Methodology for Ecological Assessment of Small Freshwater Ecosysterms (SFEU) (activity A2)

Final version

Activity description:

Defining the assessment methodology for the ecological status of small freshwater ecosystem units

Rationale:

The goal of this activity is creating a methodology that will allow us to assess the current ecological status of small freshwater units (SFEU) in the project area, which will be carried out as part of the activity A3 (mapping SFEU in the project area). The ecological status will serve as an input for prioritization of the restoration (activity A4), in order to focus restoration activities on the most valuable ecosystems in the project area, as well as enabling public institutions to make informed decisions for future restoration plans.

Ecological status in this project represents the ecological health and ecological integrity of a particular ecosystem (see DSE 2007), and reflects chemical, physical, and biological processes that keep ecosystems functional (Fennessy et al. 2007). This assessment aims to identify where exactly an ecosystem is on a spectrum between total ecological integrity (good status) and highly degraded ecosystem (bad status). Ecosystems with a good status offer a broad range of functions while those with a bad status have either a limited number of functions or the effectiveness of available functions is severely limited.

Freshwater ecosystems are defined primarily by their hydrology, pedology and vegetation, and the assessment of their status is based on understanding the factors that enable the creation and persistence of these ecosystems in a specific environment (Fennessy et al. 2007). The ecological assessment of SFEU (A2) is based on criteria that reflect the basic factors defining freshwater ecosystems, as well as the threats that limit their functionality. All criteria have a range of points and the sum of this points for represents the ecological status of SFEU.

Highly degraded
(low intgegrity)

Highly functional
(high integrity)

Resources:

DSE (2007): Index of Wetland Condition - Review of Wetland Assessment Methods. Department of Sustainability and Environment, Melbourne, Victoria, Australia.

Fennessy M.S., Jacobs A.D., Kentula M.E. (2007): An evaluation of rapid methods for assessing the ecological condition of wetlands. Wetlands 27, 543–560.

Criteria:

Name	Description	Points
1. Water presence	Presence of water is an essential criterion for freshwater ecosystems and only the permanent absence of water receives no points. Seasonality is defined as a significant decrease (or complete loss) in summer months while in winter the water level is high. Water level oscillations contribute to a higher biodiversity of the ecosystem.	no (0)
		permanent (1)
		occasional / seasonal (2)
2. Water source	If the water source is of anthropogenic origin, then it is assumed that the ecosystem is also of anthropogenic origin or is being actively maintained (e.g. a hole in the ground impregnated with concrete that is filled with water during draught). If the water source is underground water or a stream, it means that the ecosystem is connected to the wider area and is thus scored higher then the one receiving water only through precipitation.	anthropogenic (0)
		precipitation (1)
		watercourse / underground (2)
3. Visual estimation of water quality	Low transparency of water lowers the amount and range of sun rays entering the ecosystem which prevents the development of different plant species. Murky water or water covered with algae, which prevents sunlight entering the water column, is an indication of degradation. Also, if it is not possible to see the bottom of the ecosystem, the development of water vegetation is impeded, but this is not necessary a result of degradation as an ecosystem can be just too deep. A shallower ecosystem where the bottom is visible is still scored higher as it is considered more biodiverse.	Muddy, turbid water or there are algae in the water column (0)
		Clear water, bottom is not visible (1)
		Clear water, bottom is visible (2)
4. Average water depth	The higher the water depth in the ecosystem, less likely is the possibility for development of water vegetation, which represents a favourable habitat for many other species. The highest biodiversity is usually present in shallow waters, with a depth up to 30cm.	>100cm (0)
		30-100cm (1)
		0-30cm (2)

Name	Description	Points
5. Presence of invasive plant species in the water	Invasive species represent a threat to autochthonous species and can negatively impact biodiversity. Moreover, their presence indicates potential negative changes in the ecosystem, like higher trophy levels of the water. The more invasive species there are in the ecosystem it can be assumed that the level of degradation lasting longer and is more significant. As different species inhabit water and terrestrial habitats, they are scored separately.	>3 species (0)
		1-3 species (1)
		no (2)
6. Presence of invasive plant species in in the costal and terrestrial part		>3 species (0)
		1-3 species (1)
		no (2)
7. Presence of water vegetation	Water vegetation develops in the water column or on the surface and its presence indicates favourable ecosystem conditions like clean water, and it enables the presence of other organisms that need shelter. The higher the diversity of water vegetation, the higher is the possibility for the creation of diverse microhabitats. Along vascular species, algae from the Characeae should be included in the counting.	no (0)
		1-3 species (1)
		>3 species (2)
8. Presence of wetland vegetation	Wetland vegetation represents the most valuable elements of freshwater ecosystems, considering the biodiversity dependent on it. The higher the diversity of wetland vegetation, the higher the number of potential microhabitats and species associated with them.	no (0)
		1-3 species (1)
		>3 species (2)
9. Number of vegetation layers	Various species, apart from water, need different types of vegetation for their survival, like shrubs or marsh vegetation. So, more diverse the vegetation structure is (having more layers), the higher is the possibility of an ecosystem harbouring a high biodiversity.	Only 1 layer (e.g. grass around the pond) (0)
		1-2 layers (e.g. grass around the pond and wetland vegetation in the pond) (1)
		>2 layers (as abovementioned but with e.g. shrubs near the pond) (2)
10. Presence of different groups of herpetofauna	The more groups of herpetofauna are present in the ecosystem and its surroundings (up to a100m from the shore), the higher is the biodiversity of the ecosystem. The presence of autochthonous species of snakes, lizards, turtles, frogs, salamanders are noted, as well as their tracks.	Absence of specimens and of tracks of herpetofauna (0)
		Presence of tracks and/or specimens of at least one group of herpetofauna (1)
		Presence of tracks and/or specimens of more than one group of herpetofauna (2)

