Ramat Hanadiv Sustainability Report 2017

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Preface

Ramat Hanadiv, as well-kept Memorial Gardens surrounded by a Nature Park, is a location. But more than that, Ramat Hanadiv is an ethical entity that strives to find a balance between nature, man and environment. We constantly strive towards sustainable conduct and assimilation of sustainability values inside and outside of the organisation. Our fundamental approach sees man as part of the circle of nature. Therefore, what man takes from nature he should return through sustainable conduct.

Baron de Rothschild's legacy, that we continually perpetuate, means a constant striving for innovation. As part of this legacy, and with the aim of protecting the values of nature and environment in the area surrounding Ramat Hanadiv, we initiated and established The Partnership for Regional Sustainability – a regional partnership between Ramat Hanadiv and the five nearby councils in the area surrounding Hanadiv Valley.

As Director of Ramat Hanadiv I feel responsible and committed to a long-distance and long-term vision, and believe that the path of dialogue and cooperation with our neighbours will enable us to maintain a high quality environment for ourselves and for future generations.

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Hugo Jan Trago,

CEO Ramat Hanadiv

Photo: Amit Geron

About the Sustainability Report

This is the first year that Ramat Hanadiv is describing its work in the field of sustainability in a structured report, in order to share its diverse sustainability activities with colleagues and other interested people. The report includes two distinct, complementary fields: conveying values and information about diverse sustainability issues to the wider community, including those who enter Ramat Hanadiv's gates, and practical assimilation of sustainability issues into the daily routine operations of Ramat Hanadiv as an organisation.

For answers to any questions about the activities described in the report, you are welcome to contact us by email: Racheli@ramathanadiv.org.il

About Ramat Hanadiv

Ramat Hanadiv's Vision

Ramat Hanadiv is a living memorial to Baron Edmond de Rothschild, operating for the benefit of the Israeli public as a whole and for generations to come. Ramat Hanadiv plays a leading role in the management of natural and cultural resources based on sustainable interactions between man, nature and the environment, and encourages understanding and appreciation of this ideal.

The Values that Guide Us at Ramat Hanadiv

Excellence – Setting high standards in landscape management, education, heritage preservation, research and community outreach.

Innovation and creativity – Conceiving and adopting new methods of implementing Ramat Hanadiv's goals.

Tranquillity, simplicity and enjoyment – Maintaining a site that serves as a place providing recreation, peace and tranquillity for all who enter its gates.

Openness and involvement – Creating a site that welcomes diverse individuals and communities.

Ramat Hanadiv Act

The Ramat Hanadiv Act was legislated in 1958 as follows:

A company by the name of 'Ramat Hanadiv Gardens' will be designated for charitable purposes. It will receive ownership of the lands of 'Ramat Hanadiv', located on the lands of Zikhron Ya'akov and Binyamina, from the Palestine Jewish Colonization Association (established by Edmond de Rothschild), will maintain these lands, and will manage them as a public garden and park dedicated permanently to perpetuating the memory of Benjamin de Rothschild (z"l).

Photo: Amit Geron

Ramat Hanadiv is a Memorial Gardens and Nature Park perpetuating the memory of Baron Benjamin Edmond James de Rothschild and his wife Ada Adelaide. Ramat Hanadiv is managed for the benefit of the public and includes Memorial Gardens, a Nature Park, a Visitors Pavilion and an Operations Area.

The **Memorial Gardens** are beautiful, landscaped gardens covering an area of seven hectares. Planning of the gardens began in 1936 and the early work commenced in 1940, but was held back by World War II. After the establishment of the State of Israel in 1948 the work to lay out the gardens was renewed, and continued until 1954. The bones of the Baron and Baroness were then brought from France to Israel and interred at Ramat Hanadiv Memorial Gardens with a state funeral. Since then, the gates of Ramat Hanadiv have been open to the public.

The gardens instil tranquillity and serenity in the visitors who walk their trails. Visitor movement to and from the gardens creates the feeling that they are a living, beating heart. At their centre is the mausoleum in which Baron Rothschild and his wife are interred. Surrounding the mausoleum are a rose garden, iris garden, palm garden, fragrance garden and cascade garden. Each of these has its own unique beauty that provides the visitor with a peaceful and enjoyable experience. For further reading on the range of gardens follow this link: A tour of the gardens. For a virtual tour of the gardens follow this link: Virtual tour.

Ramat Hanadiv Park including the Memorial Gardens. Illustration: Gregory Katz

The Nature Park is spread out around the Memorial Gardens, covering 450 hectares at the south-western tip of Mt Carmel. It comprises a range of habitats, is rich in plant and animal species and is considered to be the most studied natural site in Israel. The park includes a spring and archaeological sites that are accessible to visitors via a network of walking trails. The beautiful landscapes of the Mediterranean coastal plain in the west and the mountains of Samaria in the east can be viewed from different locations around the park.

Between the park and the Memorial Gardens is the **Visitors Pavilion**. It was dedicated in 2008 and is credited with being the first building in Israel to be certified by The Israel Standards Institute as a 'green building' and receive a green building certificate from the American organisation LEED (Leadership in Energy and Environmental Design). The building offers visitors an InfoShop, classrooms, a lecture theatre, an auditorium which shows a film about Baron Rothschild and his activities, a kiosk, a restaurant and restrooms.

Next to the Visitors Pavilion is Ramat Hanadiv's **Operations Area**, which acts as a 'nerve centre' controlling all the activities in the Memorial Gardens, Nature Park and Visitors Pavilion. The operations area houses the offices of the park's management and its various departments, dining room and restrooms, nursery, hothouses, horticultural therapy centre, storehouses, garage for tractors and off-road vehicles, metal workshop, water purification centre, waste collection centre, meteorological station and goat pen.

Photo Tal Gluck

Ramat Hanadiv as an Organisation

Ramat Hanadiv is an organisation that comprises nine departments. Each department has its own rationale for its activities, and all the departments together are guided by the vision of Ramat Hanadiv. Sustainability is a lateral issue integrated into the activities of all departments at Ramat Hanadiv, as detailed in the following report.

The Gardening Department – the rationale guiding the Gardening Department is the maintenance and nurturing of the Memorial Gardens that perpetuate the memory of Baron Rothschild, for the well-being and enjoyment of the public; maintaining the delicate balance between development, improvement and innovation; and preserving the guidelines and original planning of the gardens, according to current needs and prevailing visitor practices at the site.

The Nature Park Department – the rationale guiding the Nature Park Department is management based on research and knowledge that strives to achieve balance and a solution to all the human and ecological needs, with a preference for renewable rather than non-renewable resources and for suitable integration of cultural assets in the natural landscape. In addition, all management activities are documented in order to examine their influence on the natural systems, and updated according to the results.

Photo: Racheli Schwartz-Tzachor

The Facilities and Operations Department – the rationale guiding the Operations Department is the construction and maintenance of buildings and infrastructures using technologies that support sustainability principles and contribute to increased efficiency and saving of resources such as water, electricity and more; separating waste at source and transferring it to recycling as much as possible; and a gradual move to biological pest control by innovative means without the use of poisons.

The Sustainability Department – the rationale guiding the Sustainability Department at Ramat Hanadiv includes outlining ways of promoting and enhancing sustainable operations at Ramat Hanadiv as an organisation and as a site, with an emphasis on reducing the ecological footprint and providing accessibility to a diverse public.

The Visitors and Marketing Department – the rationale guiding the Visitors and Marketing Department is to encourage a broad and diverse public to enter the gates of Ramat Hanadiv in an atmosphere of enjoyment, serenity and tranquillity; enrich the visitor experience, expose visitors to the knowledge acquired at the site and raise their awareness of the importance of open landscapes; and promote involvement of the nearby community through tourism and leisure activities.

The Scientific Research Department is managed according to the following rationale: familiarisation with natural systems and human–environmental relationships and their influence on the decision-making process, which is integral to park management; supporting site- and time-specific research together with Long Term Ecological Research; and creation of a database that contributes to enriching the public and the scientific community in Israel and abroad.

The Finance and Human Resources Department is managed according to the following rationale: empowering the organisation and increasing its output by developing its human assets, with an emphasis on supporting and retaining employees; and increasing the feeling of belonging and providing solutions for the needs of both the system and the employees.

The Systems Integration Department is managed according to the following rationale: improving the efficiency of various processes with advanced technological means using appropriate software; organising the different databases that accumulate continuously and presenting them in an accessible, up-to-date graphical display.

The Partnership for Regional Sustainability Department – In 2015 Ramat Hanadiv initiated The Partnership for Regional Sustainability, based on an understanding that sustainability does not end at the park's boundaries, but continues into the space surrounding the park and beyond. Its partners in The Partnership for Regional Sustainability, who share the same geographical region, are the Zikhron Ya'akov, Binyamin-Givat Ada and Jisr al-Zarqa local councils and the Hof HaCarmel and Alona regional councils. The rationale guiding The Partnership for Regional Sustainability comprises a significant improvement in sustainability issues in the region and assimilation of sustainable operations by municipalities and residents for the long term. This is to be achieved by encouraging collaboration, executing processes that involve a range of interested parties and increasing awareness of sustainability issues. This department oversees the operations of the Education, Community and Horticultural Therapy Divisions of Ramat Hanadiv.

The organisational structure of Ramat Hanadiv

Human Resources in the Organisation

The Ramat Hanadiv organisation comprises 68 employees. The proportion of women employed by the organisation is slightly higher than the proportion of men, and stands at 54%. The proportion of employees with higher education is more than half, reaching 53% of all employees (26% have a bachelor's degree, 18% have a master's degree and 9% have a PhD). The average employee age at Ramat Hanadiv is 45, and the employees represent a range of religions – Jews, Muslims, Christians and Druze. The proportion of non-Jewish employees is 13%, while the proportion of employees with special needs is 3%.

Assimilation of sustainability values at Ramat Hanadiv is also expressed through concern for our dedicated employees and wonderful team of volunteers, according to the approach that human assets and their care are of paramount importance. We focus on maintaining appropriate work conditions for both employees and volunteers, and enriching them with professional and general knowledge.

Safety and Cooperation

We are strict about safety in the work environment, safe use of work tools and adoption of an ergonomic work environment. Employees in the Operations, Memorial Gardens and Nature Park Departments receive appropriate clothing and footware. Every employee receives a pension fund and an advanced study fund. For sub-contractor employees we check that the sub-contractor provides them with the rights afforded them by law. We are sensitive to our employees' important personal occasions. We send a bouquet of flowers for joyous family occasions such as births, bar mitzvahs or weddings. When an employee is in mourning for a first-degree relative we allow the other employees to participate in the funeral and organise transport for them.

Study and Enrichment

We are an organisation that studies and teaches; therefore, we pay special attention to empowering our employees and encouraging them to attend academic studies, courses, continuing education programmes and conferences. We conduct frequent courses on workplace safety, first-aid instruction and forest fire drills. Similarly, we organise fun days, hikes, enrichment days and events for all staff members, to which their families are also invited. In 2017, we conducted a 'swap meet' event for all our employees, volunteers and guides, designed to raise awareness about reducing consumption and reusing products.

Assimilating Sustainability

In order to impart knowledge about sustainability and assimilate sustainability into the organisation, we conducted a hands-on continuing education programme called 'A Window to Sustainability' for the entire employee staff, with the help of the Israeli company The Natural Step (TNS), and the management staff underwent an additional continuing education programme called 'A Booster for Sustainability'. During these programmes, we worked on Ramat Hanadiv's sustainability vision, the future vision of sustainability of Ramat Hanadiv and the overall lateral aims of sustainability.

The Sustainability Vision

An Experience of Nature and Man - respect the past, present and future to inspire a sustainable living environment.

A Future Vision of Sustainability at Ramat Hanadiv

Ramat Hanadiv is a place that combines meticulous Gardens to perpetuate the memory of Baron Rothschild with a Mediterranean Nature Park, managed according to ecological knowledge and sustainability principles. Ramat Hanadiv is an organisation that provides a forum for joint action; the beating heart of the region that supports and surrounds it.

Ramat Hanadiv is committed to the environment, and to each and every person, and promotes support and accessibility for special populations; works for the sake of sustainability values and nature conservation, and promotes the saving of water and resources; respects heritage and history and fosters a calm and tranquil atmosphere without compromising on quality and excellence.

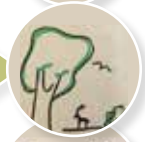
Ramat Hanadiv sees value in good communication and transparency within the organisation, while at the same time promoting dialogue with the community as a basis for decision making, from an understanding that mutual dependence among organisations in the region is essential.

Ramat Hanadiv strives to drive environmental and social activity at the regional level; to formulate a strategy and vision of a sustainable region in partnership with the community; to motivate and support decision making in the environment, in order to bring about the creation and promise of landscape continuity today and in the future.

