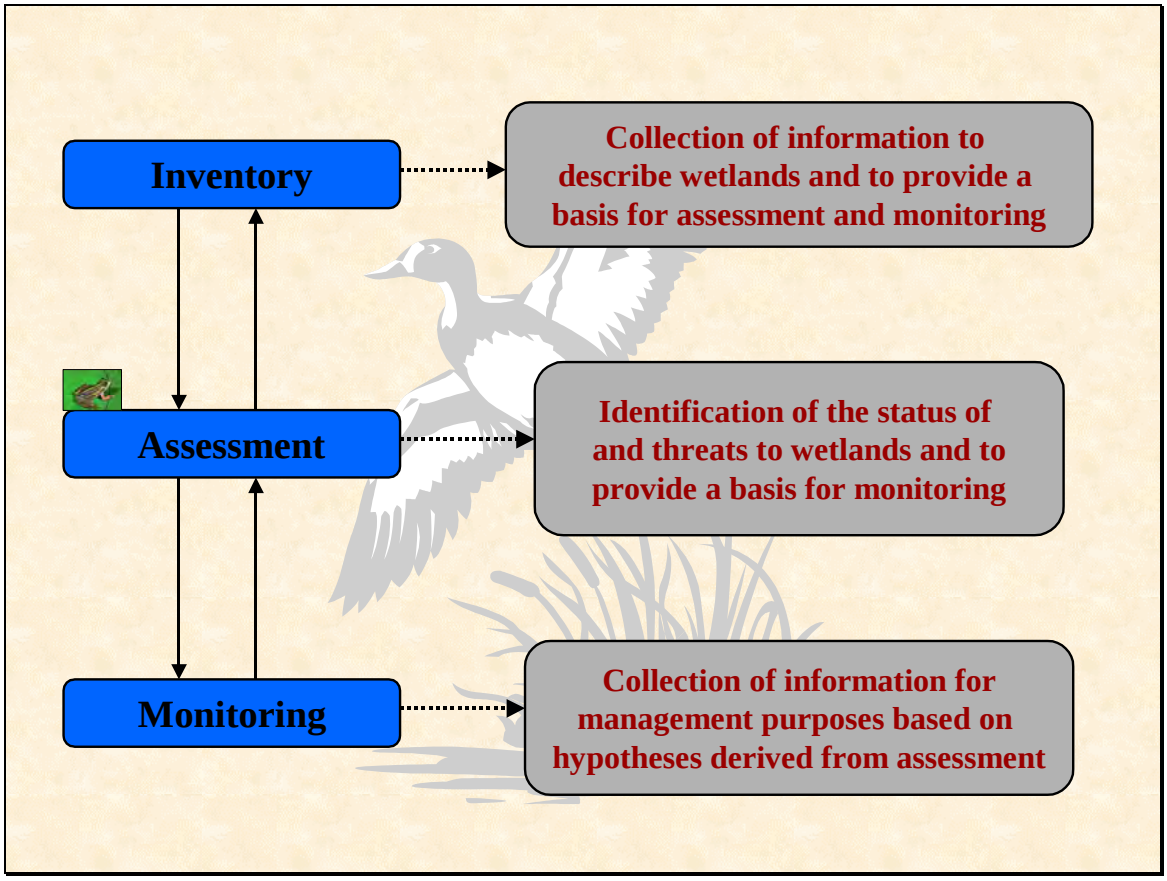
♦**Finlayson, Davidson, Spiers & Stevenson (1999). Global wetland inventory - status and priorities.** ***Marine and Freshwater Research*** **50, 717-727.**

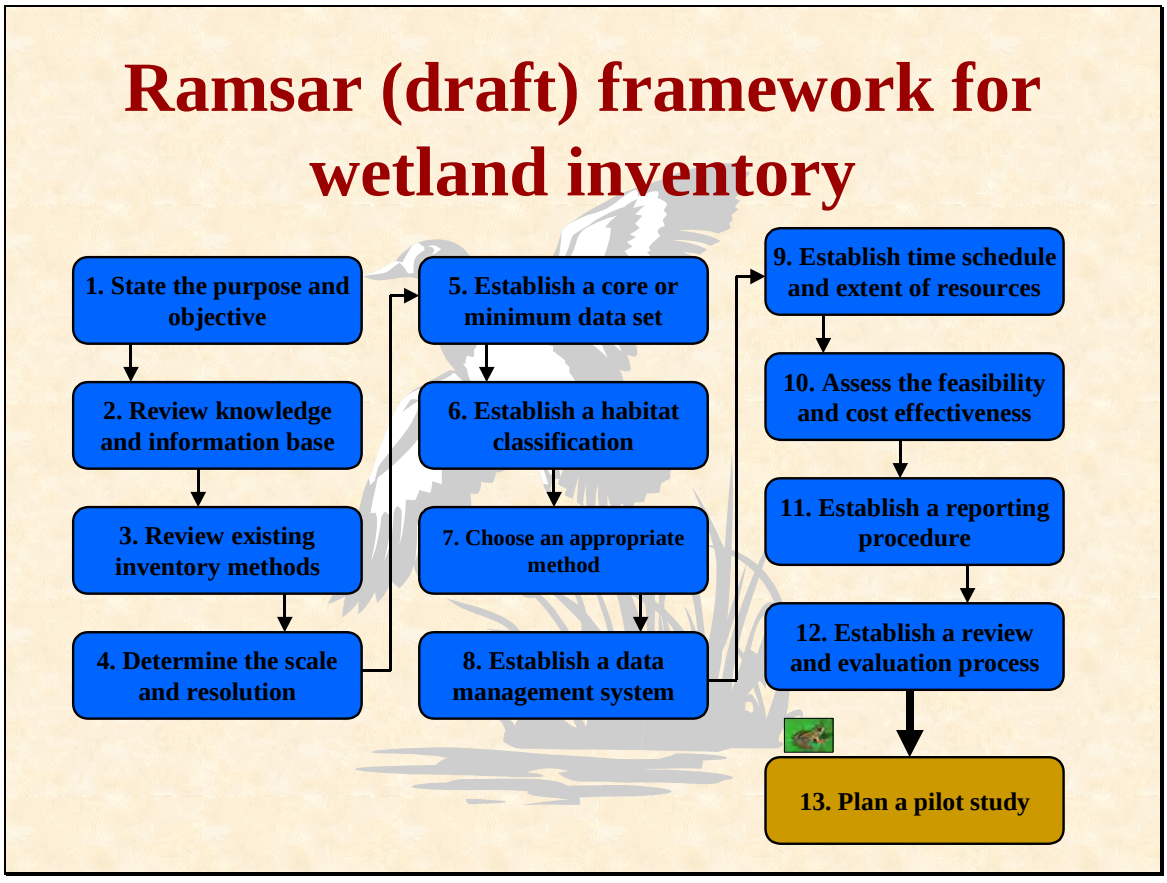
(copies available from myself)

