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Abstract. In article the question of value of inundated ecosystems of the planet for the biosphere, importance of preservation of their steady state in the conditions of the escalating pressure of an anthropogenic factor is considered. Authors within several years made monitoring of the vegetable communities of the floodplain of the Yutsa River subject to pollution by an unauthorized dump of solid household and construction waste. Change of a specific variety of grassy communities of the studied territory subject to anthropogenic influence has been as a result registered. The group of the plants which are most adapted (tolerant) for observed changes of the surrounding environment which is probably the so-called destructive link which is a basis for the subsequent restoration of the studied grassy community in these changed conditions is found. It is revealed that the changes in the specific structure of vegetable community which have led to loss of stability of the damaged territory continued some time and after elimination of anthropogenic influence, becoming populated by invasive types.

Introduction

The problem of sustainability of natural ecosystems in the modern world due to global environmental pollution is very important and has great practical value. However, natural formations, like other living systems of the biosphere, are very complex structures, represented by a huge number of interrelated and interdependent heterogeneous elements, often not yet sufficiently studied. Any change in one of the links of this organism inevitably affects the whole system. Moreover, functionally different types of natural communities on the scale of the whole biosphere, as if complementing each other, determine its stability and integrity. The loss of any of its constituent elements can cause serious, often irreversible, negative changes in the cycle of substances, reduce its stability.

Thus, the study of the structure of various natural communities, mechanisms of their sustainability, as well as monitoring and protection are imperative and urgent tasks of our time. The understanding of the insufficiently studied question of the implementation of immunity of plant organisms, the mechanism of their resistance to adverse environmental factors, especially in conditions of increasing anthropogenic pressure, which, along with natural causes, leads to a rapid change of ecosystems (succession), can help to solve this problem, along with the solution of other problems in this area.

Now it is established that development of natural formations in many respects is similar to development of individuals. In ecosystems, as well as in a single organism of an animal or plant, metabolism is detected, due to the opposite processes of catabolism and anabolism. Anabolism processes are manifested in natural ecosystems in the synthesis of biomass producers and its accumulation in ecosystems. The processes of catabolism are provided by the life activity of the reducents. This leads to the sustainability of natural communities of any complexity, ie. their equilibrium state with the natural environment.

However, from year to year the number of sustainable natural systems is decreasing, which negatively affects the global cycle of substances, leads to the destruction of ecosystems and adversely affects climate change throughout the planet. So today, about 63.8% of biogeocenoses on land are more or less susceptible to degradation.

It is known that at the present scale of anthropogenic impact on nature, when changes in environmental factors occur very quickly, living organisms do not have time to adapt to them, which leads to their extinction. The disappearance of species sensitive to various pollutants leads to the settlement of the territory by other forms (invasive) that are more resistant to the created conditions. At the same time, invasive species, and most often in herbaceous communities are ruderal plants, create an unfavourable ecological background, since they often have poisonous pollen, and sometimes poisonous vegetative organs, a more powerful root system, have a more powerful seed fund. All this leads to an increased competitive ability of the minerals in comparison with local forms. They quickly colonise nearby areas, displacing less adapted species.

In this regard, river and floodplain ecosystems deserve great attention. They are today considered as a repository of the planet's biodiversity. Each of them is unique and therefore makes an invaluable contribution to the overall integrity and stability of the biosphere.

1. Goals and Objectives

The task of our work was to study the biodiversity and stability of plant communities in the floodplain of the Yutsa river, to study the process of their transformation under the influence of anthropogenic factors, as well as the mechanisms of recovery after the cessation of this pressure.

The relevance of this work lies in the absence, as far as we know, of data on the study of floodplain ecosystems of the Yutsa river, which is the right tributary of the Podkumok river flowing through the territory of the Caucasian Mineral Waters.

It is known that the plant communities of the floodplain are significantly different from the flora of other areas. This is due to the influence of the river, which during floods, brings suspended matters on their territory. They form a layer of deposit of spring floods, mixed with the fall of vegetation, causing thus soil fertility and creating conditions for the appearance of characteristic plant communities, which are significantly different from each other in different river floodplains.