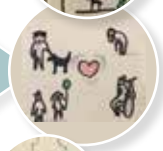
Overall lateral aims for sustainability

Reducing the ecological footprint | Systematically reducing the use of materials from the earth's crust and reducing the concentration of resistant compounds in the atmosphere.

Ecosystem conservation and management
Maintaining healthy, functioning ecosystems that support biodiversity.



An experiential, accessible visit | Empowering the visitor experience at Ramat Hanadiv and ensuring increased accessibility to the wider public.



A link and bridge to the region | Ramat Hanadiv will be connected to its environs and act as a bridge between people, communities, nature and the landscape.

An organisation of people
Fostering an organisational culture based on social sustainability, including: partnership, mutual respect, tolerance, openness, pride, trust and professionalism.

An "island" of peace and tranquillity | Ramat Hanadiv will facilitate a quiet, peaceful, calm and aesthetic experience that is inspiring and soul satisfying.

A sustainability centre | Ramat Hanadiv will be a centre of knowledge, education and demonstration of sustainability issues and will work to disseminate and assimilate them. Emphasis will be placed on fostering environmental leadership among the region's communities and among professional communities.

Preserving heritage assets | Ramat Hanadiv will work to preserve and promote heritage assets, and to integrate local traditional knowledge in its operations.

Courses at Ramat Hanadiv

In 2017 an inter-university academic course in applied ecology took place at Ramat Hanadiv, in partnership with Tel Aviv University. About 30 MSc and PhD ecology students participated in the course, together with employees of professional organisations; they studied practical issues in open landscape management.

The course 'Knowing wild plants' also took place in 2017 at Ramat Hanadiv in partnership with the Botanical Gardens at Givat Ram in Jerusalem. About 35 nature lovers and professionals working as landscape architects, gardeners, horticultural therapists, rangers in conservation organisations, nature surveyors and botanists took part in the course.

Publishing at Ramat Hanadiv

The years 2013–2016 were very productive for publishing new books at Ramat Hanadiv, on topics covering gardening, ecology and heritage: *Ramat Hanadiv*, an elegant book in three languages (Hebrew, Arabic and English) that describes the history of Ramat Hanadiv and the diverse activities conducted in it; *Management and Conservation of the Mediterranean Ecosystem – Ramat Hanadiv as an Example*, that summarises 25 years of ecological research at Ramat Hanadiv; *Secrets of Irises* and *Butterflies at Ramat Hanadiv*, that were published in Hebrew and English (second edition); *Horticultural Therapy* (second edition); *A Day in the Gardens*; *Goat Grazing in the Woodland; Wild Boar Around the World and in Israel: General Background, Population Growth, Conflicts, Management Methods and Challenges* and *A Field Guide to Invasive Plants at Ramat Hanadiv*.

Accessibility

Accessibility for special sectors of the population has always been important at Ramat Hanadiv. Already in 1984, as per the request of Dorothy Rothschild, a special garden designed for the blind – the fragrance garden – was built in the Memorial Gardens. This garden was especially designed to provide enjoyment for the blind through scented herbs and fragrant plants, tactile plants with interesting leaf textures, and listening to the gurgling of the waterfall in the pond at the centre of the garden.

The field of accessibility has developed over time in Israel and currently we aspire to improve it here as well. Therefore, we trained an accessibility coordinator for the organisation, and an accessibility consultant aided

us in mapping all of the accessibility needs at Ramat Hanadiv. We made sure to complement the process by making our website accessible, and we conducted instruction sessions about accessibility for the entire employee staff at Ramat Hanadiv.

Volunteer staff

We believe it is important to share our work with the public as part of the community sustainability of Ramat Hanadiv, therefore we created a framework that allows volunteering on site. We gladly welcome volunteers who want to contribute their time and skills and join our workforce. Today we have about 60 wonderful volunteers who contribute their time to work in the Memorial Gardens, nursery, horticultural therapy, goat pen, vegetation monitoring in the Nature Park and more. Our volunteers are an integral part of the employee staff and participate in events and holiday celebrations at Ramat Hanadiv.

Photo: Judith Katz

The Memorial Gardens

The Memorial Gardens were designed in classic European style, which is characteristically formal. Expansive lawns cover wide areas, bordered by trees and shrubs, as well as annual and perennial flowers. The garden comprises a number of unique smaller gardens, each with its own characteristics: a cascade garden, a rose garden, a palm garden, an iris garden and a fragrance garden. The garden's designers skilfully integrated meticulous gardening with ornamental plants and preservation of the natural landscape in certain areas, and combined a large diversity of cultivated plants with typical local plants.

Sustainability principles have been assimilated in Ramat Hanadiv's worldview with respect to gardening. Natural fertilisers, environmentally friendly pesticides and water-saving measures are used as much as possible. The abundance of pools, waterfalls and fountains creates the impression that Ramat Hanadiv has an abundance of water. However, in practice they are fed by a small amount of water that flows through a closed cyclical water system. The gardening and pruning waste is used to fertilise and cover the soil. Thus we enrich the soil and reduce evaporation of water from it. To save water, a streamlined programme was developed for the irrigation of the entire garden and for the irrigated flowerbeds, using drippers that bring water directly to the plants. Irrigation takes place only during the early morning and evening hours, when water absorption into the soil is at a maximum.

The Memorial Gardens
and Visitors Pavilion
Illustration: Gregory Katz

Photo: Yadid Levy

A combination of ornamental plants and natural vegetation

The Memorial Gardens cover an area of seven hectares, at an altitude of 130 m, and include 200 plant species belonging to 163 genera and 76 families (not including seasonal annual plants and species of herbaceous wild plants). Most of the area of the Memorial Gardens is devoted to ornamental plants from around the world that grow in the different well-kept flower beds. However, since the gardens' establishment, natural, wild Israeli vegetation has also grown in them, without any irrigation or special treatment. The areas of natural vegetation together comprise about one third of the area of the Memorial Gardens (about two hectares). They include mainly wild trees and herbaceous plants typical of the Ramat Hanadiv region. A few of them, such as the Persian cyclamen, poppy anemone and hyacinth squill, adorn the gardens with beautiful carpets of flowers in the winter. Other species such as white micromeria, fringed rue, za'atar and conehead thyme, used as herbs and tea, grow together with ornamental plants in the fragrance garden. Various well-kept spots integrate attractive wild plants such as the Judas tree, Syrian maple, oriental plane, Mount Tabor oak, Mt Atlas mastic tree and carob tree. In total, 56 species of wild Israeli plants grow in the gardens. Their integration in the gardens contributes to **conservation** of these wild plants and supports insects, birds and other animals that feed on them.

Photo: Ramat Hanadiv Archive

Similarly, the Memorial Gardens house a special project to conserve nine spectacular species of wild Oncocyclus irises, all of them **'red' species** in danger of extinction in Israel. In order to conserve all of these iris species we established a special garden for them that serves as an example of **ex situ conservation** outside of their natural habitats. The aims of this garden are to act as a backup for the iris populations growing in the wild, in case they are harmed, and to familiarise visitors to the garden with these spectacular wild plants and other species of Oncocyclus irises originating in Israel's neighbouring countries. In addition we published a book, Secrets of Irises, which includes information on these iris species in Hebrew and English.

Management of the plant collection

We use IrisBG software to manage the plant collection in the gardens. With its help, the 'history' of each plant and plot is documented, including the plant's exact spatial location. The programme enables management of future tasks in the gardens and sets reminders for actions that must be taken. The programme has a web interface that allows people surfing the Internet to use it to become familiar with the plants in the gardens and their locations. In addition, we place emphasis on **rehabilitation of mature trees**. Rehabilitation includes pruning, thinning branches, additional manual irrigation during the summer and drilling holes in the soil using an Air-spade device in order to insert mycorrhizal fungi into the root system. We published a booklet on this topic, called *Mature Trees at Ramat Hanadiv*, which details the rehabilitation of each mature tree in the gardens.

Nursery

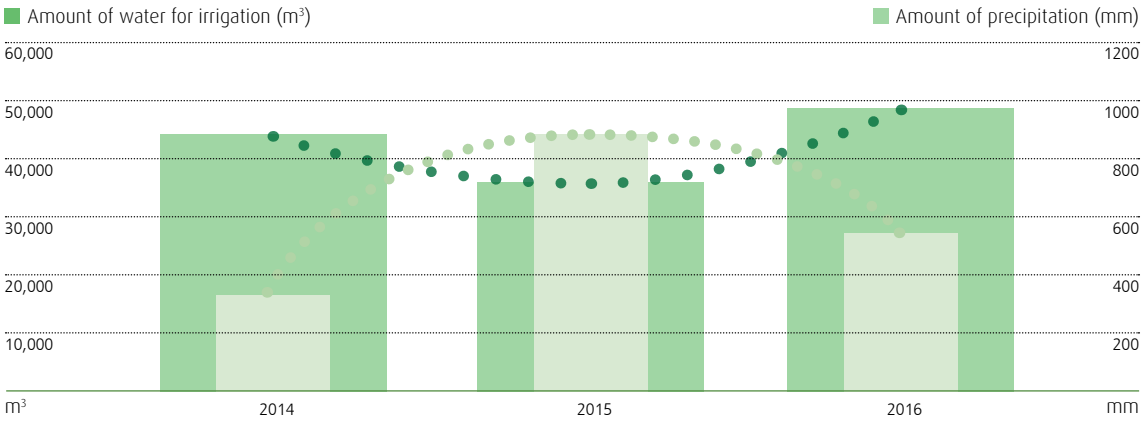
We sow and grow approximately 50,000 seasonal plants in our nursery each year, for planting in the garden. Thus, we save transfer of plants and use of disposable plant pots. Similarly, each year we grow hundreds of seedlings of herbs, shrubs and perennial trees for the garden's needs. The nursery even contributes to **conservation of rare species** that grow around the park. Each year we sow and grow rare plants for conservation and reintroduction. There is no use of fertilisers or pesticides through the irrigation system, and if a pest or disease is discovered, we do our best to treat them with environmentally friendly means.

The irrigation system

Irrigation system management and control in the gardens is carried out using **ICC Pro software**. Opening and closing of irrigation lines is conducted automatically according to the program, in which the dose of irrigation water is determined by considering the size of the irrigated area, the type of vegetation, the amount of precipitation and the season. The irrigation lines for the perennial plants, which are considered to be water-saving, are separated from the irrigation lines for the annual plants, which need more water. The water used for irrigation in the garden is **partly brackish bore water** which is not suitable for drinking.

Similarly, we use innovative means of **remote sensing** to examine the viability of the gardens' plants according to the amount of chlorophyll in the leaves. We photograph the gardens using a drone with a multispectral camera that photographs at five different wavelengths. We use the images to calculate an index that reflects the amount of chlorophyll in the leaves (NDVI). For each species of tree, we calculate the average index, and when it is below a certain level for that particular species, we conclude that it is in a low state of viability. Using the drone images we identify the locations of trees with a low level of viability and examine whether they are sick or not receiving sufficient water.

Water consumption and precipitation amount in the Memorial Gardens, 2014-2016.



The Nature Park

The Nature Park surrounds the Memorial Gardens and covers an area of 450 hectares, comprising extensive areas of garrigue, natural woodland, scrubland and planted woodlands. Three rivers flow through the park – Cabara River, Nadiv River and Timsah River – and the Ein Zur spring also flows into it. Near the spring are archaeological sites including a public bathhouse and a palace from the Roman period. Another archaeological site is Horvat Aqev, which overlooks the coastal plain. In this part of the report we will describe the efforts taken to conserve biodiversity in the park, how we work to protect the park against fire and how we promote landscape agriculture in part of its area.

The park's area

We conserve biodiversity in the park as much as possible, namely, we make sure to conserve the different habitats and place emphasis on conserving the diversity of organisms within it. We frequently survey, study and monitor some groups of organisms, focusing on the use of supportive management for conserving the diversity of plant and animal species.