What is wetland inventory?

Wetland inventory is the collection and/or collation of core information for wetland management, including the provision of an information base for specific assessment and monitoring activities.

Do not confuse inventory with assessment and monitoring - they are linked but they are different


Inventory
Collection of information to describe wetlands and to provide a basis for assessment and monitoring
Assessment
Identification of the status of and threats to wetlands and to provide a basis for monitoring
Monitoring
Collection of information for management purposes based on hypotheses derived from assessment


Ramsar (draft) framework for wetland inventory
1. State the purpose and objective
2. Review knowledge and information base
3. Review existing inventory methods
4. Determine the scale and resolution
5. Establish a core or minimum data set
6. Establish a habitat classification
7. Choose an appropriate method
8. Establish a data management system
9. Establish time schedule and extent of resources
10. Assess the feasibility and cost effectiveness
11. Establish a reporting procedure
12. Establish a review and evaluation process
13. Plan a pilot study

Expression of thanks

Thank you for this opportunity to visit and discuss wetland inventory with you.

Thank you Maria Rivera for arranging the course and my visit.

I wish you good fortune as you develop your wetland inventories and manage your wetlands in a wise manner.

Concluding comments

There are (possibly) more important things than an inventory for wetland management.

However, having an inventory will make your life as a wetland manager much easier.

And I hope it does not take you 10 years to develop and implement your approach for a national inventory


Thank you

Cali inventory background

Wetland inventory - introduction

Max Finlayson

Director, National Centre for Tropical Wetland Research, Darwin, Australia

Oceania representative
Ramsar Scientific and Technical Review Panel

Introduction to wetland inventory

1. Previous wetland inventory effort
2. Global review of wetland inventory
3. Purpose of wetland inventory
4. Integrated framework for wetland inventory
5. Wetland inventory in Colombia

Previous wetland inventory effort

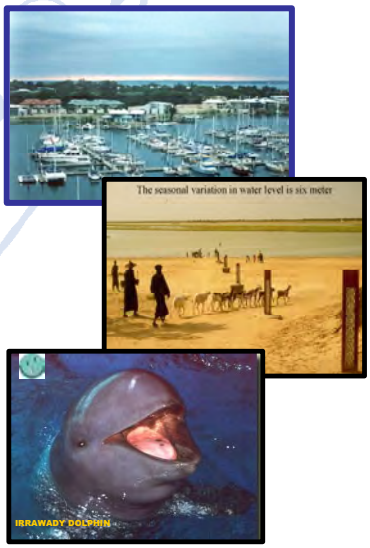
- Concerted national and international inventory effort
- Common problems with wetland inventory

National and international inventory effort

- Impressive basic coverage
- Wetland distribution
- Wetland species description
- Management problems
- Monitoring programs
- Bibliographic materials

Common problems with wetland inventory

- Wetland definition
- Wetland classification
- Inaccurate data
- Incomplete information
- Insufficient resources



Global review of wetland Inventory

- Wetland information base - uneven, outdated or absent
- Ramsar Wetland Convention provides a framework for wetland inventory

Wetland information base - uneven, outdated, lacking

Wetland area (km^2) in Australian tropics

Topographical maps (1:250 000)	89 704
Digital Chart of the World	70 078
Matthews natural wetlands	35 649
IGBP - DISCover land use	4 727
National directory of wetlands	30 849
National map of wetlands	18 539

Framework for wetland inventory

Step

1. State the purpose and objective
2. Review existing knowledge and information
3. Review existing inventory methods
4. Determine the scale and resolution
5. Establish a core or minimum data set
6. Establish a habitat classification
7. Choose an appropriate method
8. Establish a data management system
9. Establish a time schedule and extent of resources
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12. Establish a review and evaluation process
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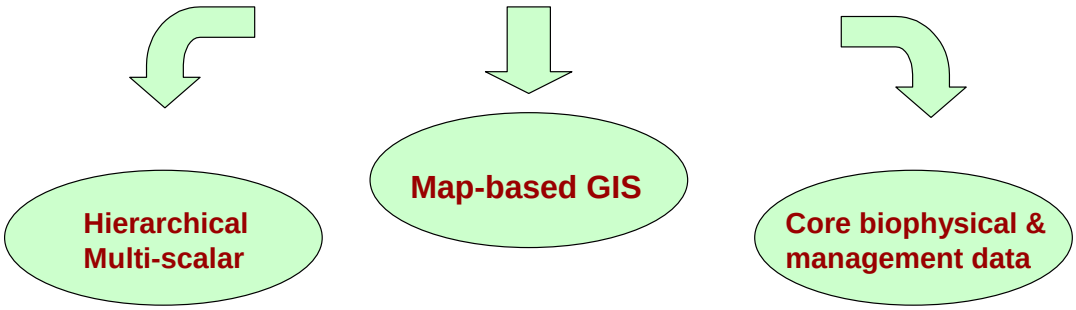
Framework for wetland inventory



