



**Environmental Protection of International River Basins Project
Contract No. ENPI/2011/279-666**

**Surface Waters Monitoring Programme
in the Prut (UA) River basin**

Ukraine

January 2015

1. INTRODUCTION

The two key environmental objectives of the Water Framework Directive (Directive 2000/60/EC; WFD) for surface waters are:

- to prevent deterioration of the status of all bodies of surface water;
- achieving good surface water status.

The status of surface waters is determined by both its *ecological* status and its *chemical* status.

Monitoring programmes and assessment is required in order to substantiate where the objectives are achieved. The surface water monitoring programme for the pilot Prut (UA) River basin covers:

- surface water categories: rivers and lakes;
- the protected areas as defined in Article 6 of the WFD;
- artificial and heavily modified water bodies.

The structure and content of this monitoring programme represents the outcome of the activities conducted under the EPIRB Project as part of the River Basin Management Plans for the Prut (UA) River basin.

2. DEVELOPMENT OF A WFD COMPLIANT MONITORING PROGRAMME

The monitoring programme outlined here is designed to meet the stated requirements of the WFD and related CIS Guidance Documents. The WFD sets out three types of monitoring programmes: surveillance, operational and investigative. These programmes will be explained further in the sections below.

In the process of monitoring programme development the data and information from the JFS-I, JFS-II and national monitoring programmes conducted in the Prut (UA) River basin were used. Furthermore, the Typology Report, the Pressure – Impact Analysis and Risk Assessment Reports were used as basic documents in selecting the sampling locations for the Operational Monitoring.

2.1 Surveillance Monitoring Programme of Surface Waters

The objectives of Surveillance Monitoring (SM) Programme for surface water are as follows:

- supplementing and validating the impact assessment procedure detailed in Annex II of the WFD,
- the efficient and effective design of future monitoring programmes,
- the assessment of long-term changes in natural conditions, and
- the assessment of long-term changes resulting from significant anthropogenic activities.

2.1.1 Sampling locations

The selection of sampling locations and the design of the SM programme is based on sub-networks each related to fulfil one or more of the main objectives of SM as presented above. The sub-networks of the SM programme for rivers include the following ones:

- **SM1:** to be representative of the overall surface water status;
- **SM2:** detection of long-term trends (the assessment of long-term changes in natural conditions and the assessment of long-term changes resulting from the anthropogenic activities);
- **SM3:** supplementing and validating risk assessments;
- **SM4:** Large rivers and significant cross border river and lakes water bodies.

Note: Nine types of the surface water bodies were identified in the Prut (UA) River basin and one sampling location per identified type with reference conditions is included in the SM Programme of the pilot river basin.

The sampling locations for the SM Programme of the Prut (UA) River basin are summarized in the Table 1 and shown in Figure 1. All together 10 sampling locations were selected to be representative for the SM Programme.

Table 1 Surveillance Monitoring sampling locations in the Prut (UA) River basin (rivers)

No.	River name	Character of WB	Expected status/potential	Location name	Risk category	SM sub-network
1	Yablunetskiy Prutets	NWB	RC	Below Bukovel	NR	SM1
2	Prut	NWB	RC	Turbaza Zaroslyak	NR	SM1
3	Beliy Cheremosh	NWB	RC	Yablunetska	NR	SM2
4	Ribnitsya	NWB	RC	Yavory	NR	SM1
5	Koroviya	NWB	RC	Chagor	NR	SM1
6	Iltsya	NWB	RC	Iltsi	NR	SM1
7	Ryngach	NWB	RC	Hotyn-Novoselitsa	NR	SM2
8	Shybeny	NWB	RC	Shybeny	NR	SM1
9	Prut	NWB	High	Luzhany	NR	SM3
10	Prut	NWB	Moderate	Below Chernovtsy (Border UA/MD)	R	SM4

NWB means Natural Water Body

Regarding the SM Programme for lakes there were not identified any lakes to be monitored in the pilot river basin. For more details see also the Appendix 1 of this report.

