Development of the World Database on Protected Areas

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Abstract

UNEP-WCMC has been the custodian of the World Database of Protected Areas (WDPA) for the past 20 years. The aim of this unique resource is to manage and link information relevant to establishing and maintaining an effective global system of protected areas. Protected areas are designated for many reasons but the global aim is that they should be representative of biological diversity at both national and global scales.

The WDPA contains over 120,000 sites and has two main components: an aspatial (attribute) database and an expanding spatial (GIS) dataset containing the boundary information. Data arrives from a number of different sources including country agencies, NGO's, IGO's, and the WDPA Consortium. The WDPA Consortium provides a focal point through which information and ideas are both pooled and shared. The Consortium members through their own projects and programmes and by tapping into a network of in-country expertise, perform a vital information-gathering role.

What is a Protected Area?

Some of the first, internationally accepted, definitions of protected areas arose from international conventions such as the London Convention in 1933 and the Western Hemisphere Convention in 1940. Since then our understanding of the importance and role of protected areas has increased significantly. That nature protection is only a part of a more complex system of management allowing for different types of access and use (Chape, S and Spalding, M (edt.), in press). At the IVth World Parks Congress in 1992 the present and widely accepted definition of a protected area was devised:

"An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means"

This definition is used by the IUCN, the IUCN World Commission on Protected Areas and in the creation of the UN List of Protected Areas.

There are number of international conventions and agreements that have strengthened protected areas networks at global and regional scales. At regional level examples include the EU Birds and Habitats Directives (1992) under European Natura 2000 and the ASEAN Heritage sites under the ASEAN Agreement on the Convention of Nature and Natural Resources (1985). At the global scale examples include the World Heritage (1972) and Ramsar Conventions (1971) and the UNESCO Man and Biosphere Reserve Program (1995). Agreements are made on bilateral and multilateral bases between countries to establish transboundary protected areas or biological corridors. Examples include the Mesoamerican Biological Corridor (2000) or the Great Limpopo transboundary protected area (2000) (Chape, S and Spalding, M (edt.), in press).

There is also nature protection at a local scale either through charities or government agencies. For example, the Royal Society for the Protection of Birds (RSPB) (1889) is a UK based charity working to secure a healthy environment for birds and wildlife and have established 150 nature reserves. Another example, English Nature, is a government agency set up by the Environment Protection Act 1990 that have established a system of National and Local Nature Reserves. They are managed on behalf of the nation and either owned/controlled by English Nature, local authorities or by approved bodies such as local community volunteer groups or Wildlife Trusts.

What is an IUCN Management Category?

Protected area designations (or types) are often defined within national legislation with respect to management objectives and legal protection for that area (Chape, S and Spalding, M (edt.), in press). For this reason, the same designation used by different countries is not necessarily comparable. Early in the history of protected area creation there were relatively few designations established under national legislation. As the number of protected areas grew so did the number of designations. In 1962 at the First World Conference on Protected Areas it was recognized that an internationally recognized protected area classification was needed. In 1978 the IUCN adopted a 10-category (I - X) classification system. By 1994 this has been reduced to 6 categories (Ia, Ib, II - VI) that also serve a range of secondary management objectives.

The IUCN Management categories play an important role in protected areas analysis as they enable comparisons to be made at global and regional levels and support interpretation of national protected area definitions (Chape, S and Spalding, M (edt.), in press). However real-world application of this classification system is often not clear-cut with some sites falling into different categories that can conflict with each other. Also, particularly for large sites, there can be different management

categories applied to different management zones. These reflect a number of different management plans and objectives within a single site.

History of the World Database on Protected Areas (WDPA)

Since 1981 UNEP-WCMC has been identifying and compiling information on the protected areas of the world to produce a comprehensive global dataset and maps. The WDPA began life as a single aspatial flat table holding only current protected area information (no historical content) of both nationally and internationally designated sites. Use of the latitude/longitude values (where known) allowed them to be displayed as a set of points on a map of the world.

