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Emergency plan for restoring the Prut river's biodiversity in case of natural disasters or accidental pollution

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Cover: **Mitică CIORPAC**, PhD candidate

The European Union is made up of 28 Member States who have decided to gradually link together their know-how, resources and destinies. Together, during a period of enlargement of 50 years, they have built a zone of stability, democracy and sustainable development whilst maintaining cultural diversity, tolerance and individual freedoms. The European Union is committed to sharing its achievements and its values with countries and peoples beyond its borders.

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EMERGENCY PLAN FOR RESTORING THE PRUT RIVER'S BIODIVERSITY IN CASE OF NATURAL DISASTERS OR ACCIDENTAL POLLUTION

"The world of protected areas is the most important heritage that we can leave to the coming generations: securing the ongoing access to nature, to material and spiritual values that it holds (…). A world lacking protected areas, deprived of wild natural sites, would simply turn into an extremely impoverished environment."

(Adrian Phillips, Chairman of CNPPA, IUCN)

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CHAPTER I: GENERAL REMARKS REGARDING THE HAZARDS THAT MAY AFFECT THE BIODIVERSITY OF PRUT RIVER

I.1. Argument

Research on the anthropic impact on the environment and biodiversity, measures related to the preservation and sustainable use of natural resources are on the fore and are paid special attention to in all countries and international institutions.

In 1992, on the occasion of the United Nations Conference regarding the Environment and Development, which took place in Rio de Janeiro, the Convention pertaining to Biological Diversity was signed. This is the first international piece of legislation in this field and is aimed at preventing global degradation of biodiversity, comprising three major objectives: preservation of biodiversity, sustainable use of the biodiversity components and the fair sharing of the resources genetic benefits (the First National Report pertaining to Biological Diversity, 2000). In 1995, Romania ratified the Convention pertaining to Biological Diversity, and is tasked to draw up and implement those respective activities, which shall guarantee the achievement of the Convention's desiderata at a national and international level.

The term biodiversity encompasses the assembly made up of all of the forms of vegetal and animal life, and the ecosystems they are part of, ones interacting with the others and the abiotic components of the environment. As it is the outcome of some dynamic processes that occur in the biotic layer at a time and space scale, the biodiversity of a region has also a dynamic character. Biodiversity is a basic feature of the structure of a biocenosis or an ecosystem; disturbing ecosystems/biocenoses by different stress factors (natural hazards, agriculture activities, industrial activities, mining activities, tourism related activities, etc.) leads to a considerable reduction of biodiversity, which asks for concrete protection and preservation measures especially in the affected territories.

The preservation of biodiversity has to be addressed as a new plural-discipline research field, developed as a response to the crises the living world is facing these days.

The preservation of biodiversity aims at three objectives: the investigation and description of the living world diversity, the comprehension of man's activities effects upon the species, communities and ecosystems, and the development of interdisciplinary methodologies for the protection and restoration of biological diversity.

In a crowded world having limited resources, one must clearly set out the priorities related to the preservation of biological diversity, more precisely for species that need to be preserved.

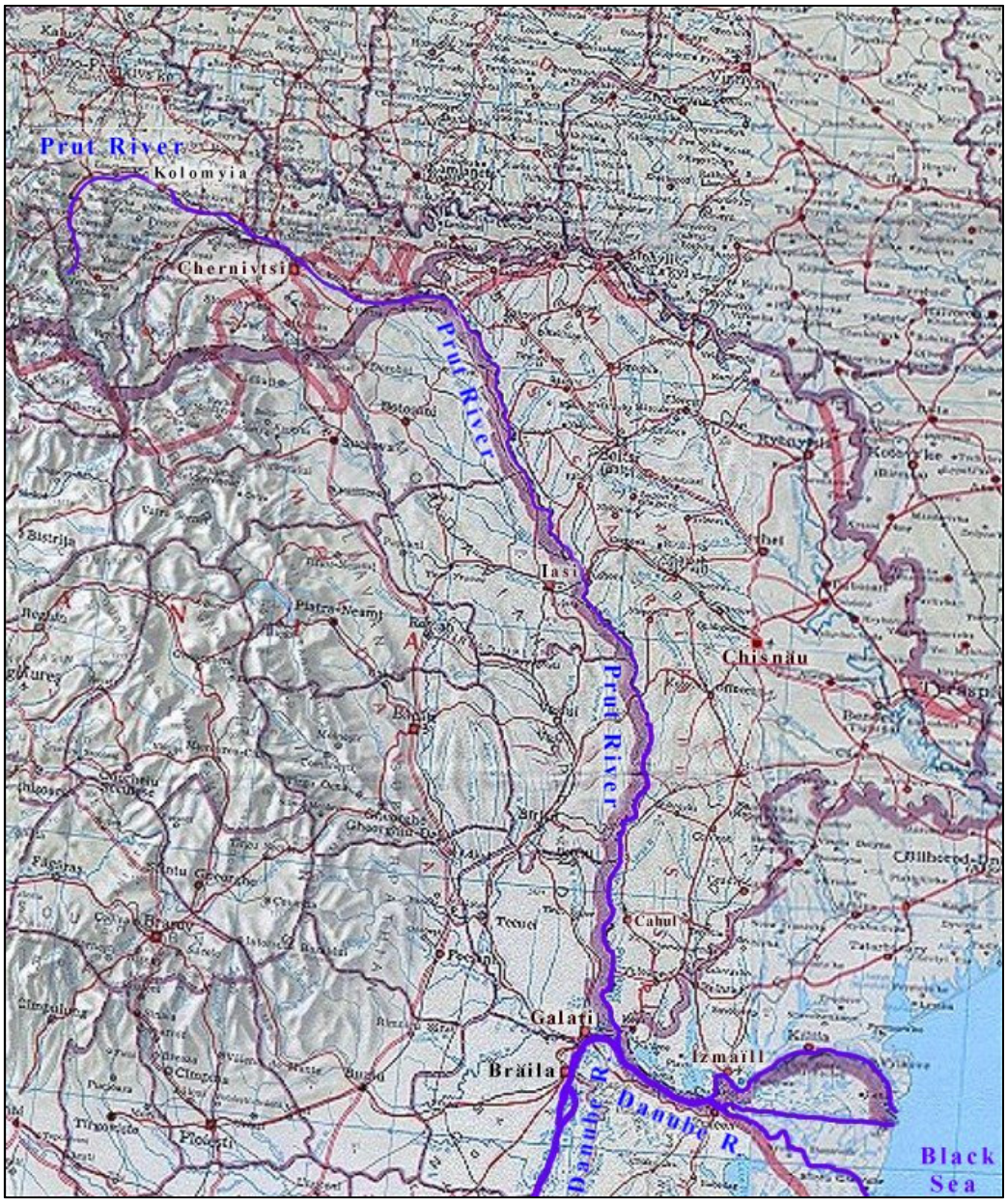
The situation created in Romania's acquatoria makes it necessary and actual to carry out complex analyses of diversity, the structural-functional status of the fish population, to take the right measures to fix the situation, to issue a strategy and an action program as the very scientific foundation for the protection, preservation, improvement and sustainable use of the fish population from the water ecosystems in Romania, which play and important role in the national economy.

In the "Prut" border area, the land management system related to other economic activities is strongly misbalanced, as lands are mainly used for annual cultures, which do not allow people obtain significant added value. Moreover, lands situated in the immediate proximity of the border have a special use regime. These are the reasons why it is necessary to diversify and make the land use more efficient, and tourism is a good opportunity in this respect.

Social-economic transformations of the society, the passage to a market economy and the new inter-state relations have radically changed the mechanism related to the protection,

reproduction and capitalization of the water resources. Under these circumstances, people have considerably intensified the exploitation of fish resources, without taking the appropriate measures to compensate for the caused damage; direct control over anthropic actions based on the principles of water ecosystems integral protection has diminished.

The fish species do not have to be considered separately, but in connection with the other representatives of the organic world from that respective basin; also, one must know the main environment factors, their variations in time and space and the action they perform on to the dissemination and behavior of fish.



Prut River course

In the past few decades, the influence of anthropic factors (household and industrial pollution, progressive eutrophication, the discharge of chemical substances specific for the industry in big urban agglomerations along the Prut, the diminishing of the water outflow etc.) onto the ecosystem of the Prut River and its tributaries bring about essential changes into the biodiversity of hydrobiocenoses, thus losing the viability and the biological importance of rivers in the biosphere and the environment system.

Prut River confluence with the Danube at springtime floods

Prut River floodplain

Copious meal of cormorants in Stânca-Costești reservoir immediately after fish release in the water

In most water basins, one discovers pesticides and other lasting organic substances in different concentrations. Lasting organic pollutants in small concentrations do not directly influence the water quality, and do not impact its aspect. Only when it comes to high levels of pesticides does the water get a specific smell, characteristic for these types of substances. Pesticides together with the rainwater infiltrate into the ground waters and even the artesian waters, due to the migration processes.

These are the causes why fish resources, one of the indicators of the water ecosystems status, have suddenly dropped down in the past few years. Species like the sterlet, the barbell and the vimba bream are almost extinct, and we are witnesses of a replacement of valuable species with less valuable ones. Should these trends persist, and then we will be facing the real danger of losing the existing gene pool and the importance of natural water ecosystems for fish, which may lead to negative economic consequences to the whole society.

One has recently noticed a reduction of the water fauna both in terms of quality and quantity, because of the irrational industrial fishing and the poaching phenomenon, which is really hard to eradicate. The ampleness and the seriousness of the effects depend on the type and complexity of phenomena, as well as the efficiency of the preset measures in the ***Emergency Action Plan***.

Protection of aquatic resources is done through multiple means, ranging from actual protection measures, by confining protection areas where fishing is forbidden or subject to restrictions, up to strict control and regulation measures related to fishing effort. Another way to protect it is to set the minimum dimensions the fish species and other living creatures that may be kept, as well as the minimum dimensions of the fishing tools nets. Specimens whose dimensions are below the minimum regulated one cannot be kept, transferred, downloaded or traded, for they need to be returned to the water right after their catch. One of the efficient protection measures is the encouraging of aquaculture, with a view to populating natural waters with species that are in decline and/or subject to great commercial pressures. This is an efficient way to reduce the pressure exerted by the commercial fishing onto the species of great economic value, which are declining in terms of their population. In this respect, we recommend the drawing and encouraging of the water living resources concessionaires to the aquaculture, with the investments being stimulated by the granting of European structural funds.

It is worth mentioning that, for the protection of living water resources, it is necessary first of all to carry out a regular assessment of the living water resources stocks, with a view to setting the total admissible capture (TAC), as well as the evaluation of the impact caused by the fishing and the aquaculture onto the water ecosystems. The public central authority, which is responsible for fishing and aquaculture, supports and encourages scientific research and collaborates with the relevant research institutions, for the accomplishment of these objectives.

The biological reliability of the water environment quality includes the index of biological/biotic integrity (IBI) determination, an index that provides information on the extent to which the fish populations are affected by the anthropic impact; one may identify the structural-functional changes of the ecosystem by means of the followed parameters.

I.2. The ecosystem of the Prut River

The Prut River, 953 km long, springs from the Carpathians in Ukraine, and from there it flows toward the East, with a great part of it running South-East. It discharges into the Danube, near Reni, East from the town of Galaţi. It makes up the border between Romania and the Republic of Moldova.

Egretta alba **(Great egret)**
– Red Book of Republic of Moldova

Egretta garzetta **(Little egret)**

Phalacrocorax carbo
(Great cormorant)

Phalacrocorax pygmaeus
(Pygmy cormorant)
- Red Book of Republic of Moldova

Platalea leucorodia **(The Eurasian spoonbill) – rare, threatened by extinction, lower Prut**

In the inter-war era, the river was navigable till Ungheni, but in the communist era, the navigation on the river was gradually abandoned, and the stream could not be maintained anymore.

At present, Prut is only navigable on its lower stream. Its main tributaries on the right side are Ceremuş and Jijia (whose tributaries are Bahlui and Başeu). On the Prut River, there is a hydropower plant (at Stânca-Costeşti) established together with the Soviet Union (currently the Republic of Moldova).

The biggest town on its way is Cernăuţi, in Ukraine. Other towns close to its stream are: Săveni, Iaşi and Huşi, in Romania, and Ungheni and Cahul, in the Republic of Moldova.

On the territory of Romania, the river has a length of 742 km, a watershed of over 10990 km² and a multiannual average discharge of 110 m³/second (before it discharges into the Danube). On an area of 39.4 km, it marks the Romanian-Ukrainian border, and on an area of 681.3 km (out of which 73.9 km are made up from the Stânca-Costeşti Lake) it marks the border between Romania and the Republic of Moldova.

Prut River was known in antiquity under the name Ierasus and Scythians called him Porata i.e. stormy water. In its upper course, Prut is a typically mountain river with a narrow valley with steep and high slopes, fast flowing and meet rapids in the river bed. In the middle Prut, the floodplain forms meanders, the speed is 1.5 m/sec., and on a small sector, where it intersects the reefs, the Prut valley becomes narrow up to several hundred meters, taking shape of keys.

Down South, the river valley widens up to 5-6 km, the stream becomes slow, the banks are not high, it acquires a symmetrical shape on the slopes, and the terraces are well defined. On its lower stream, the valley of the Prut River considerably widens up to 8-10 km, with the river forming bends, and forking, the slopes become less steep now and there, fragmented by cloughs; the river bed width varies between 50 and 180 m, its maximum depth is 6-7 m, and the speed gets down to 0.7 m/s.

Prut stops flowing, and pours, flooding the vast area of its floodplain, once the level of the Danube's waters increases. The river floodplain is partially swamped. Starting with the very first half of the 20th century, a part of the Prut floodplain has been occupied by swamps, wetlands, lakes where a very rich water animal world was living (fish, birds, mammals). This sector of the Prut floodplain used to be a lovely and miraculous paradise of nature.

Valences of Prut:

- A reservoir of natural biodiversity
- A source of food
- A supplier of drinkable water
- A relief modeling agent
- A regulator of the climate
- An electric power producer
- A route of transportation
- An attenuator of floods
- Raw material for the industry
- Leisure, cultural and aesthetic functions.

Cygnus olor **(Mute swan) Manta, Prut floodplain, and Pădurea Domnească reserve**

Colony of ducks in winter - Stânca-Costești reservoir

Ardeola ralloides **(Squacco heron) - Red Book of Republic of Moldova**

Pelecanus roseus **(Southern white pelican) - lower Prut floodplain in autumn**

After visiting Basarabia, Mihail Sadoveanu let us the following description: "Those endless waters reigning everywhere over a whole county made up the mastery of the unknown and secrecy. From the wild boar sleeping on the floating islands, from the swans and pelicans that foam up the night into the black of the lakes, up to the little birds peoples, up to the crowd of fish, up to the endless billions of buzzers – they all live from these waters that spread over a rich kingdom, brining along the mud full of feed from the far away mountains and plains…"

In the past decades, the biggest part of Prut ponds, lakes and swamps have been drained. The former swamps have turned into agricultural lands. In 1976, near the localities of Stînca and Costeşti, the Republic of Moldova together with Romania built a dam, a reservoir and a power plant, thanks to which periodical flash floods stopped.

