IMPRECO
Common strategies and best practices to IMprove the transnational PRotection of ECOsystem integrity and services

DELIVERABLE T3.3.1

IMPRECO CommonEducational Programme

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Author: PI “Sea and Karst”

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Editors:	Ines Alujević, Bojana Lipej, Massimiliano Pinat, Gvido Piasevoli

TABLE OF CONTENTS

1. IMPRECO COMMON APPROACH

Climate change, pro-capita impacts on environment, habitats reduction, biodiversity loss, deforestation, water scarcity, overfishing, soil erosion, decrease in photosynthesis, discharge of toxic substances, invasive species, energy consumption, and population growth: these are the thirteen threats, which WWF believes should encourage humankind to act immediately, with utmost commitment and dedication. All the above challenges share a common denominator: they are a result of human pressures and impacts on natural ecosystems. The loss of such natural ecosystems or a strong decrease in their functionality and capacity to provide services to humanity would eventually put an end to life on Earth. In this respect, natural heritage must be considered as a human capital: a capital for all countries as well as for all generations. These are our common resources, and all stakeholders have the responsibility to manage it. For future generations, this means that we must teach our children today how they can and should manage these primary natural resources for the future.The establishment and management of nature protected areas is one of the answers to the above threats. IUCN, International Union for the Conservation of Nature, defines a nature protected area as "*a clearly defined geographical space, recognised, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values"* (IUCN Definition, 2008). Among this nature protected areas, a valuable role in ecosystems protection is played by marine, coastal and wetland protected areas. As stated by the Convention on Biological Diversity (COP), "*many of the world's fishery resources are in danger of depletion. In addition, other living resources, such as mangroves, coral species and species amenable to bioprospecting, are subject to or under threat of overexploitation. The principal impact of overexploitation is unsustainable removal of marine and coastal living resources. The significant threats to biological diversity include habitat destruction, destructive fishing and Illegal, unregulated and unreported fishing, and by-catch. Marine and coastal protected areas have been proven to protect biodiversity, ensure sustainable use of resources and manage conflict, enhance economic well-being and improve the quality of life".* To this end, COP agreed (SBSTTA 8 Recommendation

VIII/3) that the goal for work under the Convention relating to marine and coastal protected areas should be: *"The establishment and maintenance of marine and coastal protected areas that are effectively managed, ecologically based and contribute to a permanent representative global network of marine and coastal protected areas, building upon national networks, including a range of levels of protection, where human activities are managed, particularly through national legislation, regional programmes and policies, traditional and cultural practices and international agreements, to maintain the structure and functioning of the full range of marine and coastal ecosystems, in order to provide benefits to both present and future generations."* Additionally, another issue gaining in importance is the establishment of protected wetland areas. Under the international Ramsar Convention, wetlands are defined as "*areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres"* (Article 1.1). Those areas that meet these characteristics are considered of international importance, and indeed protected by Ramsar Convention, primarily because they can provide habitats for water birds and play an important role in water cycles, hydrogeological systems and the food chain. They are one of the most productive ecosystems in the world with a wide range of benefits for people who live in or near them (Ramsar Convention Secretariat, 2016). Finally, it is important to draw attention on the main instrument in European Union policies for biodiversity and ecosystems conservation: Natura 2000, an ecological network widespread throughout the EU territory, founded in accordance with the Council Directive 92/43/EEC (the so-called Habitats Directive) on the conservation of natural habitats and of wild fauna and flora. Natura 2000 programme is a turning point in protected areas management as it "*shall take account of economic, social and cultural requirements and regional and local characteristics*" (Article 2). Thus, the Directive recognizes the value of all those areas where the presence of man and its traditional activities has kept preserving the balance between human activities and nature conservation. Furthermore, Natura 2000 programme has demonstrated the function played by certain landscape elements "*as linear and continuous structure or stepping stones essential for the migration, dispersal and genetic exchange of wild species of fauna and flora*"

(Article 10). The Programme invites Member States to conserve or, if needed, further develop such elements to improve the ecological compliance of the Natura 2000 programme. IMPRECO is a transnational project funded by the ADRION PROGRAMME which main objective is to enhance the safeguarding of ecosystem services and tackle their environmental vulnerability strengthening the potential of protected areas in biodiversity and ecosystems conservation. IMPRECO focuses on coastal protected areas considering their key role of transition areas dealing with threats both on terrestrial and marine environments, with consequently a higher vulnerability, but at the same time, connecting different ecosystems and providing benefits through their services to a wider territory and population. Six public authorities and one non-governmental organization involved in Protected Areas and Natura 2000 sites management compose the partnership. They represent relevant organizations in the ecosystems conservation field from the Adrion area: the Municipality of Staranzano is the Head of the Management Body of the Isonzo River mouth Regional Nature Reserve, which includes other 3 local Municipalities and Friuli Venezia Giulia Regional Authority (Italy); Veneto Agricoltura is the public company which manages the Veneto region (Italy) natural areas, included the Nature Reserve of Bosco Nordio involved in the project; the University of Salento is a scientific partner with a long experience in research of ecology, biodiversity, management of protected areas, included the Natura 2000 site "Aquatina di Frigole" (Italy) addressed by project interventions; DOPPS-Birdlife Slovenia is a national NGO and leading organisation in biodiversity research and monitoring which manages the project area Škocjanski zatok Nature Reserve (Slovenia); PI Sea and Karst is the Public Institution for the Management of Protected Areas in the County of Split and Dalmatia, among which the Natura 2000 site "Pakleni Islands" (Croatia); the Albanian Development Fund is in charge for national economic development which involved in IMPRECO the Protected Area Shkodra Lake and Buna Delta (Albania); the Region of Crete is the regional authority of Crete for environment and spatial planning, also in charge for the management of the three Natura 2000 sites in the North-Eastern Edge of Crete. Their work is addressed, on one side, to maintain, enhance and restore natural ecosystems and their functionality and, on the other, to integrate them in local development plans. To this end, IMPRECO adopted the so-called ecosystems services approach

but in an innovative way: unleashing protected areas potential as laboratories to test innovative measures for ecosystems conservation and transferring them in the surrounding territories. Indeed, protected areas are the most effective sites where safeguarding measures are adopted but, to enforce a dynamic protection system of ecosystems and integrate it with a sustainable use of natural resources, protected areas lighthouse experience needs to be replicated in the surrounding areas. IMPRECO aims to enhance ecosystems by setting an integrated management approach based on the collaboration among protected areas, local stakeholders and public authorities and the joint implementation of measures for ecosystems management and conservation both inside and outside the protected areas. Therefore, safeguarding ecosystems requires a comprehensive approach to be effective: by converging efforts at the local level, which requires the involvement of protected areas' managers, public bodies, civil society, academia, economic operators but also by sharing efforts on transnational ground since ecosystems are ecologically interconnected, even more if consider that IMPRECO focuses on coastal ecosystems in the Adriatic Ionian area which is characterized by a semi-enclosed sea in its core. Such ecosystems are also threatened by pressures generated at transnational level which need to be tackled on the same ground interconnecting and supporting local actors and their efforts through transnational networks. Even if Adriatic Ionian area is already characterized by a dense network of protected areas which are node of the flows of ecosystems services and of key actors in ecosystems protection, preservation and connectivity, such networks need to foster transnational cooperation as a multiplier of force related to environmental vulnerability and conservation. Transnational tools and the exchange of experience are needed to improve the capacity of protected areas to address human pressures and govern ecosystem services drivers of change. Furthermore, protected areas challenge is to enforce their cooperation with national and transnational actors in order to introduce the ecosystems services approach in the praxis of development and cohesion policy, thus facilitating the achievement of EU standards and in general increasing good governance potentials. IMPRECO is based on the idea that such transnational approach is built brick by brick from the ground up. The ground is represented by protected areas which have different levels of experience: scaling up from experienced protected areas to the transnational approach, the project can select and

share best practices in ecosystems management to test them in different contexts through pilots and better assess their results and replicability. Thanks to the transnational networking, knowledge can be shared among IMPRECO partners, protected area and their stakeholders, increasing key actors' capacity to safeguard ecosystems and supporting them with common tools and services. Through the bottom up and participative approach, a common methodology and strategy for ecosystems management could be developed with a stronger commitment of local communities and, as a consequence, decision makers and public authorities: sharing knowledge and results increases awareness in EU and IPA Countries and their citizens by understanding dependencies, impacts and trade-offs between natural ecosystems and common socioeconomic system, thus developing a joint framework of assessment and ecosystems management. As evident from these introductory comments, there is a need to adopt a Common Educational Programme aimed at increasing the awareness and knowledge of ecosystems safeguarding and its related topics among EU and IPA citizens for activating their participation both to protected areas and natural capital effective management. The need to define a joint educational approach among IMPRECO partners, besides being compliant with the strategy adopted through Natura 2000 which shown the importance of a shared strategy among natural areas close to each other, arises from the perception, that Adriatic Ionian marine and coastal protected areas are strictly interconnected in terms of biodiversity, habitat and ecosystem services, which could be only valorised and preserved within a customized and uniform approach. To reach such goals, a common awareness-raising and educational campaign, sharing key messages and values for all stakeholders, is strongly needed. The analysis of the specific experiences gained from previous educational and dissemination activities carried out in the protected areas involved, was coordinated by the IMPRECO partners with an aim to share knowledge and define the main didactical need and targets. Therefore, IMPRECO Common Educational Programme will primarily focus on pupils between six and fourteen years old since specific analyses carried out by project partners demonstrated how they represent the highest percentage of visitors in protected areas. Moreover, by transferring the project knowledge to schoolchildren, IMPRECO will have the chance to work on future generations and make use of their potential as multipliers of knowledge

dissemination. The main need addressed by the programme is, consistently, to teach our future generations the benefits of ecosystem services and what humans gain from nature for their well-being and a sustainable society, what are human activities that can affect negatively on ecosystems and biodiversity as well as the conservation and management measures of natural resources to preserve them, contributing to a development of natural assets and services needed to improve humans' quality of life while respecting the planet. To this end, the IMPRECO Common Educational Programme has been developed in order to, initially, deepen teacher's knowledge on the ecosystem's services approach thanks to specific preparation and introductory meetings. In the second phase, the programme will include classroom lectures for pupils and, at least, two field excursions which should help pupils to get a realistic picture of the contents they had been lectured on. For improving IMPRECO Common Educational Programme impact, there are a number of educational tools and SMART technologies developed by IMPRECO partners which should support pupils and teachers during the educational path. The main aim of IMPRECO Common Educational Programme is to raise the level of knowledge on the great value of the natural capital (assets and services), the role played by Natura 2000 and protected areas in biodiversity conservation and, at the same time, on the ecosystems fragility, as well as provide additional opportunities for training teachers in the fields of nature science and nature conservation.