Introduction to wetland inventory

- Previous wetland inventory effort
- Global review of wetland inventory
- Purpose of wetland inventory
- Integrated framework for wetland inventory
- Wetland inventory in Colombia

Biophysical data

- **Site name** (official name of site and catchment)
- **Area and boundary** (size and variation, range and average value
- **Location** (projection system, map coordinates, map centroid, elevation)
- **Geomorphic setting** (where it occurs within the landscape, linkage with other aquatic habitat, biogeographical region)
- **General description** (shape, cross-section and plan view)
- **Climate** (zone and major features)
- **Soil** (structure and colour)
- **Water regime** (periodicity, extent of flooding, source of surface water and links with groundwater)
- **Water chemistry** (salinity, pH, colour, transparency, nutrients)
- **Biota** (vegetation zones and structure, animal populations and distribution, special features including rare/endangered species)

Managerial data

- **Landuse** – local and in the river basin and/or coastal zone
- **Pressures on the wetland** – within the wetland and in the river basin and/or coastal zone
- **Land tenure and administrative authority** – for the wetland critical parts of the river basin and/or coastal zone
- **Conservation and management status of the wetland** – including legal instruments and social or cultural traditions that impinge on the management of the wetland
- **Ecosystem goods and services derived from the wetland** – including products, functions and attributes and, where possible, their worth to humans
- **Management plans and monitoring programs** – in place and planned within the wetland and in the river basin and/or coastal zone

Wetland Inventory

- Standardised and updated information set needed
- Ramsar Wetland Convention provides a framework for wetland inventory

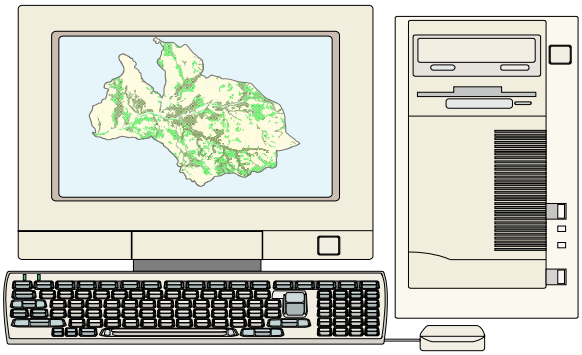
Purpose of wetland inventory

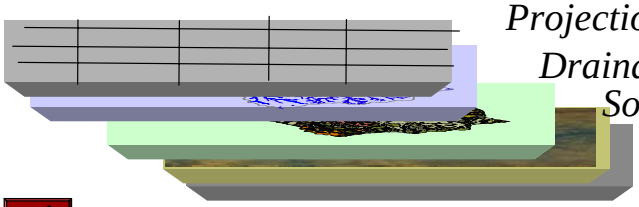
Wetland inventory is the collection and/or collation of core information for wetland management, including the provision of an information base for specific assessment and monitoring activities

Inventory purposes

list wetlands of a particular type or in an area
identify wetlands of national or international importance
describe the distribution of wetland species - birds, plants
describe natural resources - water, peat, fish, trees
assess extent of wetland loss and degradation
describe recreational or aesthetic features - tourism, angling

