ENVIRONMENT RESEARCH CENTRE
"ENVIRC"

CHARACTERIZATION OF ECOSYSTEMS OF ARCHAEOLOGICAL EXCAVATIONS AREA IN TALGAR RIVER BASIN

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CONTENTS

1. INTRODUCTION

In 1995 from 26th of June to 10th of July researchers of "ENVIRC" company carried out field study of key plots in the vicinity of archaeological excavations (key plots: Toosoosai, Talgar-3, Old Talgar).

This work was performed by botanists L.L. Stogova, E.M. Hodus, geomorphologist-cartographer Yu.G. Evstifeev, soil scientist K.M. Patchikin under general supervision of N.P.Ogar and E.I. Rachkovskaya.

The main aim of the work was to reconstruct geographical conditions and assess modern state of ecosystems of the region. The work comprises following objectives:

1. To characterize the main ecosystem components (relief, soils, vegetation).

2. Using aerial photographs as the base to make up the ecosystem maps of three key plots at a scale of 1:10 000 and large scale schematic maps of the areas adjacent to excavations sites.

Report is supplemented with herbariums, list of wild food plants, descriptions of plant communities, description of soil profiles and tables with soil analyses.

To reflect natural conditions, and modern state of the land we used cartographical method. Map allows to clearly show geographical position of the región, geological and geomorphological constitution, altitudinal belts and regularity of distribution of soil and vegetation cover. Furthermore degree of land transformation and factors responsible for it are very noticeable on the map.

All key plots have been mapped on a basis of aerial photography at a scale of 1:10 000. In addition the schematic maps of the areas adjacent to excavations sites have been made up at the following approximate scales: Toosoosai - 1:2 500, Talgar-3 - 1:4 000, Old Talgar - 1:4 400.

Excavations sites should be leveled later on. Type of ecosystem is the main mapping unit. Term "ecosystem" has general and specific

senses. We accepted specific sense of this term as a stable system including two interacting elements - bioceonose and biotope. We consider ecosystem as natural territorial complex possessing unity of lithogenic basis, definite level of interrelationship of botanical components with spatial-time dynamics and functioning regime.

There are different levels of ecosystems (planet, regional, topological, local). Ecosystems of topological level are mainly represented on our maps of Talgar region, and local ecosystems or ecosystem elements are represented on large scale schematic maps.

The map legend reflects the following characteristics of ecosystems:

1. Since this territory is subjected to severe anthropogenic loads we subdivided all ecosystems into two major categories: natural and anthropogenically transformed and anthropogenic ecosystems. Natural territories are relatively multidisturbed and occupy small areas, whereas natural-anthropogenic ecosystems prevail in the region. The vegetation cover shows largest degree of anthropogenic transformation among components of ecosystem (relief, soils and vegetation). In this connection complex characterization of vegetation is given for many types of ecosystems. Map legend comprises transformation series of plant communities from medium disturbed to highly disturbed (Toosoosai N 1). Succession series of overgrowing of fallow lands (for example, Toosoosai N2) are also given in map legend.

In addition anthropogenic ecosystems (irrigated fields, vegetable gardens, orchards, afforestations) are represented on the maps with indication of ecosystem type from which they were originated.

2. Titles of another class show the integration of ecosystems into altitudinal belts. Position of Toosoosai key plot is marked off in the belt of dry steppes. Old Talgar and Talgar-3 key plots are situated in the belt of forb-feather-grass steppes with ordinary chernozem soils (lower part) and in the belt of wild fruit-tree groves (upper foothill part).

3. Ecosystems are systematized within each belt according to the relief (piedmont plains, intermontane plains, river valleys, gentle slopes of hills formed by loess loam etc.).

4. Each number of ecosystem includes characterization of relief, soils and vegetation.

2. "TOOSOOSAI" PLOT

2.1. GEOGRAPHICAL AND GEOMORPHOLOGICAL CHARACTERIZATION OF "TOOSOOSAI" PLOT

"Toosoosai" plot is situated on the territory of Panfilovsky State farm (sovkhoz) , Talgar district, Almaty region, 10-11 km to the north-west of Talgar city. The coordinates of mapped polygon (scale 1:10 000) are : 77°5'15" - 77°7'48" E longitude, 43°20'31" - 43°22'10" E longitude.

This area is located at the northern terminal part of alluvial fan (apron) which is formed by alluvial-proluvial and proluvial deposits of medium and upper Quarternary. Alluvial fan is formed by boulder-pebble, pebble and sand-pebble deposits covered by loess loam of Anthropogene. These last mentioned upper deposits has different thickness in different sites and do not exceed 20m.

Loess loam is a soil former in this area and it shouldn't be identified with typical "loess of problematic origin". In this case this is the formations redeposited by loess in the course of long-term denudation and accumulation. Depending on tectonic movements (early Quarternary and modern period) and climatic cycle, different conditions were set up for denudation and accumulation processes affecting the deposit and relief formation

It is notable that mountain building processes in last glacial and modern (postglacial) periods at this territory are characterized by considerable (from the north to the south) involvement of block raising processes affecting the former aggraded piedmont plain. This plain was also subjected to raising processes, and base level of erosion was changed resulting in deepening of river valleys.

Tectonic processes have been going on at present as witnessed by earthquakes. This fact (raising of piedmont plains and change of base level of erosion) is marked by formation of deeply ingrown ravines on the place of former irrigation networks.

Natural relief of region under investigation is represented by 3 land forms: weakly pronounced ouvals ("ouvals" is defined in soviet

literature as elongated upland with gentle slopes without clearly pronounced foot; top surface is flat or slightly convex; "ouval" is up to 300m high) not higher than 1-2m; watershed plains with weakly pronounced microrelief in the form of gently sloping padings ("padings" is derfined as flat-bottom steppe depressions) and natural river valleys which are relatively young or "rejuvenated" due to change of base level of erosion and human impact.

Watershed plains and possessed by them slightly pronounced ouvals are dominating surfaces. They are significantly dissected both naturally by stream valleys and artificially by irrigation networks (ancient and modern).

River valleys characterized to a marked extent by elements of denudational-erosional (natural) and anthropogenic transformation.

Nameless stream at the area of archaeological excavations and nearest natural streams originates from springs and their initial flow is formed at the outburst zone of piedmont plain's ground water. River beds has root-like shape with fairly steep eroded and sometimes abrupt banks. We met only one fluvial terrace above flood plane of not uniform constitution. In some cases it is represented by sandy loam deposits with large inclusion of pebbles originated by alluvium (and perhaps by mud streams), in another cases it is represented by colluvial deposits originated by deluvial drifting from steep banks.

River bed is usually sandy-pebble, fairly dense and in our opinion sufficiently erodible resistant. Difference in inclination of banks also should be noted: the bank of western exposure is more steep and abrupt (and more eroded).

It is necessary to stress that mud streams are typical and of great importance for modern exogenic processes in Transilian Alatau.

We have already mentioned that Toosoosai plot is located in terminal part of alluvial fan of Talgar river. In essence it is an apron linked to neighboring river aprons in the west and east.

Mud streams layered deposits of different material at the terminal part of alluvial fan.

Surveyed territory is used solely as agricultural land that occupies approximately 95% of the territory. Slightly disturbed lands

are represented by narrow zones along modern rivers and irrigation canals. Now they experience the re-establishment of soil and vegetation cover.

Man made relief is of great interest for an understanding of modern geomorphological situation at Toosoosai. Let us consider main anthropogenic factors of relief formation:

1. There is Big Almaty Canal in southern part of archaeological excavations site. It lies in latitudinal direction and actually dams (except the aqueducts) most of streams of spring origin.

From the standpoint of relief transformation, damming of a natural flow affects geomorphological relief forms at river beds to the north of this canal.

2. Arterial canal and adjacent asphalt roads required intensive earth-moving work that disturbed natural ecosystems within 300-400m from the left and right river banks.

3. The network of so called flume irrigation canals also has disturbed and continue to transform natural soil and vegetation cover and relief within zone no less than 10m.

4. Former irrigation network has long been abandoned, and as a result of change of base level of erosion now they represent deeply ingrown ravines with abrupt slopes.

It should be noted that they are in active phase and will spread and widen in near future.

5. Mounds occurring on this territory should be assigned to one of the anthropogenic landforms. Their shape and antiquity enable to say that they does not affect the degradation of surrounding lands.

6. One of the main factors of environmental impact are different agricultural and industrial works.

The area of archaeological excavations is situated on watershed and represented by narrow zone between irrigated fields.

This territory is well drained because of the nameless river adjoining from the east.

The archaeological objects are covered by very small layer of modern deposits. Judging from upper soil profile these deposits

experienced natural soil formation process and are marked as dark chestnut mature (or semimature) soils.

2.2. REGULARITIES OF FORMATION OF THE SOIL COVER OF THE "TOOSOOSAI" PLOT

The Toosoosai plot is situated within the bounds of the piedmont plains of the Transilian Alatau north slope. They are represented by the flat surfaces gently sloping northwards, often dissected by the dry stream beds, ravines, hollows. Really almost of all watershed plains and flat surfaces are tilled, and the plots adjacent to irrigation channels are considerably influenced by the anthropogenic load. Ravines and gullies in the open ground were formed exclusively by loess loams mainly of lower Quaternary age genesis of which is not finally determined. It is considered that they can form as a result of different processes such as alluvial, deluvial, aeolian. The hypothesis of aeolian genesis of loess loams is the most popular. Pale-yellow color, silt texture, high carbonate content, porosity are the main characteristics of loess loams. It is an excellent material for the soil formation.

The plot is situated within the bounds of the piedmont dry steppe zone with the herb-feather-grass-tipchak ephemerous-ephemeroid associations on the dark-chestnut soils. But now practically there are no natural landscapes, and soils have been changed by the anthropogenic loads of different character.

The predominant soil type here is dark-chestnut irrigated soils. They are considerably changed in comparison with virgin soils. As a result of tilling and irrigation water-physical characteristics have been changed, and the humus content has been decreased by the irrigational erosion. Those soils are worse in content of nutritive elements: N, P, K. The watershed plains adjacent to dry stream beds and ravines are unploughed and the most unchanged dark-chestnut carbonate soils are preserved here.

The characteristic of those soils are shown by the soil section N 1. The formation of dark-chestnut watered soils is caused by the accumulation of irrigational water at the edges of the fields and directly after them. Those soils are in the stage of semihydromorphic or even hydromorphic development. Retaining the morphological structure of the dark-chestnut soils, at the same time they display the

signs of overmoistening, more high humus content and rusty and bluish marks-indicators of the development of the reduced processes.

On the bottoms of shallow hollows, ravines and temporary stream beds meadow-chernozem soils are formed the development of which is subjected to the periodical additional moistening (snow melt during spring, after rains). They are characterized by the higher humus content in comparison with the dark-chestnut soils, and also considerably leached.

At the places of ground water outburst mainly along the deeply ingrown river beds, the meadow soils are formed under influence of constant additional moistening.

2.3. SOIL CHARACTERIZATION OF THE "TOOSOOSAI" PLOT

The principal aim of this section is clearing up the history of the soil formation, exposing the genesis of soil horizons and establishing the primary directions of the soil formation. The morphological structure data and analytic characteristics are used for it. The soil sections were laid so that it was possible to compare the virgin soils with ones the natural formation of which were interrupted by an anthropogenic interference.

1. ***Toosoosai***. At the Toosoosai plot two soil sections (N 1 and N 1a) were laid out. Their description are given below.

Soil section N 1. Flat watershed surface steeply abrupted into a deep ravine.

Forb-grass-sedge vegetation.

1. *Carex pachystylis*
2. *Poa pratensis*
3. *Elytrigia repens*
4. *Thymus marschallianus*
5. *Salvia virgata*
6. *Achillea millefolium*
7. *Cichorum intybus.*

Degree of plant coverage - 80%, height - from 10-15 cm to 30-40 cm. The depth - 200 cm, A+B=44 cm, effervescence due to HCl from 40 cm.

0-6 A_1^s - gray, slightly brown, dry, dense, layered, very rooty, silty cloddy, middle - loamy

6-18 AB - brown-gray, dry, dense, rooty, sharp-edged-cloddy, horizontally layered, middle-loamy.

18-32 B_1 - gray-brown slightly darked, dry, dense, large-cloddy, porous, heavy loamy.

32-44 B_2 - gray-brown, dry, dense, with roots, large and middle-cloddy, heavy loamy.

44-69 BC - lightening-brown with slight gray hue, dry, dense, sharp-edge- cloddy, heavy loamy, with rare white carbonate speeks.

69-102 C_1^c - yellowish-brown, with numerous carbonate veins, sharp edge-large-cloddy, light clayey.

102-142 C_2^c -yellow-brown, heavily dense, with numerous carbonate veins and pseudo-mycelium, sharp-edge-large-cloddy, heavy-loamy, almost clayey.

142-170 C_3^c -light yellowish-brown, dry, heavily dense, with the whitish diffused carbonate spots and "cocoons", sharp-edge-cloddy, heavy-loamy, almost clayey.

170-200 C_4^c - light pale-brown, dry, dense, sharp-edge-cloddy, heavy-loamy.

The soil: Dark-chestnut normal middle-thick highly humus, heavy-loamy on the heavy loess loam.

Soil section N 1a was laid out within the archaeological excavations on the watershed surface adjacent to the ravine. The microrelief is represented by the elongated depressions meeting each other at the ravine. Earth's surface has been ploughed (old idle land).

Vegetation: the forb - grasses steppe greatly trampled down.

1. *Poa pratensis*
2. *Elytrigia repens*
3. *Achillea millefolium*
4. *Salvia virgata.*

The plant coverage is 60-70%. height - from 15-25 cm to 30 cm.

The depth is 210 cm, A+B=30 cm, effervescence due to HCl - from the surface.

0-5 A_1^s - gray brownish, dry, dense, rooty, powder-like-cloddy-silty, middle loamy.

