

Protective curtains ponds from Moldova Nouă for developments afforestation to address pollution on natural way

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Abstract Grassing and afforestation of barren tailing ponds from Moldomin was made in order to strengthen and stabilize it with vegetation to reduce the effects of pollution by dust, sand, and other harmful substances and environmental restoration of the economic cycle sterile lands unsuitable for cultivation.

Key words afforestation, developments

Tailings from the flotation tailings resulting copper ore are located in the city of Moldova Nouă, Caraș Severin, on the left bank of the Danube, opposite the island of Ostrov, 44° 44' north latitude and east longitude 21° 27'.

Ponds aimed at clarifying wastewater (tailings slurry final) from the processing plant (flotation). The amount of tailings from S.C. Moldomin S.A. Moldova Nouă reported the amount of ore processed ore is

processed according to the type. Thus the processing of ore extracted from underground tailings is about 89% of the processed (1.6 million tons / year). In the processing of minerals extracted from surface tailings percentage is about 94% of ore processed (4.23 million tons / year). From processing ore from underground and surface, resulting a total sterile of over 5.4 million tons annually.

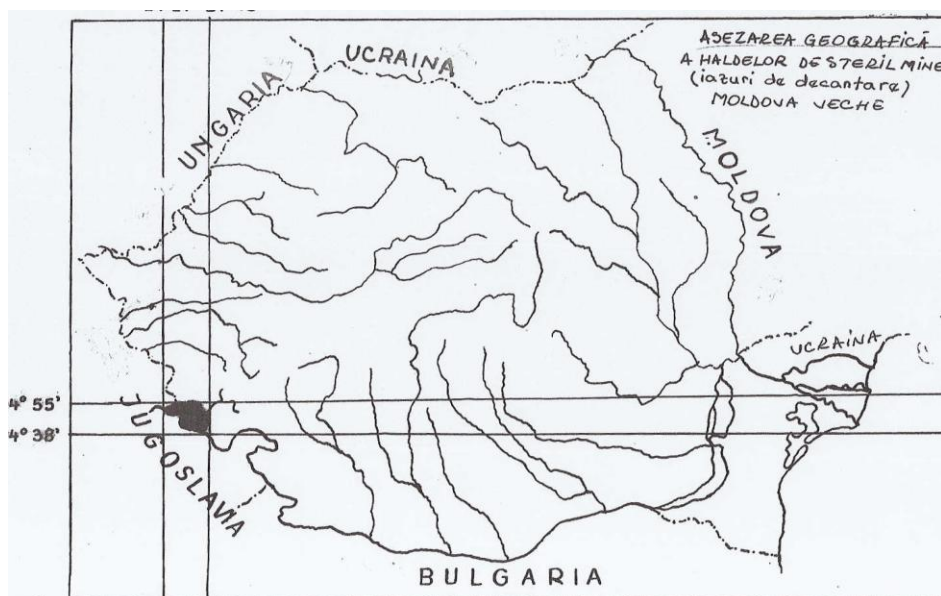


Fig. 1 Geographical location of waste dumps at Moldova Veche

Material and Methods

The material stored in ponds has physical, chemical and mineralogical varied according to baseline characteristics of ore processed and the processing technology that is subject to the ore. Work on tailings ponds from mining company Moldova Nouă were triggered after the Protocol between the Ministry of Mines and the Ministry of Forestry of 21.04.1988 for fixing the slope to sterile ponds and afforestation of degraded lands inside Moldova Nouă mining company.

Until the Protocol to the tailing ponds have tried several methods of fixing sand collapsed on them, which have failed. Thus tried rhombic grids filled with soil concrete, very hard to run and also expensive, the method was abandoned on the beach and try experimental Boşneag Pond No. 1 on an area of 10,000 square pond with a canvas cover 'the rarest, that time that was fixed with wooden pegs and plated with 2-3 cm of ground vegetation.

Vegetable land was prepared and sown with perennial grass mixture. At the end of the work of wind shattered land, entered under the cloth that broke it and gathered it. (Figure no. 2).



Fig. 2 Attempt to stabilize the dump Boşneag with textile fabric

Action to combat pollution of tailings dam broke from 24/04/1988, following the protocol of the Ministries, Enterprise Enhancement and exploitation of pastures, farm and was entrusted Moldova Nouă building work, tiling and grassing of slopes at ponds Inspectorate, Caras Severin County Forestry - Forestry Moldova Nouă, afforestation of grassed areas and mining company land transport Moldova Nouă plating plant and plants necessary, is to afforest slopes and on the platform or canopy, combating pollution, dust disperse to do with panels panels of sand (ICAS proposed solution Brasov).