The number of species in different groups of organisms within the park

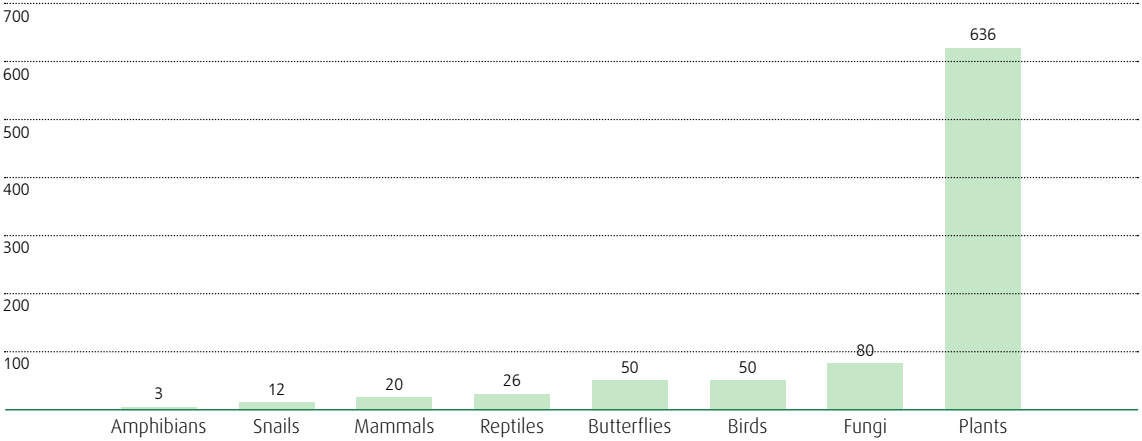


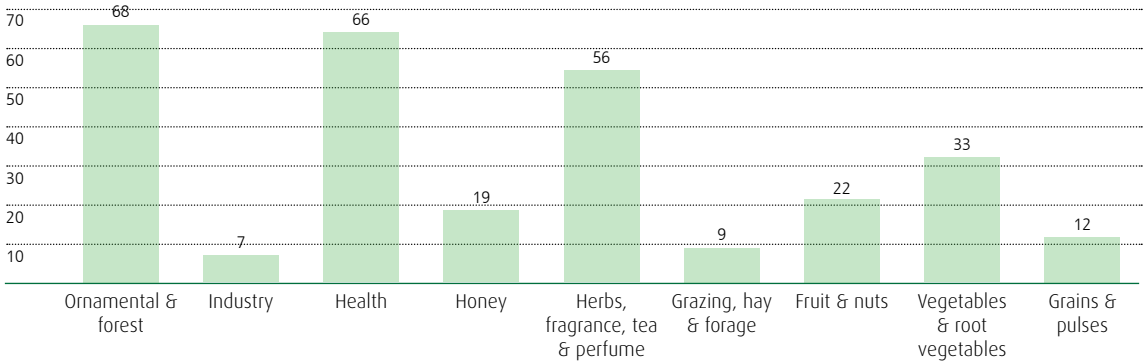
Photo: Sagie Sagiv

Conserving a treasure of wild relatives of agricultural and beneficial plants

Conserving the diversity of wild plants in the park is considered conservation of a treasure, since the 204 species of wild plants growing within it are those from which agricultural and beneficial plants were developed for man. These are one third of the wild plants growing at Ramat Hanadiv and 41% of the total number of wild relatives of agricultural and beneficial plants growing wild in Israel. In order to increase awareness of this issue we organised a national conference on 'Conservation of Wild Relatives of Agricultural and Beneficial Plants' in partnership with the Ministry of Agriculture. For the booklet of rare plants of Ramat Hanadiv follow this link: The Rare Plants of Ramat Hanadiv

Beneficial and CWR Plants at Ramat Hanadiv

Number of species of wild relatives of agricultural and beneficial plants by category
(some species appear in more than one category)



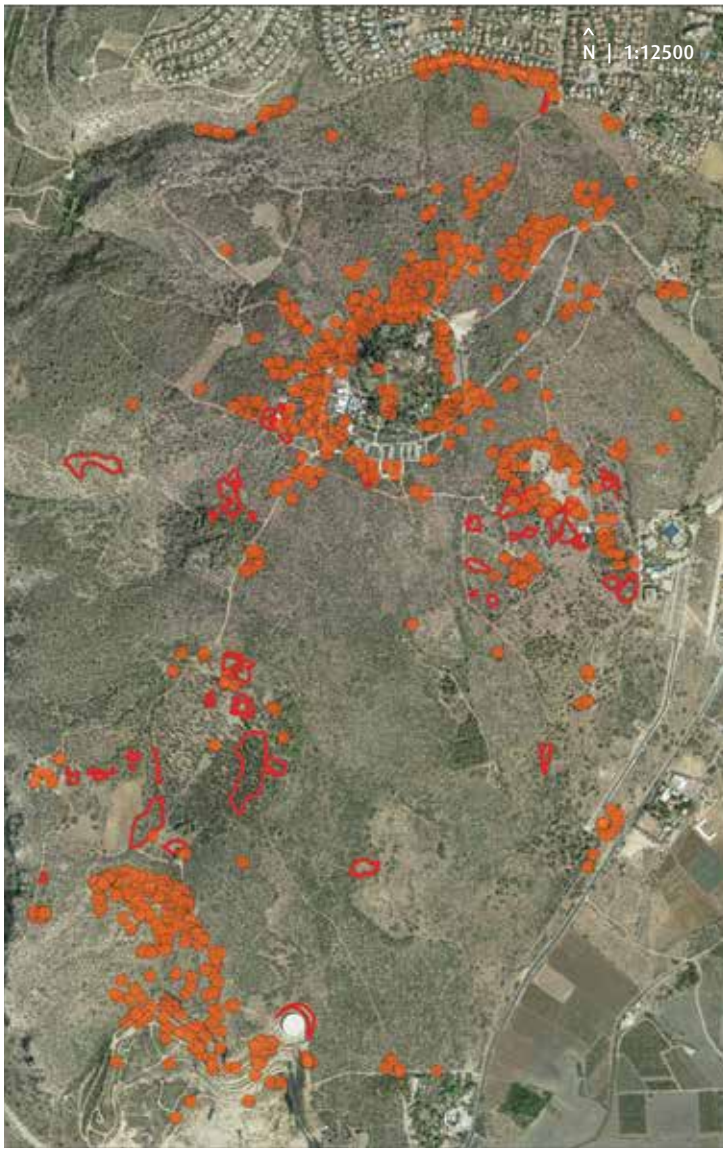
Conservation of rare and 'red' plants in danger of extinction

The Nature Park at Ramat Hanadiv is home to 636 species of wild plants, including 42 defined as **rare species** in Israel, and six **'red' species** that are in real danger of extinction. Conservation of red and rare species is of great importance since most of them will be the first to become extinct and thus biodiversity will decrease. In 2007 we decided to formulate a programme to conserve and protect the rare plant species growing in the park. We published a booklet of the rare plants growing at Ramat Hanadiv and we conducted a search of rare species in the park and mapped them using GIS. In addition, we are working hard to reinforce their populations by **in-situ conservation**, namely, conservation in the location where they grow naturally, by studying their growth form in the nursery and planting them in the field. We also work on **ex-situ conservation** outside of Ramat Hanadiv, in partnership with the Nature and Parks Authority, the Israel Plant Gene Bank, the Millennium Seed Bank in London, the Jerusalem Botanical Gardens at Givat Ram and Mt Scopus, the Tel Aviv University Botanical Garden, the Botanical Garden at Oranim College, the Ecological Garden at the Technion and others. In addition, in order to increase awareness of this issue, we organised a national conference on 'Conservation of Rare and Endangered Species' in partnership with the Ministry of Agriculture, the Nature and Parks Authority and the Israel Plant Gene Bank.

Conservation and rehabilitation of unique, mature trees

Photo: Tamar Arbel-Elisha

In 2016, we began monitoring **unique mature trees** around the Nature Park, assisted by our team of volunteers and a designated mapping application that was installed on their cellular phones. During monitoring, we map the trees and record different facts about them, including their state of health. Thus, the staff of the Nature Park can return to the sick and damaged trees and treat them. We hope to complete the monitoring of old, unique trees by 2018.



Mapping of overabundant and invasive plants in the park

Eradicating overabundant and invasive species

Overabundant plant species are Israeli species which, in soils enriched with organic matter, germinate at great density, cover the area and displace other species. In contrast, **invasive species** are species that are not native to Israel, but came from distant continents and countries, usually with the help of man. Their seeds were dispersed to wild areas and they managed to germinate, develop, reproduce and establish sustainable populations in wild areas. Both overabundant plants and invasive plants cause a decrease in the diversity of wild plants; thus we conduct regular monitoring of these species around the park and map them. The maps of invasive and overabundant plants provide a basis for eradication and management efforts for these species around the park. In order to facilitate identification and mapping we published a booklet of the invasive plants species at Ramat Hanadiv. Similarly we worked in partnership with the 'Wildflowers of Israel' website, the Nature and Parks Authority, the Society for the Protection of Nature in Israel, the Agricultural Extension Service, Keren Kayemet Le'Israel and the Ministry for Environmental Protection to create a list of the 50 most dangerous invasive species in Israel, and to publish as a graphic design poster on the 'Wildflowers of Israel' website.

For the booklet of invasive species at Ramat Hanadiv follow this link: Guide to Invasive Plants at Ramat Hanadiv. For the interesting 'map story' about the invasive plants at Ramat Hanadiv and the unique method of mapping them, follow this link: Invasive Plants at Ramat Hanadiv.

Conservation of endangered birds of prey

In the early nineteenth century, over one thousand vultures lived in Israel, most of them on Mount Carmel. In 1940 there were still 65 pairs of vultures flying over Mount Carmel; however, due to poisoning, all of the vultures became extinct there in 1952. They were poisoned by vole carcasses containing pesticides that had been dispersed against them in agricultural fields.

After many years without vultures flying over Mount Carmel a joint project was launched by the Society for Protection of Nature in Israel, the Israel Nature and Parks Authority and Ramat Hanadiv to reintroduce vultures to Mount Carmel. The aim of the project was to assist the development of a stable population of birds of prey in Israel. As part of the project an acclimation cage for **endangered birds of prey**, including vultures, was built in 1991 at Ramat Hanadiv. Establishment of the cage served two main objectives: the first was to be a place that is physically in nature and allows releasable birds of prey to be acclimated and accustomed to nature prior to their release. The second objective was to be a physical place for creating a breeding nucleus of birds of prey. The cage has been populated with **vultures** every year since its establishment until today. For many years, vulture fledglings were bred in the cage and released as young vultures to strengthen the endangered vulture population.

In 2016 there were about 200 vultures living in Israel: about 20 vultures in the Golan, 50 on Mount Carmel, two in the Judean Desert and 130 in the Negev. The acclimation cage at Ramat Hanadiv is currently populated by nine vultures that were injured in nature or born in captivity and are unable to return to nature; they include four males and five females that comprise the current reproductive nucleus. Some of these vultures

Photo: Ronen Vaturi

Photo: David Rezek

were imported from abroad – two from Cyprus and two from Armenia. During winter the vultures pair up in the cage that has been adapted to vultures with various disabilities. It includes low, accessible nesting benches, which can be reached by vultures that do not fly well. We expect that, as in previous years, the pairs will mate and lay eggs. The first egg of each pair will be taken for incubation in an incubator at the Biblical Zoo in Jerusalem. Each pair will mate again and the female will lay another egg which will also be taken for incubation and hatching in the incubator. Fledglings will be returned to 'good' pairs who will be able to rear them. For this purpose a system of cameras has also been installed in the cage for follow-up and monitoring. In addition, each spring the cage is populated with approximately 50 **lesser kestrel** fledglings. Fledglings that fell out of their nests in the communities where they nested are collected by volunteers and brought to Ramat Hanadiv. From Ramat Hanadiv they are transferred for rearing at the Safari Park in Ramat Gan. After they grow and mature at the Safari Park they are returned to the acclimation cage at Ramat Hanadiv for about two weeks, and are then released to nature.

Conserving populations of wild animals

At Ramat Hanadiv, efforts are being made to conserve populations of wild animals in the park and their connectivity with populations in natural areas outside of the park. We focus on mammals, some of which are in danger of extinction, and conduct continuous monitoring of their populations using cameras. The cameras are installed in different places around the park and include thermal capability for night vision, since most of the mammals are nocturnal. Similarly, for the last ten years we have conducted a daily **trampling survey**, namely, a survey of mammals that were trampled to death on the roads surrounding Ramat Hanadiv. Three years ago we installed motion cameras on the eastern boundary of Ramat Hanadiv and used automatic photography to monitor the animals that crossed the fence. We did this in order to determine exactly where the animals cross the fence on their way out of Ramat Hanadiv, and respectively, to examine the optimal location for establishing an **ecological corridor** between Ramat Hanadiv and Har

Photo: Eyal Bartov

Horshan and Ramot Menashe in a way that will support their populations. Today we are trying to obtain the cooperation of the Zikhron Ya'akov and Binyamina local councils in order to prepare **safe overpasses** to enable mammals and other animals to cross the busy roads. Similarly, we receive injured wild animals and treat them; Ramat Hanadiv acts as a station for first treatment and subsequently they are transferred to the hospital for wild animals.

Special attention is given at Ramat Hanadiv to the **Palestine mountain gazelle**, which is in danger of extinction in Israel; its population at Ramat Hanadiv numbers approximately 65 individuals. Since 2003 gazelle surveys have been conducted four times a month. In 2016, we examined new methods for a more reliable estimate of population size, and in 2017 we began conducting research in the park to identify the factors limiting the size of the population and to assist decision making about increasing the size of the population.

