1. Methodology and Data Sources

This paper presents the initial results of the first phase of IUCN’s review of the current distribution of natural and “mixed” sites on the World Heritage (WH) List and Tentative Lists. The paper presents a summary analysis of where WH sites occur in the world’s Biogeographical Realms and which Biomes are covered. Much of this is based on the framework provided by Miklos Udvardy in his “A Classification of the Biogeographical Provinces of the World” which was prepared for UNESCO’s Man and the Biosphere Programme, published by IUCN in 1975 with an update in 1982. The database on all natural sites held at the World Conservation Monitoring Centre has used the Udvardy system and is the source of the data used in this paper. Other sources of information used are included in Annex 1.

The second objective of the paper is to present some preliminary conclusions for consideration by the 26th Session of the WH Committee in June 2002 and to outline activities to be undertaken in phase 2 of the review.

2. Review of sites by Biogeographical Realm (Udvardy, 1982).

Udvardy’s system for classification of the world for conservation purposes begins with the Biogeographic Realm (BR). He defined 8 BRs which are continent or sub-continent sized areas with unifying features of geography/fauna and vegetation. The following table outlines the current distribution of natural WH sites in each of the BRs (see also attached map):

<table>
<thead>
<tr>
<th>Realm</th>
<th>No. of Sites</th>
<th>Land Area (Mil.km²)</th>
<th>Density Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nearctic</td>
<td>17</td>
<td>22.9</td>
<td>0.74</td>
</tr>
<tr>
<td>W. Palearctic</td>
<td>31</td>
<td>20.0</td>
<td>1.60</td>
</tr>
<tr>
<td>E. Palearctic</td>
<td>16</td>
<td>34.1</td>
<td>0.47</td>
</tr>
<tr>
<td>Afrotropical</td>
<td>34</td>
<td>22.1</td>
<td>1.54</td>
</tr>
<tr>
<td>Indomalaya</td>
<td>17</td>
<td>7.5</td>
<td>2.26</td>
</tr>
<tr>
<td>Australian</td>
<td>10</td>
<td>7.7</td>
<td>1.30</td>
</tr>
<tr>
<td>Neotropical</td>
<td>32</td>
<td>19.0</td>
<td>1.70</td>
</tr>
<tr>
<td>Oceania</td>
<td>5</td>
<td>1.0</td>
<td>N/A</td>
</tr>
<tr>
<td>Antarctica</td>
<td>6</td>
<td>0.3</td>
<td>N/A</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>168</strong></td>
<td><strong>129.6</strong></td>
<td><strong>0.22 WH sites per million km²</strong></td>
</tr>
</tbody>
</table>

Notes:

1. Oceanian (5 sites) and Antarctic (6 sites) Biogeographic realms are not analyzed further as land area is disproportionally small and site ratios correspondingly skewed.
2. Some sites (e.g. Air Ténéré) overlap more than one realm so total number of sites is inflated.

3. Border of East and West Palearctic is taken to be the Urals / Caucasus.

4. Size of marine zones not accounted for in WCMC area figures.

5. The continent of Antarctica is not included in this analysis as the WH Convention does not legally apply to that continent.

6. Note that the Australian Biogeographic Realm has 10 natural sites but Australia as a State Party has 3 natural sites outside this Realm. It thus would have a density rating of 1.6 if country boundaries were used for the analysis.

7. All numerical figures are provided by WCMC and are rounded.

Results of Realm Analysis:

- All of the world’s Biogeographical Realms have natural sites ranging from highs of 34 in the Afrotropical and 32 in the Neotropical to lows of 5 in Oceania and 6 in the Antarctic Realms.
- Regional variations in terms of natural world heritage sites per million km² of land vary from a high of 2.26 for Indomalaya to a low of 0.47 for the eastern Palearctic.
- Realms that are above the average density of 1.22 natural sites per million km² are: Indomalaya (2.26); Neotropical (1.7), W. Palearctic (1.6); Afrotropical (1.54); and Australian (1.3).
- Two Realms are below the average density: E. Palearctic (0.47) and the Nearctic (0.74).