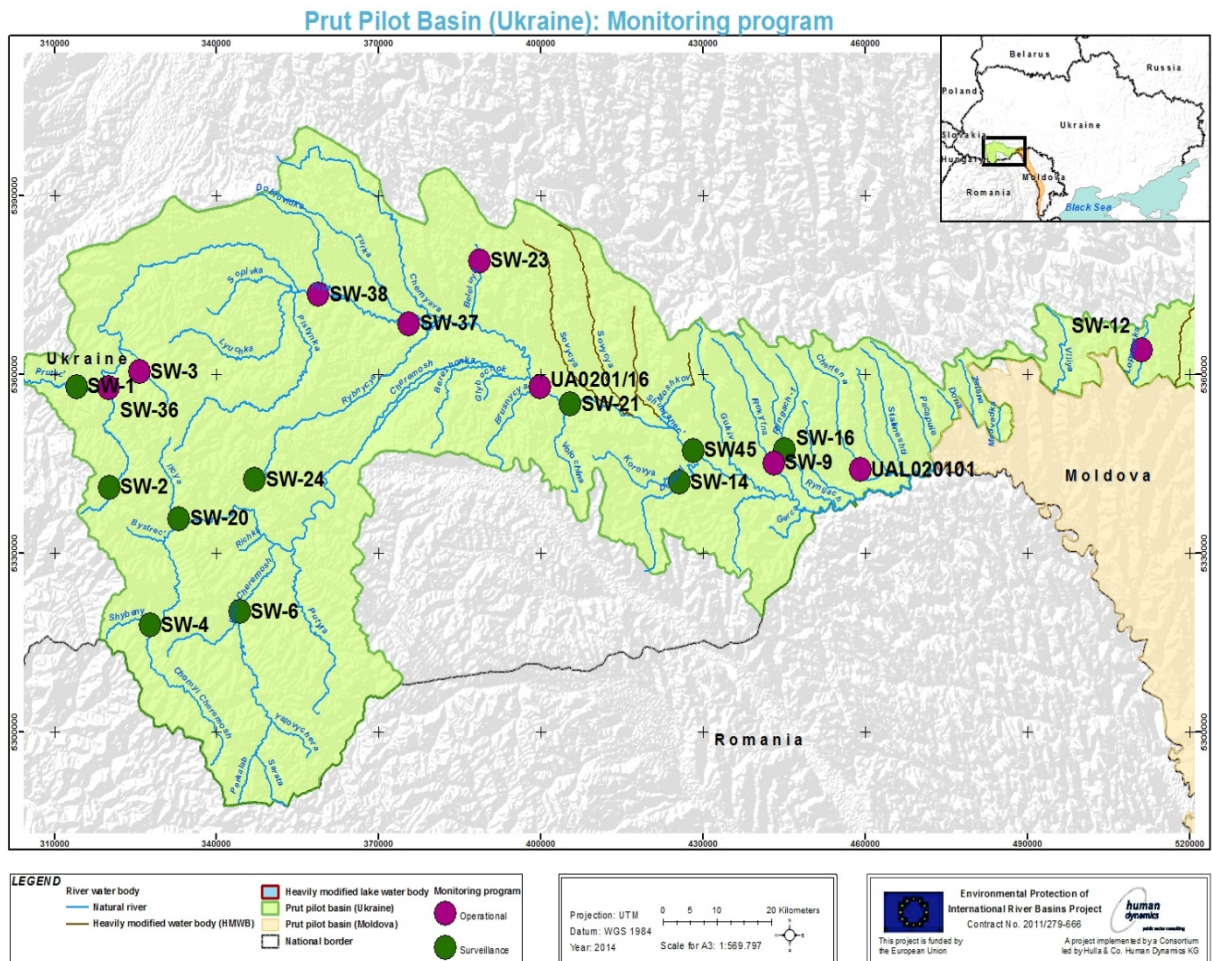


Figure 1 Sampling locations for the SW Monitoring Programme in the Upper Prut pilot river basin (UA). (Note: This map is the first draft, the final one will be developed after comments from the national team and based on the coordinates assigned to the sampling locations by the national experts).

2.1.2 Quality Elements

According to WFD Annex V.1.3.1, a Surveillance Monitoring Programme shall be performed at each selected surveillance monitoring location for a period covered by a RBMP for (see Table 2):

- parameters indicative of all biological quality elements;
- parameters indicative of all hydromorphological quality elements;
- parameters indicative of all general physico-chemical quality elements;
- priority list pollutants which are discharged into the river basin or sub-basin;
- other pollutants discharged in significant quantities in the river basin or sub-basin (pilot river basin specific pollutants).

Sampling methods and devices based on the European Standards will be used in the monitoring programmes (exception ichthyofauna).

The **biological quality elements** incorporate

for rivers:

Macroinvertebrates, Phytobenthos, Macrophytes and Fish;

for lakes:

Macroinvertebrates, Phytoplankton, Macrophytes and Fish.

The water samples will be identified for the abundance and composition for all biological quality elements up to Genus/Species level. Individual metrics (indices) will be applied to the biological quality elements (for ichthyofauna only migratory fish species will be described).

The **physico-chemical quality elements** include for both rivers and lakes:

General conditions;

Specific both synthetic and non synthetic pollutants.

EN, ISO and other international standards will be applied for the analysis of the water samples.

The **hydromorphological quality elements** will incorporate the following elements:

Hydrological regime;

River continuity;

Morphological conditions.