Elements of hydrology

Prut River watershed represents 24.3% of the Republic of Moldova territory. The most important tributaries are: Vilia (from Ukraine), Racovăț, Ciuhur, Căldărușa, Gârla Mare, Delia, Nârnova, Lăpușna, Sărata, and Larga, on the left hand (Republic of Moldova territory) and Ceremuş, Bașeu, and Jijia (with Bahlui River - the main tributary) on the right hand (Romanian territory).

The average flow of the Prut River is considered to be 2.78 km^3. The experts in Hydrology use the year 2010 as reference term for a high flow (4.29 km^3). According to the flow size, the years are classified in:

- years with high flow (more than 150% of the multiannual average);
- years with low flow (less than 60% of the multiannual average).

Values of the flow modify according to the season and depend on the quantity of precipitations (rain, snow), the water losses being caused by evaporation, volumes drained from the reservoirs built on the river course. The reservoir Stânca-Costești (functional since 1978) has the free volume for the Normal Retention Level of some 150 millions m^3.

Flora and fauna

The flora found in the Prut meadow comprises 1360 species belonging to 530 genera and 111 families, standing for around 38% of the country's flora. From a statistical point of view, around 24 families that comprise 1091 taxa make up the basic pool (Tatiana Burac, Teodor Chifu, 2002).

From an ecological point of view, species are distributed as follows:

- xeromezophites, 39%, which make up grasslands on the steppe slopes;
- mezophites and hydrophites, 23%, in the floodable area;
- xerophites, 9%, on the limestone rocks and eroded coasts.

The **vegetation** is represented by 161 vegetation associations, 39 alliances, 26 orders and 18 classes, out of which stand out associations specific for the wetland areas: Lemnetea, Potamogetonetea, and Phragmito-Magnocaricetea.

The algae flora inventory from the Prut River watershed comprises 798 taxonomic units (out of which 695 in the Prut River), out of which 234 varieties and forms, belonging to 9 phylla, 14 classes, 31 orders, 66 families and 172 genera.

The algae qualitative composition confirms the existence of a great specific diversity, overall, with the diatoms and green algae being represented the best, followed by the blue-green algae and the euglenids flagellates. The specialty works present the dominance of diatoms (63.14%), followed by the green algae (18.43%), the blue-green algae (12.69%) and the euglenids flaggelates (5.14%), as well as other groups bearing an insignificant percentage.

From the analysis of the saprobiological spectrum of the Prut River, according to the diatoms algae flora, we notice that the beta-mezosaprobe species (46.65%) dominate among the indicator species.

The repartition of aquatic and swamp plants in the hydrographic basin of Prut, according to a certain **succession** from the shore toward the middle of the basin, depending on the depth, biological and ecological particularities, the thermal regime, has influenced a suggestive distribution of the algae communities. Species of genera *Alisma*, *Phragmites, Typha, Butomus, Sagitaria, Potamogeton, Ceratophyllum, Myriophyllum, Vallisneria, Lemna, Salvinia, Spirodela, Hydrocharis* etc. provide specific support for different algae associations.

The vegetation is extremely diverse, ranging from poplar, willow or oak forests to vegetation specific for a steppe, of salty soil; large areas have been transformed into agriculture lands. In the Prut Valley, 1385 taxa have been identified, distributed in around 170 localities (out of the 206 existing ones).

The wood vegetation is represented by riverside coppices, the willow river meadow, the black polar and osier plots. In the higher area, there are hornbeam and beech forests, but, generally, the wood vegetation on the left bank is better represented than on the right bank.

According to the literature published so far, there may be around 100 fish species in the Prut River. In reality, their number is much smaller, as some have been wrongly identified or quoted, while others simply disappeared.

Research on the fish populations, carried out in the Prut River basin and its accessory system set the current composition of the fish population, which list some 44 fish species and sub-species assigned to 10 families.

In the river bed of the Prut River middle sector (the Criva-Corpaci section) and its tributaries, 24 fish species and sub-species have been identified, grouped in 6 families. From an ecological point of view, the mentioned sector fish population is assigned to the rheophileous-limnophileous complex. 9 fish species or 37.5% is of economic interest, but their relative quantity does not exceed 12.5%. 7 species or 29.2% of all the fishes species on this sector is of small economic value.

One species (4.2%), zingel, refers to rare species, which is protected by the law and included in the Red Book of the Republic of Moldova. The remaining species – 29.1% are economically depreciated, and their relative quantity is around 58.2%. According to their numerical density, the most abundant species is the bleak, with 36.4%, followed by the white-eye bream (10.4%), the European bitterling (7.6%) and the Danube bream (5.0%).

In the Prut waters, which are coming from the related fish facilities, there are allopatric species, taken by man in intensive culture, like the species brought from China (silver carp, bighead carp, grass carp) or those of American origin: buffalo fish (*Ictiobus cyprinellus*), black buffalo (*Ictiobus Niger*), smallmouth buffalo (*Ictiobus bubalus*) and the paddle fish (*Polyodon spatula*).

In the Stânca-Costeşti reservoir, one has noticed the presence of 26 fish species and sub-species included in 6 families. From the ecological point of view, the fish population from the lake is limnophileous-rheophileous. There are 10 fish species and sub-species (38.8%) that have significant economic value, 8 species (30.8%) have a small economic value, and other 8 species (30.8%) are economically depreciated. According to the numerical density and the spatial distribution of the fish populations in the Stânca-Costeşti lake, the common bream may be considered the most abundant species (32%) of the total number, followed by the common bleak (11.8%), the Prussian carp (7,9%), the roach (7,0%) and the white-eye bream (6.3%).

According to the monitoring carried out by Davideanu G., Moşu A., Davideanu A., Miron Ş., in 2008, in the Prut River, 41 species were captured and other 6 species were identified as definitely present (in the area), based on the captures made by the commercial and/or sports fishermen.

***Plegadis falcinellus* (Glossy ibis) feeding at Manta**

***Limosa limosa* (Black-tailed godwit)**

Himantopus himantopus
(Black-winged stilt)

***Philomachus pugnax* (Ruff)**

***Haliaeetus albicilla* (White-tailed eagle)**

Among the European protected amphibians, the green frog, the yellow-bellied toad and the red-bellied toad are the ones that are present on large area. The herpetological fauna of the region also includes the smooth newt (*Triturus vulgaris*) and the Northern crested newt (*Triturus cristatus*).

Out of the reptiles, we mention the lake turtle – a species protected at the European level.

Out of the representative mammals, we should mention the otter, a species protected at the European level. Several mammal species have been inserted in the current fauna of the area, at different moments in time, such as: the raccoon dog (*Nyctereutes procyonoides*), the muskrat (*Ondatra zibethica*), the fallow deer (*Dama dama*) and others.

The gradual installation of the hydrophileous and hygrophileous vegetation, as well as the border area status allowed for the occupation of these spots by birds that found there favorable conditions for nesting and rich sources of food. The Prut River is also an important route for migration.

Among birds, over 239 belonging to 42 families from 12 orders have been inventorized (out of the 375 species present in the country), many of them being protected in compliance with international, European and national relevant documents, birds such as the black stork, pelicans, the spoonbill, etc..

In the Prut basin, there were identified several biotopes with characteristic vegetation – an association of forest and shrubs, steppe associations, hydrophileus and hygrophileus plants associations, salty soil plants associations. 5 areas of bird-fauna dispersion have been identified.

The marsh area comprises the wetlands, the ponds and the lakes created for diminishing the flood risks and used for irrigation and pisciculture. The aquatic vegetation and the vegetation characteristic for salty soils allow for the nests installation of aquatic birds: *Podiceps cristatus, Anser anser, Cygnus olor, Anas platyrhyncos, Anas crecca, White egret*, etc.

The running waters zoning, represented by the minor riverbed of the Prut River and its tributaries, shelters birds like *Alcedo atthis, Cinclus cinclus, Larus argentatus, Larus ridibundus, Sterna hirundo*, etc. 182 bird species including rare and protected species in Romania have been identified in this area, by direct observation with the telescopic sniper or by the song.

The emergence of the large water areas (reservoirs) like Stânca Costeşti, Tansa-Belceşti or Hălceni are of special interest for the bird fauna, because, in this particular region, birds passing by (in spring/fall) find the necessary trophic resources; also, some small groups of anseriforms are wintering on the river stream.

The reservoirs borders are cast in concrete or used for agriculture purposes, which is why the hydro-hygrophileous vegetation is poorly developed and does not provide proper conditions for nesting or a refuge for aquatic birds. Therefore, in summertime, during the nesting period, there are so few of them, but during the transit, on the banks that are not cast in concrete, thousands of waterfowls halt there on their way to the wintering areas or on their way back; out of these birds, we mention *Vanellus vanellus, Limosa limosa, Numenius arquata, Gallinago gallinago, Gallinago media, Tringa ochropus, Tringa erythropus*, etc.

These accumulations along the Prut River are characterized by a shallow depth, which is precisely why they serve as wintering places for certain anseriformes: *Cygnus color*, *Anser anser*, *Anser albifrons*, *Anas crecca*, as well as for other aquatic birds like *Gavia arctica*, *Gavia stellata*. In the area of these artificial accumulations, there have been also noticed some rare or extinct species in Romania: *Podiceps auritus*, *Bucephala clangula*, *Somateria mollisima*.

During the autumn migration

Erithacus rubecula **(European robin)**

Lanius minor **(Lesser grey shrike)**

Ondatra zibethicus
(muskrat)

Emys orbicularis
(European pond turtle)

Anas platyrhynchos
(Mallard)

The hydro-technical facilities on the Prut valley and on its main tributaries have become fish farms. The small ponds and the stock ponds are bordered by large reed and rush strips, which provide for refuge and nesting places, as well as food sources for the birds.

I.3. The legal basis

The management plan pertaining to emergency situations that may affect the biodiversity of the Prut River (the fish population) has been drawn up while considering all the pieces of legislation and norms regarding the settlement of emergency situations generated by hazards, as follows:

1. **Government Emergency Ordinance (OUG) no. 21/2004** pertaining to the National Management System for emergency situations, passed by with its amendments and supplements by Law no. 15/ 2005;
2. **OUG 195/2005** pertaining to the protection of the environment, passed by Law 256/2006;
3. **Law no. 107/1996** – the Law related to Waters, with all its subsequent amendments and supplements;
4. **Law no. 481/2004** pertaining to the civil protection, republished, with all its subsequent amendments and supplements;
5. **Government's Decision (HG) no. 1489/2004** pertaining to the organization and performance of the National Committee for Emergency Situations, with all its subsequent amendments and supplements;
6. **HG no. 1490/2004** for the approval of the Organizational Chart Performance Set of Rules of the Inspectorate for Emergency Situations, with all its subsequent amendments and supplements;
7. **HG nr. 1491/2004** for the Framework Regulation pertaining to the organizational structure, the specific tasks, the performance and the equipment of the operative committee and centers in case of an emergency;
8. **HG no. 1176/2005** pertaining to the approval of the Organization and Performance Statute of the "Romanian Waters" National Administration, with all its subsequent amendments and supplements;
9. **HG no. 846/2010** for the approval of the Risk Management National Strategy in case of floods, on a short and medium term;
10. **OUG no. 82/2011** pertaining to some organization measures related to the land reclamation, with all its subsequent amendments and supplements;
11. **HG no. 271/2012** pertaining to the amendment and supplement of the HG no. 1.705/2006 for the approval of the centralized inventory of assets in the State's public domain;
12. **HG no. 270/2012** pertaining to the approval of the Regulation related to the organization and performance of the basin committees;
13. **The Joint Order of the Minister of the Environment and Forests, and the Minister of Administration and Internal Affairs no. 1422/192/2012** for the approval of the Regulation of the management of emergency situations generated by floods, dangerous weather phenomena, accidents related to hydrotechnical constructions and accidental pollution on the water streams and sea pollution in the coast area;
14. The **Joint Order of the Minister of the Environment and Forests and the Minister of Administration and Internal Affairs no. 245/3403/2012** for the approval of the procedure related to the encoding of meteorological and hydrological conditions related information, signals and warnings;
15. The **Order of the Minister of Administration and Internal Affairs no. 1259/2006** for the approval of the Norms pertaining to the organization and providing of activities related to the notification, warning, pre-alarming and alarming in case of civil protection situations;

16. The **Order of the Minister of Administration and Internal Affairs no. 1184/2006** for the approval of Norms related to the organization and evacuation in case of an emergency;
17. **OUG no. 1/1999** pertaining to the state of siege regime and the emergency state regime, with all its subsequent amendments and supplements;
18. The **Order of the Minister of Administration and Internal Affairs no. 132/2007** for the approval of the Methodology for the drawing up of the Plan related to the analysis and covering of risks and the Frame Structure of the Plan related to the analysis and covering of risks;
19. The **Order of the Minister of Administration and Internal Affairs no. 181/2010** for the approval of the Regulations related to the management of emergency situations specific for the types of risks assigned to the Ministry of Administration and Internal Affairs;
20. **HG no. 762/2008** for the approval of the National Strategy pertaining to the prevention of emergency situations;
21. The **Order of the Minister of Administration and Internal Affairs no. 7l8/2005** for the approval of the Performance criteria related to the organization and equipment of voluntary services for emergency situations, with all its subsequent amendments and supplements;
22. The **Order of the Minister of Administration and Internal Affairs no. 160/2007** for the approval of the Regulations related to the planning, organization, performance and completion of the prevention of emergency situations carried out by voluntary and private services for emergency situations;
23. The **Order of the Minister of Administration and Internal Affairs no. 712/2005** for the approval of the General Provisions pertaining to the training of the employees in the field of emergency situations;
24. **OUG no. 68/2007** pertaining to the responsibility related to the environment, with reference to the prevention and repair of the prejudice on to the environment, passed by Law no. 19/2008, with all its subsequent amendments and supplements.

In the European space there has been also issued an environment related legislation regarding the member state of the European Union, which all the states that negotiate their joining the EU have the obligation to ratify during their pre-admission period. There already are several conventions in relation with animal groups (the Convention pertaining to the protection of bats, the Bird Directive), ecosystems and habitats (the Habitats Directive, the European Chart of mountain areas, the Pan-European Strategy on the biological and landscape diversity) or phenomena humankind faces today (the Convention on the crossborder atmosphere pollution).

Specially important are the two directives – Birds (1979) and Habitats (1992) – based on which the "Nature 2000" network was established, which aims at blocking the decline of Europe's biodiversity and protecting the most important special protection areas for birds and some sites of communitary interest for the preservation of habitats and of their the biological communities.

- **The "Man-Biosphere" Program**, launched in 1970, allowed for the establishment of a biosphere reserves network which is under the patronage of UNESCO within the "United Nations Program for Education, Science and Culture". Within these reserves, the efforts to preserve the biodiversity are made under the conditions of a sustainable development of the local communities living in that area. The network comprises almost 400 reserves, and, on the territory of Romania, there are three biosphere reserves: the Danube Delta, the Retezat National Park, and Pietrosul Rodnei.

