D6.11 Restoration Demo at Nahal Dalia

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WP6

Lead beneficiary: INPA

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REST-COAST

Large Scale RESToration of COASTal Ecosystems through Rivers to Sea Connectivity

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Preface

In the ambitious embrace of the REST-COAST initiative, Task 6.1.2 promotes proactive communication towards society. This vision recognizes the imperative of not just undertaking restoration but also proactively communicating the essence and outcomes of these endeavors to society and stakeholders.

At the heart of this report is the Nahal Dalia pilot, that Illustrates the complexities and successes of ecological restoration in a local context. The pilot will produce Deliverables (D6.3-D6.11) including a) demonstrative material on restoration benefits; b) information on ongoing restoration upscaling; c) promotion tailored videos, targeting civil society, policy makers, stakeholders, and education community at all levels. Particular emphasis will be placed on developing educational dissemination actions for schools and universities, aimed at providing the educational community with the tools to pass on the ESS/BDV message to upcoming generations.

Summary

The Nahal Dalia Restoration Pilot, part of the REST-COAST initiative, is set in Israel's northern coastal region, bridging the Nahal Dalia Stream from the Carmel Mountain Range to the Mediterranean Sea.

Historically rich in biodiversity, Nahal Dalia has seen significant ecological decline since the 1980s, losing crucial species and suffering from habitat degradation due to human-made changes such as dams that don't allow river-to-sea connectivity and poor water quality from caused by the fishery's effluents. Encircled by commercial fishponds, the area's natural vibrancy has been stifled, prompting the need for comprehensive restoration.

The pilot aims to restore biodiversity, improve water quality, restore habitats, and restore the river-to-sea connectivity by removing barriers and suggesting alternatives for disconnecting the fishery's function from the reserve. Public awareness is also a critical component, aiming to bolster ecosystem services and as a driving force for maintaining the values of nature and ecology in the reserve for future generations. However, achieving these goals requires overcoming several challenges, including pressures for increased water production, land use and development pressures and business development pressures, leading to the need for cross-stakeholder collaboration to promote ecological restoration and sustainable economic alternatives.

The project has embarked on a multi-faceted approach, including pre-planning, stakeholder engagement, and implementation of Nature-Based Solutions (NBS). Key activities include comprehensive surveys to assess the ecological state and the restoration objectives, establishment of a project management platform among stakeholders, and hands-on restoration actions such as restoration of banks to increase biodiversity, construction of an embankment, construction of floodwater reservoir to manage fishery effluents, and more.

Recent restoration actions have already shown positive signs, such as spontaneous vegetation regrowth on restored banks, although further monitoring is necessary to fully understand the impact and success of the restoration. These efforts also present future opportunities for local economic and touristic development, aligning with broader conservation objectives.

Dissemination efforts, including videos, training days, information sheets and tours, aim to raise awareness and educate various audiences on the project's significance and progress. These activities highlight the historical and ecological importance of Nahal Dalia and advocate for its preservation and restoration.

Future hands-on actions, focused on morphological restoration and water management, will continue to involve key stakeholders to address the challenges and find solutions that will allow the continuation of successful ecological restoration. The Nahal Dalia pilot serves as a model for other restoration efforts, demonstrating the potential for ecological restoration and sustainable development.

List of abbreviations

EU	European Union
INPA	Israel Nature and Park Authority
BDV	Biodiversity
ESS	Eco-System Services

1 Introduction to Pilot Site

Nahal Dalia is a prominent stream in Israel's northern coastal region. Originating from the Carmel Mountain Range, Nahal Dalia flows through diverse landscapes before converging at its estuary with the Mediterranean Sea. The restoration pilot is situated in an area of ancient marshland that connects the Nahal Dalia Stream to the sea and spans across two nature reserves declared in 2009: the Nahal Dalia Marshland Reserve and the Nahal Dalia Estuary Reserve (Fig.1). The pilot is located amidst fish commercial farms and serves as a reservoir for clean water storage and biofiltration.