In the past, about 20 years ago, we released five individual **European roe deer** and returned them to nature at Ramat Hanadiv in a joint project with the Israel Nature and Parks Authority. Today we estimate that only one of them remains at Ramat Hanadiv and in the area surrounding it. We note that in the past this species populated the Mediterranean regions of Israel and became extinct due to hunting in 1912.

Photo: Eyal Bartov

Photo: Sagie Sagiv

Grazing

Grazing by cattle, goats and sheep takes place at Ramat Hanadiv. This combined grazing acts as a management tool that supports conservation of species diversity in the park and also aids fire prevention.

Grazing as a management tool for conservation of species diversity

How does grazing affect species diversity? The explanation is a bit complex. In Israel, and also at Ramat Hanadiv, most of the plant species are herbaceous species that grow in open areas. **Through a process of natural succession the trees and shrubs develop**, their populations grow and they fill up the open spaces. As a result the area covered by herbaceous plants shrinks and the total diversity of plant species decreases. When the diversity of plant species decreases, the species diversity of herbivorous animals feeding on them and the species diversity of predators also decrease, and thus total species diversity diminishes. This process can be slowed down and even stopped by using grazing. **Goat grazing** is the best grazing for this purpose,

Photo: Sagie Sagiv

since goats feed on trees and shrubs and facilitate maintenance of open spaces, which as mentioned, enables high diversity of plant species and high total diversity. Ramat Hanadiv manages a 200-head goat herd, which is maintained in a local pen and sets out daily to forage. The herd is too small to take over the entire area that covers 450 hectares, thus **cattle grazing** is used over most of the area. The cattle herd comprises about 200 cows belonging to farmers from nearby Binyamina. Cows, in contrast to goats, prefer to graze the herbaceous vegetation but after they finish it they also eat shrubs and trees and contribute to slowing down succession and maintenance of open spaces. In 2016 we added **sheep grazing** for the first time; we purchased a small herd of 20 sheep that joined the goat pen. The sheep eat mainly herbaceous vegetation like the cows, and we want to integrate their grazing in designated locations around the park, such as olive groves, in which delicate grazing of the herbaceous vegetation is required to prevent harm to the olive trees.

Management for fire prevention

Fire and woodland fires are not natural in Israel; nevertheless, each year fires break out around the country, caused, accidentally or intentionally, by man. In 1980, a large fire broke out at Ramat Hanadiv, wiping out about a third of the park's area and approaching the Memorial Gardens. In 1991 we instituted **fire prevention management**.

Fire prevention management is a significant part of the park's management, and includes grazing by a cattle herd, a goat herd and a few sheep. The cattle herd enters the park during February-June, eats mainly herbaceous vegetation and grazes alternately in different parts of the park. The goat herd is permanent at Ramat Hanadiv and grazes in designated plots, eating mainly woody vegetation.

In order to understand the connection between grazing and fire we must understand that the herbaceous vegetation dries out towards the summer. When a fire begins, this vegetation feeds the fire and enables it to spread rapidly with the aid of strong winds. Therefore, the solution is to remove the herbaceous vegetation using grazing before the onset of summer.

A fire will often spread from a vegetation-rich area to a nearby town, while at other times a fire may begin in a town and spread into a vegetation-rich natural area. In an attempt to prevent spread of fire, a **firebreak model** was established and examined by a long-term continuous study from 1991 to 2001. The model includes a 200-metre-wide firebreak on the border of Ramat Hanadiv with Zikhron Ya'akov. The study included plots subjected to annual cattle grazing, plots subjected to thinning of trees and shrubs, plots subjected to a combination of cattle grazing and tree thinning and control plots without intervention. Since 2003, the model has been expanded to include plots subjected to goat grazing combined with cattle grazing. Monitoring of all plots is carried out within the framework of the Long Term Ecological Research site that was established at Ramat Hanadiv in 2003.

Today, in the light of all the fires that have broken out in Israel, an ordinance to establish firebreaks against fires in communities bordering forest and woodland areas was tabled in the Israeli Knesset. This ordinance is based on the firebreak model developed at Ramat Hanadiv.

Landscape Agriculture

At Ramat Hanadiv we have considered conservation of 'landscape agriculture' for many years, however this field is still developing here. Conservation of landscape agriculture includes **habitat restoration**. We asked ourselves how the landscape at Ramat Hanadiv looked in the distant past. Archaeological excavations conducted in Horvat Aqev at Ramat Hanadiv helped us to understand that in ancient times, during the Second Temple Period (first century CE), there was an agricultural farm at that site, around which sophisticated farming took place. The agricultural facilities revealed by the excavations prove that there were wheatfields, olive groves and vineyards; excavations revealed two winepresses for treading grapes, an olive press for olive oil and a granary for threshing wheat grains from chaff.

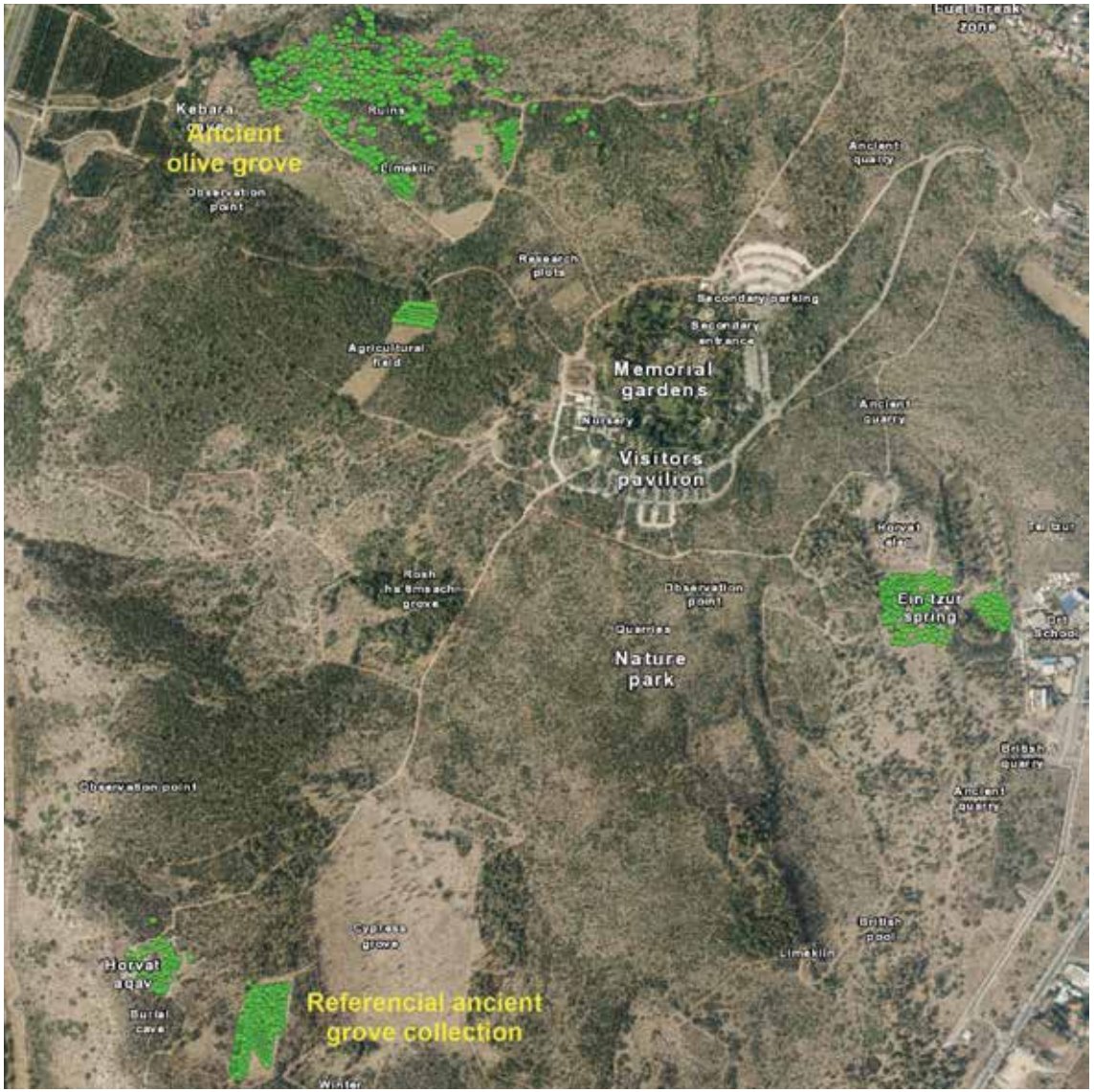
Restoration of a traditional field

The assumption is that wheatfields in ancient times were sown in the tuff valleys found at Ramat Hanadiv, which contain deep soil suitable for rain-fed crops. In one of these valleys we conducted **restoration of a field** that we cultivate using traditional methods; we plough it with a shallow plough and avoid fertilising or spraying. Each year we sow it with wheat or barley, and once in three years we sow it with legumes (vetch, broad beans or chickpeas). During the sabbatical year, once in seven years, we traditionally do not sow the field at all but let it rest. In another part of Ramat Hanadiv, near the Ein Zur spring and the adjacent ancient bathhouse, we restored terraces for growing vegetables and planted groves of fruit trees.

Photo: Racheli Schwartz-Tzachor

Olive grove

There are nine olive groves planted around the park. One of them is an ancient olive grove with an estimated tree age of over 200 years. Another is a unique grove which is the product of a joint project between researchers from the Volcani Center, the Gilat Research Center, The Hebrew University of Jerusalem and Ramat Hanadiv. In this grove we planted young olive trees grown from cuttings taken from ancient olive trees found in groves throughout Israel and the Palestinian



Olive groves at Ramat Hanadiv

Territories. This grove is defined as a reference grove for these ancient groves and its role is to act as a 'backup' for the ancient trees and their hidden traits in the event that they are damaged. Seven additional groves have been planted near the spring, near Horvat Aqev and near the ancient grove.

Goat pen

It It could be said that the saying 'a land flowing with milk and honey' rings true at Ramat Hanadiv. The importance of goat grazing in the park has already been mentioned in this report. In addition, near the **goat pen** we have established a **milking centre** in which 155 goats are milked twice daily and the milk is sold for cheese production. The average daily milk production stands at 230 litres, while production of milk during an entire year stands at 85,000 litres.

Beehives

A number of **beehives** belonging to the Bet-El community from Zikhron Ya'akov are located permanently in the park. In the winter (December–March), 150 beehives are placed in four locations around the park, with 15,000 bees in each hive for a total of 2.25 million bees. In the summer (April–November) about 30 beehives are placed at three locations around the park, with 70,000 bees in each hive, for a total of 2.1 million bees. The annual honey output produced by all the beehives together reaches 300 kg.

Photo: Sagie Sagiv

Photo: Hila Rave

Photo: Moshe Shai

Forestry

The first groves were planted in the park in 1936, in accordance with the planning approach of the Memorial Gardens that were being established at that time. A grove of Aleppo pine was planted between the entrance road and the Memorial Gardens. In addition, Mediterranean cypress and Aleppo pine were planted in the open areas surrounding the gardens, at different distances and in different directions from them, creating a landmark to attract the eyes of visitors to the gardens and direct them to look towards the landscape beyond the walls. Similarly, Palestine oak and Mount Tabor oak were planted in the area west of the gardens.


Sagie Sagiv

During 1976–1978 forestry plantings, which were considered to have potential for commercial use of wood, were renewed, mainly on soils that were under agricultural use in the distant past and on stony and rocky soils with little natural woodland. Mediterranean cypress was planted on the agricultural land while Turkish pine was planted in the stony and rocky areas. Due to a lack of pine and cypress seedlings in the nurseries of the forestry department, additional species were planted in contrast to the plan, including stone pine, canary pine and Arizona cypress.

As the trees grew, a landscape contrast was created between the planted trees and the natural vegetation. The dense groves also caused suppression of the natural vegetation and a change in the species composition of the forest understory. It turned out that the idea of economic exploitation of the trees did not justify itself; similarly, the forestry trees, mainly the cypress trees, began to suffer severely from diseases.

Therefore, in 1985, it was decided to manage the open landscapes according to landscape ecology criteria and to adapt them to public use. This change brought with it a new management approach and from the 1990s and onwards, massive thinning took place in some of the groves. Some of the cypress groves were removed and the rest were thinned significantly since many trees were sick and needed to be cut down. In addition, the pine groves were redesigned into patches of small groups of trees, while the area between them remained open to improve their integration in the typical natural landscape. Trees were thinned within the groves to facilitate development of the natural vegetation and remaining trees. Groves that according to observations provide refuge to animals were left alone. In 2011, all the trees in the stone pine grove died, probably because of the drastic decline in rainfall for several consecutive years, and were cut down.


