

The Ecoregional Approach to Identifying Afghanistan's Protected Area Network



Convention on Biological Diversity (CBD) Programme of Work for Protected Areas

National Environmental Protection Agency (NEPA) Islamic Republic of Afghanistan

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December 2009



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For the Programme of Work for Protected Areas (PoWPA)

Analysis and report prepared by the
Wildlife Conservation Society (WCS) for the
National Environmental Protection Agency (NEPA)

Government of the Islamic Republic of Afghanistan

December 2009

DISCLAIMER: This report is made possible by the generous support of the Global Environment Facility (GEF) and the American people through the United States Agency for International Development (USAID). The contents are the responsibility of the Wildlife Conservation Society and do not necessarily reflect the views of GEF, USAID or the United States Government.

ACRONYMS

CBD	Convention on Biological Diversity
CITES	Convention on International Trade in Endangered Species of Flora & Fauna
GEF	Global Environment Facility
IUCN	The World Conservation Union
MAIL	Ministry of Agriculture, Irrigation, and Livestock
NEPA	National Environmental Protection Agency
NPASP	National Protected Areas System Plan
PoWPA	Programme of Works for Protected Areas
PZ	Priority Zone
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
USAID	United States Agency for International Development
WCS	Wildlife Conservation Society
WDPA	World Database on Protected Areas
WWF	World Wildlife Fund for Nature

WWF ECOREGION NAMES AND CODES FOR AFGHANISTAN - QUICK REFERENCE GUIDE

WWF Name	WWF code
Afghan Mountains semi-desert	PA1301
Badghyz and Karabil semi-desert	PA1306
Baluchistan xeric woodlands	PA1307
Central Afghan mountains xeric woodlands	PA1309
Central Persian desert basin	PA1313
East Afghan montane conifer forests	PA0506
Ghorat-Hazarajat alpine meadows	PA1004
Gissaro-Alai open woodlands	PA0808
Hindu Kush alpine meadows	PA1005
Karakoram-West Tibetan plateau alpine steppe	PA1006
North Western Himalayan alpine shrub and meadows	PA1012
Pamir alpine desert and tundra	PA1014
Paropamisus xeric woodlands	PA1322
Registan-North Pakistan sandy desert	PA1326
Sulaiman Range alpine meadows	PA1018
Western Himalayan subalpine conifer forests	IM0502

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Introduction

Ensuring that representatives of ecologically distinct areas are protected is one of the key elements in designing any jurisdiction's network of protected areas. This report is intended to inform this process as part of the preparation of the National Protected Area System Plan (NPASP) for Afghanistan. NPASP development is being conducted with funding from the GEF/UNDP *Supporting Country Action on the CBD Programme of Work on Protected Areas* grant made to Afghanistan's National Environmental Protection Agency (NEPA) and managed by the Wildlife Conservation Society's (WCS) Afghanistan Programme.

This report is the result of initial work undertaken in January/February 2009 by Christopher Shank, a WCS consultant. The recommendations were presented to a group of Government and NGO representatives on 3 March 2009. This was followed up by meetings with the Ministry of Agriculture, Livestock and Irrigation (MoAIL) and NEPA and on 23 and 24 March respectively. Both Ministries were in support of the recommendations made here being included in the first draft of the NPASP. Further review of the draft NPASP may lead to modifications of these recommendations.

Afghanistan's National Target for Protected Areas

In 2002, the Convention on Biological Diversity (CBD) committed itself to achieving a significant reduction of the current rate of biodiversity loss by 2010. In March 2006, the CBD Conference of Parties (COP) passed Decision VIII/15 adopting the *Provisional Framework Reporting on Progress Towards Meeting the Goals and Targets of the 2010 Target*. Target 1.1 of the *Provisional Framework* indicates a goal of effectively conserving at least 10% of each of the world's ecological regions.

Differing figures exist for the surface area of Afghanistan. Here we have opted to use a value of 647,580km ² representing the sum of the areas of the WWF ecoregions as calculated by the WCS GIS system. This approach ensures internal consistency within the NPASP.
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Afghanistan, as a member country of the CBD, must strive to meet the international standard for area protection. This suggests that Afghanistan's national target for area protection should be 10% of each of the country's ecological regions and of the country as a whole. The national goal is to protect at least 10% of the country's surface area (i.e., $\geq 64,758\text{km}^2$).



Figure 1. Proposed 10% protected area land target across Afghanistan - the recommended target for protection within Afghanistan's protected area network.

Figure 1 is a map of Afghanistan with approximately 10% of the country contained in the green dots. This provides an intuitive sense of what protecting 10% of the country will entail.

What are Ecoregions?

Modern concepts of ecological land classification were pioneered by Alfred Russell Wallace in 1867. Over the last 150 years there have been numerous ecological land classifications using specific approaches and terminologies.

Ecological classifications based on differing spatial scales and criteria use diverse terminology such as *ecozones*, *life zones*, *realms*, *biomes*, *biogeographical provinces*, *biogeographic regions*, *natural regions*, *ecoregions* and others. There are many ecological classification systems all of which define and name units differently.

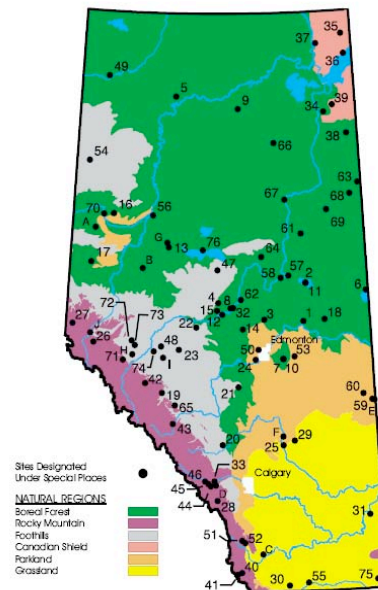
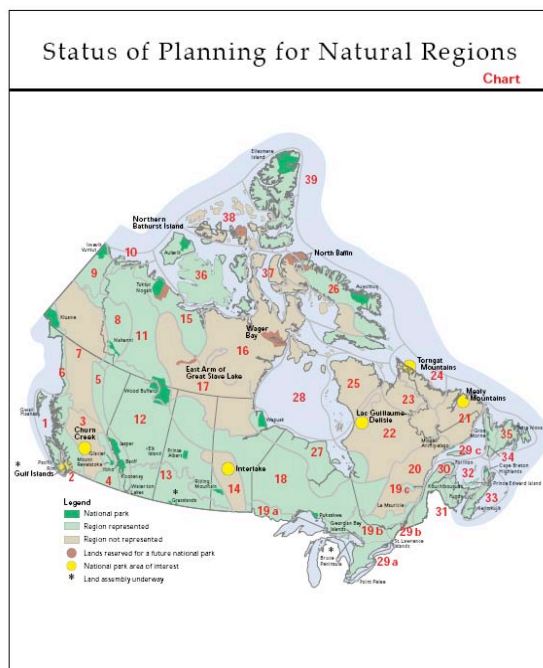
We follow usual convention in using the term "ecoregion" here in two senses. First, an ecoregion is a generic term to denote any unit within an ecological land classification generally characterized by a distinctive combination of landforms, climate, ecological features and plant and animal communities. And second, we use the term *ecoregion* as a specific unit in a particular ecological land classification that is smaller than a *biome*.

Ecoregions, both in the generic and specific senses, are classifications of convenience and their delineation is characterized by a large subjective element. Some classifications are based mostly on plants or animals, some on landscape characteristics, and others on varying combinations of many elements. The spatial correlation between these elements is not perfect making the delineation of ecoregions an imperfect science. Another complication is that environmental conditions across boundaries between ecoregions may change very gradually making it difficult to draw a clear dividing line between the two.

What is the Ecoregional Approach?

Several factors are taken into consideration when choosing areas for protection. These may include scenic beauty, tourism potential, abundant wildlife, presence of rare or valued wildlife, and political boundaries, to name but a few. One of the most widely adopted approaches is to ensure areas are protected that effectively represent the natural values of each ecoregion in a country or other political unit.

Because ecoregions can be defined at different spatial scales, the ecoregional approach often entails protecting representatives that are spatially nested within one another. For example, the Canadian national government has defined a goal having at least one national park in each of Canada's 39 national "natural regions" (Figure 2) (Canadian Heritage, Parks Canada 2005). The Province of Alberta, one of 13 Canadian sub-national jurisdictions and, at 661,185 km², almost exactly the same size as Afghanistan, has set up a protected area system with a goal of protecting representative areas in each of the Provinces "natural subregions" (Figure 3). The result is a multi-layered system with a few large national parks representing large "natural regions" and many smaller provincial parks representing smaller "natural subregions". We use this approach in the NPASP by delineating and setting protection targets for *ecoregions* that are nested hierarchically within higher-level *biomes*.



Why is the Ecoregional Approach Important?

