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Article

Anthropogenic transformation of phytocenoses in the Nalchik River valley (Kabardino-Balkaria)

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Abstract. The article presents the results of long-term studies of the dynamics of plant communities in the Nalchik River valley influenced by various anthropogenic factors. Four associations and three communities of different successional status have been identified. The class ***Molinio-Arrhenatheretea*** R. Tx. 1937 includes the association ***Centaureo kubanicae-Cynodontetum dactyli*** ass. nov. prov., which characterizes a pasture digression of meadow vegetation in the study area and corresponds to the stage of secondary pasture dominants, as well as the community ***Aegilops cylindrica***, which reflects the late stage of a recreational digression. The association ***Sisymbrietum loeselii*** Gutte 1972, the variant ***Ambrosia artemisiifolia*** (the class ***Sisymbrietea*** Gutte et Hilbig 1975) represents the initial stage of vegetation restoration, whereas the association ***Melilotetum albi-officinalis*** Sissingh 1950 (the order ***Artemisietalia vulgaris*** Lohmeyerin R. Tx. 1947, the class ***Artemisietea vulgaris*** Lohmeyer et al. in Tx. ex von Rochow 1951) – the middle stage of a restorative succession. The association ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966, as well as the community ***Urtica dioica*** **[*Artemisietea vulgaris*]** and the community ***Cichorium intybus*** **[*Artemisietea vulgaris*]** within the order ***Agropyretalia intermedio-repentis*** T. Müller et Görs 1969 of the class ***Artemisietea vulgaris*** correspond to the late succession stage. Further restoration of vegetation in the absence of anthropogenic disturbances and climatic anomalies would naturally lead to the emergence of the communities of native meadow vegetation in the study area. It was revealed that vegetation transformation caused by technogenic impacts occurred in two stages. At first, the natural meadow vegetation was buried under a layer of solid waste, followed by backfilling with soil that gave rise to ruderal communities, which almost disappeared during the second stage distinguished by intensive construction works in this area. To improve the environment of the study area, landscaping of house territories is recommended.

Keywords: small rivers, synanthropic vegetation, association, community, transformation

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Научная статья

Антропогенная динамика фитоценозов в долине реки Нальчик (Кабардино-Балкария)

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Аннотация. Описаны результаты многолетних исследований динамики растительных сообществ в долине реки Нальчик, находящейся в зоне воздействия различных антропогенных факторов. Выделены 4 ассоциации и 3 сообщества разного сукцессионного статуса. В составе класса ***Molinio-Arrhenatheretea*** R. Tx. 1937 описаны ассоциация ***Centaureo kubanicae-Cynodontetum dactyli*** ass. nov. prov., характеризующая пастбищную дигрессию луговой растительности района исследования и отвечающая стадии вторичных пастбищных доминантов, а также сообщество ***Aegilops cylindrica***, отражающее позднюю стадию рекреационной дигрессии. Ассоциация ***Sisymbrietum loeselii*** Gutte 1972, вариант ***Ambrosia artemisiifolia*** (класс ***Sisymbrietea*** Gutte et Hilbig 1975) является начальной стадией восстановления растительности. Ассоциация ***Melilotetum albi-officinalis*** Sissingh 1950 (порядок ***Artemisietalia vulgaris*** Lohmeyerin R. Tx. 1947, класс ***Artemisietea vulgaris*** Lohmeyer et al. in Tx. ex von Rochow 1951) представляет среднюю стадию восстановительной сукцессии. Ассоциация ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966, а также сообщество ***Urtica dioica* [*Artemisietea vulgaris*]** и сообщество ***Cichorium intybus* [*Artemisietea vulgaris*]** в составе порядка ***Agropyretalia intermedio-repentis*** T. Müller et Görs 1969 класса ***Artemisietea vulgaris*** соответствуют поздней сукцессионной стадии. Дальнейший ход восстановления растительности при отсутствии антропогенных нарушений и климатических аномалий закономерно привел

бы к появлению сообществ коренной луговой растительности исследуемого района. Установлено, что трансформация растительности под воздействием техногенного воздействия происходила в два этапа. Вначале произошло погребение естественной луговой растительности под слоем ТБО с последующей засыпкой почвогрунтом, что привело к возникновению рудеральных сообществ. Второй этап сопровождался активными строительными работами на указанной территории, вследствие чего описываемые сообщества практически исчезли. Для улучшения окружающей среды изучаемого района рекомендуется проводить озеленение придомовых территорий.

Ключевые слова: малые реки, синантропная растительность, ассоциация, сообщество, трансформация

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Introduction

Nowadays, human activity leads to the transformation of numerous ecosystems in Russia, such as steppe (Abramova et al., 2000; Levykin, 1997), river (Nikanorov et al., 2012), forest (Bednova et al., 2015; Kudryavtsev, 2021; Shcherbina, 2018), floodplain (Nikonova, 2015), the Arctic (Tishkov et al., 2019), etc. This process is especially pronounced in the most susceptible to changes urban ecosystems (Ovesnov et al., 2017), where natural vegetation destruction, unintentional introduction of alien and new species of cultivated plants occur (Abramova and Mirkin, 2000). Among other ecosystems, river floodplains have poor resistance to anthropogenic impacts (Abramova, 2010).

There are over 2000 rivers in Kabardino-Balkaria. These are mainly small watercourses, not exceeding 100 km in length, and with catchment areas less than 1–2 thousand km^2. Being the tributaries of medium and large rivers, they play an important role in their state and the formation of water resources as a whole. In turn, the state of small rivers depend on the surrounding vegetation. Unfortunately, small rivers and adjacent territories are often located in the zone of influence of various anthropogenic factors causing the transformation of vegetation cover. From numerous national and international scientific publications it follows that assessing vegetation under anthropogenic impact, establishing the stages of succession and other processes, as well as the monitoring observations (including regional ones) remain currently topical.

In the republic, the Nalchik River is among the objects of monitoring. The length of this mountain river from its source on the northern slope of the Rocky Ridge (2660 m a.s.l.) to the confluence with the Urvan River (a tributary of the Cherek River) is 54 km, its catchment area makes up 440 km^2. More than half of the river length falls on the populated areas: rural settlements of Belaya Rechka, Khasanya, Volny Aul, Adiyukh, Nartan, and the city of Nalchik. In the early 1980s, in order to stabilize the bottom and lateral erosion of the riverbed at the city, as well as to prevent river flooding during snowmelt in the

mountains and heavy rains, the works on its banks protection were implemented. For instance, a 10-km man-made dam with the reinforced concrete slabs was constructed. Within the city, the river ecosystem undergoes different anthropogenic loads varying with time. These are grazing, storage of municipal solid wastes, reclamation, including the construction of roads, residential and other buildings, etc.

The purpose of this work was to monitor the anthropogenic dynamics of phytocenoses in the valley of the Nalchik River. The objectives involved studying the diversity of plant communities, their classification, assessment of the floristic composition and dynamics under anthropogenic impacts. The data obtained can be useful in solving the problems of rational transformation of the environment and its protection.