2. OBJECTIVES OF THE COMMON EDUCATIONAL PROGRAMME

The environment in which we live faces many threats which threaten pristine nature and our survival or the quality of life as we know it. Several of these threats are global, while others are present at the local level. However, we should not forget that in a macrosystem such as the planet Earth local effects can have knock-on effects in other parts of the world and in certain periods their intensity might vary much more than currently expected. At the 1992 Earth Summit, the UN filed a global initiative called Agenda 21, which was directed at the development of a single international operational programme for the protection and conservation of nature. With its 'Think Global, Act Local' motto, Agenda 21 promotes the concept of intensive sustainable development, which is regarded as a "mix of activities focused on meeting current needs without threatening the options which are available to the future generation in the pursuit of their own needs". Nature conservation and environmental education play a crucial role in meeting these objectives, since their primarily goal is to improve the level of knowledge and awareness among pupils, thereby modifying their behaviour until they become citizens who are able to contribute to the sustainable society. Furthermore, young people are the link between the present and future generations and, consequently, no efficient strategy should ignore their active involvement. Through nature conservation and environmental education, pupils acquire the knowledge and skills which they need to form their own opinions and evaluate sustainable ecological decisions, participate in the decision-making processes to resolve environmental issues, and take an active part in environmental management. Trained educators, appropriate educational program with educational tools are vital for good environmental education in schools and preparing pupils to be motivated, critical and active in protection of their environment and sustainable way of living. Including nature conservation and environmental education in school curricula means enabling young people to:

- learn about the role and operation of the environment and its ecosystems;
- learn, study and deal with nature conservation and environmental issues;
- understand and implement sustainable development principles;

- be actively involved in social activities for nature, ecosystem conservation and protection of the environment;
- understand the mean and the value of ecosystem services;
- develop their own relationship for nature conservation and environment protection.

The main objective of the IMPRECO Common Educational Programme is to transfer the information and knowledge needed for understanding the richness and fragility of nature, to live in harmony with the environment and to manage natural resources in a sustainable way.

In order to achieve the above stated aim, the following specific objectives of the IMPRECO Common Educational Programme have been set:

a. **Improving the level of knowledge on ecosystems and their functions**
b. **Raising awareness on benefits we gain from ecosystem services**
c. **Highlight the role played by biodiversity for the functioning of ecosystem services**
d. **Improving the level of knowledge about the threats on ecosystem services and related solutions for their protection and sustainable management.**

2.1 Improving the level of knowledge on ecosystems and their function

In the project IMPRECO the focus has been given essentially to the ecosystem services provided by the marine and coastal ecosystems. Indeed, marine and coastal ecosystems are well represented in all the project areas, where the project partners are facing similar issues in the management and conservation of local resources. Suitable training and different educational activities can promote the knowledge about local coastal and marine ecosystems and the role played by humankind as integral part of such ecosystems. The effect is maximized, if the education starts with the youngest generations and slowly upgrade the basic knowledge at higher level of education. Small children and primary school pupils absorb information from their environment, so it is very important that they are in direct contact with nature or attend outdoor educational activities. Hands-on experience is crucial: they encourage children to think and stimulate their interest in observation, learning and discovering

nature, thereby teaching them how to be responsible and preserve biodiversity. In young people, this approach lays the foundations for understanding the basic life's processes and contributes to the well-being of the human race as well as a better awareness of the importance of ecosystem integrity and the ability to understand the role we have in the ecosystem's conservation.

2.2 Raising awareness on benefits we gain from ecosystem services

Knowledge of the meaning of ecosystem services is essential to understand how we can benefit from an ecosystem in good conservation status and how a sustainable development is now essential to ensure those services to the future generations. Unfortunately, there is a scarce consciousness about such topics in the people and consequently in local and national political choices. In order to reverse the common understanding, we need a more and specific education and training for the youth and the general public about the role of ecosystem services for a sustainable growth, which is essential in the implementation of the sustainable development of these areas. New knowledge and valid information will help successfully conserve the high rate of biodiversity in these areas and the overall conservation of ecosystems.

2.3 Highlight the role played by biodiversity for the functioning of ecosystem services

One of the primary conditions for the conservation of ecosystems integrity, and the services provided by, is to understand the connections and relationships between them and biodiversity. A sound knowledge of the complex inter-relations and systemic consequences of ecosystem interventions improves the ability to critically judge various interventions in life or nature, promote more responsible environment management and biodiversity conservation policies. This reduces the vulnerability and threat to different plant and animal species, on the one hand, and increases ecosystems' resilience on the other hand. Healthy ecosystems are vital to the wellbeing of men, their health and existence, specifically because they can offer better ecosystem services.

2.4 Improving the level of knowledge on the threats to ecosystem services and related solutions for their protection and sustainable management

In order to better conserve and manage the ecosystems and the services provided, it is important to understand the main threats to which they are subjected. Humans, through economic and social activities can affect positively or negatively on ecosystems functioning and biodiversity in general. To this end, education and training activities should highlight which are the social and economic activities that generate such pressures, who are the actors involved and their relationships with ecosystem services as well as alternative solutions for reducing the impacts on nature and promoting more sustainable way of living. This is a first starting point to find out proper solutions and management strategies to conserve them and enlarge the number and type actors actively involved in the ecosystems' protection.

3. RESULTS FROM KNOWLEDGE TRANSFERRING

As explained in the introduction, IMPRECO Common Educational Programme targets schoolchildren between six and fourteen years old since specific analyses carried out by project partners demonstrated how they represent the biggest and most important part of visitors in protected areas. The pupils of today are the adults of tomorrow who will take the responsibility for our future: they are the most important recipients of targeted nature conservation education as well as the most effective environmental education multipliers. Therefore, educational programmes in protected areas need to be developed in line with the school curricula. Experts from various professional fields, with at least 10-year experience in education or environmental education, were invited to take part in the development of the IMPRECO Common Educational Programme. They defined the following list of results foreseen by knowledge transferring to schoolchildren which can contribute to the achievement of the IMPRECO Common Educational Programme objectives listed here above while setting specific targets for environmental educators, according to the age groups previously defined.

3.1 GROUP 1 – aged 6 to 7

- Children recognize different types of environment (sea, land) and the key differences between them.
- Children identify the main characteristics of animals and plants and reconstruct some simple food chains.
- Children understand that the animals and plants depend on their environment to meet their basic needs.
- Children understand that men are part of nature and depend on environment to meet their basic needs.
- Children understand changes in the local environment that take place during daily and seasonal cycles.
- Children understand how these changes affect the behaviour of living organisms.

3.2 GROUP 2 – aged 8 to 10

- Children clearly demonstrate that they can identify different types of ecosystems at the local level and classify some key plants and animal species into these ecosystems.
- Children clearly demonstrate their knowledge of the basic biological characteristics of certain species: e.g. daily cycles, seasonal cycles (including migrations) and the life cycle.
- Children clearly demonstrate that they can identify the similarities and differences between various animal species as well as their adjustments to various environmental conditions.
- Children recognize endangered and rare species on a local level.
- Children clearly demonstrate that they are able to distinguish certain simple food chains in the environments they have studied on field trips.
- Children can define the interactions within and between different ecosystems, in particular through the concept of nature's cycles.
- Children can demonstrate knowledge about valuable water ecosystems.
- Children demonstrate the ability to recognize some of the interactions between the biotic and abiotic components in the ecosystems visited.
- Children clearly demonstrate their knowledge of the impact of certain human activities on the local environment and wildlife.
- Children recognize some mechanisms of maintaining a balance in nature.
- Children demonstrate the ability to recognize some ecosystem services.
- Children can recognize the value of some specific ecosystem services for our everyday life, such as: recognize the importance of pollination and how it works (knowing some important pollinators), understands soil formation and nutrient supply, gain insight into the concept of decomposition and soil's importance in producing food.
- Children can increase awareness of our large-scale impact on planet earth.
- Children demonstrate the ability to understand how a community is dependent on ecosystem services.