The floodplain of the river Yutsa is also unique. In the floodplain of the river there is a small lake, with its own biota, increasing the biodiversity of the area and causing its uniqueness. The study and monitoring of natural ecosystems of the recreational region of the CMW (Causacian Mineral Waters) in order to preserve the stability and biodiversity of its unique natural complexes is particularly relevant. The status of the resort of CMW requires great responsibility for the quality of the natural environment of the region, which, as in the modern world as a whole, has certain environmental problems and requires its early solution.

The creation of a tourism and recreation cluster not only develops infrastructure, but also contributes to the creation of unauthorised landfills that have a negative impact on the environment due to the rapid growth of construction institutions nearby.

The objectives of solving global problems related to environmental pollution in the construction, operation and dismantling of "end-of-life" buildings are reflected in the international standards ISO 14040-14044.

Three licensed landfills of solid household waste (SHW) are officially operating in the region: in the vicinity of Essentuki, Mineral Waters and in Lermontov. Only 9 companies out of 23 are licensed for the collection and disposal of solid household waste [1]. The problem of collection, utilisation of solid household waste (SHW) in the urban system, associated with the preservation of the environment takes the second place.

In the CMW region, observations have shown that from time to time unauthorised landfills are formed, which are monitored by the city administration and activists in order to eliminate them. The landfill consisting of SHW (Solid Household Waste) and construction debris was discovered by the

authors in the floodplain of the river Yutsa in the area of the settlement Goryachevodsky. After its discovery, having existed for another 2 years, it was liquidated.

In this paper, the dynamics of changes in the species diversity of the floodplain vegetation community of the Yutsa river, transformed by an unauthorised landfill, was studied. The monitoring was carried out for 6 years near the settlement of Goryachevodsky.

2. Methods of Study

The main method of our study was the monitoring of changes in the species diversity of ecosystems located in the immediate vicinity of the landfill in comparison with the control ecosystems located at a distance of 100 m. The object of monitoring was randomly selected areas in three replications of 1m2. With the aim of identifying species by standard methods, herbarisation of plants was carried out, using determinants: Keller B. A., Lubimenko V. N., Maltsev A. I., Fedchenko B. A., 1934-1935; Rycina, 1952; Grossheim, 1949; Galushko, 1980.

The criteria of ecosystem quality was the calculation of biomass of plant communities and their species diversity.

Results

As a result of monitoring, 27 species of plants were found in the study area. These are: blue devil (Echium vulgare), cardaria nibs (Cardaria drada), common yarrow (Achilléa millefólium), sphagnum moss (Sphagnum), white dead-nettle (lamium album), cocksfoot (Dactylis glomerataL.), oatmeal high (Festuca altissima), common thistle (Cirsium vulgare (Savi).), clover field (Amoria Trifolium campestris L.), horse sorrel (Rumex confertus Wilid), common cardaria (Cardaria vulgare), common falcaria (Falcaria vulgaris), tufted vetch (Vicia crassa), hedge vetch (Vicia sapium), small crane (Geranium pussilum), cleavers (Galium aparine), sow-thistle (Sonchus palustris L.), bird's-foot trefoil (Lotus corniculatus L.), burdock (Arctium lappa), common winter cress (Barbarea vulgaris) and plantain (Plantago major L.), field horsetail (Equisetum arvense L.), yellow sweet clover (Melilótus officinális), wormwood (Artemísia absínthium), burdock (Xánthium strumárium), bluegrass (Poa annua L), stinging nettle (Urtícaúrens) (table 1).