Map - based GIS





Projections / datum grid

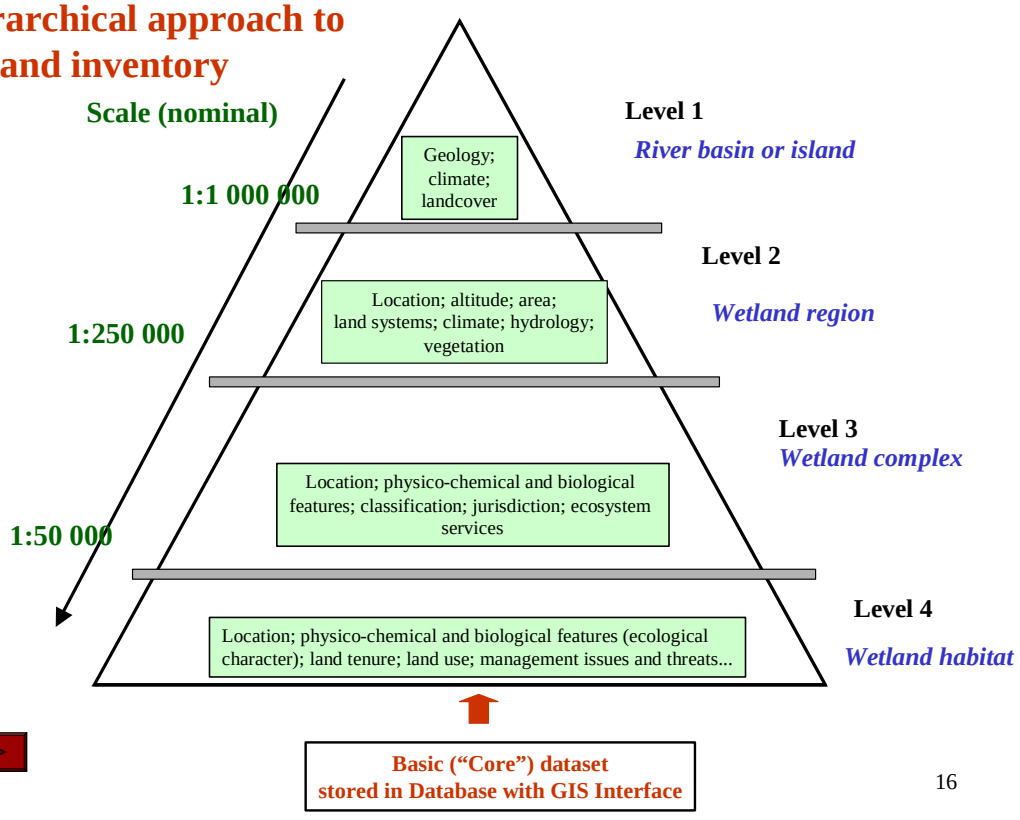
Drainage / hydrology

Soils information

Remote sensing

Study area base

Hierarchical approach to wetland inventory



Basic ("Core") dataset stored in Database with GIS Interface

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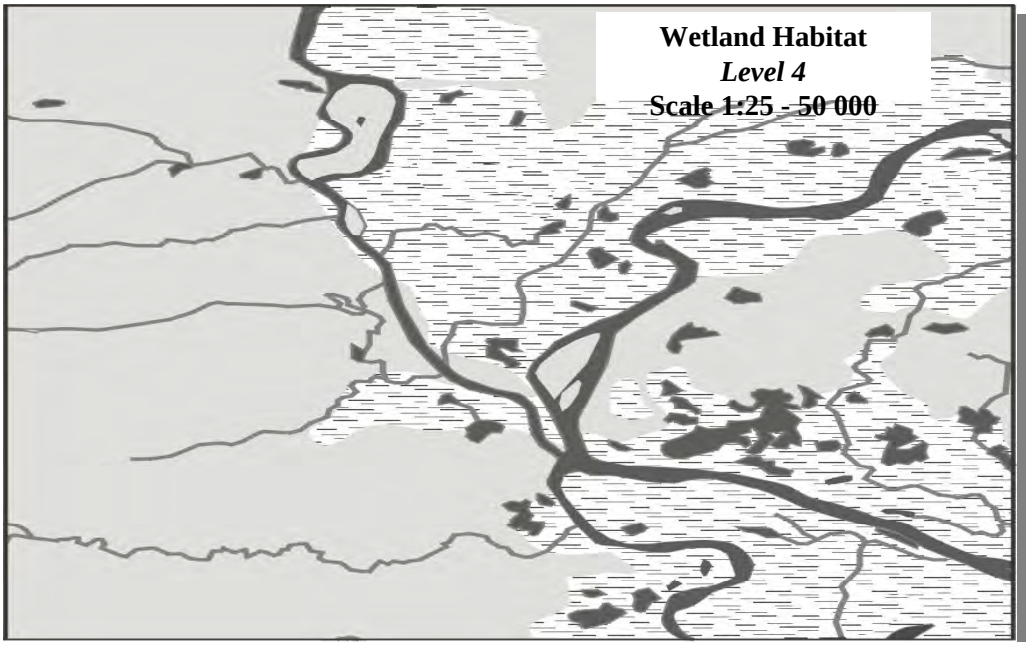

Framework for wetland inventory

Hierarchical Multiscalar

Map-based GIS

Core biophysical & management data

Introduction to wetland inventory

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Ramsar Convention - integrated framework for wetland inventory

1. State the purpose and objective
2 & 3. Review existing knowledge and methods
4. Determine the scale and resolution
5. Establish a core or minimum data set
6. Establish a habitat classification

Ramsar Convention - integrated framework for wetland inventory

7 & 8. Choose an appropriate method for data collection and management

9 & 10. Establish a time schedule and extent of resources and assess feasibility

11 & 12. Establish a reporting and review procedure

13. Plan a pilot study

Wetland inventory in Colombia

Neotropical wetland directory lists 40 sites covering 1 943 000 ha as internationally important - Scott & Carbonell 1986

Water resources analysis includes information on wetlands - Ramirez 1992

Mangrove area 379 000 ha - Sanchez & Alvarez 1997

Sub-national inventory information available - Davidson et al 1999

57 major wetlands in 27 catchments/complexes identified - Naranjo 2001

1. State the purpose and objective

- Provide the reason(s) for undertaking the inventory
- Identify who will use the information and when is it needed
- Establishes the basis for choosing a spatial scale
- Provides guidance for the minimum data or information that is required

2 & 3. Review existing knowledge and inventory methods

- Review the published and unpublished literature on wetland inventory
- Determine the extent of knowledge and information available for wetlands in the region
- Collate this information in a library catalogue or include in a report
- Review available methods
- Seek expert technical advice to ensure that the methods can supply the required information
- Assess suitability of the data management processes for the information that is collected.

4. Determine the scale and resolution

- Determine the scale and resolution that will enable the purpose and objective to be achieved
- Inventory often undertaken at multiple scales
  - large river basins: 1:5 000 000 to 1:1 000 000
  - wetland regions: 1:1 000 000 to 1:250 000
  - wetland complexes: 1:250 000 to 1:50 000
  - wetland habitats: 1:50 000 to 1:25 000
- Each scale needs a minimum mapping unit that reflects the accepted accuracy for that scale - determine the size of the minimum feature that can be clearly delineated at that scale

5. Establish a core or minimum data set

- Identify the core, or minimum, data set sufficient to describe the location and size of the wetland(s) and any special features
- This can be complemented by additional information on factors affecting the ecological character of the wetland(s) and other management issues
- Core biophysical data - name, location, size, setting, shape, soil, climate, water regime, water chemistry, biota
- Core managerial data - land use, pressures, land tenure, administration, laws, social-cultural issues, goods and services, monitoring programs, management plans

6. Establish a habitat classification

- Choose a habitat classification that suits the purpose of the inventory
- It is unlikely that a single classification would be globally accepted
- Ramsar habitat types are not generally suitable for anything but simple classification
- Recommended that classification is based on fundamental features of wetlands - landform and water regime

7 & 8. Choose an appropriate method for data collection and management

- Choose a method that is appropriate for a specific inventory based on an assessment of the technical advantages and disadvantages
- Establish the costs and benefits of alternatives methods
- Establish protocols for collecting, recording and storing data, including archiving, to enable the source of the data and its accuracy to be determined
- Identify suitable rigorous and tested methods for data analysis and document these
- Use a meta-database to record information about the inventory and details of data ownership and access

