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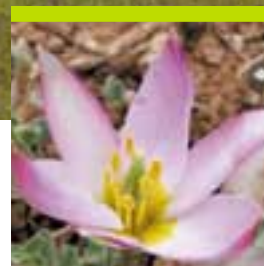
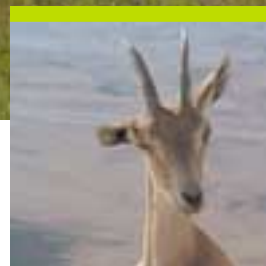
Catalyzing economic growth and national interests through sustainable development



Developing tools for improving service and professionalism



▶ View of the Carmel Photo: Ilan Malester



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A rich variety of flora and fauna and a wide range of ecosystems and landscapes characterize Israel. Some 2,400 plant species, 7 amphibian, 100 reptile, 530 bird and 100 mammal species may be found within the small land area of the country.

How to conserve the wealth of biodiversity in a small and densely populated country? How to assure the conservation of genetic resources, species and ecosystems in the face of intensive development? Israel is well aware of the threats to its unique biodiversity - habitat destruction and fragmentation, introduction and spread of alien species, intensive use of fertilizers and pesticides, diversion and drying up of wetlands and environmental pollution. It is no wonder, therefore, that the subject of biodiversity has been upgraded on the Ministry of the Environment's priority list. One of the first items on the agenda is the preparation of the National Biodiversity Strategic Action Plan whose most important component

is an action plan and recommendations for implementation.

Today, there is no longer any doubt that the conservation of Israel's biodiversity is imperative - environmentally, morally, existentially. The only remaining question is the "how" of the process. To help answer this question, the Ministry of the Environment is coordinating the preparation of a national plan which is being prepared by a task force of experts hailing from government ministries and public bodies - including the Nature and Parks Authority, the Ministries of Education, Science and Agriculture, representatives of academic institutions, and NGOs including the

▶ Photos: Flowers - Oz Golan Ibex: Motti Sela



Society for the Protection of Nature and Jewish National Fund.

To advance the process, a wide variety of activities has been launched including the appointment of expert teams on such subjects as education and public awareness, monitoring and research, threats and conservation measures, legislative and institutional framework and international aspects of biodiversity. Today all of the teams are hard at work, and many have already prepared preliminary papers which survey the professional literature, provide examples from national strategies in other countries and present the situation in Israel along with preliminary recommendations. According to Dr. Eliezer Frankenberg of the Nature and Parks Authority, who heads the international team, there is no doubt that the Biodiversity Convention has had a direct impact on the research conducted in Israel and, of course, worldwide. Questions regarding what to investigate, what to protect and how to do so are no longer dictated by academia alone, but also by the guidelines provided within the framework of the Convention.

Threats and Conservation Measures

One of the most critical chapters of the draft national biodiversity plan is entitled "Threats and Conservation Measures," compiled by Drs. Avi Perevelotsky and Yehoshua Shkedy. The chapter identifies the main threats to Israel's biodiversity including habitat fragmentation and invasive species and proposes preliminary recommendations, including long-term research and monitoring, establishment of nature and biosphere reserves and creation of a professional forum to address the problem of invasive species.

Clearly, recognition of the threats is largely dependent on the compilation of data concerning

the status of Israel's biodiversity. While the earliest references to Israel's flora and fauna may be traced back as far as the Bible and others go back to the vivid descriptions of Henry Baker Tristram in the 19th century, scientific documentation of Israel's natural heritage began in earnest in the 20th century and was much expanded in recent years. In order to provide a firm basis for conservation measures, preliminary recommendations call for setting up a central natural history museum with the twin functions of education and research, a computerized national database on biodiversity which will provide access to internet-based GIS systems, and long-term ecological research networks which will collect data in a central computerized database which will be accessible to the public.

Following is a brief look at some of the major threats to Israel's rich biodiversity:

The Problem: Habitat Fragmentation: The fragmentation and destruction of habitats through housing and development, road construction and urbanization has been responsible for the disappearance and decline of several species in Israel. Therefore, setting priorities for ecosystem conservation has been a central issue in the preparation of the national strategy.