Environment

Ramat Hanadiv has set itself the aim of reducing its negative impact on the environment and reducing its **ecological footprint**. Therefore, as will be described in this part of the report, we emphasise principles of green building, save water and energy in a range of creative ways, aim for biological pest control and produce high-quality compost from garden waste.

Water

Water is an expensive resource in Israel; therefore we devote much thought to water management at Ramat Hanadiv. Water consumption at Ramat Hanadiv is divided between the Memorial Gardens and the Visitors Pavilion, restaurant and operations area of Ramat Hanadiv. It goes without saying that the park area is irrigated only by rain. We have installed a pipeline with hydrants at the park; however, it is intended for use only during fire emergencies.

Water in the gardens

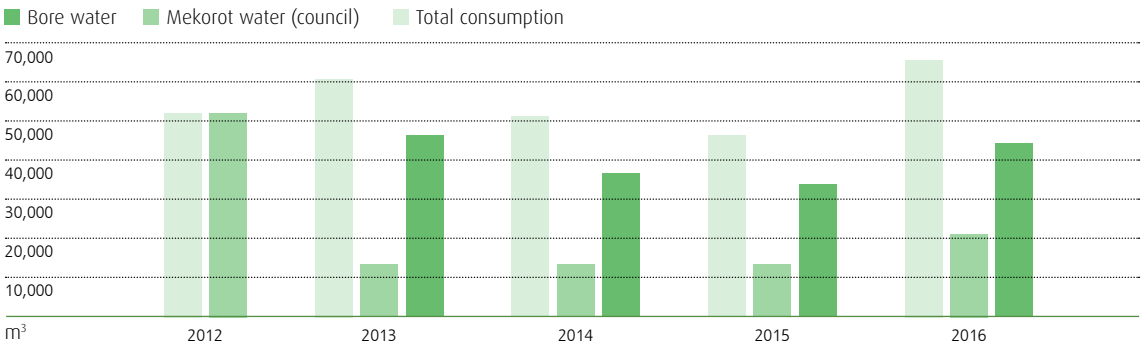
To save good drinking water we converted the irrigation system in the gardens, and moved from irrigation with fresh water ('Mekorot water'), to **irrigation with partially brackish water** that flows into the garden through a pipe from a bore located at a distance of three kilometres. In addition, to increase water saving we **separated the irrigation lines** of the perennial plants and the seasonal, annual plants that require more water. Also, following the recommendations of the Ministry of Agriculture, we irrigate according to the amount of water that is considered to be accurate and economical for irrigation based on time intervals as was practiced in the past. For this purpose we conducted an irrigation survey in the gardens. Using a GIS application, we calculated and defined, for each irrigation tap, the size of the area irrigated and the type of vegetation being irrigated. Using these data together with climate data from the meteorological station we calculate the amount of water for each tap throughout the garden.

Calculation of the amount of irrigation water for each tap is done according to the following formula:

Evapotranspiration coefficient X average calculated evaporation (mm) X irrigation interval (days) X size of irrigated area (dunam) = amount of water for irrigation (m^3).

Water consumption by supply source, 2012–2016

The figure shows that there was a drastic decrease in the consumption of fresh water in 2013 following the move to irrigation with bore water (partially brackish water).



Water in the Visitors Pavilion, restaurant, operations area and hydrant system

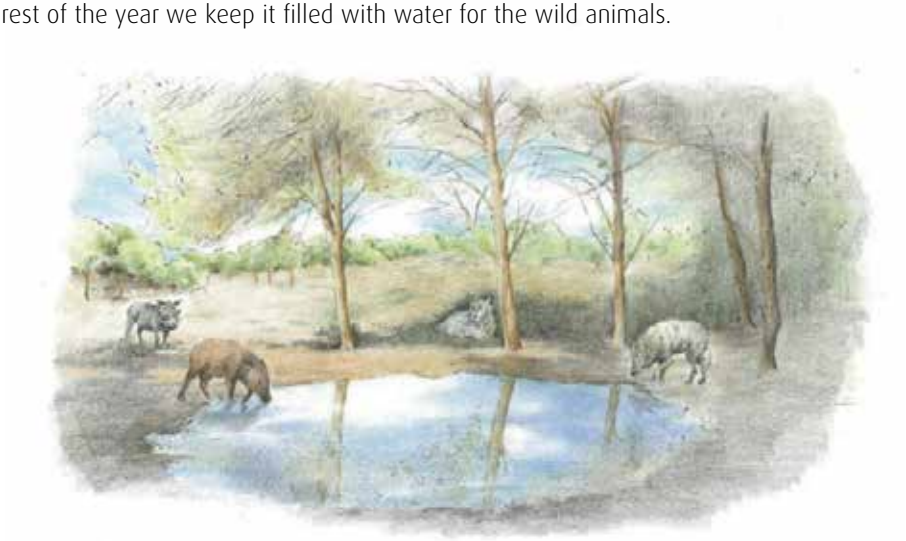
We installed a **control system** including water meters connected to a control unit in the Visitors Pavilion, restaurant, operations area and hydrant system. The control system sends us a warning at any given moment of unexpected change in water consumption due to a leak or malfunction. Similarly, we installed water-saving **electronic taps** in all the public restroom buildings and in the restroom building in the operations area of Ramat Hanadiv.

Water in the Nature Park

The Nature Park is 'irrigated' by **rainwater** alone. Typical of the Mediterranean climate, the rainy season is short; it begins in late autumn, usually during October/November, and continues until early spring, usually during March/April. Until a decade ago the average precipitation at Ramat Hanadiv was about 600 mm rainfall per year, but in the last decade it decreased to 474 mm per year. According to the prevailing view, this decrease in precipitation is due to climate change.

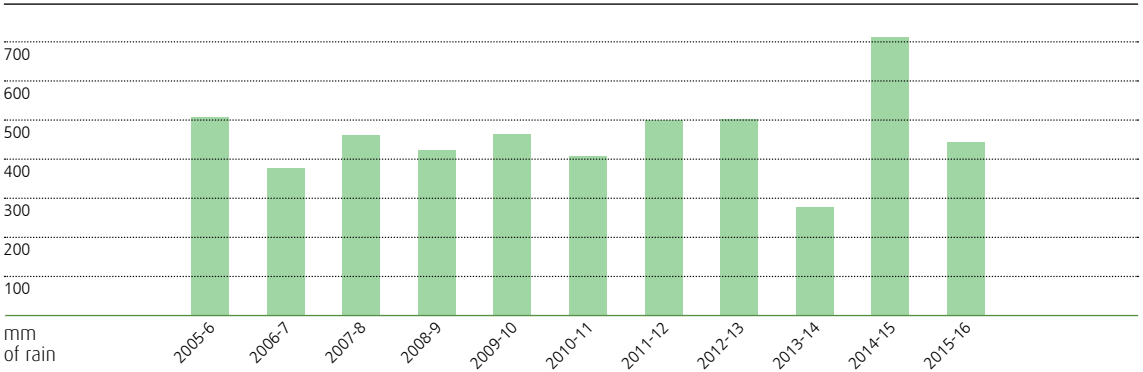
In the east of the park there is a **spring** by the name of Ein Zur. The water flow rate stands at an average of 45 m^3 water per day and about 16,000 m^3 per year. The spring water is good for drinking, flows throughout

the year and drains into the network of pools that provide water to the wild animals. When visiting the spring, many visitors prevent wild animals from approaching and drinking the water. Therefore we established an additional pool at a distant location from the spring. In the winter it fills up on rainy days and during the rest of the year we keep it filled with water for the wild animals.



The pool established at the park for wild animals.
Illustration: Lala Boriakov

Annual precipitation amounts during the last decade (2006–2016)

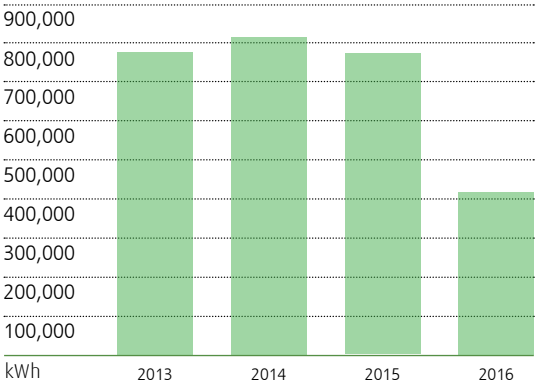


Electricity

Electrical sustainability at Ramat Hanadiv is based on saving and on solar energy. Both of these principles are important for reducing our carbon footprint, since the electricity we consume is produced by a coal power station that has a negative effect on air pollution.

Electricity consumption at Ramat Hanadiv in 2016 stood at 430,000 kWh. In comparison with the average of the previous three years our electricity consumption has decreased by about 50%. This is an achievement that stems partly from the saving and efficiency actions described below.

Electricity Consumption at Ramat Hanadiv 2013-2016



Lighting

We illuminate the **Visitors Pavilion** with daylight thanks to the unique design of the building's roof. The light penetrates the glass installed in the gap between the roof slopes, along the length of the Visitors Pavilion. According to the same principle of using natural light we installed a **skylight** in the recently renovated offices. In the other offices and the mausoleum we installed energy-saving **led lighting**. In addition, we installed solar fans in the storerooms and **solar torches** for outside light at night. The torches were installed in the area around the Visitors Pavilion, in the playground, in the footprint garden, in the picnic area, in the parking areas and around the operations area of Ramat Hanadiv.

Solar panels

Solar panels for electricity production were installed on some of the roofs. According to the existing arrangement in Israel, the electricity produced by these panels is transferred to the Electricity Company that reimburses us accordingly. We produce about 14,000 kWh annually with these panels.

Air conditioning

To save energy we chose to install an innovative **geothermal system** in the Visitors Pavilion for cooling the air inside the building. This system is based on the fact that the temperature of the soil at a depth of 2 m or more remains constant and stands at 21.7 degrees Celsius; thus the warm water flowing to the soil's depths cools down by about five degrees while the cold water flowing to the soil's depths warms up. This sophisticated system includes two separate, closed water systems that meet in a unit called the chiller (heat exchange). The first water system, System A, brings the heat from the internal spaces of the Visitors Pavilion to the chiller, via water, and returns to the building with cold water. The second water system, System B, brings the heat from the chiller, via water, to the soil's depths and returns to the chiller with cool water. System B includes 30 cylindrical shafts with a diameter of 15 cm that were drilled to a depth of 40 m in the soil beneath the footprint garden. In each shaft we installed a water pipe that reaches its base, twists like a loop and 'climbs' back up to the top.

Water carrying heat from the building flows from the chiller into these pipes in the shafts. As it flows to the bottom of the shaft and back up, it transfers the heat to the soil and reaches the soil surface after cooling down by five degrees Celsius. All the water pipes leaving the shafts converge at the 'switchboard', where they unite into a single water pipe that returns to the chiller located in the machine room in the Visitors Pavilion. Inside the geothermal chiller, which can produce 20 tons of cooling, gas cools the water by condensation. Here water System A comes into action. The cold gas cools the water flowing in the pipe that transports it along the length of the Visitors Pavilion and all its areas. The Visitors Pavilion is divided into six parts (the restaurant, the auditorium, the InfoShop, the classrooms, and in the eastern wing, the lobby and the kiosk). In each part of the Visitors Pavilion an Air Treatment Unit (ATU) is installed. In the ATUs the cool water cools the air that flows through radiators and aerates the air spaces in the building. Subsequently, the water warms up, flows back to the chiller, and so on. On hot days and when there is activity in several parts of the Visitors Pavilion, the geothermic system is backed up by regular air conditioning that can produce 60 tons of cooling. Ramat Hanadiv uses the geothermic system only for cooling, whereas in cold countries is it also used for heating.

Water pumps

In the rose garden and the cascade garden there are waterfalls driven by pumps. To prevent wastage of electricity we arranged the activity of the pumps using a timer so that they work only during the hours that the garden is open to visitors.

Refrigerators and freezers

We installed a **temperature monitoring system** in the restaurant for the refrigerators and freezers in the cold rooms and dining rooms. This system includes sensors that send warnings when the temperature moves out of the range 0–18 degrees Celsius. The warning allows immediate arrival and repair, so that on the one hand we can prevent electricity wastage when the temperature is too cold, and on the other hand prevent disposal of food when the temperature is too high.

Construction and Infrastructure

In the classrooms and auditorium we installed **movement sensors**. When no movement by people is detected for more than an hour the system turns off the lights, the projector and the air conditioners if they are accidentally left on.