➢ **The Ramsar Convention**, passed in 1971, aims at the identification and designation of wetlands of international importance especially as habitats for the migratory birds, in order to avoid their continuous degradation, to preserve the biodiversity of these ecosystems and the sustainable use of the resources. Each signing state has the obligation to designate at least one Ramsar site – at present, the network of the Ramsar sites is made up of over 900 areas. Only five regions from our country have been designated as Ramsar sites: the biosphere reserve Danube Delta (in 1991 as first Ramsar site on its territory), Balta Mică a Brăilei (in 2001), Lunca Mureşului (counties Arad and Timiş), Dumbrăviţa Fish Complex (county of Braşov) and Techirghiol Lake (county of Constanţa). The designation of a wetland as a Ramsar site is an acknowledgement of the importance of these areas as resources of great economic, natural, scientific value and their multiple role in the preservation of the environment quality by controlling the floods, supplying the underground water layer, stabilizing the banks and protecting them againts storms, by the retention of the nutrients and sediments, by the attenuation of climate changes, water purification, and preservation of biodiversity. The Convention signing countries are bound to take into account the internationally taken commitments with regard to the preservation and rational use of these areas.

➢ **The Convention pertaining to the protection of the world's cultural and natural heritage**, passed in 1972, within a network of UNESCO sites, by the "World Heritage Site Program" gathering natural or cultural areas of international importance, aiming to preserve these areas for the coming generations. The list comprises 127 natural sites whose preservation is a moral duty of mankind, sites which include the Danube Delta proposed by our country (1991).

➢ **The Washington Convention (CITES)**, passed in 1973, regulates the international trade with plant and animal species belonging to the wild flora and fauna threatened by extinction.

➢ **The Bonn Convention**, passed in 1979, aims at the preservation of migratory wild species all along the migration routes, in the reproduction areas and in the wintering neighborhoods, by means of an ecological management which will subsequently allow for a sustainable exploitation of species of kinegetic interest and the rescuing of the migratory species diversity. The secretariat of this convention issued in 1995 a special agreement concerning the migratory water birds in the Eurosian and African area (African – Eurasian Migratory Water Bird Agreement/AEWA).

➢ **The Bern Convention**, passed in 1979, was initiated with a view to preserving the wild life and the natural habitats in Europe, by means of crossborder cooperation.

➢ **The Biodiversity Convention from Rio de Janeiro, passed in 1992,** creates the legal frame for the preservation of biological diversity and the sustainable use of living natural resources. At the national level, the signing states must draw up national strategies and programs for the preservation of their natural biodiversity and sustainable development.

For an efficient preservation of biodiversity, Romania needs an adequate legal frame. At present, there are some laws pertaining to the preservation of biodiversity, as a consequence for joining the international conventions, as well as the national relevant legislation for the preservation of biodiversity, out of which we mention:

➢ **OUG 57/2007 pertaining to the regime of protected natural areas** regarding the regime of the protected natural areas, the preservation of natural habitats, wild flora and fauna;

➢ **Law no. 356/ 2007** for the approval of the OUG no. 57/2007 pertaining to the regime of protected natural areas;

➢ **The Minister Order 776/2007** pertaining to the declaring of sites of European importance as parts of the "Natura 2000" European ecological network in Romania;

➢ **HG 1284/2007 pertaining to the bird special protection areas** concerning the declaring the bird special protection areas, as part of the "Natura 2000" European ecological network in Romania;

➢ **Order no. 647/2001** for the approval of the Procedure for the authorization of activities related to the gathering, capturing and/or purchasing and trading on the domestic market or for export of the plants and animals from the wild fauna and flora, as well as their import.

The **Republic of Moldova** signed a range of **international conventions and agreements** in the field of environment. These both directly and indirectly aim to protect natural fish resources and their habitats. Among the signed conventions are:

➢ **Convention on Environmental Impact Assessment in a Transboundary Context (Espoo, 1991) -** joined by Parliament Decision Nr. 1546-XII from June 223. 1993;

➢ **Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus, 1998)** - ratified by Parliament Decision Nr. 346-XIV from April 7. 1999;

➢ **Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki, 1992)** - joined by Parliament Decision Nr. 1546-XII from June 223. 1993;

➢ **Convention on Biological Diversity (Rio de Janeiro, 1992) -** ratified by Parliament Decision Nr. 1546-XII from June 223. 1993;

➢ **Convention on Wetlands of International Importance (Ramsar, 1971) -** ratified by Parliament Decision Nr. 504-XIV from July 14. 1999;

➢ **Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), (Washington, 1973)** - joined by Law Nr. 1246 –XIV from September 28. 2000;

➢ **Convention on the Conservation of European Wildlife and Natural Habitats (Berne, 1979)** - joined by Parliament Decision Nr. 1546-XII from June 223. 1993;

➢ **Convention on the Conservation of Migratory Species of Wild Animals (CMS), (Bonn, 1979)** Joined by Law Nr. 1244 –XIV from September 28. 2000;

➢ **European Landscape Convention (Florence, 2000)** - ratified by Law Nr. 536 –XV from October 12. 2001;

➢ **Convention on Cooperation for the Protection and Sustainable use of the Danube River (Sofia, 1994)** - ratified by Parliament Decision Nr. 323-XIV from March 17. 1999;

➢ **Convention on the Transboundary Effects of Industrial Accidents (Helsinki, 1992)** -joined by Parliament Decision Nr. 1546-XII from June 223. 1993;

➢ **United Nations Framework Convention on Climate Change (CCNUSC) (New York, 1992)** - ratified by Parliament Decision Nr. 404-XIII from March 16. 1995;

➢ **Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (Basel, 1989)** - joined by Parliament Decision Nr. 1599-XIII from March 10. 1998;

➢ **Convention on Long-range Transboundary Air Pollution (Geneva, 1979)** - joined by Parliament Decision Nr. 399-X III from March 16. 1995;

➢ **Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Rotterdam, 1998)** - joined by Law Nr. 389 – XV from November 25. 2004;

➢ **Convention on Persistent Organic Pollutants (Stockholm, 2001)** - ratified by Law Nr. 40-XV from February 19. 2004.

There were also signed agreements supporting the environmental protection in the region and the management of water and biological resources, including those of the Prut River, as following:

- **Agreement** between the Government of the Republic of Moldova and the Government of Romania concerning cooperation on the protection and sustainable use of Prut River and Danube River waters (Chisinau, 2010);
- **Agreement** between the Government of Romania and the Government of the Republic of Moldova with Regard to the Cooperation in the Area of Protection of Fish Resources and the Regulating of Fishing in the Prut River and Stanca-Costesti Artificial Lake (Stanca-Costesti, 2003);

- **Agreement** between the Ministry of Waters, Forests and Environmental Protection of Romania, the Ministry of Environment and Territorial Development of the Republic of Moldova, and the Ministry of Environment and Natural Resources of Ukraine Concerning Cooperation in the Zone of the Danube Delta and Lower River Prut Nature-Protected Areas (Bucharest, 2000);
- **Memorandum** of Understanding on Cooperation at River Prut and Danube River between the National Administration Apele Romane and Apele Moldovei (1995);
- **Agreement** between the Government of the Republic of Moldova and the Government of Ukraine on Joint Use and Protection of Transboundary Waters (1994);
- **Regulation** on Operation and Maintenance of the Hydrotechnic Knot "Stânca-Costești" on the Prut River (1985).

Fisheries and aquaculture legal and regulatory framework in the Republic of Moldova:

- Law on Fisheries Fund, Fisheries and Aquaculture no. 149 from 08/06/2006 (Published: 11.08. 2006 in the Official Monitor of the Republic of Moldova no. 126-130, article 597)

It regulates procedures and conditions of the establishment and protection of fish stocks; reproduction, cultivation and harvest of aquatic organisms; amelioration of fishery water bodies. It defines the competences of public authorities, central (those responsible for the management of natural resources and environment protection - the Ministry of Environment, and those responsible for agriculture - the Ministry of Agriculture and Food Industry) and local, which have the right to manage aquatic biological resources. According to the law, the competences of the Academy of Sciences of Moldova and profile institutions consist of:

- participation to the elaboration of strategy of pisciculture development;
- carrying out scientific researches in the field of preservation and restoration of aquatic biological resources;
- working out scientific recommendations and methods of restoration, protection and preservation of aquatic biological resources.

- Water Law no. 272 from 23.11.2011 (Published: 26.04.2012 in the Official Monitor of the Republic of Moldova no. 81, article 264)

The law regulates the: a) management and protection of surface and underground waters, including measures to prevent and combat floods, erosion, and measures against drought and desertification; b) activities that have an impact on surface and underground waters, including the capture and use of water, discharge of waste water and pollutants, and other activities that could harm the water quality. The establishment of a legal base of international cooperation in the field of joint management and protection of water resources is one of the goals of the Law.

- Law on Foodstuffs no. 78-XV from 18.03.2003 (Published: 28.03.2004 in the Official Monitor of the Republic of Moldova no. 83-87, article 431)

This law establishes: a) a legal framework for production, processing and distribution of foodstuffs, and b) basic conditions governing the circuit of these products including safety standards aiming to protect human health and consumer's interests in relation to foodstuffs. It also promotes fair practices in the field of food trade.

Trends of the legislation in the field:

- Romania's Policy, especially the regional one, in the field of the environment protection, part of it being common with the desiderata undertaken and declared by the authorities from the Republic of Moldova, implies a series of measures leading to:

- The improvement of the Prut River waters quality, by diminishing and stopping pollution sources in its tributaries;

- The expansion of protected areas on both banks and the establishment of a crossborder protected area;

- The development of a common scientific concept related to the management of the Stânca-Costeşti reservoir waters, which will provide for the discharge downstream the dam, and which will preserve the viability of the biodiversity in the Prut River, etc.

- The initiation of a constructive dialogue at the ministries level and among NGOs for the establishment of a joint database about the hydrographic basin of the Prut River, and the mutual operative information about the encouragement and sustaining of bilateral activities and joint projects between local authorities and NGOs on both banks;

- The support of a grant program for environment related issues in the hydrographic basin of the Prut River from the funds specially assigned for this;

- The initiation of an economic research with a view to reasoning for the rational management of the water potential of Stânca-Costeşti reservoir;

- The development of a joint information, ecological education and public awareness program on the transformtion of the Prut River into a clean river which is to contribute to the viability of the Danube and the Black Sea ecosystem.

I.4. Terminology glossary

Ecological accident – the event occurred as a consequence of some unexpected discharges/ emissions of dangerous/polluting substances or prepared products in liquid/solid/gas form or as vapor or energy, deriving from the performance of some uncontrolled/brutal anthropic activities, whereby the natural and anthropic ecosystems are destroyed;

Imminent threat with a prejudice **–** sufficient probability to bring about a prejudice on the environment in the near future;

Environment deterioration – altering the physical-chemical and structural characteristics of natural and anthropic components of the environment, reduction of biological diversity or productivity of natural and anthropized ecosystems, impact on the natural environment bearing effects on the quality of life, mainly caused by the pollution of water, atmosphere and soil, the overexploitation of resources, their scarce management and capitalization, as well as the inappropriate management of the territory;

Disasters: events due to the triggering of some risks, because of natural causes or brought about by man, causing human casualties, material losses or changes of the environment, whereby, given their largeness, intensity and consequences, they reach or even exceed the specific levels of seriousness set by the regulations concerning the management of emergency situations;

Ecological balance – the ensemble of statuses and interrelations between the components of an ecological system, which secure the preservation of its structure, performance and ideal dynamics;

Ecosystem – the dynamic complex of plants, animals and microorganisms communities, and the abiotic environment, which interact in a functional unity;

Effluent – any form of discharge into the environment, punctual or diffuse emission, including leakage, jets, injection, inoculation, storage, emptying or vaporization;

Emission – direct or indirect evacuation, from punctual or diffuse sources, of substances, vibrations, electromagnetic and ionizing radiations, heat or any noise into the air, water or land;

Information related to the environment – any written, visual, audio, electronic information or any other form of information about:

a) the state of the environment components like the air and the atmosphere, the water, the soil, the earthcover, the landscape and the natural areas, including the wetlands, the marine areas and the coastal areas, the biological diversity and its components, including the genetically modified organisms, as well as the interaction between these elements;

b) factors like substances, energy, noise, radiations or wastes, including radioactive wastes, emissions, discharges and other evacuations into the environment, which impact or may impact the environment components mentioned under letter a);
c) the measures, including administrative measures like policies, legislation, plans, programs, conventions concluded by public authorities and natural and/or legal entities concerning the environmental objectives, the activities that impact or may impact the components and factors mentioned at letter a) and b), as well as the measures or the activities meant to protect the components mentioned at letter a);
d) The briefings related to the implementation of the legislation pertaining to the protection of the environment;
e) The cost-benefit analysis or other analyses and economic prognoses used in relation with the measures and activities mentioned at letter c);
f) the state of human security and health, including contamination, anytime it is relevant, of the trophic chain, the human life condition, the archaeological sites, historic monuments and any other constructions, as long as they are or can be impacted by the state of the environment components stipulated at letter a) or, through these, by the factors, measures and activities mentioned at letter b) and c).
Preventive measures – any measure taken as a response to an event, an action or an omission that created an imminent threat with a prejudice on the environment, with a view to preventing or diminishing the prejudice in question;
Restorative measures – any action or ensemble of actions, including measures to reduce the prejudice or interim measures meant to restore, rehabilitate or replace the prejudiced natural resources and/or the damaged services or to provide for an equivalent alternative for these resources or services;
Monitoring the environment – surveillance, forecasting, warning and intervention with a view to systematically assessing the dynamics of the qualitative characteristics of the environment components, with a view to getting to know their quality status and ecological significance, the development and the social implications of the changes having occurred, followed by the right measures to be taken;
Pollutant – any substance, chemical product in solid, liquid or gas form, or as vapor or energy, electromagnetic, ionizing, thermic, phonic radiation or vibrations that, once inserted into the environment, changes the balance of its components and of the living organisms, and brings about damage to material assets;
Pollution – direct or indirect introduction of a polluting agent that may cause damage to man's health and/or the environment quality, that may cause damage to assets/material goods or a deterioration, or obstruct the use of the environment for leisure purposes or other legitimate purposes;
Prejudice – the quantifiable in cost effect of the damages on the people's health, assets or the environment, caused by polluting agents, harming activities or disasters;
Prejudice on the protected species and natural habitats – any prejudice that bears negative significant effects on the reaching or maintaining of a faborable preservation of such habitats or species; the significant character of these effects is assessed in relation with the original status, taking into account the criteria stipulated in Appendix no. 1; the prejudices brought to the species and protected natural habitats do not include the previously identified negative effects, which derive from the actions of an operator who was explicitly authorized by the relevant authorities, according to the provisions of Art. 28 paragraph (2) and (6)-(9), as well as Art. 38 of the OUG no. 57/2007 pertaining to the regime or protected natural areas, the preservation of natural habitats, of wild flora and fauna, passed with its amendments and supplements by Law no. 49/2011.
Emergency situation: exceptional event, non-military in nature, which, given its size and intensity, poses a threat to the population's life and health, to the environment, material goods, and for the restoration of the normality status some urgent measures and actions are needed, as well as the assignment of additional resources and the unitary management of the involved forces and means;