The ability to capture the boundaries of sites as GIS polygon data was a major step forward in adding precise spatial definition to these sites. At this time, around the late 1980's, many maps were digitised at WCMC. This early information was often very coarse, often at around 1:5,000,000 scale. The availability of ESRI's Digital Chart of the World 1:1,000,000 baseline datasets provided a great opportunity to refine, give detail and standardise much of these coarser data, since protected area boundaries often follow rivers, lakes, coastlines and roads. (Figure 1)

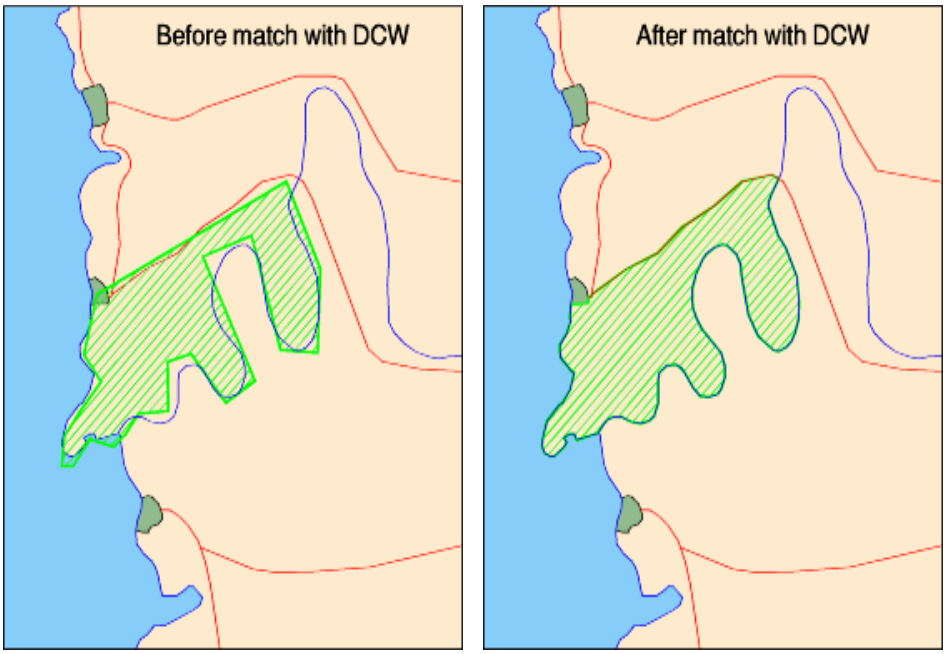


Figure 1: Enhancement of polygon data

As time has progressed, the scale of available maps and digital data has generally got much larger than 1:1,000,000 so it is no longer appropriate to match features with DCW. The availability of digital

data has increased enormously in line with the low cost and high flexibility and portability of modern GIS systems. This expansion has presented us with many challenges, particularly since the quality of the source information tends to lag behind the quality of the data itself. The availability of similar but distinct data from different sources without consistent metadata requires much effort to resolve. The most detailed data isn't necessarily the most accurate and a revision date on a map may not necessarily refer to all the Protected Areas on the map.

Key Mechanisms in Updating the WDPA

Historically data has been collected through requests (every 4 – 5 years) for latest protected area information from national agencies (national government organizations NGO's) in preparation for the production of the United Nations (UN) List of Protected Areas. The first *UN List of National Parks and Equivalent Reserves* was produced in 1962, at which time just over 1,000 sites was reported. By 1997 this had risen to over 12,754 sites and by 2003 there were 102,102 sites reported (Chape et al. 2003) within this 69066 sites had IUCN Management Categories. With continued improvement in both data quality and information a snapshot on the 1st June 2005 shows the database contains 71,000 protected areas with IUCN Management Categories covering an area in excess 16 million square kilometers, eligible for inclusion in a UN List.