We give attention to aspects of sustainability even in construction and infrastructure projects that we conduct from time to time. The cherry on the cake is the Visitors Pavilion at Ramat Hanadiv, which is a green building. On the day of its dedication, the building received **green building certification** from the Israel Standards Institute and the Ministry for Environmental Protection and was the first green building in Israel. In addition, one year after dedication the building received green building certification from the American company LEED (Leadership in Energy and Environmental Design). The guiding principle in its construction was reducing the impact on the landscape and the topography. Every amount of rock and soil that was quarried while preparing the site for construction was crushed and used as raw material for infrastructure, parking and pathways around the building. The top layer of the soil was returned to the roof of the building after being mixed with compost, and the building was covered in a 'green blanket' of trees and shrubs (green roof) in order to maintain continuous vegetation between the Nature Park and the Memorial Gardens.

Photo: Sagie Sagiv

Photo: Amit Geron

Additional sustainability principles were included in the Visitors Pavilion, as described in detail in previous parts of this report, so we will mention them here briefly. The two parts of the building's roof are connected by a strip of glass that allows daylight to enter the building and thus we save electricity. A geothermic air-conditioning system was set up in the building to allow saving of electricity, and all the sewage water flows to Ramat Hanadiv's sewage purification centre.

Sustainability principles were also assimilated when building the offices at Ramat Hanadiv. These were established in the old locksmith's workshop building. The façade was restored, and skylights were installed during adaptation of the interior to offices.

Waste Management

Waste is a by-product of man's daily conduct everywhere. Waste at Ramat Hanadiv is diverse and includes gardening waste, construction waste, leftover waste from visitors and employees and also sewage. Accordingly, waste treatment is diverse and includes aspects of recycling and sustainability.

The waste collected at the picnic site is measured by volume at the time of removal and is taken to landfill. As can be seen in the diagram below, the volume of waste increases during the spring months and holiday periods. In order to decrease the amount of waste transferred to landfill we have begun a planning process for waste separation at source for the picnic site.

At the restaurant we are working on waste separation at source; in 2016 about 8,000 cans and bottles were sent to recycling. About 1,200 litres of used oil were collected and transferred to a special collection site. Cartons were separated and compressed, and a total of about 1,800 kg cardboard was sent to recycling during the year. Similarly, each month about three tons of organic waste are separated at the restaurant and sent to the compost site in nearby Hadera.

The waste in the operations area of Ramat Hanadiv, comprising the offices, storerooms, nursery, goat pen and more, is almost completely separated, and includes separation of paper, glass, plastic bottles, plastic bags and organic waste.

The remaining waste collected from the restaurant, Visitors Pavilion, parking areas, offices, gardens and the Nature Park is compressed, weighed and transferred to landfill.

Photo: Racheli Schwartz-Tzachor

Photos: Sagie Sagiv

Garden waste and composting

Gardening waste is collected at Ramat Hanadiv in both the gardens and the Nature Park and transferred to the **on-site compost site**. Woody raw material is put through a wood shredder and comes out as wood shavings that are piled up with the rest of the gardening waste in compost piles. The composite site includes a number of elongated compost piles at different stages of composting.

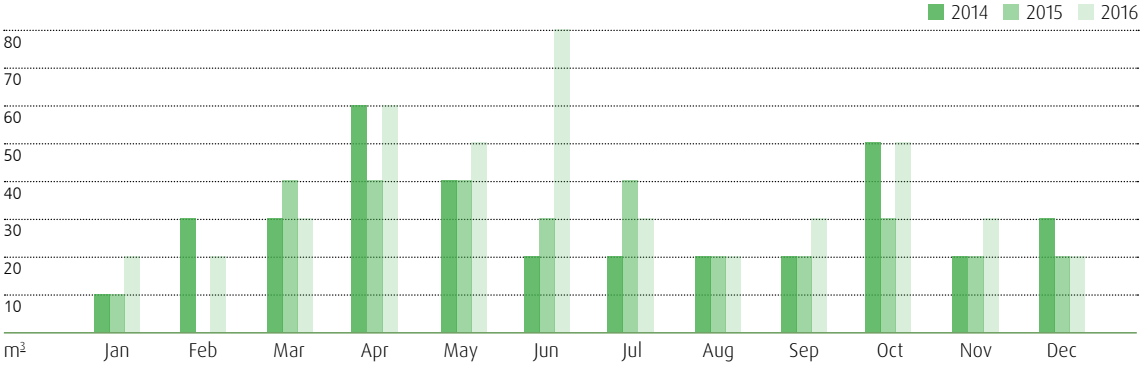
The compost produced at Ramat Hanadiv is used for feeding the soil in the Memorial Gardens. We use it to fertilise the flower, shrub and tree beds. Similarly, we plant trees in deep holes after their base is lined with planting mix combined with compost. We fertilise the grass with slow-release inorganic fertiliser to ensure long-term nutrition and to prevent leaching of the fertiliser into the soil and ground water. The compost is also used as filling material in the abandoned quarry that borders the park to the south. In the quarry we mix the compost with the on-site soil to provide aeration, organic enrichment and water retention for the vegetation that will be planted in the rehabilitated site.

In addition to compost, we produce wood chips from the garden waste as ground cover for the gardens. The ground is covered in exposed areas between the shrubs, thus maintaining soil moisture and preventing weed growth. For a description of the compostization process follow this link: Preparation of compost

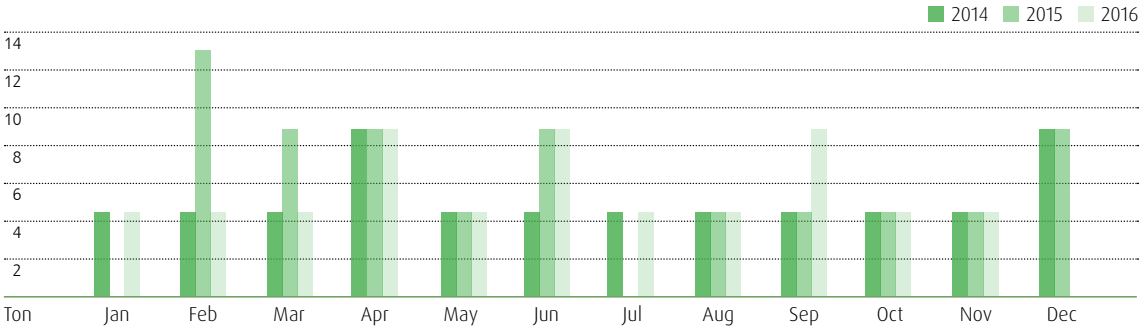
Construction waste

Ramat Hanadiv is constantly developing; thus construction, infrastructure preparation and road-building occur on a regular basis. The accumulated waste from these activities is separated for recycling: concrete and roof tiles are crushed to gravel which is used as the first filling layer when building roads. Additional construction waste is crushed together with rocks to make sand that is mixed with compost to produce the second layer of the road, and the rest of the construction waste is gathered into a container that is transferred to a landfill site.

Volume of waste for landfill, by month, 2014-2016



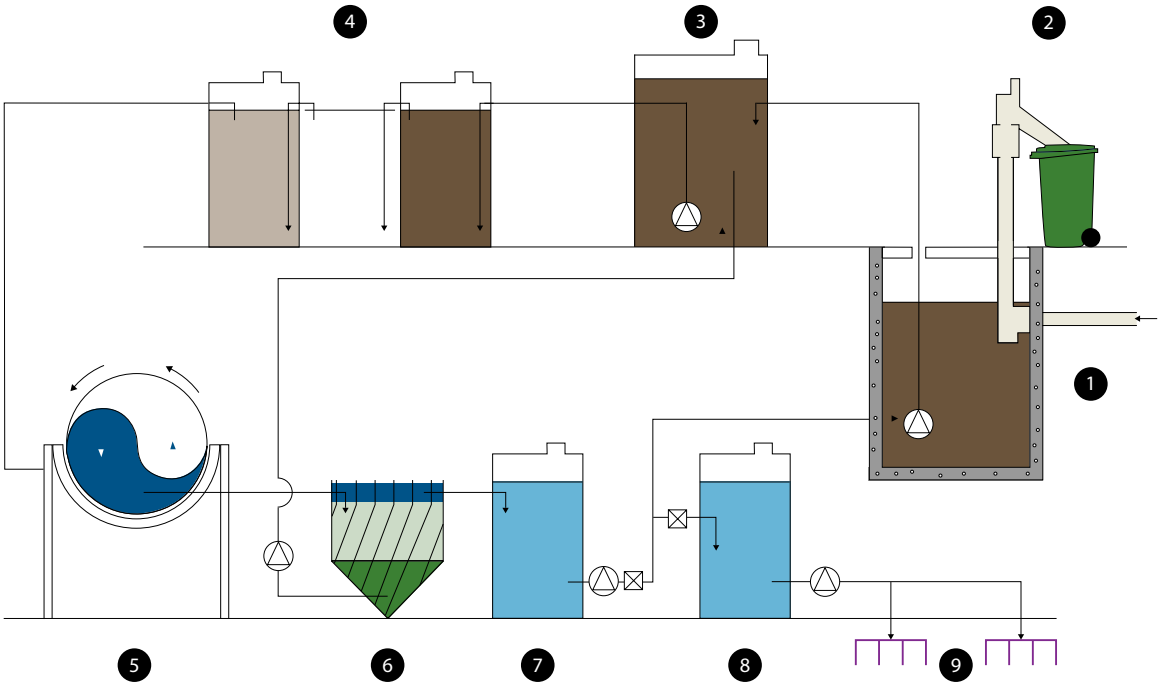
Weight of compressed waste for landfill, by month, 2014-2016



Wastewater purification

Wastewater purification at Ramat Hanadiv is carried out in an independent purification system without external connections. The process includes directing the wastewater from the toilets and basins to a collection tank, from there to the **wastewater purification system (WPS)** and from the WPS the purified water is returned for irrigation. About 10–17 m^3 water pass through the WPS each day. The WPS is of the Rotating Biological Contactor (RBC) type in which the wastewater purification takes place through the following stages:

Wastewater Purification System (Wps)



1. Septic tank – wastewater is collected to an underground septic tank located next to an innovative mechanical reactor.

2. Mechanical reactor – the mechanical reactor filters out wet wipes and female sanitation products, squeezes them, and using a mechanical arm throws them into a garbage bin installed outside of the septic tank.

3. Balance tank – the wastewater flows from the septic tank to the balance tank, from which it is pumped and transferred in measured amounts, and at a fixed frequency, to the settling tanks.

4. Settling tanks – in the three settling tanks, solids and fats are separated from the liquids. The liquid sewage flows onwards to the purification tank.

5. "Bio-Disk" purification tank – this tank contains disks with a high surface area that enables development of large bacterial colonies. Each disk rotates constantly, with one half inside the wastewater and one half outside of it, exposed to the air. The movement of the disks and their exposure to the air causes assimilation of oxygen and a process of aerobic metabolism carried out by bacteria in a way that ensures rapid, high-quality purification of the wastewater. From the Bio-Disk tank the water flows to a clearing tank.

6. Clearing tank – in this tank the water is cleared through a system of lamella separators that filter the excess sewage sludge from the purified water. The excess sewage sludge sinks to the bottom of the tank and is transferred by an automatic pump to a special tank for sewage sludge collection. The purified water flows to the pooling tank.

7. Pooling tanks – the purified wastewater is stored in this tank.

8. Pooling tank for irrigation – the high-quality purified water is stored in the pooling tanks, before flowing out for irrigation.

9. Drip irrigation – the purified water flows through purple pipes (designed for purified water) to irrigate the research plot where we grow white willow for research purposes. The research examines whether white willow can be used as a forage plant for goats and sheep, and which health benefits it provides for them.

Pest Control

We strive to reduce pest control by preventative and planning means; decreasing chemical pest control activities and promoting pest control by means of environmentally friendly organic materials, biological control and pest control by innovative technologies. Pest control challenges are complex as we try to cope with a range of pests – from rats in the Visitors Pavilion to aphids and fungi on the garden plants.

Rats - Rats cause great damage to cables and electric wires in the Visitors Pavilion and offices. To discourage them we use an electronic **ultrasonic system** that produces beeps at radio frequencies. When a rat hears the beeps it runs away. Similarly, we placed **nesting boxes for owls** near the Visitors Pavilion and offices so that they will nest in them and hunt the rats running around outside of the buildings at night. In addition, we seal the buildings and move sources of garbage away from them.

Flies, bees and other flying insects - We try to spray flies at a low frequency of once a week, during the summer and autumn months. We use edible bait in a sugar syrup that is sprayed in certain locations and attracts the flies. In the goat pen, where there are large quantities of flies, we also use biological control by means of **parasitic wasps** to mitigate the increase in the number of flies.

We minimise spraying for mosquitoes and focus our spraying, especially before events, on the hot mist method. We spray for cockroaches once a year in channels and sewage ponds.

At the entrance to the restaurant we installed **air screens** to prevent intrusion of various flying insects. For flying insects that still manage to enter the restaurant, we installed **ultra-violet receivers** to which they are attracted and stick.