3. Review of Sites by Biome (Udvardy, 1982).

The Udvardy system also classifies the world into ecosystem types, which he calls Biomes. The distribution of existing WH sites into Udvar’s 14 Biomes is as follows:

<table>
<thead>
<tr>
<th>Biome</th>
<th>No. of WH Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mixed Mt. Systems</td>
<td>30</td>
</tr>
<tr>
<td>Humid Tropical Forests</td>
<td>25</td>
</tr>
<tr>
<td>Tropical Dry/Deciduous Forests</td>
<td>25</td>
</tr>
<tr>
<td>Mixed Island Systems</td>
<td>22</td>
</tr>
<tr>
<td>Subtropical/temperate Rainforest</td>
<td>14</td>
</tr>
<tr>
<td>Warm Desert/semi-deserts</td>
<td>13</td>
</tr>
<tr>
<td>Temperate Broad-leaf Forests</td>
<td>12</td>
</tr>
<tr>
<td>Evergreen sclerophyll Forest/Scrub</td>
<td>9</td>
</tr>
<tr>
<td>Tropical Grassland/Savannas</td>
<td>8</td>
</tr>
<tr>
<td>Temperate Needle-leaf Forests</td>
<td>5</td>
</tr>
<tr>
<td>Lake systems</td>
<td>4</td>
</tr>
<tr>
<td>Tundra/polar desert</td>
<td>4</td>
</tr>
<tr>
<td>Temperate Grasslands</td>
<td>3</td>
</tr>
<tr>
<td>Cold Winter Deserts</td>
<td>0</td>
</tr>
</tbody>
</table>
Notes:

1. Some sites incorporate more than one biome so total number of sites is inflated.
2. Marine/coral reef sites are not fully reflected in Udvardy’s system.
3. Site classifications are best estimations of main values.
4. Sites inscribed for geological criterion (i) are not included.

Results of Biome Analysis:

- All of Udvardy’s Biomes have WH sites except for one (Cold Winter Deserts).
- Mountain systems, tropical humid and tropical dry forests are the three most common biome classifications of existing WH sites.
- Tundra and polar systems are the least common biome classifications occurring on the existing WH List.
- Other biomes not common are Lake systems and Temperate (boreal) forests.
- The Udvardy system of Realm and Biome classification has a number of limitations and does not adequately reflect the full range of habitats occurring in current natural WH sites. Other classification systems are needed to refine and complement the Udvardy approach.

4. Review of Sites by Biogeographical Provinces (Udvardy, 1982).

The Udvardy system subdivides each Biogeographic Realm into 203 Biogeographical Provinces (BP). Each of these BPs is characterised by distinct soil types, climate, fauna and vegetation type. IUCN has conducted a preliminary analysis of how many of these BPs have WH sites and found that 98 BPs are “represented” in the existing WH system. The analysis underlined the findings of the Biome analysis that few BP’s in the polar, lake and tundra biomes have WH sites within them as compared to BPs in humid, subtropical and mixed mountain system Biomes.

IUCN has concluded, however, that further analyses of the coverage of BPs under the WH Convention do not merit further detailed study. Indeed, this level of analysis was originally provided by Udvardy for use in UNESCO’s Man and the Biosphere Programme to determine the “representivity” of the coverage of earth’s biodiversity by the biosphere reserve system. As noted in the background document (WHC-02/CONF.201/6) for the April, 2002 Bureau:

“One of the objectives of the MAB Programme is to create a representative list of sites corresponding to the BPs of the world but this is not the objective of the WH Convention. The Convention deals with sites of outstanding universal value and there are many BPs that do not contain sites of this calibre. Therefore in its analysis of the WH List and Tentative Lists IUCN will seek to identify those geographical areas and ecosystems of the world containing sites of potential outstanding universal value which are not represented on the WH List.”