Material and methods

The study material was represented by the phytocenoses common for the valley of the Nalchik River, flowing through the city of Nalchik. For observations, a key area (N 43°28.989–43°29.172 E°43°38.059–43°38.576) with various ecotopes containing wastelands, construction sites, earthen and garbage dumps, roadsides on the floodplain terraces along the left and (partly) right banks of the river at the Ordzhonikidzevsky bridge was chosen.

The dynamics of phytocenoses was analyzed based on the ecological-floristic approach of J. Braun-Blanquet (1964), which has proven itself well in various environmental and monitoring studies. For this purpose, 80 geobotanical descriptions were made mostly at the same plots of the key site in 1994–1995, 2018, and 2020. Geobotanical descriptions of plant communities were performed on sample plots with the area of 100 m^2. The combined Braun-Blanquet scale was used to estimate the quantitative participation of species: “r” – very rare (1–4 individuals); “+” – sparse and cover less than 1% of the sample area; 1 – projective cover of 1–5%, 2 –6–15%, 3 – 16–25%, 4 – 26–50%, 5 – more than 51% (Mirkin and Naumova, 2012; Mirkin et al., 1989). The species constancy in the communities was assessed on a five-point scale: I – 1–20%, II – 21–40%, III – 41–60%, IV – 61–80%, V – 81–100% (Mirkin and Naumova, 2012; Mirkin et al., 1989).

When processing descriptions, we applied the deductive method of Kopečky and Hejny (1974). The identification and naming of new units were implemented in accordance with the International Code of Phytosociological Nomenclature (Theurillat et al., 2021) using a single block of the diagnostic species, without their dividing into characteristic and differential ones, in contrast to J. Moravec et al. (2005). The names of plants were given according to S.K. Cherepanov (1995).

Results and discussion

From the processed geobotanical descriptions, we identified four associations ***Centaureo kubanicae-Cynodontetum dactyli*** ass. nov. prov., ***Sisymbrietum loeselii*** Gutte 1972 the variant ***Ambrosia artemisiifolia***, ***Melilotetum albi-officinalis*** Sissingh 1950, ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966 (see Tables S1–S4 in Appendix) and three communities ***Urtica dioica*** **[*Artemisietea vulgaris*]**, ***Cichorium intybus*** **[*Artemisietea vulgaris*]**, ***Aegilops cylindrica*** **[*Molinio-Arrhenatheretea*]** (see Tables S5–S7 in Appendix).

Prodromus of herbaceous vegetation in the Nalchik River valley

Class ***Molinio-Arrhenatheretea*** R. Tx. 1937
Order ***Arrhenatheretalia*** R. Tx. 1931
Alliance ***Cynosurion cristati*** R. Tx. 1947
Association ***Centaureo kubanicae-Cynodontetum dactyli*** ass. nov.prov.
Variant ***typica*** (a)
Variant ***Thymus pastoralis*** (b)
Variant ***Alyssum turkestanicum*** (c)
Community ***Aegilops cylindrica*** **[*Molinio-Arrhenatheretea*]**
Class ***Sisymbrietea*** Gutte et Hilbig 1975
Order ***Sisymbrietalia*** J. Tx. ex Görs 1966
Alliance ***Atriplicion*** Passarge 1978
Association ***Sisymbrietum loeselii*** Gutte 1972
Variant ***Ambrosia artemisiifolia***

Class ***Artemisietea vulgaris*** Lohmeyer et al. in Tx. ex von Rochow 1951
Order ***Artemisietalia vulgaris*** Lohmeyerin R.Tx. 1947
Alliance ***Dauco carotae-Melilotion*** Görs ex Rostański et Gutte 1971
Association ***Melilotetum albi-officinalis*** Sissingh 1950
Order ***Agropyretalia intermedio-repentis*** T. Müller et Görs 1969
Alliance ***Convolvulo arvensis-Agropyrion repentis*** Görs 1967
Association ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966
Community ***Urtica dioica*[*Artemisietea vulgaris*]**
Community ***Cichorium intybus* [*Artemisietea vulgaris*]**

The ***Centaureo kubanicae-Cynodontetum dactyli*** association (Table S1) was described in 1995. The total projective cover (TPC) of its herbs varies from 30 to 95% (67 on average). The number of species ranges from 10 to 18 (14 on average). Its coenoflora includes 54 species. The diagnostic species of the association are *Cynodon dactylon*, *Centaurea kubanica*, *Petrorhagia saxifraga.*

In this association, we have identified three variants: ***typica***, ***Thymus pastoralis***, and ***Alyssum turkestanicum.*** Judging by high species constancy of the class ***Molinio-Arrhenatheretea*** (*Achillea millefolium*, *Plantago lanceolata*, *Taraxacum officinale*, *Trifolium pratense*), meadow vegetation can be considered in all variants as indigenous for the study area. However, livestock grazing and recreational activities (rest of residents, collection of medicinal plants) have contributed to introduction of weed species (*Eryngium planum*, *Centaurea diffusa*, *C. iberica*, *Medicago minima*, *Ambrosia artemisiifolia*, *Hordeum leporinum*, *Phalacroloma annuum*, *Setaria viridis*, *Scleranthus annuus*) and emergence of secondary communities. The dominant and codominant of the communities is the low-growing rhizomatous cereal ***C. dactylon,*** resistant to trampling and grazing. The analysis of the species composition of this association and the presence of the diagnostic species of two classes of synanthropic vegetation – ***Artemisietea vulgaris*** and ***Sisymbrietea*** (Table S1), indicate the digression of meadow vegetation corresponding to the successional stage of secondary pasture dominants (Yamalov et al., 2008).

Communities with abundant participation of *C. dactylon* are widespread and described both in Russia and abroad (Golub et Mirkin, 1986; Golub et Tchorbadze, 1995; Rukhlenko and Golub, 2013; Vegetace..., 2009, etc.). For example, in the Volga Delta, these are the associations ***Lepidio-Cynodontetum*** Golub et Mirkin 1986, ***Elytrigio repentis-Cynodontetum*** Golub et Tchorbadze 1995, ***Trifolio fragiferum-Cynodontetum*** Rukhlenko et Golub 2013. Abroad, the ruderal associations ***Cynodonto dactyli-Atriplicetum tataricae*** Morariu 1943 and ***Cynodontetum dactyli*** Gams 1927 were described. In the meadow phytocenoses, *C. dactylon* was found with high constancy in the associations ***Erysimo diffusae-Agrostietum capillaries*** Vicherek in Chytry et al., 1997 and ***Digitario serotinae-Festucetum vaginatae*** Klika 1934. The association ***Centaureo kubanicae-Cynodontetum dactyli*** differs from the above-mentioned communities by the presence of the Caucasian flora species in the diagnostic species *Centaurea kubanica* and *Petrorhagia saxifraga.*

Over 10 years (since the 1990s), the floodplain terraces served as a site for unauthorized storage of solid and construction wastes (SWs). On these dumps, the pioneer communities with *Tussilago farfara, Datura stramonium, Abutilon theophrasti* were replaced by the ruderal ones.