Hydromorphological field and assessment protocols as used during the JFS in the EPIRB project will be applied.

Table 2 List of the quality elements monitored for the Surveillance Monitoring Programme in the Prut (UA) River basin (rivers)

	Parameter	Unit	SM
Physico-chemical Quality Elements			
General conditions			
	Temperature	°C	X
	Dissolved Oxygen	mgO ₂ /l	X
	pH	pH units	X
	Conductivity	µS/cm	X
	Hardness	mg/l CaCO ₃	X
	Colour	visual	X
	o-Phosphate	mg P/l	X
	Nitrate	mg N/l	X
	Ammonium	mg N/l	X
	Chloride	mg/l	X
	Sulphate	mg/l	X
	Total suspended solids	mg/l	X
	Biochemical oxygen demand (BOD ₅)	mgO ₂ /l	X
	Chemical oxygen demand (COD - dichromide)	mgO ₂ /l	X
	Oil substances	visual	X
Other specific pollutants			
	Copper	µg/l	X
	Zinc	µg/l	X

	Chromium	µg/l	X
Priority Substances and Certain Other Pollutants			
<i>All 'Priority substances and certain other pollutants' that can be analysed with the existing laboratory capacity</i>			X
Biological Quality Elements			
	Macroinvertebrates	Metrics	X
	Macrophytes*	Metrics	X
	Phytobenthos	Metrics	X
	Fish	Migratory fish species	X
Hydromorphological Quality Elements			
	River morphological conditions	HM protocol	X
	River flow	Daily Mean Flow (m ³ /s)	X

* *Macrophytes will be monitored only in the lowland parts of the pilot river basin (small rivers).*

For more details see also the Appendix 1 of this report.

2.2 Operational Monitoring of Surface Waters

The Operational Monitoring (OM) Programme is focussed on monitoring the effect of supporting measures aimed at achieving the objectives of the WFD in the water bodies (possibly) at risk. It is designed to provide targeted information on the effectiveness of specific measures taken within the Prut (UA) River basin.

The objectives of OM programme are defined as follows:

- to establish the status of those bodies identified as being at risk of failing to meet their environmental objectives;
- to assess any changes in the status of such bodies resulting from the programmes of measures.

Because the protection of high and good status from deterioration is required by the WFD, OM programme must also provide information on whether the POMs, aimed at maintaining such status, are effective. Therefore, even water bodies that are not categorized to be at risk in the Risk Assessment Report prepared are included in the OM programme because measures are required to maintain them at their current high or good status regardless of existing risk category.

Risk Assessment Analysis has identified 28 water bodies "at risk" and 49 ones "possible at risk" in the Prut (UA) River basin and 8 as HMWBs (7 rivers and 1 lake). These results were transferred into the OM programme.

2.2.1 Sampling locations

Sampling locations for OM programme are assigned to one or more sub-networks each related to fulfil one or more of the main objectives of the OM programme.

The sub-networks of the OM programme for rivers include the following ones:

- **OM1:** to assess the effect of measures that have been aimed at improving the impact of individual and combined point sources (organic pollution, eutrophication impacts and priority substances);
- **OM2:** to assess effectiveness of the measures related to diffuse pollution sources;

- **OM3:** To assess effectiveness of measures to reduce hydromorphological alterations;
- **OM4:** To monitor high and good status sites currently not categorized to be at risk in order to assess the effectiveness of POMs aimed at maintaining high and good status water bodies;
- **OM5:** to monitor protected areas which are at risk.

Note: Several water bodies with the same type were identified to be “at risk” due to the same pressure type (hydromorphological alterations, point sources of pollution). Therefore, some of sampling locations for the OM programme were selected to be representative for the group of water bodies.

All together 8 sampling locations for rivers were identified to be monitored under the OM for the Prut (UA) River basin and results are summarized in the Table 3.

Table 3 Operational Monitoring sampling locations in the Prut (UA) River basin (rivers)

No.	River name	Character of WB	Expected status/potential	Location name	Risk category	OM sub-network
1	Prutets Chemigivskiy	NWB	Poor	Mykulychyn	R	OM1
2	Lopatynka	NWB	Poor	Shishkovtsy	R	OM2
3	Prut	NWB	Moderate	Below Kolomia	R	OM1
4	Prut	NWB	Moderate	Below Sniatyn	R	OM1
5	Prut	NWB	Moderate	Belo Zabalotyv	R	OM1
6	Rakytina	NWB	Moderate	Chernovtsy-Hotyn	R	OM1
7	Beleluya	NWB	Moderate	Toropivtsy	R	OM2
8	Prut	NWB	Moderate	UA0201/16	R	OM3

Due to the same character of the pressures and the same type of the water bodies those water bodies were grouped and sampling locations were selected to represent such groups.