9 & 10. Establish a time schedule, determine the extent of resources and assess feasibility

- Establish a time schedule for planning the inventory, for collecting, processing and interpreting the data, for reporting and for reviewing the program
- Establish the extent and reliability of the resources available and if make contingency plans to ensure that data is not lost due to shortfalls
- Assess whether or not the program, including reporting, can be done within the context of the management processes and financial resources available
- Determine if the entire costs are within budget and that the budget is available for the program to be completed

11 & 12. Establish a reporting and review procedure

- Establish a procedure for interpreting and reporting all results in a timely and cost effective manner
- The report should be succinct/concise and indicate whether or not the objective has been achieved
- The report should contain recommendations for management action, including whether further information or data is required
- Establish a formal and open review process to ensure the effectiveness of all procedures, including reporting, and supply information to adjust or even terminate the program

13. Plan a pilot study

- **Test and fine-tune the method and specialist equipment being used**
- **Assess the training needs for staff involved**
- **Confirm the means of collating, collecting, entering, analysing and interpreting the data**
- **Check that any remote sensing data collection can be supported by ground-truthing**
- **Check the reporting procedures**
- **Provide confidence in the program - to those involved and those providing the funds**

Thank you

A FRAMEWORK FOR WETLAND INVENTORY

Max Finlayson

Director, National Centre for Tropical Wetland Research, Darwin, Australia

&

Oceania representative

Ramsar Scientific and Technical Review Panel

A FRAMEWORK FOR WETLAND INVENTORY

1. Recommendations for wetland inventory 1989-98
2. Global review of wetland inventory
3. Ramsar resolution on wetland inventory
4. Definition of wetland inventory
5. MedWet model for wetland inventory
6. Asian model for wetland inventory
7. Ramsar (draft) framework for wetland inventory
8. Outline for a Colombian wetland inventory

1. Recommendations for wetland inventory 1989-98

International conferences

1989 - Astrakhan, Russia
1991 - Grado, Italy (MedWet)
1992 - Columbus, Ohio, USA
1992 - St Petersburg, Florida, USA
1995 - Kuala Lumpur, Malaysia
1998 - Dakar, Senegal

1. Recommendations for wetland inventory 1989-98

Common recommendations 1989-95

- **Standardisation of techniques, guidelines and manuals**
- **Collection of long term data on wetlands**
- **Provision of training**
- **Reviewing gaps and coordination of data collection**
- **Developing and making greater use of network**
- **Developing means to audit existing effort.**

1. Recommendations for wetland inventory 1989-98

ALL TALK AND LITTLE ACTION

1. Recommendations for wetland inventory 1989-98

Recommendations, Dakar, Senegal, 1998

- **Complete national wetland inventory using comparable approaches that focus on a basic data to describe major biophysical features.**
- **Once the basic data has been acquired more data on management issues, threats, land use and tenure, goods and services, and monitoring can be added.**
- **Include a clear statement of purpose, habitats covered and the date the information was obtained.**
- **Publish inventories electronically (GIS) for better access and updating.**

2. Global Review of Wetland Inventory

Objectives

- **Provide an overview of international, regional and national wetland inventories**
- **Identify the priorities for establishing, updating or extending wetland inventory to provide better information for describing and managing wetlands.**

2. Global Review of Wetland Inventory

Outcomes

- **few countries have comprehensive national inventories of their wetland resources, and so lack essential baseline information on their wetlands**
- **for many existing inventories their purpose and objectives were poorly, if at all, stated**

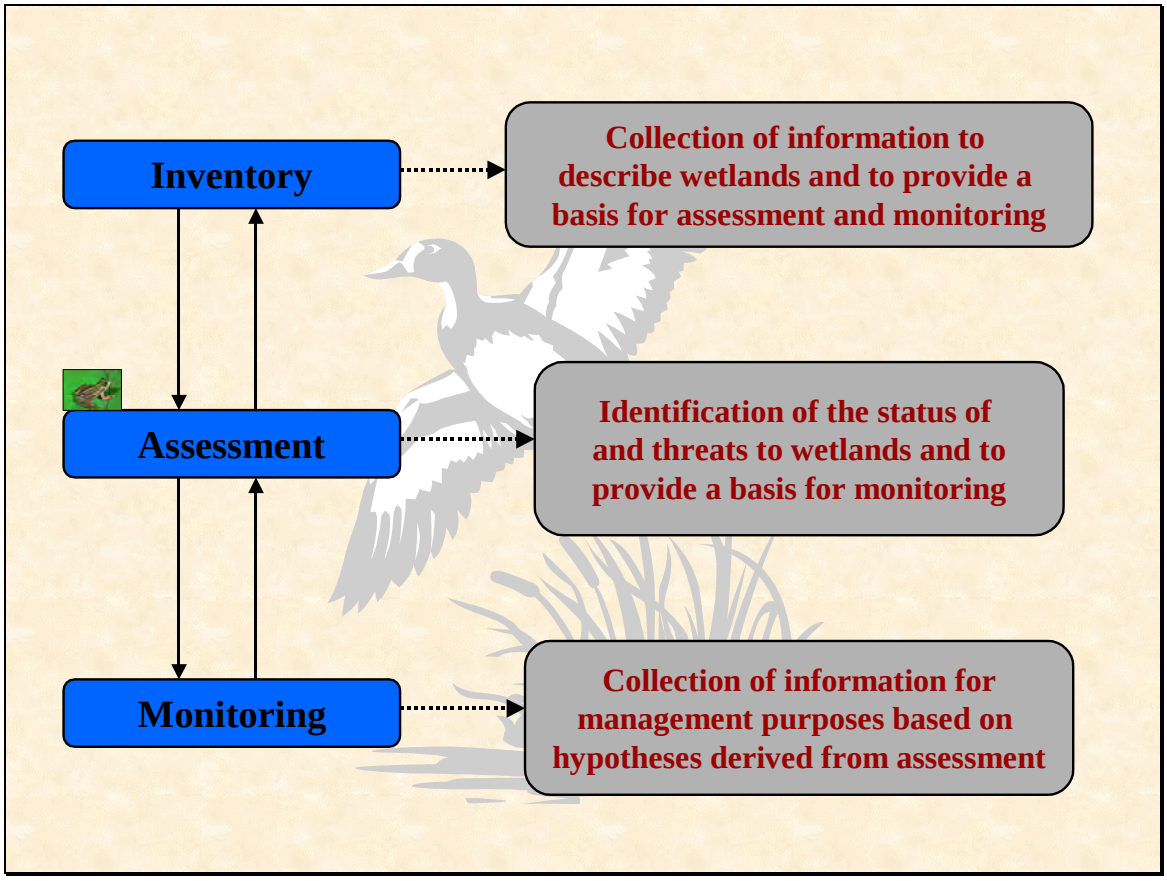
3. Ramsar resolution on priorities for wetland inventory

