

Range Rehabilitation and Biodiversity Conservation in the Syrian Steppe.

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Abstract

The Steppe ecosystems occupy more than half the land area of Syria and despite their naturally low production potential, the steppe regions were the major source of feed for domestic livestock and wildlife. In the past livestock production was a subsistence economy and Bedouin flocks depended on communally grazed but tribally regulated rangelands and animal numbers were subject to environmental regulation making exploitation of natural resources relatively stable and sustainable. Drastic socio-economic changes have taken place in the last fifty years with large buildup of domestic animals made possible by changes of the way in which they are managed including mechanized mobility. Over exploitation and habitat destruction caused deterioration and loss of natural biodiversity. An Italian funded project in Palmyra did a pioneering work in biodiversity conservation.

This paper discusses a system approach adopted in the implementation of the Range Rehabilitation and Reintroduction of Wildlife in the Syrian Steppe project. It outlines how community needs are integrated with biodiversity conservation requirements and experience of developing relationships at the local, national and international levels for successful and sustainable use of biodiversity.

The Syrian steppe commonly known as “Albadia” makes more than 50% of the total land area of the Syrian Arab Republic. This vast area is a typical desert characterized by climatic conditions of low and erratic rainfall, extreme temperatures and wide precipitation to evaporation ratio. Conditions for plant growth are therefore, low temperatures when effective rainfall is occurring (Almasri 1994) and high temperatures and no effective rainfall at other times. Forage production potential is low. Despite their naturally low production potential, the steppe regions in Syria are rangelands which traditionally constituted the basis of domestic and wildlife feed.

In the past Bedouin livestock production was a subsistence economy and Bedouin flocks depended entirely on range forage communally grazed but tribally controlled. Animal numbers were subject to environmental regulations thus the number of animals raised used to vary according to the feed resource.

Famine and periodic outbreaks of diseases used to keep steady equilibrium between animal numbers and range forage. There was, therefore a long term stable stocking levels (Mirreh 1999). For the last 40 – 50 years drastic changes has taken place and the present range conditions are poor and much lower than their productive capacity. One of the major causes of such a drastic change is the fast growth of human population which was 3.4 million in 1950 and reached more than 17.0 million in 2000.

This exponential growth in human population not only had a direct effect on the land but also increased demand for livestock products and therefore increased pressure on the grazing resources. The total number of sheep increased from 3.0million in 1950 to 15.4 million in 1998. These huge increase in the number of sheep on the range, were made possible by changes in the way in which they are managed. These changes include the use of trucks to move sheep to any place where grazing is available and the use of vehicles to provide the sheep with water and supplementary feed where ever they happen to be.

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The result has been deterioration of rangelands as feed for both domestic and wildlife. Large number of wildlife become extinct according to surveys conducted by GCP/SYR/003/ITA & GCP/SYR/009/ITA and according to Harrison and Bates 1991. Nearly 16 game animals became extinct from Syria. Some of the species were only endemic to Syria and include the Syrian wild ass and the Syrian ostrich.

The Syrian government recognizing degradation of natural ecosystems and loss of biodiversity initiated several projects to reverse the trend. An initiative to improve the status of wild animals in the Syrian steppe (Al Badia) was begun when the Syrian Government issued Decree 1030, which established Talila Reserve near Palmyra with the objective of conserving its biodiversity (Williamson 2000). In 1996 an Italian-funded project with a range rehabilitation component and a wildlife component to assist the Syrian Government in the development and management of the biodiversity reserve started under FAO implementation.

This paper discusses a system approach adopted in the implementation of the Range Rehabilitation and Reintroduction of Wildlife in the Syrian Steppe project. It outlines how community needs are integrated with biodiversity conservation requirements and experience of developing relationships at the local, national and international levels for successful and sustainable use of biodiversity.

Approach to Project Execution

The project area which was approximately 130,000 hectares consists of a 22,000 biodiversity conservation reserve (BCR) and the remaining area designated for three cooperatives. The peasants of Albadia and particularly three cooperatives with total households of 426 members, owning 95000 heads of sheep were the principal target grounds. The BCR is surrounded by the cooperative areas. This means that the status of the rangelands and activities around the reserve will have an impact on the reserve.

