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Beitillu Nature Reserve
MASTERPLAN

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1 Summary

The story telling surrounding the Beitillu nature reserve dates it back to the British Mandate over Palestine[1]. Throughout the conflicts over the territory, it has been managed by different entities until today. Designated as a nature reserve by the Ministry of Agriculture and falling under the management of the Environmental Quality Authority, it is now managed by the Palestinian authority.

With a surface of 3.6 km² of land owned by the surrounding municipality of *Al Ittihad*, it comprises woodland habitats, agricultural fields (1500m²) and a stream (permanent most of the year). This rare habitat and surface water area make it home to numerous birds, plants, amphibians, reptiles and mammals species, some of them endangered or vulnerable according to the IUCN assessment. Traces of Roman farms can be seen on site, adding to the cultural heritage of the area. Though a small nature reserve, Beitillu has high conservation value as part of a broader ecological corridor.

Every week, the reserve welcomes two hundred visitors seeking recreational activities on site[2]. Water resources are used for agriculture all year long and household needs during the drier months of summer. Beitillu is therefore a significant space for wildlife conservation but also a place of significant social and economic activities.

This masterplan aims at helping both aspects coexist through the pursuit of four main objectives:

- Wildlife conservation
- Environmental education and awareness
- Sustainable use of resources for the sake of visitors and local communities
- Safe outdoor activities for visitors

The achievement of such objectives relies on a thorough ecological survey of habitats and species to assess populations health and need for conservation; an outreach program to schools, visitors, clubs, and the general public regarding environmentally sound behavior and good practices; valuation of local products and local heritage; and a stress on research potentials at a local, transboundary, regional and international scale.

This plan requires 2 years of actual operations and about a year of previous organization and resource mobilization. It will thus run on 2 to 3 years and shall result in the implementation of a monitoring and an administrative scheme for the reserve decided through collegial decision-making processes. The existence of a monitoring scheme will be used for educational purposes at different academic levels. Cooperation shall be reinforcing regionally to help build comparative and complementary knowledge regarding wildlife species. The Beitillu nature reserve as a managed protected area will help build up ecotourism in the West Bank thanks to the development of marked hiking trails and educational guided walks.

At the end of the implementation period, a new management plan made of refined monitoring schemes for wildlife and more ambitious goals for environmental education, development and cooperation should be produced.

[1] Source: interview with Imad Atrash
[2] From the IUCN report *Assessment of Palestinian Nature Reserves*, 2006

2 Development and purpose of the plan

2.1 The ecological corridor of the area

2.1.1 Description and background

The main threat to biodiversity conservation in the Mediterranean area is habitat fragmentation (OECD). The political situation between Israel and the Occupied Palestinian Territories strengthen such threats (separation wall, fenced border, multiplication of roads and urban areas). The response to such fragmentation is the creation and conservation of ecological corridors presenting coherence in terms of species mobility, resources exchange, habitats diversity and connectivity, and shelter from neighboring anthropic areas (urban centers, agricultural fields, etc.)

The Beitillu protected area is located north-west of Ramallah, in the Ramallah governorate, and it is part of the *Mediterranean desert corridor*[3] connecting the three biogeographical zones (Mediterranean, Irano-Turanean and Saharo-Arabian) of Israël and the OPT on a North to South axis. Among the diversity of biogeographic patterns in Palestine, Beitillu's landscape is part of the Western slopes which biodiversity profile is influenced by a Mediterranean climate, and a mainly Terra Rossa soil on which woodland habitats develop.

The climate is characterized by hot and dry summers, and cool winters. Rain is limited to about 4 to 6 months a year, with up to 65% of precipitation happening in winter. The intensity of the sun is high causing high rates of evapotranspiration. Due to its topography and pluviometry, the region is subject to erosion and desertification. Such conditions suit mainly a vegetation made of shrubs and trees with access to deep water resources.

The ecological corridor that comprises the Beitillu reserve is home to numbers of Mediterranean endemic species whose habitats have shrunk in the whole region due to urbanization dynamics, demographics, land use pressures and land degradation, pollution, and other threats such as hunting and poaching. It also shelters endemic species distributed solely on the Arabian peninsula with subspecies endemic to hilly ecosystems like Beitillu such as the iconic *G. g. gazella*[4].

The transboundary situation of the corridor along the separation between Israël and the OPT requires coordination to fight threats and to implement efficient conservation. The establishment of a management plan for the Beitillu reserve represents an operational step towards addressing wildlife conservation in the OPT and aligning to regional dynamics towards conservation.

2.1.2 Building a nature reserve in Mediterranean countries

Nature reserves exist all over the world, with different sets of rules applying on such territories depending on the objectives pursued. The historical example for nature reserves are the US National Parks that were created in the 19th century as haven for wilderness conservation, looking at conserving a genuine, untouched territory from human activities. Such models correspond to a certain vision of nature and reinforce the duality between humans and nature. Nature reserves are nowadays newly built as mixed spaces between conservation areas and public open areas where activities in line with conservation objectives are allowed and traditional use of natural resources regulated towards sustainable practices. The widespread example of such reserves are the UNESCO biosphere reserves.

[3] See Appendix 1 for the map of ecological corridors

[4] IUCN SSC Antelope Specialist Group. 2008. *Gazella gazella* http://www.iucnredlist.org/details/8970/0

Around the Mediterranean Sea, different models have been developed: Natura 2000 reserves in Europe (Spain, France, Italy, Greece) that aim at reconciling economic activities with nature conservation while building a network of protected areas); in Lebanon, eight nature reserves declared by the government some of them recognized Biosphere reserve by UNESCO[5] ; in Jordan eleven nature reserves integrating socio-economic development and nature conservation ; in Egypt national parks that shelter wildlife and welcome tourists

These areas have all been built on sites that combine biodiversity of interest, landscapes that represent high value natural patrimony, territories with cultural history and/or heritage. They are also strained by the urban dynamics of the region and the broader land use planning of the country they belong to. In the Occupied Palestinian Territories, urbanization and land use in general tends to leave only limited spaces for nature conservation, especially as agriculture land and water are scarce. These parameters must be taken into account when planning the management of a nature reserve.

Biodiversity conservation must take into account different scales: genetics, species and landscapes. The diversity of landscapes is visible at a large scale and requires conservation of juxtaposed diverse ecosystems. The conservation of those ecosystems offers a diversity of habitats for species of the region and possibility to travel throughout the territory. There is an intrinsic connection between landscape diversity and species diversity, the health of species populations relying on their habitat for food and shelter. Species biodiversity responds to multiple principles: first approached through conservation of iconic species (for instance big mammals), it has now evolved towards the conservation of ecosystems functions supporting life of all species through the conservation of normal biodiversity, linking it again to habitat conservation and landscape biodiversity. Finally species populations health rely also on the maintenance of genetics diversity through travel and exchanges between different populations. The enrichment of the genetic patrimony of a population helps indeed fight diseases and harsh conditions (drought for instance) through the mixing of genes resistant to one or more threats. Integrating the three scales of biodiversity conservation leads to implementing conservation through a network or ecological corridor that connects a diversity of landscapes, species and populations, and genetics on a wider territory. This idea of an ecological corridor based on multiple spaces for conservation (a reserves network) looks relevant in the West Bank considering the territorial constraints linked to both the occupation and development.

Another significant factor for conservation areas is the institutional scheme implemented. Most nature reserves being built on nationally-owned land, they are declared by the state. Management can then rely on central institutions, on *ad hoc* structures created for the task (such as park authorities) or on independent nature conservation stakeholders. Highly dependent on local territorial management, they also rely on local institutions such as municipalities whose decisions influence the becoming of the protected area (urban planning, agricultural incentives and law enforcement).

2.2 Location of the planned area of the nature reserve

2.2.1 Description (of the park)

There are 22 nature reserves[6] in the West Bank occupying 12.4% of the total territory, most of them located in area C, still controlled by the Israeli authorities. Beitillu is located in area B and therefore falls under the control of the Palestinian Authority for civil affairs. Following the 1993 Oslo Agreements between Israel and PLO, nature reserve management and appointment was supposedly gradually handed back to

[5] See Appendix 2 for UNESCO Biosphere reserves designation criteria

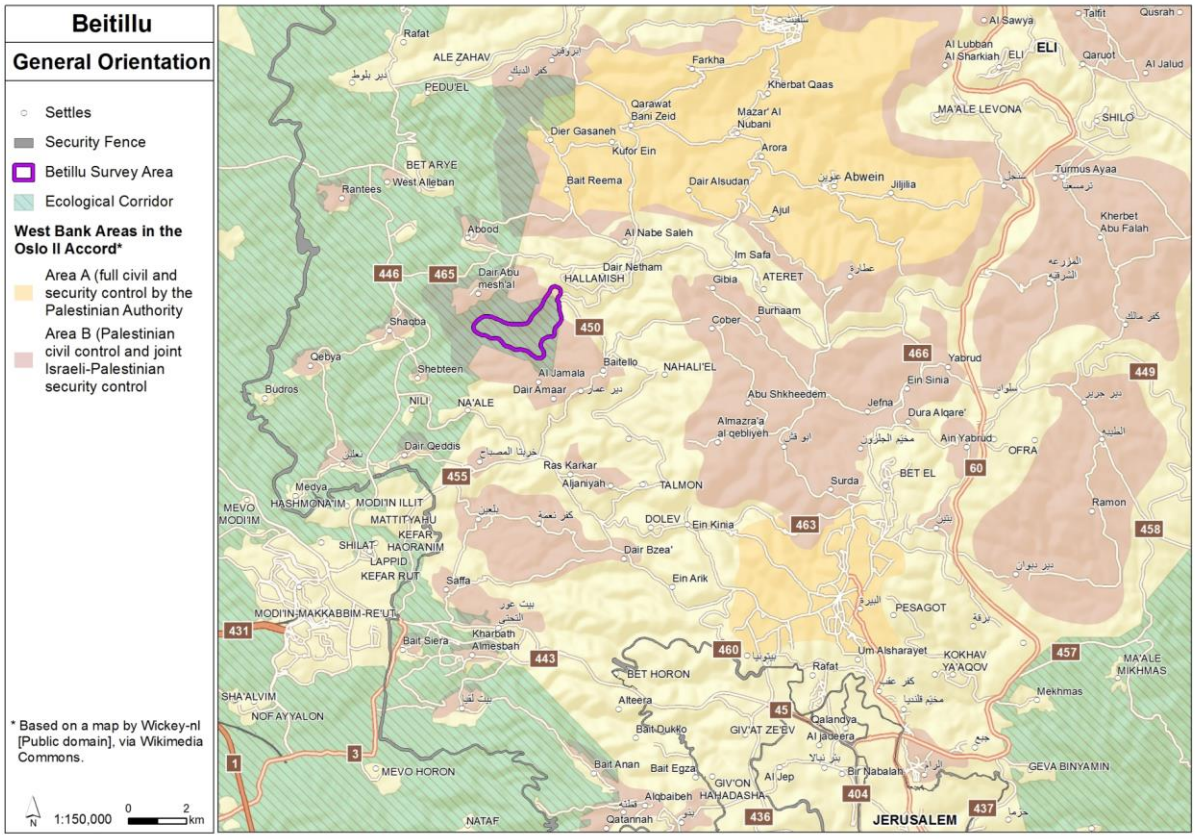
[6] See Appendix 3 for the list as quoted by ARIJ 2013 (names do not coincide, Beitillu is referred to as Al Hashmee)

the Palestinian authority. The Beitillu nature reserve has an area of 3.6 km² (360ha). Located 19 km North of Ramallah (area B) it stands on the territory of the Al Ittihad Municipality between the towns of Beitillu, Deir 'Ammar and Jammalh. The surrounding area is mostly occupied by traditional “Fellahin” agriculture: olive trees, fruits orchards, hilly fields.

The reserve itself is mainly occupied by woodland landscape made of an average density of trees and a dense vegetation cover made of bushes and shrubs. The reserve is crossed by water streams originating in the freshwater spring of *Al Zarqa*. Home to 45 identified species of birds, 39 species of reptiles, 23 species of mammals[7], it shelters a high diversity of animals and plants. Event though still missing a proper survey for those groups, species of reptiles and amphibians, some of them endangered, have been spotted in the reserve. Located along migration corridors, it plays a role in the migration of a number of bird species depending on the season. The water availability makes it a precious spot for wildlife.

Its size though limited makes sense in terms of natural habitat and passage zones for wildlife thanks to the stream and the vegetation. Part of a network of small reserves belonging to a south to north coherent transboundary ecological corridor, it can be an effective space for nature conservation, especially as it Is located on a bird migration corridor.