Recommendations

- **complete national wetland inventories**
- **review and develop models for wetland inventory and data management**
  - **use remote sensing and low-cost and user-friendly geographic information systems**

4. Definition of wetland inventory

Wetland inventory is the collection and/or collation of core information for wetland management, including the provision of an information base for specific assessment and monitoring activities.



5. MedWet method for wetland inventory

- **The Mediterranean was rich in wetlands of great ecological, socio-economic value, but many had been degraded or destroyed - Grado (Italy) Conference in 1991.**
- **MedWet launched in 1992 by the European Commission, the Ramsar Convention, the governments of the five countries and several NGOs.**
- **The aims of the inventory programme were: (1) to assess existing wetland inventories and review the methods, and (2) to prepare a standard method.**

5. MedWet method for wetland inventory

- Developed an approach that was
  - *standardised* for consistent use in the region
  - *comprehensive* to include all relevant information
  - *flexible* for use by entities with diverse resources
  - *compatible* for comparisons and exchange of information with ongoing programs

5. MedWet method for wetland inventory

Based on three levels of information

- catchment area - information for all wetlands
- wetland site - information collected at all sites
- habitat - baseline for management and monioring

5. MedWet method for wetland inventory

Contains three phases

1. Review of existing information **- compilation of existing data on known sites, using all available sources of information. Does not require fieldwork. Produces a list of wetlands with some information on the location of sites and their biological, social, economic and legal status.**

5. MedWet method for wetland inventory

Contains three phases

2. Simple inventory **- compilation of information about all the sites. May require some fieldwork and moderate resources. It is a minimum effort for recognising the wetlands and their main features within the area considered.**

5. MedWet method for wetland inventory

Contains three phases

3. Detailed inventory **- detailed information about each site and production of GIS-based maps. Importance of the sites for nature conservation and for local communities is fully evaluated. Intensive fieldwork and wetland knowledge will be necessary, and more substantial resources are needed. Provides more baseline information for planning and monitoring.**

5. MedWet method for wetland inventory

Contains five main components

- **site selection**
- **wetland identification**
- **classification system**
- **data collection and storage**
- **mapping procedure**

6. Asian method for wetland inventory

1. Analyse long-term trends in wetlands and their resources as a part of national natural resource management

2. Enable regular revisions and updates of information on wetlands of national and international importance

3. Disseminate the the information widely

4. Provide core information on wetlands to support the implementation of international conventions

6. Asian method for wetland inventory

Key features

- based on maps and collection and analysis of standardised categories of data within a hierarchical framework
- the framework relates data/information that is collected at different scales for the various aims and a link between the mapping scales and the level of detail required
- the inventory will not be undertaken as a single project
- standardised data sheets are used to maintain compatibility for collation of information from different projects

6. Asian method for wetland inventory

Wetland definition

Areas of marsh, fen, peat land or water, either natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including all inter-tidal areas above the low water mark

6. Asian method for wetland inventory

Hierarchical scale for mapping

1. River basins - 1:5 000 000 to 1:1 000 000 scale maps

2. Wetland regions - 1:1 000 000 to 1:250 000 scale maps

3. Wetland complexes - 1:250 000 to 1:50 000 scale maps

4. Wetland habitats - 1:50 000 to 1:10 000 scale maps

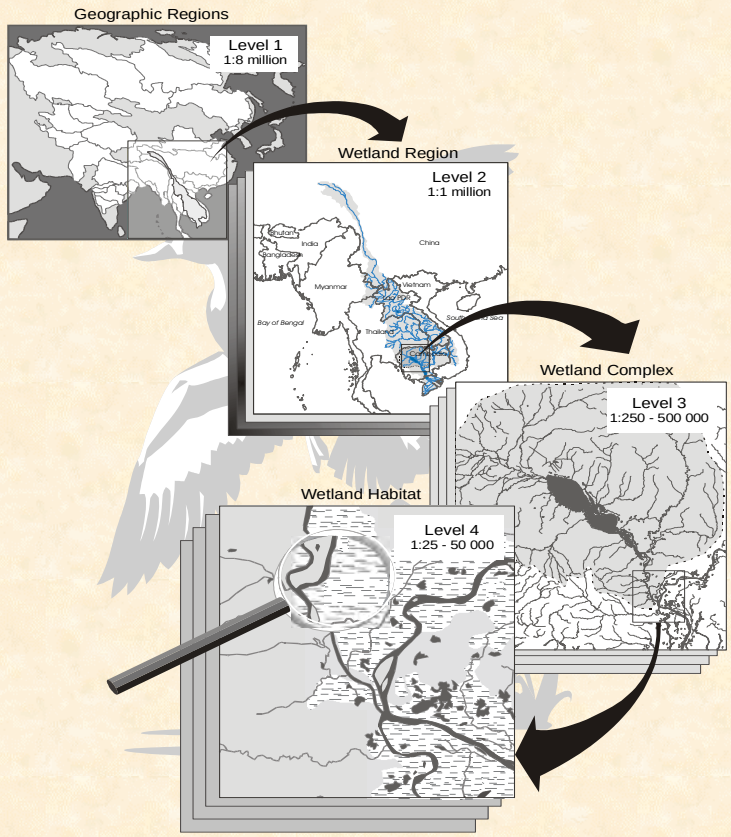


Fig 1: The four tiered landscape (or "top-down") approach of the AWI. The level of detail varies with spatial