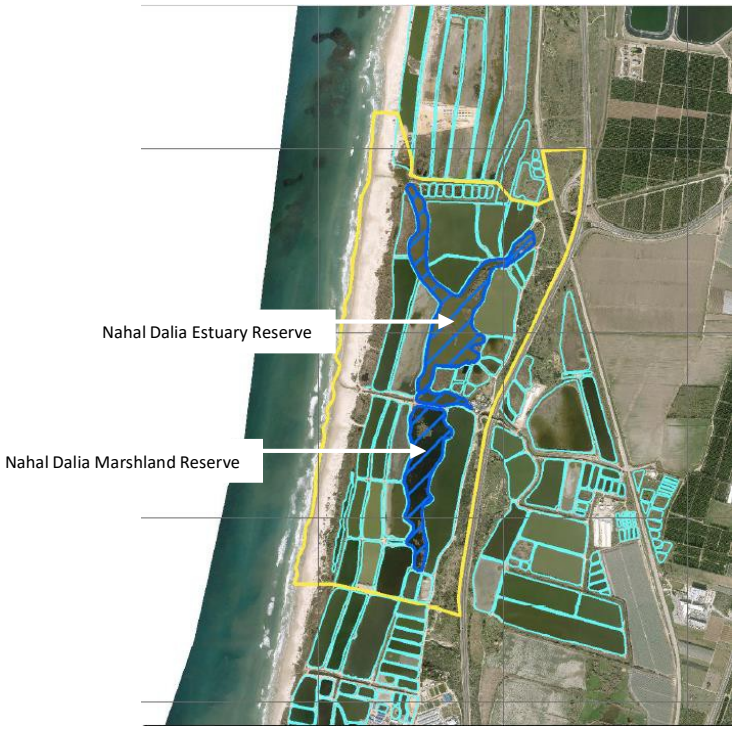

Figure 1: Nahal Dalia Reserves. INPA's project materials.

Since the 1980s, Nahal Dalia's biodiversity has been vastly degraded. Many species, such as the *Unio terminalis delicatus* and *Myriophyllum spicatum*, have gone extinct from their habitat. The leading causes for biodiversity degradation are the water regime alterations and river-to-sea dis-connectivity due to the stream dams, followed by water pollution by fishery effluents discharged into the nature reserve.
Today, the reserve is enclosed and limited by commercial fishponds.

The pilot project aims to achieve several conservation and restoration objectives, including the preservation of biodiversity and the restoration of key habitats. It also seeks to enhance water quality and promote river-to-sea connectivity by eliminating barriers such as dams, while also encouraging public engagement. These restoration efforts will provide ecosystem services such as food provisioning, water purification, water supply, and recreation.
Several challenges in the project must be addressed to meet the project's goals:

1. The governmental water authority encourages water utilities to increase water production (through abstraction and desalinization) in the region. Intensified groundwater abstraction in the area leads to reduced water level and salinization and thus negatively impacts the area's natural habitat.
2. There are challenges in improving water quality. The governmental "Water Quality Reform in Fisheries" fails to consider the Nahal Dalia nature reserve a protected area and ignores its ecologic

needs. Furthermore, the reserve's regulations allow the fishery to use the water bodies of the reserve as a water reservoir and for influent treatment. Because of the inability to use regulation to solve the problem, the project must find better alternatives to the existing situation through stakeholder engagement.

3. INPA's authority to act applies only to the water bodies. Agreements must be reached with other landowners for INPA to be able to promote restoration actions that support ESS and BDV.
4. Future development - the fishing industry in Israel is not very profitable. There is a need to provide a profitable economic alternative for the long term for the kibbutz's fisheries (for example, growing algae, high-quality sea fish, etc.) that will correspond to Israel's Land Authority lease contract, according to which, the area must remain agricultural so that the kibbutz does not lose its hold of it.
5. Existing fishing park -The fishing park is a tourist business that's adjacent to the reserve, and has land rights and plans to expand it's activity, that are approved in the land use master plan for the area. This requires collaborating with the fishing park and stakeholders to create a shared interest map and build alternatives for tourism development that will correspond with the restoration goals.