The primary intent of protected areas is to protect biodiversity; i.e., the entire variety of life forms. The biodiversity of any area is comprised of thousands upon thousands of species of bacteria, protists, fungi, plants and animals. Each of these assemblages of organisms is adapted to its environment and is different between ecoregions. It is simply impossible to provide protection for each and every species separately. By protecting representatives of each ecoregion, it is possible in principle to provide protection to some individuals of all species and ecosystems; i.e., the entirety of a country's biodiversity.

This principle is reflected in Article 38 of Afghanistan's Environment Law which states that one of the three objectives of Afghanistan's protected area system is to preserve representative ecosystems and habitats.

How Will the NPASP Incorporate the Ecoregional Approach?

The intent of the NPASP is to provide direction to the process of selecting protected areas to ensure that the NPASP goal is met as fully as possible. The NPASP will direct and

prioritize the research necessary to select these areas for protection. However, the intent of the NPASP is not actually to identify specific areas for protection.

The process of identifying key localities to investigate involves two separate criteria. The first is the identification of Priority Zones which are essentially biodiversity “hotspots” determined largely from species distribution data. Protection of areas within these Priority Zones will protect key biodiversity values. The second is the ecoregional approach which essentially ensures that each of Afghanistan’s unique ecosystems is protected.

Priorities for investigating areas for suitability as protected areas should be based on a combination of Priority Zones and ecoregional targets. First priority must be given to protecting high biodiversity areas. But, as the protected area system develops, efforts must increasingly be shifted to protecting habitats that may not be as high in biodiversity but contain different species. In this way, the unique biodiversity of every major Afghan ecosystem will be protected as well as the areas containing the largest variety of high profile species.

Which Ecoregional Classification System Should Afghanistan Adopt?

Rather than undertake the daunting task of developing a new Afghan ecological classification specifically for the NPASP, we chose to use and modify as needed classifications that have already been developed. The literature was exhaustively searched for existing classifications and 5 potentially useful systems were found. Each of these is described below.

Hassanyar’s Natural Life Zones

Hassanyar (1970) proposed the first known ecological classification specifically for Afghanistan (Figure 4) and the only one written in Dari. Hassanyar distinguished 10 “Natural Life Zones”. Despite its early date, the classification broadly reflects modern understanding of Afghan biogeography, but has some puzzling aspects such as pockets of *Deciduous Forest* scattered through the savannah steppes and a very long, thin strip

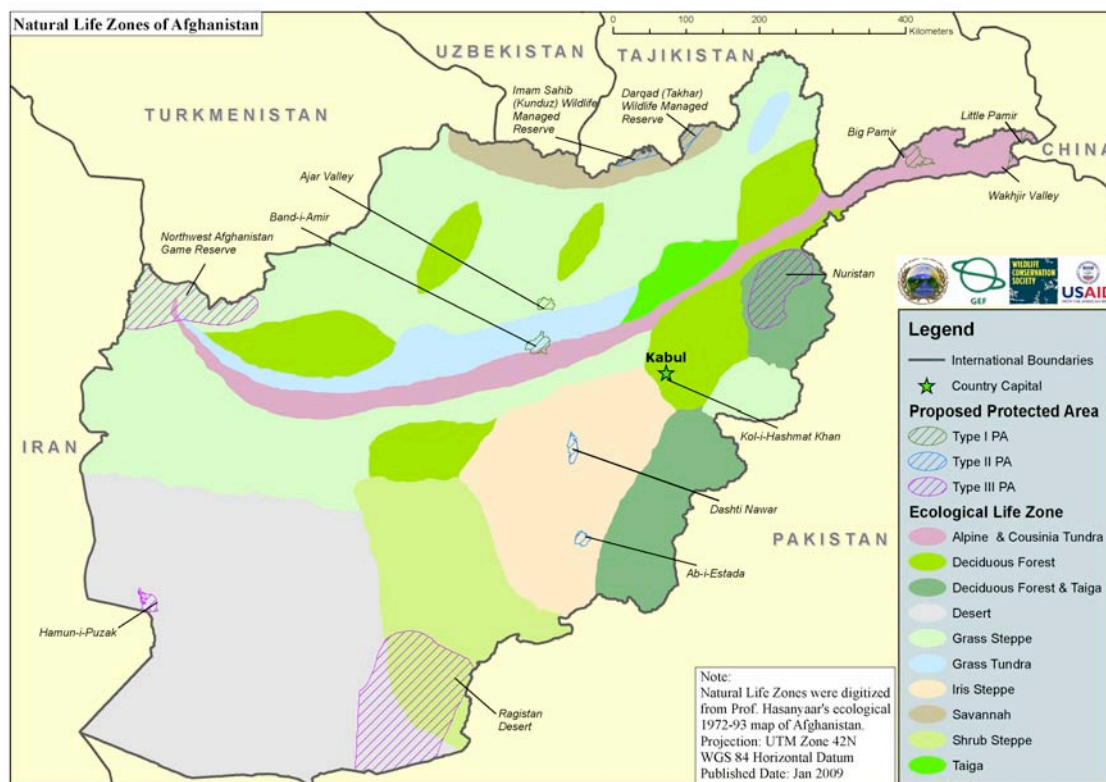


Figure 4. Natural Life Zones of Afghanistan as defined by Hassanyar (1970), with previously proposed “protected areas” classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettement within 10 years) or Type III in purple (possible gazettement within 20 years) (WCS, 2009)¹.

of *Alpine and Cousinia Tundra* though the centre of the country. There have been substantial improvements in the understanding of Afghanistan’s ecology since this system was developed.

Udvardy’s Biogeographical Provinces

For conservationists worldwide, the most influential ecological classification has been Udvardy’s 1975 classification undertaken for UNESCO’s Man and the Biosphere Programme (Udvardy 1975). In this classification, Udvardy divides the world into 8 Biogeographic Realms and 193 Biogeographic Provinces. Each of the Provinces is allocated to one of 14 Biome types found throughout the world.

According to the Udvardy classification, almost all of Afghanistan falls into the Palearctic Realm along with Siberia, Central Asia, the Middle East, Europe and most of China. The exception is the Jalalabad Valley which Udvardy (1975) classifies as within the Indomalayan Realm together with Pakistan, India and Southeast Asia (Figure 5).

¹ At the time of map production (February 2009), Band-i-Amir was still a proposed PA, and had not yet been officially-declared. Hence, its inclusion as a Type I proposed PA on the map.

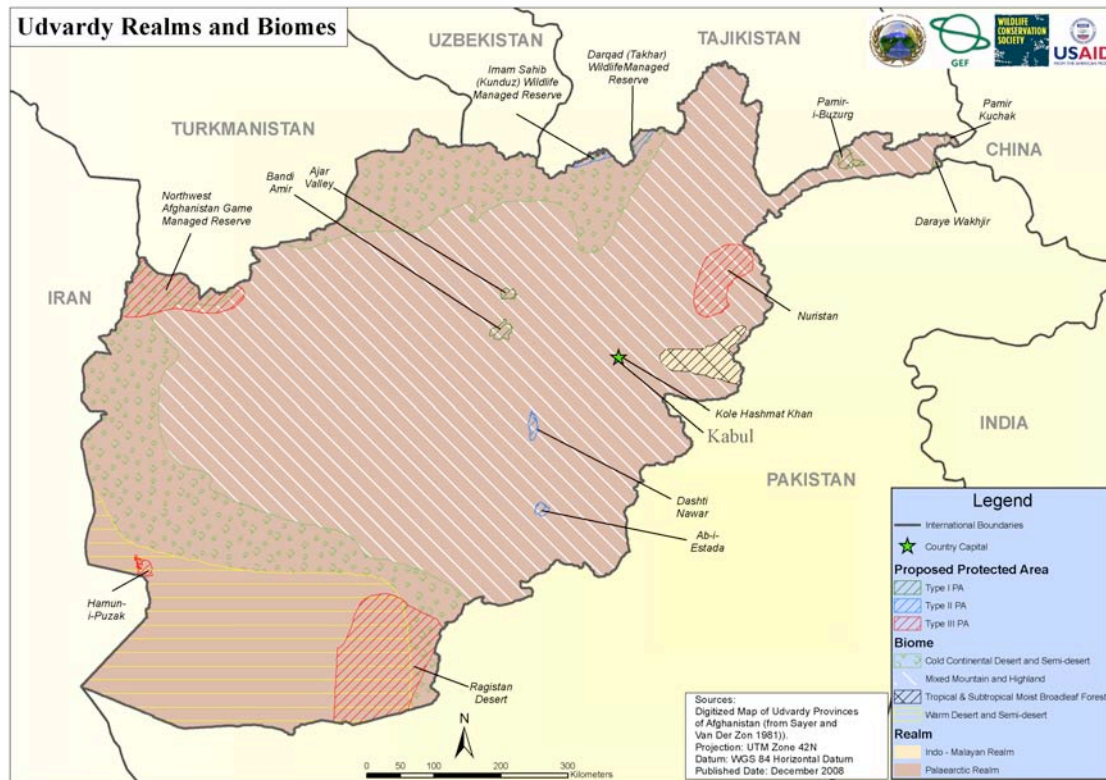


Figure 5. Udvardy's (1975) Biogeographical Realms and Biomes of Afghanistan with previously proposed "protected areas" classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettelement within 10 years) or Type III in red (possible gazettelement within 20 years) (WCS, 2009)

Udvardy's (1975) classification shows Afghanistan as being represented by 7 Biogeographical Provinces (Figure 6) nested within the Biogeographic Realms. Six of these are in the Palearctic Realm (*Anatolian-Iranian Desert*, *Himalayan Highlands*, *Hindu Kush*, *Iranian Desert*, *Pamir-Tien Shan* and *Turanian*) while one is in the Indomalayan Realm (*Indus-Ganges Monsoon Forest*).