3.3 GROUP 3 – aged 11 to 14

- Children clearly demonstrate their knowledge of habitats and associations at the local level and determine the factors of integration with the ecosystem.
- Children clearly demonstrate that they know certain interrelations between biotic and abiotic factors in the environments they studied on field trips.
- Analyses the anthropogenic influence on the dynamic balance in nature and discussed about the ways of preventing and/or rehabilitation of pollution.
- Children clearly demonstrate that they know certain load factors associated with human activities in ecosystems and how these affect the conservation of the habitats, species occurrence, and man.
- Children clearly demonstrate that they have understood the concept of habitat and species and identify and recognize certain animal and plant species of European importance that occur in the area.
- Children clearly demonstrate that they are familiar with the concepts of biodiversity and Natura 2000.
- Children clearly demonstrate that they know the Natura 2000 network and its habitat and species protection system.
- Children clearly demonstrate the ability to recognize different ecosystem services and categorize them:
    - Supporting services (photosynthesis, nutrition in nature, soil formation, water cycle, habitats for different species, biodiversity);
    - Provisionary services (drinking water, food, fuel, medicine and health resources, raw materials);
    - Regulatory services (erosion prevention, water purification, carbon storage, protection against diseases, pests and natural disasters, better climate, air purification, pollination);

- Cultural services (beauty and spiritual values, outdoors and tourism, nature inspires and provides knowledge, health and relaxation).

- Children clearly demonstrate the ability to recognize the value of some specific ecosystem services for our everyday life:
  - recognize the importance of pollination and how it works (knowing some important pollinators);
  - understand soil formation and nutrient supply, gain insight into the concept of decomposition and soil's importance in producing food;
  - recognize the importance of sustainable fishing;
  - feel what nature provides us for the soul and to discover cultural and spiritual dimensions of nature (the cultural ecosystem services);
  - gain insight about different ecosystems' purification abilities and the importance of planning wisely for good water quality.
- Children clearly demonstrate increased knowledge about valuable water ecosystems.
- Children can understand the similarities and differences in different habitats and landscapes, linking the concept of ecosystem services with the landscape and to begin realizing how the planning of communities affects the landscape's ability to deliver ecosystem services (sustainable development).
- Children can understand how the ability of ecosystems to provide us services is affected by how we affect nature.
- Children clearly demonstrate increased awareness of our large-scale impact on our earth and the concept of ecological footprints.
- Children clearly demonstrate the understanding our impact on the Earth's environment and natural resources by knowing the concept of ecological footprints

4. CEP METHODOLOGY

The educational interventions of the IMPRECO Common Educational Programme are divided into introductory/preparatory meetings with teachers, classrooms lectures, and field trips to protected areas.

4.1 Introductory/preparatory meetings with teachers

The aim of a preparatory meetings with teachers is to exchange opinions about the content of teaching proposals, test the background knowledge of pupils, and give recommendations to teachers about the teaching methods. As preparation for the learning activities, it should also be checked whether the pupils have already studied the following topics:

- species
- habitat
- ecosystems
- life cycle
- food chain/web
- Natura 2000 network
- ecological footprint
- ecosystem services
- sustainable development

Finally, the meetings with teachers are an opportunity to collect the prior information needed to perform monitoring of expected outcomes through the use of IMPRECO Common Educational Programme.

4.2 Classroom lectures

The learning process starts in the classroom by improving the pupils' background knowledge for efficient field trips:

- about animals, plants and habitats which are easiest to spot and which will be pointed out to pupils during field trips,
- about links between biotic and abiotic factors in the environments they will explore during field trips,
- about various ecosystem services (supporting, provisioning, regulatory, cultural),
- about Natura 2000 network and its habitat and species protection system.

They give also the chance to explain pupils what to wear and what to take on a field trip (binoculars, cameras, observation notebook, identification keys).

The teaching methodology used depends on the age of the pupils and the pre-set objectives, which are the basis for the preparation and execution of classroom lectures. Teaching tools are needed for the introductory meeting and field trip preparation:

- slide presentations with photographs and video clips are used to illustrate various aspects of the local areas, involved in the IMPRECO project which pupils will see and study in detail on site;
- Kahoot quiz and, for age group 1, storytelling and educational games;
- For age group 3, web interactive habitats map will be used for better understand the distribution of ecosystems and habitats related at local, national and transnational scale, highlighting the net of protected areas involved in IMPRECO project, with their similarities and differences.

The main focus of the classroom lectures is on ecosystem services, and the message will be that ecosystem and biodiversity provide services to humans which are often not visible to the naked eye and why is so important to use them wisely, with knowledge and respect. Services may consist of insect pollination of crops and orchards, water in sandy ridges or storage of carbon in green plants. We humans are both affected by and affect ecosystems. A negative effect occurs through over-use and extensive changes in the use of land and water. Emissions of pollutants, fertilizers, climate change, acidification, introduction of alien species, and a growing population's needs means, that we

are approaching the limits of what the ecosystem can deliver. The language and didactic tools used will be adjusted in relation to the pre requisites and the age group.

4.3 Field trip

A field trip is the main and most important activity of the Common Educational Programme. Young generations have less and less practical experience. This can have a negative effect on their understanding of the human presence and position on Earth and the destructive relationship humans have with the environment in which we live. A hands-on experience is deeply imprinted on each child's mind and imagination. Therefore, the main aim of the field trip must be to stimulate the pupils' interest in nature and understand the complex relationship between species, habitats and ecosystems. The field trip is designed to help children acquire nature science knowledge and practical experience in the field, which may arouse their curiosity and enthusiasm that are the key ingredients of a successful learning process. It is important, however, that in teaching children about nature we do not neglect the emotions of young learners and their senses. The underlying principle of any field trip proposal should be that we learn faster if something is interesting to us and we are more likely to respect things which we hold dear. This approach, in particular with Groups 1, must be play-based (playing is an integral part of children's life) in order to encourage the pupils' emotional interest in the environment where they live – they need to develop an eye for beauty. We propose that the storytelling that began in the classroom is continued in the field: the primary characters of the story - the animal and children - should take the lead in exploring the reserve. The most frequently observed and popular animal species come to life and are given human qualities. The fairy tale can be acted out, and children are encouraged to imitate the sound or movements of the observed species. For older children in Groups 2 and 3, the nature walk takes three hours and includes a description of environmental characteristics of the protected area, the animal species present, and the rules of conduct, applicable to the protected area. Different topics can be covered, leaving sufficient space for later detailed coverage of certain topics: characteristics of different types of ecosystems in the coastal and marine part of the protected area, animal and plant target species, human impacts, ecosystem

services, protected areas and Natura 2000 network and sustainable development. Priority should be given to observation activities. Children are given observation notebooks which will help them with their observation tasks. During the field trip practical cases should be discussed to encourage children to use the information they have already received (in the classroom).

5. EDUCATIONAL TOOLS

With a view to facilitate the achievement of pre-set objectives and ensure more efficient implementation of learning activities we recommend educators to use certain tools that will help the pupils prepare for the field trips, take notes, and perform observation tasks more effectively, while they will also provide teachers with a testing tool. Pupils can take some of the tools home with them as something that will remind them of the experience and assist them with learning and raising the nature conservation and environmental awareness in their families. The Natura 2000 logo is to be used on all materials prepared in the course of the project. The aim of the logo is to present Natura 2000 sites and inform the general public about the Natura 2000 programme. Wherever possible, the logo should be accompanied with the following text: “Natura 2000 - Europe's nature for you. This site is part of the European Natura 2000 Network”. It has been designated because it hosts some of Europe's most threatened species and habitats. All 27 countries of the EU are working together through the Natura 2000 network to safeguard Europe's rich and diverse natural heritage for the benefit of all.

5.1 GROUP 1 – aged 6 to 7

Introductory/preparatory meetings with teachers

- Slide presentations with photographs and video clips for illustrating various aspects of the protected and local areas involved in the project IMPRECO which pupils will then see and study in detail on site (field trip).

Classroom lectures

- A colouring book with different animal and plant species and the hero of the fairy tale (storytelling), to help children remember what they have seen and help them bring back home something, they did on the field trip and to help them “create” a species they had observed and heard stories about.

- Food web cards represented components of the food web that will be used in educational games.
- Slide presentation and other audio-visual material selected by the Protected Areas staff (audio tracks of bird's sound, videos, photos, guidebooks and handouts, equipment to perform simple experiments already available).

Field trip

- Laminated teaching materials (handouts) containing drawings of plants and animals involved in ecosystem services that are easiest to observe.
- Use of various instruments such as nets, magnifying glasses, tweezers, glass containers, simple dichotomous key, binoculars already available.

5.2 GROUP 2 – aged 8 to 10

Introductory/preparatory meetings with teachers

- Slide presentations with photographs and video clips for illustrating various aspects of the protected and local areas involved in the project IMPRECO which pupils will then see and study in detail on site (field trip).

Classroom lectures

- Observation notebook - a notebook with pre-field trip activities, charts to fill with facts about observed species and ecosystem services, and 'test your knowledge' tasks.
- Kahoot quiz.
- Educational games.
- Food web cards represented biotic and abiotic components of the food web that will be used in educational games i.e. 'Modelling a food web'.

- Slide presentations and other audio-visual material selected by the Protected Areas staff (audio tracks of bird's sound, videos, photos, guidebooks and handouts, equipment to perform experiments already available).