5-18 AB_1^p -grayish-brown lightened, dry, indurated, silty-cloddy, middle loamy.

18-30 AB_2^p -little darker, less indurated than previous, dry, strongly rooted, cloddy with granulars, and numerous

scanty grains of earthworm caprolytes, middle loamy.

30-41 BC - light-brown slightly grayish, dry, dense, weakly rooty, sharp-edge-cloddy with silt, middle loamy.

41-71 C_1 - whitish-light-brown, dry, dense, with the single roots, sharp-edge-cloddy, with rare carbonate specks, middle loamy.

71-82(88) BC_2^f - light-gray, dry, indurated, sharp-edge-cloddy-silty, middle- loamy, with inclusions of orange color (alike the open one, easily distroied by the fingers)

82(88)-94(100) AB - Gray, slightly loose, sharp-edge-cloddy-silty,light-loamy.

94(100)-108(110)BC. Unhomogeneously colored. The main colour-brownish-light gray with muddy brown spots, not numerous lines of the carbonate pseudomicellium, middle-loamy.

108(110)-118 BC. Light-brown, dry, dense, with met yellowish-brown surginas ways, fineporous, sharp-edge-cloddy, middle-loamy.

118-132 C_3. Gray, with numerous whitish carbonate marks, ferrous spots, porous, clotty -tile-like with the clods, middle -loamy.

132-148 BC. Gray slightly brownish, dry, weakly indurated, with the carbonate spots, sharp-edge-cloddy-silty, light-loamy, almost middle-loamy.

148-166 BC. Unhomogeneously colored. The main colours yellowish-gray, with the yellow-brown and dark-gray spots, cool,indurated, light-loamy.

166-210 C_4^c Yellow-brown, cool, weakly indurated, sharp-edge-cloddy- silty, the middle loamy loess loam unchanged by theanthropogenic loading.

The soil: Dark-chestnut with an anthropogenic and couch horizons, long-ploughed, middle-loamy on the loess-like loam.

The data of the main physical and physic-chemical features of the soils under the descriptions is represented by the tables N 1 and N

2.The soil section N 1 profile is similar to the profile of the typical dark-chestnut soils, but a humus content of the top horizon is rather increased. Moreover, the profile N 1 is characterized by the badly expressed stretched carbonate-illuvial horizon with the low concentration of the carbonates and the absence of its maximum here. Then, the increased content of the mud (lesser then 0.001 mm fraction) and the clay (0.001 mm - 0.01` mm fraction) in the middle and lower parts of the profile must be mentioned. All those point to the fact that the soil has been overmoistened from the surface during the certain stage of its development .

Due to the filtration of the surplus water through the soil mass the most fine muddy and clay particles migrated downwards by the soil suspensions and accumulated within the certain depths (from 80 to 140 cm in our case). In other words the processes of the loessivage has been going. This is the natural processes, the soil formation has been permanent all the time and there were no any external anthropogenic factors to interrupt it.

Just the different picture is noticed in the section N 1a, which was laid up within the archaeological excavations. Here we can't see the regularities of profile distribution of the physic-chemical properties. The morphological structure of this profile is not identical to the dark - chestnut soils' one, and in many cases the boundaries of the soil horizons are unparalleled to the surface-line. In the lower part of the profile within the depths of 82-110 cm to 132-166 cm the increased content of humus is noticed. The mechanical displacement of the ground (taking out, filling up, etc.) might be supposed in this case, and the process of the soil formation was interrupted by the human activity.

The fact of interest is the presence of the rusty marks in the horizon of 118-132 cm in depth. Probably, its appearance has been stimulated by the local moistening connected with the human activity. As the result of the overmoistening and the anaerobe conditions the

opportunity of the reducing processes are appeared, which led to the formation of the protoxide forms of the iron. Moreover, the horizon with the rusty marks were composed not only by the local soil former rocks ("in situ"), but also includes the clay materials brought by the man and containing the protoxide and oxide forms of the iron in the form of the rare spots.

After the ceasing of the ancient human activity an interrupted process of the soil formation continued and the soil was forming as dark - chestnut soils type. At the end of XIX - the beginning of XX ages the soil formation was interrupted again - the soil was ploughed to the depth of 30 cm. Apparently, after the formation of the deep scour (ravine) the soil was excluded from the agricultural use and the soil formation continued.

TABLE 2

Content of soluble substances (% / meq) in the soils of Toosoosai plot.

profile soil rizon	Depth of sample (sm)	Total salt (%)	Alkalinity (by HCO)	CL^-	SO_4^{-2}	Ca^{+2}	Mg^{+2}	Na^+	K^+
N 1	0-6	0,034	0,012	нет	0,011	0,003	0,001	0,001	0,006
			0,20		0,22	0,15	0,08	0,04	0,15
	20-30	0,034	0,017	нет	0,008	0,006	0,001	0,001	0.001
			0,28		0,17	0,30	0,08	0,04	0,03
	50-60	0,047	0,027	нет	0,008	0,009	0,001	0,001	0. 001
			0,44		0,16	0,45	0. 08	0. 04	0. 03
	120-130	0,059	0,034	нет	0,010	0,009	0,002	0,003	0. 001
			0,56		0,21	0,45	0,16	0,13	0,003
	130-200	0. 089	0,020	нет	0,046	0,015	0,005	0,002	0,001
			0,33		0,95	0. 75	0,41	0,09	0,03
N 1a	0-5	0,051	0,022	нет	0,014	0,008	0,001	0,001	0,005
			0,36		0,29	0,40	0,08	0,04	0,13
	18-28	0,049	0,022	нет	0,014	0,010	0,001	0,001	0. 001
			0,36		0,29	0,50	0,08	0,04	0,03
	50-60	0. 054	0,029	нет	0,011	0,011	0,001	0,001	0,001
			0,48		0,22	0,55	0,08	0,04	0,03
	87-97	0,060	0,034	нет	0. 010	0,011	0,001	0,002	0. 002

		0,56		0,21	0,55	0,08	0,09	0,05
110-118	0,059	0,032	нет	0,011	0,009	0,001	0,008	0,003
		0,52		0,22	0,45	0,08	0,13	0,08
135-145	0,051	0,024	нет	0,013	0,009	0,001	0,002	0,002
		0,39		0,28	0,45	0,08	0,09	0,05
200-210	0,053	0,039	нет	нет	0,009	0,001	0,001	0,003
		0,64		нет	0,45	0,08	0,04	0,08

2.4. VEGETATION OF "TOOSOOSAI" PLOT

The vegetation of the key plot occupies watershed plains, river valleys, balkas* and ravines, depressions with additional water supply and ploughed fields. The most of territory is occupied by anthropogenic ecosystems - irrigated fields with following cultures: *Trifolium, Medicago, Triticum, Cucurbita, Capsicum, Lycopersicon, Anethum, Daucus, Arachis, Phaseolus, Allium, Brassica, Beta, Zea.*

Vegetation of next type occurs on flat and gently sloping watershed plains. In the past the territory was occupied by dry bunch grasses steppes. This is witnessed by fragments of residual steppe including *Stipa capillata, Festuca vaiesiaca, Stipa caucasica.* These steppes often occured intermittently with brushwood (species of genera *Rosa, Spiraea*). The habitats of brushwood were connected with not deep depressions, balkas and ravines.

During investigation of vegetation cover of the key plot Toosoosai several stages of anthropogenic transformation of natural phytocoenoses were found. One of such stages is phytocoenoses represented by *Carex pachystylis* and forbs *(Dipsacus azureus, Elytrigia repens, Euphorbia soongarica, Delphinium biternatum, Papaver pavoninum, Goebelia alopecuroides, Allium caesium, Haplophyllum latifolium).*

Thinned and oppressed brushwood are situated in microdepressions. These communities are still met in a few number on describing territory.

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* "Balka" (also called as "log") - in soviet literature this term defines the dry valley of temporal stream with gentle concave bottom, soddy slopes. Several kilometers long, width up to 100 m, depth up to several tens of metres. Balkas are late stage of ravines.

Here there are communities dominated by *Elytrigia repens* in combination with the brushwood *(Rosa platyacantha)* in microdepressions. Accompanying species are *Allium caesium, Salvia virgata, Artemisia transiliensis, Thymus marschallianus, Vicia cracca.* Their quantity vary from 5-8 to 15-30. On places with additional water supply *Glycyrrhiza glabra* community with accomronying *Goebelia alopecuroides, Calamagrostis epigeios* have formed. As a rule territory with disturbed upper soil layer is occupied by ruderal plants phytocoenoses *(Onopordum acanthium, Artemisia scoparia, A. absintium).*

The describing flat watershed plains were locally ploughed as witnessed by ploughing traces and vegetation. The vegetation cover is constituted by initial communities or simple and complex aggregations dominated by *Xanthium strumarium, Setaria viridis, Goebelia alopecuroides, Acroptilon repens,* weeds *(Calystegia sepium, Echium vulgare, Capsella bursa pastoris, Achillea millefolium, Polygonum aviculare, Malva neglecta, Descurainia sophia, Atriplex tatarica, Cannabis ruderabis).* The later stages of vegetation formation on fallow lands are phytocoenoses formed by weeds and species of *Artemisia* genus *(Artemisia absinthium, A. transiliensis).*

The second type of natural ecosystems is represented by vegetation of ancient balkas of flow, river valleys with steep slopes, bottoms and fragments of terraces, deep ravines on the place of old irrigation network.

During many years this vegetation has been subjecting to grazing and hay making. The territory is adjasent to ploughed fields, irrigation network, excavations and other objects. Therefore the vegetation has essentially ruderal character but there are zonal species and phytocoenoses *(Poa pratensis, Origanum vulgare, Hypericum perforatum, Eremurus fuscus, Allium caesium, Dactilis glomerata, Hedysarum songoricum, Bothriocholoa ischaemum)* too.

Here there are ephemeroid-forb-sedge plant communities *(Carex pachystylis, Goebelia alopecuroides, Dipsacus azureus, Eremurus fuscus, Origanum vulgare, Salvia virgata, Thymus marshallianus, Allium*

caesium, Artemisia transiliensis, Calystegia sepium), ephemeroid-forb-grasses plant communities *(Elytrigia repens, Herbosa ephemeroides).*

These communities under the increase of the anthropogenic impact can turn into ruderal plant communities (dominated by *Lepidium sibiricum, Cannabis ruderalis,* grasses *(Elytrigia repens), Goebelia alopecuroides, Onopordum acanthium, Botriochoa ischaemum).*

Bottoms of wide dry river beds are occupied by forb and sedge plants communities *(Carex pachystylis, Goebelia alopecuroides, Malva mogilevskii, Verbascum macrocarpa, Echium vulgare)* in combination with the brushwood *(Rosa platyacantha, Spiraea hypericifolia).*

Often the forb-rhizome grasses communities *(Elytrigia repens, Euphorbia soongarica, Achillea millefolium, Veronica verna, Salvia virgata)* in combination with thinned brushwood *(Rosa platyacantha, Spiraea hypericifolia*) are found here. The communities of *Goebelia alopecuroides* occur in places with additional water supply; and microuplands are occupied by communities of *Botriochloa ischaemum.*

All these communities are alternated with aggregations of ruderal plants *(Cannabis ruderalis , Lepidium sibiricum, Onopordum acanthium, Trifolium pratense, Goebelia alopecuroides, Camelina microcarpa).*

Deeply ingrown ravines on loess loams are covered by aggregations of *Asperugo procumbens* and dense communities of *Elytrigia repens.* On more gentle and light parts of ravines there are forb-rhizome grasses phytocoenoses *(Elytrigia repens, Salvia vulgare, Euphorbia soongorica, Origanum vulgare, Hypericum perforatum, Achillea millefolium, Artemisia absinthium).*

The third type of natural ecosystems is ecosystems of depressions on meadow and meadow-bog soils with additional water supply. Vegetation of minor round depressions *(Typha angustifolia, Polygonum hygropiper)* and depressions along irrigation network (*Phragmites australis*) belongs to this type.

There are numerous shelter forest belts along roads on described key plot. They are composed of *Populus alba, Ulmus pumila, Robinia pseudoacacia, Elaeagnus angustifolia.* The herbaceous layer is represented by initial aggregations of ruderal plants (*Centaurea squarossa, Origanum vulgare, Calystegia sepium, Echium vulgare,*

Xanthium strumarium, Melilotus officinalis, Tragopogon sp., Achillea millefolium, Artemisia scoparia, A. absinthium, A. transiliensis, Malva neglecta, Verbascum macrocarpa, Capsella bursa-pastoris, Agropyron cristatum, Dactylis glomerata, Elytrigia repens).

The shelter forest belts along irrigation network and ground roads have different composition of arboreal flora *(Malus sieversii, Crataegus sp., Ulmus pumila, Armeniaca vulgaris, Salix alba, Populus alba, Elaeagnus angustifolia).* Often trunks of trees are covered by lianas *(Humulus lupulus, Bryonia alba, Rubus caesius).* The herbaceous layer is similar to vegetation of wide dry river beds. It is represented by tall forbs and grasses *(Origanium vulgare, Hypericum perforatum, Dactylis glomerata, Calamagrostis epigeios etc.).*

The communities of *Viola tricolor* and *Impatiens parviflora* exist in the dense brushwood. Thus the most part of studied territory is occupied by agricultural ecosystems. The rest of territory is occupied by transformed ecosystems.

Main factors of transformation are grazing, hay making, road network, irrigation network, additional water supply, tourism. The natural vegetation is practically absent. In Almaty region *Zea, Medicago, Trifolium, Panicium, Avena, Bromus, Triticum, Secale, Hordeum* are grown as forage. A rotation of crops is kept on fields.