5. Review of Sites by IUCN Theme Studies.

In 1996, IUCN, in response to the WH Committee’s strategic approach to preparing the “Global Strategy”, began to produce a series of “working papers” which provide overview assessments of major themes relating to natural sites. These papers were conducted in cooperation with the WH Centre, WCMC, and the RAMSAR secretariat and formed the basis for various technical workshops such as held on tropical forests (Berastagi,
Indonesia) and on coral reefs (Viet Nam) (results awaited). Five of these Global Overviews have been completed and distributed to the WH Committee as well as published in various professional Journals and placed on the WHIN website. These deal with the following themes:

- Geological history and fossil sites
- Wetland and marine protected areas
- Forest protected areas
- Human use of natural WH sites, and
- WH sites of importance for biodiversity

Two others in the series are in preparation and are due for completion in 2002:

- Mountain protected areas
- Geological sites, landforms and processes

In addition to updating the five earlier working papers, IUCN also intends to conduct further overviews on other themes such as:

Deserts and grasslands
Polar regions
Boreal forests
Freshwater lakes/wetlands
Summary Overview of all habitat types and biophysical features

The breakdown of the approximate numbers of WH sites used for each of IUCN's Global Theme studies is as follows:

<table>
<thead>
<tr>
<th>IUCN Theme</th>
<th>No. of WH Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial wetlands</td>
<td>60</td>
</tr>
<tr>
<td>Marine and Coastal</td>
<td>56</td>
</tr>
<tr>
<td>Mountains</td>
<td>54</td>
</tr>
<tr>
<td>Tropical forests</td>
<td>49</td>
</tr>
<tr>
<td>Grassland/savannas</td>
<td>20</td>
</tr>
<tr>
<td>Temperate forests</td>
<td>19</td>
</tr>
<tr>
<td>Deserts (non polar)</td>
<td>12</td>
</tr>
<tr>
<td>Subtropical forests</td>
<td>12</td>
</tr>
<tr>
<td>Boreal forests</td>
<td>10</td>
</tr>
<tr>
<td>Sub-polar/polar tundra</td>
<td>7</td>
</tr>
</tbody>
</table>

Notes:
1. Many sites contain more than one theme element so total numbers appear inflated.
2. For Global Theme studies not yet completed, figures are estimates.
3. Geological sites not included in this table.

Results of IUCN Global Theme Study Analyses:

- Samples of virtually all the world’s major natural habitats are found in the current system of WH sites.
- Sites with wetlands, coastal and marine areas, mountains and tropical forest components are the dominant types of biophysical features found in existing WH sites.
Sub-polar/polar tundra sites are the least common habitats/features found in the current list of WH sites.

6. The Special Case of Geological Sites

Palaeontological heritage is a subset of the natural heritage that falls under natural criterion (i) being “outstanding examples representing major stages of earth’s history including the record of life...”. The IUCN Global Theme study on Geological landforms, features and processes is currently undergoing further refinement and peer review for publication in late 2002 but some of the preliminary findings are:

- Global geodiversity at a wide range of scales is very well represented in the current WH site system: a total of 122 natural and mixed WH sites in 59 countries have features of geological significance (i.e. 2/3 of all existing sites).
- 20 of these properties in 10 countries have significant fossil deposits or values recording the evolution of life on earth.
- A total of 39 natural properties in 25 countries have been inscribed under natural criterion (i), 7 of which are inscribed only under this criterion.
- 83 existing WH sites have significant geological values but have not been inscribed under this criterion.
- A surprisingly high number of 41 WH sites worldwide (including several cultural WH sites) have a karst component, 13 of which have been inscribed mainly for karst features.
- Sites with active or dormant volcanoes total 17.
- WH fossil sites currently represent 12 of the 16 periods of geological time (the “missing” Periods are the Silurian, Permian, Eocene, Oligocene and Miocene).

The overall conclusions of the draft Global Theme study have not been formulated as yet but it appears that the current system of WH sites goes a long way in representing the geological history, features and processes that support life on earth.