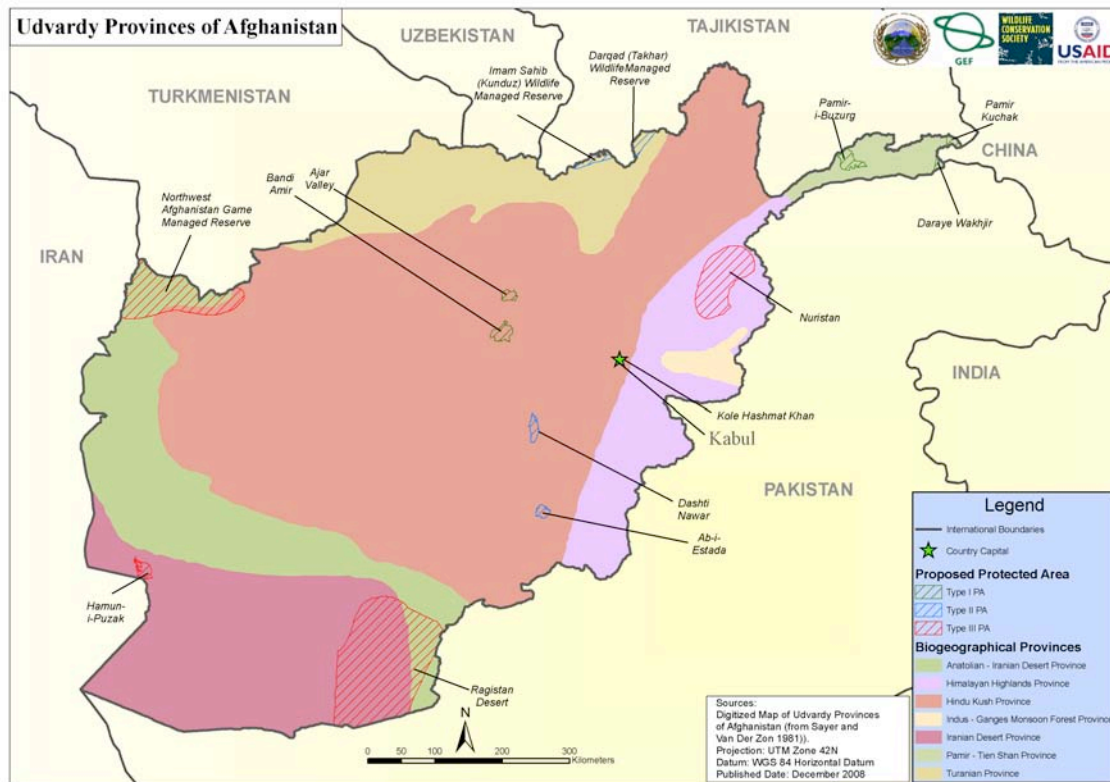


Figure 5. Udvary's (1975) Biogeographical Provinces of Afghanistan, with previously proposed "protected areas" classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettement within 10 years) or Type III in red (possible gazettement within 20 years) (WCS, 2009)

As well, Udvary classifies Afghanistan's Palearctic Realm into four biomes (*Cold Continental Desert and Semi-Desert, Mixed Mountains and Highlands, Warm Desert, and Semi-Desert*) (Figure 5). The small area in the Indomalayan Realm is classified as *Tropical and Subtropical Moist Broadleaf Forest Biome*.

The Udvary classification was intended to be applied at the global and regional scales. Accordingly, the scale is somewhat coarse at the scale of Afghanistan and the Province delineations are only approximate.

Habibi's Biogeographic Regions

Habibi, in his 2003 work on the mammals of Afghanistan, presents a simplified map of Afghanistan's major Biogeographic Regions (Figure 7). This map defines 5 major units (*Central Highlands, Intermontane Basin, Monsoon Forests, Semi-Deserts, and Steppes*). This is a similar to Udvary's Provinces, but more detailed and realistic, although the demarcations are very rough.

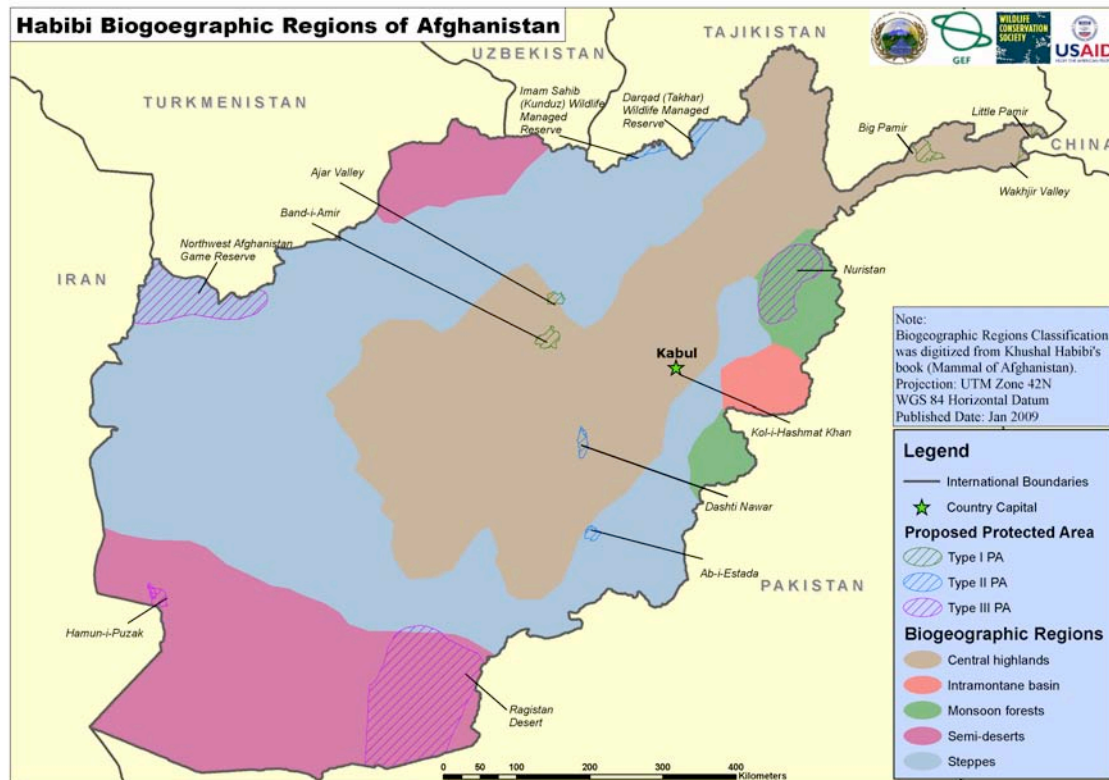


Figure 7. Habibi's (2003) Biogeographic Regions of Afghanistan with previously proposed "protected areas" classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettelement within 10 years) or Type III in purple (possible gazettelement within 20 years) (WCS, 2009)

Freitag's Vegetative Classification

Freitag (1971, 1972) published a very influential vegetative classification of Afghanistan. This classification depicts the potential natural vegetation types of Afghanistan; i.e., the vegetation present prior to extensive land modification. Determining these vegetative communities was sometimes possible only by analyzing relict species and undisturbed vegetation around protected areas such as shrines. The classification is comprised of 15 different plant community types (Fig. 8).