2.5. LEGEND OF ECOSYSTEM MAP OF "TOOSOOSAI" PLOT

ECOSYSTEMS OF DRY STEPPE BELTS ON PIEDMONT PLAIN ADJACENT TO TRANSILIAN ALATAU (ALTITUDE of 700-750 m)

A. NATURAL–ANTHROPOGENIC ECOSYSTEMS

I. Ecosystems of watershed plains

1. Flat and gently sloping plains with predominance of anthropogenically disturbed vegetation on the place of bunchgrass steppes on dark brown eroded soils .

Series of disturbance (transformation) of vegetation on watershed plain on the place of bunchgrass steppe and brushwood in microdrops .

Sedge and brushwood *(Rosa sp.)* on microdrops

↓

Forb-rhizome grasses *(Elytrigia repens)* with thinned brushwood *(Rosa sp.)* on microdrops

↙ ↘

Annual and perennial weed forbs

(ruderal plants)

(Artemisia absinthium , A. scoparia ,Onopordum acanthium)

Secondary ruderal plant communities in habitat with additional moistening *(Glycy rrhiza glabra , Calamagrostis epigeios , Goebelia alopecuroides , Phragmites australis)*

2. Flat and gently sloping plains with series of vegetation re-establishment on abandoned fields .

Series of vegetation re-establishment

Ruderal plants (weed forbs) - *Xanthium strumarium*

↓

Aggregation of ruderal plants *(Onopordum acanthium , Calystegia sepium , Echinum vulgare , Setaria viridis)*

↓

Plant communities from perennial forbs and grasses *(Goebelia alopecuroides , Acroptilon repens , Elytrigia repens)*

↓

Plant communities of perennial and annual forbs *(Artemisia absinthium , A. scoparia , Polygonum aviculare , Achillea millefolium , Malva neglecta , Asperugo procumbens , Elytrigia repens , Descurainia sophia, Atriplex tatarica , Cannabis ruderalis , Taraxacum officinale , Lappula microcarpa) .*

II. Ecosystems of river valleys, hollows and ravines

3. Ancient flow's hollow with predominance of series of anthropogenic transformation of vegetation with *Carex pachystylis, Elytrigia repens, Lepidium sibiricum, Cannabis ruderalis* on place of forb-bunchgrass steppes on dark brown soils in combination with meadows *(Poa , Bromus , Elytrigia)* on meadow-chestnut soils and afforestation *(Ulmus pumila , Elaeagnus angusti -folia, Malus sieversii)* and small vegetable-gardens.

4. River valleys with steep slopes, bottom and terraces with predominance of anthropogenic vegetation succession on place of forbs-bunchgrass steppes on dark brown soils in combination with brushwood *(Rosa platyacantha , R. canina , Spiraea hypericifolia*) and trees *Ulmus pumila , Armeniaca vulgaris , Malus sieversii* on meadow - dark brown soils and meadow soils in conditions of additional water supply.

Series of transformation on slopes on place of forb bunchgrass steppes *(Stipa capilata , Festuca valesiaca)* in combination with brushwood *(Spiraea hypericifolia , Rosa platyacantha)*

Ephemeroid forb-perennial forb-sedge plant communities *(Carex pachystylis , Goebelia alopecuroides , Dipsacus azureus , Eremurus fuscus , Origanum vulgare , Calystegia sepium , Salvia virgata , Thymus marshallianus , Artemisia transiliensis , Allium caesium)*

↓

Ephemeroid forb grass plant communities *(Elytrigia repens , Herbosa ephemeroides)*

↙ ↘

Grass - forb plant communities *(Hedysarum soongoricum , Elytrigia repens)* - ruderal plants *(Lepidium sibiricum , Cannabis ruderalis , Onopordum acanthium)* thinned grasses and forb aggregation *(Elytrigia repens , Goebelia alopecuroides , Onopordum acanthium)*

Grasses *(Botriochloa ishaemum , Elytrigia repens , Thymus marshallianus , Dipsacus azureus , Achillea millefolium)*

Series of vegetation transformation (succession) on bottom of dry river bed valley on meadow-chestnut and meadow soils :

Forb-sedge plant communities in combination with brushwood *(Goebelia alopecuroides , Malva mogilevski , Verbascum macrocarpa , Rosa platyacantha , Spiraea hypericifolia , Carex pachystylis , Echium vulgare etc.)*

↓

Forbs - rhizome grasses *(Elytrigia repens , Euphorbia soongarica , Achillea millefolium ,Veronica verna , Salvia virgata)* in combination with rare brushwood *(Rosa platyacantha , Spiraea hypericifolia)*

↙ ↘

Perennial forb plant commu-

Grasses plant communities

nities *(Goebelia alopecuroides)* in habitat with additional water supply

↓

(Botriochloa ishaemum)

↓

Aggregation of ruderal plants *(Cannabis ruderalis , Lepidium sibiricum , Onopordum acanthium ,Trifolium pratense , Goebelia alopecuroides)*

III. Ecosystems of depressions with additional water supply

5. Communities dominated by *Typha angustifolia, Polygonum hydropiper.*

B. ANTHROPOGENIC ECOSYSTEMS

IV. Agricultural ecosystems

6. Flat watershed plains with irrigated fields on dark brown irrigated soils.

7. Low flats and watershed plains with afforestation on meadow chestnut soils in combination with haymaking fields and vegetable - gardens.

8. Constant flow river valley with predominance of afforestation .

V. Technogenic ecosystems

9. Highly disturbed lands along canals and roads with predominance of ruderal plants .

Map symbols :

10. Cultural and ruderal ecosystems of settlements .

11. Forest shelter belts along roads with solid protection and canals *(Populus alba , Ulmus pumila , Robinia pseudoacacia , Elaeagnus angustifolia)*

12. Small concrete canals.

13. Main canal.

14. Ground roads.

15. Asphalt roads.

16. Boundaries archeological excavations site.

17. Hydrographic network.

2.6. LEGEND OF SCHEMATIC MAP OF ECOSYSTEMS AND THEIR ELEMENTS AT " TOOSOOSAI " PLOT"

ECOSYSTEMS OF DRY STEPPE BELT ON PIEDMONT PLAIN

A. NATURAL — ANTHROPOGENIC ECOSYSTEMS

I. Ecosystems of watershed plains

1. Flat plains (watersheds) with pronounced microrelief (micropandings) formed by loess loam with predominance of highly disturbed by overgrazing communities. These plant communities could be repsented as series of transformation: *(Carex pachystylis ---> Elytrigia repens ---> Artemisia absinthium , Onopordum acanthium)* on dark chestnut soils in combination with brushwood *(Rosa platyacantha , R. canina)* .

2. The same as in item 1 but in combination with afforestation *(Ulmus pumila , Malus sieversii , Acer semenovii)* .

3. Periodically flooded flat plains (watersheds) with predominance of series of vegetation re-establishment on abandoned fields *(Artemisia absinthium , A. scoparia , Polygonum aviculare , Malva neglecta , Asperugo procumbens , Elytrigia repens , Xanthium strumarium , Achillea millefolium , Melilotus officinalis)* .

II. Ecosystems of river valleys , balkas and ravines

4. Flood plains and stream beds (with episodic flow) formed by proluvial and alluvial pebble - stone deposits (stream beds) and sandy - loam deposits (flood plains) with predominance *(Poa pratensis, Trifolium pratense, Plantago lanceolata, Rubus caesius, Euphorbia soongarica , Carex pachystylis , Anagallis arvensis , Melilotus album, Malva neglecta)* .

5. Low fluvial terraces above floodplains formed by proluvial - alluvial sandy-loam deposits with predominance *(Botriochloa*

ischaemum , Trifolium pratense , Polygonum aviculare , Armeniaca vulgaris , Ulmus sp. , Malus sieversii).

6. Steep western steep slope of river valley formed by loess loam with predominance communities of *Elytrigia repens , Hedysarum songoricum , Cannabis ruderalis , Glycyrrhiza glabra , Botriochloa ischaemum , Carex pachystylis .*

7. Steep eastern slope of river valley formed by loess loam with local erosions *(Elytrigia repens , Goebelia alopecuroides , Hypericum perforatum , Achillea millefolium , Glycyrrhiza glabra ,Galium verum , G. octonarium , Artemisia transiliensis , Thymus marschallianus , Acroptilon repens , Cannabis ruderalis , Verbascum macrocarpa , Marrubium alternidens , Eremurus fuscus , Rosa platyacantha) .*

8. Deeply ingrown (1,5 - 3 m) ravines on place of ancient irrigated network with predominance of trees *(Ulmus pumila , Malus sieversii , Armeniaca vulgaris)* in combination with ruderal plant aggregations *(Asperugo procumbens)* on cliff .

III. Ecosystems of depressions with additional water supply

9 . Hydrophytic plant communities *(Typha angustifolia , Polygonum hidropiper) .*

B. ANTHROPOGENIC ECOSYSTEMS

IV. Agroecosystems

10. Flat plains (watersheds) with irrigated fields on dark brown irrigated soils .

11. Periodically flooded flat plains (watershed) with irrigated fields .

V. Technogenic ecosystems

12. Highly disturbed lands along road and main canals .

Map symbols :

13. Irrigation network (made of concrete).
14. Irrigation network (made of earth) .
15. Asphalt roads .
16. Main canals .
17. Ground roads .
18. Forest shelter belts along roads and canals .
19. Archaeological objects .

3. "TALGAR–3" PLOT

3.1. GEOGRAPHICAL AND GEOMORPHOLOGICAL CHARACTERIZATION OF TALGAR–3 PLOT.

"Talgar-3" plot is situated on territories of Ryskulov and Almaty collective farms, Talgar district, Almaty region, 5-6 km to the east of Talgar city. On the submitted map of 1:10 000 scale the territory of the plot is limited by the following coordinates: 77°16'41" - 77°18'45" E longitude, 43°15'48" - 43°22'58" N latitude.

The plot adjoins in the south to so called "Soldatskaya schel' " and together they form vast intermontane valley which is located within the boundaries of piedmont-low mountain belt. This territory including the plot as a whole is particular region: it differs by orographic position, climatic and microclimatic conditions from another piedmont-low mountain plains of the central part of Transilian Alatau. In essence it is half-closed intermontane plain with relief formed in lower-upper Quarternary and represented mainly by fairly dissected landforms with ouvals and hills. Fairly steep sides bound the intermontane plane and "protect" it in the north and south by low mountain medium mountain massifs (Kainazar, Talgar and Zhumat massifs (ranges)) and in the east by main ranges of Transilian Alatau. The length of the plain from the north to the south is 5-8 km and from the west to the east is 18-20 km. This plain is open in the west toward Talgar city favouring the penetration of humid air mass. This fact along with relatively protective conditions and closeness to the highest ranges of Transilian Alatau created peculiar optimum climatic conditions for the development of biota (flora and fauna). Longstading observational data confirm the optimum conditions of this territory by both duration of vegetation season and relatively high yielding of different crops.

In summary we can say that this territory was developed by man, including agricultural development, very long ago.

The area of interest to archaeologists is limited in the east and west by ouvals with pronounced slopes. Narrow south part of the area widens northwards, so that the peculiar triangular valley is formed.

Deeply ingrown left tributary of Krasilnikov river crosses central part of the valley. The valley has two parts of different levels: the lower part is situated eastwards of tributary and higher one (watershed terrace) is situated westwards of tributary. It could be assumed that tributary and it's branches migrated at historical epoch within the valley undermining steep slopes of ouvals. Moreover the valley was periodically subjected to local mud streams what is supported by presence of big rounded boulders and blocks on entire area of the valley.

Deeply ingrown bed of Krasilnikov river has two fluvial terraces above flood plain: first and second. They are formed mainly by alluvial sandy loam deposits with inclusion of boulder-pebble material.

Watershed areas adjacent to tributary bed in the west and east are formed mainly by alluvial-proluvial deposits and partly by deluvial deposits (mud streams largely contributed to deluvial deposits). In essence this territory could be considered as local alluvial fan.

It should be noted that latest tectonic processes have played a large part in formation of modern relief in this part of foothills as well as in mountains and piedmont plains of Transilian Alatau. These processes caused the character and degree of denudational and accumulative activities particularly in formation of sculptured relief (pronounced ouvals with steep slopes adjacent to the valley).

Our investigations showed that ouvals adjacent to the valley in the west and east are formed mostly by loess loam. Rocks of granitoid composition or loose rocks of the same composition lie under that loess loam. As regards the valley, it's bed is underlaid by dense rocks and covered by boulder-pebble deposits.

Main soil profiles, made at the eastern side of the area, showed that buried horizons of former soils occur in lower part of the profiles. It could be assumed that these buried horizons are consequence of latest tectonic processes causing landslides and active denudation of ouvals composed of loess loam.

Anthropogenic disturbance of relief in this region is considerably strong. First noteworthy evidence of that is the ravine with abrupt slopes locating on the place of former irrigation canal along the foot of eastern ouval. Besides the lower part of ouval has a thick layer of weakly transformed loess loam which is quarried from natural deposits for construction purposes. There are a lot of traces of anthropogenic activity at the valley and terraces such as former hibernations, agricultural winter stays, farmsteads and others (often built of concrete). There are also the remains of foundation pits, holes and embankments. It should be noted that site where profile was made situated sufficiently far from archaeological object but had analogues of virgin soils so that it could characterize natural conditions.

On the whole, this plot is characterized by strongest disturbance induced by human economic activity.

3.2. REGULARITIES OF FORMATION OF THE SOIL COVER OF THE "TALGAR–3" PLOT

The Talgar-3 plot is situated on the right bank of the small river within the high fluvial terrace above flood plain directly turning into the slopes of the highly dissected piedmonts ("counters") built by the loess loams southwards. These "counters" gently turns into the steeply-sloping middle-mountainous relief within which the loess loams are absent.

1. The fact that the plot is closed in the north by the low mountain-massif is the characteristic property of the plot. Therefore the climate here is considerably mild. Moreover the territory is characterized by the large extent of the loess loamy "counters" belt and the very gradual increasing of the absolute height. As a result, the available conditions have been established for the qrowth of the wild fruit trees (apple, apricot, hawthorn). The fruit forest belt is spread only in the central part of the Transilian Alatau, not in the west or east.