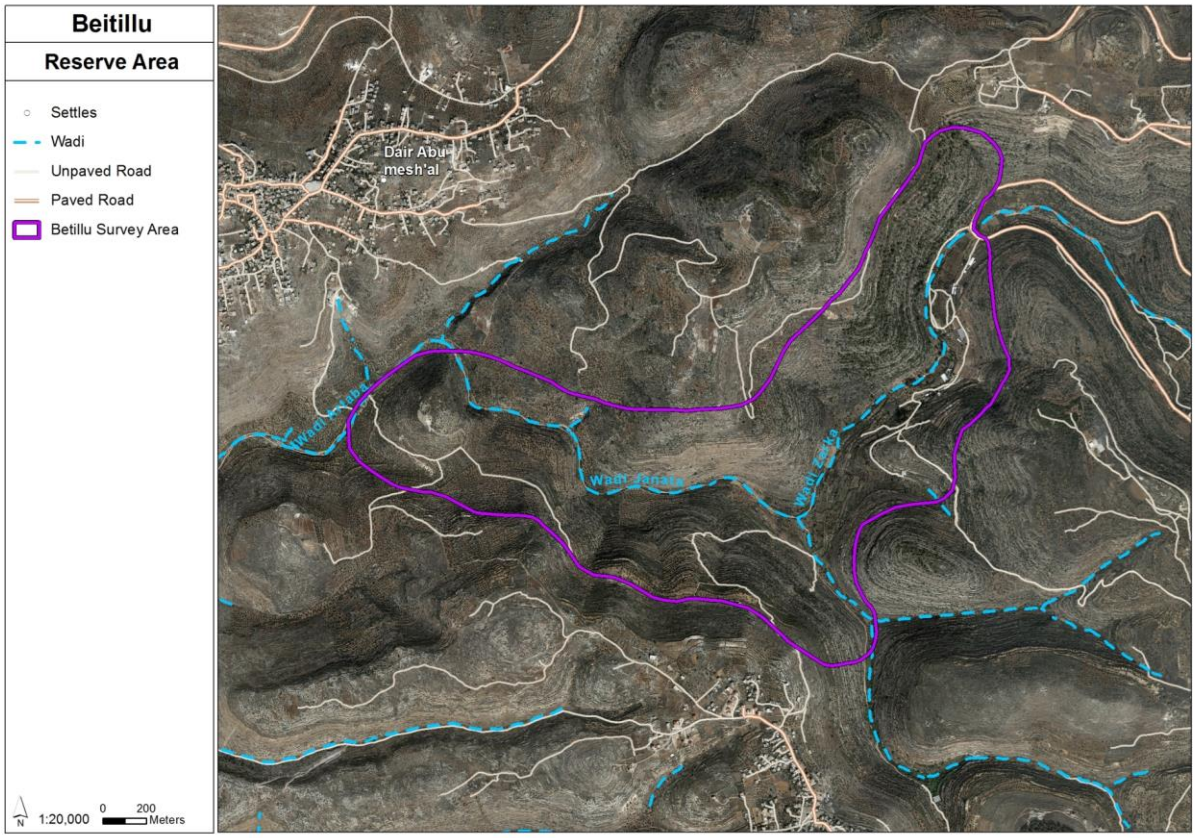
2.3 Map



Map 1: The Beitillu location in the Israel-West Bank territorial context

[7] According to the Mahmiyat website: www.mahmiyat.ps

The Beitillu reserve (purple outline on map 1, as defined by the surveyed area[8]) lies close to the West Bank barrier ("security fence" on map 1), part of a transboundary ecological corridor running between Israel and the West Bank. Located close to major urban areas in the West Bank, it stands as one of the remaining wildlife refuge to ensure continuity on both sides of the seam zone. Uncrossed by major roads and protected from urban expansion, its territory gathers potential agricultural lands, heritage sites and biodiversity (Palestinian Spatial Plan, see Appendix 5).



Map 2: Border and paths of the Beitillu reserve

This close up map of the Beitillu reserve shows the streams running through it and some of the identified paths. We will discuss further path mapping and data collection in section 5.

2.4 Greater area (around the park)

The greater area surrounding the park might influence management measures. This section therefore provides a close description of the area.

The municipality surrounding the Beitillu reserve is composed of the three villages of Deir Ammar, Beitillu and Jamalh, whose population goes up to 6800 people (Palestinian Central Bureau of Statistics, 2007). 25% of these people have livelihoods relying on agriculture, mostly orchards and livestock (sheep, goats and cows) with 1,462 heads in the area (IUCN 2006). About 20% of this population lives under the poverty limit

[8] The exact borders of the reserve are subject to discussions and official sources tend to contradict (between the Palestinian Spatial Plan and other documents), we thus chose to remain with the borders identified in the GIS database.

which make them more likely to rely on common environmental resources.

In the vicinity of the reserve stands also the Halameesh Israeli settlement. The spatial organization of settlements and the neighboring seam zone between Israel and the Occupied Palestinian Territories participate in further fragmentation of the habitat due to heavy security measures, physical closure and by-pass roads.

2.5 Pre-existing activities and their impacts on the environment

Inhabitants of the surrounding area use natural resources and ecosystem services linked to the reserve.

Water shortage and access restriction in the OPT put pressure on water resources in the area. All year long, spring water is used for irrigation and for household needs during the drier months of the year (May to September).

Grazing is very limited inside the reserve thanks to strict enforcement by the local ranger. Considering the tradition of herding in the region, grazing might actually have been part of the shaping of the ecosystem, helping keep the landscape open for some species. Nowadays balance is to be found through systematic monitoring of habitat change, limiting grazing inside the reserve as much as possible.

Household use of wild plants still exists but is not putting pressure on species of high conservation value (some plants that are picked are the following: *Salvia heirosolymitana, Majorana syriaca, Malva sylvestris, Launaea macronata, Arum palaestinum, Micromeria nerrosa, Asparagus ophyllus,* and various edible mushrooms).

Traces of tree cutting have been seen within the boundaries of the reserve. Branches and sometimes logs were left on the ground increasing risks in case of fire. Remnants were also spotted, those being leftover of logging activities.

Other pressures can result from recreational use of the reserve: in first position littering that is a major environmental issue in the whole country, and secondly accidental fires lit by visitors (from barbecues, cigarettes). The reserve welcomes 200 visitors [9]per week mostly on Fridays and Saturdays, an increase of this number would lead to higher pressure due to off-path walks, flower picking and above-mentioned issues. Such a scenario can be tackled with relevant measures.

Hunting cartridge have been found during the initial survey. Hunting might happen in the region and should be strictly prohibited within the reserve.

There are agricultural lands located inside the reserve, 150 dunums (1500m²) of land being cultivated by long-established families inside the official limits of the reserve. Such land use competes with wildlife for the use of water resources and habitats. Landscape and ecosystem functions are modified by the installations (used and unused greenhouses, olive groves, etc.).

[9] From the IUCN report *Assessment of Palestinian Nature Reserves*, 2006

Picture 1: Greenhouses inside the reserve, access road and parking area.

Agricultural expansion might become a threat as demographic pressure and resources scarcity deepen in the Occupied Palestinian Territories. Such an issue can only be addressed by clear law enforcement and land-use planning. We will develop needs for such plans in the institutional section (6.1) of the plan.

3 Data collection and analyses

3.1 Methods used

Biodiversity surveys have been conducted in the Beitillu area since 1999, focusing especially on birds, mammals and plant species.

A more intense survey has been ongoing since 2014, led by Imad Atrash and a team of 15 people collecting data on observation.org. This kind of survey has permitted to locate the observed species on a global map. Again this survey mostly looked at birds, mammals and some plant species: this focus is due to a greater expertise in these taxa and a lack of resources to conduct more surveys on other taxa.

Observations have been concentrated along the paths, stream and the spring of the Beitillu reserve, those spaces being more relevant to the observation of the targeted taxa and more accessible. A few campaigns of bird-ringing have happened in the last twenty years with no follow up on the ringed individuals. There is no licensed bird-ringer in the OPT as no system for licensing bird-ringers exist in Palestine.

Further information was collected on the observed individuals: sex, age, status. Those data can help build hypotheses about specific populations, but further research is needed to establish proper statistics for each

species, communities and ecosystems.

Locations of individuals were recorded through the observers' smartphones, putting stronger uncertainties on the exact place of observation. For birds, when seen flying, the coordinates of the observation are in fact those of the observer. With no evaluation of distance from the observer, density of presence cannot be assessed.

3.2 Data analysis with ArcGIS

3.2.1 Method used

Maps were produced[10] based on the data given by the observers' team. Information was shared through excel tables providing information on:

- Time and date of the observations
- Species: what species does the individual belongs to?
- Individual: sex, age (adult, juvenile)
- Action: in flight, dead, traces
- Collector: person who collected the data
- Coordinates collected with the GPS of the observer's smartphone

Maps were built for the different groups. [11]

3.2.2 Results

From the original survey, we can conclude about the biodiversity of the area, that it includes endemic species and protected ones. The density of observation around the *Al-Zarqa* spring shows the importance of surface water for the observed species. As stated before, these spaces are also important for migratory bird species. A significant number of them transit through Palestine every year.

3.2.3 Limits

The results and data presented must be analyzed with caution. We identified some limits in the data collection that deserve attention before moving forward with building the monitoring scheme and the management plan.

The method of survey was basic: surveys have been mostly conducted along the existing paths. Activities on those paths most certainly have modified the ecology of the surrounding environment, biasing surveys. The absence of timing for the searches, the random length of walks make the data difficult to compare with each other and with other sites. Improving comparability could be an objective in order to assess the complementarity of existing reserves and to build efficient corridors for conservation.

Data spatialization is of importance when looking at spatial planning within the reserve and its vicinity. The use of smartphones as GPS device is a factor of uncertainty for the location of observed individuals, and the distance between the observer and the observed individual have not been assessed. Methods for determining distance to observation point could be implemented to reduce the uncertainty and improve statistical use of data and refine spatialization within the reserve.

[10] All displayed in the relevant sections of this document.
[11] All displayed in the relevant sections of this document.

3.3 Building up on the existing data and pilot survey results

Thanks to the pilot survey, 117 species were spotted in the Beitillu nature reserve[12]. Among those, a few are endangered and would require further specific conservation efforts, while other are endemic or highly dependent on threatened habitats around the Mediterranean Sea. The following sections will detail for each group the current knowledge and methods to be developed to acquire further knowledge and implement efficient conservation measures.

The pilot survey that was conducted on the Beitillu reserve since 2014, has already been building up on local knowledge of the area acquired since at least 1999. Qualitative data were thus acquired for a number of groups: birds, plants, mammals and in a lesser way butterflies and some reptiles and amphibians. Due to some methodological limits and bias, these data indicating presence or absence of certain species cannot be used for further scientific analyses about the state of the environment and the viability of these populations. We therefore suggest feasible methodology to be implemented in the Beitillu reserve in order to assess the general state of the environment and to prioritize ecosystem, flora and fauna surveys in the coming years.

3.4 Land use and land cover

3.4.1 Diagnosis of existing habitats

The first step towards building a monitoring scheme is to characterize and assess the existing abiotic and biotic factors influencing biodiversity in the reserve. Such diagnosis starts with habitats mapping.

Following field visits and interviews with local experts, we have worked out different land use systems within the limits of the reserve: an attempt at creating a botanical garden, agricultural fields and greenhouses, and a variety of landscapes (slopes of scrub and woodland vegetation, stream banks with lower vegetation, caves and low cliffs). Consequently, the first step to surveying biodiversity in Beitillu is to map the existing habitats and cultivated spaces and assess heterogeneity of the observed habitats.

Such a map can be built referring to both field visits and aerial views (aerial pictures, or remote sensing images). Aerial views can help map the bigger obvious areas according to the changes in vegetation and features visible from the sky. The subsequent map can then be used to check and refine on the field the limits of the different habitats. A double check of those limits with property titles might be necessary as olive groves and abandoned greenhouses are spreading on the outskirts and inside the reserve on the flat lands bordering the stream and on manmade terraces.

The produced map should then be used for all surveys. Indeed, in order to randomize survey points and transects, a grid needs to be superimposed on the habitat map. Then sample areas should be surveyed in all habitats for the different groups.

3.4.2 Suggestions for future monitoring methods of habitats change

Woodland and scrub habitats changes are visible over cycles of at least 10 years. Once the reference map is built, a monitoring scheme can be implemented. It will require regular hike around the reserve on the main paths to record any noticeable changes such as:

- burnt areas
- change in land use

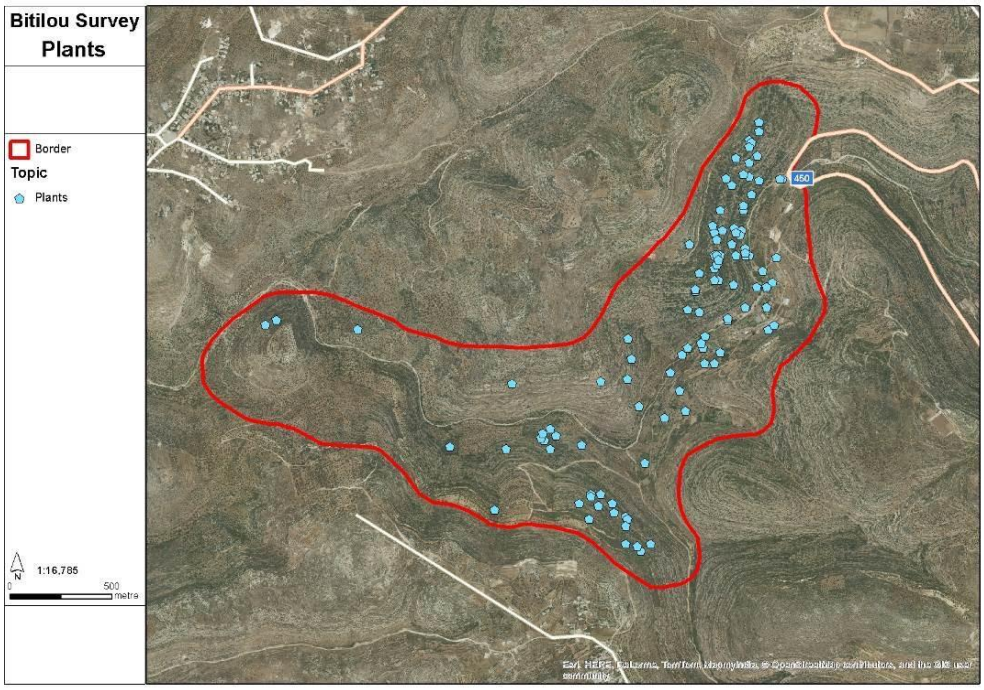
[12] See appendix 6 for list of identified species of each group

- fallen or cut trees and branches
- changes in the appearance of the stream (major increase in level, disappearance, pollution noticeable through eutrophication)
- major or new littering spots
- other important events that might occur (appearance of new tree species, drought, floods, landslide, etc.)