Field trip

- Laminated teaching materials (handouts) containing drawings of plants and animals involved in ecosystem services that are easiest to observe.
- Species identification key.
- Reserve guide-book.
- Binoculars.
- Telescope (Škocjanski zatok Nature Reserve) which will offer schoolchildren an excellent experience while learning about nature, plants, animals and last, but not least, ecosystem services. It is also an equipment for monitoring and can be used by researchers.
- Use of various instruments such as nets, magnifying glasses, tweezers, glass containers, simple dichotomous key, binoculars already available.

5.3 GROUP 3 – aged 11 to 14

Introductory/preparatory meetings with teachers

- Slide presentations with photographs and video clips for illustrating various aspects of the protected and local areas involved in the project IMPRECO which pupils will then see and study in detail on site (field trip).

Classroom lectures

- Observation notebook - a notebook with pre-field trip activities, charts to fill with facts about observed species and ecosystem services, and 'test your knowledge' tasks.
- Kahoot quiz.

- Educational games and exercises/tasks.
- Food web cards represented biotic and abiotic components of the food web and will be used in educational games i.e. “Disrupting an ecosystem”.
- Slide presentations and other audio-visual material selected by the Protected Areas staff (audio tracks of bird’s sound, videos, photos, guidebooks and handouts, equipment to perform experiments already available).

Field trip

- Laminated teaching materials (handouts) containing drawings of plants and animals involved in ecosystem services that are easiest to observe.
- Species identification key.
- Reserve guide-book.
- Binoculars.
- Cameras.
- Telescope (Škocjanski zatok Nature Reserve) which will offer schoolchildren an excellent experience while learning about nature, plants, animals and last, but not least, ecosystem services. It is also an equipment for monitoring and can be used by researchers.
- Web interactive habitats map (will be used to better understand the distribution of ecosystems and habitats related at local, national and transnational scale, highlighting the net of protected areas involved in project IMPRECO, with their similarities and differences)
- Use of various instruments such as nets, magnifying glasses, tweezers, glass containers, simple dichotomous key, binoculars already available.

6. EDUCATIONAL ACTIVITIES

6.1 GROUP 1 – aged 6 to 7

Expected learning outcomes

- Recognize different types of environment (sea, land) and the key differences between them.
- Identify the main characteristics of animals and plants and reconstruct some simple food chains.
- Understand that the animals and plants depend on their environment to meet their basic needs.
- Understand that men are part of nature and depend on environment to meet their basic needs.
- Understand changes in the local environment that take place during daily and seasonal cycles.
- Understand how these changes affect the behaviour of living organisms.

In the classroom:

1. In the classroom explain to the children the meaning of the basic terms such as: the organism, species, habitat, ecosystem, food chain. Then demonstrate the ways these organisms are connected with their environment, how changes in the environment can affect the organisms, and how organisms can adjust to change.
2. Pupils will be creating an ecosystem model, which will include both abiotic (sun, wind, rain) and biotic (animals, plants) components. Food web cards represent the biotic and abiotic components of the food web can be used. Pupils pick up the cards and stand in a circle. Then they can pass the ball of yarn to any pupil who has a card that is connected to their own in an ecosystem. Plucking a string in the middle of the web or dropping the end of a string demonstrates the connection of all different components; when you disturb one, it affects all the others in the system.
3. Bring up in the discussion about whether nature is good for us humans and in which ways to develop insights and knowledge about nature's values and ecosystem services (use memory game about ecosystem services or Kahoot quiz).
4. Briefly explain the role of Natura 2000 network, in particular the differences between protective regimes proposed by Natura 2000 and the protective regimes in national parks and nature reserves.
5. Present the protected area which pupils will visit through habitats and the organisms living there. Use slides, computer presentations, photographs and video clips.
6. Briefly describe the geographical characteristics and various aspects of nature and environment protection. Use slides, computer presentations, photographs and video clips.
7. Explain to the pupils the rules of behaviour and the clothes to wear on the field trip. Encourage them to think about the human role in the natural environment and its potential or actual consequences.
8. Briefly mention the load factors in the area and their impact on the environment (use pictures and case studies, for example: unplanned urbanization, intensive agriculture, soil degradation, exploitation of natural resources, discontinuation of traditional farming practices, waste production and pollution, light and noise pollution, overfishing,

destruction of seagrasses habitats by anchoring due to the unsustainable development of nautical tourism).

9. Use game THE STRUGGLE FOR FISH to highlight the complex relationship that exists in the management of fish stocks in a sea, being aware of global resources, to consider and discuss sustainable fishing and discuss solutions for resource management also in other contexts.

During the field trip:

1. Before the visit, present the concepts you have already explained in the classroom, in particular the characteristics of the environment in which they are located, the species present in the area, and the rules of behaviour they need to respect.
2. Present the route the group will take and the natural characteristics through the use of information boards. Give a few tips for observing the animals along the way. Use reserve guide-book.
3. Make sure the group is evenly distributed along the trail, so that they can observe the maximum number of species. Help your pupils with the identification of species and recognition of their several main characteristics. Mention how these identified characteristics help the species adjust to the environment. Encourage learners to try to understand and learn more about the concept of habitats. Use laminated teaching materials, species identification key or simple dichotomous key, magnifying glasses and binoculars.
4. Make it possible for them to observe different habitats along the way. With their questions and sub-questions guides motivate pupils to observe and describe habitats and their characteristics. Through various cases, the guides explain that habitats are places where species can find food, water, shelter and breeding grounds. Then the guides explain certain food chains and stress the importance of habitat rejuvenation and conservation for increased biodiversity, e.g. seagrasses (high production, oxygenation of coastal waters and source of food for many species, nursery areas for fish and invertebrates).
5. Once the concept of habitats is clearly explained, you can explain the role of certain habitats for the development of the offspring, and state a few differences to identify the young and adult specimens in nature.

6. In connection with what has been earlier explained, relate to the protection of habitats and the role of protected areas and explain in what way the area, that you have visited and is part of Natura 2000 site, can contribute to the conservation and protection of nature. The following concepts must be explained:
    a. The operation of Natura 2000 network and coordination of efforts to protect biodiversity in different countries.
    b. Natura 2000 is not a limitation, but a development opportunity.
    c. Restoration and rehabilitation of depleted or even disappearing environments is much more expensive and takes more effort than conservation of existing ecosystems.
7. Explain to the pupils the role of ecosystem services for sustainable growth, which is essential in the implementation of the sustainable development of these areas, they share the responsibility to prevent this from happening in the future. New knowledge and valid information will help successfully conserve the high rate of biodiversity in these areas and the overall conservation of ecosystems.

Follow-up (after the visit - Young sentinels for biodiversity and ecosystem services):

1. The pupils are invited to do research on the topics covered, thus integrating what was learned during the educational path, and then to prepare a summary (theme, billboard, web page, etc). We try to motivate them so that they can reflect on their active contribution to the protection of species and nature in general.

6.2 GROUP 2 – aged 8 to 10

Expected learning outcomes

- Demonstrate the ability to identify different types of ecosystems at the local level and classify some key plants and animal species into such ecosystems.
- Demonstrate knowledge of the basic biological characteristics of certain species: e.g. daily cycles, seasonal cycles (including migrations) and the life cycle.

- Demonstrate the ability to identify the similarities and differences between various animal species as well as their adjustments to various environmental conditions.
- Recognize endangered and rare species on a local level.
- Demonstrate the ability to distinguish certain simple food chains in the environments studied on field trips.
- Demonstrate the ability to recognize some of the interactions within and between different ecosystems, in particular through the concept of nature's cycles.
- Demonstrate the ability to recognize some valuable water ecosystems.
- Demonstrate the ability to recognize some of the interactions between the biotic and abiotic components in the ecosystems visited.
- Demonstrate the ability to identify the impact of certain human activities on the local environment and wildlife.
- Recognize some mechanisms of maintaining a balance in nature.
- Demonstrate the ability to recognize some ecosystem services.
- Demonstrate the ability to recognize the value of some specific ecosystem services for everyday life, such as: recognize the importance of pollination and how it works (knowing some important pollinators), understands soil formation and nutrient supply, gain insight into the concept of decomposition and soil's importance in producing food.
- Demonstrate increased awareness of human large-scale impact on planet earth.
- Demonstrate the ability to understand how a community is dependent on ecosystem services.

In the classroom:

1. To carry out a survey with the young people on the knowledge prerequisite compared to the concepts of biodiversity and Natura 2000 network; invite the pupils to explain their role in protecting the areas in questions and the contribution they can make for effective environmental protection.