During the inception of the project, constraints to proper execution of the project were analyzed. Lack of specialized manpower, lack of documented scientific data and information crucial for understanding the natural biodiversity system and its management, dealing with a target group (Bedouins) with mobile life style in a highly variable environment and particularly forage production, highly variable climatic conditions and particularly rainfall in a very fragile environment, a land use system which over the years have changed from subsistence but sustainable production under customary management to highly commercialized but open access system, and decimation of wildlife by hunting with total lack of conservation education and management were the realities that the project has to confront.

Implementation of the project therefore, warranted realistic assessment of the present status of the biodiversity in the project area and practical options of its improvement and management.

Extensive surveys were carried out by team of multidisciplinary international and national consultants. Based on these surveys the following conclusions were reached:

1. The rangelands are severely degraded and particularly the high potential sites. The resident scarce perennial vegetation is dominated by species of low forage value for grazing animals.
2. Management of renewable natural resources is a complex and specialized science, capacity building of the national staff in resource inventory, monitoring and analysis is deemed necessary for proper resource planning and management.
3. Without the acceptance and understanding of the local people in the project area, the long term sustainability of project activities will not be possible. Because social acceptability is no less

important than ecological sustainability, it is essential to integrate the needs of the indigenous population with the requirements of conservation.

4. Populations of endemic antelope species have been drastically reduced or become extinct.

Implementation

It was apparent that holistic approach to resource management and involvement of all stakeholders is crucial for the long term sustainability of the reserve and its surrounding rangelands.

The project therefore, implemented a program of work addressing the issues outlined and included: Capacity building of the national staff, environmental and socioeconomic monitoring, methodologies and techniques of rehabilitating of desert rangelands, wildlife reintroduction, biodiversity survey and income generation for resource dependent communities, and community participation and Bedouin extension for conservation and management of natural plant and animal diversity and particularly grazing resources.

Capacity building

Ecological degradation and its corollary-biodiversity loss pose a serious threat to development. Efforts for conservation and management of natural resources must derive from a set of clear objectives, mechanism for action and commitment from all stakeholders. Apart from this halting the process of degradation and species loss require specialized solutions and understanding of ecological processes. Protecting biodiversity does not merely involve setting aside areas as reserves. Instead, all the ecological processes that maintained biodiversity need to be understood for its proper management. This requires training a core of multidisciplinary nationals. The project therefore, started comprehensive training programme of national staff. The Programme consisted of in-service and external training in the main subject matters of range, wildlife, socioeconomics, community participation and extension. Skill training was mainly in computers, English language and production of communication materials.

Range rehabilitation

Landscape approach to conservation where protected and non-protected areas are integrated through significant protection measures at both the state and the community levels and through the improvement of cooperative lands surrounding the biodiversity reserve was considered as the key to the success of the project.

The project range management team started range resource inventory and evaluation surveys at the beginning of the project. The present range condition was found to be very poor with perennial vegetation cover averaging 5.2% in the cooperative areas. Approximately 77% of the poor cover was contributed by the low grazing value species of *Anabasis syriaca*. The vegetation indicated total absence of decreaser species with low presence of increaser species and dominance of invader species. The virtual lack of even relict plants of the key forage species *Salsola vermiculata*, *Plantago albicans* and *Atriplex leucoclada* in their natural habitats in the cooperative areas warranted the need for improvement interventions. It was also felt that sound scientific foundation is absolutely essential for future assessment, analysis and sustainable management of the rangelands. Four major programmes of i) collection, identification and photography of the range plants ii) Selection and establishment of range monitoring sites iii) Range improvement and iv) Grazing management and tenure were executed.

- i) Proper monitoring, evaluation and management of rangelands require knowledge of the plants growing in the area. Extensive programme of collection and identification and photography of plants resulted in the collection of specimens kept as herbarium materials and as education tool for technicians and references for plant scientists. Some 247 species of plants distributed in 44 families were identified (table1)

- ii) Judicious management of rangelands requires indicators that give an early warning to resource planners about the status of the rangelands. It is therefore important to monitor the range condition and trend. Condition monitoring is essential to assess the current status of site productivity and therefore in planning the use of the range. Knowledge of trend is essential to determine the effect of management on the resource.