In the context of the REST-COAST, many activities are taken in different fields: Pre-planning monitoring and evaluation actions, formulating a strategy for working with the stakeholders and regular communication with them on issues relevant to each stakeholder, a restoration plan that includes several NBS restoration actions and alternatives for solving some of the challenges facing the restoration and implementation actions:

1. A survey of the current situation was carried out. The survey included comprehensive historical, 11 thematic surveys in the fields of hydrogeology, hydrology, hydrogeochemistry, bathymetry, algae, aquatic macroinvertebrates, vegetation, fish, birds, Softshell turtles, and mammals. After collecting the data, integration was carried out to classify the habitats according to the local scale of the pilot area.
2. A core plat was established to define the project management platform within the stakeholders. The core plat consists of 4 circles working continuously to promote agreements related to land costs and economic development of the area to enable levers for ecological restoration: The professional management team led by INPA, the steering committee, the accompanying professional committee that advises on professional matters, and the landowners. The public circle is in the stages of mapping the area's users.
3. Banks restoration to increase biodiversity and habitat heterogeneity (Fig.2). Will be Further elaborated in section 1.1.
4. An embarkmentwas built to increase biodiversity and habitat heterogeneity by separating the northern water body into two water bodies with seasonal characteristics (Fig.3).
5. Building a floodwater reservoir. To address the need to stop fishery water discharge into the reserve, funding was received from Israel's Land Authority under the Foundation to Protect Open Spaced, to treat the fishpond's effluents and replace the use of the reserve. The reservoir project includes ecological elements and the rewilding of fishponds.
6. Dissemination activities were carried out, such as a webinars, tours in the pilot area to the professional community and stakeholders, and tour guide training day. Recent dissemination activities are elaborated below.

Figure 2: South-western bank restoration during works in the southern reserve. INPA's project materials.

Figure 3: New battery that separates the water body on the northern reserve to two seasonal water bodies with changing water levels. INPA's project materials.

1.1 Demonstrative material of restoration benefits

Recently, the pilot showed significant progress in enriching biodiversity through the implementation of several restoration actions. This actions, aimed at creating a veriety of habitats and promoting ecological diversity, as well as ESS, is an important stage in the pilot's journey towards further ecological restoration and community engagement. Concurrently, a series of dissemination actions, including impactful videos and

educational events, have been undertaken to broaden public awareness and foster a deeper understanding of the project's goals and achievements.

1.1.1 Benefits of restoration (perceived, achieved, not achievable, expected)

The restoration actions which have already been carried out were held in October-November of 2023, and included the first phase of the bank's restoration plan (Fig. 4) and the creation of a new bank in the northern water body (Fig.2). The goal of the bank's restoration is to create a diverse typology of banks that allows a variety of habitats and ecological niches for various animals and to increase biodiversity. The goal of the new bank inside the northern water body is to allow seasonal water level changes that will enable seasonal characteristics in the water bodies and increasing habitats and BDV.

Since the restoration actions took place recently, more time is needed to understand the impact on the ecosystem and the social and economic dimensions. However, a beginning of spontaneous bank's vegetation restoration was observed. Quantitative and measurable results from monitoring actions that will take place this summer will give better indications of the restoration actions impact.

Although the restoration operations only applied within INPA's area of authority within the water bodies of the reserve, there are also permutations for the kibbutz. To carry out the restoration actions, the agricultural road that serves the fishery was improved. Also, increasing biodiversity and creating seasonal habitats as a result of the restoration action can contribute to future touristic development that the kibbutz will benefit from.