Magnitude of the emergency situation: the magnitude of the manifestation area of the destructive effects of the event in question, having an impact on the life of people, the performance of the State's institutions, the values and interests of the community;
Intensity of the emergency situation: the development speed of the destructive phenomena, the degree of perturbation from the normality status;
The potentially generating emergency situations status: a complex of risk factors which, by their uncontrolled development and the imminence of the threat, could impact life and the population, material and cultural assets, and the environment factors;
Imminence of the threat: the status and time parameters that bring about the inevitable triggering of an emergency situation;
Alert status: this is declared according to the legal provisions in force; the implementation of the action plans and the measures related to the prevention, warning, limiting and removal of the consequences of an emergency situation;
Emergency situation management: all the performed activities and the procedures used by the decision makers, the relevant institutions and public services in charge of the identification and monitoring of risk sources, the evaluation of the information and the analysis of the situation, the elaboration of forecasts, the setting of action variants and their implementation with a view to restablishing normality status;
Monitoring of the emergency situation: the surveillance process necessary for the systematic assessment of the dynamics of the created situation parameters, for knowing the type, magnitude, intensity of the event, its development and social implications, as well as the way to accomplish the measures set in place for the management of the emergency situation;
Risk factor: phenomenon, process or complex of congruent circumstances at the same time and in the same place, which may determine or favor the emergence of some risk types;
Types of risk: extensive fires, earthquakes, floods, accidents, explosions, damages, earth slides or falls, mass illness, constructions, installations or facilities collapse, ships wreck or sinking, fall of objects from the atmosphere or space, tornadoes, avalanches, the failure of the public utilities services, and other natural calamities, serious accidents or major public events brought about or favoured by specific risk factors;
Management of the emergency situations: identification, recording, assessment of the types of risks and factors determining these risks, the warning of the population, limitation, removal, counteracting of risk factors and negative effects, as well as the impact caused by those exceptional events;
Operative intervention: the activities carried out in due time by the specialized structures with a view to prevent the worsening of the emergency situation, to limit or remove its consequences, as the case may be;
Evacuation: protection measure taken in the event of an imminent threat, of an alert status or the rise of an emergency situation, which resides in the organized removal from the affected areas or likely to be affected of some public institutions, businesses, categories or groups of population or goods, and their placing in areas and localities that provide the appropriate protection conditions for people, goods and values, and performance of the public institutions and of the businesses.
Drought: Insufficient humidity of the soil and atmosphere in relation with the minimum values necessary for the normal growth and development of (cultivated) plants. ♦ Weather, characterized by such an insufficiency; dry, droughty weather.
Flood: The covering of a land area by a large amount of water coming from the overflow of waters, from rain); large amount of water from the rivers and streams overflown on the banks, because of an increase of the water flow subsequent to a sudden melting of snow or the abundance of rains.
Original status – the status of the natural resources amd services at the moment of the prejudice, which would have existed if the prejudice on the environment had not occurred, estimated as such based on the best available information and data.

CHAPTER II: PRIORITIES AND OBJECTIVES OF THE ACTION PLAN FOR EMERGENCY SITUATIONS

II.1. Types of hazards that are object of the plan for emergency situations

The protection and intervention measures refer to the following types of hazards:

- Drought
- Floods
- Accidental pollution.

As dangerous hydrological phenomenon for Prut River are considered *the spring high waters* – characterized by slow increases of the river water level, long lasting, periodically repeated (same season), conditioned by snow melting and overlaped rains. As a consquence, the lowlands are flooded, usually the river floodplain.

For the Prut River *the spring high waters* start at mid-March and finish at the end of April. According to the observations, the earliest terms for *the spring high waters* start correspond to the 3rd decade of January and the latest to the 3rd decade of March – 1st decade of April.

For the Prut River *the pluvial floods* – sudden increases of the river flow caused by torrential rains are characteristic as well.

The peril of floods is present in the sector upstream of the Stânca-Costești reservoir, because the river course is natural and the slope is high.

Water levels/quotas used in the hydrological forecast for Prut River in Republic of Moldova

Water level/Quota	Șirăuți	Ungheni	Code	Code description
Atention quota	350 cm	420 cm	YELLOW	There are risks of floods or sudden increases of water level that do not lead to significant losses, but necessit an increased vigilance in the case of seasonal and/or exposed to floods activities.
Flooding quota	536 cm	530 cm	ORANGE	There are risks of major floods that may significantly impact upon comunities activities, people and goods security
Peril quota	740 cm	650 cm	RED	There are risks of catastrophic floods. Human lives and goods security are threatened.

Another characteristic hydrological phenomenon is *the etiage* – characterized by low water level and flow. For the Prut River, this corresponds to the lowest water level usually observed in August- September.

Prut River water chemical componence and quality are determined by natural and anthropic factors. Among the natural ones: the structure and componence of rocks and soils, the relief of the watershed, the structure and abundance of the communities of hydrobionts not enough studied so far. An enormous influence had the drought from the years 2007 and 2015, the heats and the floods from the years 2008 and 2010-2015. Among the major anthropic factors we mention the discharge of waters and wastes in Prut River watershed, the construction and functioning of the Giurgiuleşti terminal.

Main sources of ecotoxicants penetration in the aquatic ecosystems originate in household activities (and unsatisfactory cleaning of waste waters), production (without applying effective methods of waste recycling), agriculture (abuse of pesticides and fertilizers) and transportation (fuels and oils leaks), etc.

These persistent and extremely toxic substances (raw oil products, detergents, disinfectants, products from the plastics industry and synthetic fibers, pesticides, heavy metal salts, electrolites, pharmaceutical products (such as antibiotics and contraceptives), colorants, solvents, etc.), penetrate through different ways (by tributaries of Prut River, together with the abundant precipitations, a unauthorized landfills, etc.), cause severe disfunction in the production-destruction proceses, especially at the decomposers level (until their total extinction).

Water is a compulsory condition for the fish populations' existence. In extreme conditions, even an ecological disaster, these almost have no salvage posibility. At the same time, fishes represent the ultimate link of the food chain, they can form different trophic levels, occupy separate trophic niches and, consequently, may be directly affected by what is occurring at the producers' level (phytoplankton, macrophytes) and at primary consumers' level (zooplankton, zoobenthos, etc.). The bioaccumulation process is most evident at the top of the trophic pyramid, thus reflecting the status of health of the entire ecosystem.

The ecosystems aquatic are especially affected by the chemical stress due to the pollutants' tendency to homogenously and fast distribute in the area of active mixing. In such circumstances, modification of the chemical characteristics of the environment will eliminate some sensitive species and will advantage some species more resistant to toxics.

The chemical stress may be expressed by replacement of the species „*more competitive but more sensitive"* by the species tolerant to stress factors. In certain cases may occur a real „*bloom of the oportunistic species*", that normaly are excluded or marginalized by competition or predation.

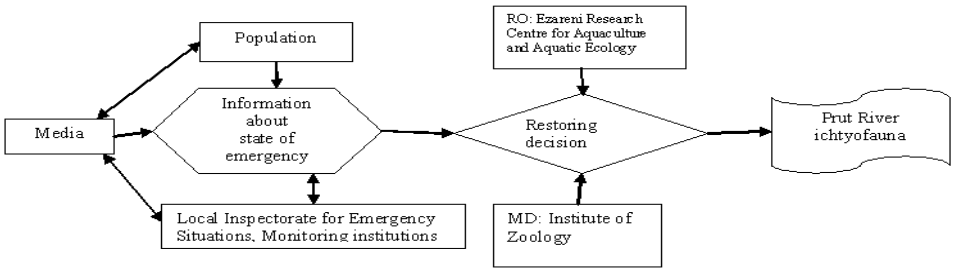
An acute polution with lethal effect conducts to the total extinction of the species, no matter the ecosystem succesional stage and consequent installation of the „pioneer species resistant to toxics" (often invasive). On the other hand, in the case of a chronical chemical exposure, the selective removal of the sensitive species occurrs, with the replacement of the dominant positions with the opportunistic species. Changes are fast if the dominant species are very sensitive to the disturbing factors. If the exposure time is enough, the regresion tendencies may become ireversible, even after the stress factor removal.

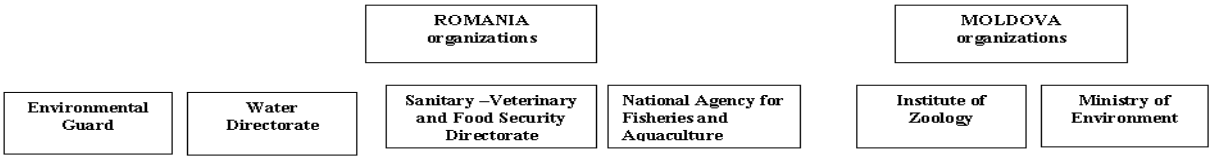
II.2. The goal of the action plan for emergency situations

The Action Plan for emergency situations was drawn up as part of the project called *Resources pilot centre for cross-border preservation of the aquatic biodiversity of Prut River* code MIS ETC 1150 carried out between 08.05.2012-31.12.2015 under the coordination of the "Alexandru Ioan Cuza" University from Iaşi, in partnership with the Zoology Institute of the Sciences Academy from the Republic of Moldova. The project was financed by a grant thanks to the Operational Joint Program Romania – Ukraine – The Republic of Moldova, 2007-2013.

The goal of the Action Plan for emergency situations is to secure and coordinate the human, material and logistical resources in order to restablish the biodiversity characteristics of the fish populations from the Prut River, in the event of some major accidents caused by natural phenomena (drought, floods) and/or anthropogenic actions (major pollution).

II.2.1. Diagram of the information flow





II.2.2. Signals indicating the rise of an emergency situation:

- Low capture in terms of the number of individuals from a particular fish species
- Extinction of some fish species

By comparison to the list comprising the 44 species, published in 2004 by Usatîi M., 11 species are missing from the actual list, but there are other 2 new species, namely *Lota lota* and *Perccottus glenii*. Man's action has altered the fish population structure, thus leading to the reduction of the characteristic species: *Abramis brama* – common bream, *Barbus barbus* – common barbel, *Blicca bjoerkna* – white or silver bream, *Cyprinus carpio* – common carp, *Chondrostoma nasus* – common nase, *Vimba vimba* – vimba bream, and *Leuciscus idus* – ide. Despite that, the coenosis has still got the ability to recover and preserves its ecological functions. Except for the reservoir, where the habitat is completely modified, in all the other sections of the river, the alterations are not very serious, and the fish populations' structure could be restored simultaneously with the restoration of the floodable areas of the floodplain.

- Emergence of some invasive fish species:

The issue related to the invasive species from the Prut River and the Republic of Moldova has been investigated by the team from the Academy Zoology Institute from the Republic of Moldova, and is presented in extenso in the monographic volume "Biodiversity, bioinvasion and bioindication in the research of the fish fauna from the Republic of Moldova" published in 2014, authors: Dumitru Bulat, Denis Bulat, Ion Toderaș, Marin Usatîi, Elena Zubcov, Laurenția Ungureanu, 430 pages.

The invasive species that entered most interior waters of Romania are also present in the Prut River:

- The Prussian carp, *Carrassius gibelio*, has entered our waters for over a century now, namely the ponds from Moldavian plateau. The species is fully acclimatized, abundant and common.

- The Asian cyprinidae: grass carp *Ctenopharingodon idella*, silver carp *Hypophthalmichthys molitrix* and bighead carp *Aristichthys nobilis* were inserted in most farms in 1960-1970, are raised even today and present in the Prut River. *Hypophthalmichthys*

has been populated in the reservoir and is present all along the river stream. There are elements indicating that the species naturally reproduces in the lower Danube, where from it may also get up to the Prut River.

- The stone moroko *Pseudorasbora parva* entered in the '70s, together with embryo roe of Asian cyprinidae; it is present in the Prut River, being kept under control by predators and competing species.

- Pumpkinseed *Lepomis gibbosus* is today accidentally present in some ponds from the Prut floodplain.

- The Chinese Sleeper, *Perccottus glenii* has recently entered the upper stream of the Prut River.

It is worth mentioning that the penetration of the invasive species is facilitated by the degradation of habitats and the extinction of sensitive species. In the intact habitats, these species are competing against well adapted indigenous species, and efficiently kept under control by predators.

- Deterioration of the natural habitat of the fish species and others:

If previously the floodplains were supplied by the rich, fertile mud brought along by floods and high waters, the former fertile soils have degraded and become salinized.The water level in Prut has considerably dropped down, for economic reasons, limiting the water supply of the remaining lakes, ponds, and mires, whose surface continues to decrease. The annual flow of the Prut River from its springs to its outflow is 2.9 cube kilometres of water.

Here is what Dimitrie Cantemir used to write about the Prut water: "The water of Prut, is the quickest and healthiest one among the ones we known, although it seems muddy because of the sand it carries along. And yet, observed in a glass bowl, it precipitates, remaining very clear …"

At present, the quality of the Prut water is no longer what it used to be during Dimitrie Cantemir's time. It is polluted by different chemical and organic substances; and yet, after cleaning, the Prut water is used as drinkable water in the neighboring localities. It is used also irrigation, in industry and in other sectors of the national economy.

The river bed is clean (it is not covered by aquatic plants), the bottom is irregular, covered by sand and pebble. One often notices sand islands and banks, which contribute to the intensification of the water masses mixture. Depth: 1-2 m, in the deep sectors of the river bed in-between its thresholds: 4-6 m. Water stream speed: 0.4-2 m/s.

We would like to mention some of the activities having had a negative impact on the biodiversity of the Prut River middle stream: drying ponds, the transformation of these lands into agriculture fields, mass grassland deforestation, the construction of the dam and the Stânca-Costeşti reservoir, abusive and irrational grazing, the grubbing-up of the steppe coasts, poaching etc.

The construction of the Stânca–Costeşti reservoir dam has brought about numerous advantages: countering floods, development of irrigations, water supply, electrical power production and pisciculture. The retention, in the reservoir, of an attenuation volume of 550 millions m^3 secures the attenuation of the flood of 1%, from 2940 to 700 m^3/s and, together with the damming downstream from the hydrotechnical node, provides with the removal of some 100 000 hectares from the flood risk. According to STAS 4273 - 61, the dam falls under the class of importance II.

Infiltrations from the dam at the Old Quarry are dangerous though. This is why the related risk index goes up to 0.72 and the dam falls under the exceptional importance category, for which special followup is needed, more than ever before.

Large industrial centers of the two countries are gathered in the hydrographic basin of the Prut River, in this particular area; this is where agriculture companies carry out their

activity, and, therefore, the quality of its waters very much depends on man's influence in the area and the compliance of nature protection measures, based on scientific analyses and the knowledge of the intra-basin processes related to the repartition and migration of chemical elements.

The stability of the freshwater ecosystems depends, to a great extent, on the quality of the water and the normal performance of species, which exert a great influence on the formation of its quality.