In the pilot river basin only one reservoir was identified to be monitored under the OM Programme (see Table 4).

Table 4 Operational Monitoring sampling locations in the Prut (UA) River basin (lakes)

No.	Lake name	Character of WB	Expected status/potential	Location name	Risk category	OM sub-network
1	Cherlena reservoir	HMWB	Moderate EP	Cherlena	PR	OM2

2.2.2 Quality Elements

In order to assess the magnitude of the pressure to which the surface water bodies are exposed in the Prut (UA) River basin those quality elements are monitored that are indicative of the identified pressures. The following quality elements will be monitored as relevant (see Table 5 and 6):

- parameters indicative of the biological quality elements, most sensitive to the pressures to which the water bodies are subject;
- all other specific pollutants discharged in significant quantities into the river basin or sub-basin;
- parameters indicative of the hydromorphological quality elements most sensitive to the pressure identified.

Table 5 List of the quality elements monitored for the Operational Monitoring Programme in the Prut (UA) River basin (rivers)

	Parameter	Unit	OM
Physico-chemical Quality Elements			
General conditions			
	Temperature	°C	X
	Dissolved Oxygen	mgO ₂ /l	X
	pH	pH units	X
	Conductivity	µS/cm	X
	Hardness	mg/l CaCO ₃	X
	Colour	visual	X
	o-Phosphate	mg P/l	X
	Nitrate	mg N/l	X
	Ammonium	mg N/l	X
	Chloride	mg/l	X
	Sulphate	mg/l	X
	Total suspended solids	mg/l	X
	Biochemical oxygen demand (BOD ₅)	mgO ₂ /l	X
	Chemical oxygen demand (COD - dichromide)	mgO ₂ /l	X
	Oil substances	visual	X
Other specific pollutants			
	Arsenic	µg/l	X
	Copper	µg/l	X
	Zinc	µg/l	X
Biological Quality Elements			
	Macroinvertebrates	Metrics	X
	Macrophytes	Metrics	X
Hydromorphological Quality Elements			
	River flow	Daily Mean Flow (m ³ /s)	X

For more details see also the Appendix 1 of this report.

Table 6 List of the quality elements monitored for the Operational Monitoring Programme in the Prut (UA) River basin (lakes)

	Parameter	Unit	OM
Physico-chemical Quality Elements			
General conditions			
	Temperature	°C	X
	Dissolved Oxygen	mgO ₂ /l	X
	pH	pH units	X
	Conductivity	µS/cm	X
	Colour	visual	X
	Total Phosphorus	mg P/l	X
	Total Nitrogen	mg N/l	X
	Hardness	mg/l CaCO ₃	X
	Alkalinity	mg/l CaCO ₃	X
	Ammonium	mg N/l	X
	Chloride	mg/l	X
	Sulphate	mg/l	X
	Calcium	mg/l	X
	Sodium	mg/l	X
	Magnesium	mg/l	X
	Silica	mg/l	X
	Sechi disc	m	X
	Biochemical oxygen demand (BOD ₅)	mgO ₂ /l	X
	Chemical oxygen demand (COD - dichromide)	mgO ₂ /l	X
	Depth at site	m	X
Other specific pollutants			
<i>There are not identified any specific pollutants discharged in significant amounts into the lakes</i>			
Biological Quality Elements			
	Phytoplankton	Metrics	X
	Chlorophyll a	mg/m ³	X
	Macroinvertebrates	Metrics	X
	Macrophytes	Metrics	X
Hydromorphological Quality Elements			
	River flow (inflow and outflow)	Daily Mean Flow (m ³ /s)	X

For more details see also the Appendix 2 of this report.

2.3 Investigative monitoring

The WFD includes a third type of monitoring called Investigative Monitoring (IM). The WFD states that this type of monitoring is required for situations when the surface water body is at risk with a very specific manner that causes of water bodies failing to achieve the required

environmental objectives under the WFD. The list of parameters in this case will be dynamic and its validity in time should be limited, in order to respond to new information on the potential risks posed by emerging pollutants and any others alterations. However, it is not expected to conduct the IM in the Prut (UA) River basin in this stage of the monitoring programme.

2.4 Frequency of monitoring programme

Sample frequency will vary depending on the monitoring programme and the individual sub-networks and the quality element. The WFD outlines the minimum requirements for frequency of monitoring, as it is presented in Table 7.