Preliminary Recommendations: *In light of the importance of ecosystem conservation, a critical recommendation is to map all of Israel's remaining natural habitats, protect them, and, if necessary, restore them. All of Israel's ecosystems should then be classified and the level of their representation in protected areas should be assessed. To protect ecosystems, several approaches have been forwarded including a focus on biodiversity hotspots, GAP Analysis and ecological corridors. Furthermore, since agricultural, industrial and residential development have left insufficient open spaces*

In juxtaposition to its small land area, Israel is characterized by a rich variety of flora and fauna



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Menachem Zalutzki: Biodiversity Conservation in Israel

Director, Open Spaces Division, Ministry of the Environment



There is a legal imperative and a moral imperative to protect and preserve the country's remarkable biodiversity

Recognition of the fact that biodiversity is a necessity of life, with a critical role in sustainable development, has spurred the Ministry of the Environment to initiate the preparation of a National Biodiversity Strategic Action Plan. The reasons for this decision may be traced to two parallel needs - the legal imperative to comply with the provisions of the Convention on Biological Diversity and the moral imperative to protect and preserve the country's remarkable biodiversity.

While several bodies in Israel have been and continue to be engaged in important work in the field of biodiversity, there is a great need for integration and cooperation. I hope that the studies currently being undertaken by the different teams preparing Israel's national strategy will provide answers to such vital questions as where to monitor, what to research, which actions to take immediately, and how to allocate already tight resources. **It is of utmost importance for Israel to have a national plan which will consolidate objectives, principles and priority for action in the short, medium and long range.**

The preparation of the plan has highlighted some of the major threats to biodiversity in this country and has pointed the way to potential solutions, some of which are already being implemented. For example, for the past decade we have given high priority to the restoration of our wetland ecosystems - specifically our major rivers which have been tapped at their source to supply urban and agricultural demand and all too often replaced by urban, industrial and agricultural effluents. We did this in order to achieve two important aims: to facilitate the preservation and rehabilitation of unique aquatic habitats and to provide our residents with open spaces for recreation and leisure.

In another area, just a few months ago we published, along with the Jerusalem Institute for Israel Research,

a policy document on "Alien Plant Species in Protected and Open Areas in the Central District." The aim of the study was to determine

which exotic plant species occur in open and protected areas, to define their current level of proliferation and to indicate which alien plant species require the most urgent control measures. The study, which identified some 18 alien species in the central area of the country, some of them already invasive, proposes basic principles and practical measures that may be incorporated in an environmental policy targeted at eradicating and controlling alien species.

Another area of progress relates to the implementation of guidelines on animal passages in roads as a means of mitigating habitat fragmentation. In fact, a 150-meter long passageway for animals has already been incorporated into one of our major roads, the Trans-Israel Road (Road #6). Furthermore, we demanded - and obtained - environmental compensation for the nuisances which will be caused by the road in an area which is particularly rich in landscapes, flora and fauna. This entailed the establishment of an animal passage on Road #70 which will allow large mammals such as gazelles to cross between two biologically rich areas - the Carmel and Ramat Menashe and the Alona Hills.

And finally, I am especially proud of our most recent internet-based project, which is targeted at the general population - "**Plant of the Week.**" Every week, our Hebrew website features one of the country's blooming plants, with a description, a picture and suggestions for a "**Hike of the Week,**" along with a map of the area in which the flower may be found. Those interested in further information need only click on the link to the interactive map to learn more about the landscape unit which features the plant and to find out about plants in this and other areas, including rare, red and endemic plants.

for biodiversity conservation, additional measures may include reconciliation ecology which calls for the establishment of new habitats in the urban environment.

Invasive Species: After habitat destruction, invasive species are the second greatest cause to species decline and extinction worldwide. Therefore, the Ministry of the Environment and the Nature and Parks Authority have upgraded this subject on their priority list.

Preliminary Recommendations: To address the threat to biodiversity from invasive species, initial recommendations call for creating professional and administrative forums to determine priorities and measures for controlling and eradicating invasive species, preventing the introduction of alien species into the country and defining means for reducing the size of invasive species populations in Israel.

Endangered Species: Israel is currently identifying and assessing its endangered species through the preparation of Red Data Books on vertebrates (already published) and wild plants (in preparation). According to these Red Books, some 35% of the country's vertebrates are endangered, although the rate ranges between 20% for nesting birds to 83% for amphibians, and about 17% of the country's wild plants are listed as endangered. Today's

protection measures include the establishment of protected sites such as national parks, nature reserves and forests, strengthening of endangered populations and reintroduction of locally extinct species such as oryx, onagers, Persian fallow deer, and others.

Preliminary Recommendations: To strengthen protection, preliminary recommendations call for formulating detailed conservation plans, establishing priorities for treatment and setting up a fund to finance emergency measures. Additional recommendations call for institutionalizing and upgrading scientific counts of selected populations of flora and fauna and determining optimal population sizes for key species at a regional level in order to help formulate management plans.