With regard to the intense pollution of the environment, eco-toxicological research has expanded a lot, being oriented toward the deciphering of the biological importance of chemical substances and their action on hydrobionts and water quality.

Any type of household related activity carried out by man on the territory of the water capture basin directly or indirectly acts on the hydro-chemical and hydro-biological regime of the water body. The quality of the water is influenced to a great extent by the polluting agents that penetrate the stream together with the waste waters and the surface runoff. There may be household waste water, industrial waste water, (agriculture) drainage water, surface runoff.

Household waste waters insert, into the water bodies, significant quantities of organic and mineral substances in dissolved, colloidal form and as suspensions.

According to their composition, industrial waters are very diverse and contain salts of heavy metals, crude oil, crude oil products, phenols, tensioactive agents. For a large number of chemical products, there are no removal methods in the water cleaning process, which is why the penetration of such substances can have serious consequences on the water ecosystems.

The discharge from the farming lands brings along considerable amounts of mineral salts, organic and anorganic fertilizers, as well as toxic chemical agents.

The surface runoff from the urban territories contains high amounts of susbstances in suspension, organic matter, salts of heavy metals, and etero-soluble substances.

All the types of surface runoff are characterized by sudden oscillations of the pollution level. A great danger for hydrobionts is the regulating of the water streams, which cannot always be consistent with their biological needs. For example, many fishes lay their roe at certain temperatures, in less deep waters, which, in the event of the stream regulation, often remain bared, and consequently the conditions for the development and nutrition of the spawn change.

The rheophile habitats from the Prut mid-channel owe their diversity to the geological constitution of the substrate whereby the river forms its bed, and also to the water flow speed. Downstream the Mitoc-Stânca area, one would often come across habitats that the locals would call "shallow waters", having the bottom made up of pebble or sands, and having a swift stream, which alternate with habitats with the bottom made up of clay or loess, having high banks, low water flow speeds, and big depths, making up "valleys" or "whirlpools". The fishes, those species of fish that are "permanent inhabitants" of those habitats were the sturgeon ones: sterlet (*Acipenser ruthenus*), frequent and the bastar sturgeon (*Acipenser nudiventris*), which is quite rare. These species could be seen all along the Romanian mid-channel of the Prut River, but especially in the river rapids area.

In the Prut River basin, a perimeter inhabited by man since "always", the fauna structure has gradually undergone the anthropic impact that changed the composition of the fish populations, which later on led to their depletion and even the extinctiion of certain species. The extinct fishes from the Prut waters are the European sea sturgeon (*Acipenser sturio*), the verner (*Carassius carassius*), the blue bream (*Abramis ballerus*), the tench (*Tinca tinca*), and the pike (*Esox lucius*).

The exploitation of the hydrotechnical complex Stânca-Costeşti, as well as other hydrotechnical facilities situated on the tributaries of the Prut River, the catchment of the

water for irrigation and urban, every day needs, the environment pollution by wastes, waste and household used waters, imbalances of the hydrological and physical-chemical regime, caused by the performance of the power plant, plus other anthropic activities have brought about radical changes on the functional status of the fish populations from the river bed and the basin of the Prut River, in general. There are ongoing negative changes in the composition of the fish populations; there is an ongoing replacement of the valuable species with species having a limited growth rhythm and economically depreciated species, and the reproduction conditions of the fish aboriginal species also change. The prevention of these phenomena, which may have negative consequences for the fish populations, cannot be achieved without the diversity in detail study, the mapping of the fish populations distribution in the Prut River, the identification and the protection of the reproduction and wintering spots of valuable species, which are vulnerable and jeopardized by the fish, the issuance of the principles related to the formation, performance and preservation of the fish pool.

Summary of the evaluation of issues related to watermanagement, relevant for the Prut River (adaptation after Alexander Zinke, 2007)

Types of impact		Prut River
Pollution	Nutrients loading	+
	Dangerous substances	+
	Organic	+
	Heat	+
Hydromorphological	Longitudinal connectivity	+
	Lateral connectivity	+
	Water alterations, water uptake	+
	Drinkable water source	+
	Sedimentation management	+
	Availability as a source of drinkable water	
	Change of habitats and ecological associations, loss of ecosystems	+
Fish and living resources use and management	Over-use	+
	Useless capture (bycatch), waste	
	Decrease of stocks by contamination/illnesses	
	Impact on the biological and genetic biodiversity	+
Floods	Use of natural retention areas	+
	Flood technical administration	+
	Training for emergency situations	+
Invasive species	Allogen species	+
	New parasytes and deseases	+
Social and economic changes, having a crossborder impact on the waters management	Increase or decrease of the human population	+
	Increase/decrease of the industrial production, of used and discharged water	+
	Development of the agriculture sector, irrigations, drainage	
	Tourism, water tourism	
	Wastes management	+
	Hydroenergetic structures	+
Drought		

1. **The risk situations due to ecological accidents or accidental pollution** may have extremely serious consequences, but, in the case of the Prut River, are highly unlikely to occur, and this is a consequence of the current economic situation in the Moldavia region, and the relatively low industrial development level in the neighboring counties on both banks.

2. **The risk situations due to extreme weather phenomena**, more frequent subsequent to the climate changes in the past few years, subject the fish populations to stress.
The large oscillations level is a characteristic of waters in Moldavia's Plateau. We have to admit that the flow oscillation is a natural phenomenon, which all the species in Moldavia's Plateau are adapted to. Most of these species have a natural capacity to rapidly redo their number as soon as the environmental conditions go back to their normal coordinates, by moving and getting shelter in more recluse habitats, and by prolificacy. As Grigore Antipa demonstrated at the beginning of the last century, periodical floods are a major factor in the regulating and maintaining of healthy fish populations. This ecological reality had recently come back under the name of "flood pulse concept".

3. **The risk situations amplified by man's action**. The natural recovery capacity of the fish fauna is undermined because of the alteration of some environmental factors, as a consequence of man's intervention. Examples:

- Dams and defence embankments interrupt the rivers connectivity and block the movement of the aquatic species, which, thus, are prevented from sheltering and/or repopulating the areas affected by natural or man caused disasters. The Prut River, upstream from Stânca-Costești reservoir, in the dammed lower floodplain, and the lower stream of Jijia, have undergone strong alterations, and are now significantly modified;
- Water uptake from the river beds for different uses reduces the size of the water habitats and populations;
- The discharges of waters from agricultural or urbanized lands have a negative impact given the polluting agents they contain. This effect is felt in all the small tributaries of the Prut River, both in Romania and in the Republic of Moldova;
- The drainages of the wetlands diminish the area of specific habitats and the size of the populations. The aquatic reserve "Old Backwater of the Teiva-Vișina pond" and many other areas from this floodplain are in this situation;
- The nutrients carried away from the agriculture lands degrade the ground waters in the Moldavian Plateau, in the following counties: Botosani, Iasi, Vaslui, in the Prut and Siret Rivers watersheds;
- The invasive species jeopardize the native ones: *Lepomis gibossus* and *Percotus glenii* feed on eggs, larva and spawn from some rare amphibians and fish species, protected by law;
- Climate changes increase the emergence of disastruous weather phenomena.

The Action Plan should suggest some measures likely to favor the fauna's recovery natural capacity, measures that are more efficient and sustainable, on a long term, than the repopulation direct actions, which are more difficult to sustain, economically speaking, because of the related costs and logistical issues. The proposals should include: the restoration of some reproduction areas in the floodplain by restoration projects, the adoption of current European policies in the field of protection against floods, "more room for the rivers", and cooperation with the administrators of the Stânca-Costesti reservoir, so as to secure an annual cycle of the flow as close as possible to the natural one.

4. The risk situations due to the emergence and proliferation of some invasive species, favored by human activities and/or climate changes.
The situation of these species needs special monitoring and, if necessary, the suggesting of measures to attenuate the negative impact on the ecological balance.

The Prut River is one of the best preserved great rivers of Europe and of Romania; it is included in various systems related to the preservation and national and international protection for almost all of its stream (RO SPA 0058 Stânca-Costesti Lake, RO SCI 0213 Râul Prut, The Lower Prut Lower Floodplain Natural Park, Beleu and Manta lakes from the Republic of Moldova) and make up, naturally, a "green corridor" connecting the Danube Delta Biosphere Reserve and the protected areas from Northern Europe. Any intervention and development plan related to this region should start from the argument of the ecological services value generated by the "ecological infrastructure" provided by the Prut River.

II.3. Information sources regarding the emergency situations:

No.	Information source	Information collection method	Information method
1.	Population, businesses	Direct observation, samples	Written notification, by email or telephone
2.	Written and/or audio-visual media	Public notifications	Press release or news
3.	Institutions specialized in the monitoring of the hydrological, physical-chemical and biological characteristics of the Prut River		
3.1.	Prut-Bârlad Watershed Administration	Periodical sampling (per semester/monthly/daily) and processing in the lab (water, sediments, fish population)	Monitoring brief
3.2.	The Agencies for the Environment Protection from Botoşani, Iaşi, Vaslui, Galaţi	Periodical and instantaneous sampling upon the emergence of event – processing in the lab (water, sediments)	Analysis bulletin
3.3.	Sanitary Veterinary and Public Health Directorate from Iaşi	Sampling upon noticing the event and processing in the lab (fish population)	Analysis bulletin
3.4.	National Environmental Guard County Commisary Units from Botoşani, Iaşi, Vaslui, Galaţi	Control upon noticing the event	Finding note and identification of source and liability
3.5.	The Ministry of the Environment from the Republic of Moldova – Natural Resources and Biodiversity Directorate	Periodical sampling (quarterly/monthly/daily) and processing in the lab	Monitoring brief
3.6.	The Ministry of the Environment from the Republic of Moldova – Waters Management Directorate	Periodical sampling (quarterly/monthly/daily) and processing in the lab	Monitoring brief
3.7.	The Science Academy of Moldova – the Zoology Institute	Periodical sampling (quarterly/monthly/daily) and processing in the lab	Monitoring brief
3.8.	The Aquaculture and Aquatic Ecology Research Station Ezăreni	Periodical sampling of water, sediments, fish population, with a view to establishing the environmental prejudice and the punctual action plan for the restoration of the environmental balance	Monitoring brief ; evaluation brief : Action plan
3.9	The Inspectorate for Emergency Situations Iaşi		

CHAPTER III. INTERVENTION OUTLINES IN CASE OF AN EMERGENCY SITUATION

III.1. Regular monitoring of the fish population in the Prut River
III.1.1. Sampling spots

The decision to restore the environmental balance state shall be taken by agreement by the involved institutions. The support population or repopulation, as the case may be, shall be done in the following transversal sections of the Prut River: Stânca-Costeşti, Ungheni, Prisecani-Bumbata, Oancea-Cahul, and Şiviţa-Giurgiuleşti.

The support population or repopulation, as the case may be, shall be done with indigenous species at the stage of: roe, larvae, and reproductive fish.

III.2. Fish species that will provide the support population or repopulation of the Prut River

Species of rare fish, threatened by extinction, which live in the Prut River, and whose populations need interventions to secure the preservation and the restoration of the populations.

Measures are needed for most of these species, for the restoration of habitats, and of the lateral and longitudinal connectivity.

For certain species, it takes measures for forbidding the capture, measures adopted by bilateral moratoria and/or a strict limitation of the quantities allowed for fishing.

Order	Family	Name	Actions
Acipenseriformes	Acipenseridae	*Acipenser rhutenus*	Spawn/moratorium
		Acipenser nudiventris	Spawn/moratorium
Clupeiformes	Clupeidae	*Alosa tanaica*	
Cypriniformes	Cyprinidae	*Aspius aspius*	Limitation
		Leucaspius delineatus	
		Alburnoides bipunctatus	
		Abramis (Ballerus) sapa	
		Vimba vimba	Moratorium
		Carassius carassius	Spawn
		Leuciscus idus	Moratorium
		Pelecus cultratus	Moratorium
		Chondrostoma nasus	Moratorium
		Rhodeus sericeus	
		Barbus petenyi	Limitation
		Barbus barbus	
		Romanogobio kessleri	
	Cobitidae	*Misgurnus fossilis*	
		Cobitis taenia	
		Sabanejewia aurata	
	Siluridae	*Silurus glanis*	Limitation
Gadiformes	Lotidae	*Lota lota*	
Gasterosteiformes	Gasterosteidae	*Pungitius platygaster*	
Perciformes	Percidae	*Gymnocephalus schraetser*	
		Gymnocephalus baloni	
		Zingel streber	
		Zingel zingel	
	Gobiidae	*Gobius fluviatilis*	
		Gobius kesslerii	
		Proterorhinus marmoratus	

One of the objectives of the Pilot Centre is to preserve the rare and threatened species populations. For the achievement of this objective there is a strategic, efficient way, which takes a significant amount of time: this method/way resides in interventions for the preservations of habitats.

Another quick response that may provide, on a short term, the preservation of the cohorts of certain species is the repopulation with spawn obtained under directed/artificial conditions. For this type of intervention, the first stage is the capture of the reproducers, with a view to achieving the directed reproduction.

The capture is done by scientific fishing in the natural habitats where these species are still present. For fishing, non-lethal methods are used, such as electronarcosis or, in the case of sturgeons, fishing with the help of drifting gill nets.

The procedures used for fishing are similar to the ones used for the investigation of the fish populations (see the ***Methodological Guide for the monitoring of the fish populations structure***, Chapters 2 and 3). The only difference is that only certain species are targeted, and the captured specimens are not set free immediately, but transported to the station Ezăreni, to be used in order to obtain spawn.