Table 1. Species diversity of herbal communities of the Yutsa river floodplain during the monitoring period

Year of study	Control area	Experimental area
1	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3.The ordinary cardaria - Cardaria vulgare 4. Common yarrow – Achilléa millefólium 5. Sphagnum Moss-Sphagnum 6.Common fascaria - Falcaria vulgaris 7. Tufted vetch - Vicia crassa 8. Hedge vetch -Vicia septum 9. Small crane - Geranium pussilum 10. Cleavers – Galium aparine 11. Sow-thistle – Sonchus palustris L. 12.The common Thistle - Cirsium vulgare (Savi) 13.White dead-nettle – lamium album 14. Oatmeal high - - Festuca altissima 15. Bird's-foot trefoil – Lotus corniculatus L. 16.Cocksfoot – Dactylis glomerata L.	1.Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3.The horse sorrel – Rumex confertus Wilid 4.Common yarrow - Achilléa millefólium 5.White dead-nettle – lamium album 6, Cocksfoot - Dactylis glomerata L. 7. Tall fescue - Festuca altissima All 8.Field clover-Amoria (Trifolium) campestris.L. 9.Sphagnum Moss-Sphagnum 10.The common thistle - Cirsium vulgare (Savi)

2	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3.Horse sorrel – Rumex confertus Wilid 4. Common yarrow – Achilléa millefólium 5.White dead-nettle – Lamium album 6. Cocksfoot – Dactylis glomerata L. 7.Oatmeal high – Festuca altissima 8.Field clover – Amoria (Trifolium) campestris L. 9. Sphagnum moss - Sphagnum 10. Common thistle - Cirsium vulgare (Savi)	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3. Common cardaria - Cardaria vulgare 4. Common yarrow – Achilléa millefólium 5.Sphagnum Moss-Sphagnum 6. Common Fascaria - Falcaria vulgaris 7. Tufted vetch - Vicia crassa 8. Hedge vetch - Vicia septum 9. Small crane - Geranium pussilum 10.Cleavers – Galium aparine 11. Sow-Thistle – Sonchus palustris L. 12.The common Thistle - Cirsium vulgare (Savi) 13. White dead-nettle – lamium album 14. Oatmeal high - - Festuca altissima 15. Bird's foot – Lotus corniculatus L.
3	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3.Horse sorrel – Rumex confertus Wilid 4. Common yarrow – Achilléa millefólium 5.White dead-nettle – lamium album 6. Cocksfoot – Dactylis glomerata L. 7.Oatmeal high – Festuca altissima 8. Field clover – Amoria (Trifolium) campestris L. 9. Sphagnum moss - Sphagnum 10. Common thistle - Cirsium vulgare (Savi) 11.Wheatgrass janalski – Elytrigiad.shinalica Sablina 12.Hordelymus eureurropaeus 13.Plantain – Plantago major L.	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3. Common cardaria - - vulgare Cardaria 4. Common yarrow – Achilléa millefólium 5.Sphagnum Moss - Sphagnum 6.Common fascaria - Falcaria vulgaris 6. Tufted vetch - Vicia crassa 7. Hedge vetch - Vicia septum 8. Small crane - Geranium pussilum 9. Cleavers – Galium aparine 10. Sow-Thistle – Sonchus palustris L. 11.The common thistle - Cirsium vulgare (Savi) 12. White dead nettle - lamium album 13.Oatmeal high - Festuca altissima 14. Bird's foot - Lotus corniculatus L. 15.Cocksfoot – Dactylis glomerata L.