The project established fenced exclosures in five different range sites. Cluster of three transects were established inside the exclosures with similar cluster of transects permanently established in similar range sites to those of the exclosures in areas open for grazing. Repeated measurements of vegetation attributes of cover, density, distribution and production are made every year (Mirreh et al 1998). The aim of the monitoring programme is to follow up the rate of recovery, vegetation composition changes (Al-Jundi et al 1999 & 2001) and eventually to develop range condition guides in the future for different range sites in the Syrian Steppe (when sufficient data is collected and hopefully management systems are tested in the long run).The exclosures are also useful for *insitu* conservation of germplasm and demonstration areas for site potential when excluded from grazing.

In order to assess the impact of range rehabilitation and range utilization on livestock production and Bedouin living conditions socioeconomic data collection and monitoring is used to integrate range and animal dynamics to human livelihood

- iii) Rehabilitation of rangelands by seeding or planting is expensive and risky. In order to minimize the risk of failure and maximize the potential for successful improvement, proven and tested techniques used in other countries in the region with similar ecological conditions were used. Direct seeding under rain-fed with reseeding at onset of rains in October with sowing of adapted native forage species using chisel or pitter seeders were followed. Cost monitoring clearly established considerable advantage of reseeding compared to planting. Planting cost is estimated at 3824 Syrian Pounds (SP)/ha. With the highest cost component being watering cost (1856 SP/ha) and nursery cost (1207 SP/ha). In comparison to this reseeding cost 820 SP/ha where seed collection (320 SP/ha) and equipment (243 SP/ha) are major costs (Wattenbach 2004). The cost per produced Feed Unit (FU) is also in favor of reseeding compared to replanting. Planting is estimated to produce 350 FU/ha at year five of the project, while reseeding produced 250 FU/ha after three years.

- iv) Range rehabilitation and improvement even if successful and combined with protection of the areas for reasonable period of time to allow good establishment and self regeneration of plant, will not make much sense if the improved areas are not utilized in a manner that will ensure their long-term sustainability. The purpose of grazing management system is to maintain the status quo of the plants in the ecosystem, to allow for increased forage production, ensure enough seed production for self regeneration and meet the nutritional needs of grazing animals. These requirements can not be met without a certain degree of control that will allow for vegetation and animal manipulations to satisfy both plant and animal needs. Field observations have shown that the system in use in the project area and else where in Syria is open access opportunistic grazing. It was also observed that plants are cropped as soon as they germinate.

This early and close grazing will not only diminish the seed production required for regeneration but will also significantly reduce the potential dry matter production and thus reducing the carrying capacity.

In order to ensure sustainable use of rangelands, control of grazing is imperative.

This is achieved by the establishment of the grazing management committee and the acceptance of the co-operatives in the implementation of grazing management plans in their co-operative areas. This was the result of a land tenure workshop in which recommendations of studies in customary management of the rangelands came up with the three options of tribes, cooperatives or state were

seriously debated. The cooperatives as the basis of grazing management of the rangelands were the accepted option.

Community participation

The project tried to integrate the needs of the community with the requirement of conservation and sustainable development. This resulted the initiation of set of activities to promote community participation by developing and promoting four closely inter-related strategies (Chatty and Baas 1997) : introduction of Participatory Rural Appraisal (PRA) methodology and its use in practical field work, identifying and establishment of a demand driven extension approach for settled and mobile segment of the population living in the project area, preparation of a communication strategy which helps to reach local community members and facilitates dialogue with them and provision of concrete services and income generating activities to local target groups.

Key stakeholders which include the co-operative representatives, Peasant Union, Badia Directorate and project staff were trained in the use of PRA techniques in resource management. Informal resource mapping, ranking and scoring, SWOT analysis (strength, weakness opportunity and threat), standard of living ranking (wealth ranking) and conflict resolutions and their application in practical field situations were found to be effective.

The use of the PRA helped national staff in identifying demand driven extension needs. Resource management requires proper understanding of the end users of the importance of sustainability and conservation of the resource. A mechanism (s) to establish dialogue and communication is critically important. Because of the high illiteracy rate of the Bedouin range user and their mobility, an important link was identified to be Bedouin facilitators. These are Bedouin males and females who can read and write.

The project produce communication materials such as flipcharts and leaflets and the facilitators were trained to use them to deliver extension messages and feed back the project. This was found to be an effective method of awareness raising, reach out and identification of Bedouin problems.

The building of trust quite often happens when concrete services are provided to target groups. Community demands within project limits were met by conducting training programs aimed at income generation and particularly for semi settled Bedouins (mainly woman) these included, embroidery, tailoring and literacy education and study tours to neighboring countries (Jordan) and abroad for cooperative members.