In the 1972 paper, Freitag combined these 15 communities into the following 6 types:

- Semi-desert Vegetation
- Open Deciduous Woodlands
- Evergreen Sclerophyllous Forests and Woodlands
- Evergreen Coniferous Forests and Woodlands
- Subalpine Thickets and Cushion Shrublands
- Alpine Vegetation

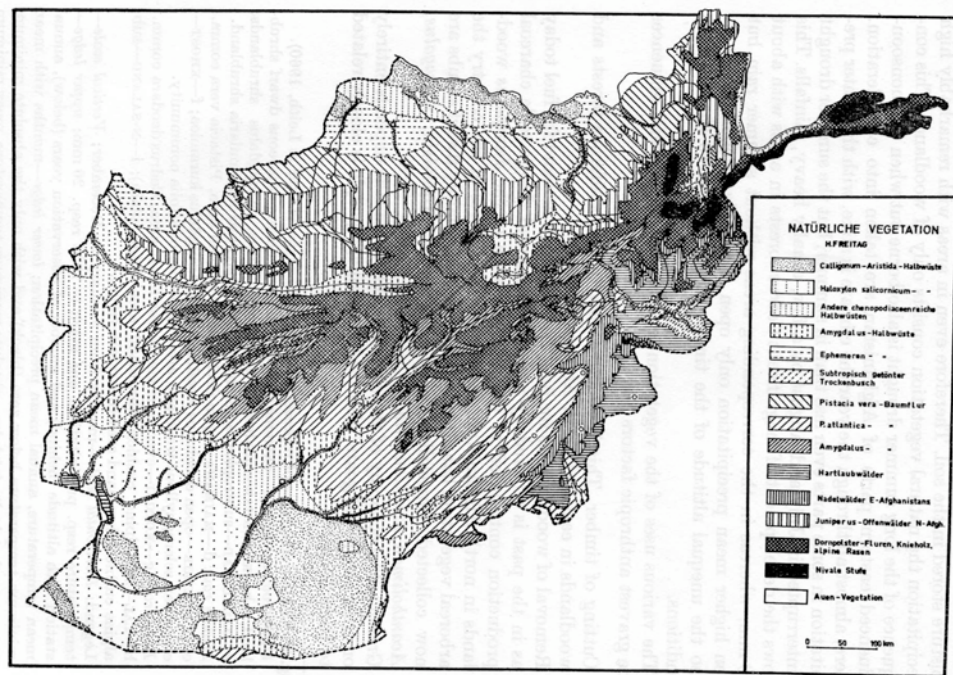


Fig. 3 Natural vegetation of Afghanistan.

Figure 8. Freitag's (1971) natural vegetation classification for Afghanistan.

Breckle's Refinement of Freitag's Vegetative Classification

Breckle (2007) has recently refined Freitag's (1971) potential vegetation classification, translated it into English and provided a clearer map. Breckle's classification contains 17 plant communities (Fig. 9).

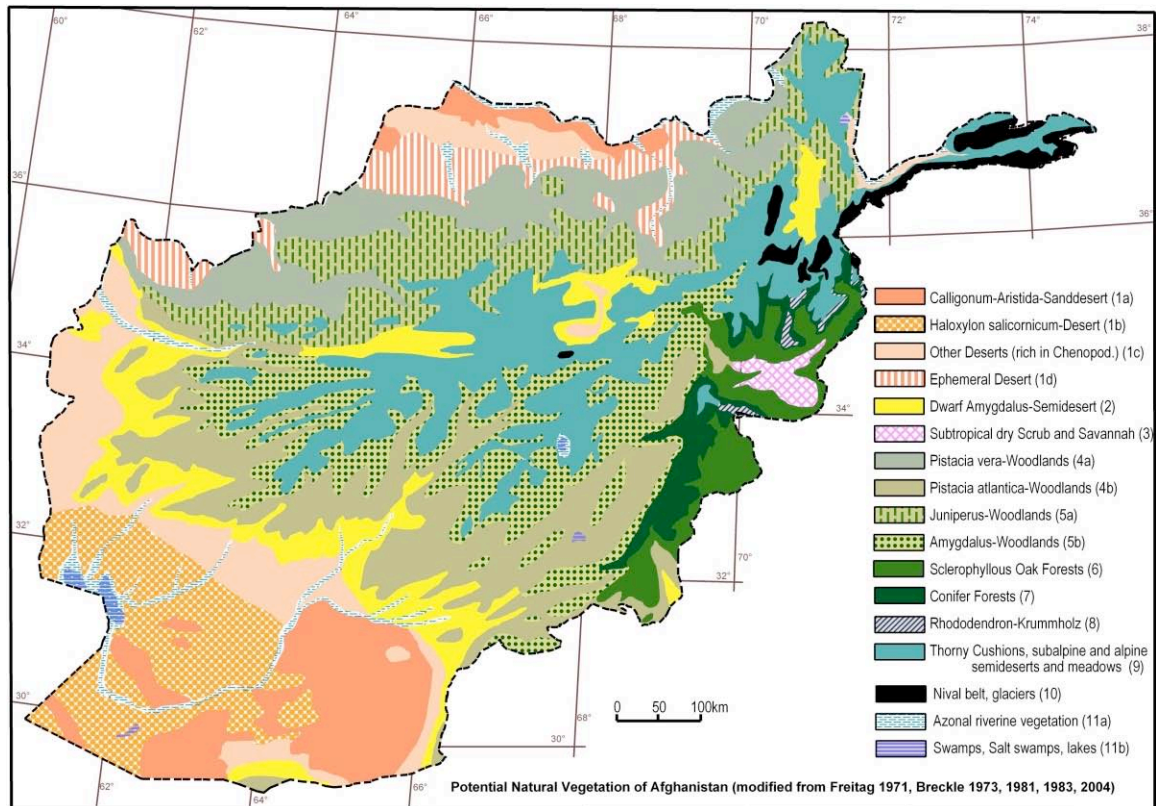


Figure 9. Breckle's (2007) refinement of Freitag's (1971) natural vegetation classification.

WWF Biome and Ecoregion Classification

Olson et al. (2001), on behalf of the Worldwide Fund for Nature (WWF), produced the most influential modern map of the world's ecoregions (Fig. 10). They classify the world into 867 terrestrial ecoregions of which 17 occur in Afghanistan. They also developed a system of freshwater and marine ecoregions which are not considered here. The data for delineating Afghan ecoregions relies heavily on Freitag's vegetation classification but also utilized information from neighbouring countries. Note that the NPASP uses the term "ecoregion" in the generic sense while WWF uses the term to refer specifically to the units of their classification.

The WWF ecoregions are nested into 5 biomes; *Deserts and Xeric Woodlands*, *Montane Grasslands and Shrublands*, *Rock and Ice*, *Temperate Coniferous Forest*, and *Temperate Grasslands, Savannahs and Shrublands* (Fig. 11). These ecoregions are very broad to accommodate classification at the global scale and lose considerable ecological resolution by combining desert with xeric woodland ecoregions.

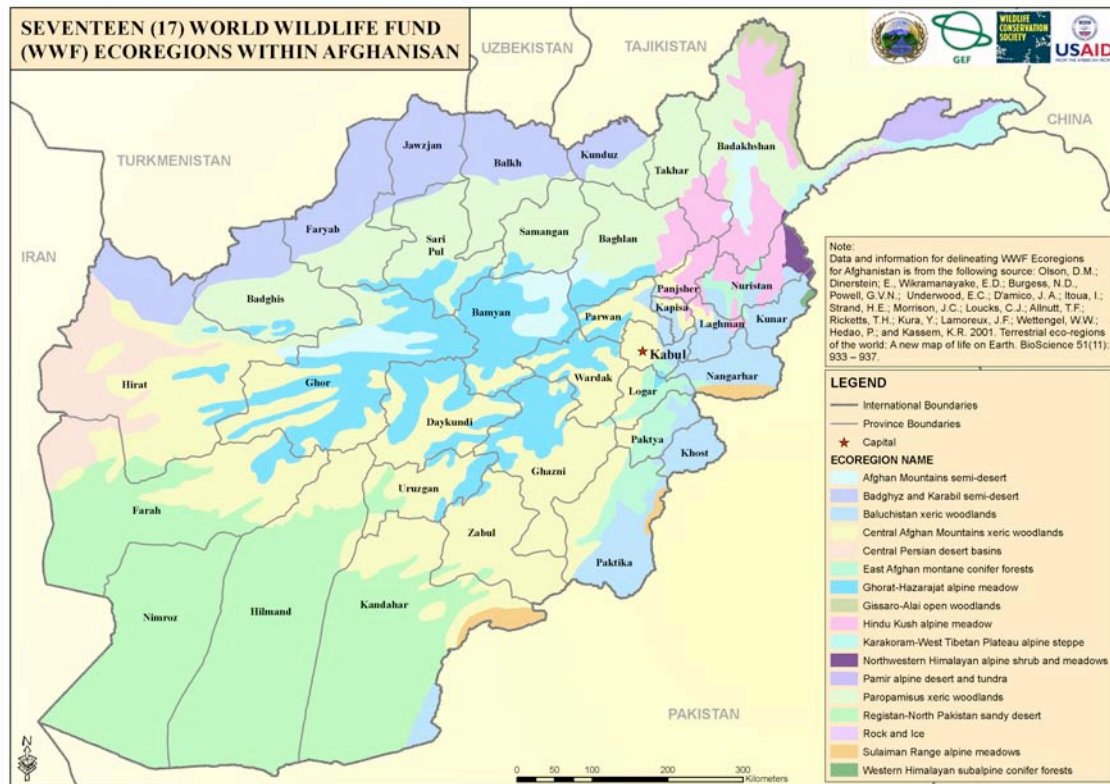


Figure 10. The WWF classification of Afghanistan’s ecoregions (Olson et al. 2001) based largely on Freitag (1971) with previously proposed “protected areas” classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettement within 10 years) or Type III in red (possible gazettement within 20 years) (WCS, 2009).