Dynamics of the management of an emergency situation jeopardizing the fish resources of the Prut River

	Activity	Involved factors	Tools
1.	Knowledge and understanding of the phenomenon generating the emergency situation	APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate Higher education and research institutions The Meteorology and Hydrology National Institute The National Management System for Emergency Situations The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni	Database Risk maps Handbooks and specialty papers Working procedures
2.	Capitalization of the previous experience	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate Higher education institutions	Database Professional papers
3.	Monitoring of normality, abnormality, critical situation and emergency	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate Higher education institutions	Multi-valent network, updated on a permanent basis
4.	Identification, evaluation and forecast based on the capitalized experience and the existing databases comprising the challenges, dangers and threats that may occur in the event of possible emergency situations.	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni Prut-Bârlad Basin Directorate Higher education institutions The National Management System for Emergency Situations	Databases Dynamic inventories of species of interest, of dangers and threats Maps, graphs, assessments, prognoses Guidelines Warning and alerting systems

5.	Calculation of the risk level for each and every type of possible event, for the river sectors, types of habitats and fish species	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni Higher education and research institutions APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate	Risk levels grids Risk maps Standards, graphs etc.
6.	Issuance of policies and strategies for timely intervention meant to diminish effects and for the protection of the natural heritage	The Resources Pilot Centre for the preservation of the aqutic biodiversity Ezăreni Higher education and research institutions APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate	Strategies for emergency situations Tactics, procedures, standards
7.	Issuance of the intervention plans per sectors, habitats and species, according to the emergency that occurred	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni Higher education and research institutions APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate	Intervention plans Missions, tasks, responsibilities
8.	Issuance of the measures needed for the preservation, reconstruction of habitats and the repopulation with rare species or threatened by extinction	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni Higher education and research institutions APM: Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate	Plans Documentations Methodologies Projects
9.	Issuance of the training framework for specialists and voluntaries who are to efficiently work in case of an emergency	Higher education and research institutions	Curricula, courses, professional training systems
10.	Development of the Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni, its connection with other institutions tasked with the monitoring of the aquatic fauna and intervention in the event of perturbating situations	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni Higher education and research institutions Central and local authorities Ministry of the Environment National Agency for Fishing and Aquaculture	Protocols of collaboration with other institutions Laws, Govermental Decisions Research projects and grants
11.	Establishment of a single action centre for monitorization and intervention with a view to connecting all the action systems in the event of an emergency threatening the preservation of the fish fauna of the Prut River	The Resources Pilot Centre for the preservation of the aquatic biodiversity Ezăreni Higher education and research institutions APM Botoşani, Iaşi, Vaslui, Galaţi Prut-Bârlad Basin Directorate Central and local authorities	Policies, strategies, doctrines, tactics, standards, procedures

Action plan for the reduction and decrease of the risks related to the fish species threatened by extinction from the Hydrographic Basin of the Prut River

- Inventory of threats to the fish species
- Localization of actions and action directions of threats
- Removal of the harming-negative effect of threats (counteraction measures)
- Analysis of the exerted anthropic pressures and the marking, on the river stream, of centres of maximum anthropic action and pressure
- Evaluation of the vulnerabilities of fish species and other aquatic animals and habitats
- Establishment of the ecological impaxct of the threat/vulnerability upon the fish species
- Plan of measures proposed for the reduction of the ecological impact of anthropic threats/pressures/vulnerabilities upon the rare and vulnerable fish species
- Achievement of the action plan by means of partnerships between the Romanian Waters Company – the Waters Directorate Prut and the "Alexandru Ioan Cuza" University from Iași, in collaboration with Prut environment protection NGOs (workshops or conferences that shall take place in November-December, at the end of each year)
- Implementation of the action plan by:
- Setting the necessary institutional frame for the amendment of the management plan by the neighboring EPAs (Botoșani, Iași, Vaslui, Galați)
- Annual verification and implementation of measures to reduce threats/impact to the environment, as well as man's pressures, by the Environmental Guard Botoșani, Iași, Vaslui, Galați, in partnership with the Fishing and Aquaculture National gency - ANPA, The Border Police, The Romanian Waters Company
- Media coverage of these activities, on an annual basis, by TV stations, the written press, partner NGOs, the responsabile riparian local authorities; educational programs, students' visits (*The Other way week*), trips (local and regional awareness of the inhabitants of rural and urban communities from HB Prut)
- The annual performance of the research program for the assessment of the ecological impact on the aquatic biodiversity (habitats, species), of the set of scientific analyses: sediment analyses, physical-chemical analyses, samples of water taken from the standard stations already chosen by the project, analysis of the biodiversity: inventory of the fish species, amphibians, reptiles, mammals, invertebrates, zoobenthic and phytobenthic associations, especially the aquatic macroinvertebrates that are the production basis of water ecosystems (water habitats), annual comparative analysis of the progress or regress of the surfaces/areas covered by thse benthic communities; the annual quantitative estimation per species of the fish stock (spawn, juveniles, adults) from all the fish species that are relevant, and the conclusions regarding the species that are threatened on an yearly basis
- Annual setting of the vulnerable species with the lowest fish headcounts
- Sampling of a small lot from the Hydrographic Basin of the Prut River, from the species that are considered very rare and rare from "Nature 2000" Network
- Research on the reproduction in captivity, in Ezăreni station, setting the directed reproduction techniques with regard to these species and the achievement of the repopulation
- Breeding the spawn in the incubation station and in basisn for 35-50 days (cyprinidae, percidae species) or 4-5 months (sturgeons, sterlet)
- Repopulation of the targeted areas with species and populations in decline: August (Cyprinidae), October-November (sterlet).

III.3. The technology related to the production of the spawn

Fundamental changes of the ecological conditions occur because of the rivers damming (in our case, the Prut River), of the damming of the floodplain, of the waters pollution, thus limiting the natural fish production capacity.

Under such circumstances, it is the role of the experimental aquaculture and ecology to find the best, most appropriate ways to restore biocoenoses, for a more efficient use of the water basins.

In this respect, the artificial reproduction of fish is one of the important ways to obtain big quantities of larva and spawn, with a view to populating the Prut River, the Stânca-Costești Reservoir and their tributaries, and this under beneficial economic conditions, thus compensating the natural reproduction lacking adequate areas.

Providing the reproducers batch:

The obtaining of the mature sexual elements is conditioned by the catch of healthy reproducers, which are well developed and have no trauma.

Their selection shall be done in the fishing areas obtained with the help of the river net, with the pound nets at the outflow opening, with the trammel nets and the fishing electrical device. The fishing by the gill nets also works.

Among the characteristics for choosing the reproducers, we would like to mention:

- In the case of females: big belly, soft upon touching, a greater quantity of mucus on the body, reddish genital pore;
- In the case of males: soft belly and reddish genital pore.

The closer the fishing of the reproducers is to the optimal reproduction area and temperature, the more pronounced, emphasized the features are.

Transportation and parking of the reproducers:

The transportation from the fishing area to Ezăreni Station has to be done with preservation of their integrity. The transportation shall be done in a utility vehicle Nissan, in a glass fiber basin equipped with an oxygen tube. Density during transportation has to be inversely proportional to the transportation distance and the water temperature in the Prut River, at the moment of the fishing. During transportation, the fishes have to be protected from any mechanical or heating shocks. Periodically, they will be checked upon, to see their status, and, if need be, regulating the quantity of oxygen, the temperature and the volume of the water.

The parking of the reproducers is done in Ezăreni, in special ground or concrete basins. If the fishing is done in autumn, the reproducers are parked in ground basins having an area of 2000 m^2 with a depth of 2 m, and independent supply and evacuation. In this case, the ageing, which is a neuro-hormone process that triggers depending according to the environmental conditions, requires special parking basins.

Reproducers captured in spring are parked in the hall, in concrete basins, with permanent supply, and the possibility to adjust the temperature, to oxygenate and filter water. Parking shall be done separately, per gender.

Artificial reproduction: biological basis

Artificial reproduction refers to a complex of conditions and means created by man with a view to achieving the proliferation process and development of the offspring. The achievement and development of the whole process rely on an in-depth knowledge of the species' biological characteristics.

Artificial reproduction does not modify the natural phenomena which are essential to reproduction (the necessary maturation of the sexual elements, insemination, embryo and post-embryo development), but, on the contrary, it provides them with a normal development, in specially managed conditions. The final goal is to increase the fish headcounts, to secure the perpetuation of some highly economic valuable species, more and more affected by the change of natural environment conditions (pollution, hydrotechnical constructions, etc.).

Development of the sexual elements and the reproduction:

Reproduction of fish is, overall, the complex of processes that secure the formation of new generations and the perpetuation of the species, and comprises the following: the development of the sexual elements in the body, laying and fertilization of the eggs, embryo and post-embryo development.

The evolution of the body up to the adult stage, and the cyclical participation in the reproduction is grouped per two periods:

- The interval between the formation of the gonads and the sexual maturity, i.e. the development of the body until sexual maturity and the possibiltity to participate in the reproduction process;
- The time interval between two reproductions (the sexual cycle).

The process of the fish passage in to the reproduction status can be drawn out as follows:

- The optimal conditions created by external factors (temperature, the water stream, substrate, etc.) act through the sense organs upon the central nervous system and stimulate the activity of the hypophysis;
- The hypophysis secretes gonadotropic hormones and releases them into the blood; these hormones stimulate the maturation of the ovocites and their release from follicles.

The main condition for the artificial reproduction of fish is to obtain mature, grown-up sexual cells. The stimulation of their development is done, just like under normal conditions, under the influence of the hypophysis hormone. The difference is that the hormone excess in the blood increases due to the administration of the hypophysis extract from other fish.

The basic principle of this methos resides in the fact that adult fish, in a state close to the reproduction one, are injected hypophysis extract into their spine muscles. 20-30 hours later, the adults are ready to release their sexual cells.

Artificial fertilization:

Various methods essentially rely on the same principles: collection of row and sperm with the preservation of their specific biological features under conditions providing for their normal union and the formation of the zygote.

According to the gamete collection and mixture, there are the following fertilization methods:

- The wet method, according to which the collection of row and sperm is done directly in the water, simultaneously; afterwards, they are mixed up and let couple of minutes to fertilize;
- The dry method: the collected sperm is poured over the collected row, both in dry bowls; afterwards, they get mixed up and let couple of minutes for fertilization.
- The half-dry method: the roe and the sperm are collected in dry bowls, but, before mixing, the sperm is diluted with water.

Embryo development:

This period includes the time interval during which the egg, after fertilization, undergoes a series of special processes: the segmentation and the formation of the blastula, the gastrulation and the formation of the embryo foils, the shaping and development of the embryo, the differentiation of the main systems and organs, the emergence of certain systems functions, etc. This period ends once the embryo is hatched out.

Although the embryo development process takes place inside the roe, it also needs the existence of certain environment conditions, among which, of great importance are: temperature, oxygen regime, salinity, light, etc.

Post-embryo development:

This period starts with the release of the embryo from the roe layers. When hatching out, the larvae of different fish species present a different degree of development and organization of the main systems and organs. The vitelline bag provides them with an endogenous feeding during the first stages of post-embryo development.

The larva development rhythm during this period depends on the existence of some optimal factors related to temperature, oxygen, the absence of pests (chemicals, suspensions, enemies).

The embryo type breathing (the blood network at the surface of the vitelline bag) is replaced by the gills breathing. All the body parts start to develop. Larvae start consuming also food from the external environment, as reserves are consumed. The quantity and quality of the existing food during this time are conditioning the proper development of the larvae.

Once they fully move on to active feeding, larvae continue to develop and grow, thus gradually acquiring the adults' features and starting to display a specific behaviour.

Technical characteristics of the Artificial Reproduction Station

- The pre-aging basins

These are ground basins, having an area ranging from 1000-5000 sqm and a depth of 1.5-2 m. The supply and evacuation are independent, and can get done in maximum one day. The population density is 1000-1500 kg/ha.

- The maturation basins

These are the concrete basins from the hall. They are used for the parking of the reproducers, after the administration of the injection with hypophysis. They can be supplied with water from the outer decanter-basin. Also, the water can be recirculated by its own system of recirculation/filtration/ hall heating, thus limiting the variations of the temperature from outside.

- The room for the collection of the sexual products and fertilization

In the control room, near the incubators.

- The incubation room

Provides a constant water temperature, its filtration and recirculation. The incubation is done in Zug type basins.

- The larvae's parking basins, after hatching

These are circular basins made from glass fiber having 1 meter in diameter.

Artificial reproduction in carp

When selecting the reproducers lots, special attention shall be paid to the health of the reproducers. 5-6 days prior to reproduction, the reproducers are transported from the wintering ponds/the Prut River to the Reproduction Hall, and parked in concrete basins specially dedicated.

15-20 hours prior to the moment when the collection of the seminal products and the artificial fertilization is scheduled, the reproducers are taken out of the concrete basins and injected.

15-20 hours after the injection, the reproducers are checked, and, where the aging is complete, the seminal products are gathered.

Fertilization is dry, and the products are easily mixed up with a rod. After homogenization, the fertilized liquid is added, mixing them altogether for one hour. This is also a desizing operation, at the same time, which is completed by the changing of the liquid for 2-3 times.

Incubation:

After the desizing of the row, they are transferred into the Zug Weiss type incubators. Once they are in the incubators, the water circuit has to provide a constant water flow, which is to be increased after 10 hours.

Hatching:

After 80 hours (160 degrees/days), the row hatches. After the hatching of 60-70% of the row, the content of the incubators is poured into bowls with a water current for a complete hatching, then it is transferred into the nursy nets**,** where they will settle to the new environment conditions.

Larva development:

The larva characteristics from hatching till 14 days are:

- Endogenous nutrition
- Mixed nutrition, yolk sac still present
- Remains of yolk sac
- Swimming fold, remains of yolk sac
- Exogenous nutrition, without yolk sac
- Semitransparent body, whitish on the lateral sides
- Non-transparent body, yellow.

After 17-18 days, it is considered to be the end of the larva period and the beginning of the alevin stage.

Artificial reproduction in bream, barbel and common nase

As they belong to the Cyprinidae family, the bream, the barbel, and the common nase are species typical for the river, as they live in the hilly area or the plain area, where there are relatively swift streams and a high quantity of O_2.

The basis of the artificial reproduction is the gathering of the gametes. Sexual dimorphism is pretty obvious, with the females having a more obvious volume. Males have nuptial buttons.

The fish get injected with carp hypophysis; the dose is 4-5 mg/kg body for females, and 2.5-3 mg/kg body for males. The optimal temperature to make the injections is 10-12^{0}C. At this temperature, the maturation period is 72 hours for the bream, 42 hours for the barbel, and 40 hours for the common nase.

After maturation, the fish are milked, the reproduction being a dry one. The process is relatively similar to the one of carp, involving the mixture of the fertilized liquid and the desizing.

After fertilization and hydration, the row is inserted in the Zug-Weiss incubators, the incubation lasting for 10-12 days. The water current varies, as the roe is pretty sensitive in the first two days, therefore the current will be reduced. After the morula stage, the roe becomes more resistant, the need for O_2 increases, and so the necessary water current is increased.

After hatching, the larvae are inserted into the tanks, where, after the resorption of the yolk sac, they move on to the feeding on natural food, smallsized forms of zooplankton.

For good results, the larvae have to be inserted into basins that simulate the natural conditions as much as possible.

Overall, the reproduction is not so much different than the one of the carp. The temperature is a bit lower, and the hatching time is a bit longer, but, most important is that these are wild species, which means they cannot stand, as the carp easily does, the conditions of an artificial reproduction.

Artificial reproduction in pike

In the natural environment, the pike's reproduction begins in February when the water temperature reaches 4-5^{0}C, with a peak in March when the water temperature is about 9-10^{0}C.

Providing the necessary reproducers lot:

It is recommended to use medium sized reproducers (1-2 kg) or reproducers that have been fished from the natural environment during the reproduction period, or bred in ponds, where they are captured from, for the purpose of reproduction.

Artificial reproduction uses the dry method. The female is immobilized, her belly is lightly massaged and the roe is collected. The same goes for the males, the sperm being directly collected over the roe. The seminal products are mixed together, and after 1-2 minutes water is added, while continuously mixing. The mixture is allowed to stand for 10-20 minutes, for the fertilization to occur, and then water is added again, to remove impurities.

Incubation:

It is done in Zug Weiss incubators; for a volume of 8 liters it is necessary to have a flow of 2-4-6 l/min to provide with the engagement of the row in a continuous movement that does not let the roe stick together, without altering the membrane of the fertilized egg. The best incubation temperature is 8-10^{0}C. The embryo development lasts for 10-12 days.