One of the major outcomes of the community participation is the management of the Talila wildlife reserve for approximately 1200 heads of camel (which is the largest camel concentrations in one area). This is achieved by the establishment of the grazing management committee which works with the project.

Another important result is the acceptance of the co-operatives in the implementation of grazing management plans in their co-operative areas. This was the result of a land tenure workshop in which recommendations of studies in customary management of the rangelands came up with the three options of tribes, cooperatives or state were seriously debated. The cooperatives as the basis of grazing management of the rangelands were the accepted option.

Talila Biodiversity Reserve

Reserve Selection

Large numbers of wildlife were decimated in Syria. Some became extinct in the wild (table 2) while others are critically endangered. In the 1950s gazelles were still common in the Badia and particularly Talila. They were hunted for private consumption and also commercially for sale in

market towns like Palmyra and Deirzoor. Their numbers declined since then because of motor vehicles and firearms (Williamson 2000).

The Syrian Government demarcated Talila as biodiversity reserve in 1991 and made a trench around its perimeter.

The reserve is located 30km east of Palmyra and covers an area of 22000 hectares with underlying geology of mainly quaternary or more recent origin derived from limestone and gypsum with part of alluvial deposits. Topography of the enclosed area is generally flat to gently sloping interspersed with localized sand dunes, depressions and drainage lines which lead to relatively big wadis.

Range of soil types support a relatively high diversity of plant species, particularly in the perennial component of the vegetation. The most important perennials which interchange in dominance in different areas inside the reserve are *Artemisia herba-alba*, *Achillea conferta*, and *Achillea fragrantissima*. *Calligonum comosum* and *Stipagrostis plumosa* are present on stable sand dunes. *Anabasis syriaca* and *Seidlitzia rosmarinus* are common in more saline habitats. *Chenolea arabica*, *Poa sinaica* and *Ephedra alata* are found in localized pockets in different parts of the reserve. *Astragalus sp.* make a dense mat in most parts of the reserve in wet years and are the dominant species in the annual component, this is in sharp contrast to the surrounding area, where both diversity and density of plant species are very poor, indicating improvement of the reserve by excluding sheep.

The relatively high diversity of land features and vegetation makes Talila an ideal place for the reintroduction of antelopes but this could not be done without taking the account of its traditional importance to camel grazers.

Management considerations

The development of the reserve for biodiversity conservation and its management consideration were detailed by Williamson (1997) and is outlined here.

Talila is the first reserve in Syria created specifically for the purpose of biodiversity conservation. As such its development is a pioneering effort which to a considerable extent is occurring in a legal and institutional vacuum. This makes it very important to give priority to learning as much as possible from experience gained elsewhere in protected area development.

An important general consideration is that as a result of experience in many parts of the world it is now widely accepted that biodiversity reserves cannot function as isolated islands. This means that there is a need to develop and maintain relationships between Talila and people and institutions at all levels. The more effectively these relationships are developed, the better it will be for the protected area.

In the case of Talila there is scope for developing relationships at local, national, regional and international levels.

1 Local

At the local level both rural and urban populations need to be considered. Relationships with the rural population could involve the following: working with local camel owners to make arrangements for access to grazing in Talila for their animals; on a seasonal basis and as required, negotiating for people to have access to *Kameh* (truffle) in the reserve; establishing a public relations program to inform people about the development and management of the reserve and secure their support for it; developing recreational and educational facilities and activities for the use and involvement of local people, and involving Bedouins in the development and running of cultural and eco-tourism to increase their opportunities for income generation.

The urban population includes local Palmyreans and overseas visitors to the antiquities. Relationships with them will involve the following: developing recreational and educational facilities and activities for their use and involvement, creating scope for cultural and eco-tourism in the reserve and involving local people in cultural and eco-tourism as guides and operators.

2 National

Relationships at the national level will concern both private citizens and institutions and organizations. For private citizens they could involve the following: visits to the reserve for recreational or educational purposes, visits to the reserve for the purposes of cultural or eco-tourism.

Relationships with institutions and organizations could involve the following: visits by parties from schools or universities for recreational and/or educational purposes; collaboration with universities on research and training relating to the protected area; providing government agencies and other organizations with opportunities to learn from the experience being gained at Talila; arranging for staff from Talila to visit other agencies and organizations to learn about their capabilities and facilities.