Taking pictures from an overviewing point at regular intervals (for instance 1 year) can help follow if the habitat is closing or opening. Quantitative indicators can also be used such as regeneration rate for trees, mortality rates, etc. But a qualitative monitoring already shows trends and major changes. These observations can be made by the local ranger as they mostly rely on knowledge of the area and continuous observations.

3.5 Plants

During a field visit, we identified endemic and alien species coexisting in the woodland of the reserve.



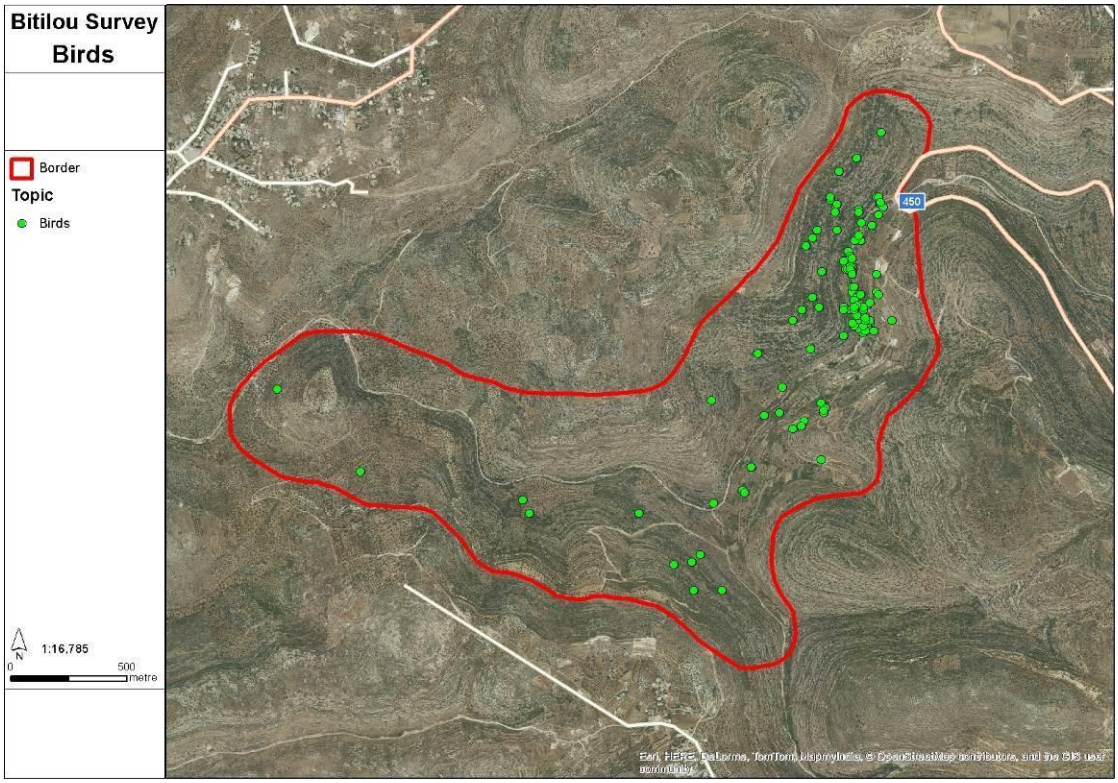
Map n° 3: Identified plants during the pilot survey

The main system we are looking at is woodland, with long regeneration rates. To assess plants diversity and heterogeneity, the area must be parted according to a superimposed grid. Size for the grid should revolve around 2 500m² with the central quadrat centered on the buildings and greenhouses in order to keep that area unsurveyed (following the assumption that human presence and activities have disrupted the system to a point where it is no more comparable with the surrounding areas). Such a grid will result in 13 minus one (the one comprising buildings) squares, so twelve among which transects and smaller quadrats can be determined to refine plants diversity surveys.

As stated in the previous section, woodland changes tend to occur on long time-scales. To monitor those, we already mentioned regular photography. For smaller plants, seasonal surveys can be implemented focusing on certain groups of plants.

3.6 Birds

Forty-five different bird species were spotted in the Beitillu reserve. Compared to other groups, birds have been more thoroughly studied due to longer interest and higher level of expertise. Israel and the OPT have been identified as migratory corridors for a number of bird species, some of them protected. Vulnerability during migration is an extra factor to the need for conservation of passage spaces such as Beitillu.



Map n°4: spotted and identified birds in the Beitillu reserve during the pilot survey

Surveys must differentiate between locally breeding species and migratory birds. To do so, seasonal surveys must be implemented.

A thorough survey therefore needs to be seasonal (spring and autumn). The grid established for plants survey can be used to create stratified random transects (meaning one transect per quadrat located randomly within the quadrat). Once again permanent transects will be determined in order to create comparability. For the same reason, searches along those transects will be timed. For bird surveys in closed habitats, the best methodology is to implement point counts: meaning the observer walks from one point to another along a predetermined path and stops at predetermined points for a given amount of time to spot birds. Time at each point is set between 5 and 10 minutes, depending on the area to be covered and the resources available for the search (number of participants, gear). Along a transect of 2 km, a point will be placed every 200m (for example) but distance and time must be adapted to the habitat and resources. For closed habitats, points should be closer (50m) but again the distance must take into account the feasibility and thus the means available. The observer will stop there for a given amount of time and spot and identify birds by sight, sound, or other indication (nest for instance).

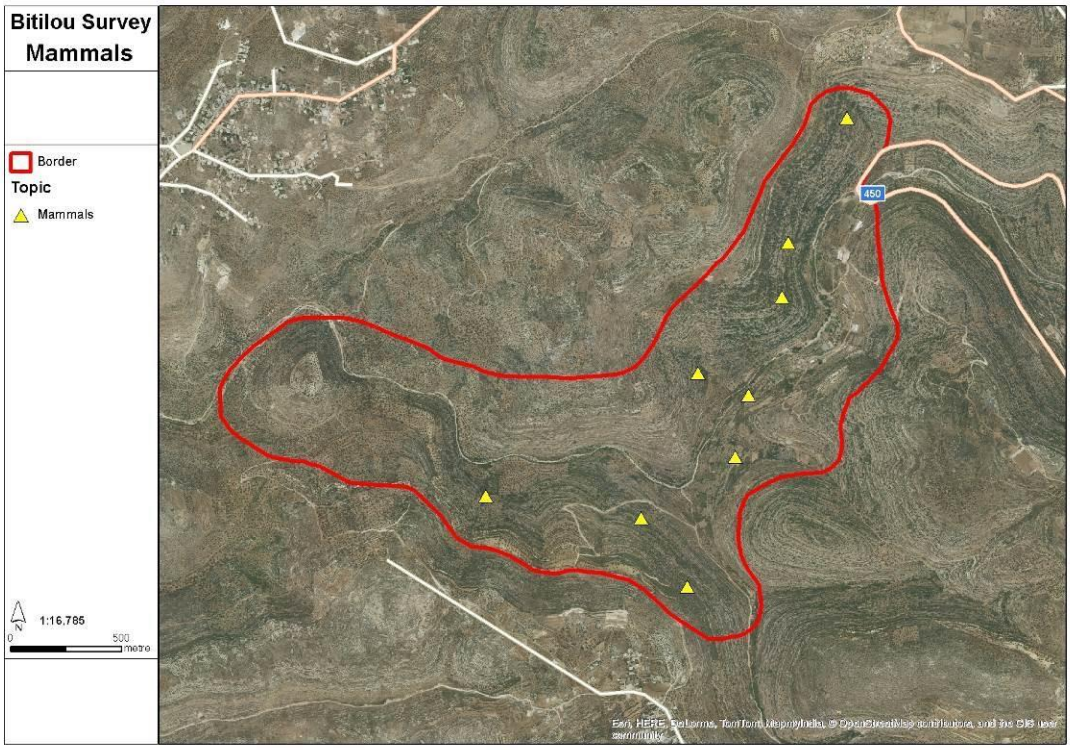
Distance to the sampling point is an interesting information to collect and assess density. It requires more time and training but can be done easily by experienced researchers. The most straightforward way to assess distance is to determine bands of distance around each sampling point. The observer will then only

need to determine if the bird is: 5m or less, between 5m and 10m, between 10m and 25m, between 25m and 50m, between 50m and 100m, further than 100m. In order not to count twice, the observer will count only birds in front of him turning only 180° degrees around himself.

After two years of continuous systematic survey of the area, conservation efforts and measures can be assessed depending on the species spotted, their conservation status and the evolution of the surrounding environment. Amongst the identified species in the Beitillu reserve, four are currently endangered or vulnerable according to the IUCN lists[13]. Those are to be prioritized when looking at population dynamics and threats in order to implement rapidly efficient conservation measures.

3.7 Mammals

the presence of 13 different species of mammals in the Beitillu reserve have been found in the pilot survey. These species have been seen, or were identified indirectly, for example due to prints or feces . Among those thirteen species some major carnivorous such as the striped hyena were identified as well as small rodents. A more systematic survey would be needed to identify species dwelling in the Beitillu area, populations size and if possible areas where they can be observed.



Map n°5: Partial map of some of the identified mammals in the Beitillu reserve

Mammal surveys rely on direct spotting of individuals but also on indirect methods like looking at traces, burrows and feces. They require the definition of transects of a few kilometers and the identification on these transects of the above mentioned indicators of mammal presence. These searches require training in mammals identification.

Regarding the timing of searches, data collection must be done during the day and during the night to spot

[13] See appendix 6.3

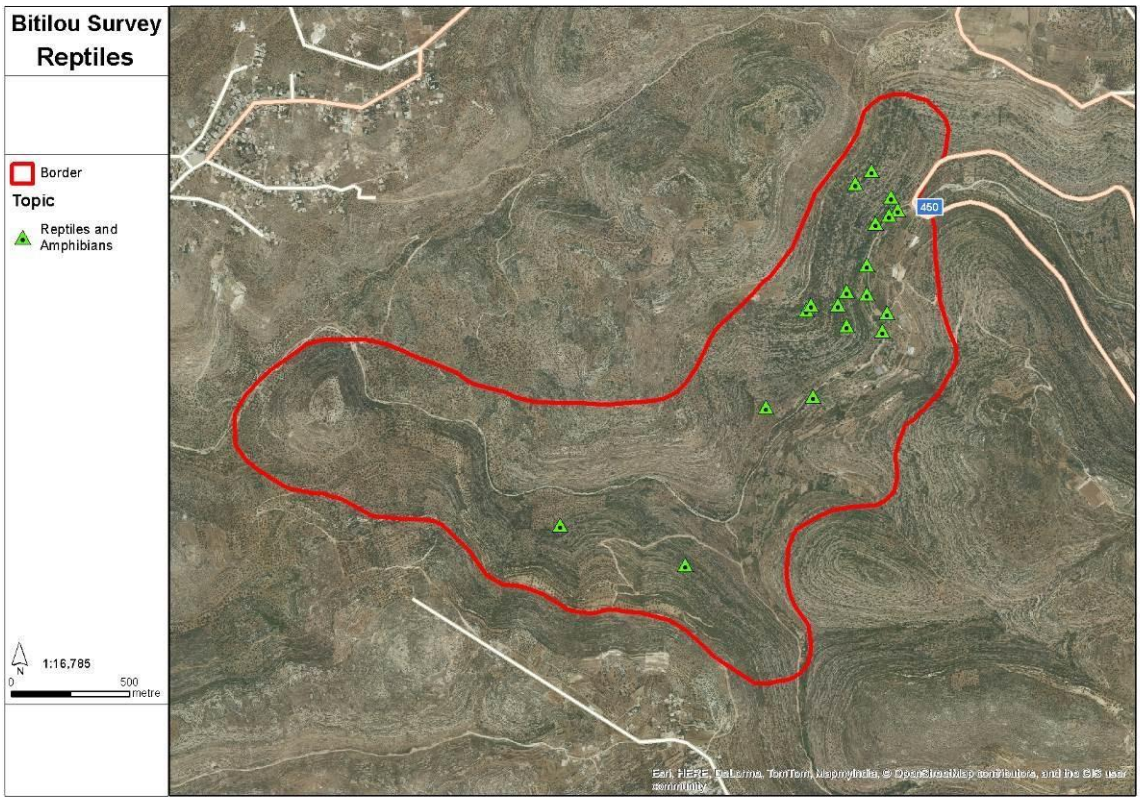
day active and nocturnal species. Activity of mammals will be higher during the breeding season and during cooler moments of the day (early morning and dusk). Data collection can therefore be led more intensely in spring, but can continue throughout autumn and winter. Once the twelve transects have been defined, data collection could be organized every two months on two or three transects at a time with at least one being searched at night. In winter, accent will be put on spotting tracks in wet soil.