7. Other Global Classification Systems for Natural Site Assessments

As noted above, the Udvardy system was developed 20 years ago and has a number of limitations in its practical application to analysis of WH sites. Moreover, the IUCN Global Theme studies have developed in a way that is not consistent with Udvardy’s classification resulting in a number of different categories being applied. IUCN intends to discuss with the WHC and the WCMC the adequacy of the Udvardy system against the other systems that have become available over the past 5 years. The aim of the discussion will be to refine/combine the different systems into a more standardised format (for example using the 26 habitat types defined in WWF’s Global 200 Programme) that will allow a harmonised and on-going assessment of the coverage of WH natural sites.

Alternative systems for global conservation frameworks and prioritisation include that developed by Bailey (1998), the WWF Global 200 Ecoregions, Conservation International’s Biodiversity Hotspots, the Endemic Bird Areas of Birdlife International and by the IUCN/WWF Centres of Plant Diversity. Inclusion of a system for marine areas is a particular need. A technical workshop to review and possibly integrate these frameworks as they apply to WH sites will be proposed at a later phase.
8. Preliminary Conclusions and Next Steps

The preliminary analysis above provides sufficient direction to outline where greater attention is needed in defining the location and type of natural sites that are not yet sufficiently reflected on the WH List. It also provides the technical background for the second phase of this study that will focus on reviewing in greater detail the Tentative Lists for natural sites that State Parties have submitted. This second phase would be aiming to suggest which nominations deserve priority attention, thus can also guide the allocation of WH Fund for Preparatory Assistance for preparation of new nominations. The timetable for this second phase is February 2003 in time for consideration at the 27th Session of the Bureau.

IUCN would add the caution, however, that, as for any natural resource, natural WH sites are not distributed evenly around the globe and a perfect “balance” for all areas and types would not therefore be achievable. It follows that, although preference may be given to sites in selected regions or biomes, rigorous standards of evaluations should still be maintained.

For natural sites, the analysis above indicates the following conclusions to take into account in priority-setting:

1. The Biogeographic Realms that have the least density of natural WH sites are the E. Palearctic and the Nearctic. The two Realms with the highest densities are Indomalaya and the Neotropics.

2. The only one of the world’s 14 Biomes not having a WH site is the Cold Winter Desert. Three BRs contain this Biome: Nearctic, Palearctic and Neotropical.

3. Other Biomes in the minority on the existing WH list are Temperate Grasslands, Tundra/Polar deserts, Lake systems and Temperate needle-leafed forests. The most common biomes on the WH List are found in mountains, humid tropical forests, tropical dry forests and mixed island systems.

4. The least common habitat types, as defined by IUCN, present in existing WH sites are sub-polar/polar tundra and boreal forests. The most common occurring habitat types are wetlands, marine and coastal habitats, mountains and tropical forests.

5. A relatively high number of sites with geological values have been inscribed on the WH List and there are few “gaps” in terms of karst systems and fossils sites.

6. There is a need for an expert meeting to review the various global classification schemes and agree on one that would best suit on-going WH natural site analysis. Assuming that resources are available, IUCN will still proceed with its theme studies on habitat types that have not been reviewed as yet, giving particular priority to the polar regions and boreal forests.
Sources of information used for the IUCN review of the World Heritage List and Tentative Lists.

IUCN technical and thematic studies:

- *Global Overview of Wetland and Marine Protected Areas on the WH list* (1997).
- *A Global Overview of Forest Protected Areas on the WH List* (1997).
- *A Global Overview of Protected Areas on the WH List of Particular Importance for Biodiversity* (2000).

Reports from regional meetings and UNESCO World Heritage initiatives to identify potential natural World Heritage Sites:

- Task force to select a global inventory of fossil sites (1991);
- Nordic World Heritage - proposals for new areas for the UNESCO World Heritage List (1996);
- Identification of potential World Heritage sites in Arab countries (1999);
- Tropical Forests (Berastagi meeting report, 1998);
- Identification of WH properties in the Pacific (1999);
- Regional Workshop on the Nomination of World Heritage Sites, Mozambique (2000);
- Seminar on Natural Heritage in the Caribbean, Suriname (2000);
- Central Asian meeting (2000);
- Karst sites in East and South East Asia (2001);
- Tropical marine and coastal sites (Vietnam workshop, 2002).