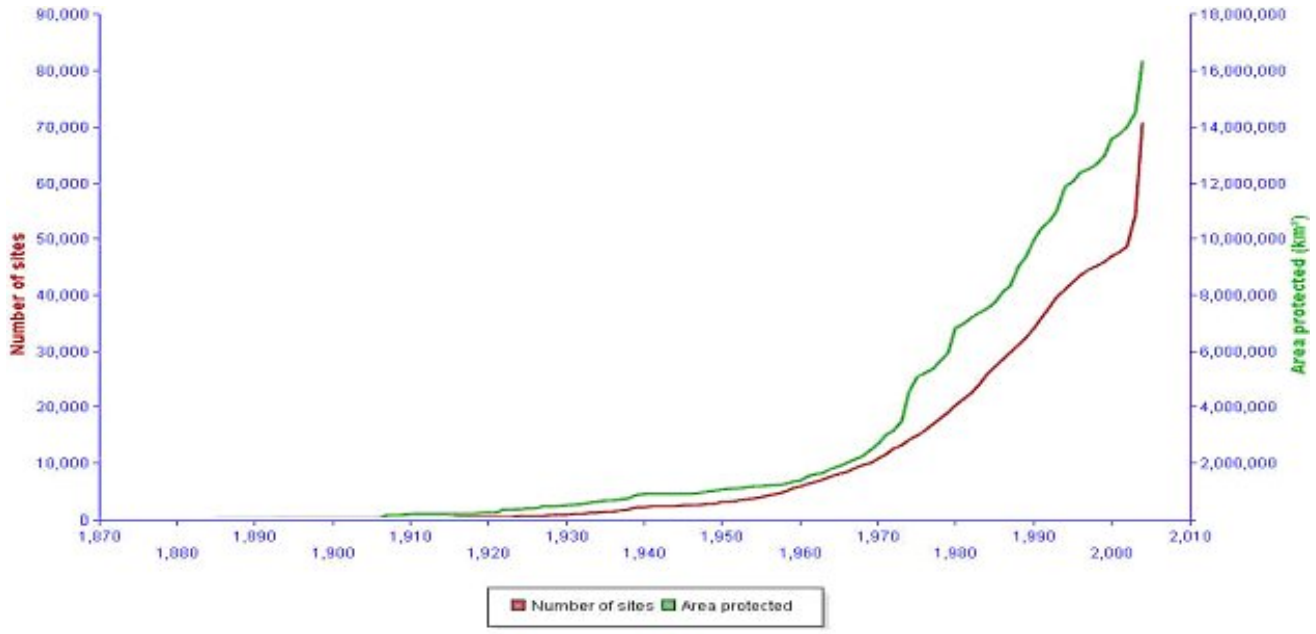


Figure 2: Growth of the National Protected Areas with IUCN Management Categories

At the Vth World Congress on Protected Areas in September 2003, UNEP and IUCN signed a Memorandum of Understanding (MoU). The MoU reaffirms and updates the longstanding partnership between IUCN and the UN on protected area information management, dating back to UN resolutions in 1959 and 1962.

During the last 40 years the extent and importance of protected areas had greatly increased. In the interests of improving the WDPA UNEP-WCMC is also working with a wide range of partners many of whom work with government agencies at the national level, on an ongoing basis. On a regional basis UNEP-WCMC also works with inter-governmental partners in the provision of protected area information. The most longstanding collaboration is with the European Environment Agency (EEA) who has responsibility for the European countries. The European data is available through the Common Database on Designated Areas (CDDA). EEA has appointed the European Topic Centre on Nature Protection and Biodiversity (ETC/NPB) to manage the database and liase with national focal points. The national European data is then transferred by the ETC/NPB from the CDDA to the WDPA maintained by UNEP-WCMC, which also provides information to the CDDA on international sites. In Southeast Asia UNEP-WCMC has collaborated with the ASEAN Regional Centre for Biodiversity Conservation (ARCBC) in obtaining protected area information for that region.

In June 2002 the World Commission on Protected Areas (WCPA), IUCN and UNEP-WCMC and other organizations agreed to progress the development of the WDPA through the formation of a Consortium of co-operative stakeholders (Chape et al. 2003). The MoU signed in September 2003 provided the framework for the Consortium and the future development of the World Database on Protected Areas. The Consortium currently comprises representatives from intergovernmental organizations (IGO's) including major global conservation organizations (Appendix iv) that have agreed on a set of common principles to ensure that information on protected areas is maintained on a cooperative basis and used effectively in monitoring the effectiveness of global conservation agendas.