The flat part of the plot is situated within the steppe belt (the subbelt of the moderately moistened forb-grass steppes). The highly dissected piedmonts and low mountains are situated within the forest-meadow-steppe belt (its lower subbelt of fruit tree forests).

The ordinary chernozems are the zonal soil type of the steppe zone. In the natural (virgin) conditions they were formed under the grass-forb vegetation, with crucial role of bunch grasses (tipchak, feather, desert oat, *Koeleria gracillis*, timophy-grass), steppe forbs (thyme, sage, milfoil), sometimes the shrubs (spirea, honeysukle etc.). The soil forming rocks here are the loess loams.

The ordinary chernozem soils are the dark gray-coloured, lightened and somewhat brownish in the lower part of the humus horizon (A+B=50-75 cm). It has the cloddy-granular or granular structure in the upper part (A= 25 - 35) and the granular - cloddy or cloddy one in the lower part (B=30-35 cm). Deeper the grayish-brown transitional horizon of lesser thickness is bedded (BC=10 cm) which is

underlaid by the indurated whitish-yellow brown carbonate illivial horizon (C) with the visible carbonate depositions. At the depth of 120-130 cm it is exchanged by the more loosed pale -yellow- brown loess loam , almost unaffected by process of the soil formation. The effervescence due to HCl is noticed, as a rule, in the middle part of the humus horizon.

The ordinary chernozems contains 7-10% of humus in the upper horizon and 0,3-0,5% of the total nitrogen. The humus structure is mainly humic-calcic. The absorbed base sum is rather high (35-40 meq per 100 l of soil). The absorbing complex is saturated by calcium, partly by magnesium.

The soil cover structure of the mountains is considerably more complex than the one on the plains. The exposure unhomogeneity of slopes plays a great part here. The slopes of southern and closed to them exposures are more supplied by the heat and light than the northern ones. The evaporation here is higher too. Thus the following regularities of the soil formations can be noticed within the belt of fruit forests. On the slopes of the northern and north-eastern exposures the mountain-forest chernozem-like soils have been formed (under the apple, apricot, hawthorn trees). The slopes of the north-western, south-eastern, sometimes northern exposures have been covered by the mountain leached chernozems (grasses-forb meadow steppes, steppe meadows). The mountain - steppe thermoxeromorphic soils have been prevailed on the southern and south-western slopes, especially formed on the shingle loams and tight bedrocks.

The peculiarity of the plot is almost complete absence of the slopes of the southern exposures, and the soil cover consists of the mountain-forest chernozem-like soils and mountain leached chernozems.

The mountain-forest chernozem-like soils are being formed within the describing region exclusively on the loess loams. The vegetation cover is formed by the herbed apple-aspen and apple forests, under the of which canopy of which the undergrowth (bird-cherry tree, honeysukle, hawthorn, sweetbrier, currants), shade

demanding dicotyledonous herbs and mesophyle grasses are developed.

The mountain-forest chernozem-like soils have the humus horizon of the high thickness (A+B=80-100 cm). As a rule, on the surface the partly decomposed dead litter is laid. During the summer period it is rapidly mineralized. The humus-accumulative horizon (A=25-45 cm) lies downward. It is dark-gray, often with the cinnamonic hue, powderlike-granular by the structure. The colour and structure differences stipulate the division of this horizon into two subhorizons (A1 and A2). Then below there is the transitional humus horizon (B=30-60 cm). It also may be divided into two subhorizons and is characterized by the darkish-grey colour with the brownish hue. Beneath the humus horizon usually there is a carbonate-leached brown or ferrous brown, vaguely-nutty transitional horizon (BC=10-50 cm), almost devoid of humus colour. At the depth of 130-150 cm there begins a yellow-brown carbonate-illuvial horizon (C1) with carbonate depositions in the form of veins, speeks and crusts on the bottom of rubbish which then changes to the poorly-changed loessial rock or rubbish loose material of dense rock.

Mountain forest chernozem-like soils have a considerable humus content (9-15%). The humus content decreased with depth , at first sharply and then gradually. The soil suspension reaction changes from the poorly acid in the upper profile part to the poorly-alkaline in the bottom part. Calcium cations predominate in the absorbing complex. As to mechanical composition the soils are medium and heavy-loamy.

The mountain leached chernozems have been formed under the forb-grasses, large-herb often shrubby (sweetbrier) steppe meadows or grass-forb meadow steppes. The soils possess a thick humus horizon (A+B=80-100 cm, sometimes more). The upper accumulative-humus horizon (A=30-50 cm) is coloured with saturated dark-gray or darkish-grey cinnamonic hues and has a well-expressed cloddy-granular structure. The underlying transitional humus horizon (B=40-60 cm) has a cinnamonic or gray cinnamonic colour and becomes denser with granular-cloddy structure. Deeper there is a slightly-humus poor-nutty leached transitional horizon (BC^b= from 10-30 till 50-60 cm) which

changes then into calcareous loess loam. According to the depth of effervescence and thickness of humus transitional horizon (BC^b) it might be distinguished the leached chernozems which are bedded in the upper and middle parts of the belt and deeply leached- in the upper one.

Leached mountain chernozems are characterized by a high content of humus (11-15%) and total nitrogen (0,5-0,8%) which is more visible at the top and gradually decreases with the depth. The absorbed base sum is high (40-55 meq per 100 g of soil). The absorbing complex is saturated mainly with calcium. Soil suspension reaction is almost neutral at the top and alkaline in the calcareous horizons. The soils are well - supplied with mobile forms of nitrogen, potassium and phosphorus.

Among the described zonal soils there are wet intrazonal soils (of additional moistening). They are located at the bottoms of ravines and river valleys. Among them the mountain meadow-chernozem soils are marked out, and along the valleys and alluvial bottoms of the rivers - the meadow ones.

It is necessary to mention, that the described soils have been met within the plot, are most fertile soils of Kazakhstan and all over the world too. In the conditions of the flat and weakly dissected relief they gives a high yield of agricultural crops. When the ploughing is impossible due to steepness of the slopes the soils have been used for the unirrigated fruit-growing.

3.3. SOIL CHARACTERIZATION OF THE "TALGAR–3" PLOT

The "Talgar-3" plot is situated within opened in the north intermontane valley of the nameless river. The valley turns into the slopes of the high dissected piedmonts ("counters"). There soil sections were laid up here. The soil sections N 2 and N 2c characterize the main zonal soils spread upon this territory - the mountain-forest chernozem-like soils and the ordinary chernozems.

The soil section N 2b is represented by the outcrop of the slope falling down to the valley and revealing the marks of human activity.

The description of the morphological structure of profiles is given below.

The soil section N 2 is laid up in the lower part of the slope of north-western exposure turning into a terrace of the nameless river.

The vegetation is represented by the wild fruit tree herb forest. The depth is 220 cm, A+B =110 cm, effervescence due to HCl from 167 cm. The profile is single-shingled down to the depth of 180 cm, poorly-shingled in the lower horizon (till 200 cm) and then strongly-shingled (deeper than 200 cm).

0-9 A_1 - Dark-gray, dry, weakly indurated, very rooty, largely- and middle-granular, heavy-loamy.

9-22 A_2 - Dark-gray, dry, weakly indurated, very rooty, granular-cloddy, heavy-loamy.

22-53 B_1 -Brown-gray, cool, becomes more brown after drying, weakly indurated, rooted, middle and largely-cloddy, heavy-loamy.

53-89 B_2 - Brownish-gray on the split and dark-brown on the profile cutting surface, cool, indurated, weakly rooty, middle - and little-cloddy, heavy loamy.

89-110 B_3 - Almost the same by the colour and indication, unstable-cloddy, with the seanty grains of earthworm caprolytes, fine-porous, heavy-loamy.

110-146 BC_1^l -Dark-brown grayish, cool, more indurated than previous,with the rare roots, unstable cloddy with sharp-edged clods, heavy-loamy.

146-167 BC_2^l -Darkish-brown slightly grayish, light-brown after the drying, cool, dense, unstable-sharp-edged-cloddy, shingled alittle, heavy-loamy.

167-200 C_1^c - Muddy-brown, with numerous carbonate veins, cool, light-brown after the drying, dense, sharp-edged-cloddy, heavy-loamy.

200-210 CD^c - Yellow-brown, with numerous carbonate depositions in the form of the veins and pseudo-mycelium, shingled, whitish- yellowish - brown lightened after the drying, unstructured,middle-loamy.

The soil: Mountain-forest chernozem-like, highly leached, thick, middle-humused, heavy-loamy on the heavy loess loam, underlaid with the loose rocks of granite.

The soil section N 2a is laid up on the gentle (7-8) western slope of the ouval.

Vegetation: grasses - forb (weed herb) steppe.

1. *Marrubium alternidens*
2. *Goebelia alopecuroides*
3. *Glycyrrhiza glabra*
4. *Origanum vulgare*
5. *Cannabis ruderalis*
6. *Bromus gracillimus*
7. *Centaurea belangeriana.*

The depth is 330 cm, A+B=72 cm, effervescence due to HCl from 50 cm. The profile is single-shingled down to the depth of 250 cm, poorly-shingled in the lower horizon (250-280 cm) and then strongly-shingled (280-330 cm) by the loosed rock of the granites.

0-10 A_1 - Dark-gray, dry, weakly indurated, very rooty, cloddy-granular, heavy loamy.

10-30 A_2 - Dark-gray, dry, weakly indurated, very rooty, granular-cloddy, heavy loamy.

30-52 B_1- Darkish-grey slightly brownish, dry, weakly indurated, rooty, powder like-cloddy, heavy-loamy. With rare debris of the bones.

52-72 B_2 Lightly-gray brownish, sharp-edged-cloddy with caprolites, cool, dense, heavy-loamy. It is sharply distinguished from the previous by colour and structure. The cementing is noticed.

72-97 BC_1 - Grayish-brown lightened, weakly-moistened, gray lighted after the drying, dense, similar to previous by the structurewith caprolites and mole-hills, anthropogenic, heavy-loamy.

97-130 BC_2 - Brown slightly grayish, cool, indurated, with rare roots, vaguely-cloddy, with carbonate depositions, heavy-loamy.

130-177C_1 Yellowish-brown, cool, indurated, fine-porous, withcarbonate specks along the pores and veins of pseudomycelium, silty-little-sharp-edged-cloddy, heavy-loamy.

177-203AB_1 Grayish-dark-brown, moistened a little, indurated, unstable-sharp-edged-cloddy,heavy-loamy,anthropogenic

203-234AB_2 - Dark-gray slightly brownish, moistened a little,indurated, unstable-sharp-edged-cloddy,heavy-loamywith numerous veins of pseudomicellium.

234-280C_2 Yellowish-dark-brown, slightly moistened, indurated, unstable-sharp-edged-cloddy, heavy-loamy, with numerous veins of carbonates.

280-330CD Yellowish-light-brown, after drying-whitish, slightly moistened, unstructured, sandy-shingle, light-loamy.

The soil: Ordinary chernozem, with the fossil humus and anthropogenic horizons, of the middle thickness, medium-humused, heavy-loamy on the sandy woody loose rocks of the granites.

Soil section N 2c. Outcrop on watershed surface of the ouvals.

The vegetation:

1. Marrubium alternidens
2. Trifolium pratense
3. Poa pratensis
4. Malva neglecta
5. Euphorbia soongarica
6. Glycyrrhiza glabra.

0 - 12 A_1^s - Dark-gray slightly brownish, dry, weakly indurated, very rooty, cloddy granular, middle-loamy.

12 - 26 A_2 - Dark-gray brownish with the lenses of yellow-brown colour, very rooty, nutty-granular, heavy-loamy.

26 - 45 B_1 - Brownish-dark-gray, indurated, dry, rooty, large-cloddy-nutty, heavy-loamy.

72 - 90 B_3 Dark-brown grayish, dry, dense, sharp-edged-cloddy, vertically cracked, with caprolytes, heavy-loamy.

90-120 BC_1^c - Yellowish-brown, dry, heavily dense, with more dark illuvial humus tongues than at the previous horizon, heavy-loamy, with the carbonate depositions in the form of pseudomicellium.

120-140 C_1 - Whitish-yellow-brown, dry, heavily dense, prism-like-cloddy, locally horizontally laminated, with the diffused whitish carbonate spots, heavy loamy.

140-156 C_2^c - Yellowish - brown, dry, indurated, small-sharp-edged-cloddy, with the mole-hills and single roots, with the carbónate pseudomicellium, heavy-loamy.

156-190 C_3^c - Brownish-yellow, dry, dense, large-cloddy, with the carbonate veins and pseudomicellium, heavy-loamy.

190-240 C_4 - Lighter-than the previous horizon, dry, dense, clodded, with rare carbonate depositions, heavy-loamy.

240-278 C_5 - Slightly changed,heavy loess loam,almost unstructured, without visible carbonates, heavy-loamy.

278-350 C_6 - Unchanged by the soil formation heavy loess loam of yellowish-brown lightened colour.

The soil: Ordinary chernozem highly effervesced, of the middle thickness, heavy-loamy on the heavy loess loam.