3 Regional

There is appreciable scope for cooperation with conservation agencies in other countries in the region for the following purposes: obtaining animals for reintroduction in Talila; using Talila to relieve the pressure on overstocked reserves such as Shaumari in Jordan; developing cooperative programs for the management of populations of Oryx and other threatened species in the region and sending and receiving people on study tours to learn about progress and problems in conservation in the region.

4 International

The development and management of Talila would be facilitated by cooperation with international organizations such as: IUCN [The World Conservation Union], which has a world wide network of experts in protected area management which could be useful and also has a regional grouping which could provide valuable contacts for Syria; ACSAD, which is accessible because it is based in Syria and could be useful because of its well established international links; and ICARDA, which is also established in Syria and may be able to contribute expertise on habitat management and improvement and which may also be interested in work on these areas that is being done in Talila.

Implementation

Implementation of management considerations in the planning stage are dealt within, in the reintroduction of wildlife, managed camel grazing, income generation and conservation education.

1. Reintroduction of wildlife

There is clear historical evidence that Oryx, *Oryx Leucoryx* used to occur in the project area. Gazelle *Gazella subgutturosa marica* were common until recently and few still survive today in the wild. Decisions were reached to reintroduce both species.

The way by which these reintroductions are being implemented is influenced by two important considerations:

- a) The Talila reserve is much smaller than the annual range of either of these species and animals released in it would therefore be very much unlikely to remain within its boundaries.
- b) Because of the absence of conservation among people surrounding the reserve, it is very unlikely that the animals leaving the reserve would survive.

To allow for this situation, a 10 Km² release area has been created where Oryx and gazelles will be able to become habituated to local conditions and live under substantially free ranging conditions without leaving the reserve. Because their managements are restricted, their conditions are monitored continuously so that they can be provided with supplementary feed and water as required.

To secure Oryx and gazelles, the project approached the Royal Society for Conservation of Nature (RSCN) of the Kingdom of Jordan and the National Commission for Wildlife Conservation and Development (NCWCD) in the Kingdom of Saudi Arabia . Both governments generously agreed to help Syria in its efforts to re-establish population of both species.

Before animals were reintroduced, Syrian national counter parts were sent to RSCN and NCWCD for practical training in handling and management of antelopes.

Founder group of 8 Oryx (4 males & 4 females) from Jordan and 30 gazelles (10 males & 20 females) from Saudi Arabia were reintroduced into a large enclosure after a period of acclimatization in prerelease area.

The success of antelope reintroduction to Syria is a clear indication of how neighboring countries with similar ecological conditions can benefit from each other in resource conservation and management and in transfer of technology.

2. Managed camel grazing

Talila has been one of the principal grazing areas and camel owners consider it as the life support system for the remaining camel herds in Syria. Traditional access of camel to the reserve and involvement of camel owners in the decision making is part of the management plan. The long term management aim for grazing by both camel and reintroduced antelopes is that this should be regulated by a grazing plan based on the principles of sound range management and use of indigenous knowledge and involvement of target beneficiaries. Grazing committee was therefore, elected by the camel owners.

The grazing system adopted by the project was selected to sustain the productivity of the key perennial species in the area while at the same giving a long period of grazing for camels. The period starting from late autumn to late spring or early summer (from November to May) to give seven months of grazing. This system of grazing was selected for the following reasons:

Plant aspect:

The key perennial species in Talila is *Haloxylon salicornicum*. The species starts growing in late spring with peak of its production in the summer. The plant starts flowering in late summer and set seeds in late autumn and go into winter dormancy. Grazing of the plant after seed maturation and winter dormancy is the least detrimental stage of growth. Plants generally have their highest demand for carbohydrate utilization during early initiation of growth and during fruiting, any grazing system that will allow resting during these periods will favor the well-being and productivity of the plants. Studies in Saudi Arabia have shown that close-grazing of shrubs followed by relatively long period of rest when opportunity for regrowth exist during the rest period had no negative effect of shrubs (Mirreh et al 1993). As *Haloxylon salicornicum* is a summer growing plant, very close grazing that will remove the above ground dry biomass during the dormancy and little grazing of green materials mixed with above ground biomass will favor

new growth (pruning effect). Thus grazing of the plant after seeds drop in November and stopping of grazing at the start of the peak active growth towards the end of May and resting for a period of five months covering both the active vegetation growth and fruiting period will maintain sustainable production of the species in the ecosystem.