Control of plant pests in the Memorial Gardens

As a rule in the Memorial Gardens we aspire to implement Integrated Pest Management (IPM).

For **aphids and thrips** we use an environmentally friendly organic material based on a plant extract from the Australian tea-tree, *Melaleuca alternifolia*, as well as Sophora and natural pyrethrin produced from chrysanthemum. Another substance we use for thrips is produced from bacteria, and has low toxicity for mammals.

For **mites** we use a substance based on an extract of the neem tree or a chemical that doesn't harm their natural enemies. For mites we also irrigate with excess water, when appropriate, to increase the humidity around the plant, since mite eggs do not hatch under high humidity.

To control diseases such as **powdery mildew and wheat rust** that attack roses we use an environmentally friendly substance also based on a plant extract. From time to time we change the pest control method to prevent development of resistance among the pest populations. Sometimes we need to use chemical materials that are not organic and then we choose the least dangerous one.

To protect the palm trees from the invasive **palm weevil** we use traps containing pheromones and other volatile substances that attract it. The traps attract both sexes. In 2016 we trapped 795 weevils.

Photo: Yadid Levy

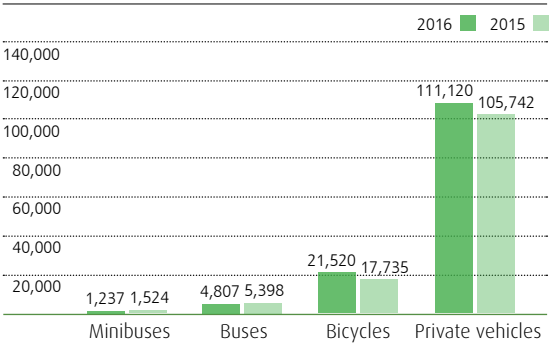
Pedestrians, Transport and Fuel

Vehicles are a necessary 'motor' for movement of visitors and employees to and from Ramat Hanadiv each day. Nevertheless, we must reduce our use of vehicles and work tools that run on fuel since they pollute the air by combustion. We encourage visitors to walk and ride bicycles, and are working on connecting Ramat Hanadiv to cycle trails and walking trails that lead to the surrounding communities and other sites.

Motorised transport

The number of visitors to Ramat Hanadiv each year is close to half a million people. Most come in private cars or buses hired for trips. Public transport, which is quite infrequent, does not enter Ramat Hanadiv, but stops at its entrance.

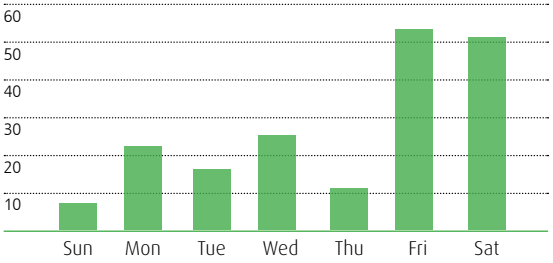
Distribution of vehicles entering Ramat Hanadiv, 2015–2016



Cyclists

Recently we finished preparing two **cycle trails** through the park, which will join the route of the **Israel National Bike Trail** that is planned to pass through the park's area, and cycle trails throughout the region. Currently, about 18,000 cyclists ride through Ramat Hanadiv each year. We have begun monitoring cyclists on the new trails using counters, and we have discovered that cyclists use the trails every day of the week. However, as can be seen in the figure below, their numbers increase significantly over the weekend.

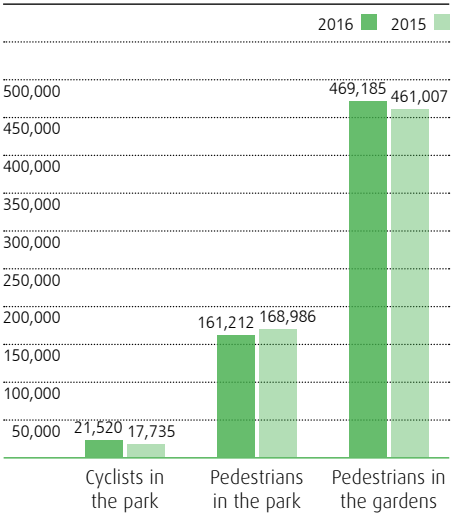
Average number of cyclists on the cycle trails by day of the week



Hikers and pedestrians

Entry of visitors to the well-kept gardens is on foot. In 2016, almost 470,000 visitors walked the paths of the gardens. Some of the visitors choose to hike around the park. They may choose among **three circular walking trails** that meander through nature and along part of **The Israel Trail** that crosses the park. In 2016 the trails were walked by about 160,000 people from near and far – from the nearby communities and from around the country.

Distribution of visitor movement at Ramat Hanadiv 2015-16



Trails in the park: Vulture trail Manor trail Spring trail Connecting trail Woodland trail Cliff trail

Visitors & Marketing

At Ramat Hanadiv, diverse activities are carried out for the public in the Memorial Gardens and in the Nature Park. These activities also deal with the different aspects of sustainability. For example, during the summer vacation we screened films in a solar cinema on the lawns of the gardens for the enjoyment of families. And recently, we launched cycle trails through the park for the enjoyment of cyclists. In this section we will describe in detail the different activities relating to sustainability which attracted families, students, nature lovers and decision makers during 2017.

Commemorating Earth Day

During Passover we organised a butterfly-themed day in honour of both the holiday and Earth Day. During the event visitors met actors dressed up as butterflies, heard how butterflies act as a biological indicator of ecosystem health, and participated in a hands-on station game about the stages of the butterfly's lifecycle.

World Environment Day

World Environment Day was commemorated at Ramat Hanadiv with a festival of nature and environmental films by Israeli artists. The festival's opening, dedicated to environmental films by the journalist and artist Motty Kirschenbaum z"l, attracted film-makers and representatives of nature and environmental organisations. The festival lasted two days and was open to the wider public. Its uniqueness lay in the

Photo: Yadid Levy

Photo: Racheli Schwartz-Tzachor

Photo: Tal Gluck

Photo: Eyal Bartov

opportunity given to the audience to meet the films' creators and chat with them following their screening. This day was organised in partnership with the Society for Protection of Nature in Israel and the Nature and Parks Authority.

International Vulture Awareness Day

The griffon vulture is endangered in Israel and other places around the world. To raise awareness of the state of this impressive bird of prey, we decided to commemorate International Vulture Awareness Day at Ramat Hanadiv. Visitors, families and nature lovers participated in a guided tour to the vulture acclimation cage located in the park, and then viewed an exhibition of vulture photos and participated in an art and craft activity on the subject.

Summer events

During the summer vacation, in August 2016, we held weekly screenings of solar-powered films for the public, who were invited to sit on the lawns of the gardens and enjoy the viewing. For this purpose we used special solar batteries that were charged during daylight hours via solar panels and during the evening provided the required electricity for the screening. In addition, during the event visitors were invited to pedal on special bicycles; the energy produced from the pedalling was also stored in the batteries. The films screened as night fell were of course on the subject of nature and the environment.

Photo: David Silverman

Photo: Moshe Shai

Wine festival

The wine festival at Ramat Hanadiv continues the legacy of Baron Rothschild who established the first wineries in Israel in Zikhron Ya'akov and Rishon Letziyon, 127 years ago. The festival is a spectacular and enjoyable event that strengthens the local economy. It exposes the produce of the small wineries from Hanadiv Valley region, Alona, Mount Carmel and Hefer Valley to the public. Prior to the festival we published a Regional Wine Map to encourage wine and agricultural tourism to the region.

Friday concerts

During the last year we held seven concerts in the open amphitheatre in the Memorial Gardens, as part of the 'Friday morning concert' programme. The audience that came to the selected concerts enjoyed magical music in the pastoral gardens. Especially moving was the performance by the 'Ladders' ensemble that aims to offer 'music for social change'. This ensemble comprises five blind and visually impaired youth who play very inspiring music on five harps. All the concerts were offered free to the wider public.

Tai chi in the gardens

New in 2016 were tai chi lessons in the gardens, taking place every Wednesday on the grass in the Memorial Gardens and offered free to residents of the nearby communities. The participants in these lessons speak of the amazing feeling that arises from healthy activity taking place outside in the beautiful garden environment.

Planning cycle trails

In the past year, we worked hard at Ramat Hanadiv to plan cycle trails throughout the Nature Park. The considerations were to encourage healthy activity and 'green transport'. Therefore, the trails are planned with links to the communities bordering Ramat Hanadiv and to The Israel National Bike Trail, which is also currently being planned. The planning includes a family trail and a trail for professional cyclists, on existing paths, to prevent harm to nature and the natural habitat of the plants and animals.

Photo:Yadid Levy

Photo: Tal Gluck

Photo: Tal Gluck

The InfoShop in the Visitors Pavilion

The concept of the shop at Ramat Hanadiv is one of 'nature and sustainability', according to which we select the products sold in the shop. These are selected according the 'three Rs' idea – Reuse, Reduce, Recycle. Examples: products made from recycled raw materials, such as hot mats for pots, and cups made from recycled plastic pipes; products that were designed to enable multiple use such as material bags for sandwiches and books and games that deal with nature and sustainability.

Website of Ramat Hanadiv

Ramat Hanadiv's website serves as an important platform for showcasing the achievements of Ramat Hanadiv, including our sustainability activities, to both the wider public and professionals. The website is also a platform for advertising different events that we organise on the subject of the environment, sustainability and ecology for the benefit of the public and as a stage for the knowledge accumulated here for professionals and other interested parties. A significant section of the website is translated into English

to enable exposure of the sustainability activities at Ramat Hanadiv to English readers around the world. We work hard on a newsletter that is distributed monthly to 7,000 subscribers, in which we describe all the events, conferences and lectures taking place at Ramat Hanadiv, most of which deal with nature, the environment, ecology and sustainability. In the last year we have been working on making the website accessible to the blind and visually impaired; this process of website accessibility continues and is part of our commitment to social sustainability. Click the link to the website of Ramat Hanadiv

Tours in the Memorial Gardens and Nature Park

You can book a tour of the Memorial Gardens and Nature Park on the themes of gardening, landscape architecture, nature, the environment, green building, heritage or history. In 2017, tours were held on these themes for about 50 groups and in total about 1,500 people participated.

Photos: Amit Geron

Scientific Research

Ramat Hanadiv has been a leader in diverse ecological research for over 30 years and is considered to be the most studied site in Israel. Ecology, the theory of environment, is the foundation of 'sustainability' and an integral part of it. Decision making for management, based on study and understanding of the natural system and consideration of the entire range of factors and issues, is an important component of the sustainability approach.

Within the framework of research activity at Ramat Hanadiv, special emphasis is placed on disseminating the knowledge produced from the research in diverse ways, including lectures within the framework of the 'Ramat Hanadiv Forum', conferences and symposia, organising conferences at Ramat Hanadiv, conducting courses and guided tours, scientific publications, publication on the website of Ramat Hanadiv and publishing booklets and books.

Research at Ramat Hanadiv

In 2017 six studies were conducted at Ramat Hanadiv within the framework of MSc programmes on different subjects including: 'Establishment of the invasive tree *Tetraclinis articulate* in natural woodland', 'Regeneration and mortality of woody species in the Mediterranean landscape', 'The impact of Aleppo pine establishment on predation pressure on bird nests'. Similarly, six studies were conducted this year within the framework of PhD programmes on diverse subjects including: 'Examining the wild boar population with an emphasis on demography, spatial exploration, agricultural damage and the effect of hunting', 'Examining the medium-size predator guild in Ramat Hanadiv and its surroundings' and 'Exploitation of recycled water for growth of grasslands for forage and grazing'.

Similarly, five research efforts were made this year to enable optimal management of the park's environment and landscapes, including: 'Monitoring and study of trends in animal movement inside and outside of the park's boundaries' and 'Landscape and ecological changes in the cypress grove following forestry treatment'. In order to conduct research at Ramat Hanadiv in the future, we make sure to maintain control areas for research, as well as areas without management intervention (in the west of the park).

Part of the ongoing research activity includes presenting the research conducted at Ramat Hanadiv at conferences in Israel and abroad and publishing papers that summarise the research results in professional journals. Click on the following link to the research website of Ramat Hanadiv, where you can find general background about the park and about previous and current research Research.

Photos: Sagie Sagiv

Long-term ecological research (LTER)

Data collected for the long term are essential for understanding environmental changes, and they have important consequences for nature conservation and management.

Since 2003, ongoing monitoring of a suite of biologically meaningful variables has been conducted at Ramat Hanadiv, within the framework of the Long Term Ecological Research (LTER) programme. As part of this activity, and in addition to studies that deal with specific research questions, we have been conducting long-term monitoring of several predetermined variables and organisms: gazelles, partridges, songbirds, pines, herbaceous vegetation and woody vegetation. Climatic data are collected from a meteorological station located in the park. The long-term data are stored in an online database; they are also processed, analyzed and made accessible. In this way we can build data and knowledge bases that are used for synthesis and comparison and as baseline data for future generations.