Mammals are usually good flag-species for communication on conservation effort. The bigger species spotted are more vulnerable to habitat loss. If surveys do require training and specific qualifications, it would nevertheless be worth assessing health of existing population species in the Beitillu area and on a larger scale.

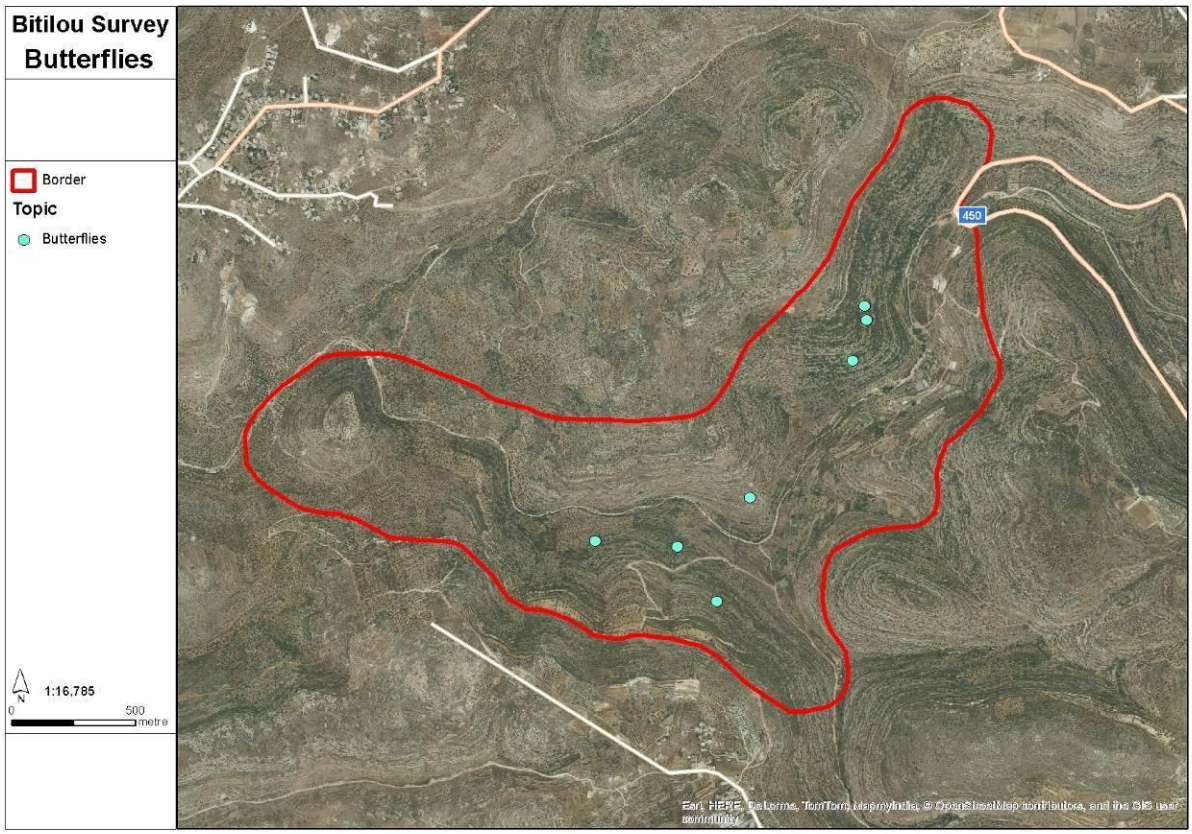
3.8 Other groups

Surveys can be done on any group with different methodologies. Priority has been defined for the above groups considering their ecological and touristic significance but also the availability of local experts. For the following groups, survey methods are more invasive (traps, artificial refugees) and require expertise in specific groups and taxa. The ecological significance of this group cannot be assessed from available data, surveys would definitely help to develop knowledge on the local ecosystem but hindrances remain.

The pilot survey randomly identified some reptiles, amphibians, and butterflies, as displayed on the following maps.



Map n° 6: Reptiles and amphibians identified in the Beitillu reserve (See appendix 6 for the list of species)



Map n°7: Butterflies identified during the pilot survey in the Beitillu reserve

3.8.1 Butterflies

A recent study has identified butterflies present in the West Bank. Encouraging further research in this area could help sustain the local scientific community.

Recording should ideally be carried out weekly from 1 April to 29 September. For each count the surveyor walks at a uniform pace along the transect and records all butterflies seen within 5 m on either side of the transect. To ensure comparability of counts, certain weather criteria must be met.

3.8.2 Amphibians

Almost all amphibians are endangered in the Mediterranean region due to intensive farming, degradation of wetland habitats and Wadi systems. As much as 39 species were spotted in Beitillu. Further research on amphibian populations could help assess the health of the Wadi system, evolution of pressures on the water resources in the area and degradation.

Small amphibians need to be trapped in order to be counted. For bigger amphibians, transects walks are suitable methods, they must be concentrated around water bodies and correspond to the ecology of the observed species. Trapping requires training for safe manipulation of individuals.

The demands of such a survey are high and resources limited (in terms of expertise). Conservation of amphibians is quite an important stake in the region, but this survey shall be implemented when means are available.

3.8.3 Reptiles

The same goes for reptiles which are not as endangered but quite numerous and diverse in the Beitillu area. Some six reptile species present in Palestine are regulated under the CITES convention protecting rare and endangered species from illegal trade and traffic.

Monitoring reptiles populations will help enforce the convention, but requires strong identification skills and sometimes trapping. For basic surveys, the positioning of artificial refugee along a predefined transect helps counting reptiles. They are indeed very shy and can mostly be spotted in their hiding spots. Artificial refugees create artificial pre-identified hiding spots.

3.8.4 Other invertebrates

Invertebrates enclose a diversity of taxa that each requires specific knowledge for identification and sometimes trapping. The most interesting invertebrates to survey would be dragonflies, as the diversity in the Mediterranean region is important and they work as index for health of water bodies. Looking at Hymenoptera could also be interesting for local and international research on pollination and to assess their role in the local agricultural system.

4 Conflicts and opportunities in the area

4.1 Threats

Threats in the area are closely related to human activities in the reserve. The intensification of the existing activities would lead to higher threats. The extension of agricultural lands would reduce space available for conservation and habitats for a diversity of species. Strict enforcement and monitoring of agricultural fields in the area is therefore needed to protect the reserve grounds.

Recreational use has already resulted in frequent littering inside the reserve. To avoid further pollution through garbage disposal, awareness-raising of visitors is needed. The strict interdiction of littering need to be enforced inside the reserve, and fining could be considered to strengthen the measure. The garbage problem inside the reserve also exists in the rest of the country: education is very important to tackle this issue all around the Occupied Palestinian Territories.

Picture n°2: Traces of the last week-end barbecue in the Beitillu reserve

Accidental fires are also a threat. The local ranger has ensured that he was able to control fires lit by visitors and that no incident was recorded. The increase in the number of visitors could make this control more challenging and raising awareness about the risk of fire, especially in the driest months need to be implemented in all communication towards visitors.

A recreational complex is open during summer months, using the spring water to fill a swimming pool and welcoming visitors at a restaurant. This activity is unregulated and surprising inside a nature reserve, especially considering the lack of water in the area. It actually goes towards what the municipality intends for the Beitillu area: recreational use in such forms. Regulation should be made clear about further building and efficient water use inside the reserve.

Picture 3: Private recreational area inside the reserve: swimming pool and restaurant.

Locals have also highlighted the degradation of the reserve by neighboring settlers at time of conflict intensification. Those facts could not be verified, but rules inside the reserve should apply equally to inhabitants of the OPT and Israeli settlers.

4.2 Strategy towards fulfilling all four objectives

Nature conservation often appears constraining for local populations whose access tends to be restricted and use of natural resources forbidden. Acceptability and respect of such areas therefore relies on the creation of a win-win situation promoting wildlife conservation and community development through the activities held in the reserve.

In the case of the Beitillu reserve, the four pursued objectives are complementary: considering threats on wildlife and biodiversity in the Palestinian territories, an effort towards education and environmental awareness could help reduce those drastically. Knowledge about the outdoor, the surrounding species, the specificity of the habitat ensures safety of visitors regarding dangerous species, risk of injuries. Promotion of leisure activities in the reserve can help create a complementary market for ecotourism based on hiking, educational tours, promotion of the area. The conservation of the woodland habitat found in the reserve will therefore be necessary for the promotion of the reserve and what it has to offer. The development of birding as an amateur activity in the Beitillu reserve relies on the knowledge about spottable bird species and behavior acquired through systematic monitoring.

Working towards all four objectives therefore means working on each one of them at the same time. While establishing the described monitoring scheme, it is necessary to train new observers. Building awareness of visitors goes hand in hand with promoting the reserve and consequently increasing the number of visitors.

The local ranger and trained guides could see more demand and shall adapt the offer to the new requirement of the protected area. Transmission of knowledge will be the key to building a sustainable and safe recreational use of the reserve.

On a longer term, education directed towards children should help shape mentalities towards nature conservation and enjoyment of sustainable outdoor activities such as hiking. Reaching out to local schools with educational tours could be an action in that direction.

5 Result based planning recommendations

5.1 Core protection areas

This section will help determine the need for entirely closed areas, why and where they would be needed and how to implement such interdictions.

Core protection areas aim at preventing any disruption in some parts of nature reserves in order to sustain wildlife populations and to ensure the existence of safe haven for protected species.

Considering the limited size of the reserve and the heterogeneity of land use within the reserve, the existence of entirely closed areas would be difficult to sustain in the Beitillu reserve. The agricultural lots will remain exploited, and the surrounding woodlands are crossed by many paths and offer a complete hiking path. Nevertheless, it will be necessary to advise visitors to remain on the marked paths to avoid disruption of wildlife and of monitoring protocols. Transects will be located mostly off path, but should not bear permanent marking to avoid attracting visitors to these areas. Smoking and any use of fire should be prohibited outside of the leisure areas in order to avoid higher risks.

The respect of those basic rules will ensure protection of the local species and habitats.

5.2 Getting there and around: leisure activities and frequentation

5.2.1 Getting there: roads and parking areas

One main road, partly paved, leads to the vicinity of the *Al Zarqa* spring and stream. An empty space already figures a parking lot.

The road goes further to houses and a restaurant and swimming pool complex. These places will need to remain accessible by car. But as the road goes deeper into the reserve to access houses; visitors might end up there by mistake. A sign saying the road is only for local dwellers could help avoid extra traffic on this section of the road and reduce disturbance for the inhabitants. Another sign should be erected at the entrance of the path from the main road to help visitors find the reserve

The parking area is visible and obvious but should be marked in order to incite people to park there instead of randomly leaving their cars on the side of the road. The parking lot as it is can welcome 10 cars. Spots could be marked with local stones in order to optimize the space in moments of higher frequentation.

Picture n°4: View on the parking lot and access road

5.2.2 Hiking trails

A formerly marked trail can be spotted along the river bed (especially in summer when water levels are very low). Marked in blue and white, it is the remnant of a trail marked by Israeli authorities.

Picture n°5: Visible mark of a former trail.

This trail cannot be followed all along, and marks are easily lost in high vegetation or erased. It could be remarked and maintained in order to make it easier to follow it and to link it to existing paths untangling on the woodland slopes of the reserve. Starting on the river bank, into the olive groves then woodland, a one-hour hike is possible and would most certainly be the most popular one in the area. Colors should be renewed and repainted.

A longer hike is advertised by guides going around the reserve on both sides of the river. This is unmarked, and marking it would require concertation with the guides who use it. Contact has been attempted with one of them who appeared not willing to discuss his knowledge of the reserve and its paths and the activities he offers. Such individual initiatives would be threatened by clear marking of the trails, but they could also win with higher frequentation of the reserve. A further work would be to identify and list these guides and try to create a dialogue with them on how to sustain and develop their activity while making the reserves in the OPT accessible to a broader audience.

Once a trail is marked and published (in a digital or paper map) it becomes the responsibility of the statutory authority in charge of the geographical area. In this case it would be the municipality in cooperation with the ministry of agriculture and the EQA. The municipality must therefore be informed of any trail marking, use, maintenance operations. In the long term, the maintenance of the trail could be a shared responsibility between the MoA and the municipality if the action of the local ranger turns out not to be sufficient. Marking should be renewed every two or three years, with permanent monitoring based on hikers' reports and updates. There should be a referent inside the reserve (for instance the ranger) to whom hikers can report disappearance of marks, problems on the trail (such as fallen trees, growing grasses).

5.2.3 Biking trails

At first glance no trail is suitable for biking in the Beitillu reserve: the existing hiking trails or paths that could be marked will not be suitable to welcome both pedestrians and cyclists. They are also quite short to be considered for biking.

5.2.4 Educational trails

There are different educational purposes to be pursued in the Beitillu area.

For visitors seeking recreational use of the reserve (picnic and barbecue area), a short walk along the stream with explanation about the protected area status, wildlife conservation, rules to protect the surrounding environment and bins to avoid littering could help raise awareness for the need to make these goals compatible. The threats linked to fire and littering should be highlighted.

For children visiting with school or in groups on weekends, guided walks through the different areas of the reserve (stream banks, woodland) showing the interests of the landscape, the plants to be spotted, animals traces and birds would be a first approach to nature conservation and environmental protection.

For interested groups of visitors (adults but also children) a one-hour hike following the trail along the river, through the olive grove and on the woodland slopes could be an introduction to the different ecosystems coexisting in the reserve, the threats and richness of the area, the good practices for hikers. Such a walk would be an introduction to more challenging and autonomous hikes in Beitillu but also in other areas.