Name	Description	Points
11. Presence of dragonflies	Dragonflies are closely dependent on water surfaces and their life cycle requires an adequate water and coastal habitat, as well as a diverse insect fauna as prey. That is why they can be used as indicators of environmental conditions of freshwater ecosystems and the presence of their nymphs can indicate a good integrity of the ecosystem.	no dragonflies present (0)
		present only specimens of one dragonfly species (1)
		present specimens of more than one dragonfly species and/or nymphs (2)
12. Presence of invasive species of vertebrates	Invasive species of vertebrates (e.g. mosquitofish, goldfish, red-eared slider) have a negative impact on various elements of freshwater ecosystems and can lead to a significant loss of biodiversity. So, the presence of these species can indicate a bad condition of the ecosystem.	invasive species of vertebrates are present in the ecosystem (0)
		invasive species of vertebrates are not present in the ecosystem (1)
13. Shape of the banks	If the banks are steep or there is a sudden change in depth, (>30cm), there is less space for development of marsh vegetation, as well as the lack of space for occurrence of specific habitat that is developed in the low, muddy banks during the seasonal drying up, which are essential for biodiversity.	steep banks (0)
		low laying banks at least on one part (shore with a depth lower than 10cm) (1)
		low laying banks cover most of the coastal line (shore with a depth lower than 10cm) (2)
14. Partial shade present	The presence of shade in the coastal part and the water surface is considered, as this means there is marsh vegetation or tall woody vegetation near the water. Partial shade creates diversity in ecological conditions so is positively scored. Permanent shade (over the entire ecosystem) is treated the same way as the absence of shed, as in both cases it leads to homogenous ecological conditions in the ecosystem.	no / permanent shade (0)
		partial shade only in the coastal part (1)
		partial shade covers also the deep part of the ecosystem (2)
15. Accessibility of the water surface	The ease of access for animals (e.g. frogs, foxes, cows) to the water surface is scored, as it indicated that this water surface is an important element of the animal's habitat.	no access to the water surface (0)
		water surface can be accessed only by animals of a certain size (e.g. only small animals or only cows) (1)
		water surface can be accessed by all animals, regardless of their size (2)

Name	Description	Points
16. Ecosystem surroundings (100m from the shore)	Freshwater ecosystems often receive water from the surrounding area, so if this area is exposed to anthropogenic pressures, there is a higher possibility of a source of pollution being present there. That is why only natural and semi-natural habitats in the surroundings are scored positively.	anthropogenic elements present (e.g. road, house) / agricultural elements present (0)
		only natural habitat (grassland, scrub, woodland) (1)
17. Signs of use	Active use of freshwater ecosystems as source of potable water for animals and people can lead to negative changes in the ecosystem due to negative changes in the water quantity and quality, as well as changes in the coastal area, which can negatively affect biodiversity of the ecosystem. If there are signs of recent use (including for agriculture) but there are no negative changes to the water column or coastal area (e.g. murky water, predominantly trampled surroundings), the use is not considered as having a negative impact. Use by wild animals fits into the most favourably scored category.	intensive use as a source of water for the cattle (obvious signs of heavy trampling in the surroundings) / actively used for irrigation or as a source of potable water for people (0)
		low to medium use as a source of water for the cattle (no signs of heavy trampling in the surroundings) (1)
		no recent sings of anthropogenic use (2)
18. Presence of trash	Presence, type and quantity of trash is noted as it indicates degradation of the ecosystem. If trash is present on all three parts of the ecosystem (water/bed, shore, vicinity), the ecosystem can be considered severely degraded. Vicinity of the ecosystem comprises the area of 100m from its banks.	trash present in all three parts of the ecosystem (water/bed, shore, vicinity) (-3)
		trash present in the water or in the bed of the ecosystem (-2)
		trash present in the vicinity or on the shore of the ecosystem (-1)
		trash not present in the ecosystem (0)
19. Trapping hazard	The surveyor assesses the possibility of the ecosystem becoming a death trap for animals, meaning that the animal can enter the ecosystem, but they cannot exit it on their own, due to e.g. conformation of the banks or changes in the ecological conditions.	ecosystem can present a trapping hazard for at least one species (e.g. tadpoles, once transformed into frogs, cannot get out) due to steep banks) (-1)
		the possibility of the ecosystem being a death trap is negligible (subjective estimate) (0)