4	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3. Horse sorrel – Rumex confertus Wilid 4. Common yarrow – Achilléa millefólium 5.White dead-nettle – lamium album 6.Cocksfoot – Dactylis glomerata L. 7. Tall fescue - Festuca altissima 8. Field clover-Amoria (Trifolium) campestris L. 9. Sphagnum Moss-Sphagnum 10. The common Thistle - Cirsium vulgare (Savi) 11. Wheatgrass jamalski – Elytrigiadshinalica Sablina 12. Hordelymus European - Hordelymus europaeus 13.Plantain – Plantago major L.	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3. Common cardaria - - vulgare Cardaria 4. Common yarrow – Achilléa millefólium 5. Sphagnum Moss - Sphagnum 6. Common fascaria - Falcaria vulgaris 7. Tufted vetch -Vicia crassa 8. Hedge vetch - Vicia septum 9. Small crane - Geranium pussilum 10. Cleavers – Galium aparine 11. Sow-thistle – Sonchus palustris L. 12.The common Thistle - Cirsium vulgare (Savi) 13. White dead nettle - lamium album 14. Oatmeal high - - Festuca altissima 15. Bird's foot - Lotus corniculatus L. 16.Cocksfoot – Dactylis glomerata L.
5	1. Blue devil - Echiumv ulgare 2. Cardaria nibs - Cardariadrada 3. Common yarrow – Achilléa millefólium 4. The common Thistle - Cirsiumvulgare (Savi) 5. Wheatgrass jamalski – ElytrigiadshinalicaSablina 6. Tufted vetch - Vicia crassa 7. Hedge vetch - Vicia septum 8.Wild carrots – Daucus carota L. 9. Yellow sweet clover – Melilotus officinalis 10.Hop clover – Medica golupulina L. 11. Cleavers – Galium aparine 12. Flattened meadow grass – Poacompressa L. 13.Wild chicory - Cichorium inthybus L. 14.Celandine – Chelidonium majus L. 15.Acanthus bristlethistle – Carduus acanthoides L. 16.Sea-side lavender - kerlik	1. Blue devil - Echiumv ulgare 2.Cardaria nibs – Cardaria drada 3. Common cardaria - Cardaria vulgare 4. Common yarrow - Achilléa millefólium 5.Sphagnum Moss-Sphagnum 6. Common falcaria - Falcaria vulgaris 7. Tufted vetch - Vicia crassa 8. Hedge vetch - Vicia septum 9. Small crane - Geranium pussilum 10. Cleavers – Galium aparine 11. Sow-Thistle – Sonchus palustris L. 12.The common Thistle - Cirsium vulgare (Savi) 13. White dead-nettle – lamium album 14. Oatmeal high - - Festuca altissima 15. Bird's foot –Lotus corniculatus L. 16.Cocksfoot – Dactylis glomerata L.
6	1.Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3. Common yarrow – Achilléa millefólium 4.The common Thistle - Cirsium vulgare (Savi) 5.Wheatgrass of janal – Elytrigia dshinalica Sablina 6.Tufted vetch - Vicia crassa 7. Hedge vetch - Vicia septum 8.Wild carrot - Daucus carota L. 9.The yellow sweet clover – Melilotus officinalis 10. Wild chicory - Cichorium inthybus L. 11. Celandine – Chelidonium majus L.	1. Blue devil - Echium vulgare 2.Cardaria nibs - Cardaria drada 3. Common cardaria - - vulgare Cardaria 4. Common yarrow – Achilléa millefólium 5.Sphagnum Moss - Sphagnum 6.Common fascaria - Falcaria vulgaris 7. Tufted vetch - Vicia crassa 8. Hedge vetch - Vicia septum 9. Small crane - Geranium pussilum 10. Cleavers – Galium aparine 11. Sow-Thistle – Sonchus palustris L.

	12.Prickly Thistle – Carduus acanthoides L. 13.Burweed - Xánthium strumárium 14.Wormwood - Artemisia 15. Orache –Atriplex sagittata	12.The common thistle - Cirsium vulgare (Savi) 13. White dead nettle - lamium album 14.Oatmeal high - Festuca altissima 15. Bird's foot - Lotus corniculatus L. 16.Cocksfoot – Dactylis glomerata L.

During the monitoring period, the authors registered a change in the species composition of the plant communities transformed by the landfill, which was reflected both in the disappearance of some species, probably the most sensitive to the changed environmental factors, and also the coverage of the study area with new invasive species for the area.