A Look to the Future

Recognition of the fact that biodiversity is a necessity of life, with a critical role in sustainable development, has spurred Israel to initiate the preparation of a National Biodiversity Strategic Action Plan. The strategic action plan, which will hopefully be completed in 2005, will include both guiding principles and recommendations for implementation in the short, medium and long terms. Hopefully, the formulation of the action plan, and more importantly its implementation, will pave the way for the sustainable use and conservation of Israel's biodiversity.



▶ Small Photos: *Verbescina encelioides*
Burning and soil solarization of *Acacia saligna*

▶ *Acacia saligna* at the coastal sand dunes of Israel
Photo: Pua Bar



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Prof. Pua Bar (Kutiel): Invasive Species in Israel

Department of Geography and Environmental Development,
Ben-Gurion University of the Negev

Awareness of the critical problem of invasive species must be increased



Invasive species are alien species which have been directly or indirectly introduced by man to a new habitat where they become established and spread to additional new habitats.

These species spread at the expense of indigenous species, a process that is accompanied by a decrease in biodiversity, that is to say a decrease in species diversity, a decrease in habitat diversity (homogenization of the landscape) and a disruption of ecological and environmental processes with significant economic impacts (damage to aquifers, introduction of pests and disease agents in agriculture, etc.).

In Israel, invasive alien species, both plants and animals, are found in all terrestrial and aquatic habitats. Unfortunately, methodological long-term research studies have not been carried out to investigate the causes, patterns and impacts of the problem or the tools to minimize it, and consequently there are no tools or a comprehensive policy to address such aspects as prevention, management and enforcement. What's more, Israel does not participate in global and European projects on the subject.

Yet, there are initial signs of progress. A master's student in Tel Aviv University has developed an updated inventory of invasive fauna in terrestrial and fresh water habitats. This inventory reveals the following: 18 invasive bird species, of tropical origin, are mainly found along the coastal plain or the Syrian-African Rift. Among these, starlings have a high representation. There are 20 species of fresh water fish in the Jordan River system, coastal rivers and Sea of Galilee, of which 10 reproduce in nature. The invasive species in the Sea of Galilee, one of Israel's drinking water reservoirs, compete with local species (including endemic species) for littoral habitats and nesting

sites and impair water quality over time. The invasion of species from the Red Sea (Lessepsian immigration) to the Mediterranean Sea is one of the best-known phenomena in biological invasion on a global scale, which began with the opening of the Suez Canal in 1869. More than 300 flora and fauna species of Red Sea origin have invaded the Mediterranean Sea, of which 60 were documented as model species which constitute about 15% of the fish fauna in the Middle East. Currently, one invasive fish is discovered every year. Other known or suspected invasive species include 200 invasive insects, most of which are considered pests, 28 alien ant species, 10 terrestrial and 26 fresh water mollusk species, and mussels from the Red Sea that infiltrated to the Mediterranean.

There are 164 alien vascular plant species in Israel, of which 53 are considered invasive (24 are known as weeds in agriculture). Unfortunately, there are nearly no systematic research studies on the ecological-environmental-economic significance of invasive plants in Israel. One comprehensive research study is currently being compiled in Ben-Gurion University, with the participation of researchers from the Hebrew University and the Volcani Institute. It focuses on management tools for suppressing the spread of invasive species through a combination of methods, with an emphasis on the suppression of the seed bank. Invasive plant species, such as the *Acacia saligna* (a legume tree), on the one hand, and *Heteroteca subexilaris* (an herbaceous composite), on the other, produce over 400,000 seeds per individual per year and their seed bank, in the case of the acacia, reaches 40,000 seeds per square meter. The research also concentrates on invasion strategies of plants and their impacts on habitat diversity.

In recognition of the severity of the problem, the Nature and Parks Authority has set out to deal with all aspects of invasive species. For this purpose, a steering committee has been established, in which I am a member, one of whose aims is to advance the subject on the national and the international scale.

Prof. Moshe Shachak: Long-Term Ecological Research

Professor of Ecology, Mitrani Department for Desert Ecology, Blaustein Institute for Desert Research, Ben-Gurion University of the Negev

If Israel wants to be among the leaders in ecological research, we should have a national network of ecological research sites

I have been investigating ecosystems in Israel for many years. I have come to the conclusion that if Israel wants to be among the leaders in ecological research, we should have a national network of ecological research sites. It is for this reason that with my colleagues, Drs. Avi Perevolotsky and Bertrand Boeken, we founded the Israel Long-Term Ecological Research Network in 1990, which is part of the International LTER.

Global scientific interest in LTER programs, which aim at assessing complex environmental issues, has expanded significantly over the past decade, and Israel is proud to be an integral part of this global network.