Larva development:

Before hatching, the row is transferred into incubation boxes, where kept for 9-10 days, period that corresponds to the feeding from the yolk sac. After 10 days, the larvae start to feed. There are three feeding stages:

- The 10-12 mm larvae are mainly feeding on phytoplankton
- The 15-20 mm larvae are mainly feeding on zooplankton
- The 30-80 mm larvae are mainly ichthyophagous.

One should also keep in mind that the pike larvae and offspring cannot be fed with artificial food, so that the natural feeding is required.

Directed artificial reproduction of the pike perch

In the natural environment, reproduction starts in early March when the water temperature is 10-12^{0}C, with a peak in mid-April when the temperature reaches 15-16^{0}C.

Providing the reproducers lot:

This is done by fishing them from natural basins. Special care must be paid to the fishing, transportation and handling, as reproducers are extremely sensitive.

Reproduction is done on specially built mattresses, at a depth of 1-2 m and at a distance of 2-3 m from the shore.

Once the roe is laid, it will be transported in special boxes and immersed in basins, where the embryo and larva development takes place.

Larva development:

The larva development is an extremely critical stage, as the environmental requirements are particularly special. After 10 days the yolk sac reserves are gone and this is the moment when most cases of mortality occur. This is the moment when the conditions that are closest to the natural environment, the abundant natural food provide a good survival of the larvae. There are three feeding stages:

- with algae and rotifers (up to 10-12 days)
- with cladocerans and copepods (up to 23-25 days)
- with fish larvae (up to 50-60 days).

Artificial reproduction in tench

Providing the necessary reproducers lot:

This is done by fishing them from natural basins; the recommended age is 7-8 years, i.e. 400-700 g/ex. They are kept separately, per gender, till June when they are transported to the reproduction station, kept in basins of minimum 4 m^3, a water flow of 0.2 l/sec and an O_2 concentration of 6-7 mg/l, and a temperature of 18-22^{0}C.

Hormone stimulation can be done by injection with suspension of carp hypophysis or an analogue GnRH hormone. For males is recommended 1 mg of suspension of hypophysis/kg body weight, and for females: 2-3 mg/kg body weight.

20-30 hours after the administration of the suspension of hypophysis or the analogue GnRH, the gonads are in the final maturation stage, with the reproducers being able to release the sexual products. Females are watched in the maturation basins because, when the laying of the roe draws near, they start to actively move, swimming along the basin. At that moment they are fished from the basin and then the roe is gathered.

For the collection of the seminal products, the reproducers are immobilized in a relatively oblique position, their head up and the genital pore toward the collection bowl, slightly massaging the belly.

The dry method shall be used for fertilization, i.e. mixing the roe with the sperm. The mixture is activated by a 100 cm^3 activation solution (pH 9 or, to make it easier, dechlorinated water). The desizing process shall begin 2-3 minutes later, by the classic clay suspension procedure.

Incubation:

The desized roe is transferred to the Zug Weiss incubators, where is provided a constant circulation of the water, to avoid the crowding and sticking of the roe.

Hatching:

After 60-70 degree days, the embryos start to hatch; the larvae are transferred into the nursy nets from the parking basins. 3-4 days after the hatching, the larvae can be transported and launched for the purpose of population.

The technology related to the reproduction of sturgeons

This technology comprises the following stages:

- Capture and selection of the reproducers;
- Sexing and assessment of the reproductive state;
- Transport and parking;
- Selection of potential reproducers;
- Stimulation of the sexual cells maturation;
- Gathering the sexual products;
- Fertilization;
- Incubation of the sexual products.

The catchment is done from the natural environment, and the transportation is done in basins made from glass fiber, in densities that do not stress on the reproducers, and with the related liquid oxygen supplement.

Reproducers shall be checked in terms of the gonads development degree, by extraction (biopsy) of the sexual cells. The reproducers selected for reproduction are parked in basins, separated per gender, until the optimal temperature is reached (e.g. sterlet 12-17^{0}C).

The hormone stimulation is done with gonadotropins (carp dry hypophysis) or specialized products obtained in Russia (Nerestin). The genesis of sperm takes place 12-24 hours later. Several methods are used for the collection of the egg cells:

- The surgical method
- The minimum invasive surgical method
- The method of eggs collection by milking.

Fertilization and incubation:

The semi-dry method is recommended for fertilization (the sperm gets diluted with water in a 1:200 ratio) with a view to reducing polyspermy. After dilution, the sperm is immediately added over the roe, covering the entire row quantity.

After fertilization, the exterior mucoprotein layer - a sticky adhesive layer on the surface of the roe, is removed. A suspension of mud, clay or bentonite is used.

The row incubation follows right after the desizing. The incubators may be of different shapes and dimensions, the basic principle being to provide a constant exchange of water, so facilitating the gas exchange at the embryonated roe level.

The hatching is done progressively, over a quite long period of time, depending on the temperature and the efficiency of the gas exchange.

The **larva growth** is a critical stage in the process. The exhaustion of the yolk sac reserves and the passage to feeding on exogenous food is done by procuring the best food, the so-called living food, which is gathered from the natural environment and adapted to the larvae dimensions.

The directed reproduction of the catfish

Providing the reproducers lot:

In natural-directed conditions, catfish reproduces in ground pools of 1000 m², introducing five breeding pairs. Catfish reproduces in the spring, in the same period with carp, when the water temperature is 18-20^{0}C. During this period, catfishes are grouped in pairs. According to their spawning mode, catfish fall within phytofilous fish. The female lays eggs in nests in shallow areas, among the roots of aquatic plants. After the roe has been deposited, the female and male do not leave the nest, guarding it from predators for several days.

These are the natural conditions to be reproduced in order to obtain catfish offsprings.

Incubation and hatching:

It is relatively fast, lasting 3 days at 21-23^0 C. At the end of three days of incubation, hatching occurs.

Larva development:

The larvae are sensitive to light and do not move too far from the nest. 7 days after hatching, the larvae are 14 mm, start feeding actively, though they have reserves from the yolk sac. After 8-9 days, the yolk sac is consumed and the larvae feed on plankton. Till 15-20 days, the larvae are feeding on plankton; after 25-30 days, the stomach also contents chironomid and ephemeropteran larvae.

At 5 weeks after the hatching, 5 cm long larvae can be harvested in order to achieve the populating. Offsprings become ichthyophagous after first summer.

III.4. Logistics

The logistics is made up of the measures related to the organization and supply of the equipment, tools and quick intervention means, and the performance of the operations in the event of a disaster; it comprises the following:

The supply of the needed technique and intervention equipment

NO.	RESOURCE NAME	LEGAL HOLDER	SITE
Fast transportation and intervention equipment			
1	Mercedes minibus 8+1	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
2	Nissan van, 5 seats	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
3	Motor boat	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni
4	Trailer for the boat	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni
5	Volkswagen Caravelle	The Science Academy of Moldova – the Zoology Institute	Str. Academiei no. 1, Chişinău
6	Motor boat	The Science Academy of Moldova – the Zoology Institute	Str. Academiei no. 1, Chişinău
Equipment dedicated to the live transport of the genetic material			
1	Live fish container	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni
2	Depth and fish finder	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni
3	Multiparameter measurement device HI 9828/4	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni Build. B, Bd. Carol I no. 20A, Iaşi
4	GPS unit/compass (hand held)	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni Build. B, Bd. Carol I no. 20A, Iaşi
5	Laser range finder	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni Build. B, Bd. Carol I no. 20A, Iaşi
6	Electrofisher	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni Build. B, Bd. Carol I no. 20A, Iaşi
7	Video camera	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni Build. B, Bd. Carol I no. 20A, Iaşi
8	Portable aeration pomps	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni
9	Portable refrigerator	« Alexandru Ioan Cuza » University of Iaşi	The Aquaculture and Aquatic Ecology Research Station Ezăreni Build. B, Bd. Carol I no. 20A, Iaşi
10	Diving equipment	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi

Lab research equipment

1	Multiparameter measurement device for pH, TDS, and conductivity	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
2	Recording device for chemical-physical parameters data, dew point, temperature, humidity	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
3	Multiparameter measurement device HI 9828/4	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
4	Microscopes	« Alexandru Ioan Cuza » University of Iaşi The Science Academy of Moldova – the Zoology Institute	Build. B, Bd. Carol I no. 20A, Iaşi Str. Academiei no. 1, Chişinău
5	Stereomicroscopes	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
6	Reversed microscope	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
7	Atomic absorption spectroscopy system	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
8	Biochemical analiser	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
9	High performance massive parallel computing and storage system	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
10	Total organic compounds analyser	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi
11	Cross maze ethoscope	« Alexandru Ioan Cuza » University of Iaşi	Build. B, Bd. Carol I no. 20A, Iaşi

The supply of fuels and lubricants: from the own income of « Alexandru Ioan Cuza » University of Iaşi and the Zoology Institute of the Science Academy from the Republic of Moldova;

The supply of accommodation and food for the intervention personnel: from the own income of « Alexandru Ioan Cuza » University of Iaşi and the Zoology Institute of the Science Academy from the Republic of Moldova;

The supply of labor protection and labor security equipment adequate for the intervention in question, according to weather conditions: from the own income of « Alexandru Ioan Cuza » University of Iaşi and the Zoology Institute of the Science Academy from the Republic of Moldova;

Medical insurance and insurance for accidents involving the personnel: from the own income of « Alexandru Ioan Cuza » University of Iaşi and the Zoology Institute of the Science Academy from the Republic of Moldova.

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APPENDICES:

Appendix 1. Security and Health Plan for the scientific fishing activity in the Prut River

Activity name: Scientific fishing in the Prut River in the following areas: Stânca-Costești, Ungheni, Prisecani-Valea Mare, Bumbata-Leova, Oancea-Cahul, Sivita-Giurgiulești

General Information :

By "scientific fishing" we mean extracting living aquatic resources from the public domain of the State and fishing facilities, at any time of the year, including the prohibition times, in any area, for any aquatic species, at any age and size, using any means, tools, devices and fishing nets, in daytime and at night, based on a special authorization issued for scientific purposes.

The scientific fishing shall be done by a team of experts from the Alexandru Ioan Cuza University of Iași, using the following methods: net fishing – on the bank or in the boat, electrical fishing by means of reversible electronarcosis using continuous currents not harmful for the fish or other aquatic organisms; the tools and equipment can be mounted in the boat or can be portable. Captured fish shall be released alive after identification and the appropriate biometric measurements. By electrical fishing we mean the type of fishing whereby the fish is retained and immobilized with the help of the electrical field in the water.

The danger posed by accidents during the electrical fishing

Electrical fishing uses high voltage impulses, which are dangerous for man, whether we speak about touching the electrodes or a man falling into the water. Practice has shown us that very serious accidents are extremely rare; however, as they are not impossible to occur, the electrical fishing must be only done based on an authorization, which is only issued to the qualified personnel for this particular type of fishing.

As a special measure for fishing from the boat, where there is the danger to fall into the water, the fisherman handling the electrode (anode) sits on a safety breaker, which, while it is pressed down, keeps the circuit shut down. Should the man fall into the water, the power is automatically cut. Another safety measure is to mount a breaker on the electrode handle. For higher intensities, the mercury breakers are recommended, which are inserted in the handle. The inconvenient when using breakers mounted on the handle is that the fisherman has to permanently keep his hand on the breaker's button, which is uncomfortable when fishing. When the button is not pressed, the power is cut.

As a conclusion, it is necessary to comply with all the general norms and rules related to the mandatory labor security technique in electrotechnique, in order to avoid accidents.

Preparing fish for the collections

Generally speaking, we keep the average sized specimens, i.e. 15-20 cm. in general, the use of 4% diluted formalin is done on the bank (for safety reasons and in order to avoid accidental pollution). It is useful to have already prepared the jars having the appropriate size (500 and 1000 ml) half filled with the already prepared formalin, so as to save precious time.

Caution! Formalin is toxic and has to be handled with care; gloves and protection goggles shall be worn during the work.

2. The working procedure and the health and security measures in labor, in relation with the scientific fishing

Each team shall be led by a person in charge of the labor security and health, who shall train the team and shall participate in all the performed activities.

The installation is dangerous because of the high voltage currents: 700V, 20A. This is why the team shall only work with the observance of the following conditions:

- A team of minimum 3 trained people;
- Protection equipment: electroinsulating boots and gloves;
- NO untrained persons allowed on site!

All the body parts likely to enter in contact with the electrodes must be protected with the help of isulating and waterproof clothing. One must use protection equipment in compliance with the weather conditions and, if need be, noise protection headphones. It is recommended for the working team to use polarized glasses and peak caps, which help one to avoid the light reflected by the water surface and, thus, increase visibility onto the fish.

1. It is mandatory to wear a life rescue vest in water that is deeper than the knee level and when fishing from a boat.
2. The fishing nets have to have the handles made from insulating materials, the net has to be with no knots, so as not to hurt the fish.
3. The bowls for the fish have to be made from insulating materials, and to have the proper dimensions, depending on the number of collected fish. If need be, they should be equipped with aerators, so as to provide a better recovery and survival of the fish.
4. There must be a communication device, for emergency cases.
5. The first aid kit is also needed for the respiratory resuscitation procedures, including the guidelines.
6. It is necessary to have a proper fire extinguisher when fishing from a motorboat.

There is an electrocution risk and danger related to the electronarcosis devices, if they are not used and handled according to their function instructions. During the work, the personnel have to wear appropriate insulating equipment. **They must wear waders and insulating gloves**. In case the boots get soaked inside, the fishing is interrupted until they are replaced.

- **It is strictly forbidden to touch the active elements of the electrodes while they work**.
- **The auxiliary staff shall go into the water to gather fish or any other objects only after the power is off and the anode is removed.** Fishing can only be resumed after everybody is out of the water (except for the working team).
- **It is strictly forbidden to modify the fishing equipment**, the connections, breakers, as well as any intervention of unauthorized staff on it.
- **It is strictly forbidden to fish near people who are in the water, near domestic animals**, etc.
- No fishing during storms or rains.
- During the fishing session, the person in charge of the labor security and health procedures has to know where the closest first aid point is, and to have all the necessary alarming means (cell phone, radio-telephone).
- Although the authority lies with the person in charge of the labor security and health, each team member has the responsibility to ask for the amendment of an action or to withdraw if the related labor security and health are not complied with.
- At the beginning of the activity, the coordinator – the person in charge of the labor security and health shall make a short training and shall assign precise tasks to the team members.
- Connexions and breakers shall be checked on site before starting the work, while they are OFF.
- The generator shall be switched ON only after the immersion of the catode into the water and after all the team members have confirmed that they are ready for work.
- When starting fishing, one must check if all the team members are correctly equipped, as well as the equipment integrity.
- One must adopt a system of visual signs to ensure the communication between the working team and the operator of the fixed device on the bank (a hands free radio-telephone is recommended for this).
- It is strictly forbidden to fish during floods or rains.
- It is stricltly forbidden to fish by one's self.
- It is strictly forbidden to go on with the fishing when the team members are tired.
- Keep your hands out of the water when you are near the electrodes.
- Stop immediately fishing when your clothes get soaked.
- Make all the necessary electric connections only when the device is switched off.
- Fuel the generator when the equipment is switched off and the surfaces are cold.