Animal aspect

The pattern of vegetation production in desert ecosystem of the Middle East and changes in nutrient content of the different vegetation components in a one year cycle indicate that the range can be divided in terms of nutrient content of available forage into production, maintenance and sub-maintenance phase (Mirreh et al 1990). Any kind of a grazing management system should consider animal needs for better performance. In Talila the key perennial species is *Haloxylon salicornicum* which is not preferred by grazing animals during the growing period when the nutrient content of the species is highest. The feed value of shrubs is extremely poor in the winter dormancy period with digestible crude protein of less than 3% and metabolizable energy of less than 1.7 m cal/kg (Mirreh et al 1993).

Deficiency combined with lower intake resulting from the physical characteristics of their fibrous stems make shrubs inadequate to meet animal nutritional needs for maintenance and growth during winter. This period is the most crucial period for range base animals since it coincides with late pregnancy, early lactation and mating season of camels.

Grazing management strategy to meet nutritional needs should be one that supplements animals during the winter period. The utilization of Talila range from winter to spring has two important elements. Dry standing biomass of *Haloxylon salicornicum* is a bulk feed which help camel tolerate the cold winter and Bedouins consider the plant as the equivalent of bread for humans. Camels are supplemented during the winter with small quantities which meet the maintenance needs of dry animals but not the nutritional needs of lactating camels. Most of the camel loose weight during the winter. Spring grazing of the reserve when the nutritionally rich annuals and other more palatable perennials are available compensate the weight loss of camel and they reach the summer in good condition.

The high perennial shrub density together with the typographic diversity makes Talila an ideal place for young calves to take protection from the cold winter winds, reducing calve mortality.

More than 1200 heads of camel graze the reserve annually for a period of seven months with no negative impact even in drought years indicating the importance of judicious use and sustainable management. Some 20 households benefit from the reserve for camel grazing.

3. Income generation

The biodiversity reserve is close to an important tourist attraction, Palmyra city.

Involving Bedouins in the development and running of cultural and eco-tourism will increase their opportunities for income generation. Identified potential income generating activities using PRA techniques include; embroidery, camel wool products, collection and packaging of medicinal plants, seasonal truffle collection from the reserve and involving local people in cultural and eco-tourism as guides and operators. Targeted practical training programmes and study tours of some Bedouins to neighboring countries with advanced income generation from eco-tourism such as Jordan, is an encouraging example of learning by seeing.

4. Conservation education

Establishment of public relations programme and awareness raising for conservation of biodiversity is key element considered at the planning stage of managing the reserve. The reserve has a botanical garden, dioramas, natural trails, bird-watching, sighting of wild antelopes, thermal bath, camel riding, and other recreational potentials which all can develop into ecotourism and income generating activities.

Information Center for conservation education targeted to wide range of audiences which include school children, students, local visitors and Bedouins surrounding the reserve is a good education tool. The information center will help visitors to discover biodiversity of the steppe, the different ecosystems and the link between the daily lives of the Bedouins with the natural world of Albadia. Material production such as environmental guide for extension agents, teachers volunteers etc, flip charts, children coloring book, initiation of Talila conservation clubs and direct field visits and interaction with the natural environment are all effective tools for conservation education put into effect.

5. Natural biodiversity

The Palmyrean AlBadia supports interesting wildlife communities. Surveys conducted over a three- year period by the Range Rehabilitation and Re-introduction of Wildlife project in the Syrian Steppe reported a total of 306 species of vertebrates and 31 taxa of invertebrates. Birds constituted nearly 85% of the total vertebrates and of the 264 species of birds detected, 60% were passage migrant birds, 25% semi-resident (wintering or migrant breeder) 8% were resident and 7% were accidental birds

It is interesting to note that the oasis in Tadmor is an attractive habitat for migratory birds as the small oasis is surrounded by vast area of desert landscape. In the oasis birds can find water, shade and trees on which they can safely rest during the night from terrestrial predators.

Tadmor (Palmyra) lies on the silk road. The caravans carrying goods and spices from the far east to the Mediterranean used to rest in the oasis. The bird migration and the caravans of the silk- road were similar in their migrations. The only difference was the axis of their travel (the Silk road was East-West axis while bird's axis is North-South).