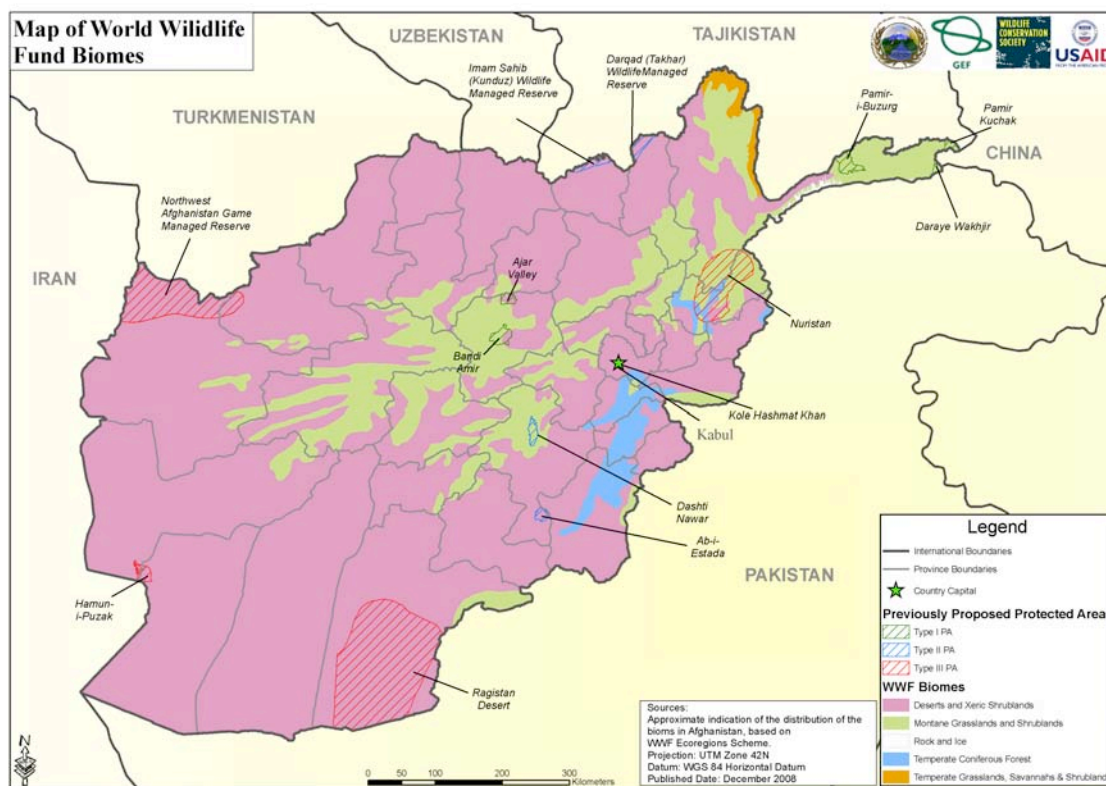


Figure 11. WWF biomes created by amalgamating WWF ecoregions according to the biome classification of the WWF ecoregions (Olson et al. 2001), with previously proposed “protected areas” classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettement within 10 years) or Type III in red (possible gazettement within 20 years) (WCS, 2009)

The WWF ecoregion classification, with its 17 ecoregions in Afghanistan, represents an intuitively appropriate scale of resolution for protected area planning. It is based on the detailed and science-based Freitag vegetative classification and is recognized internationally as an effective classification system. For these reasons, the WWF ecoregion classification has been accepted as the basis for Afghanistan’s ecoregional approach to protected area target setting. However, the WWF biome classification was considered as too coarse for setting upper level targets for Afghanistan.

Biomes based on the Freitag and WWF Classifications

WCS created a new biome level of classification entailing assigning WWF ecoregions to biomes based on Freitag’s (1972) classification potential natural vegetation into “vegetation types”. The assignment of WWF ecoregions to 4 the NPASP biomes is as follows:

Desert and Semi-Desert Biome

- Registan-North Pakistan sandy desert
- Badghyz and Karabil semi-desert
- Central Persian Desert Basins

- Afghan Mountains semi desert

Open Woodlands Biome

- Central Afghan xeric woodlands
- Sulaiman Range alpine meadows
- Paropamisus xeric woodlands
- Gissaro-Alai open woodlands

Closed Woodlands Biome

- Baluchistan xeric woodlands
- East Afghan montane conifer forests
- Western Himalayan Subalpine conifer Forests

Alpine and Subalpine Biome

- Ghorat-Hazarajat alpine meadow
- Karakoram-West Tibetan Plateau alpine steppe
- Hindu Kush alpine meadow
- Northwestern Himalayan alpine shrub and meadows
- Pamir alpine desert and tundra
- Rock and Ice

Details on how the NPASP biomes were derived is presented in Appendix I.

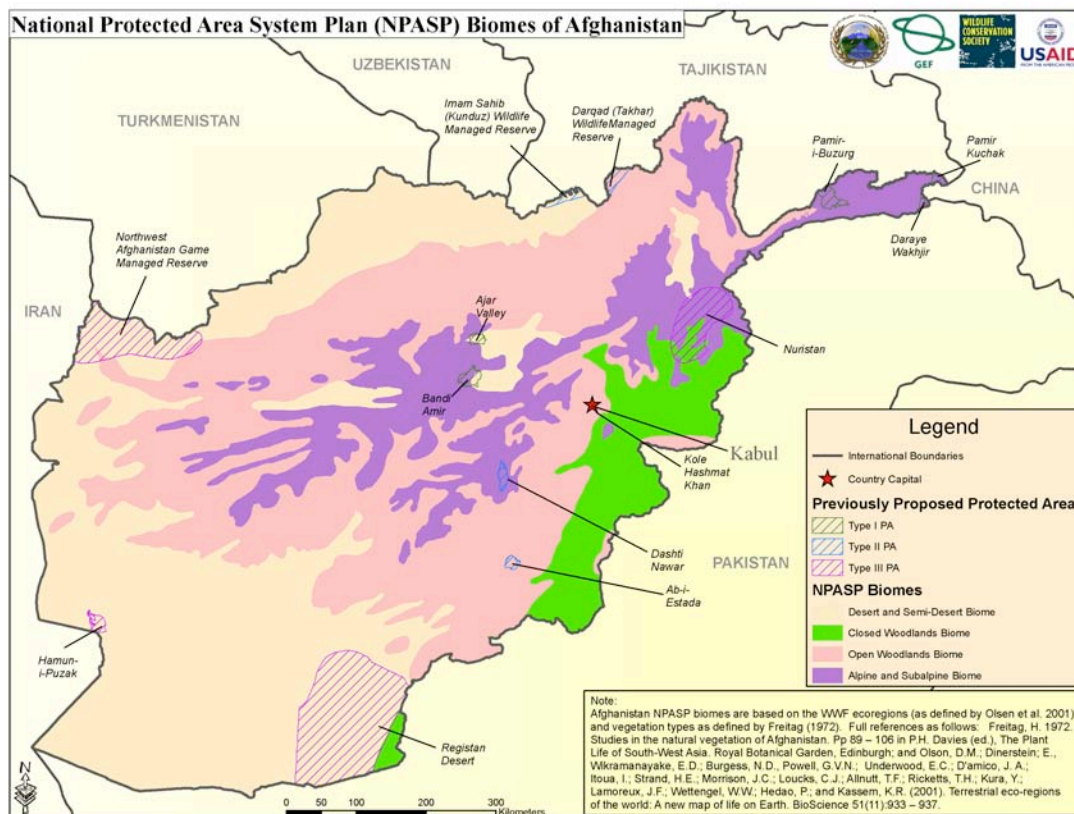


Figure 12. The NPASP biome map created by amalgamating the World Wildlife Fund (WWF) ecoregions according to the vegetation types of Freitag (1971).

The resulting NPASP biome map (Fig. 12) is similar to Habibi's map of Biogeographic Regions, but has more precise delineation of units. It is also similar to the WWF biome map, but with a differentiation between the Desert and Semi-desert biome and the Open Woodland biome which were lumped in the WWF classification.