TABLE 4

Content of soluble substances (% / meq) in the soils of Talgar-3 plot.

of profile in soil horizon	Depth of sample (sm)	Total salt (%)	Alkalinity (by HCO_3)	CL^-	SO_4^{-2}	Ca^{+2}	Mg^{+2}	Na^+	K^+
2	0-9	0.106	0.034	нет	0,035	0,009	0.002	0.001	0,025
			0.56	нет	0,73	0,45	0,16	0,04	0.64
	30-40	0,024	0,007	нет	0,010	0,003	0,001	0,001	0,002
			0,11		0,20	0,15	0,08	0,04	0,05
	95-105	0,023	0,005	нет	0,011	0,002	0,001	0,001	0,003
			0,08		0,22	0,10	0,08	0,04	0,08
	150-160	0.023	0,007	нет	0,010	0,002	0,001	0,002	0,001
			0,11		0,19	0,10	0,09	0,09	0,08
	210-220	0,052	0,037	нет	0,002	0,009	0,001	0,002	0,001

		0,61		0,04	0,45	0,08	0,09	0,03
0-10	0,060	0,037	нет	0,19	0,008	0,001	0,001	0,009
		0,61		0,39	0,40	0,08	0,04	0,23
40-50	0.042	0.022	нет	0,010	0,006	0,001	0,001	0,004
		0,36		0,19	0,30	0,08	0,04	0,10
80-90	0.060	0,020	нет	0,013	0,009	0,001	0,001	0,007
		0,33		0.27	0,45	0,08	0,04	0,18
150-160	0,047	0,029	нет	0,006	0,009	0,001	0,001	0,001
		0,48		0,12	0,45	0,08	0,04	0,03
210-220	0,047	0,027	нет	0,008	0.009	0,001	0,001	0.001
		0.44		0,16	0,45	0.08	0.04	0,03
320-330	0,045	0.027	нет	0,006	0,008	0,001	0.001	0,002
		0.44		0,13	0,40	0,08	0.04	0,05
0-10	0,077	0,029	нет	0,025	0,013	0,001	0,003	0,006
		0.48		0,53	0,65	0,08	0,13	0,15
30-40	0,062	0,029	нет	0,014	0,09	0,001	0,001	0,008
		0,48		0,29	0,45	0,08	0,04	0,20
75-85	0.071	0.032	нет	0.017	0,010	0,001	0,001	0,010
		0.52		0.35	0,50	0,08	0,04	0,25
130-140	0,208	0,020	нет	0,129	0,051	0,004	0,002	0,002
		0,33		2 ,69	2,55	0.33	0,09	0.05
170-180	0,050	0,029	нет	0.008	0,010	0,001	0,001	0,001
		0,48		0,17	0,50	0,08	0,04	0,03
250-260	0,052	0,029	нет	0,010	0,006	0,003	0,001	0,003

		0,48		0,19	0,30	0,25	0,04	0,08
280-290	0,068	0.024	нет	0.026	0,007	0.005	0.001	0,005
		0,39		0.54	0,35	0,41	0,04	0,13
340-350	0,151	0,020	0,006	0.083	0,012	0.014	0,004	0,012
		0,33	0,17	1,73	0,60	1,15	0.17	0,31

3.4. VEGETATION OF "TALGAR–3" PLOT

Vegetation of key plot includes two subbelts: (1) the subbelt of rich forb-bunch grasses steppes on ordinary chernozems, (2) the subbelt of wild fruit tree forests on leached chernozems.

Agroecosystems occupy considerable proportion of first subbelt ecosystems. They are gardens, vegetable gardens, fields and private plots arranged on the piedmont plain near the Soldatskoe gorge.

Excavations are carried out on high terrace of the river valley with highly transformed vegetation on place of former agricultural settlement. Here vegetation is represented by aggregations of ruderal plants (*Onopordum acanthium, Centaurea belangeriana, Cannabis ruderalis, Achillea filipendulina*) and ruderal communities (*Poa pratensis, P.annua, Cichorium intybus, Achillea filipendulina, Arctium tomentosum, Potentilla bifurca, Centaurea belangeriana*) as well dominated by *Cynodon dactylon, Marrubium allernidens, Taraxacum officinale, Achillea millefolium.*

There are ruins of ancient town, burial mounds on this territory. It follows that the given territory is subjected to longstanding (for many centuries) anthropogenic impact. Therefore the vegetation have long history of transformation.

In the subbelt of wild fruit tree forests and meadow steppes the vegetation is represented by various communities and their combinations. Thinned wild fruit tree forests (*Malus sieversii, Crataegus sp.*) with brushwood (*Rosa platyacantha*) and weed forbs occupy intermontane plains and high terraces. The forests are highly transformed because of overgrazing and tourism.

Upper soil layer is very compact. A soil surface is covered by *Cynodon dactylon* and ruderal plants aggregations (*Urtica dioica, Polygonum aviculare, Centaurea belangeriana, Cannabis ruderalis, Achillea filipendulina*).

Piedmontal and low mountain ouvals (north-eastern and northern slopes) formed by loess deposits are occupied by wild tree fruit forests (*Malus sieversii, Crataegus sp.*). Species composition of herbaceous layer in such forests is characterized by abundance of grasses (*Avena*

sativa, Agropyron cristatum, Dactilis glomerata,Bromus inermis, Poa pratensis, Melica transilvanica). The *Acer semenovii, Crataegus turcestanica, Ulmus pumila* belong to the composition of arboreal flora apart from *Malus sieversii* and *Crataegus*. The shrub layer is well expressed and represented by many species (*Lonicera altmannii, Berberis sphaerocarpa, Spiraea hypericifolia, Rosa platyacantha, R.canina*). Lianas (*Humulus lupulus, Brionia alba*) often heavily twine round trees and brushes.

The wild fruit tree forests occur intermittently with communities of tall forb meadows.

The flora of meadows is very rich.

There are *Vicia cracca, Impatiens parviflora, Poa pratensis, Phlomis salicifolia, Origanum vulgare, Hypericum perforatum, Nepeta cataria, Dactilis glomerata, Glycyrrhiza glabra, Goebelia alopecuroides, Bromus inermis*. Species of *Viola, Taraxacum, Polygonum, Malva, Trifolium, Urtica* genera are presented too.

The brushwoods are widespread on piedmontal and intermontane ouvals. These communities of *Rosa, Berberis, Lonicera* take up considerable part in vegetation cover of the Transilian Alatau.

Within its areal limits species of *Rosa* genus have wide amplitude of vertical distribution and great ecological plasticity due to ability to quick vegetative reproduction. They occur at brushwoods and in form of separate clumps at zone of deciduous forests and brushwoods.

The roseries are characteristic type of communities for the Transilian Alatau.

Composition of herbaceous layer in roseries depends on altitude, exposure and steepness of slopes. Herbaceous plants of dense brushwoods (*Ferula sp, Eremurus, Dactylis glomerata, Bromus inermis*) in some cases could exceed the level of brushwood.

Rosa platyacantha often occur in formations of xerophilous plants, but in conditions of water deficiency it is undersized and grows in combination with steppe species.

The north-western, western steep slopes are occupied anthropogenically modified communities of meadow steppes

(*Glycyrrhiza glabra, Bromus inermis, Phlomis pratensis, Euphorbia soongarica, Origanum vulgare etc.*)

There are small groups of *Malus sieversii, Crataegus sp.* on slope depressions. The herbaceous cover of such groves is often strongly trampled.

Vegetation of northern macroslope of the Talgar mountain formed by loess is represented mainly by mixed forests (*Populus tremula, Malus sieversii, Crataegus sp, Rhamnus sp*) with predominance of aspen forests. The steppe meadows (*Bromus inermis, Urtica dioica, Vicia cracca, Geranium collinum, Talictrum collinum, Lugularia macrophylla, Nepeta cataria*) form herbaceous layer.

Brushwoods on these slopes completely correspond to descriptions of above brushwoods. Besides zonal vegetation there is intrazonal one at river floodplains of Talgar - 3 plot.

Vegetation of such habitats is partly presented by zonal mesophytic species and their aggregations. Here there are trees (*Malus sieversii, Crataegus turcestanica, Ulmus pumila, Acer semenovii)* and brushwoods *(Berberis heteropoda, Rosa canina, R. platyacantha, Lonicera microhylla, Rhamnus cathartica, Syringa vulgaris, Spiraea hypericifolia*).

The moisture-loving species (*Scirpus lacustrics, S. setaceus, Prunella vulgaris, Polygonum hydropiper, Mentha arvensis, Trifolium pratense, Viola dioica, Plantago major, Taraxacum officinalle etc.*) grow along the banks of the river and on floodplain terraces. The dense brushwoods of *Rubus casius* occur locally.

It is necessary to note that great areas of key plot are occupied by artificial terraces with gardens. The terraces are situated on all slopes, but they prevail on western and eastern slopes.

3.5. LEGEND OF ECOSYSTEM MAP OF "TALGAR–3" PLOT

A. NATURAL AND ANTHROPOGENIC–NATURAL ECOSYSTEMS

a. ECOSYSTEMS OF RICH FORB - BUNCHGRASS STEPPE BELTS ON ORDINARY CHERNOZEMS

I. Ecosystems of intermontane plains and high fluvial terraces above floodplains

1. High fluvial terraces above floodplains with anthropogenic vegetation on place of former agricultural settlement and modern archeological excavation with predominance weed of aggregations *(Onopordum acanthium , Centaurea belangeriana , Canabis ruderalis , Achillea filipendulina , Poa pratensis , Arctium tomentosum , Potentilla bifurca , Cynodon dactylon , Alyssum campestre , Veronica verna , Artemisia scoparia , Malva neglecta)* .

b. ECOSYSTEMS OF WILD FRUIT-TREE GROVES ON MOUNTAIN FOREST CHERNOZEMLIKE SOILS AND MEADOW STEPPES ON LEACHED CHERNOZEMS

II. Ecosystems of intermontane plains

2. Gently sloping flat plains with predominance of wild fruit forests *(Malus sieversii , Crataegus sp. ,Rosa platyacantha)* with forbs and weeds *(Elytrygia repens , Urtica dioica , Polygonum aviculare , Centaurea belangeriana , Cannabis ruderalis , Taraxacum officinale*).

3. Gentle slopes of eastern exposure with predominance of thinned brushwoods *(Rosa platyacantha)* in combination with weed plant communities and plant aggregations *(Achillea millefolium ,*

Malva neglecta , Cychorium intybus , Cannabis ruderalis) on leached chernozems .

III. Ecosystems of piedmontal and low mountain ouvals formed by loess loam

4. Northern and northeastern steep slopes of ouvals with predominance of wild fruit tree forests *(Malus sieversii , Crataegus sp. ,Rosa platyacantha , R. canina , Lonicera tatarica , Rhamnus cathartica , Humulus lupulus)* in combination with tall forb meadows *(Dactylis glomerata , Melica transsilvanica , Eremurus fuscus , Hedysarum soongoricum , Inula aspera , Urtica dioica , Poa pratensis , Nepeta cataria ,Phlomis pratensis , Glycyrrhiza glabra , Origanum vulgare , Arctium tomentosum , Lathyrus tuberosus , Vicia cracca)* on mountain forests leached chernozem like soils .

5. Western and north-western steep slopes of ouvals with predominance of anthropogenic modification of meadow steppes *(Glycyrrhiza glabra , Bromus inermis , Phlomis pratensis , Euphorbia soongarica , Hypericum perforatum , Lamium album , Cannabis ruderalis , Malva neglecta , Origanum vulgare , Trifolium pratense)* on leached chernozems in combination with thinned forests *(Malus sieversii , Crataegus sp.)* on hollow.

6. Western, south-western steep slopes of ouvals with predominance of brushwood (*Rosa platyacantha , Phlomis pratensis , Bromus tectorum , Sólidago virgaurea , Origanum vulgare , Hypericum perforatum , Elytrigia repens , Vicia cracca , Lathyrus tuberosus*) on deeply leached chernozems .

IV. Ecosystems of northern macroslope of Talgar mountains formed by loess loam on hard rocks

7. Steep slopes with predominance of aspen forests *(Populus tremula , Malus sieversii , Crataegus , Rhamnus , Humulus lupulus)* in combination with steppe meadows *(Ligularia macrophylla , Dactylis glomerata , Aegopodium podagraria , Angelica decurrens , Bromus*

inermis , Urtica dioica , Delphinium barbatum , Arctium tomentosum) on mountain chernozem-like soils .

8. Balkas (depressions) on mountain steep slopes with brushwood *(Ribes janczewskii , Rosa canina , R. albertii , R. laxa , Rubus idaeus , R. caesius)* on deeply leached chernozems .

9. Northern and north - eastern slopes of hills with predominance of steppe meadows *(Saussurea elegans , Erysimum hieracifolium , Dactylis glomerata , Poa pratensis , Elytrigia repens , Crepis sibirica , Origanum vulgare , Cichorium intybus , Berteroa spathulata)* .

c. INTRAZONAL VEGETATION OF MOUNTAIN STREAM VALLEYS

V. Ecosystems of mountain stream valleys

10. Rivers and stream valleys with meadow and hydrophytic plant communities *(Trifolium pratense , Scirpus lacustris , Arctium tomentosum , Mentha arvensis , Polygonum aviculare , Geranium collinum , Elytrigia repens , Viola biflora , Urtica dioica , Potentilla recta , Plantago lancifolia , Nepeta cataria)* and tree groves with brushwood *(Acer semenovii , Crataegus , Malus sieversii , Berberis heteropoda , Rosa canina , Syringa vulgaris)* on meadow and meadow-chernozem soils .

B. ANTHROPOGENIC ECOSYSTEMS

11. Gently sloping intermontane plains with irrigated fields and vegetable - garden on irrigated ordinary chernozems on the place of rich forb-bunchgrass steppes .

12. Weakly sloping intermontane plains with fruit tree gardens .

13. Weakly sloping intermontane plains with abandoned fields .

14. Terraced slopes of ouvals with apple tree gardens .

15. Terraced slopes of Talgar mountain with afforestation of *Pinus sibirica* and *Betula tianschanica.*

Map symbols

16. Settlements and towns .
17. Asphalt roads .
18. Asphalt roads with forest shelter belts.
19. Ground roads.
20. Boundaries of key plots with archeological excavations sites .
21. Hydrographic network.