Studying climate effects on growth processes

Since 2006 a study based on a holistic approach to the ecosystem and all of its biotic and abiotic

Photo: Yael Navon

components, as well as nutrient, energy and water balances, has been conducted at Ramat Hanadiv. Within this framework, long-term biogeochemical research and monitoring are being conducted to study the central processes that drive the ecosystem in the Nature Park, to estimate the effects of management and climate change on its functioning and to develop indices for monitoring human-managed ecosystems under global environmental change.

In 2013 a multichannel camera was installed at Ramat Handiv, and we commenced a long-term study to monitor the effect of climate change on plant lifecycles – viability, budding, leaf drop and flowering, and to obtain an early warning of desiccation and mortality of the vegetation. This camera will serve as a calibration station for the Israeli-French satellite VENμS that was launched in late 2017.

Another long-term study on air pollution and its two-way relationship with the vegetation began in 2015.

Studying the human factor in and around the Park

In 2014 we initiated a socio-ecological study, which sees humans as part of the system and focuses on the type of use, preferences and approaches of the public to issues of environment and sustainability. The studies being conducted within this framework include: A sociological study – 'The Partnership for

Regional Sustainability – on the way to a new paradigm of science-community partnership?', 'Community empowerment using citizen science', 'Studying and strengthening the nature experiences of visitors to Ramat Hanadiv' and 'A science-based visual model as a tool for predicting the future appearance of the landscape and as an assisting tool for decision making for planning and management'.

Conferences and symposia at Ramat Hanadiv

In 2017, five symposia and conferences were held at Ramat Hanadiv on a range of topics including: 'Theory and practice in river rehabilitation', 'The role of trains in local and regional planning', 'Promoting infrastructures for cycling', 'The annual horticultural therapy conference on the topic of growing circles' and 'The annual conference of education for sustainability in Arab society'. In total, about 600 professionals, decision makers, residents and interested parties attended these conferences.

Ramat Hanadiv Forum

During 2017, there were five meetings of the Ramat Hanadiv Forum, in which lectures on nature, environment and sociology were hosted in the Visitors Pavilion at Ramat Hanadiv. During the meetings, the following four studies conducted at Ramat Hanadiv were presented: 'Landscape value as a measure of ecological value', 'Advances in goat nutrition', 'Processes of regeneration and mortality of woody species in the Mediterranean landscape' and 'Visitor behaviour'. At an additional meeting of the Forum a lecture was given by an expert from abroad on the topic 'Challenges in the conflict between man and wild animals'. Employees of Ramat Hanadiv, researchers, students, employees of environmental organisations and interested members of the public were invited to the meetings; in total, 250 people participated.

Hosting tours for academic courses and professionals at Ramat Hanadiv

At Ramat Hanadiv there is a long tradition of hosting courses from a range of academic institutions in the park, Memorial Gardens, therapeutic garden and operations area. Similarly, we regularly host groups of professionals for professional tours and workshops. This year we hosted 17 tours of academic courses (on ecology, nature conservation, horticultural therapy and landscape architecture) and 12 professional tours and workshops, on sustainability, climate research, cattle breeding and horticultural therapy. In total, about 550 students and 150 professionals participated in these tours.

The Partnership for Regional Sustainability

Municipal heads and the Director of Ramat Hanadiv signing the Partnership for Sustainability agreement.
Photo: Eyal Fried

In 2015, Ramat Hanadiv initiated **The Partnership for Regional Sustainability**. The Partnership's aim is to connect Ramat Hanadiv with the five councils in the region surrounding the Hanadiv Valley and Taninim River watershed and to encourage cooperation among them, in order to promote and improve the state of the environment and quality of life of the residents. The member councils of the partnership are Zikhron Ya'akov, Binyamin – Givat Ada, Jisr al-Zarqa, Alona and Hof HaCarmel. The guiding assumption is that sustainability issues do not consider municipal borders – whether the issue is air pollution, waste treatment or transportation on the one hand, or the spread of an invasive species such as the palm weevil, or preventing decline of the populations of Palestine mountain gazelle, on the other.

To develop a clear action plan for The Partnership for Regional Sustainability we established a **leading forum** of stakeholders, in which about 150 representatives of 22 different interested groups participate. The forum members, guided by a staff of content experts, mapped the sustainability issues relevant to the region and prioritised three issues that in their opinion should be the initial focus of the partnership.

The three core issues selected by the forum are: **sustainable regional economy, sustainable transport and coexistence of nature, agriculture and man**. In order to formulate a strategy for each core issue, a

designated working group for each issue was established from among the forum members. Each of these three groups formulated a vision, objectives and directions of action for achieving the objectives. The groups, which included diverse representation from about 30 stakeholders as well as representation from each of the region's councils, continue working to promote the defined objectives. To read more about these groups' activities follow this link: The Partnership's website.

Establishment of forums within The Partnership for Regional Sustainability

To create a culture of discourse and dialogue among the different interested parties, including council heads and municipal officials, as well as residents, emphasis was placed on establishing forums that would enable discussion on shared issues that people were interested in promoting: **Forum of Council Heads**, which meets every two months to discuss issues with regional significance; **Forum of Representatives**, including representatives at the implementation level of all the member councils of the Partnership, which meets every month and a half; **Senior Educational Forum**, including the education department heads of the five councils.

Regional Leadership for Sustainability

In 2017, within the framework of the Partnership, and in cooperation with the Heschel Center for Sustainability, a training course on regional leadership for sustainability took place at Ramat Hanadiv. The aim of the course was to provide participants with tools for advancing processes and projects that will lead to significant change in the field of sustainability in the Partnership region. Sixteen people participated in the course, mostly from the Partnership region.

Community initiatives

The Partnership for Regional Sustainability supports community initiatives that promote different aspects of sustainability in the communities neighbouring Ramat Hanadiv that are considered to be 'Partnership communities'. These community initiatives are run by residents from the community who contribute their energy and time to promote them.

Photo: Duby Tal

In 2017, Ramat Hanadiv supported 18 community initiatives, such as **The Wildflower Project** in Binyamina, where residents of Binyamina adopt sections of the streets close to their homes, and sow them with wildflowers from the region. The project operates in partnership with the gardening department of the local council and the community centre, and its importance lies in supporting biodiversity and saving irrigation water.

Another project called **A Bridge to Arabic** deals with community sustainability. This project takes place in Jisr al-Zarqa; it helps Israelis with no knowledge of Arabic to learn the language, via walking tours around the village, meetings with residents, meetings with local professionals and joint meals hosted by families in the village. The project integrates residents in the meetings with the course participants, and the management of the Jisr al-Zarqa community centre is a project partner.

To Operate and Preserve It, a project taking place in Zikhron Ya'akov is another example of the range of community initiatives. In this project, a group of ultra-Orthodox women established a community garden while learning the principles of sustainable gardening. The garden was established in an abandoned open space with the aim of turning it into a flowering, well-kept place that will be used a setting for meetings and community events. The department for environmental quality in the Zikhron Ya'akov local council was a driving partner in establishing and running this project.

For detailed information about the 18 community initiatives follow this link: Community Projects.

Educational initiatives

As well as supporting community initiatives, The Partnership for Regional Sustainability supports educational initiatives developed by schoolchildren in the region of the Partnership. In 2017 The Partnership supported 12 such projects.

For example, **Reading from the Beginning** is a project initiated by the Bereshit school in Binyamina, in which the students work to establish community libraries in public places around Binyamina and Givat Ada, with the aim of encouraging reuse of books by free, mutual exchange.

Another educational initiative is **A Nest for the Swallow**; this project operates in schools in Zikhron Ya'akov and aims to encourage nesting by swallows near schools by building artificial nests and installing them on the children's houses and on those of the neighbourhood's residents. Another aim of the project is to stop destruction of swallow nests by the town's business owners.

Yet another project, **A Bridge between Communities**, works to create a communication bridge and cooperation between Hof HaCarmel high school students in Ma'agan Michael and Jisr al-Zarqa high school students. In this project the students are partners in a unique activity to restore the historic Wilhelm Bridge.

For detailed information about all the educational initiatives, follow this link: Education for Sustainability in the region of The Partnership

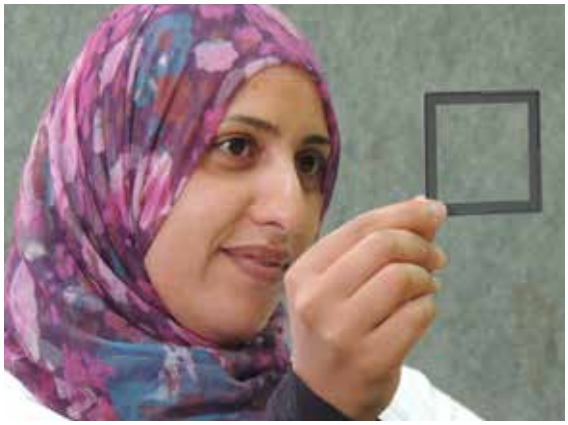


Photo: Tamar Arbel-Elisha

Photo: Yael Navon

Educational programmes in schools

A number of educational programmes on different aspects of sustainability operate in schools in the region of The Partnership.

The Generous Garden programme, which is run in partnership with the horticultural therapy staff at Ramat Hanadiv, includes a professional continuing education programme for the teachers and establishment of a school garden. It aims to provide students with experiential and out-of-class learning in the belief that direct contact with the soil, plants and animals leads to feelings of excitement among the students and encourages them to familiarise themselves and deepen their knowledge about interactions in nature and in their surrounding environment.

The project **A Glance at Regional Sustainability** is a programme in the 'Geography, man and environment, study track, which includes learning in the classroom and tours in the nearby environment; its aim is to arouse the students to critically examine their residential environment through the prism of sustainability aspects and the camera lens. During the tours, the students took photos that expressed issues related to phenomena linked to sustainability, nature, man and the environment. At the end of the programme an exhibition of the students' photos was held.

The Biomimicry and Sustainability programme is conducted jointly by the Israeli Biomimicry Organisation and the education department at Ramat Hanadiv. It is designed for elementary and middle-school students. It emphasises natural phenomena that provide a basis and inspiration for innovative inventions, such as the invention of hook and loop fasteners (Velcro) based on the hooked bristles of the fruit of the medick plant which attach to an animal's fur and thus facilitate the plant's dispersal.

Educational programmes for students at Ramat Hanadiv

In 2017, as in previous years, the educational programme **LTER Edu Man and Environment** took place at Ramat Hanadiv, with the aim of familiarising students with the values of nature and the impact of man via the continuing investigation and monitoring that the students learn at Ramat Hanadiv and implement near their schools. Thirteen classes from nine schools, including 200 students, participated in the programme. The 'Bio-investigation' programme also took place during 2017 at Ramat Hanadiv, as in previous years. This

high-demand course enables students to learn about the ecosystem and get experience through a range of investigative activities in the Nature Park. One thousand five hundred students from 60 classes and 20 schools participated in this course. Another programme that began running in 2017 is **Social Involvement** in which high school students gain experience in instruction, research and supervisory activities in the Nature Park, while learning about sustainability and the environment. Twenty tenth- and eleventh-grade students from high schools in Zikhron Ya'akov and Binyamina participated in the programme in 2016. Similarly, **sustainability tours** took place as part of this programme for 55 groups with the participation of 1,300 students who came to Ramat Hanadiv from 45 schools. The tours included exposure to a significant part of the sustainability activities taking place on-site and were adapted to the ages of the students.

Horticultural therapy for people with special needs

Horticultural therapy activities form a significant part of our efforts in the field of social sustainability. This framework offers both enrichment and counselling for therapists, as well as professional work with groups of special needs people, such as the physically disabled, intellectually disabled, elderly and learning disabled. In 2017 the horticultural therapy staff ran a programme called 'Circle of growth' for five groups from communities near Ramat Hanadiv. As part of the programme, weekly three-hour meetings were held throughout the school year for two groups of intellectually and developmentally disabled people, a group of at-risk youth, a group of youth with mental health issues and a group of people suffering from Parkinson's disease. Similarly, the horticultural therapy staff ran workshops for 250 people with special needs from ten different institutions around the country, gave professional advice for the establishment of therapeutic gardens to professionals from six different institutions, including a hospital, the municipality, a home for the elderly and more. In addition, the horticultural therapy staff ran tours and workshops for 16 groups of students from different academic institutions and professionals from various organisations, and hosted the Annual Conference for Horticultural Therapy in Israel, in partnership with 'Growing Humans' - the Israeli Horticultural Therapy Organisation.

www.ramathanadiv.org.il