By the early 2000s, the phytocenoses of the ***Centaureo kubanicae-Cynodontetum dactyli*** association in the river valley were buried under a 3–4-meter layer of various wastes. After landfill closing, the area was reclaimed by backfilling that brought to the anthropogenic transformation of the ecosystem. Its natural landscape was replaced by an artificial, the so-called neolandscape. On its wastelands, roadsides of the paved dirt road and in other places, an active dispersal of ruderal and local flora species was recorded. In the last decade, the river terraces were heavily built up. As a result, some catering enterprises, several multi- and single-story buildings have appeared. Anthropogenic impacts on the riverine territory gave rise to the development of a number of serial ruderal phytocenoses.

The association ***Sisymbrietum loeselii*** with the variant ***Ambrosia artemisiifolia*** (Table S2), described in 2020, belongs to the class ***Sisymbrietea***, the communities of which represent the initial stage of a restorative succession. In the key site, they are growing along the dirt road and on earthen embankments. Here, the diagnostic species are ***S. loeselii*** and ***A. artemisiifolia***, TPC makes up 60–100% (average: 80%), herbs height reaches 90–180 cm (average: 118 cm). The communities contain 16–20 species (18 on average) and the association coenoflora consists of 54 species, including the species of the class ***Artemisietea vulgaris***, ***Polygono arenastri-Poëtea annuae*** that confirms

instability, ecological heterogeneity of the floristic composition and floristic inferiority of the communities of the ***Sisymbrietea*** class (Arepyeva, 2015; Mirkin and Solomeshch, 1989).

The association ***Melilotetum albi-officinalis*** Sissingh 1950 (Table S3) is a part of the class ***Artemisietea vulgaris***, which unites ruderal communities of tall biennial and perennial species. It has been found that vegetation of this class is closely related to the class ***Sisymbrietea*** (Golovanov et al., 2017). If the ***Sisymbrietea*** communities develop on initially or frequently disturbed substrates, vegetation of the class ***Artemisietea vulgaris*** follows them in the course of secondary succession, representing its middle and late stages (Arepyeva, 2015; Golovanov et al., 2017). Communities of the considered association inhabit wastelands, mainly located along the right and, to a lesser extent, left banks of the Nalchik River. The diagnostic species and dominant is the Eurasian species *Melilotus officinalis*, which determines the external appearance of the communities. TPC of herbs is within 75–100% (average 77%) and herbs height – from 85 to 150 cm (average: 124 cm). The communities contain 11–19 species (on average 15). The coenoflora of the association is formed mainly by species of two classes – ***Artemisietea vulgaris*** with high constancy of *E. repens*, *C. intybus*, *Ph. annuum*, *C. incanum* and ***Molinio-Arrhenatheretea***. In total, there are 43 species in the coenoflora. The association ***Melilotetum albi-officinalis*** corresponds to the middle stage of a restorative succession, being, apparently, the transitional one to the next stage demonstrated by the syntaxons of the order ***Agropyretalia repentis*** Oberd. et al. 1967 ex T. Muller et Görs 1969 (Tsepkova and Abramova, 2021). The ***Melilotetum albi-officinalis*** association is widespread in Russia, in particular, in the Kursk Region (Arepyeva, 2015), the Crimean Peninsula (Bagrikova, 2016), and in the Republic of Bashkortostan (Golovanov et al., 2017).

The association ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966, the community ***Urtica dioica* [*Artemisietea vulgaris*]** and the community ***Cichorium intybus* [*Artemisietea vulgaris*]** as a part of the order ***Agropyretalia intermedio-repentis*** T. Müller et Görs 1969 of the class ***Artemisietea vulgaris*** were described owing to geobotanical descriptions of the years 2018 and 2020. This order unites Eurasian ruderal communities representing an advanced stage of a restorative succession (Mirkin and Naumova, 2012). Therefore, the described syntaxons correspond to the late successional stage.

The community ***Cichorium intybus* [*Artemisietea vulgaris*]** (Table S6) is widespread along dirt roads (Tsepkova and Abramova, 2021). It is composed of species from two classes of ruderal vegetation: ***Artemisietea vulgaris*** (*Cichorium intybus* (dominant), *Cirsium incanum*, *Ambrosia artemisiifolia*, *Daucus carota*) and ***Sisymbrietea*** (*Convolvulus arvensis*, *Conyza canadensis*, *Sisymbrium loeselii*, *Chenopodium polyspermum*). These are tall-grass communities (average height: 120 cm) with TPC of 90–100%, and low in species (on average 14 species). Their coenoflora consists of 34 species, including 3 invasive ones (*A. artemisiifolia*, *C. canadensis*, *Ph. annuum*). The external appearance of the syntaxon communities is determined by the dominant *C. intybus* – the European-West Asian plurizonal species, xeromesophyte and typical ruderal encountered in various disturbed habitats, often in the roadside ecotopes. The communities of this syntaxon are close to the association ***Melilotetum albo-oficinalis*** Sissingh 1950. From the latter, they differ by *C. intybus* dominance with codominance of *A. artemisiifolia* and *Elytrigia repens*, not by representatives of the genus *Melilotus*.

The community ***Urtica dioica* [*Artemisietea vulgaris*]** (Table S5) on disturbed floodplain terraces has a small number of species (on average 11 species). TPC of herbs is 70–80% (average: 77%), herbs height varies from 45 to 60 cm (average: 53). The community is formed of dominant species of two classes: ***Artemisietea vulgaris*** (*Artemisia vulgaris*, *Cirsium incanum*, etc.) and ***Sisymbrietea*** (*Stellaria media*, *Solanum nigrum*, *Capsella bursa-pastoris*). It is well-known that the communities dominated by *Urtica dioica* prefer nitrophilic habitats. Their spread on the floodplain terraces of the Nalchik River during the landfill operation is explained by the presence of much organic wastes usually kept by (later demolished) private farmsteads, i.e. houses, front gardens, barns, etc.