The WDPA today

The aspatial information on protected areas is held in a relational database containing many attributes including name, designation, size, IUCN management category and the date of establishment. Protected Areas information cannot be relied upon to stay in a fixed state for any length of time. New sites are constantly being created. Existing sites get extended, reduced, reclassified, amalgamated with neighbouring sites and renamed. Some sites even cease to exist, a process known as degazettment. A continuous issue is how to record this evolution effectively and also how to source the necessary information to enable this evolution to be recorded. The WDPA has the ability to keep

historical information on the development of sites through time. A list of the most commonly used fields for National and International sites is shown in Appendix ii - iii. In addition to nationally designated sites, the WDPA holds information relating to a number of international conventions and agreements. The three major global conventions are described in Appendix i.

The spatial information on protected areas encompasses polygon (boundary) or location (if known) point data all managed and updated using ArcGIS 9.0 and SQL Server. Data are held as ArcSDE layers stored in a geodatabase (using SQL Server) and these can be converted to shape files when required by external users.

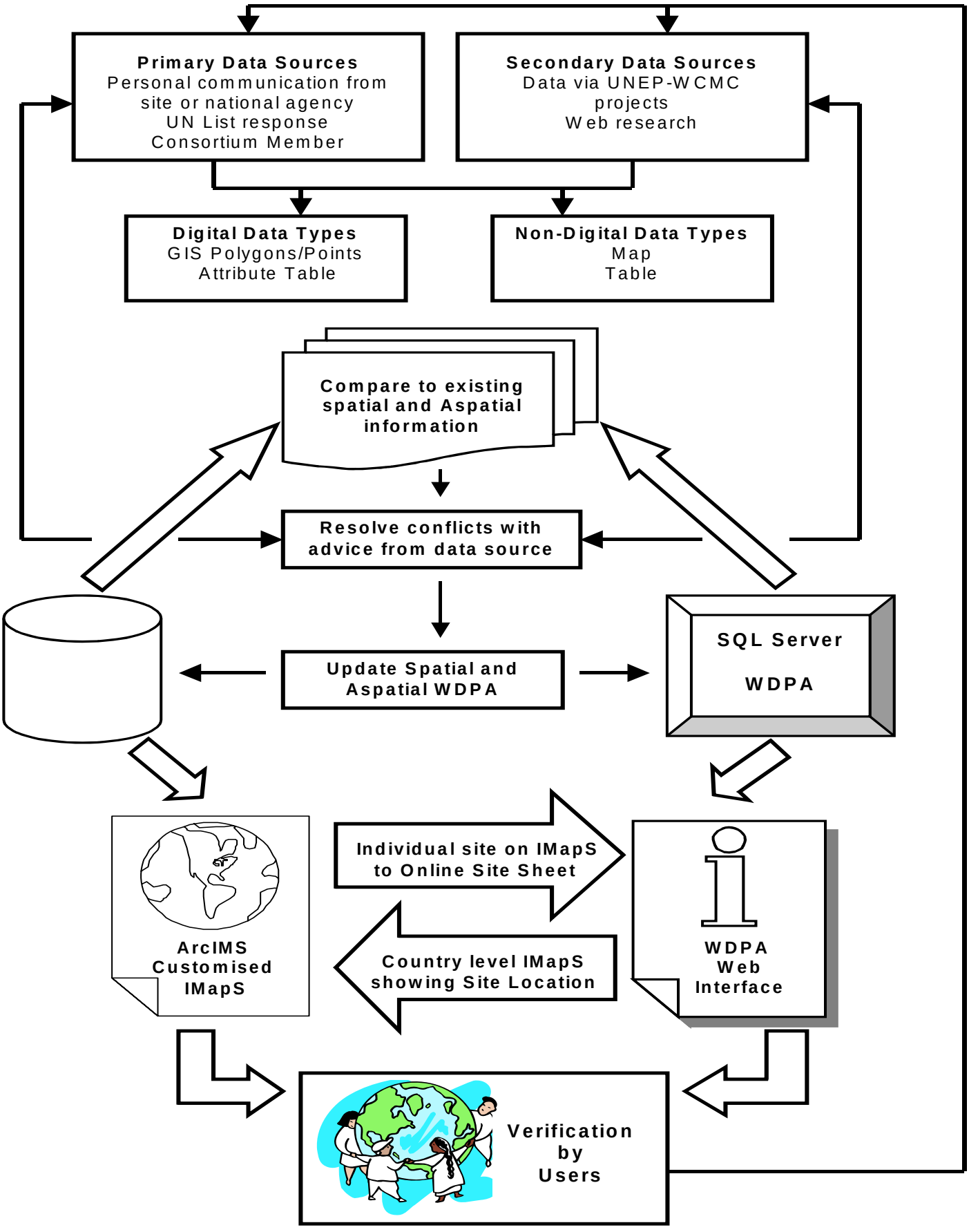
Information about protected areas is received in the form of paper maps, digital data, GPS XY locations, satellite data and text descriptions. In recent years the spatial (particularly boundary) information had increased, a reflection not only of the availability of quality maps but also the expanding network of agencies and individuals who have access to GIS systems. Once the information is received by UNEP-WCMC it often needs some level of processing (for example, registration of a map and digitisation or conversion into useable data format) in order for it to be compared to the existing spatial and aspatial components of the WDPA (Figure 3 or detailed flow diagram depicting WDPA spatial and aspatial updating process see Appendix v). During comparison we may need to further input from the data source where conflicts have arisen. Once this is completed the spatial and aspatial WDPA can be updated.