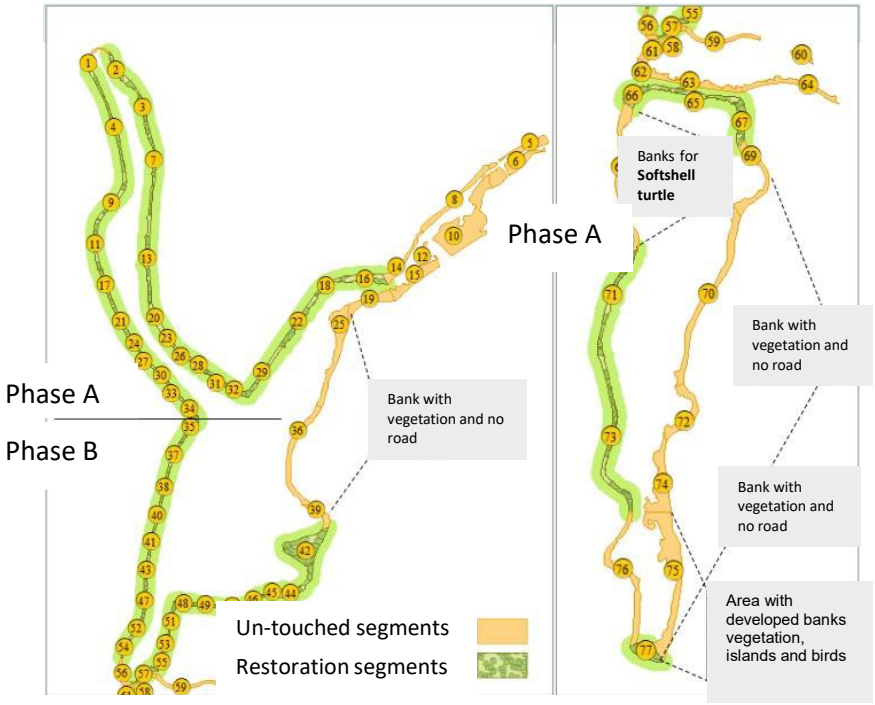

Figure 4: Map of the bank's segments and restoration phases. On the left-the northern reserve, on the right-the southern reserve. INPA's project materials.

2 Nahal Dalia videos

The first video (https://www.youtube.com/watch?v=ntgdkguOBzs) shows the history of the Nahal Dalia pilot site, the changes the marshland has undergone over time, and the motivation for restoration. The video highlights the ecological values of the marsh area as an important and rare habitat and the need to preserve it for biodiversity, landscape, and cultural heritage. Furthermore, the video describes the challenges in managing the different interfaces in the reserve, the leading restoration goals, and the actions taken at the beginning of the restoration process.

The video was distributed on INPA's Facebook page (1500 views) and Agma's YouTube channel (1465 views). The video is mainly used on social networks to expose the project to a broader audience and raise awareness. In addition, the video was sent to the participants before each event or meeting as an introduction, presenting the background for the restoration. This video is mainly for marketing and appeals to various audiences and populations.

A second video was recently produced by INPA (https://www.youtube.com/watch?v=uksl4EYkGAQ), part of INPA's nature-documentary short videos series. The documentaries touch on the core values of nature conservation and demonstrate the main conflicts, hard work, frustrations, and successes in nature conservation processes that the organization promotes. This video has a more educational and professional approach. It shows the variety of species found in Nahal Dalia reserve, demonstrates the environmental conditions those species need, the hydrological regime and connectivity between the water bodies, and the disturbance caused by the fishery and other ecosystems in the area. In just ten days, this video has received 24,533 views.

Another dissemination action that was recently taken is the Tour Guide Training Day, which was conducted on February 25th. The training day addresses an audience of tour guides aiming to build an infrastructure to make the reserve accessible to visitors in the future at the end of the restoration processes and establish the reserve as an integral part of the area's rich historical and cultural heritage. The training day consisted of three lectures about the history of Nahal Dalia, wetlands restoration processes, and the variety of landscape units and habitats in the Carmel plains (will add training day document and photos in English when ready). Furthermore, an official webpage with more information about the reserve and the restoration project is being published these days, and all the updated information on the reserve will be gathered in an accessible way through INPA's website.