3.6. LEGEND OF SCHEMATIC MAP OF ECOSYSTEMS AND THEIR ELEMENTS OF " TALGAR–3 " PLOT

A. NATURAL AND ANTHROPOGENIC–NATURAL ECOSYSTEMS

I. Ecosystems of rich forb–bunchgrass steppes belt on ordinary chernozems

1. High fluvial terraces above floodplain of river valley with anthropogenic vegetation on place of agricultural settlement and modern archaeological excavations *(Onopordum acanthium, Centaurea belangeriana, Cannabis ruderalis, Achillea filipendulina, Alyssum campestre, Artemisia scoparia, Cynodon dactylon)*

2. Network of well worn roads with predominance *Polygonum aviculare* communities in combination with weed plants aggregations *(Taraxacum officinale, Centaurea belangeriana, Cannabis ruderalis).*

3. Knoll with archaeological objects and highly transformed vegetation *(Cannabis ruderalis, Cynodon dactylon, Malva neglecta, Marrubium alternidens, Taraxacum officinale, Polygonum aviculare).*

II. Ecosystems of intermontane plains

4. Weakly sloping flat plains with predominance of thinned wild fruit tree forests *(Malus sieversii, Crataegus sp., Rosa platyacantha)* with forbs and weeds *(Elytrigia repens, Urtica dioica, Polygonum aviculare, Centaurea belangeriana, Cannabis ruderalis, Veronica verna, Taraxacum officinale).*

III. Ecosystems of piedmontal and low mountain ouvals formed by loess loam

5. North-eastern and eastern slopes of ouvals with predominance of wild fruit tree forests *(Malus sieversii, Crataegus sp., Rosa platyacantha, R. canina, Lonicera tatarica, Rhamnus cathartica, Humulus lupulus)* in combination with tall forbs meadows *(Dactylis glomerata, Melica transsilvanica, Eremurus fuscus, Hedysarum soongoricum, Inula aspera, Urtica dioica, Poa pratensis, Nepeta cataria, Phlomis pratensis, Glycyrrhiza glabra, Origanum vulgare, Arctium tomentosum, Lathyrus tuberosus, Vicia cracca).*

6. North-western and western steep slopes of ouvals with predominance of anthropogenic modification of meadow steppes *(Glycyrrhiza glabra, Bromus inermis, Phlomis pratensis, Euphorbia soongarica, Hypericum perforatum, Lamium album, Cannabis rudeRalis, Malva neglecta, Origanum vulgare, Trifolium pratense)* on leached chernozems in combination with thinned forests *(Malus sieversii, Crataegus sp.)* on hollows.

7. South-western and western steep slopes of ouvals with predominance of brushwood *(Rosa platyacantha, Phlomis pratensis, Bromus tectorum, Solidago virgaurea, Origanum vulgare, Hypericum perforatum, Elytrigia repens, Vicia cracca, Lathyrus tuberosus)* on deep leached chernozems.

IV. Ecosystems of mountain stream valleys

8. River and stream valleys with meadow and hydrophytic plant communities *(Trifolium pratense, Scirpus lacustris , Arctium tomentosum, Mentha arvensis, Polygonum aviculare, Geranium collinum, Elytrigia repens, Viola biflora, Urtica dioica, Potentilla recta, Plantago lancifolia, Nepeta cataria)* and tree-brushwood *(Acer semenovii, Crataegus sp., Malus sieversii, Berberis heteropoda, Rosa canina, Syringa vulgaris)* on mountain meadow and meadow-bog soils.

B. ANTHROPOGENIC ECOSYSTEMS

9. Weakly sloping intermontane plains with irrigated fields and vegetable gardens on irrigated ordinary chernozems on places of rich forb-bunchgrass steppes.

10. Weakly sloping intermontane plains and slopes of ouvals with orchards.

11. Weakly sloping plains with abandoned fields.

12. Terraced slopes of ouvals with apple tree gardens.

Map symbols:

13. Asphalt roads.

14. Ground roads.

15. Hydrographic network.

16. Old irrigation canal.

17. Outcrops of loess rocks.

18. Ruins on the place of former building sites.

19 Soil profile cut sites.

4. "OLD TALGAR" PLOT

4.1. GEOGRAPHICAL AND GEOMORPHOLOGICAL CHARACTERIZATION OF "OLD TALGAR" PLOT.

This territory is situated within the official boundaries of modern Talgar city and directly adjoins to it in the south. The territory is limited by the following coordinates: 77°12'43" - 77°14'42" E longitude, 43°20'6"- 43°22'22" N latitude. Inclined plains and terraces of right bank of Talgar river basically identical to described above "Soldatskaya schel' ". Closeness of full-flowing Talgar river, relatively (temporarily) protected high right bank could attract first settlers. Furthermore denuded gorge in the south along valleys of right and left Talgar rivers provided opportunities for first settlers to penetrate into medium and high mountain areas.

We are sure that earliest settlements of a man in this region was also caused by optimum conditions for a living.

But we can not completely identify bioclimatic conditions of this plot with "Talgar-3" plot. Firstly this territory is situated at the beginning of deep alluvial fan of Talgar river and along with Toosoosai plot is affected by mud streams. Secondly this territory is concentrated on left watershed terrace and within a short distance turn into low mountains with steep slopes and then into medium and high mountain belt of Transilian Alatau.

In addition since this area is the sufficiently formed upper part of alluvial fan of fairly strong Talgar river it is subjected to two main factors of relief formation: accumulative and denudational activity caused by periodical mud streams.

It should be noted that geomorphological landforms of Talgar river valley and it's modern bed are subjected to sufficiently dynamic processes. Most likely the terraces adjacent to river bed including pebble shallows, first, second and third (watershed) terraces which are marked at present time are not stable.

Degree of their pronouncement and extent (often fragmentary) and particularly their constitutive material could drastically change in accordance with power and recurrence of mud streams. These mud streams are both denudational and accumulative factors. In addition we should note that these denudational and accumulative processes are mostly distinct at outlet of Talgar river from gorge where the study plot is situated. Recall again the increased importance of neotectonics reflected by deep ingrowth of modern Talgar river bed and it's abrupt bank of western exposure.

Let's turn back to archaeological matter. Here, it is worth noting that right higher watershed bank for a long was less subjected to mud streams. Judging by marks on modern topographical maps, this watershed terrace for a long was not subjected to destructive processes of mud streams. The only exception is the left undermined and sharply abrupt bank of Talgar river.

On the whole, upper part of alluvial fan of Talgar river valley was subjected to one-way (western) orientated erosional-denudational processes keeping high left bank relatively untouched.

The whole Talgar river valley (whole southern narrow part) is limited in the west and east by pronounced ouvals and turns in south into sufficiently narrow closed gorge, and it would be natural to assume that the valley as a whole formed mostly by boulder-pebble, sandy-pebble and loam-sandy-pebble deposits mostly of mud stream origin. Sides of this valley in contrast to the valley properly covered by loess loam of different thickness and as in case of "Talgar-3" plot are underlaid by dense rocks of granitoid composition or loose rocks of the same composition.

Area of the valley (or more properly area of high terraces adjacent to Talgar river) is underlaid by proluvial boulder-pebble deposits; bed of the valley, undoubtedly, is also represented by dense granitoid formations.

Let's now turn our attention specifically to the site of archaeological excavations which is situated on the left high (watershed) bank of Talgar river. It could be assumed that:

1. Judging by remains in ancient profile of the left bank (remains of wattle and daub walls, quarters and squares) it may be stated that this left bank was weakly transformed to the present day (the age of this period should be determined by archaeologists).

2. Relation between site of ancient settlement and Talgar river also confirms the relatively constant undermining of right Talgar river bank. It should be noted that closeness of western wall to the abrupt Talgar river bank could be explained by widening of river bed in eastern direction.

3. There is no escape from the notice that all mentioned above peculiarities of traces of ancient anthropogenesis are considerably (one may say greatly) hidden by modern economic disturbance.

These modern anthropogenic disturbance are represented by series of roads, dumps, various cavities, abandoned concrete grounds, temporal aryks (small irrigation ditches) etc.

These factors in our opinion considerably hide and distort the ancient situation at the archaeological excavation sites and surroundings.

4. We are sure and think that serious restoration of ancient settlements require, first of all, the limitation of modern aggressive human impact at area of archaeological excavations.

4.2. REGULARITIES OF SOIL COVER FORMATION AT THE "OLD TALGAR" PLOT

The soil cover formation regularities and the main list of soil types of the "Talgar-3" plot are similar to ones of the "Old Talgar" plot. That's why the main differences and peculiarities should be considered.

First of all, mountain slopes and piedmonts near Talgar mountain are not protected by low-mountain massif in the north as they are at the "Talgar-3" plot. That's why the fruit tree forest belt is fragmentary here. The fruit tree growing occur only on the internal protected slopes of the hollows and river valleys. Only in the upper part of the plot they form an uninterrupted belt. Therefore the mountain leached chernozems with grasses-forb and shrubby vegetation predominates here, and the forest chernozem-like soils are only within the hights of 1500-1600 m abs.

Due to the closeness of the Talgar settlement the territory is greatly affected by the anthropogenic influence: such factors as ploughing and different technogeneous factors within the piedmont plain and horticulture on the mountain slopes. The pasture is very intensive here and the processes of a soil erosion are widely spread. The loess loams which are the predominant soil-forming rocks of the region are easily disturbed by this process. Besides slopes are terraced for the horticulture, and the natural ecosystems are disturbed.

The other peculiarity of the territory is the presence of the south-exposured slope falling down to the Talgar river. Here the mountain-steppe thermoxeromorphic and meadow-steppe mountain soils have been forming. The soil-forming rocks here are the eluvial-deluvial loams and the vegetation is mountainous xeropetrophytic steppe (tipchak, feather, absenthium, etc.). The soils are shingle and have a humus horizon of decreased thickness (A+B=90-60 cm). The humus - accumulative horizon (A=10-15 cm) has a gray-cinnamonic colour and a powder like-cloddy structure.

The underlying lighter horizon (B=20-25 cm) has a cloddy-granular structure. It is gradually (by the BC-horizon) or shortly transiting to the bed-rocks or its loose shingle.

The soils formed on the loess loams keep the features of the soils formed under the conditions of the high xerothermic regime. They are not enough humused and have a granular-cloddy horizon (A+B=50-70 cm) of a middle thickness. The soils are often calcareous from the surface, and almost in all the cases are suffering from the quickened pasture erosion.

4.3. SOIL CHARACTERIZATION OF THE OLD TALGAR PLOT

The Old Talgar plot is situated on the high fluvial terrace above flood plain of Talgar river, structured by the alluvial-proluvial sandy-gravel deposits, which are covered by loess loams of not great thickness. The small river flows through the terrace and brings here additional moistening. Therefore the meadow chernozem soil predominate here. They have been characterized in section 3. The terrace is highly disturbed by human activity. Numerous sodded banks form the checks. They are nearly 3-4 meters in height and covered mainly by absinth and weed herbs. The soil section N3a is layed out on such bank on the place of the archaeological excavations. The soil section description are given below.

The soil section N3 is laid out on the fluvial terrace above flood plain of the Talgar river. At the same time this place is an alluvial terrace of nameless river.

The vegetation is plantain - milfoil with

1. *Plantago major*
2. *Achillea millefolium*
3. *Poa bulbosa*
4. *Cichorium intybus*
5. *Descurania sophia*
6. *Onopordum acanthium*
7. *Marrubium alternidens.*

The vegetation density - 90-100%, the height - 9-5 cm to 40-50 cm. The depth is 190 cm, A+B=60 cm, effervescence due to HCl from 54 cm.

0-5 A_1 - Darkish-grey, dry, indurated, with strong-interlaced roots, powder-like-small-granular, middle-loamy.

5-15 A_2 - Darkish-grey, slightly brownish, dry, indurated, rooted, middle and small-granular, middle-loamy.

15-27 AB - Brown-gray, dry, indurated, rooted, large- and middle-granular, heavy-loamy.

27-43 B_1 - Brown, cool, indurated, with rare roots, cloddy, heavy-loamy.

43-60 B_2 - Grayish-brown, cool, indurated, grainy-cloddy, heavy-loamy.

60-93 BC - Yellow-dark-brown, cool, indurated, vaguely-sharp-edged cloddy, heavy-loamy.

93-140 C_1 - Yellowish-brown, weakly moistened, with carbonate veins, sharp-edged-cloddy, heavy-loamy. On the same depth under the large boulder are the features of the additional strong moistening -the horizon is muddy-gray with the rusty and bluish spots, middle-loamy.

140-180C_2- Yellowish-dark-brown, dense, fine-porous, with the carbonate depositions, especially at the pores, sharp-edged-cloddy, middle-loamy.

180-190CD- Yellowish-brown with the bluish hue, sandy-gravel deposit with boulders and loam, light-loamy.

The soil: meadow-chernozem, normal, middle-humused, middle-thickened, heavy-loamy on the loess loam, underlying by the sandy-gravel-pebble deposits.

The soil section N 3a. The outcrop at the archaeological excavations within the fluvial terrace above floodplain of the Talgar river.

The vegetation is absinth with

1. *Artemisia transiliensis*
2. *Poa bulbosa*
3. *Bromus gracillimus*
4. *Onopordum acanthium*
5. *Achillea millefolium*
6. *A.filipendulina*
7. *Marrubium alternidens.*

The depth is 330 cm, A+B-15 cm, the effervescence due to HCl - from the surface.

0-4 A_1 - Gray-dark-brown, dry, indurated, very rooty, silty-unstable-cloddy with granulars, middle-loamy.

4-15 B_1 - Rather grayer than the former, dry, indurated, cloddy, horizontally -laminated, with the granulars, very rooty, middle-loamy.

15-40 BC - Grayish-light-brown, dry, indurated, with the roots, sharp-edged-cloddy, heavy-loamy.

40-58 C_1 - Yellow-brown, cool, indurated, with the single roots, sharp-edged-cloddy, middle-loamy.