Among the migrant breeders (summer visitors) discovered in Palmyra by project GCP/SYR/009/ITA is a small relict colony of 3 Bald Ibis pairs still breeding within Palmyra (Serra 2003). It was regarded as extinct from Syria during 1930s and from Europe in 1989 when the colony in Bircik, Turkey died out. This is one of the rarest and most endangered bird globally.

A total Population of 47 species of vertebrates excluding birds is also found in Palmyra. There is one species of amphibian, 25 species of reptiles and 21 species of mammals (Table 3)

Plant diversity in the 22000 ha reserve is relatively fair with approximately 90 perennial and annual species.

Lessons learned

Considerable achievement can be made when community need are integrated with conservation requirement. Building of trust quite often happens when concrete services are provided to target groups.

Bedouin facilitators were found to be an important mechanism to establish and a two way communication linkage between mobile Bedouins and other stakeholders in resource management for felt extension needs.

Study tours of resource user to neighboring countries is very effective in technology transfer and open them up to new ideas that may have a significant positive impact on sustainable resource use and income generation .

The successful reintroduction of antelopes to Syria from Jordan and Saudi Arabia is an indication that greater success are achieved when neighboring countries or regions of similar conditions cooperate in information sharing , training and technology transfer.

A surprising outcome from this project is the high level of public interest that the gazelles and Oryx have aroused. This creates an excellent opportunity to use these animals and Talila reserve to make a useful contribution to meeting the urgent need to raise the level of public awareness of conservation and environment issues.

The discovery near Palmyra of relict colony (the Bald Ibises) of one of the rarest and globally most endangered bird, gave great publicity to the Syrian conservation effort and contributed significantly to the biodiversity conservation education.

The importance of Talila Reserve as multiple use resource (wildlife, camel, recreation, collection of medicinal plants, truffle collection, bird watching, thermal bathing, etc) is eye opening to many who rarely understood the importance of biodiversity conservation.

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Table 1: Flora of Palmyra area of the Syrian Steppe

| Family | Number of species | family | Number of species |
|-----------------|-------------------|------------------|-------------------|
| Aizoonaceae | 3 | Graminae | 16 |
| Berberidaceae | 5 | Hyacinthaceae | 2 |
| Boraginaceae | 5 | Illecebraceae | 2 |
| Campanulaceae | 1 | Iridaceae | 5 |
| Capparaceae | 8 | Labiatae | 13 |
| Caryophyllaceae | 8 | Leguminosae | 4 |
| Chenopodiaceae | 15 | Liliaceae | 5 |
| Cistaceae | 1 | Malvaceae | 2 |
| Compositae | 38 | Mimosaceae | 1 |
| Convolvulaceae | 2 | Orbanchaceae | 1 |
| Crassulaceae | 4 | Papaveraceae | 9 |
| Cruciferae | 25 | Papillionaceae | 21 |
| Cucurbitaceae | 1 | Plantaginaceae | 2 |
| Cyperaceae | 2 | Plumbaginaceae | 2 |
| Dipsacaceae | 2 | Polygonaceae | 1 |
| Ephedraceae | 4 | Rainunculaceae | 7 |
| Euphorbiaceae | 2 | Rutaceae | 1 |
| Frankeniaceae | 1 | Scrophulariaceae | 5 |
| Fumariaceae | 2 | Solanaceae | 3 |
| Geraniaceae | 6 | Tamricaceae | 1 |
| Graminae | 16 | Umbelliferae | 3 |
| Hyacinthaceae | 2 | Utricaceae | 1 |
| Illecebraceae | 2 | Valerianaceae | 1 |
| | | Zygphyllaceae | 4 |