3 Demo activities

3.1 Hands-on restoration actions

The first hands-on restoration action taken within the pilot was the bank restoration. As mentioned in Section 1, this restoration action aims to create a diverse typology of banks that allows a variety of habitats. The main problem that was addressed is the engineering section of the banks, which is caused by the reserve being on the other side of the embankments of the fishponds that are built in an engineering way. There was no variety of bank types; they were steep and lacked structural complexity and natural characteristics. The banks had

little ecological value for biological diversity. To solve this problem, the banks were widened to serve as a buffer between the fishponds and the nature reserve and to change water levels to allow different habitats. The recommendations from the existing situation survey enabled a morphological restoration that could create optimal habitats and consider the endangered, endemic, and invasive flora species and egg-laying spots. In the future, additional morphological restoration and monitoring will be done alongside a proposed plan for preserving the restored nature that will be implemented over time and will address the topic of crowd management within the protected area.

The second hands-on restoration action was the creation of a new embankment. As mentioned in Section 1, the goal of the new dike inside the northern water body is to create seasonal water bodies. The main problem addressed is that the same water level is maintained year-round due to the dams, and there are no seasonal water level fluctuations –water levels are not influenced by seasonal characteristics such as winter floods, rain events, etc. The built embankment divides the northern reserve into a seasonal flow channel, a permanent flow channel, and an estuary. When the whole reserve is flooded, the water level is uniform. Water bodies with different ecological characteristics are formed when the water level drops. The seasonality of the water level increases biodiversity and the complexity of the existing ecosystem. Although the restoration operation contributes to the creation of seasonal variation, it is necessary to treat the dams to achieve an optimal result. The handling of the dams is in the discussion stages and will be carried out in the future after decisions have been made and there is an agreement between the stakeholders for a solution. The stakeholders are the kibbutz, INPA, the drainage authority, and the water association.

Additional hands-on restoration actions will be taken in the future, such as rewilding ponds, building a floodwater reservoir, and relocating or replacing dams. Those actions will contribute to water management, improve water quality, restore connectivity between Nahal Dalia and the Estuary, and increase BDV. To further promote those restoration actions, there is a need to involve various stakeholders, mainly the kibbutz, INPA, the drainage authority, and the water association, who all have different interests and concerns regarding the water regime in Nahal Dalia.

3.2 Demonstration value and replication

As a demonstration project, the activities undertaken within the project aim to contribute mainly to the out-scaling of the demo values. The Nahal Dalia pilot site work is promoted by both the INPA and AGMA - the Israeli knowledge center for Waterways, Dams and Streams as a dissemination project. This status enables a professional and academic discourse around the objectives - identifying barriers and enablers at the national level, clarifying economic and social benefits, and thereby promoting local and regional interests. Around the activity that has already with a professional audience and the stakeholders, the interest in the project has increased and there are several professionals who are following what is being done to apply insights in other places. One example of implementation of the technical aspects and restoration strategies insights is in a plan that is currently being developed by a different planning team for restoring the Kabara marshland – an ancient marshland south of Nahal Dalia.