2. To provide information on Natura 2000 network and in particular on the differences between the principles of protection, provided by Natura 2000 compared to national parks and nature reserves.
3. Describe the protected area that they will visit from the point of view of the ecosystems, habitats and species present, with particular regard to the species of Community interest (to do these, charts to fill with facts about observed species, 'test your knowledge' task, slides, photos and videos can be used).
4. Describe the context in which they are located from the geographical point of view and the protection of natural areas (to do this, slides with maps and photos can be used).
5. To illustrate the rules of behaviour and clothes to wear during field visits, try to link these topics to reflect on the role of man in the natural environment and how this role can have consequences on a large-scale, in order to boy towards an awareness of their actions (to do this, notebook with pre-field trip activities can be used).
6. Describe the pressure factors that exist in the area and the way in which they interact with the environment (use of images and examples: unplanned urbanization, intensive farming, land degradation, exploitation of natural resources, abandoning of traditional land use, waste production and pollution, light and noise pollution), starting from these elements, some good practices for environmental conservation can be introduced (examples: pollution reduction, reduction and recycling of waste, production and consumption of food, short food supply chains, production and consumption of energy, destruction of seagrasses habitats by anchoring due to the unsustainable development of nautical tourism).
7. Bring up in the discussion about whether nature is good for us humans and in which ways to develop insights and knowledge about nature's values and ecosystem services (use memory game about various ecosystem services: supporting, provisionary, regulatory and cultural, based on the E-cards, or Kahoot quiz).
8. Link our impact on the Earth's environment and natal resources by explaining the concept of ecological footprints. Demonstrate how to calculate this and to become aware of

different people having different sizes of footprints. www.wwf.se/vrt-arbete/ekologiskafotavtryck/1127697-ekologiska-fotavtryck

During the field trip:

1. Explain the concepts already expressed in the classroom and in particular the characteristics of the environment in which they are about to visit, the species present in the site and the code of conduct to be respected during the visit.
2. Introduce the path that the group will carry out and its characteristics from a naturalistic point of view using for example, the didactic and interpretative panels; also provide some guidance on how to observe animals along the way.
3. Move the group along a path to allow observing the largest number of species; guide the pupils in identifying the species and recognizing some of their main characteristics; highlight how the characteristics identified allow adaptation to the environment around them; to define the concept of habitat. Use laminated teaching materials, species identification key or simple dichotomous key, magnifying glasses, binoculars and telescope.
4. Allow the observation of different habitats along the way. The guides describe the habitats and their characteristics by trying to make it clear with examples that the habitat is a place where the species can find food, water, shelter and sites for breeding. As a result, guides introduce some hints on food chains and how important it is to work on restoration or conservation of habitats to increase biodiversity.
5. Starting from the concept of habitat it is possible to explain the role of species in the diurnal cycle of the seasons and of life; the discussion must be focused on services provided by e.g. seagrasses (high production, oxygenation of coastal waters and source of food for many species, nursery areas for fish and invertebrates).
6. Reconnecting, therefore, to the protection of habitats and the role of protected areas compared to what was previously explained, we can explain the contribution offered by the site in question to the Natura 2000 network. It is important to transmit the following concepts:

a. Networking and the importance of involving and coordinating efforts to protect biodiversity in different countries.
b. Natura 2000 is not a limit but an opportunity for development.
c. Restoring and recovering depleted or even missing environments is much more expensive and tiring than keeping existing ones; explain that young people have the responsibility to prevent this from happening in the future.

7. Explain to the pupils the role of ecosystem services for sustainable growth, which is essential in the implementation of the sustainable development of these areas, they share the responsibility to prevent this from happening in the future. New knowledge and valid information will help successfully conserve the high rate of biodiversity in these areas and the overall conservation of ecosystems.

Follow-up (after the visit - Young sentinels for biodiversity and ecosystem services)

1. The pupils are invited to do research on the topics covered, thus integrating what was learned during the educational path, and then to prepare a summary (theme, billboard, web page, etc). We try to motivate them so that they can reflect on their active contribution to the protection of species and nature in general.

6.3 GROUP 3 – aged 11 to 14

Expected learning outcomes

- Demonstrate knowledge about habitats and associations at the local level and determine the factors of integration with the ecosystem.
- Demonstrate knowledge about certain interrelations between biotic and abiotic factors in the environments they studied on field trips.
- Demonstrate the ability to analyse the anthropogenic influence on the dynamic balance in nature and to discuss about the ways of preventing and/or rehabilitation of pollution.
- Demonstrate knowledge about certain load factors associated with human activities in ecosystems and how these affect the conservation of the habitats, species occurrence, and man.

- Demonstrate the ability to understand the concept of habitat and species and to identify and recognize certain animal and plant species of European importance that occur in the area.
- Demonstrate increased familiarity with the concepts of biodiversity and Natura 2000, as well as Natura 2000 network and its habitat and species protection system.
- Demonstrate the ability to recognize different ecosystem services and categorize them:
    - Supporting services
    - Provisioning services
    - Regulation services
    - Cultural services
- Demonstrate the ability to recognize the value of some specific ecosystem services for our everyday life:
    - recognize the importance of pollination and how it works (knowing some important pollinators)
    - understand soil formation and nutrient supply, gain insight into the concept of decomposition and soil's importance in producing food;
    - recognize the importance of sustainable fishing;
    - feel what nature provides us for the soul and to discover cultural and spiritual dimensions of nature;
    - gain insight about different ecosystems' purification abilities and the importance of planning wisely for good water quality.
- Demonstrate increased knowledge about valuable water ecosystems.
- Demonstrate the ability to understand the similarities and differences in different habitats and landscapes, linking the concept of ecosystem services with the landscape and to begin realizing how the planning of communities affects the landscape's ability to deliver ecosystem services (sustainable development).
- Demonstrate the knowledge of understanding how the ability of ecosystems with providing us services is affected by how we affect nature.

- Demonstrate increased awareness and knowledge about sustainable human activities, such as the prevention or rehabilitation of pollution, in order to preserve the landscape's ability to deliver ecosystem services.
- Demonstrate increased awareness of human large-scale impact on our earth and the concept of ecological footprints.
- Demonstrate the understanding our impact on the Earth's environment and natural resources by knowing the concept of ecological footprints.

In the classroom:

1. To carry out a survey with the young people on the knowledge prerequisite compared to the concepts of biodiversity and Natura 2000 network; invite the pupils to explain their role in protecting the areas in question and the contribution they can make for effective environmental protection.
2. To provide information on Natura 2000 network and in particular on the differences between the principles of protection, provided by Natura 2000 compared to national parks nature reserves.
3. Describe the protected area that they will visit from the point of view of the ecosystems, habitats and species present, with particular regard to the species of Community interest (to do these, charts to fill with facts about observed species, "test your knowledge" task, slides, photos and videos can be used).
4. Describe the context in which they are located from the geographical point of view and the protection of natural areas (to do this, slides with maps and photos can be used).
5. To illustrate the rules of behaviour and clothes to wear during field visits, try to link these topics to reflect on the role of man in the natural environment and how this role can have consequences on a large scale, in order to boy towards an awareness of their actions (to do this, notebook with pre-field trip activities can be used).
6. Describe the pressure factors that exist in the area and the way in which they interact with the environment (use of images and examples: unplanned urbanization, intensive farming, land degradation, exploitation of natural resources, abandoning of traditional land use,

waste production and pollution, light and noise pollution), starting from these elements, some good practices for environmental conservation can be introduced (examples: pollution reduction, reduction and recycling of waste, production and consumption of food, short food supply chains, production and consumption of energy, destruction of seagrasses habitats by anchoring due to the unsustainable development of nautical tourism).

7. Bring up in the discussion about whether nature is good for us humans and in which ways to develop insights and knowledge about nature's values and ecosystem services (use memory game about various ecosystem services supporting, provisionary, regulatory and cultural based on the E-cards, or Kahoot quiz).
8. Link our impact on the Earth's environment and natal resources by explaining the concept of ecological footprints. Demonstrate how to calculate this and to become aware of different people having different sizes of footprints. www.wwf.se/vrt-arbete/ekologiskafotavtryck/1127697-ekologiska-fotavtryck

During the field trip:

1. Explain the concepts already expressed in the classroom and in particular the characteristics of the environment in which they are about to visit, the species present in the site and the code of conduct to be respected during the visit.
2. Introduce the path that the group will carry out and its characteristics from a naturalistic point of view using for example, the didactic and interpretative panels; also provide some guidance on how to observe animals along the way.
3. Move the group along a path to allow observing the largest number of species; guide the pupils in identifying the species and recognizing some of their main characteristics; highlight how the characteristics identified allow adaptation to the environment around them; to define the concept of habitat. Use laminated teaching materials, species identification key or simple dichotomous key, magnifying glasses, binoculars and telescopes.
4. Allow the observation of different habitats along the way. The guides describe the habitats and their characteristics by trying to make it clear with examples that the habitat is a place

where the species can find food, water, shelter and sites for breeding. As a result, guides introduce some hints on food chains and how important it is to work on restoration or conservation of habitats to increase biodiversity.

5. Starting from the concept of habitat it is possible to explain the role of species in the diurnal cycle of the seasons and of life; the discussion must be focused on services provided by e.g. seagrasses (high production, oxygenation of coastal waters and source of food for many species, nursery areas for fish and invertebrates).
6. Reconnecting, therefore, to the protection of habitats and the role of protected areas compared to what was previously explained, we can explain the contribution offered by the site in question to the Natura 2000 network. It is important to transmit the following concepts:
    a. Networking and the importance of involving and coordinating efforts to protect biodiversity in different countries.
    b. Natura 2000 is not a limit but an opportunity for development.
    c. Restoring and recovering depleted or even missing environments is much more expensive and tiring than keeping existing ones; explain that young people have the responsibility to prevent this from happening in the future.
7. Explain to the pupils the role of ecosystem services for sustainable growth, which is essential in the implementation of the sustainable development of these areas, they share the responsibility to prevent this from happening in the future. New knowledge and valid information will help successfully conserve the high rate of biodiversity in these areas and the overall conservation of ecosystems.

Follow-up (after the visit - Young sentinels for biodiversity and ecosystem services)

1. The pupils are invited to do research on the topics covered, thus integrating what was learned during the educational path, and then to prepare a summary (theme, billboard, web page, etc). We try to motivate them so that they can reflect on their active contribution to the protection of species and nature in general.