Table 7 Monitoring frequencies according to WFD Annex V.1.3.4

	Rivers	Lakes
Biological quality elements		
Phytoplankton	6 months	6 months
Other aquatic flora	3 years	3 years
Benthic invertebrate fauna	3 years	3 years
Fish	3 years	3 years
Hydromorphological quality elements		
Continuity	6 years	
Hydrology	continuous	1 month
Morphology	6 years	6 years
Physico-chemical quality elements		
Thermal conditions	3 months	3 months
Oxygenation	3 months	3 months
Salinity	3 months	3 months
Nutrient status	3 months	3 months
Acidification status	3 months	3 months
Other pollutants	3 months	3 months
Priority substances	1 month	1 month

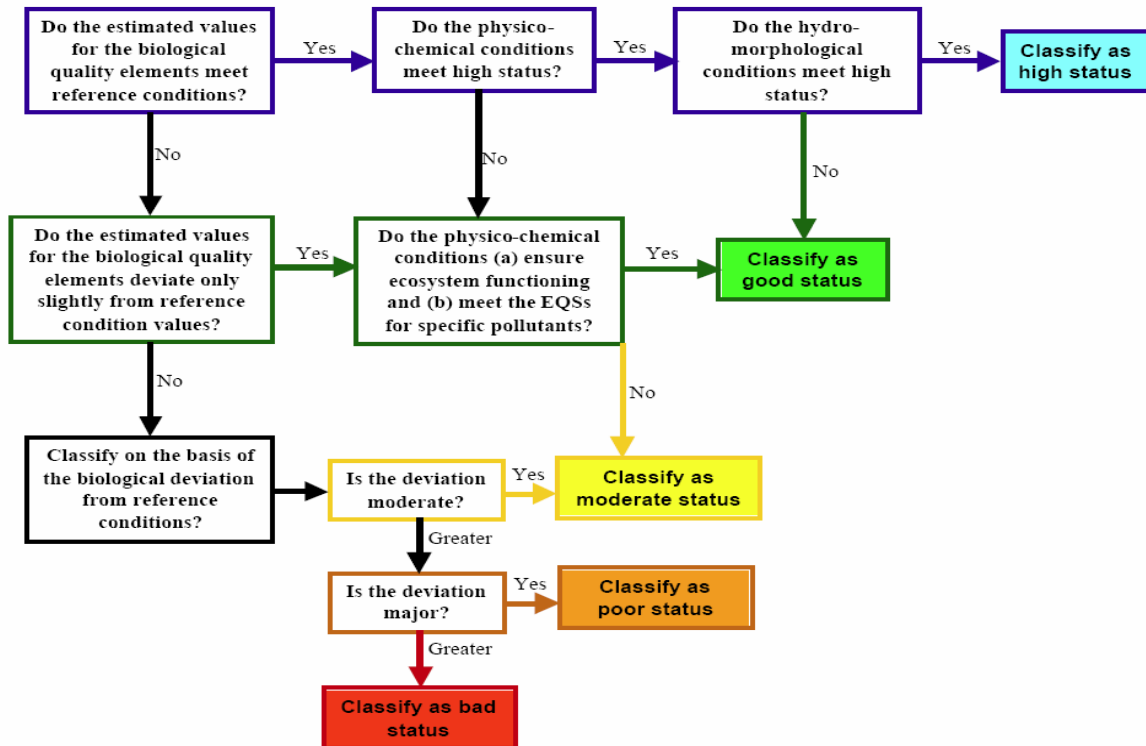
Long-term trend monitoring locations will require high frequency sampling. The sites required for supplementing and validating the risk assessment will be monitored with different frequencies depending on the importance of the risk, details of the frequency of monitoring required for each of the individual river sub-networks are given in Appendix 1 and 2_EPIRB_River_Prut_UA.

3. QUALITY CONTROL AND QUALITY ASSURANCE

It is important for the surface water monitoring programme to ensure that data generated by WFD physico-chemical and biological monitoring parts are reliable and representative. Furthermore, as it is known a data should allow the assessment of the impacts of Programs of Measures on the water body status. Therefore, Quality Management Programme should be prepared for all steps of the monitoring programme from sampling via analysis to the data management and interpretation. It is expected that sampling and analysis (physico-chemical and biological quality elements) will be conducted in accordance with ISO Standards (other International Standards) and laboratories will meet the requirements of the ISO 17025 Standard.

4. ECOLOGICAL STATUS ASSESSMENT

The WFD defines ecological status in the high, good and moderate classes for each of the ecological quality element for each of the surface water categories. It describes the biological and hydromorphological parameters and the physico-chemical and relevant pollutants required in the overall ecological assessment. The overall ecological status assessment is shown on the scheme below.