58-78 C_2 - Unhomogenously-coloured. The basic background in yellow-brown with carbonate depositions and new formations in the form of small pieces of coal, rusty spots, middle-loamy, anthropogenic.

78-94 C_3 - Yellow-gray, with the small carbonate spots and specks, ancient bones and crocks, silty-large-cloddy, light-loamy, anthropogenic.

94-122 C_4 - Yellow-gray, cool, dense, large-cloddy, heavy-loamy, anthropogenic.

122-175 C_5 - Yellowish-gray, loose with new formations in the form of small pieces of coal, bones and crocks, light loamy, anthropogenic.

175-185(205)C_6 - Unhomogeneously-coloured. The basic background is the muddy-brown with white carbonate veins, with bones, middle-loamy, the boundary is irregular, anthropogenic.

185(205)-265AB - Almost chocolate, with darker probably humus spots, cool, indurated, heavy-loamy.

265-310 C_7 - Yellow-brown, weakly moistened, silty-sharp-edged-cloddy, the middle almost unchanged by the soil formation loess loam.

310-330 CD - Yellow-brown, damp, whitish after the drying, sandy-gravel-pebble deposit.

The soil: is at the first stage of the soil formation after the long period of anthropogenic influence.

The analytical data characterizing the soil sections N3 and N 3a are shown in the tables N5 and N6. The soil section N3 is laid up on the abrupt bank of the small river flowing through the terrace of the Talgar river. The soil profile is typical for the soil with additional ground watering. In its upper part the profile is similar to one of the zonal soils - the chernozems in our case. The lower part has the particular features of additional moistening - the rusty and dove-coloured spots and the bluish hue of the profile. The analytical data points to the continuous and natural process of a soil formation.

The soil under the excavation site (soil section N 3a) had the complex way of the development. The soil profile is notable for the humus-coloured horizon with an increased humus content at the depth of 230-240 cm. Probably it is the fossil humus horizon formed during the first stage of soil formation before the territory was developed by the man.

After that the intensive anthropogenic influence was occurred over the territory. The all upper horizons have the certain anthropogenic origin. It was seemed to be a spreading the grounds and soils of different genesis upon bank. It is also indicated by the unparallel bedding of horizons according to the surface line. The analytical data confirms the anthropogenic origin of the horizons (the absence of the regularities through the profile). The particular feature of this soil section is the chloride and sulphate salinity of average degree beginning from the depth of 60 cm. It may be described in a following way. Since the main surface of the terrace receives the additional ground moistening, the natural levees of higher level are fed by weak ascending wick-like moisture currents. Though the ground waters are slightly saline, during sufficiently long period soluble salts comes up with the ascending water and are accumulated in the profile.

The water-physical features of the soils have been changed, and the exchanging reactions between soil suspension and an exchangeable cations takes place now and took place before. The

process leads to the formation of the secondary salts with a considerable content of the sodium sulphates among them.

Now the soil formation process has started again but the soil has not formed yet. It cannot be named as chernozem because of unexpressed main features of chernozem and a low humus content.

TABLE 6

Content of soluble substances (% / meq) in the soils of Old Talgar plot.

N of profile in soil horizon	Depth of sample (sm)	Total salt (%)	Alkalinity (by HCO_3)	CL^-	SO_4^{-2}	Ca^{+2}	Mg^{+2}	Na^+	K^+
3	0-5	0.049	0.017	нет	0,016	0,006	0,001	0,001	0,008
			0,28		0,34	0,30	0,08	0,04	0,20
	16-26	0,044	0,012	нет	0,018	0,006	0,001	0.001	0,006
			0,20		0,37	0,30	0,08	0,04	0,15
	45-55	0,059	0,024	нет	0,018	0,010	0,001	0,002	0,004
			0,39		0,38	0,50	0,08	0,09	0,10
	110-120	0,053	0,029	нет	0,010	0,009	0,001	0,002	0,002
			0,48		0,19	0,45	0,08	0,09	0,05
	180-190	0,043	0,020	нет	0,011	0,007	0,001	0,001	0,003
			0,33		0,22	0,35	0,08	0,04	0,08

0-4	0.102	0,029	нет	0,036	0,009	0,001	0,001	0,026
		0,48		0,76	0,45	0,08	0,04	0,67
20-30	0,075	0,034	нет	0,019	0,012	0,001	0,002	0,007
		0,56		0,39	0,60	0,08	0,09	0,18
60-70	0,612	0,017	0,090	0,287	0,034	0,013	0,091	0,080
		0,28	2,54	5,97	1,70	1,07	3,96	2,06
100-110	0,651	0,022	0,090	0,304	0,023	0,020	0,085	0,107
		0,36	2,54	6,33	1,15	1,64	3,70	2,74
180-190	0,692	0,012	0,062	0,364	0,030	0,017	0,074	0,133
		0,20	1,74	7,58	1.50	1,40	3,22	3.40
270-280	0,462	0,017	0,042	0,227	0,016	0,007	0,050	0,103
		0,28	0,18	4.72	0,80	0,58	2,17	2,63
310-320	0,303	0,017	0,021	0,148	0,008	0,003	0,033	0,073
		0,28	0,59	3,08	0,40	0,25	1,43	1,87

4.4. VEGETATION OF "OLD TALGAR" PLOT

Vegetation of "Old Talgar" key plot is represented by 2 subbelts. The belt of forb-bunchgrass steppes on ordinary chernozems is connected with piedmontal and intermontane dissected plains.

Wild fruit tree forests on mountain forest chernozem-like soils and meadow steppes on leached chernozems are characteristic combination for dissected plains, low mountains, intermontane valleys.

Vegetation of piedmont valley on place of ancient town is represented by dense cover of *Cynodon dactylon*, numerous weed aggregations and communities dominated by *Goebelia alopecuroides, Onopordum acanthium,* ruderal plants *(Marrubium alternidens, Achillea millefolium, A. filipendulina, Cichorium intybus, Xanthium strumarium, Allysum desertorum, Taraxacum officinale, Poa annua, Elytrigia repens, Artemisia transiliensis).* Phytocoenoses of Artemisia occupy microuplands (ancient walls, mounds, elevations). The accompanying species are *Poa bulbosa, Bromus gracillimus, Kochia prostrata* and mentioned above ruderal plants. Not deep depression are covered by *Euphorbia soongarica, Trifolium repens, Malva neglecta, Acroptilon repens, Goebelia alopecuroides.* Fragments of brushwood *(Rosa platyacantha)* remained in the valley. Probably they were represented on great areas in the past.

The vegetation of stream banks includes hydrophytic and mesophytic plants *(Trifolium pratense, Prunella vulgaris, Poa pratensis, Trifolium repens, Mentha arvense, Puccinellia distans).* There is single old tree of *Salix alba* and several tree-stamp of this species along the stream. At present the territory is full of different wastes.

The western and eastern slopes of ouvals are covered by vegetation including mainly xerophytic species. Dominant species is *Festuca valesiaca.* The *Bromus gracillimus, Potentilla bifurca, Taraxacum officinale, Galium verum, Elytrigia repens, Helictotrichon pubescens* are accompanying species.

Brushwood *(Rosa platyacantha)* represents one of dominant types of vegetation widely distributed on northern slopes. It is very dense brushwood. Sometimes individual trees and brushes *(Malus sieversii,*

Spiraea hypericifolia, Atraphaxis muschketovii, Lonicera altmannii) are found among the brushwood. The composition of herbaceous layer is very various *(Glycyrrhiza glabra, Origanum vulgare, Artemisia absinthium, Potentilla reptans, Melica altissima, Galium verum, G. octonarium, Polygonum aviculare, Taraxacum officinale etc.)*

Fragmentary rosaries form combinations with communities dominated by species of genus *Artemisia*. There are numerous paths trampled by livestock among these brushwood which mainly occupies eastern and western slopes. During survey of territory it was revealed that great part of rosaries burnt out in 1994.

At the tops of ouvals natural vegetatio is absent and represented by ruderal communities *(Descurainia sophia, Cannabis ruderalis, Urtica dioica, Marrubium alternidens, Calystegia sepium)* in combination with fragmentary rosaries.

Gentle slopes of ouvals mainly of southern exposure are subjected to overgrazing and their vegetation cover consists of communities dominated by *Artemisia dracunculus* and forbs *(Origanum vulgare, Hypericum perforatum, Artemisia scoparia, A. absinthium, Allium caesium, Galium octonarium, Achillea millefolium, Eremostachys speciosa, Delphinium biternatum, Calystegia sepium, Verbascum macrocarpa).*

Wild fruit tree forest and open forest. *Malus sieversii* and *Crataegus* form wild fruit tree forests. Often *Acer semenovii* is associated with these species. Sometimes trees are covered by lianas *(Humulus lupulus)*, and soil are covered by *Rubus caesius.*

The herbaceous layer consist of tall forbs *(Glycyrrhiza glabra, Euphorbia soongarica, Urtica dioica, Lamium album, Dactilis glomerata, Artemisia dracunculus, A. absinthium, Verbascum macrocarpa).*

Wild fruit tree forests are often accompanied by brushwood *(Rosa platyacantha, R. canina, Lonicera altmanii, Spiraea hypericifolia, Atraphaxis muschketovii, Berberis sphaerocarpa).* Wild fruit tree forest in balkas differs from the others by herbaceous layer. In balkas herbage is more moisture-loving and represented by following species: *Salvia virgata, Plantago lanceolata, Medicago falcata, Inula macrophylla, Vicia cracca, Melilotus officinalis, Trifolium pratense.*

Mixed aspen-fruit tree forests *(Populus tremula, Malus sieversii, Crataegus turkestanica, Acer semenovii)* prevail on steep slopes of ouvals. They have well developed herbaceous cover *(Dactilis glomerata, Poa pratensis, Helyctotrichon pubescens, Phleum phleoides, Phlomis tuberosa, Geranium collinum)* and form combinations with brushwood and meadows.

On more gently sloping elements of relief steppe meadows occupy great areas. These meadows consist of tall forbs *(Dactylis glomerata, Bromus inermis, B. gracillimus, Glycyrrhiza glabra, Origanum vulgare, Sesseli sessiliflorum, Melica transilvanica, Dracocephalum intergrifolium)* in combination with thinned brushwood *(Rosa platyacantha).*

Vegetation cover of high fluvial terraces above floodplain is represented by transformed secondary vegetation of weed phytocoenoses. There are thinned communities dominated by *Goebelia alopecuroides* with *Cannabis ruderalis, Malva neglecta, Elytrigia repens, Lamium album, Trifolium pratense* in combination with brushwood and individual fruit trees.

Low fluvial terraces above floodplains are occupied by gardens and vegetable gardens.

Thus the most part of "Old Talgar" key plot is represented by natural and anthropogenic-natural ecosystems. Territory has no terraced gardens and is subjected to overgrazing that transforms the vegetation.

4.5. LEGEND OF ECOSYSTEM MAP OF "OLD TALGAR" PLOT

A. NATURAL AND ANTHROPOGENIC–NATURAL ECOSYSTEMS

a. ECOSYSTEMS OF FORB-BUNCH GRASS STEPPES ON ORDINARY CHERNOZEMS

I. Ecosystems of piedmontal and intermontane plains

1. Weakly sloping plains with predominance of anthropogenically transformed forb-bunchgrass steppes *(Elytrigia repens , Dactylis glomerata , Achillea millefolium , Potentilla daelbata , Melandrium album , Melica altissima)* on ordinary chernozems in combination with brushwood *(Rosa platyacantha)* .

2. Plains with highly anthropogenically transformed ecosystems on place of ancient town ruins with predominance of plant communities dominated by *Cynodon dactylon* and numerous aggregations with ruderal plants *(Onopordum acanthium , Goebelia alopecuroides , Marrubium alternidens , Achillea millefolium , A. filipendulina , Xanthium strumarium , Cichorium intybus , Poa annua)* and brushwood *(Rosa platyacantha)* .

3. Intermontane weakly sloping plains with aggregations of ruderal plants *(Goebelia alopecuroides , Descurainia sophia , Artemisia scoparia , Cannabis ruderalis , Malva neglecta , Bromus gracillimus , Elytrigia repens , Cichorium intybus , Poa pratensis)* on ordinary chernozems .

II. Ecosystems of moderately dissected piedmonts formed by loess loam

4. Northern slopes of ouvals with predominance forb - grasses steppe (*Dactylis glomerata , Poa pratensis , Bromus inermis , B.*

gracillimus , Glycyrrhiza glabra ,Origanum vulgare , Artemisia transiliensis , Potentilla reptans , P. transcaspica , Galium verum , Achillea millefolium , Thymus marschallianus) on mountain ordinary chernozems in combination with brushwood *(Rosa platyacantha , Spiraea hypericifolia ,Atraphaxis muschketovii)* and open fruit tree forests on mountain meadow - chernozem soils along hollows.

5. Northern slope of ouvals with predominance of brushwood *(Rosa platyacantha , Atraphaxis muschketovii , Spiraea hypericifolia ,Lonicera altmanii)* and *Malus sieversii* in combination with south-western slopes with predominance of plant communities dominated by *Artemisia transiliensis* and locally by brushwood *(Rosa platyacantha)*

6. Western and eastern steep slopes of ouvals with predominance of steppe communities *(Festuca valesiaca , Bromus inermis , B. gracillimus , Potentilla bifurca , Taraxacum officinalis , Poa pratensis , Galium verum , Elytrigia repens , Helictotrichon pubescens)* on ordinary eroded chernozems .

b. ECOSYSTEMS OF WILD FRUIT TREE FORESTS ON MOUNTAIN FOREST CHERNOZEMLIKE SOILS

III. Ecosystems of intermontane plains

7. Northern slopes of ouvals with predominance of tall grass meadow steppes *(Phlomis salicifolia , Euphorbia soongarica , Dracocephalum integrifolium , Ferula kelleri , Thalictrum collinum , Glycyrrhiza glabra , Urtica dioica , Echinops chantavicus , Artemisia dracunculus)* .