6. Asian method for wetland inventory

1. River basins - desk study to describe the geology, geomorphology, hydrology, climate of each geographic region using existing maps and remotely sensed images

2. Wetland regions - desk study to identify the wetland regions within each geographic region using information already collated on landforms and water regimes and existing maps and remotely sensed imagery

3. Wetland complexes - fieldwork and analysis within each wetland region to identify the wetland complexes and their ecological characteristics and connections

4. Wetland habitats - detailed field work and analysis to delineate and describe wetlands within each wetland complex. This will also include further information on wetland management

6. Asian method for wetland inventory

Data collection - standardised data sheets linked to maps in GIS

1. River basins - geology, climate zone, vegetation - broad overview

2. Wetland regions - location, geology, climate pattern, vegetation, altitude, area, water regime, jurisdiction - more detail of common features of a physical region within the river basin

6. Asian method for wetland inventory

Data collection - standardised data sheets linked to maps in GIS

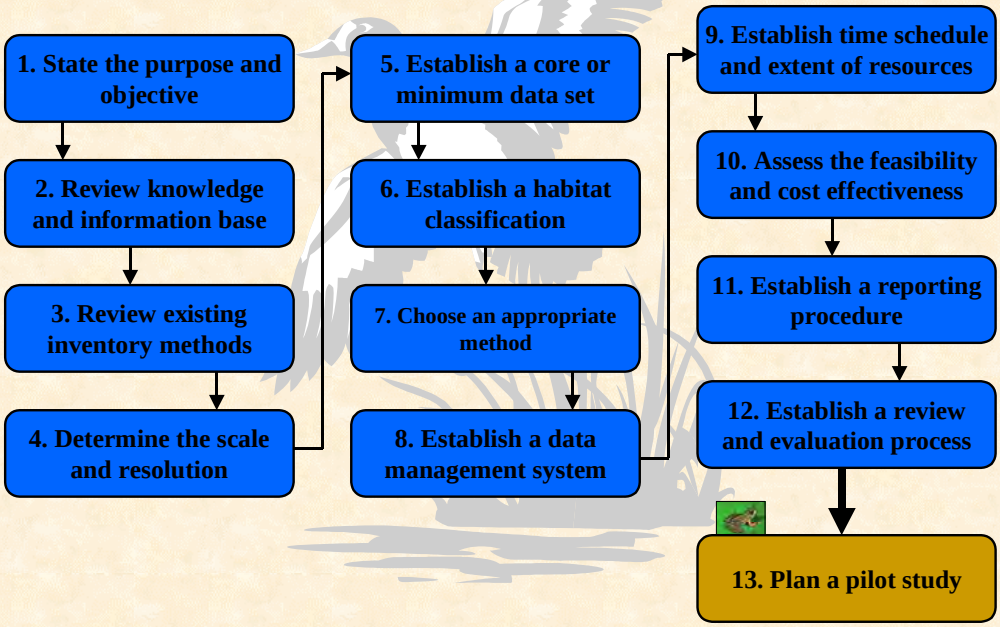
3. Wetland complexes - location (coordinates and centroid), climate (precipitation, temperature, humidity, evaporation), ecological character (physical - geomorphic setting, size and shape, bathymetry, soil and sediments, water regime, groundwater; physico-chemical - temperature, salinity, transparency, colour, hardness, alkalinity, pH, nutrients; biological - vegetation structure and pattern, major fauna, rare and endangered species) - detailed field collections

4. Wetland habitats - as above with managerial data added (landuse, pressures, goods and services, social and cultural interests, jurisdiction, monitoring and management plans - detailed field collections and management considerations

7. Ramsar (draft) framework for wetland inventory

- provides guidance on a standard approach to designing a wetland inventory program
- includes information on
  - remote sensing techniques
  - wetland classifications
  - existing standardised inventory methods
  - core data fields
  - metadata recording

7. Ramsar (draft) framework for wetland inventory



Ramsar (draft) framework for wetland inventory

1. State the purpose and objective

State the reason(s) for undertaking the inventory and why the information is required, as the basis for choosing a spatial scale and minimum data set.

Ramsar (draft) framework for wetland inventory

2. Review the knowledge and information base

Review the published and unpublished literature and determine the extent of knowledge and information available for wetlands in the region being considered.

Ramsar (draft) framework for wetland inventory

3. Review existing inventory methods

Review available methods and seek expert technical advice to ensure that methods are used that can supply the required information and that suitable data management processes are established.

Ramsar (draft) framework for wetland inventory

4. Determine the scale and resolution

Determine the scale and resolution that will enable the purpose and objective to be achieved.

Ramsar (draft) framework for wetland inventory

5. Establish a core or minimum data set

Identify the core, or minimum, data set sufficient to describe the location and size of the wetland(s) and any special features.
This can be complemented by additional information on factors affecting the ecological character of the wetland(s) and other management issues, if required.

Ramsar (draft) framework for wetland inventory

5a. Establish a core or minimum data set

The core data can be divided into two components - biophysical and major management features of the wetland.
The decision on whether to undertake an inventory based only on core biophysical data or to also include data on management features will be based on individual priorities, needs and resources.