All biological quality elements must be taken into account when assigning water bodies to any of the ecological status or ecological potential classes. For each biological element the set of the metrics (or indices) will be selected to be indicative for the given pressures. The status of each of the biological elements for natural water bodies is determined by measuring the extent of the deviation, if any, of the observed condition from the **reference condition** established for that type of water body. Reference conditions are the conditions established for the biological elements in the absence of pollution or disturbance (or at least minimum disturbance).

Ecological status assessment system will be expressed numerically as *ecological quality ratios* (EQR) in the range between 1 (high status) and 0 (bad status). The EQR scale for the assessment system for each surface water category is divided into the five classes by assigning a numerical value to each of the boundaries between the classes.

The physico-chemical and hydromorphological quality elements are supporting elements of the biological assessment for the purpose of the overall ecological status assessment. Therefore, based on the existing data from the JFS and national monitoring programmes statistical analysis will be conducted to express numerically boundary for the classes.

5. CHEMICAL STATUS ASSESSMENT

The chemical status of surface water bodies is linked with the WFD Annex X pollutants. The latest EU directive specifying both the pollutants (*‘Priority substances and certain other pollutants’*) and their environmental quality standards (EQS), is the Directive 2013/39/EU *“amending Directives 2000/60/EC and 2008/105/EC as regards Priority substances in the field of water policy”*.

The Directive 2013/39/EU has defined EQSs for in total 45 (groups of) substances, comprising four metals (cadmium, lead, mercury and nickel) and a wide array of organic micropollutants.

In principle, two (complementary) environmental quality standards are defined; both EQSs are to be met in order to qualify as ‘good chemical status’:

- annual average – environmental quality standard (AA-EQS), applying to the arithmetic mean of one year of data, with monthly sampling presumed;
- maximum concentration – environmental quality standard (MAC-EQS), applying to the maximum concentration in the annual set of data.

Annex 1

Recommended List of Standards and Guidelines

ISO 10870: 2012 Water quality - Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters (ISO 10870:2012).

ISO 5667-1: 2007 – Water quality - Sampling - Part 1: Guidance on the design of sampling programmes and sampling techniques (ISO 5667-1:2006)

ISO 14996: 2007 – Water quality - Guidance on assuring the quality of biological and ecological assessments in the aquatic environment.

ISO 8689-1: 2000 – Water quality - Biological classification of rivers - Part 1: Guidance on the interpretation of biological quality data from surveys of benthic macroinvertebrates. (ISO 8689-1:2000).

ISO 8689-1: 2000 – Water quality - Biological classification of rivers - Part 1: Guidance on the interpretation of biological quality data from surveys of benthic macroinvertebrates. (ISO 8689-1:2000)

ISO 16150:2012 – Water quality - Guidance on pro-rata Multi-Habitat sampling of benthic macro-invertebrates from wadeable rivers.

ISO Project AQEM, 2002. Manual for the application of the AQEM System (Asterics 3.3.1, www.aqem.de)

EC, 2003. Guidance Document No. 7 Monitoring under the Water Framework Directive, Luxembourg: Office for Official Publications of the European Communities.

ISO 15843:2010 Water quality. Guidance standard on determining the degree of modification of river hydromorphology, CEN, 2010.

ISO 14614:2004 Water Quality - Guidance standard for assessing the hydromorphological features of rivers, CEN, 2004.

ISO Water Sampling Standards 5667 (series).

Appendix 1:

EU WFD compliance monitoring for the Prut (UA) Pilot Basin (Rivers)
List of Quality Elements for rivers
Sampling Frequency for rivers

Appendix 2:

EU WFD compliance monitoring for the Prut (UA) Pilot Basin (Lakes)
List of Quality Elements for lakes
Sampling Frequency for lakes

EU WFD compliance monitoring for the Prut Ukraine Pilot Basin (Rivers)

No.	Water body number	River name	Character of water body	Expected status/potential	Location	Latitude	Longitude	Area (km2)	Surveillance monitoring sites	Operational monitoring sites	Risk category							
									SM1 Overall status	SM2 Long-term trends	SM3 Supplementing and validating IA	SM4 Large rivers and significant cross border RWBS	OM 1 Point Source Risk	OM 2 - Diffuse Risk	OM 3 - Hydromorphology	OM 4 - Measures to protect High/Good Status	OM 5 - Protected Areas	
1		Yablunetskiy Prutets	WB	RC	Below Bukovel				1	1								NR
2		Prut	WB	RC	Turbaza Zaroslyak				1	1								NR
3		Beliy Cheremosh	WB	RC	Yablunetska				1		1							NR
4		Ribnitsya	WB	RC	Yavory				1	1								NR
5		Koroviya	WB	RC	Chagor				1	1								NR
6		Iltsya	WB	RC	Iltsi				1	1								NR
7		Ryngach	WB	RC	Hotyn-Novoselitsa				1		1							NR
8		Shybeny	WB	RC	Shybeny				1	1								NR
9		Prut	WB	High	Luzhany				1			1						NR
10		Prut	WB	Moderate	Below Chernovtsy (Border U/A/MD)				1				1					R
11		Prutets Chemigivskiy	WB	Poor	Mykulychyn									1				R
12		Lopatynka	WB	Poor	Shishkovtsy										1			R
13		Prut	WB	Moderate	Below Kolomia								1	1				R
14		Prut	WB	Moderate	Below Sniatyn								1	1				R
15		Prut	WB	Moderate	Belo Zabalotyv								1	1				R
16		Rakytyna	WB	Moderate	Chernovtsy-Hotyn								1	1				R
17		Beleluya	WB	Moderate	Toropivtsy										1			R
18		Prut	WB	Moderate	UA0201/16											1		R