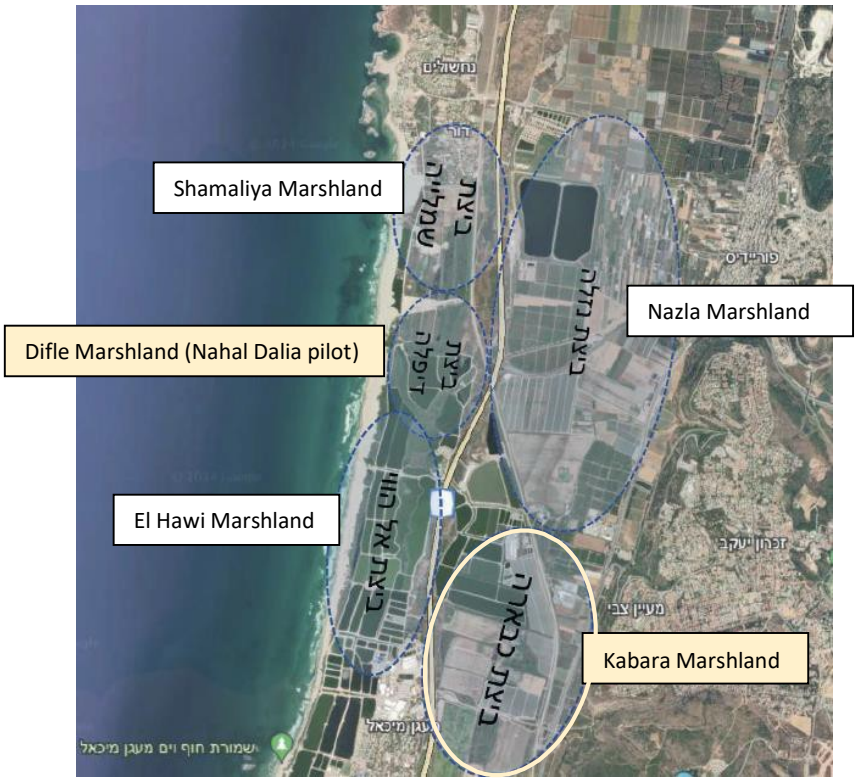

Figure 5: Aereal photo with marks of ancient marshlands of the area and the new restoration area. INPA's project materials.

Annex

Introduction and information page (will be published in INPA's website in Hebrew and English).

Getting to Know You
Dalia Stream (Difleh) Estuary Nature Reserve
When the Stream Meets the Sea
At the foot of Mount Carmel, among the fish ponds, the golden sands along the beach and the azure sea, a flowing stream has remarkably survived, as well as a marsh where human efforts to drain it were ultimately abandoned. In the winter, ducks paddle in the water, a gray heron stands unmoving waiting for prey, and on the branches of the tamarisk tree, a white-throated kingfisher preens its feathers after a dip in the water.

The marsh once boasted clear water from springs that welled up from its depths. The marsh water flowed to the sea, forming an estuary where the stream could mix with the seawater, creating together a special natural realm. Today it's hard to tell the difference in color between the marsh water and the fish ponds, and the world of flora and fauna here has been marred. But beautiful days lie ahead for this site. The Israel Nature and Parks Authority is spearheading a project to rehabilitate the reserve and restore it to its former splendor. And meanwhile, we'd like to briefly introduce you to this charming spot.

We almost forgot...In Arabic, the place is called *difleh*, which means oleander – named after the many oleander plants that grow along the banks of the marsh.

We're Drying Out
Hard as it is to imagine, the Land of Israel once abounded with waterscapes – the sources of the Jordan River, the Hula Lake and its wetlands, the springs of the Jezreel Valley and the swamps of the coastal plain, along with hundreds of seasonal pools in almost every corner of the country's inhabited regions. Regrettably, less than five percent of all of these remain.

The aquatic habitats of the coastal plain were particularly hard hit. The aquatic ecosystems have been seriously damaged by the draining of wetlands in favor of cultivated fields, the use of springs for human consumption, stream pollution, as well as residential and infrastructure development. Streams once full of flowing water, like the Na'aman, the Kishon and the Yarkon, have almost completely dried up. The ample wetlands and seasonally flooded areas, among them the Hadera Marshes, the Taninim Stream's Kebara Marsh, the Poleg Marsh and the Sorek Stream, are mere vestiges of their former selves.

Are the waterscapes and their flora gone forever? Not at all. Water sources have an amazing ability to restore themselves if only we give them a chance.

The Uniqueness of the Difleh Reserve
The Difleh Reserve is formed by the confluence of the Dalia Stream and the local *kurkar* (calcareous sandstone) aquifer. Originating near Kibbutz Ein HaShofet, the waterway, enriched by tributaries such as the Tut and the Shelef streams, flows westward through the chalk hills of the Menashe

Plateau. After an 18-kilometer journey, it flows into the Mediterranean Sea. As the Dalia Stream approaches the coast, its surface runoff converges with the aquifer water emerging at the coastal marsh. At this juncture, near the estuary, the stream bifurcates into two branches – the southern branch known as Nahr el-Tantura and the northern branch, the Difleh.