The need to make this information as widely available as possible is of paramount importance. We use IMapS (customized ArcIMS) to enable user access to the polygon or point (spatial) component of the WDPA and a Web Interface that enables users to view the aspatial component of each site including its historical background (Figure 3). Users of the IMapS and WDPA web interface are strongly encouraged to verify the current status of information by using the Internet, and notifying UNEP-WCMC of any errors or omissions through the email addresses provided. This information is then fed back into the WDPA updating process (Figure 3).

Conclusion

The WDPA Consortium has had a major impact in plugging any remaining gaps in the WDPA. The organisations within the Consortium have particular regional expertise and have provided much useful data where responses have been lacking from the national agencies. This network of contacts also helps to validate the data that is made available on the Internet through the Interactive Map Service (IMapS).

Figure 3: Overview of the WDPA Spatial and Aspatial Updating Process



The WDPA Consortium will continue to benefit in future years from the use of a database into which all members have contributed. The use in analyses of this standardised product will ensure that consistent results are obtained and that there is no conflicting message in the results produced by different organisations.

It is through the development and availability of portable GIS platforms such as ArcGIS or ArcView, the growth of the Internet/email and the ability of the WDPA Consortium and other partners to tap into their in-country expertise that enables the WDPA to continue to be the largest repository of information on global protected areas. The information within the WDPA is being applied to an increasing variety of scientific studies, helping decision makers to consider environmental implications to all aspects of industrial and commercial planning. We appreciate the continued support of ESRI in the management and development of the World Database on Protected Areas.

Acknowledgments

We gratefully acknowledge the continued support of ESRI through UNEP, the WDPA Consortium members, partners and stakeholders.

Appendix

i) Three Major Global (International) Conventions

Convention	Criteria	Definition
World Heritage Convention[1] formed as a result of General conference of UNESCO in November 1972. It noted that cultural heritage and natural beauty are increasingly threatened by destruction the decay but also changing social and economic conditions. The UNESCO World Heritage Convention is a treaty that has become, over the past 30 years, the foremost international legal tool in support of the conservation of the world's cultural and natural heritage.	Natural Sites	Natural features consisting of physical/biological formations, geological and physiographical formations that constitutes habitat of threatened species of animals/plants or natural sites/areas of universal value from point of view of science, conservation or natural beauty.
	Cultural Sites	Monuments, groups of buildings or a site (works of man and/or nature that have outstanding universal value from the historical, aesthetic, ethnological or anthropological points of view.
	World Heritage Site in Danger	To inform the international community of the conditions that threaten the very characteristics for which the site was originally inscribed on the WH list.
Wetlands of International Importance (Ramsar Sites)[2] are as a result of intergovernmental treaty called The Convention on Wetlands of International Importance especially as Waterfowl Habitat, adopted 2nd Feb 1971 at Ramsar, Iran. The original emphasis was on the conservation and wise use of wetlands primarily to provide habitat for water birds.		Under the Convention wetlands are defined as*: "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".* The scope of the convention has now broadened to cover all aspects of wetland conservation, recognising wetlands as ecosystems that are important for biodiversity conservation in general and well-being of human communities.
UNESCO Man and Biosphere Reserve (MAB)[3] origin is the Biosphere Conference organized by UNESCO in 1968. The definition opposite is the basis of the Man and the Biosphere (MAB) programme launched in 1970.		*"Areas of terrestrial and coastal-marine systems, which are internationally recognized for promoting and demonstrating a balanced relationship between people and nature"*. The 3 functions of a biosphere reserve is: Conservation of biodiversity (ecosystems, species), Development in association with the environment and Logistical Support through an international network for research and monitoring