Communities of the association ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966 (Table S4) with predominance of *E. repens*, a rhizomatous paleoarctic grass, became common on wastelands after the reclamation of the territory disturbed by garbage dumps. TPC of herbs makes up 75–85% (on average 84%); herbs height is within 45–85 cm (average 63 cm). In the study sites, 16–20 species (on average 18) with a total of 25 species in the community were found. The coenoflora of the association is formed mainly by the species of the class ***Artemisietea vulgaris*** (*A. vulgaris*, *C. intybus*, *C. incanum*, *D. carota*, *Melandrium album*, *M. officinalis*, *Ph. annuum*). Species of other classes of ruderal vegetation (***Sisymbrietea***, ***Polygono arenastri-Poëtea annuae***, ***Epilobietea angustifolii***) and classes of natural vegetation (***Molinio-Arrhenatheretea***, ***Festuco-Brometea***) (Table S4) play an insignificant role

in the formation of the communities. Adventitious species in the communities are few (*Ph. annuum*, *A. artemisiifolia*). Despite the participation in the herbs formation of the species of classes with different stages of a restorative succession, the dominance of species of the class ***Artemisietea vulgaris*** and the order ***Agropyretalia repentis*** indicates the late successional stage of the communities of this association. The stages are reported in publications by L.A. Arepyeva (2012, 2015), E.O. Golovina (2015), E.M. Volkova and S.M. Yamalov (2015), etc. The association is widespread in European Russia, on the territory of the Crimean Peninsula (Bagrikova, 2016). Earlier, on ruderalized lawns of Nalchik, the ***Phalocrolomo annui-Elytrigietum repentis*** association Tsepkova, Kuchmezova & Abramova 2008 was studied and described. Its communities are characterized by a high proportion of perennial grasses (*E. repens*, *Lolium perenne*, *C. dactylon*, *Dactylis glomerata*) (Tsepkova et al., 2008).

The ***Aegilops cylindrica* [*Molinio-Arrhenatheretea*]** community (Table S7) on the dam edges was described in 2020. The diagnostic species *Aegilops cylindrica* is an annual grass growing as a weed on the open rocky and fine-earth slopes, sands, pebbles, and along roads (Tsvelev, 1978). At the dam edges, it was first discovered in 2018. TPC of herbs ranged from 65 to 100% (average: 87%); herbs height – as 25–60 cm (average: 39). On average, the site contains 15 species, with a total of 39 species in the coenoflora. Species of six classes participate in herbs formation (Table S7) with predominance of the species of the ***Molinio-Arrhenatheretea*** class (*A. millefolium*, *D. glomerata*, *Plantago media*, *Poa pratensis*). Not exposed to large disturbances, the community represents a refugium for the flora of the Nalchik River valley, where some species of the previously existed communities have been preserved. In terms of successional status, it corresponds to the late stage of a recreational digression.

Analysis of the identified syntaxons clearly demonstrates the transformation of vegetation cover in the Nalchik River valley (Table 1).

Construction works, materials delivery by heavy transport and intensive traffic of numerous vehicles (construction cranes, dump trucks, tractors, etc.) along a dirt road located in the vicinity of the already populated and ready-to-occupy buildings cause the environmental pollution. Rising dust and gas emissions from vehicles are the driving factors of pollution.

It is common knowledge that green spaces serve as filters for the atmosphere and play the major role in the environment improvement. They trap dust, absorb toxic gases, and have noise and windproof properties. Therefore, landscaping of house territories is recommended for providing better environmental conditions. When selecting an assortment of trees and shrubs, one should rely on the opinion of the specialists in this field. Note that the creation of lawns and flower beds reduces the contamination of plant communities with ruderal and alien species. In addition, beautifully flowering ornamental plants in flowerbeds have a strong aesthetic effect on humans.

Conclusion

Over the past decades, human activity has greatly contributed to various changes in vegetation cover of the Nalchik River valley within the city of Nalchik. Pasture and recreational impacts induced minor digression of the communities of meadow vegetation, unlike technogenic effects responsible for a significant two-stage transformation of vegetation. At the first stage, the native meadow vegetation was buried under a thick layer of SWs (later soil), a dirt road was built along the river dam, and a number of serial ruderal communities appeared on the recultivated territory. The analysis of syntaxons, identified in the course of eco-floristic classification, made it possible to define the community belonging to different stages of restorative succession with further determination of its direction. The second stage is related to the construction works, i.e. already built facilities (six multi-story residential buildings, one three-story building, the Breeze cafe, a paid parking lot) and the constructions currently under way (two eight-story buildings). As for the described communities, they are about to disappear. Only small "islands" of former habitats with remnants of the communities have been preserved.

It was expected that restorative successions would bring to the restoration of the previously existed meadow communities, characteristic of the studied area before technogenic impacts. However, the increased anthropogenic loads on the ecosystem of the Nalchik River valley have hindered this process.

In order to improve the environment of the studied area, we suggest perform landscaping of the house territories (planting of trees and shrubs, creating of lawns and flowerbeds) thus mitigating the communities' contamination with weeds and alien species.

Table 1. Vegetation transformation of floodplain terraces of the Nalchik River influenced by anthropogenic factors.

Impact stage	Period	Type of anthropogenic impact on river ecosystems	Plant communities	Main types
1	1960–1990	**Disturbing type.** Minor pasture impact (grazing by private cattle); recreational (rest of the local population in summer, collection of medicinal plants.	Meadow communities represented by the association ***Centaureo kubanicae-Cynodontetum dactyli*** with variants ***typica***, ***Thymus pastoralis*** and ***Alyssum turkestanicum*** within the class ***Molinio-Arrhenatheretaea***.	*Cynodon dactylon*, *Achillea millefolium*, *Plantago lanceolata*, *Taraxacum officinale*, *Trifolium pratense;* indicators of grazing and recreational impact are *Eryngium planum*, *Centaure diffusum*, *C. ibericum*, *Medicago minima*, *Thymus pastoralis*, *Hordeum leporinum*, *Setaria viridis*, *Scleranthus annuus,* etc.
2	1991–1994	**Damaging type.** Beginning of gradual unauthorized filling of floodplain terraces with solid and construction waste (SWs).	Emergence of monodominant pioneer communities on garbage dumps and earth piles; mass spread of the ruderal community ***Urtica dioica* [*Artemisietea vulgaris*]**. Gradual disappearance of meadow communities under SWs.	*Tussilago farfara*, *Datura stramonium*, *Abutilon theophrasti,* etc. *Solanum nigrum*, *Stellaria media*, *Barbarea arcuata*, *Capsella bursa-pastoris*, etc are a part of the ruderal community.
3	1995–2000	**Destructive type.** Final filling of terraces with SWs. Territory reclamation via SWs backfilling.	Disappearance of meadow communities under a 3–4 m layer of solid wastes and soils. The emergence of diverse ruderal communities reflecting different stages of restoration succession: comm. ***Cichorium intybus* [*Artemisietea vulgaris*];** comm. ***Aegilops cylindrica* [*Molinio-Arrhenatheretea*]**; ass. ***Sisymbrietum loeselii***; ass. ***Melilotetum albi-officinalis;*** ass. ***Convolvulo arvensis-Elytrigietum repentis***.	*Cichorium intybus*, *Cirsium incanum*, *Ambrosia artemisiifolia*, *Daucus carota, Conyza canadensis*, *Aegilops cylindrica*, *Melilotus officinalis*, *Sisymbrium loeselii*, *Phalacroloma annuum*, *Convolvulus arvensis*, *Elytrigia repens*, *Artemisia vulgaris.*
4	2001 г. –present	**Destructive type.** Man-made impact: digging pits for various facilities construction, including residential and catering buildings, (cafe "Breeze", parking lot, etc.).	Because of construction works, the habitats occupied by co. ***Cichorium intybus* [*Artemisietea vulgaris*]**; ass. ***Sisymbrietum loeselii***; ass. ***Melilotetum albi-officinalis***, ass. ***Convolvulo arvensis-Elytrigietum repentis*** have almost completely disappeared. Only small "islands" of former vegetation still remain.	In 2018–2022, the species previously undetected in in the study area appeared: *Aegilops cylindrica*, *Brassica campestris*, *Cuscuta europaea*, *Chenopodium botrys*, *Lavatera thuringiaca*, *Limonium meyeri*, *Oenothera biennis*, *Reynoutria japonica*, *Rorippa austriaca*, *Sambucus ebulus*, *Sedum acre*, *Sorghum halepense.*

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APPENDIX. Botanical descriptions of plant associations and communities of the Nalchik river Valley within the key area (N 43°28.989–43°29.172 E 43°38.059–43°38.576).