Note: PR - possibly at risk
 NR - not at risk
 R - at risk

List of Quality Elements for rivers

			Surveillance monitoring site	Operational monitoring site	Protected Area site
Physico-chemical quality elements					
General conditions					
	Temperature	°C	1	1	
	Dissolved Oxygen	mgO ₂ /l	1	1	
	pH	pH units	1	1	
	Conductivity	µS/cm	1	1	
	Hardness	mg/l CaCO ₃	1	1	
	Colour	visual	1	1	
	o-Phosphate	mg P/l	1	1	
	Total Phosphorus	mg P/l			1
	Total Nitrogen	mg N/l			1
	Nitrate	mg N/l	1	1	
	Ammonium	mg N/l	1	1	
	Chloride	mg/l	1	1	
	Sulphate	mg/l	1	1	
	Total suspended solids	mg/l	1	1	
	Biochemical oxygen demand (BOD5)	mgO ₂ /l	1	1	
	Chemical oxygen demand (COD - dichromide)	mgO ₂ /l	1	1	
	Oil substances	visual	1	1	
Other specific pollutants discharged in significant quantities (basin specific)*					
	Copper	µg/l	1	1	
	Zinc	µg/l	1	1	
	Chromium	µg/l	1	1	
Priority Substances and Certain Other Pollutants			1		
<i>All 'Priority substances and certain other pollutants' that can be analysed with the existing laboratory capacity</i>					
Biological Quality Elements					
	Macroinvertebrates	Metrics	1	1	
	Macrophytes	Metrics		1	
	Phytobenthos	Metrics	1	1	
	Fish	Migratory fish species	1		
Hydromorphological Quality Elements					
	Morphological Conditions	HM protocol	1	1	
	River flow	Daily Mean Flow	1	1	1

* to be monitored if discharged in the dignificant quantities

Sampling Frequency for rivers

Frequencies for Physico-chemical Quality Elements

Operational Monitoring

OM1	Point Pressure	4	times per year for general parameters and other pollutants discharged in significant quantities (basin specific)
OM2	Diffuse Pressure	4	times per year for general parameters and other pollutants discharged in significant quantities (basin specific)
OM3	Hydromorphological	4	times per year for general parameters
OM4	High and Good status	4	times per year for general parameters (However, not all sites in this sub-network require physico-chemical parameters to be monitored)
OM5	Protected areas (habitat)	4	times per year for general parameters

Notes:

These are minimum sampling frequencies and more frequent sampling may be required depending on the confidence and precision required and the particular programme of measures that is being monitored under the Prut Pilot river basin.

Surveillance Monitoring Network

General conditions and other specific pollutants	12	times per year
Priority Substances	12	times per year for one year in each 6-year cycle for priority substances
Overall status Sites	12	times per year for general parameters and other pollutants discharged in significant quantities (basin specific)
Long-term Trend Sites	12	times per year for general parameters and other pollutants discharged in significant quantities (basin specific)
Supplementing and Validating the IA	6	times per year for general parameters and other pollutants discharged in significant quantities (basin specific)
Large Rivers and Significant Cross Border RWBs	12	times per year for general parameters and other pollutants discharged in significant quantities (basin specific)

Notes:

As a principle the sub-network with the most frequent requirement should be respected for the sampling frequency

Biological Quality Elements

Surveillance monitoring

	Minimum Frequency	
Macroinvertebrates	2	time per year in each 6-year cycle
Macrophytes	1	time per year in each 6-year cycle
Phytobenthos	1	time per year in each 6-year cycle
Fish	1	time in each 6-year cycle

Operational monitoring

Macroinvertebrates	2	time per year in each 6-year cycle
Macrophytes	1	time per year in each 6-year cycle
Phytobenthos	1	time per year in each 6-year cycle
Fish	1	time in each 6-year cycle