Biology students could take part in the surveys teamed up with experience researchers. This would broaden their knowledge about the ecosystem, the existing species, survey methods, etc. It could be arranged with academic partner to organize a full course based on the survey with theoretical training and field work complementing each other.

5.2.5 Other potential leisure activities

The Beitillu reserve already welcomes families and groups who come to enjoy the quietness of the reserve and have a barbecue or picnic on the grounds. Those activities will be difficult to forbid, but can be made

more sustainable and respectful of the area. For this it would be necessary to create an area for meals not far from the parking lot.

Birding could be developed in the reserve attracting more people with environmentally-sound practices and raising awareness on the richness of the area.

5.3 Buildings and permanent furniture

5.3.1 Information center with shop

There is a high need for information considering most visitors are not used to outdoor activities and nature conservation. There are two sites in the reserve that are relevant for visitors information: the parking lot and the old ranger's house, that is unoccupied. From the road leading into the reserve, the old ranger house is visible up the slope north of the road. A path leads to it easily, making it a very accessible first stop for visitors.

At the parking lot, a wooden or stone (depending on locally available resources) panel could be erected to display the map of the reserve with hiking path and interest points, and the rules[14] to be observed inside the reserve. At the house, a more thoroughly explanation about the status of the reserve, the habitats, the species to be spotted, the conservation measures could be displayed.

Information should be provided in Arabic and English. It would be preferable to avoid distributing leaflets and any other objects that might add to the littering problem.

A shop should not be necessary. The existence of a restaurant inside the reserve makes water easily available to visitors who might have forgotten to take any. There are, for the moment, no products that can be sold as coming from the reserve. The farmers exploiting the agricultural land inside the reserve already have their market, and a more detailed study would be needed to assess the possibility for direct sales of local products.

5.3.2 Restrooms

Hikes within the reserve are quite short. The existing buildings can provide emergency solutions. Unless the number of visitors increases, no restrooms are needed. It could be discussed with the owner of the restaurant if the restrooms there can be made available to visitors. If new ones need to be built, they must be thought with low water consumption and integrated in the landscape.

5.3.3 First aid Station

The first aid station should be located in the ranger's house whether inside if his presence is certain or outside if there are chances he might be away when visitors are here. The ranger must also receive a first aid training.

5.3.4 Permanent furniture

In order to regulate areas for barbecue and picnics and to limit risks of littering anywhere in the reserve, it would make sense to create a picnic area with fixed benches and tables and stone fireplaces. This area would also bear garbage bins which should be maintained by the ranger. A flat area located north of the

[14] See Appendix 7 for examples of rules to be displayed

road, east of the parking very close to it has been noticed and would be suitable for such use.

Other garbage bins must be located in key areas such as the parking, the ranger's house, the information center. Garbage collection must be negotiated involving the municipality and the ranger. Overflowing bins would not help tackle the littering problem.

5.3.5 Others

Wildlife watching hides could be built once the survey has shown areas with higher density or specific observations. Hides would especially be needed if birding grows as an activity in the reserve.

Considering one of the hiking trail goes up to the top of the surrounding hills, it could be interesting to set an orientation stone up there depicting the surrounding points of interests (villages, places, historical sites).

Wooden or stone signs could help locate the important spots within the reserve and be located at major crossroads (from the parking lot showing the direction of the first aid station and information center, up the trails directing towards view point).

5.3.6 Wildlife watching hotspots

Guided tours for wildlife watching will require a frequent monitoring of interesting species and their whereabouts. Defining spots evolving throughout the year as part of an educational trail or a specialized one (for instance for birding).

5.3.7 On site maps and information

The main map should be located around the parking area, visible for visitors who stop there. Signs should be located at ambiguous direction points, and at constant walking distance: for instance, every hour and direction towards points of interest and facilities (view point, picnic areas, restrooms). On site information could be completed with digital information. The development of an application showing the hiking trails in the different reserves is currently discussed. Information about hiking in the Beitillu reserve and about facilities available for visitors can be advertised on the Mahmiyat.ps website.

5.4 Safety concept for wildlife and visitors

Visitors coming to a nature reserve have to deal with the conservation constraints and the environment surrounding them. It is important to inform them about risk related to outdoor activities, wildlife proximity and rules.

Some species found in the Beitillu area can be dangerous, especially venomous snakes. Locals tend to know about them, but foreigners or urban dwellers would be more at risk. Information about those species should be given to visitors at the information center, and an emergency strategy should be ready in case of accident. The ranger will be the reference in case any problem arises and must be trained accordingly. Seasonally, some species might become more dangerous (boar when the small ones are still following their mother for instance). Monitoring of such events (presence of a boar family on site) should help inform visitors about potential risks.

Trails must be maintained in order to prevent people from getting lost, falling or getting injured. Trail maintenance also helps safeguarding the environment by preventing off-tracks walks and disturbance for wildlife.

Rules must be set to also protect wildlife from accidental fires, heavy disturbance, pollution from littering and environmental degradation. These rules are suggested in appendix 7. Enforcement strategies must be discussed and developed with the ranger and the authorities.

6 General conservation approaches – effective protection

6.1 Identifying viable and important institutions

As stated in the introduction, nature reserve efficiency relies as much on the institutional framework as on the environmental factors. The Oslo agreement article on nature reserves (article 25)[15] transfers powers and responsibility to the Palestinian authorities. The interpretation of this led the Ministry of Agriculture to designate the reserves and assign rangers to some of them. According to interviews led at the EQA and to discussions with major stakeholders, management is in the hands of the Environmental Quality Authority. These two institutions provide the global frame and means for management of reserves in the West Bank.

In the Beitillu reserve case, a ranger appointed by the ministry of Agriculture has been in place for years (and before him, his father since 1995). He ensures law enforcement in the reserve (helping multiple interdictions to be respected such as: grazing limitation, fire control). His salary is paid by the ministry of Agriculture, and his appointment comes from his knowledge of the area. He is also the owner of the agricultural lands in the reserve, and lives in a house located inside the boundaries of the reserve. This could represent a conflict of interests, if agricultural lands were to be extended and harming the conservation objective.

The local municipality (the municipality of Al Ittihad) also has a part in the protection of the area. The municipality is the one contracting with the garbage removal company. The reserve being set on land mostly owned by the municipality, according to rules in use in nature reserves regarding leisure paths and activities, they should be responsible for the maintenance of trails and leisure facilities unless an ad-hoc authority is created to manage the reserve. Decisions must be taken in close relation with the municipality as it might otherwise develop projects that are not compatible with the conservation objectives for the area.

Those three institutions represent the base of the reserve management. Them working together is a requirement for the implementation and permanent effective management of the area.

For specific tasks they can rely on:

- Local universities (Bethlehem, Al-Najah, Birzeit, Al Quds, etc.): they can take part in some of the scientific work to be implemented in the reserve. Building up courses in cooperation with the above mentioned institutions could help cover some of the needs for trained individuals during surveys.
- Local and international NGOs: they could take part in the funding and implementation of specific projects such as species conservation, capacity-building for local communities, education oriented projects.
- UN Agencies and international donors: they could have a part in building a stronger institutional background for the conservation of the Beitillu area and the global environment in Palestine.
- Global environmental NGOs such as Birdlife, Conservation International or the IUCN could provide scientific guidance as well as funds for specific protection measures.

[15] See appendix 4 for related legal texts

The Palestinian Authority and its ministries rely on international funds to pay the salaries and running costs of normal governmental activities. The absence of finance resources linked to the political situation and the occupation demands to imagine solutions for sustainable management that are whether self-sustained financially or that rely on existing structures.

6.2 Establishing a sustainable resource management and wildlife monitoring strategy

As stated in section 3, systematic standardized surveys must be held to assess the state of the environment and wildlife populations in the Beitillu reserve. Even with reasonable ambitions and limited means, monitoring could help value the reserve and its natural and cultural heritage. The assessment of natural assets is set on a long time period. It is important that in the following years, projects within and around the reserve compel with the conservation objectives. Ideally, all projects shall be directed at building environmental exemplarity within the reserve.

Agricultural activities within the reserve should not expand nor evolve towards mechanization or harmful practices (intensive use of fertilizers or other inputs). Limitation of agricultural plots answers two main challenges: habitat preservation and sustainable water management in the reserve. On a longer time-scale, agriculture within the reserve could be directed towards organic and high quality value chains, transforming the local constraints regarding agricultural practices in market value. This would nevertheless require a specific project looking at labelling products coming from Palestinian nature reserves, taking stock of relevant example in Jordan.

Recreational activities, when ignoring environmentally-friendly practices put pressure on natural habitats and wildlife. At the same time, visiting the reserve for any activity is a good opportunity to learn about the conservation of nature. Recreational activities should therefore be encouraged but in regard of certain rules. Avoiding new building construction, or overuse of water resource for recreational activities is necessary in order to protect the area and its ecosystem characteristics. The reserve, the landscape should be the main attraction to visitors. The number of visitors should not exceed the capacity of the reserve: part of the management and monitoring should be to build statistics and index regarding the number of visitors per day and the related increase of threats (fires and trash).

6.3 Building environmental education and awareness

Through environmental education, people can explore environmental issues and take action towards problem solving to improve the environment. It helps them explore and understand these issues (and how they influence their daily lives and activities) in order to make responsible decisions. Education works towards: awareness to environmental issues, knowledge, attitudes and behaviors, skills and participation. Environmental education trains people to make their own choices taking into account environmental factors and consequences. It builds up adhesion to environmentally friendly behaviors and consumption choices on a daily basis.

There is a theoretical background to environmental education and awareness that can be taught at school in the normal curriculum, and that could be globally incorporated to school programs. Nevertheless, awareness is linked to a strong relationship to nature built through field trips, outdoor activities and scientific education. Promoting the Beitillu reserve as an environmental education place would help move towards both the conservation objective and the education and awareness objectives: while teaching students about the environment and biodiversity of the reserve in the field, it would help build their relationship to nature and awareness about the consequences of their actions on the environment.

Reaching out to schools at all levels and all education facilities (summer camps, sports club, scouts) and planning educational trails, field courses and green camps, would therefore train a generation to question their choices according to environmental considerations.

Environmental education and awareness can be specific to the space where it is taught but also broader. It could be interesting to include broader information about environmental protection in the reserve documents (digital information, visitors center, guides discourse), and using the reserve as an illustration (for instance risk of drought under climate change).

6.4 Local community involvement

Local communities have already been involved in the management of the reserve, especially through the appointment of the ranger, who comes from the family who has been farming this land for decades. The input of local communities lies in their constant presence in the area, making it easier for them to notice changes. They are also the ones benefiting from ecosystem services at a local scale that derive directly from the sound environmental state of the ecosystems. They should therefore be involved both in the monitoring of the reserve as well as in the valuation. Working with them on the benefits coming from the reserve and the potential consequences of its disappearance would be a good way to build an argument for conservation.

Furthermore, local residents take more interest than distant ones in the environment and can help built interest in conservation for local authorities. Community consultation regarding future projects should be implemented, reaching out to common users of the reserve. Training and sensibilization, community actions (community cleaning) could also be organized to build up commitment in environmental protection within the reserve.

Later, a participatory ecological monitoring scheme could be built involving interested people in a standardized, timed survey following the model of participatory sciences (also known as citizen science). Such a scheme should be designed in order to produce usable data for further scientific research. It shall only be built and implemented after the baseline survey has been done and analyzed.

6.5 Local and regional cooperation

Ideally nature conservation should know no border. Wildlife ignores boundaries and populations of animals and plants have always travelled to meet their adaptation needs. Connectivity of similar and different ecosystems, continuity and margins are part of habitats and repartition areas. Genetics of population are a significant viability factor that is optimized by diversity and exchange.

These are some of the reasons why, as part of an ecological corridor shared by Israel and OPT, the Beitillu reserve efficiency as a wildlife conservation area partly relies on regional cooperation. Two objectives can thus be pursued through local and regional cooperation: knowledge and good practices exchange, and optimization of wildlife conservation.

Much can be learned from exchanging experiences and lessons with other differently (or similarly) managed protected areas. Longer monitored reserves can give insights on best methodologies, and bias to be avoided when designing monitoring techniques. Looking into similar areas strategies in the region (Jordan, Israel and Lebanon) can help adapt general methodologies to local seasonality and conditions.

For specific wildlife protection initiatives, a regional monitoring is necessary. Exchanging information about

travelling animals, building a network of reserves with comparative follow up on species population, working together on territorial connectivity are measures significant to efficient wildlife conservation. Training of rangers also gains from being trans-boundary.

Institutional schemes can also be nurtured by experiences in other areas. For instance, in Lebanon nature reserves management has been delegated to local NGOs created for this purpose leaving more flexibility to the implementation of local conservation measures and daily management of the reserve but with a weak enforcement of national strategies.

6.6 International, national and local marketing for eco-tourism

Ecotourism is part of the sustainable use of resources objective as it aims at promoting responsible travel to natural areas while sustaining the well-being of local people.

At a local scale, the reserve is well known and many already enjoy it on weekends for family gatherings. Communication should be directed at limiting the impacts on the reserve and at building environmental awareness. Marketing directed towards local community should therefore stress the benefits of the reserve for local landscape and agriculture, and incorporate them in the process of protecting the area.

At the national scale, Beitillu is being held as an example for other nature reserves to be recognized and managed in the future. The specificity of the woodland ecosystem, the interaction between human activities and nature conservation make it a very interesting space both environmentally and culturally speaking. It should be advertised for both its recreational and educational potentials.