6.4 Examples

Source - © Chicago Botanic Garden - http://www.paconserve.org/151/energy-flow-where-does-it-go (Western Pennsylvania Conservancy provides good information on energy flow through and ecosystem)

Name of the Activity – *NATURE WALK & ECOSYSTEM INTRODUCTION*

Description:

- **Pre-Activity Preparation**
  - Print out the food web cards and review the activity. Cards represent biotic and abiotic components of the food web. There are six shape-coded sets of five cards each. Each set consists of components that make a simple food web. Students will form groups based on these shapes in the second part of the activity.
  - One card from each of the set has an X in the upper right-hand corner. This card represents an ecosystem element that will be "disturbed" in part 2 of the activity. If you have access to a colour printer and laminator, you may want to print out the cards and laminate them. This creates a set that can be used multiple times.
- **Part 1: Nature Walk** - Students take a walk-through nature, make observations of their surroundings, and learn or review what a food chain is and how it functions in an ecosystem.
  - Walk with students or sit down in the most "natural" spot available. Somewhere with sunlight, plants, etc. If possible, have students spread out a little to have their own space.
  - Have students write down one observation using multiple senses. Ask them to record at least one thing they see, hear, smell, and can touch. This is just to get them observing and becoming aware of some of the processes going on around them. Take a few student responses.
  - Some of the observations should involve plants and animals. If they do not, ask students whether they observed any natural things around them. Maybe a student saw a bird, bee, some grass, or heard the wind blowing through the trees. If no animals were observed or happen to show themselves during this part of the activity,

just pick an animal that could be seen. If a bird were spotted for example, ask the students, "What does that robin over on the lawn need to survive?' Students may say things like: air, food, or water.

- Then tell the students, "Yes. All living things need energy and the robin gets energy from its food. What kind of things does a robin eat?" Likely responses would be worms or bugs.
- Next, ask students where the bugs and worms get their energy. They may not really know that worms and many of these insects get their energy from plant material. Worms feed on decaying plant material in the soil, for example. You may have to lead them there. They don't realize yet that you are having them build a food chain from the top down.
- Once you have arrived at plants in your food chain, you can ask, "How do plants get their energy?" You may hear answers such as water, plant food, or the sun. Explain to the students that sunlight is the original source of energy for all living things on our planet. The sun provides energy for the plants and the plants provide energy either directly or indirectly for everything else. Ask them what this process is called. This is called food chain. Have them record this term below their observations.
- Have students skip down a few inches in their notebook and draw a sun. Then have them draw an arrow going from the sun up to a plant or flower. They can draw the plant of their choice or sketch something nearby that they can actually see. Then another arrow up to a bug or earthworm. Finally, another arrow up to the robin. You can adapt this process to your particular situation and whichever organisms the students observe. It might be:

  Sun -> grass -> rabbit, or sun ->flower nectar -> butterfly, etc.
- Review the roles that each organism plays in this chain. Indicate which are producers, primary consumers, and secondary consumers.

- **Part 2: Building an Ecosystem Model** - This activity can be used as either an introduction to food webs or as a culminating activity for the food chain. (Students will actually be creating an ecosystem model, which is a bit more complex than a food web—as their model will include both abiotic (sun, wind, rain) and biotic (animals, plants) components, while a food web typically contains only biotic components. This activity is designed to provide both visual and tactile demonstrations of the interconnectedness of all components of an ecosystem, and that they are dependent on each other for survival.

  (1) **Modelling a food web**

  1a. Introduce the activity by asking students to list some of the things they observed in their walk outside; make notes on the board. Ask students:

  • How all of these different things are connected to each other?

  • How do they interact with each other?

  • How do they depend on each other?

  Today they are going to explore in a little more detail the connections in a regional ecosystem.

  1b. Pass a picture card out to each student.

  1c. Have students stand in a circle either in the classroom, or outside. Explain to the students that they are going to create an ecosystem. Students can pass the ball of yarn to any student who has a card that is connected to their own in an ecosystem. For example:

  • Student 1 – I have a bird, and I will pass the yarn to Student 2 because s/he has a tree and some birds eat nuts.

  • Student 2 – I have a tree, and I will pass the yarn to Student 3 because s/he has water and trees need water to grow.

  • Student 3 – I have water, and I will pass the yarn to Student 4, because s/he is a fish that swims in water.

  • Student 4 – I have a fish, and I will pass the yarn to Student 5 because….

1d. Have the first student hold onto the loose end of the string and pass it on to the next student. Every time the yarn is passed, the student should hold onto their piece of yarn. As students pass the ball back and forth, they will create a web between them.

1e. When all of the students are holding one part of the web, have them close their eyes.

1f. Pluck a string in the middle of the web, and ask students to raise their hands if they felt the tug. Most, if not all students will feel the tug. Have them open their eyes, and look to see how many students have their hand up. Explain that this is because everything in an ecosystem is connected.

1g. Mention to students that an ecosystem contains both living (biotic) and non-living (abiotic) things that interact. Ask students to raise their hand if their card is an abiotic factor of an ecosystem, and then if their card is a biotic factor.

1h. Next, have one student drop his or her string—ask students what happened to the web they created.

1i. Explain that the web they just made is like a natural ecosystem. All the different components are connected and when you disturb one, it affects all the others in the system.

(2) Disrupting an ecosystem

2a. Have students break into groups of nine students, each based on the shape on their card.

2b. Have students first create a diagram of the ecosystem that includes all nine cards. They should indicate producers, primary and secondary consumers, and any abiotic factors (sun, water) and the relationships between them. Students should draw their ecosystem diagram either in their journal or on a piece of paper.

2c. One of the cards will have an X in the corner. The card with the X is the component of the ecosystem that has been "disturbed."

2d. Once they have completed their diagram, have them remove the card with the X and discuss and write down the potential impacts on the ecosystem if the X is taken away. Have students use the following questions as prompts. They should write their answers in their journals.

• Label each organism as a producer, primary consumer, or secondary consumer. Do not label abiotic factors.

• Is the organism you removed a producer, or a primary or secondary consumer?

• List the other organisms that are directly dependent on the one you removed.

i. Write a sentence describing how each organism depends on the organism you removed.

ii. Write a sentence describing what will happen to each organism without the organism you removed. (For example, if it is a food source, are there other food sources available? If not, what will happen?)

• How does the removal of that organism affect other organisms that are not directly dependent on it? List all the secondary impacts you can think of.

• Explain how the removal of one organism from an ecosystem can impact the whole ecosystem using yours as an example. Make sure you describe how all the organisms in your ecosystem are impacted.

2e. This can be done entirely in class or completed as an individual homework assignment. If this is done as homework, have students answer the prompt questions in their journal.

2f. Conclude the activity with a discussion of what happened when the ecosystem was disrupted. What are the consequences for the ecosystem when one component is removed?

(3) Ecosystem Model Grading Rubric

3a. In their model and description students should:

• Identify each organism correctly as a producer, consumer, or secondary consumer

• Identify the direct impacts of removal of the assigned organism

• Identify secondary impacts of the removal of the assigned organism

• Explain how an ecosystem functions as a system, with all organisms linked together, directly and/or indirectly.

(4) Extensions:

• In groups or individually, students can draw food webs or ecosystem models of organisms from different habitats, for instance: prairie, pond, forest, desert. Students can then label producers and primary and secondary consumers. They can compare diagrams across different habitat types, and show that these roles are common to different ecosystems.

• To continue the idea of ecosystem disruption, students can research a specific disruption to their habitat types (for example: deforestation in forest habitats, eutrophication in ponds) and show how the effects of this disruption are felt among different interconnecting organisms in that habitat.

• You may wish to draw the distinctions between energy and nutrients in an ecosystem. Energy flows in one direction through an ecosystem, while nutrients cycle through an ecosystem.

Source - © Text 2013 WWF - Published: 2013 av WWF Sweden

Name of the Activity - NATURE'S INTIMATE MOMENTS - ABOUT POLLINATION

Objectives of the work: Increasing knowledge about ecosystem service pollination and how to protect it.

Purpose: To understand the importance of pollination and how it works, to know some important pollinators, to know how to help, protect and enhance pollinators in our surroundings by building a nest, and to know how, in other ways, to support these natural heroes and a rich variety of plants that can feed them.

Description: Pollination is one of the most visible and distinct ecosystem services. It is an important part of generating our food. It has a great economic value for those who produce food, for example, growers of apples and producers of honey. Pollination is a sexual reproduction of plants that is not entirely unlike humans which also gives the pollinators – bumblebees, bees and many others - food for both themselves and to feed their "babies", the larvae. This is an exciting and beautiful phenomenon in our rich nature

Workflow: There are three tasks of varying difficulty and scope presented here. One tip is to start with the first one as an orientation exercise, and then follow with one of the more extensive, practical proposals.

- **Task 1: Locate pollinators** - Go out with cans and nets and try to find some pollinators such as bees. Study a few of these insects closely. How do they manage to spread the pollen from one flower to another? Also look at some flowers. Look for stamens and pistils. Is there any pollen? How does a conception take place? Make a ”pin-image” of a pollinator e.g. by magnifying an insect and try to recreate it using natural objects
- **Task 2: Be a pollinator** - A bumblebee is attracted to a flower because it is colourful and hides sweet nectar. When the insect flies around the flower, pollen sticks to the bumblebee’s body. Try to illustrate this as a little drama sketch.
- **Task 3: What is pollination?** - Describe by writing, drawing or painting a chain of connections - how pollination is an important ecosystem service. Start with one of these characters:
    - A blooming plant
    - An apple trees
    - A bird eating seeds
    - A deer that enters a yard
    - A teenage girl or boy
    - A farmer who cultivates clovers and rapeseed
    - A grandfather/grandmother who grow apples in the yard
    - A man or woman who sells honey and marmalade at the square

  These words may be included in the description: *Pollen, Seeds/Fruit, Income, Bees/Bumblebees, Honey, Plant (or name of plant), Ecosystems, Biodiversity, Spring, Summer, Autumn, Ecosystem Services*
- **Task 4: Learn more about bees!** - Interview a beekeeper about bees and pollination, how do they get bees to thrive and how do they make sure they have food all year round? Firstly, write down the questions you want answers to.