Projects were prepared by ICAS executive branch Brasov, and consisted of leveling and fixing fences coastal slopes with diamond and linear fascine fences between them, over which vegetable earth plated, 15 cm thick grass mixed herbs perennial (*Lolium*, *Festuca*, *Dactylis*, *Trifolium*, *Medicago* *Lotus*), and in autumn forest species planted with wind resistant (*Eleagnus* A., *Prunus* s., *Hippophae* r. v. *Syringa* *Cotinus* c.).

Results

Seeding mixture gave good results, the next year in June-July of seedlings exceeded and protective forest with the wind against, especially by setting slope soil erosion and the surface wind.

The experiment was tried on an area of several hundred square meters, the herbaceous vegetation to be cut, seedlings exposed to the sun but mostly dry. In the second year of growing legume grasses have been overwhelmed, that closure vegetated to stage massive plantation. In alfalfa and clover first three years were a series of green mass per unit area than arable crops grown nearby.

With the increase in seedlings, sown species disappeared at the expense of species that have evolved to new conditions arisen and that have a status of active vegetation. Although vegetation on slopes was better than expected dust pollution on the platform (beach) ponds 1, 2 and 3 did not work with panels of dust (solution proposed by the ICAS project Brasov). In 1992 Moldova MOLDOMIN His new project commissioned a disperse dust off those platforms at SC

meadow ponds SA Moldova Nine. The project has provided work for establishment of a windbreak forest belts with a width of 50 m canopy ponds and Danube Valley Boşneag all sides.

Work started in spring 1993 Boşneag Pond No. 1 platform in an area of 2.5 ha by plating plant earth, grassing and planting of forest trees. The mixture of herbs used was 70% grass (*Lolium*, *Festuca* and *Dactylis*) and 30% legumes (*Medicago*, *Trifolium* and *Lotus*). An increase in sowing area was planted with *Sălcioara*, hawthorn and corcoduş. In the first phase of fixing the percentage was 95% but with time *Sălcioara* to overcome other species remain single.

So the mixture sown in the first phase have sprung grasses, legumes which then eliminated during dry grasses remains a pure culture of legumes. Land used for plating is poor, with plenty of stone resulting from stripping the land, which would then build Tăuşani pond, a thickness of 20-25 cm and stored at 1500 m from the pond. Alfalfa and clover left in pure cultures were grown for 3 years for nitrogen fixation from the atmosphere in the

layer of soil by nitrogen fixing bacteria (*Rhizobium* sp.)

After three years of culture with pure legumes were executed works *Sălcioara* planting seedlings (*Eleagnus angustifolia*) in autumn. The following year they performed maintenance work consisted of 3-5 cm seedlings cut followed a lot of works and weeding, fertilization with NPK complex fertilizers (15 15 15) - 300 kg / ha, and in autumn were Completing work plantations made the previous year. In the third year of vegetation were performed maintenance and completion of seedlings. Areas planted in 1995.1996 was completed without *Sălcioara* with acacia seedlings (*Robinia pseudocacia*) that gave unexpected results as good in the coming years will be planted in one row alternating with one *Sălcioara* acacia.

After 6-10 years planting of the platform have become true forest belt which stood first sand and dust blown away from the surface of ponds that have not been consolidated and Second wind was prevented to act on the platform surface ponds located between the curtains. (Figure no.3).



Fig. 3. The effect of wind in protection curtains Danube Meadow Lake

All these species were sown directly in sterile soil plated 5 cm thick and 10 cm thick plated sterile and fertilized with 15-15-15 NPK complex fertilizers - 500 kg / ha. The portions *Tussilago australicus* windbag and *Phragmites* were made with the following experience: unfertilized, fertilized with NPK 15-15-15 -500 kg / ha and fertilized with complex fertilizers (15-15-15) -1000 kg / ha, and the places where spontaneous vegetation appeared more isolated or no fertilization was done in their amounts of chemical fertilizers as well as in areas with coltsfoot and cane. Today we can say that all slopes are grassed and wooded ponds and 40% of Pond Boşneag platforms, which today are an obstacle to the wind from landfill.