8. Western interior slopes of ouvals with predominance of forb - bunchgrass meadow steppes *(Euphorbia soongarica , Origanum vulgare , Hypericum perforatum , Calystegia sepium , Dactylis glomerata , Elytrigia repens , Bromus gracillimus , Goebelia alopecuroides , Potentilla transcaspica)* on mountain leached chernozems in combination with brushwood (Rosa platyacantha , R. canina) .

9. Flat tops and southern and western weak slopes of ouvals with predominance of ruderal plant aggregations *(Descurainia sophia ,*

Cannabis ruderalis , Lepidium sibiricum , Onopordum acanthium , Malva neglecta , Goebelia alopecuroides , Calystegia sepium) and ruderal plant communities *(Artemisia dracunculus , A. scoparia , A. absinthium , Allium caesium , Origanum vulgare , Achillea millefolium , Eremostachys speciosa , Hypericum perforatum , Verbascum macrocarpa)* on mountain leached eroded chernozems.

10. Slopes of ouvals with predominance of brushwood *(Rosa platyacantha , Spiraea hypericifolia , Atraphaxis muschketovii , Lonicera altmanii)* in combination with weed plant communities (*Cannabis ruderalis, Urtica dioica, Marrubium alternidens, Malva neglecta, Goebelia alopecuroides*) on mountain chernozems.

11. Hollows on slopes with predominance of wild fruit tree forests *(Malus sieversii , Crataegus turcestanica)* on mountain-forests chernozem-like soils in combination with brushwood *(Rosa platyacantha , Spiraea hypericifolia)* on mountain highly leached chernozems in combination with meadow steppes *(Geranium collinum , Euphorbia soongarica , Artemisia dracunculus , Phlomis salicifolia)* .

IV. Low mountains with steep slopes on loess loam and alluvial — deluvial loams with pebble

12. Northern steep slopes of ouvals with predominance of meadow steppes *(Euphorbia soongarica , Phlomis salicifolia , Artemisia dracunculus , Glycyrrhiza glabra , Sissymbrium loeselii , Melica altissima , Polygonum coriarum , Berteroa spathulata)* .

13. Southern steep slopes of ouvals with predominance of brushwood *(Rosa platyacantha)* on strong leached chernozems in combination with thin meadow steppes *(Bromus gracillimus , Dracocephalum integrifolium , Hypericum perforatum , Achillea millefolium , Lappula microcarpa , Alyssum desertorum , Dipsacus azureus)* on mountain meadow-steppe soils formed by loam with pebble and stone .

14. Steep slope of mountain with predominance of meadow steppes *(Bromus inermis , Dactylis glomerata , Festuca valesiaca , Stipa*

capillata ; Ajania fastigiata , Echinops chantavicus , Thymus marschalianus) on steppe mountain thermoxeromorphic soils in combination with open wild fruit tree forests *(Armeniaca vulgaris , Crataegus turkestanica)* on loams with pebble and stones .

15. Hollows on eastern slopes with predominance of steppe meadows *(Euphorbia soongarica , Geranium pratense , Berteroa spathulata , Goebelia alopecuroides , Elytrigia repens , Phlomis salicifolia)* on mountain meadow leached chernozem soils .

16. Steep slopes of ouvals with predominance of mixed forests *(Populus tremula , Malus sieversii , Crataegus turkestanica , Acer semenovii)* in combination with meadows *(Dactylis glomerata , Poa pratensis , Helictotrichon pubescens , Phleum phleoides , Phlomis tuberosa , Geranium collinum , Lamium album)* on mountain meadow - chernozem soils .

17. Hollows on slope of ouvals with predominance of wild forest brushwood and stepped meadow *(Salvia virgata , Plantago lanceolata , Medicago falcata , Inula macrophylla , Vicia cracca , Achillea millefolium , Melilotus officinalis)* on mountain forest leached chernozem like soils .

V. Ecosystems of intermontane valleys

18. High and low terraces with anthropogenic transformation of meadow steppes *(Cannabis ruderalis , Malva neglecta , Elytrigia repens , Lamium album , Trifolium pratense)* on leached chernozems in combination with brushwood *(Rosa platyacantha , Spiraea hypericifolia)* and single trees *Malus sieversii , Crataegus turkestanica* .

B. ANTHROPOGENIC ECOSYSTEMS

19. Cultivated fields .
20. Vegetable gardens .
21. Orchards .
22. Settlements .
23. Asphalt roads .

24. Ground roads .
25. Forest shelter belts along roads and canals.
26. Talgar river .
27. Hydrographic network .
28. Pebble - boulder deposits .
29. Archaeological excavations site.

4.6. LEGEND OF SCHEMATIC MAP OF ECOSYSTEMS AND THEIR ELEMENTS OF "OLD TALGAR" PLOT

A. NATURAL AND NATURAL–ANTHROPOGENIC ECOSYSTEMS

a. ECOSYSTEMS OF FORB-BUNCHGRASS STEPPES ON ORDINARY CHERNOZENS

1. Weakly sloping piedmont plains with anthropogenically transformed forb-bunchgrasses steppes *(Goebelia alopecuroides, Festuca valesiaca, Botriochloa ischaemum, Poa stepposa, Polygonum aviculare, Glycyrrhiza glabra, Melandrium album, Potentilla dolbata)* in combination with brushwood *(Rosa platyacantha).*

2. Weakly sloping plains with predominance of ruderal plants aggregations *(Cynodon dactylon, Onopordum acanthium, Goebelia alopecuroides, Marrubium alternidens, Xanthium strumarium, Cichorium intybus, Polygonum aviculare).*

3. Weakly sloping plains with highly anthropogenically transformed soil-vegetation cover. There are sparse ruderal plants aggregations *(Xanthium strumarium, Onopordum acanthium, Salvia virgata, Berteroa spathulata, Achillea filipendulina, Centaurea belangeriana, Cannabis ruderalis, Taraxacum officinale, Cichorium intybus).*

4. Plains with highly anthropogenically transformed ecosystems on places of ancient town ruins with predominance of plant communities dominated by *Cynodon dactylon* and numerous aggregations of ruderal plants *(Onopordum acanthium, Goebelia alopecuroides, Marrubium alternidens, Achillea millefolium, Xanthium strumarium, Cichorium intybus)* and brushwood *(Rosa platyacantha).*

5. Northern slopes of ouvals with predominance of brushwood *(Rosa platyacantha, Atraphaxis muschketovii, Spiraea hypericifolia, Lonicera altmanii).*

6. Foots of ouvals with predominance of brushwood *(Rosa platyacantha)* and *Malus sieversii* in combination with ruderal communities dominated by *Goebelia alopecuroides.*

b. ECOSYSTEMS OF WILD FRUIT TREE FORESTS AND MEADOWS STEPPES ON LEACHED CHERNOZEMS

7. Northern slopes of ouvals with predominance of anthropogenically transformed tall grasses meadow steppes *(Phlomis salicifolia, Euphorbia soongarica, Dracocephalum integrifolium, Ferula kelleri, Glycyrrhiza glabra, Urtica dioica)* on leached chernozems in combination with brushwood *(Rosa platyacantha).*

8. Western slopes of ouvals with predominance of plant communities dominated by *Artemisia transiliensis* and numerous aggregations of ruderal plants *(Goebelia alopecuroides, Calystegia sepium, Cannabis ruderalis)* in combination with brushwood *(Rosa platyacantha)* on mountain leached eroded chernozems.

9. Slopes of ouvals with predominance of brushwood *(Rosa platyacantha, Spiraea hypericifolia, Lonicera altmanii)* in combination with aggregations of ruderal plants *(Cannabis ruderalis, Urtica dioica, Marrubium alternidens, Malva neglecta, Goebelia alopecuroides).*

10. Balkas on slopes with predominance wild fruit tree forests *(Malus sieversii, Crataegus turkestanica)* on mountain forest chernozem-like soils in combination with brushwood *(Rosa platyacantha)* and meadow steppes *(Geranium collinum, Euphorbia soongarica, Artemisia dracunculus, Phlomis salicifolia).*

c. RIVER VALLEYS

11. Flood-plain terraces with ruderal plants communities *(Cannabis ruderalis, Malva neglecta, Lamium album, Trifolium pratense, Elytrigia repens)* in combination with brushwood *(Rosa platyacantha, Berberis heteropoda, Spiraea hypericifolia)* and vegetable gardens.

12. Flood-plain terrace with forests and brushwood *(Rosa platyacantha, Berberis heteropoda).*

13. River valleys with hydrophilous and mesophytic vegetation *(Trifolium repens, Prunella vulgaris, Poa pratensis, Puccinellia distans, Mentha arvense)* and single trees of *Salix alba.*

B. ANTHROPOGENIC ECOSYSTEMS

14. Vegetable gardens.

Map symbols:

15. Settlements.
16. Asphalt roads.
17. Ground roads.
18. Forest shelter belts along rivers.
19. Talgar river.
20. Hydrographic network.
21. Abrupt bank.
22. Boulder-sand-pebble deposits.
23. Soil profile cuts sites.

5. CONCLUSIONS

A set of ecosystems which have been revealed in this study, and analysis of their distribution at the index plots as well as general regularity of soil and vegetation cover distribution on piedmont plains and adjacent space enabled us to make the following conclusions.

1. Though transformed enough by human impact, the flora of piedmont plains and foothills of Talgar part of Transilian Alatau has got very diverse species composition and has been a long-standing source of valuable and in many respects irreplaceable resources for economics.

Wild fruit-tree forests and groves at the foothills, diversity of steppes on the piedmont plains in combination with nearby piedmont deserts (deserts are situated in 30-35 km from Talgar city and 20 km from Toosoosai settlement) undoubtedly can be considered as one of the favourable primary lands of the development of agricultural and cattle-breeding civilization.

Without question people always used contrasting features of nature in this region. Among foothill territories of Transilian Alatau, Talgar massif has a particular climatic conditions since it is situated in a rain shadow of highest part of mountains range (piedmont humid inverted zonality). Mountain plains of Talgar massif have the increased amount of precipitation on the side of leeward macroslope if compared with plains of the same latitude but out of influence of the mountains. Steppe vegetation here occupies territories that are remote from mountains to 30 km, while near Almaty city steppes terminates in a distance of 20 km. from foot of mountains, and in west and east parts of mountain range the piedmont deserts directly adjoin to mountains.

2. Of special note is the seasonal difference in use of pastures. It was possible to move cattle to desert steppes and deserts in winter, to steppes and middle mountains meadows in spring and summer.

At the present time cattle winter at desert regions and pasture in summer time at high mountain meadows and steppes. This is due to

the fact that highly productive pastures of piedmont plains are completely ploughed up.

Thus this territory was ideal for cattle-breeding development.

3. Survival of men was also supported here by reach resources of food plants(see list of food plant).

4. There is no escape from the notice of possibility to use forest resources for construction and as a fuel along with traditional kizyak (pressed dung used for fuel).

5. Water resources (rivers, brooks)were also rich.

6. Moreover very high soil fertility along with good moistening conditions (precipitations at the zone of chernozem soils, additional water supply at the zone of dry steppes (fluvial terraces above flood plain and dry beds of sais (ravines)) were favorable for local development of agriculture. "Soldatskaya schel'" region was particularly promising for this purpose since this intermontane plane is protected from cold and dry winds and has very high soil fertility lands.

7. At present ecosystems of this territory is highly transformed by human impact. Natural slightly transformed ecosystems are rare, natural-anthropogenic and anthropogenic ecosystems (agroecosystems, technogenic ecosystems) prevail on this territory.

We think that starting from ancient times cattle-breeding mainly developed on this territory, requiring a great quantity of forage and fuel. This fact is reflected on vegetation cover of foothills of Transilian Alatau and adjacent mountain plains: the composition and structure of pasture vegetation changed in such a way that importance of inedible components and fire resistant species as well as weeds increased. Of great importance particularly at this century is the agricultural development of the territory initially unirrigated and then irrigated one. Complex irrigation network is distributed over the entire territory of mountain plains.

Big Almaty Canal lies through territory of the region and therefore it is densely populated. From our point of view preservation of ancient relics and monuments of this land is threatened by intensive human economic activity.

EDULIS PLANTS

ПИЩЕВЫЕ РАСТЕНИЯ

Вид Species	Тузусай Toosoosai	Талгар old Talgar	Талгар-3 Talgar-3
	Деревья - Trees		
1. Armeniaca vulgaris	+	-	+
2. Crataegus songarica	-	+	+
3. Malus sieversii	-	+	+
4. Sorbus tianschanica	-	-	+
	Кустарники - Schrubs		
5. Berberis sphaerocarpa (heteropoda)	-	+	+
6. Cerasus tianschanica	-	+	+
7. Rubus caesius	+	+	+
8. Rubus idaeus	-	+	+
9. Rubus saxcatile	+	+	+

10. Rides janzewskii	–	+	–
11. Rosa canina	–	+	+

Травянистые - Herbs

12& Aegopodium podagraria	–	+	–
13. Alliaria officinalis	–	+	+
14. Allium caesium	+	+	+
15. Allium longiaispis	–	+	+
16. Barbarea arcuata	–	+	+
17. Cychorium intybus	+	+	+
18. Paeonia anomala	–	–	+
19. Pacstinaca sativa	+	+	+
20. Rheum wittrockii	–	+	+
21. Eremurus robustus	–	+	–
22. Heracleum			

dissectum	–	+	+
23. Humulus lupulus	+	+	+
24. Fragaria viridis	–	+	+
25. Rumex acetosa	–	+	+
26. Taraxacum officinale	+	+	+
27. Urtica dioica	+	+	+

Злаковые – Grasses

28. Digitaria sanguinalis	+	–	–
29. Avena sativa	+	+	+
30. Glyceria plicata	–	+	+