Name	Description	Points
20. Presence of other negative indicators	If there are obvious other indicators of intensive or inadequate use of the ecosystem (e.g. fishing, too much dung, woody species in the bed), they can indicate to the degradation of the ecosystem. These indicators are assessed subjectively by the surveyor.	presence of other negative indicators (e.g. fishing, woody vegetation it the bed) (-1)
		No clear signs of other negative indicators (0)
21. Presence of dead animals	In case there are signs of dead animals in the ecosystem, it is an indication of an unfavourable structure of the ecosystem, as it does not allow animals to exit the water once they're inside. The death of the animals and its subsequent decomposition leads to a deterioration of the ecosystem, especially in case of a death of a big animal. Number and condition of the dead animal should be recorded.	signs of dead animals (-1)
		no signs of dead animals (0)

Points:

Criteria	Min	Max
hydrology	0	8
biodiversity	0	15
structure	0	6
threats	0	3
indicators of negative status	-6	0
∑	-6	32

Classes:

I	II	III	IV	V
-6	0	10	18	25	32

Fieldwork form:

Id	
Date	
Surveyor	
Natura 2000	

Criteria

Water presence	no (0)	0	Water source	anthropogenic (0)	0
	permanent (1)	1		precipitation (1)	1
	occasional / seasonal (2)	2		watercourse / underground (2)	2
Visual estimation of water quality	Muddy, turbid water or there are algae in the water column (0)	0	Average water depth	>100cm	0
	Clear water, bottom is not visible (1)	1		30-100cm	1
	Clear water, bottom is visible (2)	2		0-30cm	2
Presence of invasive plant species in the water	>3 species (0)	0	Presence of invasive plant species in in the costal and terrestrial part	>3 species (0)	0
	1-3 species (1)	1		1-3 species (1)	1
	no (2)	2		no (2)	2
Presence of water vegetation	no (0)	0	Presence of wetland vegetation	no (0)	0
	1-3 species (1)	1		1-3 species (1)	1
	>3 species (2)	2		>3 species (2)	2
Number of vegetation layers	Only 1 layer (e.g. grass around the pond) (0)	0	Presence of different groups of herpetofauna	Absence of specimens and of tracks of herpetofauna (0)	0
	1-2 layers (e.g. grass around the pond and wetland vegetation in the pond) (1)	1		Presence of tracks and/or specimens of at least one group of herpetofauna (1)	1
	>2 layers (as abovementioned but with e.g. shrubs near the pond) (2)	2		Presence of tracks and/or specimens of more than one group of herpetofauna (2)	2
Presence of dragonflies	no dragonflies present (0)	0	Presence of invasive species of vertebrates	invasive species of vertebrates are present in the ecosystem (0)	0
	present only specimens of one dragonfly species (1)	1		invasive species of vertebrates are not present in the ecosystem (1)	1
	present specimens of more than one dragonfly species and/or nymphs (2)	2			

Shape of the banks	steep banks (0)	0	**Partial shade present**	no / permanent shade (0)	0
	low laying banks at least on one part (shore with a depth lower than 10cm) (1)	1		partial shade only in the coastal part (1)	1
	low laying banks cover most of the coastal line (shore with a depth lower than 10cm) (2)	2		partial shade covers also the deep part of the ecosystem (2)	2
Accessibility of the water surface	no access to the water surface (0)			0	
	water surface can be accessed only by animals of a certain size (e.g. only small animals or only cows) (1)			1	
	water surface can be accessed by all animals, regardless of their size (2)			2	
Ecosystem surroundings (100m from the shore)	anthropogenic elements present (e.g. road, house) / agricultural elements present (0)	0	**Signs of use**	intensive use as a source of water for the cattle (obvious signs of heavy trampling in the surroundings) / actively used for irrigation or as a source of potable water for people (0)	0
	only natural habitat (grassland, scrub, woodland) (1)	1		low to medium use as a source of water for the cattle (no signs of heavy trampling in the surroundings) (1)	1
				no recent sings of anthropogenic use (2)	2
Presence of trash	trash present in all three parts of the ecosystem (water/bed, shore, vicinity) (-3)	-3	**Trapping hazard**	ecosystem can present a trapping hazard for at least one species (e.g. tadpoles, once transformed into frogs, cannot get out) due to steep banks) (-1)	-1
	trash present in the water or in the bed of the ecosystem (-2)	-2			
	trash present in the vicinity or on the shore of the ecosystem (-1)	-1		ecosystem can present a trapping hazard for at least one species (e.g. tadpoles, once transformed into frogs, cannot get out) due to steep banks) (-1)	0
	trash not present in the ecosystem (0)	0			
Presence of other negative indicators	presence of other negative indicators (e.g. fishing, woody vegetation it the bed) (-1)	-1	**Presence of dead animals**	signs of dead animals (-1)	-1
	No clear signs of other negative indicators (0)	0		no signs of dead animals (0)	0
Comment					