Research on spontaneous vegetation on dumps from Moldova Veche, were taken in 2001 which identified a number of new species of which 141 species and 128 woody herbaceous species. Our observations being repeated installation flora indicates a smaller number of species, among which stands out as particularly important colonizing species: *Tusilago* dumps windbag-forming populations on fixing outstanding power and expansion continues from one year to another. Is one of the most important species with high tolerance to pH and heavy metal content; to the nitrate supply is a problem to be studied in perspective interesting.



Fig. .4 Tussilago windbag special installation on sterile material, at lake Boşneag

Phragmites australis is installed in depressions that retain water from precipitation and extends through the air runners surrounding soils. The migration has a strong protective effect against the wind.

Calamagrostis epigeios and *Cynodon dactylon* is installed around the existing concrete dams on the pond in places protected from wind strong action.

Scirpus holoschoenus-is present as vigorous bushes, the stockpile loose, although rare, they do well and can be studied for growing seedlings on vegetative or such dumps.

Robinia pseudacacia and *Hippophae rhamnoides*-tend the natural range of curtains to protect drajonare planted in previous years. Natural Installation observed after 2-6 years.



Fig. 5. Installation holoschoenus *Scirpus* species on sterile material at lake Bosneag



Fig. 6. *Robinia pseudacacia* at Lake Boşneag 1.

Listed in the following most important colonizing species identified dumps from Moldova Veche:

Table 1

Flora on spontaneous dumps from Moldova Veche

No.	Species	No.	Species
1	<i>Achillea pannonica</i>	33	<i>Hypericum perforatum</i>
2	<i>Aegilops cylindrical</i>	34	<i>Lolium perenne</i>
3	<i>Alyssum alyssoides</i>	35	<i>Lotus corniculatus</i>
4	<i>Ambrosia artemisiifolia</i>	36	<i>Medicago falcate</i>
5	<i>Anthemis austriaca</i>	37	<i>Melilotus officinalis</i>
6	<i>Anthemis tinctoria</i>	38	<i>Oenothera bienis</i>
7	<i>Apera spica-venti</i>	39	<i>Ononis arvensis</i>
8	<i>Artemisia absinthium</i>	40	<i>Onopordum acanthium</i>
9	<i>Bromus arvensis</i>	41	<i>Orlaya grandiloflora</i>
10	<i>Bromus sterilis</i>	42	<i>Petrorhagia saxifraga</i>
11	<i>Calamagrostis epigeios</i>	43	<i>Phragmites australis</i>
12	<i>Cardaria draba</i>	44	<i>Picris hieracioides</i>
13	<i>Centaurea micranthos</i>	45	<i>Plantago lanceolata</i>
14	<i>Chondrilla juncea</i>	46	<i>Poa angustifolia</i>
15	<i>Clematis vitalba</i>	47	<i>Poa compressa</i>
16	<i>Convolvulus arvensis</i>	48	<i>Polygonum aviculare</i>
17	<i>Conyza canadensis</i>	49	<i>Populus alba</i>
18	<i>Coronilla varia</i>	50	<i>Populus nigra</i>
19	<i>Crepis setosa</i>	51	<i>Prunus spinosa</i>
20	<i>Cynodon dactylon</i>	52	<i>Reseda lutea</i>
21	<i>Echium vulgare</i>	53	<i>Robinia pseudacacia</i>
22	<i>Elaeagnus angustifolia</i>	54	<i>Rosa canina</i>
23	<i>Elymus repens</i>	55	<i>Rubus caesius</i>
24	<i>Erigeron annuus</i>	56	<i>Rumex acetosella</i>
25	<i>Eryngium campestre</i>	57	<i>Rumex crispus</i>
26	<i>Erysimum diffusum</i>	58	<i>Salsola kali</i>
27	<i>Euphorbia cyparissias</i>	59	<i>Salvia nemorosa</i>
28	<i>Festuca rupicola</i>	60	<i>Sorghum halepense</i>
29	<i>Festuca valesiaca</i>	61	<i>Tussilago farfara</i>
30	<i>Galium mollugo</i>	62	<i>Verbena officinalis</i>
31	<i>Hippophae rhamnoides</i>	63	<i>Xanthium italicum</i>
32	<i>Hordeum murinum</i>	64	<i>Xeranthemum annum</i>

Species may be present spontaneously dump object of study for their introduction in culture, preferably in the form of seeds or vegetative germination of seeds and seedlings obtained protected against deflation. Because they have worked since 1992 commissioned a project to create curtains of canopy protection, was not a large amount of land required for borrowing and the money were used less. These curtains have given good results.

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