Table S1. Association ***Centaureo kubanicae-Cynodontetum dactyli*** ass. nov. prov.

Single encounters: *Alyssum calycinum* 20(+), 24 (+); *Anisantha tectorum* 13 (+); *Arenaria serpillifolia* 21 (+), 25 (+); *Arctium lappa* 5 (+), 6 (+); *Atriplex tatarica* 4 (+); *Bromus mollis* 13 (1); *Centaurea diffusa* 16 (+); *Centaurea iberica* 8 (+); *Descurainia sophia* 5 (+); *Festuca valesiaca* 2 (+), 5 (+); *Geranium pusilum* 11 (+), 14 (+); *Hordeum leporinum* 8 (+); *Lolium perenne* 3 (+), 6 (+); *Lotus corniculatus* 21 (1); *Malva neglecta* 5 (+); *Medicago falcata* 2 (+), 7 (+); *Poa bulbosa* 3 (1), 14 (1), 23 (1); *Scabiosa bipinnata* 7 (+), 13 (+); *Thesium procumbens* 14 (+), 20 (+); *Xanthium spinosum* 5 (+).
Location of communities: Kabardino-Balkarian Republic, Nalchik, left bank of the Nalchik River on floodplain terraces.
Dates of descriptions: №№ 1–2 – 27.05.1994, №№ 3–5 – 30.05.1995, №№ 6–8 – 02.07.1995, № № 9–14 – 12.07.1995, №№ 15–25 – 1.08.1995.
Author of descriptions: N.L. Tsepkova

Variants	***typica*** (a)										***Thymus pastoralis*** (b)							***Alyssum turcestanicum*** (c)								Constancy		
Description number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
Projective cover,%	60	65	65	70	55	70	60	85	90	95	80	90	80	80	90	85	60	50	45	75	70	45	35	30	45	a	b	c
Number of species	14	11	17	10	18	12	16	18	13	11	14	14	17	16	15	15	12	14	16	15	17	15	13	14	16			
Diagnostic species of the association ***Centaureo kubanicae-Cynodontetum dactyli***																												
Cynodon dactylon	3	4	4	4	3	3	2	5	3	4	2	2	2	2	2	1	2	1	+	1	1	1	1	1	2	V	V	V
Centaurea kubanica	1	1	1	2		3	3	1	1	+	.	1	1	1	1	1	+	1	1	1	3	2		1	1	V	V	V
Petrorhagia saxifraga	+	+								+	+		+		+	1		1	+		+	1	+		+	II	III	IV
Poterium polygamum		+						+	1			1	1					1	1			1	1	1	2	II	II	IV
Diagnostic species of variants																												
Thymus pastoralis											4	1	2	2	3	4	3									-	V	-
Alyssum turkestanicum																		1	+	+	+	1	1		1	-	-	V
Acinos arvensis																		+	+	+	+	+	+	+	+	-	-	V
Barkhausia rhoeadifolia																			1	1	1	+	1	1	1	-	-	V
Sedum hispanicum																		1	1			1	1	+		-	-	IV
Medicago minima																		+			+	+		1	1	-	-	IV

Variants	***typica*** (a)										***Thymus pastoralis*** (b)							***Alyssum turcestanicum*** (c)								Constancy		
Description number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
Diagnostic species of the class ***Molinio-Arrhenatheretea*** and the order ***Arrhenatheretalia***																												
Achillea millefolium	2	1	2	2	2	1	1	2	3	3	2	4	2	3	3	1	1	2	2	2	3	1	2	1	2	V	V	V
Plantago lanceolata	1	2	3	2	1	1	1	1	3	1	1	3	2	2	2	1	2	2	3	2	2	3	2	1	1	V	V	V
Taraxacum officinale			1	+	+		+	1	1	2		1	2	1	1				+	3		1				IV	III	II
Poa pratensis	3	1				1	1	1			1			1		2	+	1			1		+		1	III	III	III
Trifolium pratense			1								1	1	1	+		1				1						I	IV	I
Diagnostic species of the class ***Sisymbrietea***																												
Setaria viridis	1		1	+	1	2	1	1	1		1	1		1	1	1	+	2	2	1	1	1	1	2	1	IV	V	V
Erodium vulgare			+				+		1		1	+	1		1				+							II	III	I
Amaranthus retroflexus											+		1		+	1	+									-	IV	-
Capsella bursa-pastoris					1				+	+																II	-	-
Chenopodium album							+	+								+										I	I	-
Diagnostic species of the class ***Artemisietea vulgaris***																												
Echium vulgare	2		+		1		+	1		+	1	1	1	1	1	1		1	1		1	1		1	+	III	V	IV
Cichorium intybus		+	+	+	+		+	+	1	1		1	1	1	1	1				1						IV	IV	I
Berteroaincana	+								1	1	1				1		1									II	III	-
Artemisia vulgaris			+			1	+	+																		II	-	-
Diagnostic species of the class ***Polygono-Poëtea***																												
Polygonum aviculare	1				+			+																		II	-	-

Variants	***typica*** (a)										***Thymus pastoralis*** (b)							***Alyssum turcestanicum*** (c)									Constancy		
Description number	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25			
Other species																												
Phalocroloma annuum			+		1			+	1			+		1	+		+			1	1		1	1		II	III	III
Kohlrauschia prolifera	+		+			+								+		+	+									II	III	-
Bothryochloa ischaemum	+		+	+							1			1			1								+	II	III	I
Eryngium planum	+				+			+				+			+											II	II	-
Catabrosella humilis																		+			+	+	+	+	+			IV
Ambrosia artemisiifolia					1	+	1	+					+						+		+					II	I	II
Asperula humifusa			+						+	1									1							II	II	I
Verbascum thapsus				+	+															+						I	-	II
Portulaca oleracea	+					+	+																			II	-	-

Table S2. Association ***Sisymbrietum loeselii*** Gutte 1972, variant ***Ambrosia artemisiifolia***.