Table2: Species of fauna locally extinct from Syria and Syrian Al Badia

| English Name | Species | Global Conservation Status IUCN 2003 |
|--------------------------|-----------------------------|---|
| Syrian Wild Ass | <i>Equus hemionus</i> | Extinct |
| Saudi Gazelle | <i>Gazelle saudiya</i> | Extinct in the wild |
| Leopard | <i>Panthera pardus</i> | Critically endangered |
| Persian Lion | <i>Panthera leopersica</i> | Critically endangered |
| Nubian Ibex | <i>Capra nubiana</i> | Endangered |
| Arabian oryx | <i>Oryx leucoryx</i> | Endangered |
| Mesopotamian fallow deer | <i>Dama mesopatamica</i> | Endangered |
| Golden Hamster | <i>Mesocricetus auratus</i> | Endangered |
| Cheetah | <i>Acinonyx jubatus</i> | Vulnerable |
| Lion | <i>Panthera lLeo</i> | Vulnerable |
| Wild goat | <i>Capra aegagrus</i> | Vulnerable |
| Lynx | <i>Lynx lynx dinniki</i> | Lower Risk |
| Carcal | <i>Carcal lynx</i> | Lower Risk |
| Brown bear | <i>Urus arctos</i> | Not listed |
| Wild Boar | <i>Sus scrofa</i> | Not listed |
| Ostrich | <i>Struthio camelus</i> | Not listed |

Table 3: Vertebrates excluding birds in Talila Reserve

| Class | English/ common name | Scientific name |
|--------------------------|---------------------------------------|---|
| AMPHIBIA | Frog(Difda'a) | <i>Pelobates syriacus</i> |
| REPTILIA | Turtle (Sulhafa) | <i>Testudo graeca/kleinmanni</i> |
| | Chameleon(Hirba) | <i>Chameleo chameleo</i> |
| | Gecko (Hardun) | <i>Stenodactylus petrei</i> |
| | | <i>Ptyodactylus puiseuxi</i> |
| | Agama Lizard | <i>Trepelus ruderatus</i> |
| | | <i>Laudalia stellio</i> |
| | Lizard | <i>Lacerta trilineata/cappadocica</i> |
| | | <i>Acanthodactylus schmidti</i> |
| | Monitor's (Sihliya) | <i>Varanus griseus</i> |
| | | <i>Chalcides ocellatus</i> |
| | (Afa'a, Haya) | <i>Eumeces schneiderii princeps</i> |
| | Camel Snake | <i>Eryx jaculus jaculus</i> |
| | | <i>Spalerosophis diadema cliffordii</i> |
| | | <i>Psammophis schokari</i> |
| | False Cobra | <i>Malpolon moilensis</i> |
| | | <i>Malpolon monspessulanus</i> |
| | | <i>Lythorhyncus diadema gaddi</i> |
| | Cat Snake | <i>Telescopus fallax hoogsraali</i> |
| | | <i>Coluber spp.</i> |
| | | <i>Eirenis coronella</i> |
| | <i>Eirenis spp.</i> | |
| Black Cobra(Hanash) | <i>Walterinnesia aegyptia</i> | |
| Horned Viper)Ummu qarun) | <i>Pseudocersates persicus fieldi</i> | |
| MAMMALIA | Long Eared Hedgehog | <i>Hemiechinus auritus</i> |
| | Shrew SPP(Abu Amyun) | <i>Suncus/Crodidura spp.</i> |
| | Schlieffens's Bat(| <i>Nycticeinops schlieffeni</i> |
| | Hemprich's Long-Eared Bat | <i>Otonycteris hemprichii petersi</i> |
| | Sind Serotine Bat | <i>Eptesicus nasutus</i> |
| | Asiatic Jackal(Ibnu A'awi) | <i>Canis aureis suriacus</i> |
| | Wolf(Di'ib) | <i>Canis lupus arabs</i> |
| | Red Fox(Sa'alab) | <i>Vulpes vulpes</i> |
| | Ruppell's Sand Fox | <i>Vulpes ruepelli</i> |
| | Marbled Polecat | <i>Vormela peregusna</i> |
| | Badger | <i>Meles meles</i> |
| | African Small-Spotted Genet | <i>Genetta felina</i> |
| | Striped Hyena | <i>Hyaena hyanea syriaca</i> |
| | Wild Cat | <i>Felis silvestris lybica</i> |
| | Sand Cat | <i>Felis margarita</i> |
| | Jungle Cat | <i>Felis Chaus</i> |
| | Sand Gazelle | <i>Gazella Subgutturosa marica</i> |
| | Cape Hare | <i>Lepus capensis</i> |
| | Indian Crested Porcupine | <i>Hystryx indica</i> |
| | Mouse Spp. | <i>Apodemus/Acomys spp.</i> |
| Euprathes Jerboa | <i>Allactaga euphratica</i> | |
| Lesser Jerboa | <i>Jaculus jaculus</i> | |
| Libyan Jird | <i>Meriones libycus</i> | |