At the international scale, Beitillu presents good examples of local agriculture, ecosystems and landscapes, but the reserve needs cleaning to meet international standards for outdoor activities. Advertising towards travel agencies and tour companies could help include a nature component to travels in Palestine. Foreign residents in the territory should also be targeted by daily excursions and discovery hikes. Some guides already offer such hikes (mostly advertised on specific Facebook pages), but the offer should be made more visible and centralized.

6.7 Making recreation and protection compatible within a nature reserve – discussion about stakes, issues and potential solutions

Recreation and protection tend to be contradictory objectives when looking at traditional nature reserves that exclude human activities from their ground in order to evolve towards a higher level of wilderness (meaning here distant from human intervention). The model on which we based this management plan works towards making both protection and recreation compatible seeking fulfillment of objectives regarding both wildlife and human activities. The interdependence of these objectives is the keystone of the model implemented: acceptability of the reserve is based on its value for users, and this value gets its foundation in the success of wildlife and ecosystem protection.

Such objectives should be met by enforcing rules with not only sanction but also education. Using the beautiful natural landscape at hand to build up visitors' environmental awareness is one strategy: from the positive experience of their visit, they should start wanting to protect the area to be able to enjoy it in the future. Consequences of environmentally-harmful practices should be highlighted. Relying on local community knowledge of the area is another argument for adhesion to the conservation initiative, working towards protecting and valuing its own culture and heritage.

Community events should be organized to build up commitment into conserving the area: community cleaning, participatory monitoring, training. Scientific knowledge production also helps advocate for both objectives as it reveals new arguments for conservation and improves wildlife population management.

The Beitillu reserve is too small and shelters long-existing human activities that prevent the creation of a strict protection area. It must therefore be thought as a space of cohabitation between wildlife and humans. The expansion of human activities must nevertheless be regulated (or prevented) to avoid increasing pressure on natural resources (refer to section 4 for more information about threats).

Sustainable use of natural resources associated with environmentally sound practices for visitors (developed through education) should definitely make recreation and protection compatible in the area.

7 The implementation of the masterplan – timeframe and strategy

All these actions need to be distributed in time with clear deadlines and intermediary objectives. Building up an effective sustainable management will require a long-term strategy, an evaluation process and some evolution as it goes. The present plan has been laid out as a two to three years timeframe, dependent on the time needed to mobilize the necessary resources. It will then need evaluation and modifications to work towards a longer timeframe.

Components of the strategy:

- following the state of the environment
- assessing the species' populations dynamics throughout time
- improvement work and installation of furniture, signs.
- popularity: number of visitors (and origin), follow up on each activity (satisfaction, durability of trails and information, updates)
- impacts on local communities' livelihoods through interviews and meetings
- statistics on education and awareness activities

8 Administration and staff management

8.1 Personnel needs

8.1.1 Existing positions and external resources

The Ministry of Agriculture already funds a permanent ranger position. The ranger lives inside the reserve, and helps with rules enforcement and protection of the area. The ranger's position is a significant one and his/her mission should be better defined. Following the recommendation of this plan, the ranger Terms of Reference (ToR) should be created and adopted by the MoA. This ToR should include the following:

- Enforcement of rules, with support from the local police: he is the one who prevents fires and alarms in case of fire within the reserve; he is the one who interacts with visitors regarding their activities. He prevents grazing and wood cutting, illegal fires and smoking in forbidden areas. The ranger is responsible for preventing littering within the reserve.
- Monitoring of habitat change: by his permanent presence and activities in the reserve, the ranger is able to notice and record changes and unusual events (fires, drought, global aspect of woodland). He can be put in charge of annual photographic monitoring.
- Trails checking and maintenance: as he works inside the reserve, the ranger is used to hike the

trails. Maintenance means keeping them open and ensuring the visibility of signs, openness of the path (pushing and cutting vegetation that might cover them), erosion. This should be written down for evaluation every season (and especially following the rainy season).

- First aid and safety: visitors should be able to refer to somebody inside the reserve in case of accident or medical problem. The first aid station shall be located near or inside the ranger's house. The ranger should therefore be able to provide basic help and information about medical assistance.
- Education and sensibilisation: As the only person located on the ground up to this day, the ranger is the reference regarding rules and their enforcement within the reserve. He should therefore be available to answer visitors' questions. He could also lead basic educational hikes to explain the rules and vulnerability of the space. He must look after recreational activities on the ground and explain the importance of monitoring fires and respecting garbage disposal.
- Monitoring of visitors' numbers and assessment of maximum capacity and troubles encountered as figures go up.

This extended ranger mission might require to second him with a trainee or assistant. Periods of absence should be covered by another ranger or the assistant. Later, a scientific technician could take over some of these missions and organize the monitoring campaigns.

The different types of hikes (educational, recreational) will require guides with different training. Some guides already received an ecotourism training and are familiar with the trails in Beitillu. These should be listed and the list should be made available to visitors on the mahmiyat.ps website. Free monthly educational hikes could be organized as part of an education project.

The need for scientific research requires the recruitment of teams to establish the research and monitoring protocols and train locals to implement the chosen methodologies. Researchers do not need to be employed as part of the reserve personnel, but can be consultants or in an ideal scheme part of a research project working on the reserve but getting fund from other sources .

Regarding administrative personnel needs, the recruitment will depend on the administrative scheme chosen by the authorities in charge (see 8.1.2).

8.1.2 Administration

The reserve needs to be administered by both a strategic committee and a scientific committee. Both committees should pay attention to promoting public participation of local communities in major decisions through consultation, especially regarding access restriction, resources use and other conflictual topics.

The strategic committee should bring together institutions in charge of the management of the reserve, independent figures and donors: Ministry of Agriculture, EQA, municipality, donors, etc. Those will provide orientations for the future of the reserve in terms of spatial planning, projects, human resources. It should promote interaction with other institutions on education and awareness raising activities in the reserve, and help with fundraising.

The strategic committee should agree on the creation of a management scheme for the Beitillu reserve depending on available funds and possibilities. Choices are between creating an ad-hoc institution made of a director and multiple staffs (for instance ranger(s), project coordinator), relying on existing organization to manage the reserve (such as local NGOs), or any other scheme adapted to the local context.

The scientific committee should be in charge of organizing, following and interpreting the scientific data gathered in the reserve and making decisions about what to change and what to keep in terms of

monitoring methodologies. They should therefore meet at least twice a year after each main monitoring campaign (spring and autumn). It should gather researchers and scientific personalities according to their specialty and involvement in the Beitillu reserve monitoring. In two or three years from the start of the implementation of the management plan, the scientific committee shall emit a new one relying on results and evaluation of the present plan.

Participation in the committees should be part of normal activities of the designated members and shall not be paid for. Cost of transportation to and from the meeting place can be covered with limitation of expenses.

8.2 Expected budgetary needs

The budget will need to cover the operational and maintenance costs as well as a set of initial investments.

Operational and maintenance costs will depend on the chosen administrative scheme and the number of employees.

Initial investments will need to cover equipment (and installation) such as permanent furniture, setting of signs and maps, marking of the trails.

Research funds will be needed but do not need to be included in the reserve's budget.

8.3 Possible funding sources

The ecological gain of a nature reserve can only be assessed on the long term. Funding must therefore be secured on the long term taking into account exceptional expenses (establishment of facilities, early on trainings, offsets and diversification for local communities) and long term frequent funds (monthly, annual) covering administrative, running and maintenance costs.

Such funds can be sought in:

- International and regional funds for the protection of the environment such as the Global Environmental Fund, green climate fund, lifeweb, UNESCO subsidies for the conservation of cultural and natural heritage, HIMA fund.
- Bilateral donors involved in the development of the West Bank and state building of the State of Palestine (such as Belgium, Sweden, Japan, Turkey etc…).
- National funds: the management of the Beitillu reserve appeals to three national organizations that are the Ministry of Agriculture, the Ministry of Tourism and the Environmental Quality Authority. The latter being the focal point for the implementation of all environmental conventions the Palestinian Authority is party of. The absence of direct funds makes the participation of these institutions possible only in terms of human, organizational resources and strategic expertise.
- NGOs: local and international NGOs can help fund specific programs for the conservation of nature, environmental education and awareness, rehabilitation and improvement of on-site installations. Specific funds should be sought for by presenting specific project proposals on topics such as birds conservation, trail marking, management facilitation, outreach, etc.
- Research funds: specific research funds and organizations look closely at the Mediterranean region (EnviMed, IFPO for instance). Teaming up with such organizations can help secure scientific funds for ecological monitoring and general environmental conservation
- Private foundations and individual donors financing environment protection such as the

Zennstrom philanthropies, the Gordon and Betty Moore foundation, the William and Flora Hewlett Foundation, the Lawrence Foundation, Environmental funders network, Oak Foundation
- Decentralized cooperation between local entities in Europe and the local Municipality in the West Bank

A funding strategy should be established for each donor working in the West Bank and other donors not yet working in the area but interested in environmental conservation (foundations, funds and decentralized cooperation).

9 Recommendations

This paragraph aims at summarizing the different actions that need to be taken in the timeframe of this plan and the priorities that can be highlighted. The recommended actions shall be quoted thereafter in the order they should be implemented, each section independant from the other one.

9.1 Recommendation regarding the reserve grounds:

- Installing furniture and signalisation on the grounds: directional signs, delimitation of the parking and leisure areas, basic furniture such as benches, tables and garbage bins should not require much funding and could be done shortly using available means and resources.
- Work out a garbage collection scheme with the operator, the municipality and the EQA and MoA.
- Trail marking: though technical this task requires a limited amount of time and would make the reserve very attractive. It should therefore be one of the tip priority.
- Mapping: bringing hikers requires to provide a comprehensive map of the reserve grounds. This map should include the different areas above and the trails and should therefore be created once first steps have been taken towards installing the above mentioned areas and signs.
- File a funding request for creating a visitors center.

9.2 Administrative scheme

- Sign a protocol to secure cooperation between the MoA, the EQA and the municipality establishing the strategic committee, frequency of meetings, responsibilities.
- Creation of the scientific committee, with relevant scientific personae and institutions. This committee should include the people working on nature conservation in the Occupied Palestinian Territories (Palestinian Museum of Natural History; the main universities including Birzeit, Bethlehem, Al Quds; specialists coming from the ministry and EQA; optionally experts from neighbouring countries)
- modify the ranger's terms of references according to the proposition written in section 8 of this document to meet enforcement needs within the reserve grounds
- Decisions about recruitment and personnel needs within the reserve
- fund raising activities

9.3 Scientific protocols

- Implement basic monitoring thanks to the ranger's activities (trail maintenance and observation,

yearly photographs of the reserve)
- Record unusual events (strong winds and damages they may cause, extreme drought, fires)
- Mobilize scientific teams through projects proposals
- Implement monitoring scheme as described in section 3 of this document
- Seek funding for nature conservation following the results of the monitoring (specific species or habitats)

9.4 Beyond this plan

- implement evaluation of both the administrative scheme and scientific actions after the 2 to 3 years period
- encourage and monitor the creation of a new plan for the Beitillu reserve building up on the results obtained through this one

10 Glossary

EQA Environmental Quality Authority

IUCN International Union for the Conservation of Nature

LC Least Concern (status on the IUCN red lists)