Hydromorphological quality elements

River flow	daily
Morphological conditions	1 time in each 6-year cycle

EU WFD compliance monitoring for the Prut Ukraine Pilot Basin (Lakes)

No.	Water category	Lake name	Character of water body	Expected status/potential
1		Cherlena Reservoir*	HMWB	Moderate

Note: PR - possibly at risk

* - two sampling locations per water body

Location*

Latitude

Longitude

Altitude

Area (km2)

Surveillance monitoring sites	
SM1 Overall status	
SM2 Long-term trends	
SM3 Supplementing and validating IA	
Stipulated lakes	
Protected areas	
Operational monitoring sites	
OM 1 Point Source Risk	
OM 2 - Diffuse Risk	1
OM 3 - Hydromorphology	
OM 4- Protect High and Good Status	
OM 5 - Habitat Protected Areas at risk	
PR Risk category	

List of Quality Elements to be monitored for lakes

Surveillance monitoring site	Operational monitoring site
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General conditions

Parameter	Unit	Surveillance monitoring site	Operational monitoring site
Temperature	°C	1	1
Dissolved Oxygen	mgO ₂ /l	1	1
pH	pH units	1	1
Conductivity	µS/cm	1	1
Colour	visual	1	1
Total Phosphorus	mg P/l	1	1
Total Nitrogen	mg N/l	1	1
Hardness	mg/l CaCO ₃	1	1
Alkalinity	mg/l CaCO ₃	1	1
Ammonium	mg N/l	1	1
Chloride	mg/l	1	
Sulphate	mg/l	1	
Calcium	mg/l	1	
Sodium	mg/l	1	
Magnesium	mg/l	1	
Silica	mg/l	1	
Secchi disc	m	1	1
Biochemical oxygen demand (BOD ₅)	mgO ₂ /l	1	1
Chemical oxygen demand (COD - dichromide)	mgO ₂ /l	1	1
Depth at site	m	1	1

Other specific pollutants

There are not identified any specific pollutants discharged in significant amounts into the lakes

Priority Substances and Certain Other Pollutants

All 'Priority substances and certain other pollutants' that can be analysed with the existing I 1

Biological Quality Elements

Parameter	Unit	Surveillance monitoring site	Operational monitoring site
Phytoplankton	Metrics	1	1
Chlorophyll	mg/m ³	1	1
Macroinvertebrates	Metrics	1	1
Macrophytes	Metrics	1	1
Fish	Migratory fish species	1	

Hydromorphological Quality Elements

Parameter	Unit	Surveillance monitoring site	Operational monitoring site
Morphological Conditions	HM metrics	1	1
Inflow and outflow	m ³ /s	1	1
Water level	m	1	1

Sampling Frequency for lakes

Frequencies for Physico-chemical Quality Elements

Operational monitoring			
OM1	Point Pressure	4	times per year for general parameters
OM2	Diffuse Pressure	4	times per year for general parameters
OM3	Hydromorphological Pressure	4	times per year for general parameters
OM4	High and Good status	4	times per year for general parameters (However, not all sites in this sub-network require physico-chemical parameters to be monitored)
OM5	Protected areas (habitat)	4	times per year for general parameters

Notes:

These are minimum sampling frequencies and more frequent sampling may be required depending on the confidence and precision required and the particular programme of measures that is being monitored under the Prut Pilot river basin.

Freshwater Fish Directive Sites	12	times per year for general parameters
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Surveillance monitoring

General conditions and other specific pollutants	12	times per year
Priority Substances	12	times per year for one year in each 6-year cycle for priority substances
Overall status Sites	12	times per year for general parameters
Long-term Trend Sites	12	times per year for general parameters
Supplementing and Validating the IA	6	times per year for general parameters
Stipulated lakes	12	times per year for general parameters
Protected areas	6	times per year for general parameters

Notes:

As a principle the sub-network with the most frequent requirement should be respected for the sampling frequency

Biological Quality Elements

Operational monitoring

	Minimum Frequency	
Phytoplankton	4	times per year in each 6 years cycle as per general physico-chemical parameters
Chlorophyll a	4	times per year as per general physico-chemical parameters
Macroinvertebrates	1	time per year in each 6-year cycle
Macrophytes	1	time per year in each 6-year cycle
Fish		not monitored

Surveillance monitoring

Phytoplankton	4	times per year as per general physico-chemical parameters
Chlorophyll a	4	times per year as per general physico-chemical parameters
Macroinvertebrates	1	time per year in each 6-year cycle
Macrophytes	1	time per year in each 6-year cycle
Fish	1	time per year in each 6-year cycle

Hydromorphological quality elements

Inflow and outflow	1	daily
Level of lake	1	daily
Morphological Conditions	1	time per year in each 6-year cycle