Single encounters: *Artemisia annua* 3 (+); *Artemisia armeniaca* 7 (+), 8 (+); *Asperula humifusa* 8 (1); *Brassica campestris* 7 (r), 8 (+); *Bromus mollis* 4 (+), 5 (+); *Cannabis ruderalis* 8 (r); *Coronilla varia* 9 (+); *Cynoglossum officinale* 3 (r); *Dactylis glomerata* 4 (+), 5 (+);*Datura stramonium* 6 (r); *Fallopia convolvulus* 6 (+), 9 (r); *Humulus lupulus* 8 (1), 3 (r); *Lappula squarrosa* 10 (+); *Lolium perenne* 4 (+); *Malvas ylvestris* 9 (+), 1 (r); *Matricaria recutita* 6 (1); *Medicago falcata* 7(+); *M. lupulina* 6 (+);*Morus alba* (young growth) 7 (r); *Phalacroloma annuum* 10 (+); *Poa bulbosa* 4 (1), 5 (+); *Populus alba* (young growth) 6 (r), 8 (r); *Rumex confertus* 7 (+), 10(+); *Thlaspi arvense* 6 (+); *Tragopogon dubium* 4 (r); *Trifolium pratense* 6 (+), 9 (+); *Verbascum laxum* 1 (+); *Vicia angustifolia* 1 (+); *V. dasycarpa* 6 (+), 10 (+); *Xanthium strumarium* 10 (r).
Location of communities: Kabardino-Balkarian Republic, Nalchik, side of the dam dirt road along the left bank of the Nalchik River, on earthen embankments.
Dates of descriptions: №№ 1–4 –01.06.2020, №№ 5–7 – 18.06.2020, №№ 8–10 – 24.06.2020.
Author of descriptions: N.L. Tsepkova.

Description number	1	2	3	4	5		6	7	8	9	10	
Area of description, m^2	30	10	12	5	12		30	25	30	6	10	
Projective cover, %	95	80	75	60	60	Constancy	85	100	95	90	65	Constancy
Average grass height, cm	110	150	90	180	90		100	100	150	120	90	
Number of species in description	15	11	14	12	17		19	18	21	16	16	
Diagnostic species of the association ***Sisymbrietum loeselii***												
Sisymbrium loeselii	3	5	5	5	4	V	5	3	3	5	3	V
Diagnostic species of the variant ***Ambrosia artemisiifolia***												
Ambrosia artemisiifolia	+	+	1	1	2	V	2	2	1	2	1	V
Diagnostic species of the class ***Sisymbrietea*** and syntaxa included in it												
Chenopodium album	.	.	.	1	1	II	1	3	1	.	.	III
Convolvulus arvensis	1	.	.	+	1	III	.	1	1	+	.	III
Cirsium incanum	2	.	.	.	+	II	r	+	.	+	.	III
Lactuca serriola		+	+	.	.	II	.	.	.	r	r	II
Capsella bursa-pastoris	.	1	.	.	.	I	+	.	.	+	.	II
Sonchus arvensis	.	r	.	.	.	I	.	r	.	+	.	II
Setaria viridis	.	.	+	.	1	II	.	+	.	.	.	I
Bromus japonicus	.	1	.	.		I	.	.	.	+	1	II

Description number	1	2	3	4	5	Constancy	6	7	8	9	10	Constancy
Diagnostic species of the class ***Artemisietea vulgaris*** and syntaxa included in it												
Melilotus officinalis	3	1	+	+	+	V	+	1	2	1	2	V
Cichorium intybus	1	.	.	+	+	III	.	1	.	r	+	III
Artemisia vulgaris	+	+	+	.	1	IV	1	.	+	.	.	II
Elytrigia repens	+	.	+	.	+	III	+	2	+	.	.	III
Daucus carota		.	.	.	r	I	.	.	+	r	.	II
Berteroa incana	+	.	.	.	r	II	+	.	r	.	.	II
Echium vulgare	.	+	+	.	+	III	.	.	+	.	.	I
Diagnostic species of the class ***Digitario sanguinalis-Eragrostietea minoris***												
Anisantha sterilis	.	.	+	+		II	.	.	1	.	+	II
Bromus tectorum	.	+	+	.	+	III	.	.	.	.	.	.
Diagnostic species of the class ***Polygono arenastri-Poëea annuae*** and syntaxa included in it												
Polygonum aviculare	.	.	.	.	.	.	+	+	1	.	+	IV
Poa annua	1	.	.	.	.	I	.	+	1	.	+	III
Plantago major	+	.	+	.		II	.	+	.	.	r	II
Other species												
Polygonum persicarium	.	+	.	.	.	I	+	.	.	1	.	II
Picris canescens	+	.	.	.	+	II	.	.	+	.	3	II

Table S3. Association ***Melilotetum albi-officinalis*** Sissingh 1950.

Single encounters: *Agrimonia eupatoria* 2 (r), 4 (+); *Ajuga repens* 10 (+);*Allium atroviolaceum* 5 (r); *Amoria ambigua* 2 (1); *Asperula humifusa* 2 (1), 3 (+); *Cardaria draba* 3 (r); *Centaurea kubanica* 4 (r), 6 (r); *Coronilla varia* 6 (+), 8 (+); *Fraxinus excelsior* (young grouth) 3 (r); *Galium aparine* 10 (r); *Hypericum elegans* 10 (r); *Lolium perenne* 3 (1); *Medicago lupulina* 2 (+), 6 (+); *Phragmites australis* 8 (+), 10 (+); *Plantago media* 4 (+); *Populus alba* (young grouth) 6 (r); *Trifolium campestre* 6 (+); *Vicia tetrasperma* 2 (+), 4 (r).
Location of communities: Kabardino-Balkarian Republic, Nalchik, floodplains on the left (descriptions 1–7) and right (descriptions 8–10) bank of the Nalchik River.
Dates of descriptions: №№ 1–6 – 15.06.2020, №№ 7–10 – 18.06.2020.
Author of descriptions: N.L. Tsepkova

Description number	1	2	3	4	5	6	7	8	9	10	Constancy
Area of description, m^2	50	100	30	100	100	100	21	100	100	50	
Projective cover, %	85	95	95	100	100	100	90	100	75	80	
Average grass height, cm	150	150	150	120	130	90	140	150	85	85	
Number of species in description	13	15	12	17	12	19	11	13	17	18	
Diagnostic species of the association ***Melilotetum albi-officinalis***											
Melilotus officinalis	5	5	5	5	5	5	4	5	3	2	V
Diagnostic species of the class ***Artemisietea vulgaris*** and syntaxa included in it											
Elytrigia repens	1	1	2	2	1	2	4	3	4	4	V
Cichorium intybus	+	+	r	+	+	1	r	r	1	+	V
Phalacroloma annuum	+	1	+	+	+	+	r	r	+	.	V
Cirsium incanum	r	1	2	+	.	.	+	1	1	+	IV
Artemisia vulgaris	.	.	.	+	.	+	+	+	.	.	II
Daucus carota	+	.	.	.	.	.	r	.	.	r	II
Echium vulgare									+	+	I
Melandrium album	.	.	.	.	.	.	.	.	r	+	I
Diagnostic species of the class ***Molinio-Arrhenatheretea*** and syntaxa included in it											
Poa pratensis	2	1	1	1	2	2	+	+	2	1	V
Dactylis glomerata	+	+	1	1	1	2	.	.	.	.	III
Lotus corniculatus	+	.	.	.	.	.	.	.	+	1	II