The Difleh encompasses two nature reserves: the Dalia Stream estuary in the north, which covers 171 dunams (17.1 hectares), and the Dalia Stream marsh, which covers 108 dunams (10.8 hectares).

The Difleh reserve sustains two separate eco-hydrological systems, which together create a unique ecosystem of an estuary and a coastal marsh. One hydrological system is the eastern Dalia Stream basin, which channels the increased winter discharge from its many springs to the Difleh. This water is low in saline. The second system is the Carmel coast aquifer. Here too, we find a unique ecosystem, which integrates springs emerging from the Yarkon-Taninim Aquifer with the coastal aquifer.

Another exceptional aspect of the reserve is the link of the marshes to the sea and the diverse surrounding habitats. To the east of the marshes stands a *kurkar* ridge, while to the west, shifting sand dunes extend to the coast. The marshes are also enveloped by archaeological sites, including an Ottoman-period bridge over the Dalia Stream and next to it, the remnants of ancient olive presses and the Tafat Ruins – the remnants of a Byzantine fortress strategically positioned on the *kurkar* ridge. Adjacent to it are burial caves carved into the *kurkar* rock. Additionally, there is a dam dating back to the Roman period, and although it is situated east of Highway 2, it significantly impacts the dynamics of the Difleh Marshes.

Flora and Fauna

Old aerial photos attest to the existence of a well-developed marsh and stream estuary with lush foliage. The marsh water in those days was clear and pure. Among the plants that grew in the water were swamp sawgrass (*Cladium mariscus*), water milfoils (Haloragaceae), yellow water lily (*Nuphar lutea*) and soft hornwort (*Ceratophyllum submersum*). To this day, the banks sprout the rare spear-leaved dog bane (*Trachomitum venetum*), swallowworts (*Cynanchum acutum*), common reed (*Phragmites australis*), arrow-leaved morning glory (*Ipomoea sagittata*), holy bramble (*Rubus sanctus*) and Nile tamarisk (*Tamarix nilotica*). Among the meadow plants are creeping millet (*Panicum repens*) and strawberry clover (*Trifolium fragiferum*).

The *kurkar* ridge, known as “Tulip Hill,” east of the southern Difleh, is carpeted with wildflowers in winter and spring, including late-blooming narcissus (*Narcissus serotinus*), sun’s-eye tulip (*Tulipa agenensis),* Persian cyclamen (*Cyclamen persicum*), crown anemone (*Anemone coronaria*) and fan-lipped orchid (*Anacamptis collina).* The reserve was also once home to the rare mollusk *Unio semirugatus*, last seen here in the 1980s.

Surveys conducted in the reserve in preparation for its rehabilitation recorded 23 species of nesting birds. Nests of softshell turtles (*Trionyx triunguis*) were also found. Mammals commonly seen here include the Egyptian mongoose (*Herpestes ichneumon*) and the golden jackal (*Canis aureus*). Alongside large mollusks the water abounded with fish, included gray mullet (*Mugil cephalus*) and European eels (*Anguilla anguilla*), as well a variety of aquatic invertebrates.

Human Impact of the Reserve

The human imprint on the Difleh area dates back to antiquity, with the most notable transformation occurring around 2,000 years ago during the Roman period. The Romans built an elaborate waterworks between the Taninim and Dalia streams to divert them to Caesarea. The system included dams, water lifting pools and aqueducts, effectively altering the flow regime in the area. A dam separated the Kebara Marshes in the south from the Difleh Marshes in the north, transforming the once-unified large marsh into distinct entities. Vestiges of this ancient dam are still visible today, situated between Highways 2 and 4.