- ❖ During storage, the equipment has to be locked away and kept under proper conditions (away from moisture, dirt, shocks).
- ❖ During the work with the device that is on the bank, this has to be placed in a stable and fixed position. The generator shall not be moved during its performance unless it is portable by construction.
- ❖ **When fishing from the boat**, the personnel shall be accordingly trained with regard to the use and handling of the boat. All the metal parts of the equipment have to be grounded (interconnected) and fixed so that thay can't move. The boat has to be stable (not swing or lean).
- ❖ **It is mandatory to wear a life rescue vest.**
- ❖ As a special measure when fishing from the boat, where there is the likeliness to fall into the water, the fisherman handling the electrode presses the safety breaker, which, as long as it is pressed, keeps the circuit closed. Should the man (from the boat) fall into the water, the power is automatically shut down.

The composition of the reversible fishing team, as per Work Order no. PR072/05.06.2013

	JOB TITLE	FIRST NAME AND LAST NAME
1	Head of the investigation team – in charge of the labor security and health	DAVIDEANU GRIGORE
2	Operator	CRĂCIUN NICOLAI
3	Operator – boat manager	PLĂVAN GABRIEL
4	Operator	IRIMIA DUMITRU
5	Operator	POPESCU IRINEL
6	Operator	GORGAN LUCIAN
7	Operator – boat manager	FOTEA MIHAI VLAD
8	Operator	OPREA EUGEN
9	Operator	DAVIDEANU ANA

Accidents caused by power

Phenomena that occur in the human body as a consequence of the power crossing define the very concept of electrocution or electric shock.

➢ *Giving the first aid*

With accidents caused by electrocution, it is only by accident that one may benefit from qualified help, which is why giving the first aid depends on the competence of those who are present on site at the time of the accident.
The person giving the first aid has to acknowledge in a timely manner the actual situation on site, the condition of the victim, and to decide upon the measure to take, so that the savior to be out of danger, as long is exposed to the same risk.

➢ *Taking the accidented person out of the influence of the electrical power*

1**. Follow the below listed steps in order to get the accidented person out of the electrical power action, from the 1000 V voltage installations:**

a. If the accidented person is in contact with the electrical installation and is somewhere high:
   - If the electrocuted person is at a distance from the commutation that could cut the power supply (i.e. the terminals of the electric engines, lighting devices, etc.), the accidented person shall be pulled by his clothes, thus securing his falling down, at the same time.

Caution: The rescuer shall mandatorily wear insulating equipment inserted between the accidented person and the ground (insulating gloves and boots, insulating gloves and carpet or wooden grill).

b. Cut the power by opening the power supply breaker; unless there is a breaker, open the separator, remove the fuses, plug out, as the case may be.
   - If the electrocution occurred near the commutation devices, they will be switched, so as to secure fall of the injured person.

c. If it takes time to get the installation out of the voltage, by using any insulating materials or equipment that may be at hand, so that the injured person is taken away from the danger area.

2. In case of an over 1000 V voltage installation, one should know that the very approaching of the accidented person can pose a threat to the rescuer, because of the voltage. The following steps shall be taken, as appropriate:

- The deconnection of the installation (taking it out of the voltage) can only be done by someone who is very familiar with the respective installation; the removal of the injured person from the installations under voltage is allowed only after the disconnection.
- Taking the accidented person out of the installation under voltage is allowed only in the power stations where the operation is performed by the specially trained personnel who use insulating protection means (boots and gloves for the work under high voltage, the appropriate handling rod, consistent with the installation nominal tension).
- If, because of the electric arch caused by the acidented person, subsequent to touching the electrical installation, his clothes caught fire without being in contact with or in the vicinity of the electrical installation under voltage, the fire on his clothes shall be put down by blanketing. It is recommended that the injured person to be lain down on the ground, while performing all these operations and interventions.

➢ *Assessing the condition of the injured person*

After removing the accidented person from under voltage and getting him outside the danger area, one shall determine the clinical condition of the victim, in a quick assessment done on site, because everything that is going to be afterwards done very much depends on this condition.

First aid actions are differentiated, depending on the condition of the injured person:

A. If the injured person is conscious;
B. If the injured person is unconscious;
C. If the injured person has wounds or is hurt.

A. <u>If the injured person is conscious:</u>

In such a situation, the examination is facilitated by the fact that one can set verbal contact with the injured person in question, the injured person shall be supervized until the medical staff arrives on site, visually looking for any exterior signs of "bad condition":

- color of the skin, especially face color (if it is pale or excessively red);
- sweat on the face and palms;
- presence and characteristics of the breathing and pulse.

B. <u>If the injured person is unconscious</u>**:**

An accidented person is considered to be unconscious if he/she lacks self-defence reflexes and the capacity of autonomous move. The basic vital functions are missing, i.e. breathing and circulation, so the cardio-respiratory resuscitation procedures have to be performed immediately.

Drowning

Drowning is a form of asfixiation, caused by the water entering the airways, a spasm when getting in contact with water or reflex phenomena related to the interruption of breathing and circulation in persons who jump into the water from a very big height, who enter a very cold water or get blows in the abdomen or their head while in the water.

These accidents frequently get complicated by other injuries like fractures, wounds or hypothermia.

Water accidents are dangerous for rescuers too, who could become victims themselves.

Giving the first aid

The basic rules for saving someone from drowning are illustrated by the following words:

THROW a floating object to the person who is drowning, using a rubber tire, a rescue vest or even a paddle to support the victim!

PULL the person who is drowning to the shore with the help of a rope or a cable!

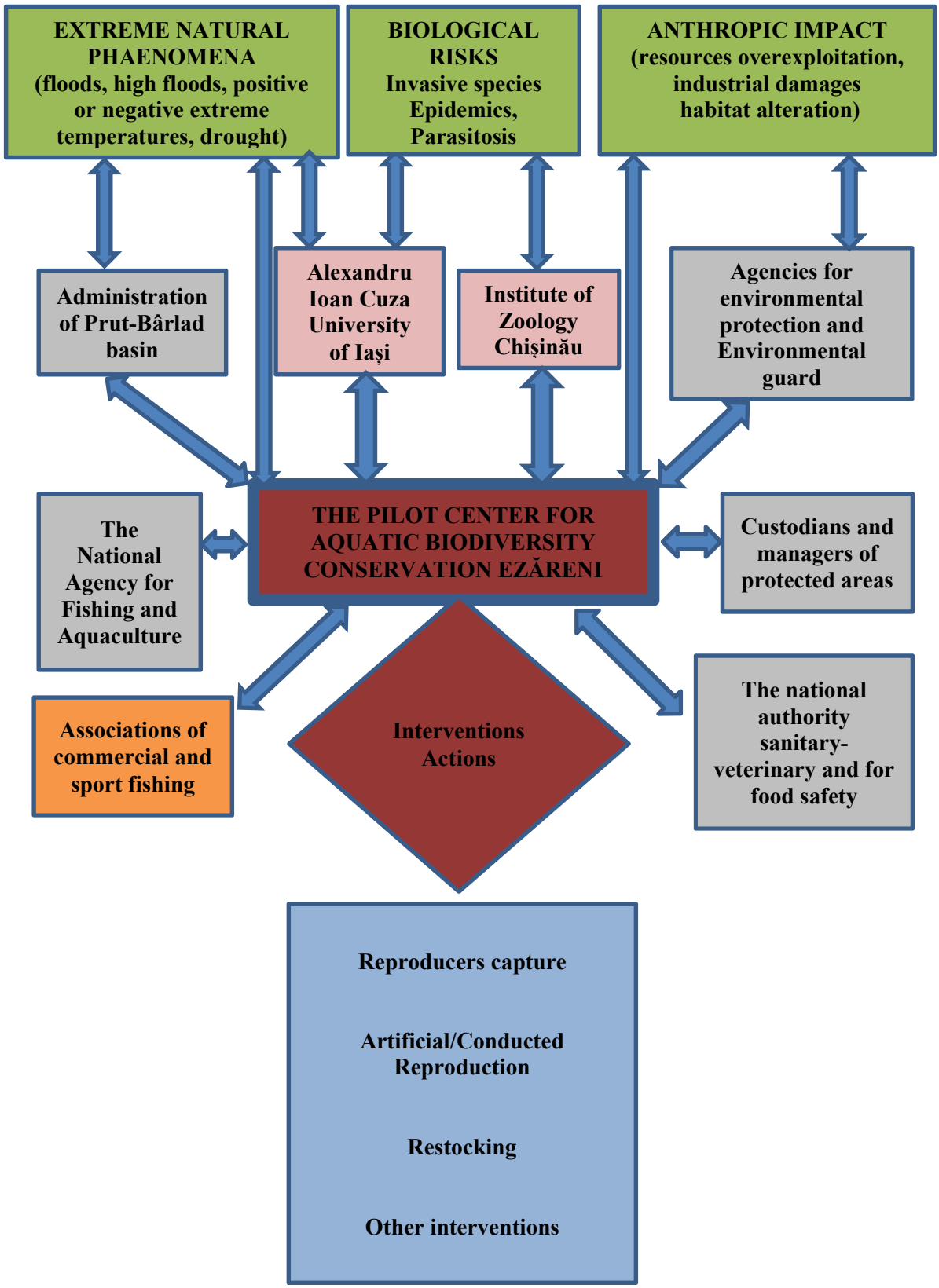
PADDLE toward the person who is drowning, in a boat, a surfing board or any other floating object!

SWIM toward the person who is drowning only if you are qualified to do this. Only specially trained staff must try to rescue victims from drowning!

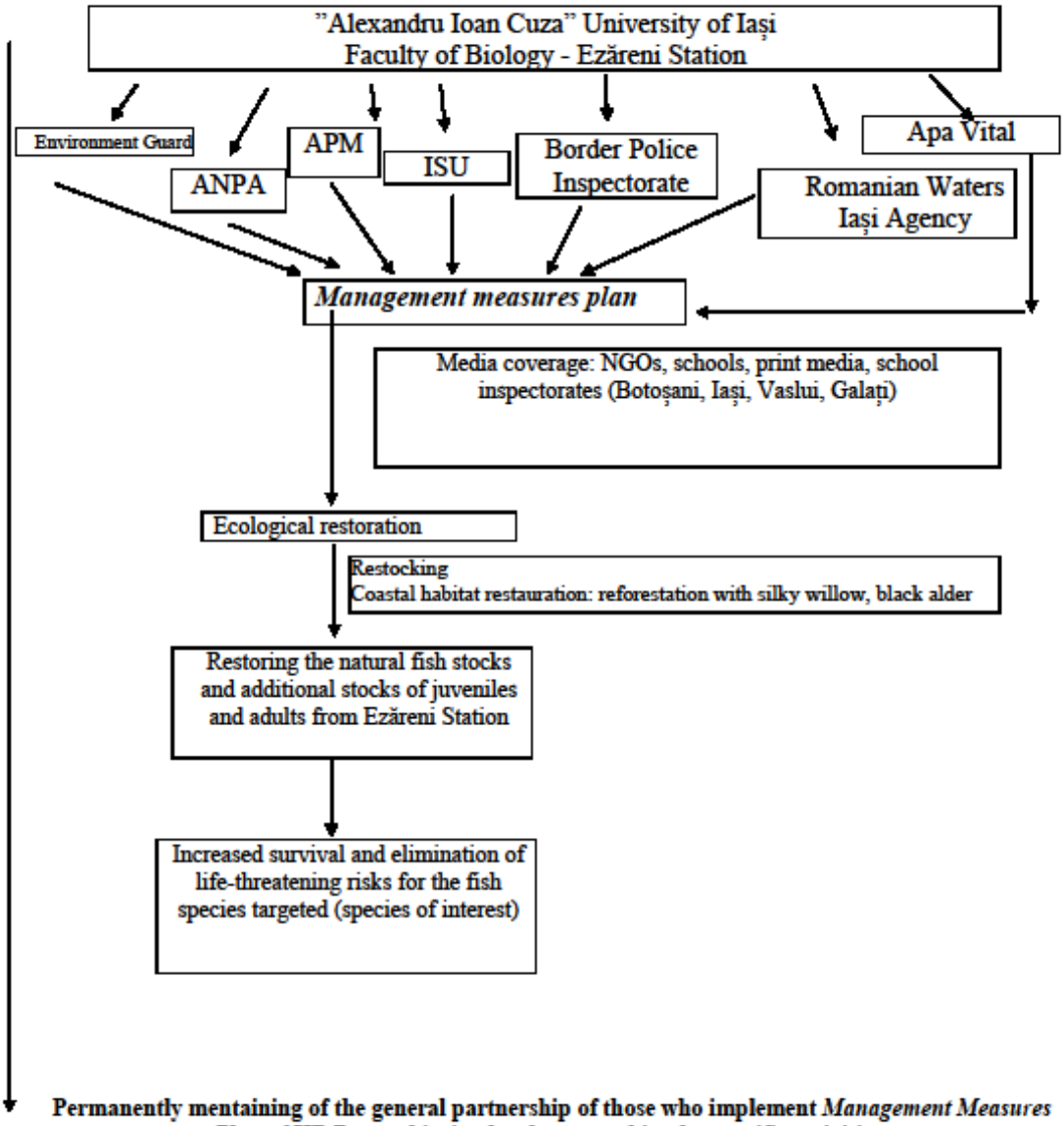
First aid procedures

- Re-establish the breathing imediately. This is the most important requirement of the first aid procedures, in case of drowning.
- Clean the airways from any foreign visible material and, if the breathing is not spontaneously resumed, start the artifical breathing, by direct methods.
- Treat the victim as if he/she had a spinal cord injury, if the accident occurred while diving, navigating, etc. A victim who has a spinal cord injury or lesion is often found with his/her face downwards, into the water.
- You must carefully turn him/her with his/her face upwards, so as not to twist his/her backbone. The victim's head and nape must be sustained during the mounting of the floating device.
- Begin and maintain artificial breathing while that person is taken out of the water, until medical help is obtained.
- As soon as the victim is lain on a firm surface, control the blood circulation, by feeling the pulse at the level of the carotid.
- Unless there is a pulse, start the cardio-respiratory resuscitation procedures, provided you are qualified to do that.
- **Cardio-respiratory resuscitation or artificial breathing must be continuously administered until the victim is rescued and handed to the specialized medicall staff.**
- Provide the first aid for hypothermia, if need be.
- Get your hands under the victim's abdomen and lift him/her up, with the victim "on the belly" position, so as to get the water out of his/her stomach.

Appendix 2. The diagram of the actions



Appendix 3. Institutions involved in implementation of the Emergecy Plan and measures for species conservation and the elimination of the extinction risk



Permanently mentaining of the general partnership of those who implement *Management Measures Plan of HB Prut*, achieving local partnerships for specific activities: educational activities with schools, colleges, LAGs and applied scientific researches, etc.

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