Description number	1	2	3	4	5	6	7	8	9	10	Constancy
Achillea millefolium	.	.	.	+	+	+	.	.	.	.	II
Rumex confertus	.	.	.	.	.	.	.	+	+	.	I
Festuca pratensis	.	.	.	.	.	.	.	.	+	.	I
Trifolium pratense	.	.	.	.	.	+	.	.	.	.	I
Astragalus cicer	.	.	.	.	r						I
Diagnostic species of the class ***Festuco-Brometea*** and syntaxa included in it											
Medicago falcata	+	.	.	1	+	+	.	+	1	1	IV
Diagnostic species of the class ***Sisymbrietea*** and syntaxa included in it											
Convolvulus arvensis	1	1	+	2	2	1	1	1	+	+	V
Ambrosia artemisiifolia	.	.	.	.	.	.	+	.	.	.	I
Diagnostic species of the class ***Polygono arenastri-Poëtea annuae*** and syntaxa included in it											
Poa annua	.	.	.	.	.	1	.	.	1	2	II
Diagnostic species of the class ***Epilobietea angustifolii*** and syntaxa included in it											
Rubus caesius	.	+	.	.	.	1	.	.	+	.	II
Other species											
Vicia angustifolia	+	+	.	+	.	1	.	.	+	+	III
Rorippa austriaca	r	.	.	.	.	.	.	.	1	+	II
Vicia dasycarpa	.	.	.	+	+	.	.	+	.	.	II

Table S4. Community ***Urtica dioica* [*Artemisietea vulgaris*].**

Single encounters: *Lamium album* 3 (1).
Location of communities: Kabardino-Balkarian Republic, Nalchik, left bank of the Nalchik River. In garbage dumps, earthen heaps.
Dates of descriptions: №№ 1–2 – 27.05.1995, №№ 3–5 – 30.05.1995.
Author of descriptions: N.L. Tsepkova

Description number	1	2	3	4	5	Constancy
Area of description, m^2	12	10	10	6	6	
Projective cover, %	80	80	80	75	70	
Average grass height, cm	60	50	50	60	45	
Number of species in description	14	10	11	10	9	
Diagnostic species of the community ***Urtica dioica* [*Artemisietea vulgaris*]**						
Urtica dioica	5	5	5	4	4	V
Diagnostic species of the class ***Artemisietea vulgaris*** and syntaxa included in it						
Artemisia vulgaris	+	+	2	2	.	IV
Cirsium incanum	r	+	+	.	r	IV
Arctium lappa	+	r	r	.	.	III
Cynoglossum officinale	r	.	.	.		I
Diagnostic species of the class ***Sisymbrietea*** and syntaxa included in it						
Stellaria media	2	2	2	3	2	V
Solanum nigrum	1	1	.	+	2	IV
Capsella bursa-pastoris	+	.	1	.	.	II
Diagnostic species of the class ***Polygono arenastri-Poëtea annuae*** and syntaxa included in it						
Taraxacum officinale	2	1	+	2	2	V
Poa annua	2	1	1	1	1	V
Diagnostic species of the class ***Molinio-Arrhenatheretea*** and syntaxa included in it						
Rumex confertus	+	.	.	+	+	III
Other species						
Armoracia rusticana	+	+	+	+	+	V
Barbarea arcuata	+	.	r	r	+	IV
Lappula sqarrosa	+	.	+	.	.	II
Tussilago farfara	.	+	.	1	.	III

Table S5. Community ***Cichorium intybus* [*Artemisietea vulgaris*].**

Single encounters: *Amoria repens* 1 (+); *Anisantha sterilis* 6 (1); *Lotus caucasicus* 6 (+); *Medicago falcata* 6 (+); *Poterium polygamum* 4 (r).
Location of communities: Kabardino-Balkarian Republic, Nalchik, side of the dam dirt road along the left bank of the Nalchik River.
Dates of descriptions: № 1 – 29.07.2018, №№ 2–4 – 15.08.2018, № 5 – 16.08.2018, №№ 6–8 – 17.08.2018, №№ 9, 10 – 21.08.2018.
Author of descriptions: N.L. Tsepkova

Description number	1	2	3	4	5	6	7	8	9	10	Constancy
Area of description, m^2	25	15	20	6	4	8	10	4	4	6	
Projective cover, %	100	100	100	95	90	100	100	100	90	90	
Average grass height, cm	130	150	110	130	110	120	100	130	110	100	
Number of species in description	15	16	16	12	13	17	14	12	15	12	
Diagnostic species of the community ***Cichorium intybus* [*Artemisietea vulgaris*]**											
Cichorium intybus	5	5	4	4	4	4	4	5	4	4	V
Cirsium incanum	1	1	1	1	1	1	1	1	1	1	V
Ambrosia artemisiifolia	+	1	+	+	2	+	1	1	3	2	V
Daucus carota	+	r	+	+	1	+	+	r	+	1	V
Diagnostic species of the class ***Artemisietea vulgaris*** and syntaxa included in it											
Elytrigia repens	3	+	3	1	1	3	+	+	+	3	V
Phalacroloma annuum	+	+	+	1	+	+	+	+	.	.	IV
Melilotus officinalis	1	+	+	.	+	r	.	.	+	.	III
Artemisia vulgaris	+	1	.	+	.	.	1	1	.	.	III
Berteroa incana	r	+	+	.	2	.	.	.	.	.	II
Echium vulgare	.	.	.	.	.	.	+	.	+	1	II
Diagnostic species of the class ***Sisymbrietea*** and syntaxa included in it											
Convolvulus arvensis	+	3	+	.	.	+	.	.	+	1	III
Conyza canadensis	.	r	+	.	+	+	.	.	+	.	III
Sisymbrium loeselii	.	.	.	1	.	.	+	+	.	.	II

Description number	1	2	3	4	5	6	7	8	9	10	Constancy
Chenopodium polyspermum	.	.	.	.	.	+	.	.	+	+	II
Setaria viridis	.	.	.	.	.	.	.	+	.	.+	I
Diagnostic species of the class ***Molinio-Arrhenatheretea*** and syntaxa included in it											
Rumex confertus	1	+	+	.	.	r	.	.	.	.	II
Poa pratensis	.	+	+	.	.	.	.	.	.	.	I
Festuca pratensis	.	.	.	.	.	.	1	.	+	.	I
Achillea millefolium	.	.	.	.	.	+		.	+	.	I
Senecio jacobaea	.	.	.	.	.	.	r	.	.	.	I
Other species											
Pterotheca sancta	+	+	2	.	2	+	1	r	+	.	IV
Bromus japonicus	1	.	.	+	.	2	1	+	.	.	III
Verbascum orientalis	+	.	.	.	+	.	.	+	.	r	II
Picris canescens	.	r	+	.	.	.	2				II
Caucalis lappula	.	.	1	+	.	+	.	.	.	.	II
Rubus caesius	.	.	.	.	+	.	.	.	+	+	II
Asperula humifusa	.	1	+	.	.	.	.	.	.	.	I
Artemisia armeniaca	.	.	.	+	+						I
Armoracia rusticana									+	+	I

Table S6. Association ***Convolvulo arvensis-Elytrigietum repentis*** Görs 1966.