Ramsar (draft) framework for wetland inventory

5b. *Biophysical features*

Site name **(official name of site and catchment)**
Area and boundary **(size and variation, range and average values)**
Location **(projection system, map coordinates, map centroid, elevation)**
Geomorphic setting **(within the landscape, biogeographical region)**
General description **(shape, cross-section and plan veiw)**
Climate **– zone and major features**
Soil **(structure and colour)**
Water regime **(depth, periodicity, flooding, source of water, groundwater)**
Water chemistry **(salinity, pH, colour, transparency, nutrients)**
Biota **(vegetation zones, animal populations, rare/endangered species)**

Ramsar (draft) framework for wetland inventory

5c. *Managerial features*

Landuse **in the river basin and/or coastal zone**
Pressures **on the wetland, river basin and/or coastal zone**
Land tenure **and** ***administrative authority*** **for the wetland, river basin and/or coastal zone**
Conservation and management status **of the wetland including legal instruments, social-cultural traditions that affect management**
Ecosystem goods and services **derived from the wetland including products, functions and attributes**
Management plans **and** ***monitoring programs*** **in place and planned**

Ramsar (draft) framework for wetland inventory

5. Establish a core or minimum data set

Identify the core, or minimum, data set sufficient to describe the location and size of the wetland(s) and any special features.
This can be complemented by additional information on factors affecting the ecological character of the wetland(s) and other management issues, if required.

Ramsar (draft) framework for wetland inventory

6. Establish a habitat classification

Choose a habitat classification that suits the purpose of the inventory.
It is unlikely that a single classification would be globally accepted.

Ramsar (draft) framework for wetland inventory

7. Choose an appropriate method

Choose a method that is appropriate for a specific inventory based on an assessment of the advantages and disadvantages, and costs and benefits of the alternatives.

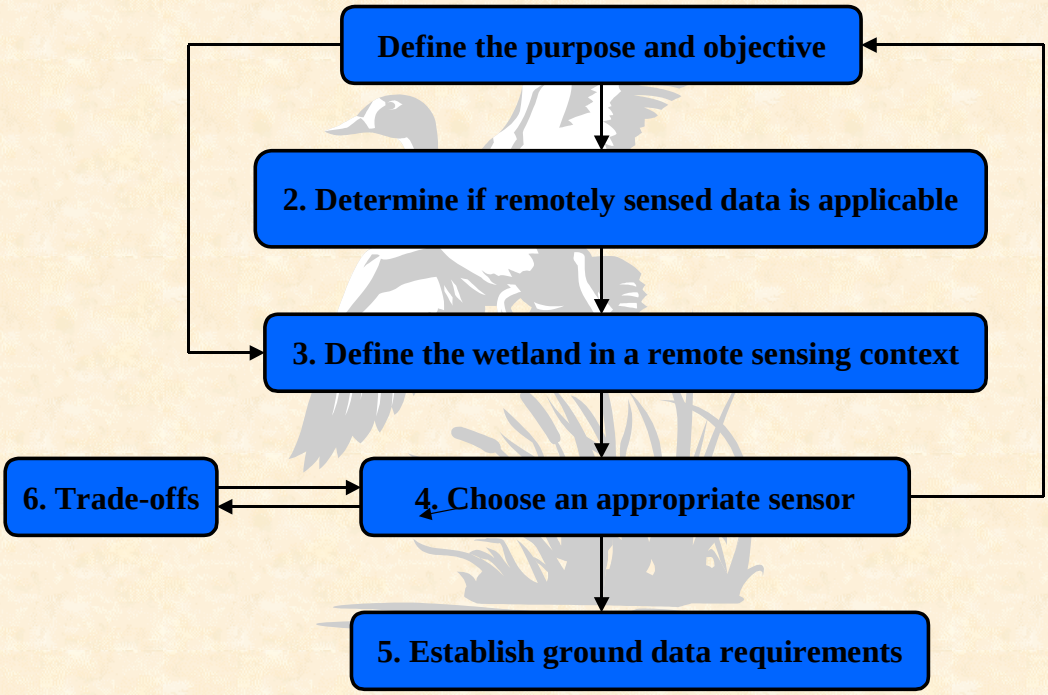
Ramsar (draft) framework for wetland inventory

7a. Comparison of methods

Inventory methods in use

Mediterranean (MedWet) inventory
US national wetland inventory
Ugandan national wetland program
Asian wetland inventory

Process for choosing an appropriate remote sensing sensor



Ramsar (draft) framework for wetland inventory

8. Establish a data management system

Establish clear protocols for collecting, recording and storing data, including archiving, to enable the source of the data and its accuracy to be determined.
Identify suitable rigorous and tested methods for data analysis and document these.
Use a meta-database to record information about the inventory and details of data ownership and access.

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Use a meta-database to record information about the inventory and details of data ownership and access.

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9. Establish a time schedule and extent of resources

Establish a time schedule for planning the inventory, for collecting, processing and interpreting the data, for reporting the results, and for reviewing the program.
Establish the extent and reliability of the resources available and if necessary make contingency plans to ensure that data is not lost due to shortfalls.

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10. Assess the feasibility and cost effectiveness

Assess whether or not the program, including reporting of the results can be done within the context of the management processes and financial resources available.
Determine if the costs of data acquisition and analysis are within budget and that the budget is available for the program to be completed.

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11. Establish a reporting procedure

Establish a procedure for interpreting and reporting all results in a timely and cost effective manner.
The report should be succinct/concise and indicate whether or not the objective has been achieved, and contain recommendations for management action, including whether further information or data is required.

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12. Establish a review and evaluation process

Establish a formal and open review process to ensure the effectiveness of all procedures, including reporting and, where necessary, supply information to adjust or even terminate the program.

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13. Plan a pilot study

Test and fine-tune the method and specialist equipment being used, assess the training needs for staff involved, and confirm the means of collating, collecting, entering, analysing and interpreting the data. Ensure that any remote sensing data collection can be supported by ground-truthing.

Ramsar (draft) framework for wetland inventory

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Thank you