- **Task 5: Put a sting in the schoolyard!** - Building nests of wild bees and bumblebees will help you get more pollinators. They do not compete much with the ”tame” bees that live in hives and they can withstand the rigors of a little bad weather. Bumblebees are fewer in number but a bit ”tougher” than bees – therefore they complement bees in an important way. The result is more fruits and berries.

  A. Build a ”bee-battery”

  Model 1:

  1. Obtain bamboo sticks, reeds or other hollow plants in as many different thicknesses as possible. Between a 3- and 15-millimetre holes are about right. You also need something to attach them together with such wire or strong tape.
  2. Cut the sticks into pieces of 20-30 cm so they all have a partition in the middle or the end.
  3. Some bamboo is not hollow but has a soft marrow in the middle. You can push it out with a nail or drill, but not all the way through. The insects do not build in the sticks where they can see right through. Please leave a stick with marrow left because some wasps like to remove it themselves.

  4. Gather your sticks in bundles of 10-30 pieces each and fasten them together with wire, strong tape or similar. You may instead figure out another way to put them together in bundles. Hang them up horizontally in a suitable location such as a buildings wall. They are to be in sunlight as much as possible yet protected from rain. See the picture.
  5. Make many bee-batteries. Please contact an allotment, a farmer, or someone who grows in their garden and give away or sell the bee-batteries. At the same time inform them about what you know about pollination and its value.

Model 2:

1. An easy way to make a bee-battery is to drill a lot of holes in a wooden block. A diameter of 4-8 mm is a suitable size, and depth of the holes should be about 7-10 cm. It is ideal if you drill many holes close together. Mark the size by the holes (see picture). In the picture you can see how it looks when some insects have covered over holes using different materials. When the female has filled the hole with pollen and a larva, she covers over the hole again. It is therefore clearly visible if the bee in charge of covering over has visited or not. Grey is clay, yellowish is resin and green are chewed

B. Build a wasp stump

A wasp stump is a peeled log placed upright that is 1-1.5 m high. In it, holes are drilled with different diameters. The minimum should be 3 mm and the most 8-13 mm. A cover prevents the stump from getting wet - then is lasts longer. The cover also protects the nests from a great deal of rainwater.

C. Build a simple bumblebee nest

When the spring sun begins to warm the garden, the bumblebee queens wake up from their winter hibernation. They fly out and start looking for food. Then they look for a place to nest in order to lay eggs and raise their young. Bumblebees often live down in the ground, ideally in old field mice and mice burrows. Help the bumblebees get a nice nest, a flowerpot nest.

1. Take a flowerpot of clay that is about 15 cm wide. Ensure that there is a hole in the bottom of the pot.
2. Dig a hole in the ground so that the pot can fit upside down and the bottom is level with the ground. A good location is sunny and sheltered, preferably with high grass around.

3. Fill the pot halfway up with nesting material. The best material is from field mice or mice burrows! Loosely packed hay or wood shavings are also good. A tip: Ask a pet shop if you can get chips that have been in the mice cages.
4. Place the pot in the hole and pack soil around it. Add some beautiful rocks that protect the entrance to the nest so it looks more like a natural hole.

A little more advanced way to make a bumblebee nest is this: Build a bumblebee nest of wood, like a birdhouse. The hole should be no more than 12-15 mm in diameter. The side of the nest can be 10-15 cm. The nest can be buried in a hillside or placed in a wall.

You can have one of the walls or ceiling made of plexiglass so you can peek in on the bumblebees. Then you have to have something to cover the plexiglass with when you are not looking at them - a little tar paper for example.

- **Task 6: What plants do bees like?** Beekeepers are good at recognising plants that bees like. They also know which plants provide the most nectar and pollen. Sometimes they make a list of when different plants bloom where they have their hives to know if the bees have enough food. A community with a variety of trees, shrubs and flowers in gardens and parks means that there are usually good places for bees to live in. Learn to recognise some plants that are important to bees. Look up images on the internet. How many can you find near the school or where you live?
- **Summary report proposal** - Show your work to your classmates and tell how it works. Take the opportunity to talk about what great helpers we have, the flying pollinator bees, bumblebees, wasps and butterflies. Feel free to invite a beekeeper to work with you on your summary. The beekeeper can then tell a bit about bees and beekeeping, and you talk about your work to help more bees to work for the good of us all. Discuss what you can do to support the ecosystem service called pollination:

- Buy organically grown vegetables, fruit and other food.

- Make sure there are plants that bees like so they get food during the greater part of the year. - Make sure there is good habitat for bees, bumblebees and wasps. - Avoid all toxins and pesticides in gardens.

7. TOOLS AND METHODS FOR EVALUATION AND MONITORING

One of the key tasks of the IMPRECO Common Educational Programme is to evaluate the efficiency of the programme and its specific activities in the achievement of common goals. Evaluation is not merely a method to determine the quality of education but rather a method for improving the quality of the educational process. To this end, a specific educational activity as well as the entire educational programme are evaluated against a set of criteria or indicators. It is important to stress the transnational comparability of the results, which is one of the main goals of the IMPRECO Common Educational Programme. For such evaluation a set of common indicators needs to be defined.

7.1 Indicators

7.1.1 Activity indicators

MODULES	INDICATORS
Introductory/preparatory meetings with teachers	• Number of teachers involved in the preliminary meetings • Number of topics covered: □ species □ habitats □ ecosystems □ life cycle □ food chain/web □ Natura 2000 network □ ecological footprint □ ecosystem services □ sustainable development
Classroom lectures	• Number of pupils attending the lectures, total and by age group: • Group 1 (6 – 7 years) • Group 2 (8 – 10 years) • Group 3 (11 – 14 years) • Number of topics covered:

	☐ species ☐ habitats ☐ ecosystems ☐ life cycle ☐ food chain/web ☐ Natura 2000 network ☐ ecological footprint ☐ ecosystem services ☐ sustainable development • Number of positive and consistent answers to the final questions (questionnaire) submitted to the pupils

Field trip	• Number of pupils attending the field visit, total and by age group:
	  • Group 1 (6 – 7 years)
	  • Group 2 (8 – 10 years)
	  • Group 3 (11 – 14 years)
	• Number of species and habitats belonging to the Natura 2000 network, food chains, and ecosystem services recognised during the field trip
	• Number of rare and endangered species and habitats recognized during the field trip
	• Number of positive and consistent answers to the final questions (questionnaire) submitted to the pupils
	• Number of positive and consistent answers to the final questions (questionnaire) submitted to the teachers.

Follow-up (after the visit - young sentinels for biodiversity and ecosystem services)	• Number of pupils (volunteers) – young sentinels/Eco sentinels by age 11 – 14 • Number of Young Eco guides (pupils who bring their families and show them protected area).

7.1.2 Results indicators

GROUP 1 – aged 6 to 7 **Expected learning outcomes** ➢ Recognize different types of environment (sea, land) and the key differences between them ➢ Recognize some characteristic animals and plants ➢ Identify the main characteristics of animals and plants ➢ Reconstruct some simple food chains ➢ Understand that the animals and plants depend on their environment to meet their basic needs ➢ Understand that men are part of nature and depend on environment to meet their basic needs ➢ Understand the impact of certain human activities on the local environment and wildlife	**Indicators** • Number of environments and key differences recognized • List of recognized animals and plants • Number of main characteristics of recognized animals and plants • Number of reconstructed food chains • Number of recognised basic needs of plants and animals • Number of recognised human needs depending of nature • Number of recognised human activities affecting living organisms and environment
GROUP 2 – aged 8 to 10 **Expected learning outcomes** ➢ Identify different types of ecosystems at the local level ➢ Classify some key plant and animal species into these ecosystems ➢ Identify the similarities and differences between various animal and plant species as well as their adjustments to various environmental conditions ➢ Understand that the animals and plants depend on their environment to meet their basic needs ➢ Recognize endangered species on a local level	**Indicators** • Number of ecosystems and key differences recognized • List of classified animals and plants • Number of recognised animals and plants adjustments to various environmental conditions • List of recognised basic needs of plants and animals • List of recognised endangered species on local level • Number of reconstructed food chains