Among the dropped types were noted: sphagnum moss (Sphagnum), white dead-nettle (lamium album), cocksfoot (Dactylis glomerata L.), tall fescue (Festuca altissima) and identified invasive plants: field horsetail (Equisetum arvense L.), yellow sweet clover (Melilótus officinális), wormwood (Artemísia absínthium), burweed (Xánthium strumárium), bluegrass (Poa annua L), stinging nettle (Urtícaúrens), burdock (Arctium lappa), common winter cress (Barbarea vulgaris) and plantain (Plantago major L.).At the same time, the species diversity of the control area remained unchanged.

The disappearance of the mentioned species brought the system out of a stable state, as evidenced by a significant decrease in plant biomass in comparison with the control area. Later, during the restoration of the disturbed plant community, the difference in the amount of biomass between the control and experimental areas tended to decrease (table 2).

The results of the monitoring showed that if the difference between the biomass of the disturbed community and the control area in the first year of monitoring was 33%, then by the sixth year of observation, after the elimination of the unauthorised landfill, it decreased to 10.8%, which can be explained by the coverage of the territory by invasive species instead of the disappeared local species.

Table 2. Changes in biomass of the plant community disturbed by an unauthorised landfill during the monitoring period

year	biomass gr/м^2		The difference between the amount of biomass in control and experimental area	
	Experimental area	Control area	gr/м^2	%
1	466	700	234	33
2	500	703	203	28
3	510	709	199	28
4	550	710	160	23
5	600	720	120	16.7
6	650	729	79	10.8

It should be noted that for the entire period of observation the plant community of the control area was stable, i.e. we did not record the emergence of new or disappearance of local plant species.

Besides, this work has allowed to identify the plant species growing in the floodplain of the Yutsa river which are most resistant to the prevailing conditions.They are: field horsetail (Equisetum arvense L.), wormwood bitter (Artemísia absínthium), common cocklebur (Xánthium strumárium), stinging nettle (Urtícaúrens), burdock (Arctium lappa), common winter cress (Barbarea vulgaris).

These species were found both in the area disturbed by the landfill and in the control area during the entire observation period. Probably, they provided elasticity and stability of plant community in the created conditions, ensuring its stability and possibility of the subsequent restoration.+

Conclusions

As a result of the monitoring, the change in the species diversity of the herbal community of the landfilled community was recorded, which resulted in its initial impoverishment, accompanied by a simultaneous decrease in biomass.

During the research such plants as sphagnum moss (Sphagnum), white dead-nettle (Lamium album), cocksfoot (Dactylis glomerata L.), tall fescue (Festuca altissima All.) have disappeared from the area transformed by the landfill. Grass coverage biomass decreased by 33%.

Later on, after the elimination of the pollution source, there has been a tendency to recovery of the biomass, due to the appearance of invasive species such as field horsetail (Equisetum arvense L.), yellow sweet clover (Melilótus officinális), wormwood bitter (Artemísia absínthium), common cocklebur (Xánthium strumárium), annual bluegrass (Poa annua L), stinging nettle (Urtícaúrens), burdock (Arctium lappa), common winter cress (Barbarea vulgaris) and common plantain (Plantago major L.).

However, observations showed that some of the species of the original community remained unchanged, as it was detected during the entire period of monitoring both at the experimental site and at the control site. These are: field horsetail (Equisetum arvense L.), wormwood (Artemísia absínthium), common cocklebur (Xánthium strumárium), stinging nettle (Urtícaúrens), burdock (Arctium lappa), common winter cress (Barbarea vulgaris). This allows us to consider this group of plants as the most adapted (tolerant) to the newly established environmental conditions. Probably, it was this group which was the destructive link that served as the basis for the subsequent restoration of the disturbed ecosystem.

An important result of the monitoring, in our opinion, was the observation that after the elimination of the landfill, during the studied period of time, there was no restoration of the former species diversity of this herbaceous community, although plant biomass tended to recover.

Thus, studies have shown that unauthorised landfills and construction waste, so often found in many regions of the country, are not harmless. They have a negative impact on the species composition of ecosystems, disrupting their sustainable state. Even their subsequent elimination does not lead to a complete restoration of biogeocenosis parameters in a short period of time (monitoring time).

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