The goals of Israel's LTER network include:

- To investigate the structure, function and long-term dynamics of ecological systems and their impact on biodiversity in specific sites along Israel's rainfall gradient.
- To use this knowledge to develop ecological management methods for preserving and rehabilitating biodiversity.
- To integrate the sites and data in environmental education programs which emphasize the importance of biodiversity for the functioning of the biological system and its services to man.

Over the past decade, long-term ecological research stations have been - and are continuing to be - established along the rain gradient. At present, seven sites, representing arid, semi-arid, sand and Mediterranean scrubland ecosystems, operate in Israel. These are, from south to north, Mitzpe Ramon (with less than 100 mm of rain), Ovdad, Shaked, Lehavim, Adulam, Nitzanim and Ramat HaNadiv (with some 600 mm of rain). In the future two

others will begin to operate - Miron and Begin. A director and a managing team administer each site. The site directors form the managing team of the network. A three-member steering committee represents the network in Israel and abroad.

At most of the sites, research is undertaken on the effects of woody vegetation as landscape modulators on biodiversity. In all of the sites, long-term data are collected on selected groups of plants and animals. These data will be available to researchers, managers, educators and the general public in the near future.

There is no question as to the contribution of these sites to the understanding of long-term trends in ecosystem dynamics along Israel's rainfall gradient. Moreover, the research itself is not merely an academic exercise. Already today the Jewish National Fund and the Nature and Park Authority have adopted management methods based on the Israel LTER findings.





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Amir Balaban: Urban Ecology

Co-Director, Jerusalem Bird Observatory



We must recognize the enormous potential of community urban wildlife sites

Urban ecology is a new concept on the local planning scene in Israel. Unlike what is happening in several European countries and the United States, Israel, as a young state with an accelerated rate of urban development, has taken little or no account of the importance of incorporating nature sites into the densely built urban fabric. Yet the sustainable management of natural systems is both easy and inexpensive. **We just have to let nature do what it can do in order to create a unique attraction in the urban environment, which will also help to abate nuisances** - moderate climate, absorb pollutants and facilitate the penetration of water to the soil and groundwater. As realization grows that nature is not the personal property of only those who live in the countryside, so does public demand for green spaces in the urban environment.

My vision is that statutory nature sites be allocated and protected in every town, everywhere. I

would like our municipalities to incorporate the concept of urban wildlife sites into their day-to-day management, with the participation of an urban ecologist who will be dedicated to managing these areas as sustainable green spaces, which are open and accessible to all. Unfortunately, we are still far away from the fulfillment of this vision since our planning bodies and municipal authorities continue to view land reserves as opportunities for building and development. What is needed is a change in conception. As has occurred in such cities as London, **nature should only be a walk away, accessible and free for all.**

As a first step we must conduct an inventory of the current state, then we must prioritize existing open spaces according to their value in terms of both biodiversity and public attraction. Only then can a decision be taken on what to preserve, what to develop.

Unlike the case of nature reserves, both man and the environment are equal in urban nature sites. The idea is both to conserve biodiversity and to

create a place in which every person can meet the natural resources which are unique to his city, inexpensively, immediately and accessibly. Moreover, the public is welcome to participate in different aspects of urban nature sites, whether in research, education, site maintenance or in a wide variety of leisure activities.

Today, the first buds of progress are already here. For example, **the Jerusalem Bird Observatory is the first official community urban wildlife site in Israel which was allocated by the state specifically as an urban natural site.** The site, which is part of the Israeli Ornithological Center of the Society for the Protection of Nature in Israel, is one of the few traditional birdwatching areas (IBA) in Jerusalem that has not been harmed by development, and is centrally located by the Knesset, making it attractive as an educational

West Jerusalem neighborhoods and only minutes away from a large shopping mall. The valley is best known for a herd of mountain gazelles (about 30 individuals) which survived the massive urban development of the area and is sustained from the local natural resources. However, this urban wildlife site has been threatened by a large construction project whose realization will not only impose a death penalty on the gazelles but will mean the loss of the last open space in the area and one of the few remaining natural valleys in the city as a whole. Residents of the area did more than just call for the preservation of the valley but set up an action committee and drew up an alternative plan for developing the valley. Based on both resident participation and scientific surveys of the natural resources of the area, the alternative plan calls for preservation of a large part of the valley as a



▶ At the Jerusalem Bird Observatory and Gazelle Valley
Photos: Amir Balaban

and tourist center. It is no wonder, therefore, that the site has succeeded in meeting its main goals: environmental education, conservation research, eco-tourism and a meeting ground for all sectors of the public in Israel. Around the bird-ringing table, in summer camps and in numerous courses, it is not uncommon to see young and old, religious and secular, Jew and Arab, working and learning together in an apolitical setting which serves as a common denominator.