Many of the decisions made in deriving the NPASP biomes were arbitrary in nature and designed to fit the perceived needs of NPASP planning. The research underlying the ecological classifications is considered by experts to be rudimentary and will likely be revised upon further study. And, it should be understood that ecoregions and biomes are not delineated in nature by precise lines. The ecoregion and biome maps should be used as a flexible guide to planning and are not intended to support rigid requirements. The ecoregional approach should only be used as a general guide to planning Afghanistan's system of protected areas.

WWF Global 200 Ecoregions

Olson and Dinerstein (2002), on behalf of WWF, developed an ecological land classification comprised of 238 of the world's most important ecoregions—the Global 200. This list is represented by 142 terrestrial, 53 freshwater, and 43 marine priority ecoregions which together comprise the most outstanding and representative habitats for Earth's biodiversity.

The Global 200 ecoregions are composites of some of the 867 WWF ecoregions (Fig. 10). Afghanistan is represented by three Global 200 ecoregions (Fig. 13). The Global 200 *Middle Asian montane woodlands and steppe* is an aggregation of the WWF *Gissaro-Ali open woodlands*, *Hindu Kush alpine meadow*, and *Pamir alpine desert and tundra* ecoregions. The Global 200 *Tibetan Plateau steppe* is identical to the WWF *Karakorum-West Tibetan Plateau alpine steppe*. The tiny amount of the Global 200 *Western Himalayan Temperate Forest* is the same as the WWF *Western Himalayan subalpine conifer forest*. Descriptions of the Global 200 ecoregions can be found at http://www.panda.org/about_our_earth/ecoregions/ecoregion_list/.

These Global 200 ecoregions in Afghanistan are not the most endangered ecological areas in the country, so their protection may not be a national priority. But, at the global scale, these are Afghanistan's most important ecosystems for the preservation of Earth's biodiversity, so protecting them is an international priority.

No targets are set specifically for Global 200 ecoregions; however they are taken into consideration in the synthetic ranking system for Priority Zones.

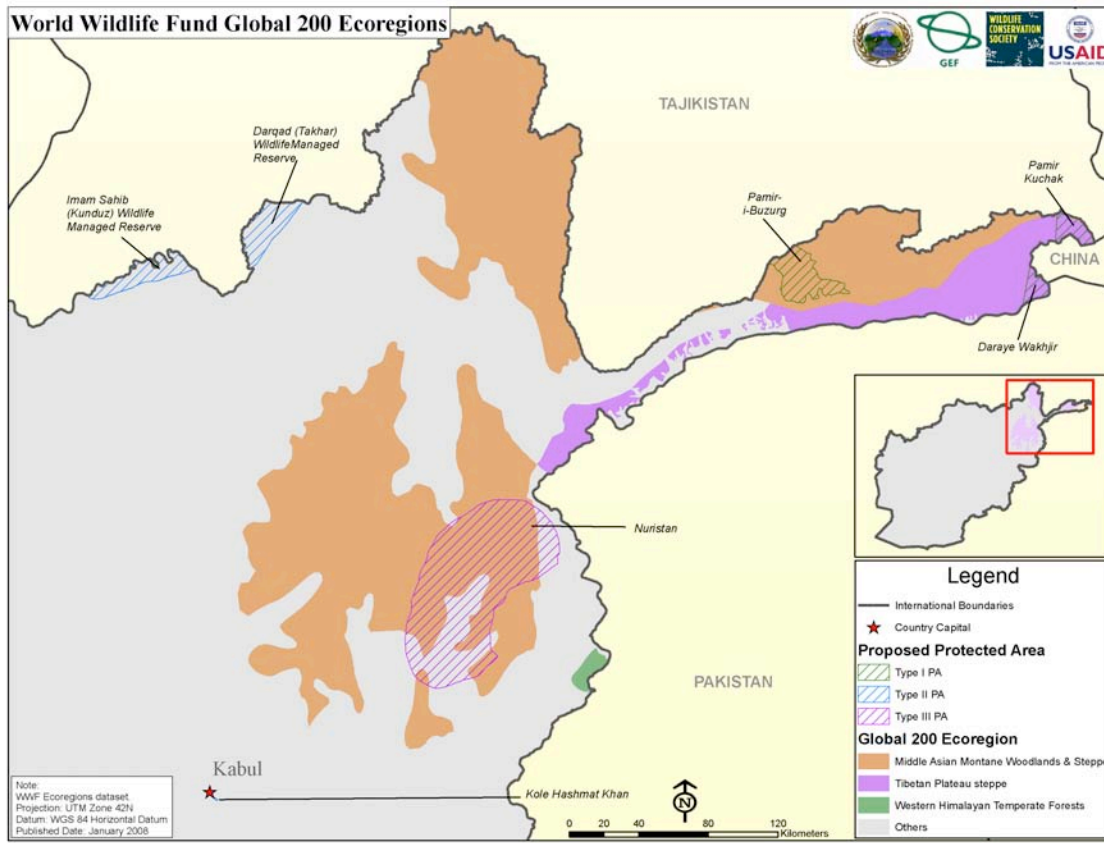


Figure 13. Afghanistan's WWF Global 200 ecoregions (Olson and Dinerstein 2002), with previously proposed "protected areas" classed as either Type I in green (expected to be gazetted within 5 years), Type II in blue (expected gazettelement within 10 years) or Type III in purple (possible gazettelement within 20 years) (WCS, 2009)

Ecoregion and Biome Targets

Afghanistan's long-term objective is to have 10% of the country (ca. 65,000km²) in protected areas by 2030. Establishing a network of proposed protected areas to meet this target will entail distributing the proposed areas in such a way as to provide protection to as many of Afghanistan's ecoregions as possible.

Ecoregional targets are determined to provide focus for action and benchmarks for performance. Well-formulated targets are an effective tool for allocating available financial resources so they will have the largest effect in preserving biodiversity. Determining whether targets are being met is a simple and transparent measure of programme success.

Ecoregional targets should be reviewed and revised as new information becomes available and conditions change.

Target Setting Strategy

The overall objective of the ecoregional approach is to achieve a target of at least 10% of the entire country in protected areas that are representative of the ecological diversity of the entire country. The ideal way to achieve ecological representivity would be to protect at least 10% of each of the 17 WWF ecoregions (Table 1). Because the ecoregions and biomes are hierarchically nested, protecting 10% of each ecoregion would automatically protect 10% of each of Afghanistan's four major biomes and of the entire country.

However, this approach provides little flexibility to address practical problems that always arise in creating protected areas. For a variety of reasons, it will be difficult or impossible to protect 10% of some ecoregions. Reasons include lack of support for protected area development by local communities and politicians, lack of suitable protected area locations, logistical difficulties in working in some areas, and insufficient resources for protected area development. Conversely, it will be easy to create large protected areas in other locations and protecting large areas will be possible. This is particularly feasible in areas with low human populations.

The strategy employed here recognizes these realities by setting modest targets for ecoregions and biomes where creating protected areas is difficult while maintaining the overall goal of protecting 10% of the country's surface area. It does this by setting a modest minimum target for each ecoregion (5%) and biome (7%) with the understanding that if an ecoregion has less than 7% protected, another ecoregion in the biome will need to have more than 7% protected to meet the 7% biome target. The minimum target is intended to ensure that at least some of each ecoregion and biome will be protected.

For example, if a biome were 1000 km², then the ideal amount in protected areas would be 100 km² (10%) and the minimum would be 70 km² (7%). If there were two ecoregions in the biome each of 500 km² and the minimum 5% (25 km²) were protected in one, then at least 45 km² (= 9% of 500 km²) would need to be protected in the other to meet the 7% biome minimum (70 km²).

The second strategy in ecoregional target setting is to set both long term targets and more modest short term targets. Setting short term targets ensures that the process gets underway in a timely manner and provides the opportunity to achieve early success in meeting stated goals.

2030 Targets

The date 2030 was picked as the date by which long-term targets should be achieved. This date, 20 years into the future, provides ample time to meet ambitious goals, yet is not so distant as to invite delay.

2030 Targets are set for 13 of the 17 WWF ecoregions (Table 1). No targets are set for *Rock and Ice*, *Sulaiman Range Alpine Meadows*, *Western Himalayan Subalpine Forests*, and for *Northwestern Himalayan Shrub Alpine Shrub and Meadows* because the aerial extent of each of these is very small in Afghanistan and because they are peripheral ecoregions located on national borders. Nonetheless, protection for these areas should be encouraged as part of larger protected areas in adjacent ecoregions.

The targets for all ecoregions and for all biomes sum to 10% of Afghanistan's surface area; i.e., to 64,758 km². A minimum target of 5% is set for each ecoregion. Similarly, each biome has a minimum target of 7% of the area.

Table 1 also indicates how much of each ecoregion and biome is currently identified as Type I or Type II protected areas. The difference between the areas of the targets and proposed protected areas represents the amount of land that must be identified for new protected areas.