Single encounters: *Galium aparine* 1 (+); *Lamium album* 5 (+); *Lolium perrene* 2 (+).
Location of communities: Kabardino-Balkarian Republic, Nalchik, wasteland (territory covered with soil on top of a garbage dump) on the left bank of the river Nalchik.
Dates of descriptions: №№ 1–3 – 30.05.2020, №№ 4–6 – 03.06.2020.
Author of descriptions: N.L. Tsepkova

Description number	1	2	3	4	5	6	Constancy
Area of description, m^2	100	50	50	50	50	50	
Projective cover, %	75	95	95	80	80	80	
Average grass height, cm	85	70	75	60	45	50	
Number of species in description	18	20	18	19	17	16	
Diagnostic species of the association ***Convolvulo arvensis-Elytrigietum repentis***							
Elytrigia repens	4	5	4	4	4	5	V
Convolvulus arvensis	+	1	1	+	1	1	V
Diagnostic species of the class ***Artemisietea vulgaris*** and syntaxa included in it							
Artemisia vulgaris	+	1	3	1	1	+	V
Cirsium incanum	+	+	+	+	+	+	V
Phalacroloma annuum	+	+	+	+	+	+	V
Melandrium album	+	+	r	r	r	+	V
Daucus carota	.	.	1	1	+	.	III
Melilotus officinalis	.	.	.	+	.	+	II
Cichorium intybus	.	+	+	.	.	.	II
Diagnostic species of the class ***Molinio-Arrhenatheretea*** and syntaxa included in it							
Poa pratensis	2	1	1	1	1	1	V
Festuca pratensis	+	1	1	+	+	+	V
Rumex confertus	+	+	+	.	r	.	IV
Diagnostic species of the class ***Sisymbrietea*** and syntaxa included in it							
Ambrosia artemisiifolia	+	+	+	+	+	+	V
Diagnostic species of the class ***Polygono arenastri-Poëtea annuae*** and syntaxa included in it							
Poa annua	1	2	2	2	1	1	V
Diagnostic species of the class ***Epilobietea angustifolii*** and syntaxa included in it							
Rubus caesius	+	+	1	1	1	+	V
Diagnostic species of the class ***Festuco-Brometea*** and syntaxa included in it							
Medicago falcata	1	1	+	+	+	+	V
Other species							
Rorippa austriaca	+	1	1	1	.	1	IV
Vicia angustifolia	+	+	1	+	+	.	IV
Vicia dasycarpa	+	+	.	+	.	+	IV
Phragmites australis	+	.	1	.	1	.	III
Armoracia rusticana		r		r		+	III
Vicia grandiflora		+	.	+	.		II

Table S7. Сообщество ***Aegilops cylindrica* [*Molinio-Arrhenatheretea*].**

Single encounters: *Bothryochloa ichaemum* 4 (1); *Bromus tectorum* 9 (1);*Chenopodium album* 9 (+); *Cichorium intybus* 1 (+), 8 (r); *Echium vulgare* 2 (+); *Festuca valesiaca* 7 (+); *Galium aparine* 3 (+), 4 (+); *Lolium perrene* 8 (+); *Melandrium album* 4 (r); *Melilotus officinalis* 1 (r), 9 (r); *Poa angustifolia* 3 (+), 7 (+); *Polygonum aviculare* 2 (+), 9 (+); *Scorconera biebersteinii* 2 (+); *Sedum pallidum* 5 (+), 7 (+); *Setaria viridis* 7 (1), 9 (1); *Sisymbrium loeselii* 8 (+), 9 (+); *Thymus pastoralis* 5 (1), 7 (1); *Tragopogon dubium* 9 (r);*Vicia dasycarpa* 9 (+).
Location of communities: Kabardino-Balkarian Republic, Nalchik, edge of the dam along the left bank of the river Nalchik.
Dates of descriptions: №№ 1–5 – 30.05.2020, №№ 6–9 – 05.06.2020.
Author of descriptions: N.L. Tsepkova

Description number	1	2	3	4	5	6	7	8	9	Constancy
Area of description, m^2	2.4	2	2	1.5	2	1	2	1	3.0	
Projective cover, %	100	100	100	80	75	90	65	85	90	
Average grass height, cm	45	40	40	45	30	25	40	60	25	
Number of species in description	16	14	17	16	13	11	15	10	19	
Diagnostic species of the community ***Aegilops cylindrica* [*Molinio-Arrhenatheretea*]**										
Aegilops cylindrica	5	4	3	2	3	4	3	4	3	V
Diagnostic species of the class ***Molinio-Arrhenatheretea*** and syntaxa included in it										
Achillea millefolium	+	+	1	3	3	2	+	2	+	V
Plantago media	+	+	3	2	+	+	1	.	+	V
Poa pratensis	2	3	1	.	.	+	.		.	II
Dactylis glomerata	+	+	+	.	.	.	.	+	+	III
Diagnostic species of the class ***Festuco-Brometea*** and syntaxa included in it										
Medicago falcata	1	3	2	3	.	.	+	+	2	IV
Poa bulbosa	.	+	.	+	2	1	1	+	+	IV
Diagnostic species of the class ***Digitario sanguinalis-Eragrostietea minoris***										
Cynodon dactylon	1	1	+	+	.	+	.	.	+	III
Anisantha sterilis	+	.	.	+	.	.	.	.	3	II

Number of species	1	2	3	4	5	6	7	8	9	Constancy
Diagnostic species of the class ***Sisymbrietea*** and syntaxa included in it										
Ambrosia artemisiifolia	+	.	1	+	.	.	+	.	+	III
Erodium cicutarium	.	.	.	.	1	3	+	.	1	II
Bromus mollis	.	.	.	.	+	+	.	.	2	II
Diagnostic species of the class ***Artemisietea vulgaris*** and syntaxa included in it										
Berteroa incana	+	+	+	+	+	+	1	.	.	IV
Elytrigia repens	.	.	1	1	+	.	.	.	.	II
Diagnostic species of the class ***Polygono arenastri-Poëtea annuae*** and syntaxa included in it										
Poa annua	2	1	1	.	1	.	1	1	.	III
Other species										
Catabrosella humilis	+	.	1	1	+	1	+	1	.	IV
Taraxacum officinale	+	+	.	.	.	+				II
Alyssum turkestanicum	.	.	+	+	+	.	.	.	.	II
Alyssum calycinum	.	.	+	+	+	.	.	.	.	II
Centaurea kubanica	+	.	r	.	.	.	+	.	.	II