Yet that's not all, residents of Jerusalem are continuing to struggle on behalf of urban wildlife sites. **A prominent example is the so-called "Gazelle Valley" in the urban heartland of several**

natural zone, reserved for the valley's wildlife, surrounded by public spaces for recreation, leisure and sport.

These and other examples highlight the importance of identifying the enormous potential of community urban wildlife sites. The advantages are enormous not only in terms of biodiversity conservation but in terms of the communities themselves. Such sites also offer immense potential for special education programs - offering employment possibilities, work in the open air, development of professions related to urban ecology, and training on monitoring, gardening, and maintenance of ecosystems, public infrastructures and nest boxes. It's a win-win situation for all.



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Prof. Avi Shmida: Israel's Wild Plants

Professor, Department of Evolution, Systematics and Ecology
Director of Rotem, Hebrew University of Jerusalem



Yellow Iris Photo: Oz Golan

Over the past 25 years, Rotem, the Israel Plant Information Center, in cooperation with the Society for the Protection of Nature, has been hard at work developing a comprehensive database of Israel's wild plants, which is based on over 650,000 observations by people throughout the country who report on the location and blooming times of different plants.

The aim is three-fold:

- **Education** - To instill a love and knowledge of Israel's wild plants in the general public and nature lovers.
- **Science** - To undertake research on the geographic distribution, biology and phenology of wild plants in Israel.

- **Nature Conservation** - To promote the conservation of wild plants in Israel by supplying botanical information and especially information on rare and endemic plants for conservation use.

Today, access to information concerning the botanic richness of different areas in Israel is only a click away. Thanks to a research project, conducted by Rotem in conjunction with the Ministry of the Environment, quick and free access to listings of 2,383 plant species, including endemic, rare and endangered species, is already available on the Environment Ministry's website.

But that's not all. The two bodies are currently advancing an ambitious project which should



see the transformation of different aspects of the Rotem database into a user-friendly, internet-based guide to the wild plants of Israel. The electronic guide, which will be accessible on the Ministry of the Environment's website, will include something for everyone: a full lexicon of Israel's wild plants, replete with their names and synonyms in Hebrew, Arabic, Latin and English; immediate access to photographs of all of Israel's wild plants (one click - one photograph, an additional click, additional photographs); a distribution map for each plant, with information on blooming periods, plant characteristics, habitat, and flower color. In the second stage of the project, additional features will be provided: a full description of each plant and a paragraph about plant uses, folklore, seed dispersal and flower pollination. **As of December 2004, the Ministry of the Environment's website already includes weekly online information about a blossoming plant and where it can be found, a so-called "Plant of the Week", accompanied by a "Hike of the Week".**

Israel's flora comprises 2,383 species of which 148 are endemic and 405 are Red. The Red List includes



all of Israel's endangered plant species based on five major factors: rarity (number of sites where the species is present), extinction rate and habitat vulnerability (decreasing rate in number of sites and destruction probability of the habitat), attractivity (probability of picking or exploiting the plant), endemism (species which are endemic to Israel) and peripheralality (plants which are at

the edge of their distribution). **The Rotem-Ministry of the Environment internet-based project features a map which identifies Israel's botanic hotspots so that information on Israel's rare and "Red Plants" and their geographic distribution is available to anyone, anywhere. These maps should go a long way toward identifying rarity and biodiversity hotspots in order to set priorities for conservation and development policies in Israel. The information will be incorporated in a Red Data Book of wild plant species.**

Today we are witnessing a positive phenomenon - a return to nature. My hope is that Israelis will learn to look beyond the smoke of barbecues to the beauty of the country's wild plants. Hopefully, they will take the time to look at and to enjoy the remarkable plentitude of our wild plants, which is remarkable not only nationally but internationally as well. The "Flower of the Week" which is featured on the ministry's website, and is available to anyone, provides essential information on hiking routes to blooming plants in different areas of the country in different parts of the year. It is important to remember

that an average of 36 different plant species abound in one meter of land in Israel, making it one of the richest areas in the world. Furthermore, the spring blossoming in Israel is among the most spectacular in the world since some 60% of our plants are annuals which flower together within a short period of time and compete for each wild bee fauna. The spectacular corollas, which are displayed by these plants as they compete for pollinators is truly memorable. It is my wish that our public will identify and recognize as many of these species as possible. The internet-based guide should go a long way toward fulfilling this wish.

I hope that Israelis will take the time to look at and to enjoy the remarkable plentitude of our wild plants, which is remarkable not only nationally but internationally as well