Several protected areas have been proposed for Afghanistan over the past 30 years. These areas differ greatly in the likelihood of their becoming recognized protected areas in the foreseeable future. NPASP has roughly categorized them as Type I (expected to be gazetted within 5 years), Type II (expected gazettelement within 10 years) or Type III (possible gazettelement within 20 years).

Table 1. 2030 protected area targets for ecoregions and biomes.

	Ecoregion or Biome Area (km ²)	Area of Type I PAs (km ²)	Area of Type II PAs (km ²)		Target Minimum(km ²)
Desert and Semi-Desert					
Registan-North Pakistan sandy desert	161346	0	0	at least	8067
Badghyz and Karabil semi-desert	53930	0	582	at least	2696
Central Persian Desert Basins	23079	0	0	at least	1154
Afghan Mountains semi desert	13689	416	0	at least	684
Biome Total	252044	416	582	at least	17643
Open Woodlands					
Central Afghan xeric woodlands	139693	0	284	at least	6985
Paropamisus xeric woodlands	92521	0	616	at least	4626
Sulaiman Range alpine meadows,	4873	0	0		0
Gissaro-Alai open woodlands	3658	0	12	at least	183
Biome Total	240745	0	911	at least	16852
Closed Woodlands					
Baluchistan xeric woodlands	34358	0	0	at least	1718
East Afghan montane conifer forests	12749	0	0	at least	637
Western Himalayan Subalpine conifer Forests	248	0	0		0
Biome Total	47354	0	0	at least	3315
Subalpine and Alpine Vegetation					
Hindu Kush alpine meadow	28260	0	0	at least	1413
Karakoram-West Tibetan Plateau alpine steppe	4973	333	0	at least	249
Northwestern Himalayan alpine shrub and meadows	1770	0	0		0
Ghorat-Hazarajat alpine meadow	66560	477	375	at least	3328
Pamir alpine desert and tundra	5020	720	0	at least	251
Rock and Ice	854	0	0		0
Biome Total	107437	1530	375	at least	7521
NATIONAL TOTAL	647580	1945	1868	at least	64758

2015 Targets

Five-year targets (i.e., 2015) are proposed to focus efforts to identify and protect areas in the near future. The current security situation makes it difficult to work in many areas of the country, so near future efforts are intended to concentrate on the safest regions. These short-term targets (Table 2) are based on the expectation that at least 2% of each of 8 WWF ecoregions (Fig. 14) will be protected by 2015.

This is a very feasible goal. Currently, previously proposed protected areas in these ecoregions represent about 61% of the area (5783 km²) of the 2015 targets.

Table 2. 2015 protected area targets for ecoregions.

	Area (Km2)	Area of PA Type I (km2)	Area of PA Type II (km2)		Target (km2)
Desert and Semidesert					
Badghyz and Karabil semi-desert	53930	0	582	at least	1079
Afghan Mountains semi desert	13689	416	0	at least	684
Open Woodlands					
Paropamisus xeric woodlands	92521	0	616	at least	1850
Gissaro-Alai open woodlands	3658	0	12	at least	73
Subalpine and Alpine Vegetation					
Hindu Kush alpine meadow	28260	0	0	at least	565
Karakoram-West Tibetan Plateau alpine steppe	4973	333	0	at least	99
Ghorat-Hazarajat alpine meadow	66560	477	375	at least	1331
Pamir alpine desert and tundra	5020	720	0	at least	100
Rock and Ice	854	0	0		0
TOTAL	269466	1945	1584		5783

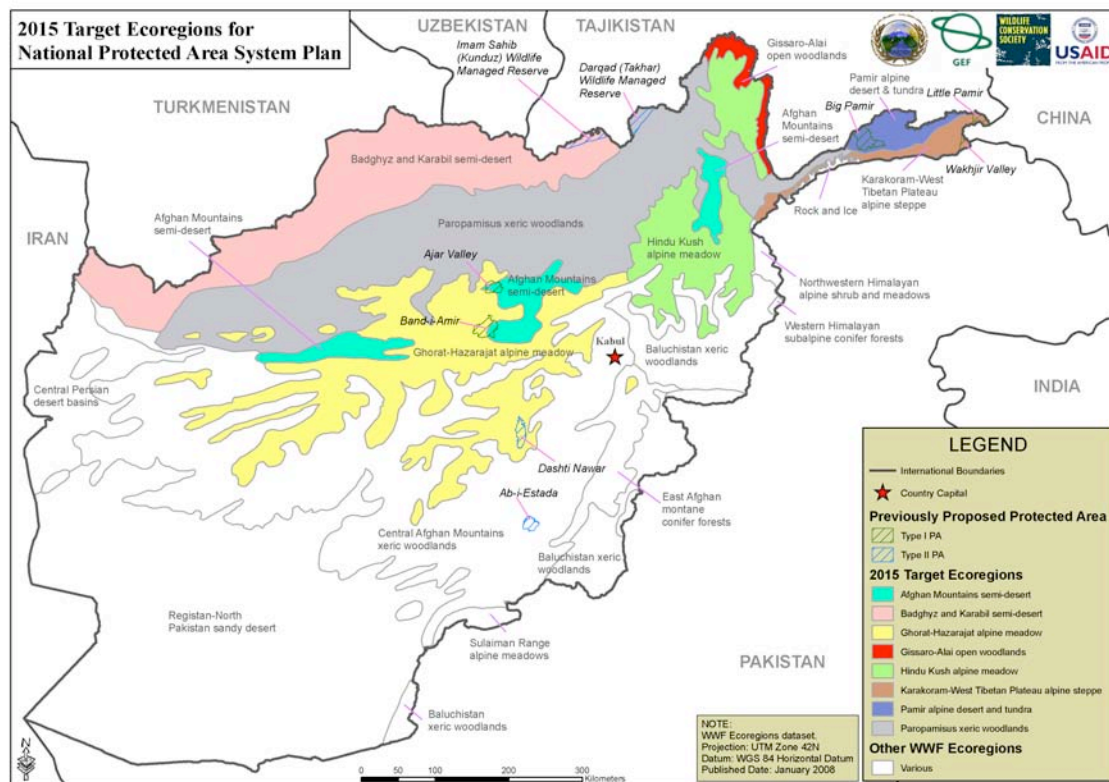


Figure 14. 2015 targets ecoregions with previously proposed “protected areas” classed as either Type I in green (expected to be gazetted within 5 years), or Type II in blue (expected gazettement within 10 years) (WCS, 2009)

Summary and Conclusions

Afghanistan should adopt the WWF ecoregional classification (Olson et al. 2001) as the basis for identifying its ecoregional targets. At a higher spatial hierarchical level, the 17 Afghan WWF ecoregions should be amalgamated into 4 biomes following the vegetation types defined by Freitag (1972). Separate targets should be set for the entire country, biomes and ecoregions and for short- and long-term completion dates; i.e., 2015 and 2030 respectively.

The recommended long-term targets are:

- By 2030, provide effective protection to a minimum of 10% of the Afghan land area ($\geq 64,758\text{km}^2$)
- By 2030, provide effective protection to a minimum of 7% of each of the following major biomes (Fig. 12):
 - Desert and Semi-desert ($\geq 17,643\text{km}^2$)
 - Open Woodlands ($\geq 16,852\text{km}^2$)
 - Closed Woodlands ($\geq 3,315\text{km}^2$)
 - Alpine and Subalpine ($\geq 7,521\text{km}^2$)
- By 2030, provide effective protection to at least 5% of the following 13 of Afghanistan's 17 ecoregions (Fig. 10):
 - Registan-North Pakistan sandy desert ($\geq 8067\text{km}^2$)
 - Badghyz and Karabil semi-desert ($\geq 2696\text{km}^2$)
 - Central Persian Desert Basins ($\geq 1154\text{km}^2$)
 - Afghan Mountains semi desert ($\geq 684\text{km}^2$)
 - Central Afghan xeric woodlands ($\geq 6985\text{km}^2$)
 - Paropamisus xeric woodlands ($\geq 4626\text{km}^2$)
 - Gissaro-Alai open woodlands ($\geq 183\text{km}^2$)
 - Baluchistan xeric woodlands ($\geq 1718\text{km}^2$)
 - East Afghan montane conifer forests ($\geq 637\text{km}^2$)
 - Hindu Kush alpine meadow ($\geq 1413\text{km}^2$)
 - Karakoram-West Tibetan Plateau alpine steppe ($\geq 249\text{km}^2$)
 - Ghorat-Hazarajat alpine meadow ($\geq 3328\text{km}^2$)
 - Pamir alpine desert and tundra ($\geq 251\text{km}^2$)

The recommended short-term targets are:

- By 2015, provide effective protection to at least 2% of the following 8 ecoregions (Fig. 14):
 - Badghyz and Karabil semi-desert ($\geq 1079\text{km}^2$)
 - Afghan Mountains semi desert ($\geq 684\text{km}^2$)
 - Paropamisus xeric woodlands ($\geq 1850\text{km}^2$)
 - Gissaro-Alai open woodlands ($\geq 73\text{km}^2$)
 - Hindu Kush alpine meadow ($\geq 565\text{km}^2$)
 - Karakoram-West Tibetan Plateau alpine steppe ($\geq 99\text{km}^2$)

- Ghorat-Hazarajat alpine meadow ($\geq 1331 \text{ km}^2$)
- Pamir alpine desert and tundra ($\geq 100 \text{ km}^2$)
- There are no biome targets for 2015.