1. Extracted from the UNESCO World Heritage Convention Text 16th November 1972 (http://whc.unesco.org)
2. Extracted from The Ramsar Convention Manual 3rd Edition 2004 (www.ramsar.org)
3. Extracted from Frequently asked questions on biosphere reserves (http://www.unesco.org/mab)

ii) Main Fields and their Structure for National Sites in the WDPA

Field Name	Type	Length (Precision)	Field Contains
SITE_CODE	Long Integer		Unique ID for Site (used in the WDPA)
STATUS_REC	Long Integer		Unique ID for sites historical records
AREANAME	Text (String)	120	Name of site (Official)
DESIGNATE	Text (String)	100	Designation of site e.g. National Park, Nature Reserve etc
STATUS	Text (String)	50	Current Status of Site e.g. Designated, Proposed etc
ISO3	Text (String)	3	ISO Standard Short Country Code
COUNTRY	Text (String)	50	Short Country Name
LAT	Double		Latitude - Location of Site (Decimal Degrees)
LON	Double		Longitude - Location of Site (Decimal Degrees)
IUCNCAT	Text (String)	8	IUCN Management Category (if known)
EST_DATE	Date		Establishment date of site status (current/historical)
AREA_HA	Double		Total area of site in hectares (terrestrial and marine)
ADMIN	Text (String)	200	Administrator - Is the body which appoints/regulates the management or manager of the site in the longer term
MANAGEMENT	Text (String)	200	Is the agency/person who controls or directs the day to day running of the site
OWNER	Text (String)	200	Owner of site
NOTES	Text (String)	254	Additional information can include alternative name for site, extent of marine area or why site was designated etc
SOURCE	Text (String)	254	Source of information
ALT_MIN	Long Integer	7	Minimum elevation in meters of site
ALT_MAX	Long Integer	7	Maximum elevation in meters of site

iii) Main Fields and their Structure for International Sites in the WDPA

Field Name	Type	Length (Precision)	Field Contains
SITE_CODE	Long Integer	7	Unique ID for Site (used in the WDPA)
AREANAME	Text (String)	120	Name of site (Official)
ISO3	Text (String)	3	ISO Standard Short Country Code
COUNTRY	Text (String)	50	Short Country Name
LAT	Double		Latitude - Location of Site (Decimal Degree's)
LON	Double		Longitude - Location of Site (Decimal Degree's)
CONV_FULL	Text (String)	80	Convention Description
CRITERIA	Text (String)	120	Indicates criteria of site e.g. WHC Natural etc
AREA_HA	Double		Total area of site in hectares
EST_DATE	Date		Establishment date of site
NOTES	Text (String)	254	Additional information can include alternative name for site, extent of marine area or why site was designated etc
SOURCE	Text (String)	254	Source taken of information
ALT_MIN	Long Integer	7	Minimum elevation in meters of site
ALT_MAX	Long Integer	7	Maximum elevation in meters of site

iv) Current Members of the WDPA Consortium

American Museum of Natural History

BirdLife International

Conservation International

Convention on Biological Diversity

Fauna and Flora International (FFI)

The Nature Conservancy

UNEP World Conservation Monitoring Centre (UNEP-WCMC)

Wildlife Conservation Society

World Resources Institute

World Wildlife Fund (WWF US)

World Wildlife Fund for Nature (WWF – International)

Other Key Stakeholders include:

Convention on Biological Diversity Secretariat (CBD Secretariat)