In the early twentieth century, pioneers of the Zionist Movement drained the Kebara Marshes to make room for settlement and agriculture. To facilitate the drainage, an opening was made in the Roman dam, and surplus water from the northern part of the Kebara Marshes was channeled to the Difleh. After the establishment of the State of Israel, most of the area of the Difleh Marshes was used for Kibbutz Ma'ayan Zvi's fish ponds. East of the marshes, next to Highway 2, the kibbutz operates a fishing attraction for tourists.

The foremost problem faced by the Difleh is water quality in the marshes. The fish ponds, which draw their water from the marshes, channel it back after fish have been raised. This practice predates the declaration of the area as a nature reserve, leading to a minimal distinction between the water quality in the marshes and that in the fish ponds today. The southern part of Difleh encounters more significant disturbances, primarily due to the infusion of additional water from the fish ponds of Ma'agan Michael, where the water is more saline.

The exploitation of the Dalia Stream is made possible by means of a dam, blocking the stream from its natural outlet to the sea. The convergence of the stream's estuary with the coast holds significant ecological value, characterized by noteworthy seasonal variations. Preserving the connectivity between the stream and its estuary at the coast is crucial for maintaining the integrity of their value from a natural and landscape perspective. Indeed, the Dalia Stream coast currently carries the designation of a proposed nature reserve.

Rehabilitation of the Reserve

The primary challenge in revitalizing the reserves lies in enhancing the water quality and its overall dynamics, aiming to ecologically stabilize the system and to establish a robust connection to the sea. Although the confines of the nature reserve align with the boundaries of the marshes' water bodies, the rehabilitation plan extends its focus beyond these limits. It encompasses surrounding areas such as the fish ponds, the beach, and the *kurkar* ridge, encompassing a total expanse of 2,250 dunams (22.5 hectares).

The main goals of the project are:

1. To enhance the flow and quality of the water within the reserve.
2. To restore ecological functionality of the habitats and reintroduce the area's former biodiversity.
3. To facilitate the unimpeded flow of the Dalia Stream to the sea, currently blocked by a dam.
4. To engage the local community in developing ecological tourism initiatives; visitor-friendly routes that align with the character of the site and the community.

As a foundation for ecological planning, 11 surveys have been undertaken so far to document the current state of the reserve, including surveys of fish, birds, softshell turtles, mammals, plant life, hydrological patterns and water quality. The surveys have yielded copious knowledge about the reserve.

The rehabilitation of the Difleh presents a multifaceted project, necessitating a comprehensive approach. Success hinges on the careful consideration of all interests in the area, including those of Kibbutz Ma'ayan Zvi, which owns the fishery, as well as the pumping and drilling stations at the site. Additionally, it is imperative to align the project with the strategic vision of the Hof HaCarmel Regional Council.

The Israel Nature and Parks Authority is in charge of the rehabilitation work and the conservation actions together with the Carmel Drainage and Streams Authority, the Hof HaCarmel Regional Council, Agma – a knowledge center for waterways, dams and streams, as well as other stakeholders.

An Important National and International Project

The rehabilitation of the Dalia Stream has won the support of the European Union as one of nine pilot sites of the RESTCOAST project, which undertakes pioneering efforts for large- scale restoration of coastal ecosystems through rivers to sea connectivity using up-scaled coastal restoration interventions.

The Day Will Come

Upon the completion of the rehabilitation process, the Nahal Dalia Stream will gracefully resume its flow to the sea. Clean water will course through the marshes, and sustainable solutions will be implemented to preserve their ecological functionality. At the same time, the values of our partners' interests in the project will have been taken into account. Nesting areas and thickets will be introduced, visitors will enjoy the waterscapes teeming with flora and fauna. When that time comes, the gray mullet, the eel, the ferruginous duck, the marbled duck, the gray heron and the large egret otter will coexist here and perhaps, who knows, the elusive jungle cat may even hunt here again.

The Difleh is currently closed to the public during its rehabilitation. The aspiration is for the local community to embrace it as a source of pride and actively participate in its conservation. The goal is for the local community to "adopt" the site, so that both residents and visitors from across the country can eventually revel in the romantic rendezvous between the stream and the sea.