The ecoregional targets will be merged with the Priority Zones to develop a list of priority areas for further investigation. These targets, along with other components of the NPASP, should be reviewed periodically and amended as required.

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Appendix I. Derivation of NPASP Biomes

This Appendix provides detailed information on how the NPASP biomes were delineated. The intent is to have WWF biomes nest hierarchically in the NPASP biomes. WWF provided biomes of nested ecoregions, but these were considered to be too in coarse, as noted in the text.

The NPASP biomes were based on the “vegetation types” into which Freitag (1972) categorized vegetation communities (Freitag 1971, 1972). Freitag’s maps are labelled in German, but Breckle (1972) translated the German community names into English in his redrawing of Freitag’s (1971) map. Breckle’s English names are used here.

Freitag’s vegetation types were renamed and largely accepted. There were four major deviations:

- 1) Freitag’s Evergreen Sclerophyllous Forests and Woodlands type and Eastern Coniferous Forest and Woodlands type were combined into an NPASP Closed Woodlands Biome.
- 2) Freitag’s Subalpine Thickets and Cushion Shrublands type and Alpine Vegetation type were combined into an NPASP Alpine and Subalpine Biome.
- 3) Freitag recognized a Subtropical dry Scrub and Savannah type in the Jalalabad Valley corresponding to the small intrusion of the Indo-Malayan Realm into the Palearctic Realm comprising the remainder of Afghanistan as noted by Udvardy (1975). This is a potentially important contributor to Afghanistan’s biodiversity, but WWF does not delineate this area in their ecoregion maps but include it the Baluchistan xeric woodlands ecoregion. Accordingly, the NPASP ecoregions and biomes do not reflect this potentially ecologically important region. Future revisions of the NPASP should address this issue.
- 4) Freitag recognized an Azonal Riverine vegetation type occurring along the Amu Darya and some of the major rivers running into it. This type is not reflected in the WWF ecoregions and therefore is not considered in the NPASP. However, in searching for potential sites for protected areas, special attention should be given to riparian habitats.

Table 1 shows the correspondence between Freitag’s types and communities, WWF ecoregions and NPASP biomes. For the most part, WWF ecoregions could be assigned unambiguously to one or more of the Freitag vegetative communities and Freitag vegetation types.

Table 1. Correspondence between Freitag's (1972) vegetation types, Freitag's (1971, 1972) communities, WWF's ecoregions and NPASP biomes. Rows are coloured by NPASP biome.

Freitag (1972) Vegetation Type	Freitag (1971, 1972) community (Breckle's 1972 English name)	WWF Ecoregions	NPASP Biomes
Semi-Desert	Calligonum-Aristida Halbwüste (Calligonum-Aristida Sanddesert)	Registan-North Pakistan sandy desert	Desert and Semi-Desert
Semi-Desert		Badghyz and Karabil semi-desert	Desert and Semi-Desert
Semi-Desert	Haloxylon salicornicum Halbwüste (Haloxylon salicornicum Desert)	Registan-North Pakistan sandy desert	Desert and Semi-Desert
Semi-Desert	Andere chenopodiacaenreiche Halbwüste (Other Desert [rich in Chenopod.])	Registan-North Pakistan sandy desert	Desert and Semi-Desert
Semi-Desert	Andere chenopodiacaenreiche Halbwüste (Other Desert [rich in Chenopod.])	Central Persian Desert Basins	Desert and Semi-Desert
Semi-Desert	Andere chenopodiacaenreiche Halbwüste (Other Desert [rich in Chenopod.])	Badghyz and Karabil semi-desert	Desert and Semi-Desert
Semi-Desert	Ephemerale Halbwüste (Ephemeral Desert)	Badghyz and Karabil semi-desert	Desert and Semi-Desert
Semi-Desert	Amygdalus Halbwüste (Dwarf Amygdalus-Semidesert)	Afghan Mountains semi desert	Desert and Semi-Desert
Semi-Desert	Amygdalus Halbwüste (Dwarf Amygdalus-Semidesert)	Registan-North Pakistan sandy desert	Desert and Semi-Desert
Open Deciduous Woodlands	Pistacia atlantica Baumflur (Pistacia atlantica Woodlands)	Central Afghan xeric woodlands	Open Woodlands
Open Deciduous Woodlands	Pistacia atlantica Baumflur (Pistacia atlantica Woodlands)	Baluchistan xeric woodlands	Closed Woodlands
Open Deciduous Woodlands	Pistacia vera Baumflur (Pistacia vera Woodlands)	Paropamisus xeric woodlands	Open Woodlands
Open Deciduous Woodlands	Pistacia vera Baumflur (Pistacia vera Woodlands)	Badghyz and Karabil semi-desert	Desert and Semi-Desert
Open Deciduous Woodlands	Amygdalus Baumflur (Amygdalus Woodlands)	Central Afghan xeric woodlands	Open Woodlands
Open Deciduous Woodlands	Amygdalus Baumflur (Amygdalus Woodlands)	Sulaiman Range alpine meadows	Open Woodlands
Woodlands	Hartlaubwälder (Sclerophyllous Oak Forests)	Baluchistan xeric woodlands	Closed Woodlands
Eastern Coniferous Forest and Woodlands	Nadelwälder E-Afghanistans (Conifer Forests)	East Afghan montane conifer forests	Closed Woodlands
Eastern Coniferous Forest and Woodlands	Nadelwälder E-Afghanistans (Conifer Forests)	Western Himalayan Subalpine conifer Forests	Closed Woodlands
Eastern Coniferous Forest and Woodlands	Juniperus Offenwälder N-Afgh. (Juniperus Woodlands)	Paropamisus xeric woodlands	Open Woodlands
Eastern Coniferous Forest and Woodlands	Juniperus Offenwälder N-Afgh. (Juniperus Woodlands)	Gissaro-Alai open woodlands	Open Woodlands
Subalpine Thickets and Cushion Shrublands	Dornpolster-Fluren, Knieholz, alpin Rasen (Thorny Cushions, subalpine and alpine semideserts and meadows)	Ghorat-Hazarajat alpine meadow	Alpine and Subalpine
Subalpine Thickets and Cushion Shrublands	Dornpolster-Fluren, Knieholz, alpin Rasen (Thorny Cushions, subalpine and alpine semideserts and meadows)	Karakoram-West Tibetan Plateau alpine steppe	Alpine and Subalpine
Subalpine Thickets and Cushion Shrublands	Dornpolster-Fluren, Knieholz, alpin Rasen (Thorny Cushions, subalpine and alpine semideserts and meadows)	Hindu Kush alpine meadow	Alpine and Subalpine
Subalpine Thickets and Cushion Shrublands	Dornpolster-Fluren, Knieholz, alpin Rasen (Thorny Cushions, subalpine and alpine semideserts and meadows)	Northwestern Himalayan alpine shrub and meadows	Alpine and Subalpine
Alpine Vegetation	Nivale Stufe (Nival Belt)	Pamir alpine desert and tundra	Alpine and Subalpine
Alpine Vegetation	Nivale Stufe (Nival Belt)	Karakoram-West Tibetan Plateau alpine steppe	Alpine and Subalpine
Alpine Vegetation	Nivale Stufe (Nival Belt)	Rock and Ice	Alpine and Subalpine
None	Subtropical Detönter Trockenbusch (Subtropical dry Scrub and Savannah)	Baluchistan xeric woodlands	None (contained in Closed Woodland)
None	Auen - Vegetation (Azonal riverine vegetation)	Several ecoregions	None (contained in various biomes)

There are two major exceptions in which WWF ecoregions fall into two different Freitag vegetation types:

- 1) The WWF Badghys and Karabil semi-desert ecoregion covers several of the Freitag Semi-Desert types, but also a significant portion of *Pistacia vera* Woodland (Open Woodland vegetation type) in northern Badghys Province. This was ignored and the entire Badghys and Karabil semi-desert ecoregion was assigned to the NPASP Desert and Semi-Desert Biome.
- 2) The WWF Baluchistan xeric woodland ecoregion corresponds closely to Freitag's Evergreen Sclerophyllous Forests and Woodlands type, but a small portion of *Pistacia atlantica* Woodlands is located in southern Paktika Province. This was ignored and the entire WWF Baluchistan xeric woodland ecoregion was assigned to the NPASP Closed Woodland Biome.