➢ Recognize simple food chains in the environments ➢ Demonstrate knowledge of the impact of certain human activities on the local environment and wildlife ➢ Recognize some ecosystem services and their value for our everyday life, such as: recognize the importance of pollination and how it works (knowing some important pollinators); understands soil formation and nutrient supply, gain insight into the concept of decomposition and soil's importance in producing food	• Number of recognised human activities affecting living organisms and environment • Number of recognised ecosystem services and their value for our everyday life
GROUP 1 – aged 11 to 14 **Expected learning outcomes** ➢ Demonstrate knowledge of habitats and associations at the local level and determine the factors of integration with the ecosystem ➢ Capacity to identify and recognize certain animal and plant species of European importance that occur in the area ➢ Capacity to analyse the anthropogenic (human) influence on the dynamic balance in nature and the ways of preventing and/or rehabilitation of pollution ➢ Demonstrate knowledge of Natura 2000 network and its habitat and species and of the concept of protected areas in general ➢ Recognize different ecosystem services and categorize them: • Supporting services (photosynthesis, nutrition, soil formation, water cycle,	**Indicators** • Number of habitats and associations on the local level • Number of identified and recognized animal and plant species of European importance that occur in the area • Number of recognized human activities affecting living organisms and the dynamic balance in nature • List of recognised rare and endangered species and habitats under the Natura 2000 network • List of Natura 2000 sites and other protected areas on the local level • Number of recognized and categorized ecosystem services

habitats for different species, biodiversity) • Provisionary services (drinking water, food, fuel, medicine and health resources, raw materials) • Regulatory services (erosion prevention, water purification, carbon storage, protection against diseases, pests and natural disasters, better climate, air purification, pollination) • Cultural services (beauty and spiritual values, outdoors and tourism, nature inspires and provides knowledge, health and relaxation)	

7.2 Evaluation tools

7.2.1 Activity indicators

ACTIVITY INDICATORS		MEANS OF VERIFICATION

Introductory/preparatory meetings with teachers	• Number of teachers involved in the preliminary meetings
	• Number of topics covered:
	  species
	  habitats
	  ecosystems
	  life cycle
	  food chain/web
	  Natura 2000 network
	  ecological footprint
	  ecosystem services
	  sustainable development
		• Attendance list
		• Report from educators

Classroom lectures	• Number of pupils attending the lectures, total and by age group:
	  • Group 1 (6 – 7 years)
	  • Group 2 (8 – 10 years)
	  • Group 3 (11 – 14 years)
	• Number of topics covered:
		• Attendance list
		• Report from educators
		• Completed questionnaire/Teacher's note including the oral answers provided by the pupils

	☐ species ☐ habitats ☐ ecosystems ☐ life cycle ☐ food chain/web ☐ Natura 2000 network ☐ ecosystem services ☐ sustainable development • Number of positive and consistent answers to the final questions submitted to the pupils	

Field trip	• Number of pupils attending the field visit, total and by age group:
	  • Group 1 (6 – 7 years)
	  • Group 2 (8 – 10 years)
	  • Group 3 (11 – 14 years)
	• Number of topics covered
	• Number of species and habitats belonging to the Natura 2000 network, food chains and ecosystem services recognised during the field trip
		• Attendance list
		• Report from educators
		• List of recognized species, rare and endangered species, food chains and ecosystem services
		• Completed questionnaire from pupils (only group 2 and 3)
		• Completed questionnaire from teachers
		• Photographs, including date and location of the photographed species

	• Number of rare and endangered species recognized during the field trip • Number of positive and consistent answers to the final questions submitted to the pupils • Number of positive and consistent answers to the final questions submitted to the teachers	
Follow-up (after the visit - young sentinels for biodiversity and ecosystem services)	• Number of pupils (volunteers) – young sentinels/Eco sentinels aged 11 – 14 • Number of young Eco guides (pupils who bring their families and show them protected area)	• List of pupils (volunteers) • Short report as a questionnaire – fulfilled by pupils • Photographs of their visit to the protected area with date, location and number of family members or other relatives

7.2.2 Results indicators

RESULT INDICATORS	MEANS OF VERIFICATION
GROUP 1 – aged 6 to 7 • Number of environments and key differences recognized • List of recognized animals and plants • Number of main characteristics of recognized animals and plants • Number of reconstructed food chains • Number of recognised basic needs of plants and animals • Number of recognised human needs depending of nature • Number of recognised human activities affecting living organisms and environment	• Report by educators • List of recognized species and food chains/teachers note • Questionnaire, completed from teachers • Teacher´s note including the oral answers provided by the pupils • Photographs, children's drawings
GROUP 2 – aged 8 to 10 • Number of ecosystems and key differences recognized • List of classified animals and plants • Number of recognised animals and plants adjustments to various environmental conditions • List of recognised basic needs of plants and animals • List of recognised endangered species on local level • Number of reconstructed food chains • Number of recognised human activities affecting living organisms and environment • Number of recognised ecosystem services and their value for our everyday life	• Report by educators • List of recognized species, rare and endangered species, food chains and ecosystem services • Questionnaire, completed from pupils and teachers • Photographs including a date, time and location of the photographed species • Photographs, maps, pupil drawings

GROUP 3 – aged 11 to 14 • Number of habitats and associations on the local level • Number of identified and recognized animal and plant species of European importance that occur in the area • Number of recognised human activities affecting living organisms and the dynamic balance in nature • List of recognised rare and endangered species and habitats under the Natura 2000 network • List of Natura 2000 areas and other protected areas on the local level • Number of recognized and categorized ecosystem services	• Report by educators • List of recognized species, rare and endangered species, food chains and ecosystem services • Questionnaire, completed from pupils and teachers • Photographs including GPS position, a date, time and location of the photographed species • Photographs, maps

8. CONCLUSIONS

8.1 The educational offer about Ecosystems and Ecosystems Services in a Protected Area

To ensure the uniform quality of services offered to the public, the educational activities available in a protected area shall only be provided by one managing authority. If several suitably qualified persons are involved, they shall follow the same objectives and operational procedures and should, ideally, be led by one person whose responsibility is to coordinate all the activities, their execution, planning, supervision and evaluation. The information communicated to the general public about the area and its planned activities over a certain period of time must be consistent. The relations between the public, visitors and the managing authority shall be as direct as possible, in order to facilitate the appropriate dissemination and search for information. The most crucial stage in the preparation or development of an educational programme is the definition of its contents, which should cover the ecosystems of protected areas as well as other similar topics related to protected areas and their functions. For certain topics, several educational and informative channels may be planned together with other educational activities aimed at updating and informing the public about the protected areas. Such topics are: promotion of the role of biodiversity within the Natura 2000 network, raising awareness about natural values of protected area and importance of their preservation, involving local stakeholders and visitors in the management of the protected area and biodiversity monitoring through specially prepared web-applications, transferring best practices and measures for the management and conservation of ES and ESS through the IMPRECO e-learning platform and sharing information, collected on species, habitats, ES and ESS of IMPRECO's protected areas through the transnational biodiversity geo-database. This would greatly facilitate the promotion of educational programme. The shared network of information would therefore form a common framework for the development of these activities/instruments, which will form part of the educational activities in Natura 2000 sites.

8.2 The relationship between the Protected Areas management boards and the guide(s) – educational programme providers

In running educational activities and on field trips organized in protected areas, the quality of service offered by a qualified and professionally competent provider is of utmost importance. Guides shall be properly qualified to provide high-quality services and have verifiable and relevant experience in the field of nature conservation education and providing guiding services to groups of all ages and interest. The educational and tourist programme of a protected area takes several years to develop (a 5-year planning phase) and often involves different local providers and establishes relationships with other subjects (schools, public administration bodies, tourist offices, public works operators, service providers). Continuous implementation of these activities enables planning, programming and promotion of the area and its offer. In this way, it connects teachers, local stakeholders and visitors, who can then contribute to the promotion of the reserve by becoming its "promotors". It is necessary to conduct continued monitoring of activities, namely through surveys such as the Service Quality Assessment Scheme (for services available to the users of the area) and Guide Assessment Scheme. The surveys, which are primarily designed to analyse and improve the quality of the services provided, also enable collection of interesting information concerning the categories of visitors and most popular activities and establish a database for transmitting information and proposals. Publication of information obtained from various protected areas is highly relevant and valuable as it helps develop a high-level uniform offer while providing the public with a range of comprehensive proposals listing sufficient information and possibilities to support the public in their decision-making process. Finally, it is appropriate that the contents to be covered during a field trip are determined by professionally trained staff who is responsible for the environmental management of the area and through these programmes promotes a multidisciplinary network of activities. Pre-setting of the learning contents can assist in the planning of new actions and measures, which could be used in future participation in joint EU projects.

8.3 Partnership with local stakeholders

The process of planning educational activities can include different stakeholders such as. municipalities, regions, public institutions for park management, lands and associations, as well as educational and research institutions and universities. Involvement may be initiated by inviting people to visit and explore the protected areas or through an exchange of studied topics. The aim of expanding the network of partners is to encourage initiative, secure funding for activities, and intensify efforts to raise the funds needed to manage the area, knowing that such an area possesses social, environmental and economic values which go beyond the borders of the protected area. For this reason, coordinated "management" that involves local authorities and privately-held entities, e.g. cooperatives, is highly recommended. The proposed "management" model may promote the economic development and growth, which is the basis for planning more comprehensive educational, research and cultural programmes. These activities are particularly appreciated by large areas: the value of the area increases through the formation of spin-off companies, and creation of new jobs delivers social value. A crucial element of the "management" of the educational activities is promotion of local products (local area or method of production). These products may form part of various packages, e.g. Quality Trails, and are very effective and suitable tools in these areas since they can increase and boost the traditional tourist offer in protected areas. Additionally, these products can be included into a wider network of area-specific food products that can represent the food industry, the culture segment and nature in general. Such partnerships should include local authorities, culture associations, NGOs, cooperatives, protected area managing authorities, nature conservation guides, network of museums and local tourist organizations, and a network of all companies in the food industry which provide high-quality products. The involvement of the above-mentioned activities demonstrates active management of Natura 2000 sites and the joint management of educational activities will have considerable positive economic impact on the entire area.

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