OECD Organization for Economic Cooperation and Development

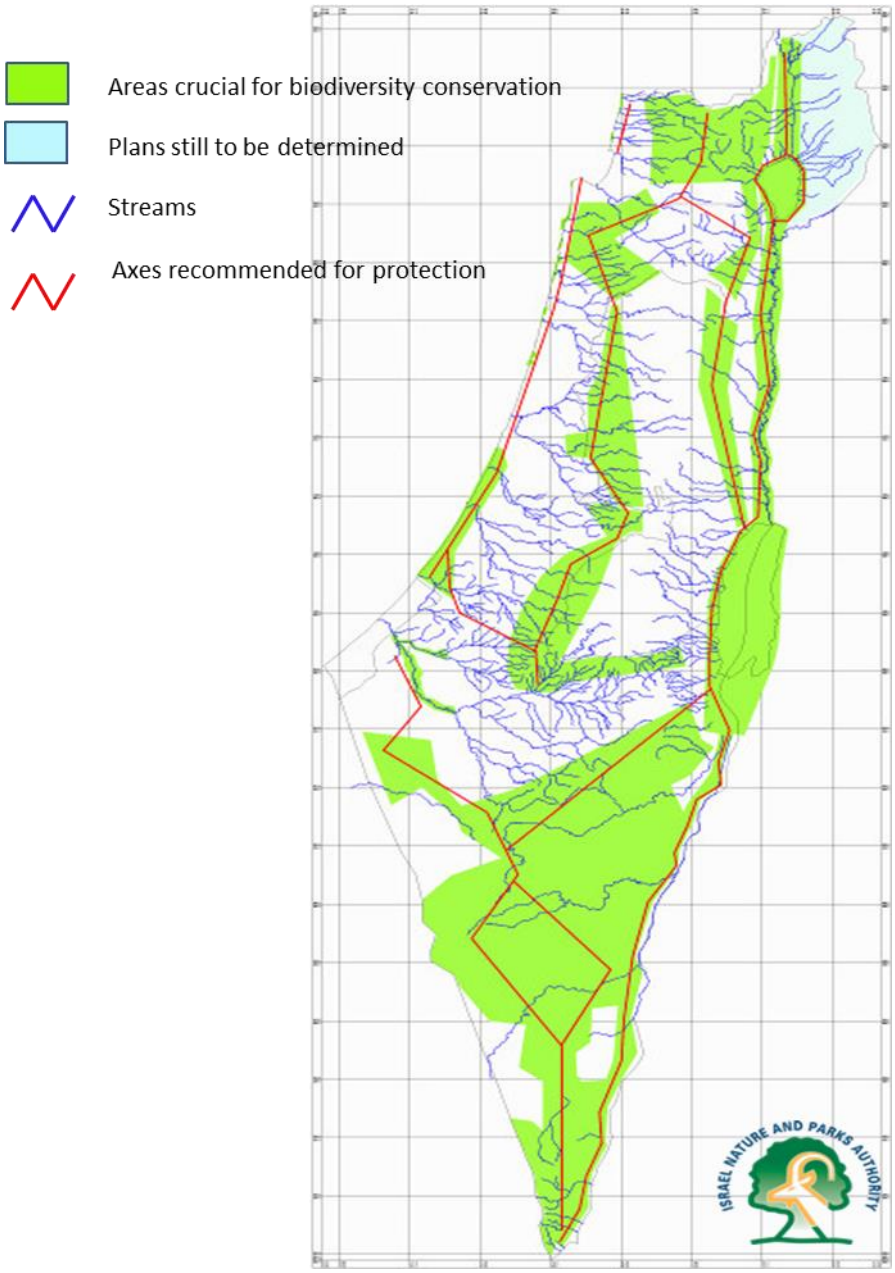
OPT Occupied Palestinian Territories

MoA Ministry of Agriculture

UNESCO United Nations Educational Scientific and Cultural Organization

11 Appendices

APPENDIX 1: Map of ecological corridors



APPENDIX 2: UNESCO Biosphere reserves criteria for designation

2. CRITERIA FOR DESIGNATION AS A BIOSPHERE RESERVE:
[Article 4 of the Statutory Framework presents 7 general criteria for an area to be qualified for designation as a biosphere reserve which are given in order below.]

2.1 "Encompass a mosaic of ecological systems representative of major biogeographic region(s), including a gradation of human interventions".
(The term "major biogeographic region" is not strictly defined but it would be useful to refer to the Udvardy classification system (http://www.unep-wcmc.org/udvardys-biogeographical-provinces-1975_745.html)).

2.2 "Be of significance for biological diversity conservation".
(This should refer not only to the numbers of endemic or rare species, but may also refer to species on the IUCN Red List or CITES appendices, at the local, regional or global levels, and also to species of global importance, rare habitat types or habitats with unique land use practices (for example traditional grazing or artisanal fishing) favouring the conservation of biological diversity).

2.3 "Provide an opportunity to explore and demonstrate approaches to sustainable development on a regional scale".
(Describe in general terms the potential of the area to serve as a site of excellence for promoting the sustainable development of its region (or "eco-region")).

2.4 "Have an appropriate size to serve the three functions of biosphere reserves"
(This refers more particularly to (a) the surface area required to meet the long term conservation objectives of the core area(s) and the buffer zone(s) and (b) the availability of areas suitable for working with local communities in testing and demonstrating sustainable uses of natural resources)

2.5 Through appropriate zonation:
"(a) a legally constituted core area or areas devoted to long term protection, according to the conservation objectives of the biosphere reserve, and of sufficient size to meet these objectives".
(Describe the core area(s) briefly, indicating their legal status, their size, the main conservation objectives).

"(b) a buffer zone or zones clearly identified and surrounding or contiguous to the core area or areas, where only activities compatible with the conservation objectives can take place".
(Describe briefly the buffer zones(s), their legal status, their size, and the activities which are ongoing and planned there).

"(c) an outer transition area where sustainable resource management practices are promoted and developed".
(The Seville Strategy gave increased emphasis to the transition area since this is the area where the key issues on environment and development of a given region are to be addressed. Describe briefly the transition area(s), the types of questions to be addressed there in the near and the longer terms. The Madrid Action Plan states that the outer boundary should be defined through stakeholder consultation).
(d) Please provide some additional information about the interaction between the three areas.

2.6 "Organizational arrangements should be provided for the involvement and participation of a suitable range of inter alia public authorities, local communities and private interests in the design and the carrying out of the functions of a biosphere reserve".

2.6.1 Describe arrangements in place or foreseen.
(Describe involvement of public and/or private stakeholders in support of the activities of the biosphere reserve in core, buffer and transition areas (such as agreements, protocols, letters of intent, protected area(s) plans)).

2.6.2 Have any cultural and social impact assessments been conducted, or similar tools and guidelines been used?
(e.g. Convention on Biological Diversity (CBD)'s Akwé: Kon guidelines; Free, Prior, and Informed Consent guidelines, Biocultural Community Protocols, etc.). (UNESCO's Programme on Man and the Biosphere (MAB) encourages biosphere reserves to consider and respect indigenous and customary rights through programmes or tools, in accordance with the United Nations Declaration on the Rights of Indigenous Peoples

2.7 Mechanisms for implementation:

Does the proposed biosphere reserve have:
"(a) mechanisms to manage human use and activities in the buffer zone or zones"?
If yes, describe. If not, describe what is planned.

"(b) a management policy or plan for the area as a biosphere reserve"?
If yes, describe. If not, state how such a plan or policy will be developed, and the timeframe. (If the proposed area coincides with one or more existing protected natural area(s), describe how the management plan of the proposed biosphere reserve will be complementary to the management plan of the protected area(s))

"(c) a designated authority or mechanism to implement this policy or plan"

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Does the proposed biosphere reserve have:
"(a) mechanisms to manage human use and activities in the buffer zone or zones"?
If yes, describe. If not, describe what is planned.

"(b) a management policy or plan for the area as a biosphere reserve"?
If yes, describe. If not, state how such a plan or policy will be developed, and the timeframe. (If the proposed area coincides with one or more existing protected natural area(s), describe how the management plan of the proposed biosphere reserve will be complementary to the management plan of the protected area(s))

"(c) a designated authority or mechanism to implement this policy or plan"?

"(d) programs for research, monitoring, education and training"?

If yes, describe. If not, describe what is planned.

APPENDIX 3: Names of Nature reserves handed back to the PNA following the Oslo II Interim Agreement

Al-Hashmee [Beitillu]
Deir Ammar
Ein Darra
Fahmeh
Jabal-Alkabeer
Jerusalem Wilderness
Sheikh Katrwany
Sheikh Zayed
Shoubash
Sirris
Tammoun
Tayysir
Um-Altutt
Wadi Al-Dlb
Wadi Zarqa Al-Elwey
Al Qarrin
Deir Razeh
Ein Al-Uja
Suba
Um Al-Saffa
Wadi Al-Quff
Wadi Al-Qilt

Source: The Geo-Informatics department, – ARIJ-2013

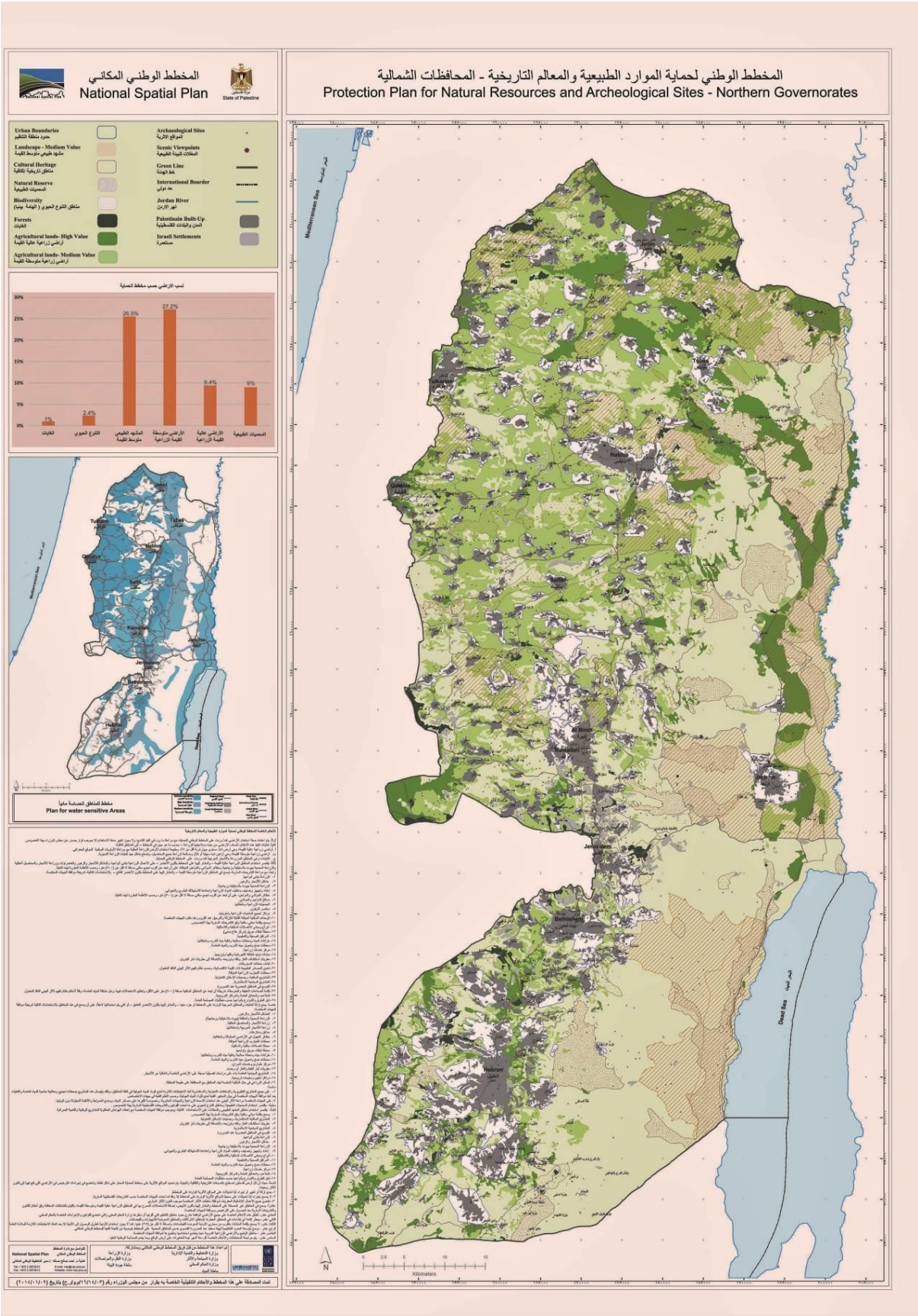
APPENDIX 4: 1995 Interim Oslo Agreement on nature reserves and Palestinian environmental law

Nature Reserves

1. Powers and responsibilities in the sphere of Nature Reserves in the West Bank and the Gaza Strip will be transferred from the military government and its Civil Administration to the Palestinian side and shall be assumed by it, including, inter alia, the establishment, declaration, administration, supervision, protection and preservation of Nature Reserves and of animal species, natural assets and plants.
2. In Area C, powers and responsibilities related to the sphere of Nature Reserves will be transferred gradually to Palestinian jurisdiction that will cover West Bank and Gaza Strip territory except for the issues that will be negotiated in the permanent status negotiations, during the further redeployment phases, to be completed within 18 months from the date of the inauguration of the Council.
3. The Palestinian side shall safeguard and preserve the Nature Reserves in accordance with established scientific standards.
4. The two sides shall agree on methods of cooperation regarding the protection and preservation of Nature Reserves, through a Joint Committee of Experts from the two sides. This cooperation shall include exchange of information and data regarding issues such as animal and plant diseases, pests, and scientific research.
5. The two sides shall each take appropriate measures in order to protect Nature Reserves, Protected Natural Assets and species of animals, plants and flowers of special breeds, as well as to implement rules of behavior in Nature Reserves.
6. Each side shall enforce, within the areas under its responsibility, the regulations pertaining to hunting, and in particular the prohibition on hunting of protected and endangered species.
The Israeli side shall coordinate with the Palestinian side activities in Area C outside Settlements and military locations, which may change the existing status of this sphere.
(interim agreement of sept. 1995)

According to the Palestinian environment law number (7) for a year 1999:
Article (40) 'the ministry, in cooperation with competent authorities, shall designate bases and criteria to maintain natural reserves and national parks, supervising, announcing and demarking them'.
Article (41) 'it shall be banned to hunt, kill or catch land birds, land and maritime animals and fish itemized in the executive list of this law. It shall be prohibited, too, to own, transfer, wander with or display such birds and animals either dead or alive; their nets and eggs shall not to be destroyed'.
Article (42) 'the ministry shall designate necessary conditions to maintain vital variety in Palestine, in collaboration with competent authorities'.
Article (43) 'The ministry, in coordination with competent authorities, shall undertake setting sufficient fundamentals and criteria to itemize plants, forest and land trees that cannot be cut, cultivated, damaged, either temporarily or permanently to guarantee their continuity and perpetuity'.
Article (44) 'anyone shall be banned to do any activities and behavior leading to endangering natural preserves, forest areas, public parks, historical and archeological sites or affect aesthetic level of such areas'.
Article (72) 'Anyone who violates provisions of article (44) of this law shall be punished by a fine not less than twenty Jordanian dinars (JD) but not more than two hundred dinars (JD) or their equal in the legally active currency or jail for not less than three days but not more than one month or by one of the two penalties'.