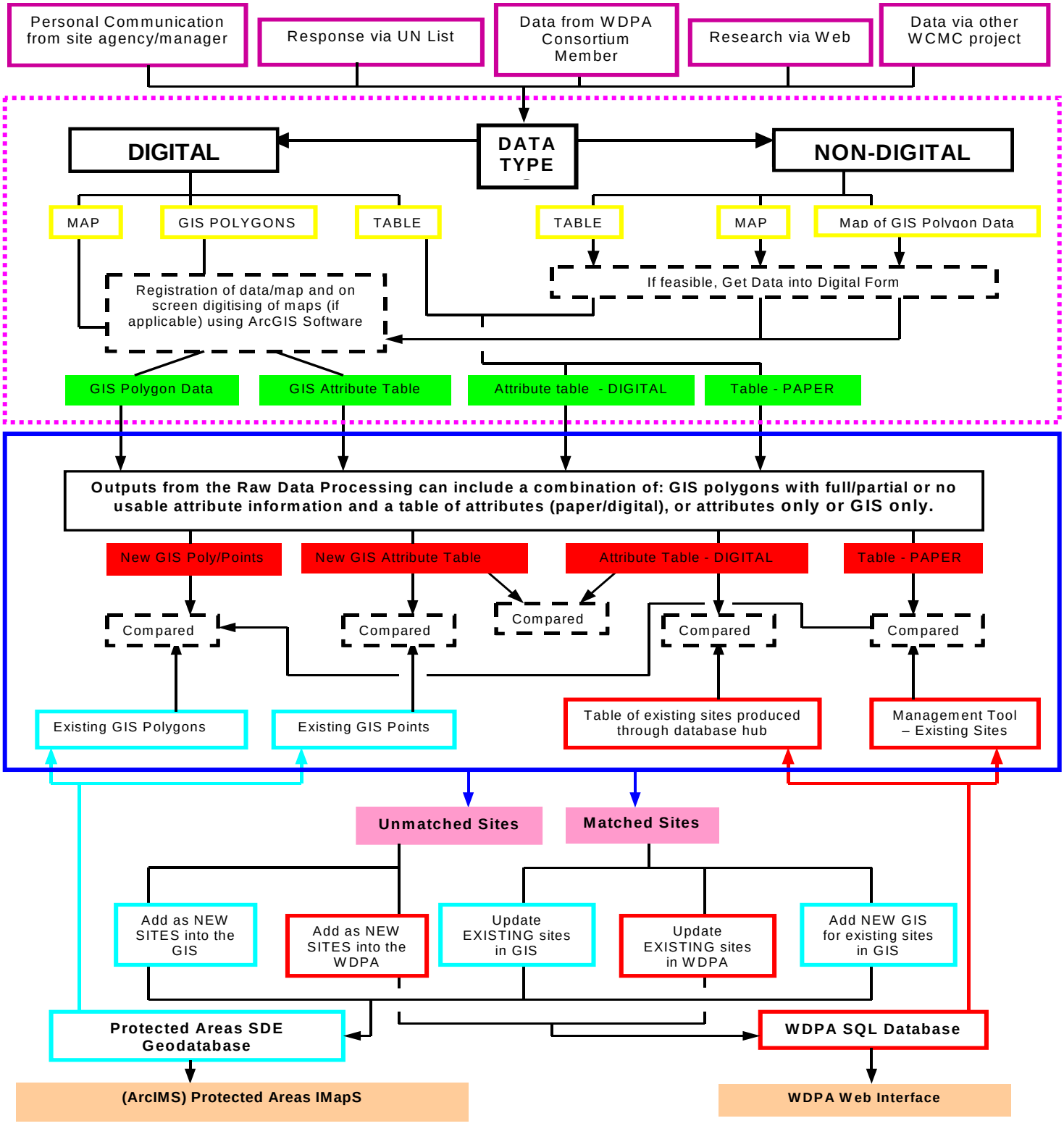
Conservation Biology Institute

Ramsar Convention Secretariat

World Heritage Centre (UNESCO)

Man and Biosphere Program (UNESCO)

V) Detailed Flow Diagram of the WDPA (Spatial and Aspatial) Updating Process



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