APPENDIX 5: Palestinian Spatial Plan, Protection Plan for Natural Resources and Archeological Sites



APPENDIX 6: List of species spotted in the Beitillu reserve and their conservation status

A.6.1 Mammals

English name	**Scientific name**	IUCN lists status
Beech marten	*Martes foina*	LC
Cape hare	*Lepus capensis*	LC
Eastern spiny mouse	*Acomys dimidiatus*	LC
Egyptian mongoose	*Herpestes ichneumon*	LC
Eurasian badger	*Meles meles*	LC
Golden jackal	*Canis aureus*	LC
Hedgehog	*Erinaceus concolor*	LC
Indian crested porcupine	*Hystrix indica*	LC
Mountain gazelle	*Gazella gazella*	Vulnerable
Red fox	*Vulpes vulpes*	LC
Striped hyaena	*Hyaena hyaena*	Near threatened
Wild boar	*Sus scrofa*	LC
Wild cat	Felis silvestris	LC

A.6.2 Reptiles and Amphibians

English name	Scientific name	IUCN Status
Rüppell's Snake-eyed Skink	*Ablepharus rueppellii*	LC
Günther's Cylindrical Skink	*Chalcides guentheri*	Vulnerable
Saw-scaled Viper	*Echis coloratus*	?
Crowned Dwarf Snake	*Eirenis coronella*	LC
Lined Dwarf Racer	*Eirenis decemlineata*	LC
Roth's Dwarf Racer	*Eirenis rothii*	LC
Schneider's Skink	*Eumeces schneideri*	?
Kotschyi's Gecko	*Mediodactylus kotschyi*	LC
Müller's Two-headed Snake	*Micrelaps muelleri*	LC
Beaked Blind Snake	*Myriopholis macrorhyncha*	?
Latast's Snake Skink	*Ophiomorus latastii*	?
Braid Snake	*Platyceps ladacensis*	?
Schokari Sand Snake	*Psammophis schokari*	?
European Glass Lizard	*Pseudopus apodus*	?
Sinai Fan-fingered Gecko	*Ptyodactylus guttatus*	?
Simon Worm Snake	*Rhinotyphlops simoni*	?
Palestine Kukri Snake	*Rhynchocalamus melanocephalus*	LC
Rough-tailed Rock Agama	*Stellagama stellio*	LC
European Cat Snake	*Telescopus fallax*	LC
Mediterranean Spur-thighed Tortoise	*Testudo graeca*	Vulnerable
Bridled Mabuya	*Trachylepis vittata*	LC
Eurasian Worm Snake	*Typhlops vermicularis*	?
Spotted Newt	*Ommatotriton vittatus*	LC
Variable Green Toad	*Bufotes variabilis*	?
Snake-eyed Lizard	*Ophisops elegans*	?
Mediterranean chameleon	*Chamaeleo chamaeleon*	LC

Eyed cylindrical skink	*Chalcides ocellatus*	?
Savigny's tree frog	*Hyla savignyi*	LC
Levant green frog	*Pelophylax bedriagae*	LC
Caucasian sand boa	*Eryx jaculus*	?
Large whip snake	*Dolichophis jagularis*	?
Palestine viper	*Daboia palaestinae*	LC
Western Caspian Turtle	*Mauremys rivulata*	?
Mediterranean House Gecko	*Hemidactylus turcicus*	LC
Lebanon Lizard	*Phoenicolacerta laevis*	LC
Red Whip Snake	*Platyceps collaris*	LC
Asian Racer	*Hemorrhois nummifer*	?
Dice Snake	*Natrix tessellata*	LC
Montpellier Snake	*Malpolon insignitus*	?

A.6.3 Birds

English name	Scientific name	IUCN Status
Common Kestrel	Falco tinnunculus	LC
Common Swift	Apus apus	LC
Eagle Owl	Bubo bubo	LC
Eurasian Sparrowhawk	Accipiter nisus	LC
Glossy Ibis	Plegadis fascinellis	LC
European Goldfinch	Carduelis carduelis	LC
Blackbird	Turdus merula	LC
Blue Rock-thrush	Monticola solitarius	LC
Cattle Egret	Bubulcus ibis	LC
Chaffinch	Fringilla coelebs	LC
European Bee-eater	Merops apiaster	LC
Greenfinch	Carduelis chloris	LC
European Honey Buzzard	Pernis apivorus	LC
Hoopoe	Upupa epops	LC
Lesser Kestrel	Falco naumanni	LC
Linnet	Carduelis cannabina	LC
Little Owl	Athene noctua	LC
Long-legged Buzzard	Buteo rufinus	LC
Marsh Harrier	Circus aeruginosus	LC
Palestine sunbird	Nectarinia osea	LC
Red-rumped swallow	Cecropis daurica	LC
Sardinian Warbler	Sylvia Melanocephala	LC
Spanish Sparrow	Passer hispaniolensis	LC
Syrian Woodpecker	Dendrocopos syriacus	LC
White stork	Ciconia ciconia	LC
White-throated Kingfisher	Halcyon smyrnensis	LC
Barn Owl	Tyto alba	LC
Bluethroat	Luscinia svecica	LC

Common Kingfisher	Alcedo atthis	LC
Common Quail	Coturnix coturnix	LC
Crested Lark	Galerida cristata	LC
Cretzschmar's Bunting	Emberiza caesia	LC
Eurasian Jay	Garrulus glandarius	LC
European Robin	Erithacus rubecula	LC
European Stonechat	Saxicola torquata	LC
Hooded Crow	Corvus cornix	?
House Sparrow	Passer domesticus	LC
Long-billed Pipit	Anthus similis	LC
Rufous Bush Robin	Cercotrichas galactotes	LC
Eurasian Scops-owl	Otus scops	LC
White Wagtail	Motacilla Alba	LC
Woodchat Shrike	Lanius senator	LC
Wryneck	Jynx torquilla	LC
Chukar	Alectoris chukar	LC
Barn Swallow	Hirundo rustica	LC
Black Redstart	Phoenicurus ochruros	LC
Blackcap	Sylvia atricapilla	LC
Black-eared Wheatear	Oenanthe hispanica	LC
Booted Eagle	Hieraaetus pennatus	LC
Common Chiffchaff	Phyloscopus Colybita	LC
Collared Dove	Streptopelia decaocto	LC
Common Buzzard	Buteo buteo	LC
Common Crane	Grus grus	LC
Common Cuckoo	Cuculus canorus	LC
Common Moorhen	Gallinula chloropus	LC
Common Myna	Acridotheres tristis	LC
Common Redstart	Phoenicurus phoenicurus	LC
Corn Bunting	Miliaria calandra	LC
Eastern Olivaceous Warbler	Hippolais Pallida	LC

Egyptian Vulture	Neophron percnopterus	Endangered
Eurasian Reed Warbler	Acrocephalus scirpaceus	LC
Eurasian Stone-curlew	Burhinus oedicnemus	LC
European Roller	Coracias garrulus	LC
Eurasian Hobby	Falco subbuteo	LC
Golden Oriole	Oriolus oriolus	LC
Graceful Prinia	Prinia gracilis	LC
Great Spotted Cuckoo	Clamator glandarius	LC
Great Tit	Parus major	LC
Grey Heron	Ardea cinerea	LC
Hen Harrier	Circus cyaneus	LC
House Martin	Delichon urbicum	LC
Lesser Whitethroat	Sylvia curruca	LC
Little Egret	Egretta garzetta	LC
Long-eared Owl	Asio otus	LC
Masked Shrike	Lanius nubicus	LC
Eastern Orphean Warbler	Sylvia cassirostris	?
Ortolan Bunting	Emberiza hortulana	LC
Peregrine Falcon	Falco peregrinus	LC
Sand Martin	Riparia riparia	LC
Short-toed Eagle	Circaetus gallicus	LC
Song Thrush	Turdus philomelos	LC
Spur-winged Lapwing	Vanellus spinosus	LC
Squacco Heron	Ardeola ralloides	LC
Steppe Eagle	Aquila nipalensis	Endangered
Turtle Dove	Streptopelia turtur	Vulnerable
Great White Pelican	Pelecanus onocrotalus	LC
White-Spectacled Bulbul	Pycnonotus xanthyophygos	Vulnerable
Willow Warbler	Phyloscopus trochilus	LC

A.6.4 Plants

Common Name	**Scientific Name**
Smaller tree-mallow	Lavatera cretica
Great Hairy Willowherb	Epilobium hirsutum
Ribwort Plantain	Plantago lanceolata subsp. lanceolata
Friar's Cowl	Arisarum vulgare
Black Calla	Arum palaestinum
Water Arum	Arum hygrophilum
Schildartiger Klee	Trifolium clypeatum
Anthemis	Anthemis pseudocotula
Smooth Sow-thistle	Sonchus oleraceus
Aleppo pine	Pinus halepensis
white hedge-nettle	Prasium majus
Woody Fleabane	Dittrichia viscosa
Fig	Ficus carica
Rough Poppy	Papaver hybridum
Common Pennywort	Umbilicus intermedius
Sarcopoterium	Sarcopoterium spinosum
Mastic	Pistacia lentiscus
Wooly Nightshade	Solanum villosum
Etruscan Honeysuckle	Lonicera etrusca
Dominican Sage	Salvia dominica
Red Everlasting, Red cudweed	Helichrysum sanguineum
Early Vrigin's-bower	Clematis cirrhosa
Olive Willow	Salix elaeagnos
pedunculate oak	Quercus spec.
Raspberry	Rubus idaeus
Mt. Atlas mastic tree	Pistacia atlantica
common buckthorn	Rhamnus spec.

Soft-Hairy Rockrose	Cistus creticus
river red gum	Eucalyptus camaldulensis
Green Olive Tree	Phillyrea latifolia
Anchusa	Anchusa spec.
Asparagus	Asparagus spec.
Ferulago setifolia	Ferulago setifolia
Cirsium	Cirsium spec.
Strawflower	Helichrysum spec.
Jafna, thummam	Aizoon hispanicum
Silver nailroot, Silvery Whitlow Wort	Paronychia argentea
Syrian Pear	Pyrus syriaca
Olive tree	Olea europaea
Golden - Drop	Onosma orientalis
Sun's-eye Tulip	Tulipa agenensis
Common Narcissus	Narcissus poeticus + Narcissus tazetta
Crocus	Crocus hyemalis
Common Roman squill	Bellevalia flexuosa
Fine-Leaved Star-of-Bethlehem	Ornithogalum trichophyllum
Narbonne Star-of-Bethlehem	Ornithogalum narbonense
Trigonella	Trigonella berythea
Wild marjoram	Origanum syriacum
White Mignonette	Reseda alba
Common Stork's-bill	Erodium cicutarium
Rigid Flax	Linum strictum
Jerusalem Spurge	Euphorbia hierosolymitana
Squirting Cucumber	Ecballium elaterium
Blunt Nonea	Nonea obtusifolia
Golden Henbane	Hyoscyamus aureus
Tree Tobacco	Nicotiana glauca
Black Bryony	Tamus communis
Lesser Bulrush, Narrow Leaf Cattail	Typha domingensis

Toothed Medick	Medicago polymorpha
White asphodel	Asphodelus aestivus
Sharp varthemia	Chiliadenus iphionoides
Spring Groundsel	Senecio vernalis
Common Reed	Phragmites australis
Spiny Starwort	Pallenis spinosa
Boissier Oak	Quercus boissieri
Terebinth	Pistacia palaestina
Officinal Styrax	Styrax officinalis
sea onion	Drimia maritima
Carob	Ceratonia siliqua
White leaved savory	Micromeria fruticosa
Southern Daisy	Bellis sylvestris
Bay	Laurus nobilis
Hawthorn	Crataegus monogyna
Mastic tree, Lentisk	Pistacia lentiscus
Eastern Strawberry Tree	Arbutus andrachne
Poppy Anemone	Anemone coronaria
pink garlic	Allium trifoliatum
Starry Clover	Trifolium stellatum

APPENDIX 7: Rules to be displayed in the reserve

There are two ways to display rules for the general public: putting the stress on the positive behavior or on the interdiction. Here are some examples:

YES
Stay on the trails
Stay near the guide
Keep nature clean
Keep relatively quiet (no loud music) to prevent disturbance of animals
Respect instructions
Enjoy the scenery
Keep your dog on the leash
Pick up your trash
Inform the ranger about anything unusual

NO
Hunting
Flower and plants picking
Wood cutting
Smoking or fire lighting outside of the designated areas
Camping
Off paths walking

SAFETY RULES:
Always bring water with you
Do not remove rocks or lift logs, reptiles might be hiding underneath
Do not pick up wounded animals, tell the ranger
Cross the stream at the designated crossing points.

IF YOU NOTICE ANY DAMAGE to equipment, trails marks or signs, INFORM the ranger.

APPENDIX 8: Context of redaction of this plan

The present plan was written by Christelle Bakhache, Msc. Ecology and Political science, external consultant specialized in nature conservation, between May and July 2016.
It relied on existing data and literature and on interviews and meetings.

Interviews were held with:
Eng. Adalah Atteereh, Chairman of the EQA
Dr Issa Mussa, Program officer at the EQA
Zyad Radwan, Ranger on the Beitillu Reserve
Municipality of Al Ittihad (Mayor and technical staff)
Imad Atrash, Head of the Palestinian Wildlife Society
Dr. Mazen Qumsiyeh, Head of the Palestinian Natural History Museum
Dr. Anton Khalilieh, Ornithologist at the PNHM