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ANNOTATIONS

N.T. NECHAEVA AND DEVELOPMENT OF DESERT SCIENCE

December 14, 2009 marked the 100 birth anniversary of Academician of Academy of Sciences of Turkmenia SSR, USSR State Prize winner, Hero of Socialist Labor Nina Trofimovna Nechaeva (1909-1996) – an outstanding scientist and organizer of the study, transformation and management of natural grazing land in deserts, biology and ecology of desert plants. In December 2009, the Institute for Problems of Ecology and Evolution RAS, where N.T. Nechaeva worked the last years of her life as a professor-consultant, Jubilee Scientific Readings were held dedicated to her memory. At the readings 4 reports were heard, which reflected the memories of the life and work of the scientist, as well as materials on key research areas of arid ecosystems that have developed by N.T. Nechaeva. This issue is dedicated to 100 anniversary of the N.T. Nechaeva and contains articles of her students and followers, in which development of many ideas of Nina Trofimovna have found on complex research, development and management of arid ecosystems.

Fundamental works of N.T. Nechaeva in ecology, enriching the desert pastures were published in various languages, and really became reference books, not only for geobotanists, but for all desert researchers. Most of her work is closely connected with the study and evaluation of all components of the deserts nature and thorough coverage of the functioning of ecological systems in arid lands. Particularly close attention N.T. Nechaeva has given to the study of desertification processes, which development is mainly due to the anthropogenic factor in many of its manifestations. In the developed scheme of desertification indicators, she advanced to the forefront the importance of vegetation cover. Along with theoretical problems N.T. Nechaeva actively involved in developing practical proposals that have been successfully introduced into production. Her years of experience in the improvement of pastures and re-establishment of desert saxaul forests confirmed promising phyto-ameliorative techniques and has received international recognition.

The members of the Organizing Committee of Scientific Readings in Memory of Academician N.T. Nechaeva:

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DOCTRINE OF N.T. NECHAEVA ABOUT DESERTED PASTURES

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Abstract. In this article the doctrine of Prof. Nina T. Nechaeva about deserted pastures as scientifically-technological basis of sustainable development of great vitality pasture management in arid areas of Central Asia and the Russian Federation is stated.

Key words: pasture farming, life forms, dominant species, rhythm of plants development, phytomass, resources conservation, phytomelioration technologies.

THE CONTRIBUTION OF N.T. NECHAEVA IN DEVELOPMENT OF SCIENTIFIC BASIS OF SOILS PHYTOAMELIORATION OF DESERT ECOSYSTEMS IN THE

CASPIAN LOWLAND

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Abstract. The meaning of doctrine created by N.T. Nechaeva about phyto-amelioration of soils of deserted communities presenting more than 50% of the territory in the Caspian lowland was reflected. The criteria of salinization, wind erosion processes and solonchic of soils for evaluation of productivity of vegetative deserted communities and their diversity is found out. The map of soil desertification in the Terek-Kuma lowland is made up, presenting a basement of development activities towards improvement of herbage state of the vegetative cover on the basis of soil conditions and hydrological regime.

Key words: cartography, phytoamelioration, desert communities, soils aeriels, granulometric content, degradation, humus profile.

CONTEMPORARY STATE OF KARAKUL SHEEP RANGELANDS OF KYZYL-KUM DESERT AND THE WAY OF ITS RATIONAL USE

© 2010. S.Yu. Yusupov, A.R. Rabbimov, T.X. Mukimov

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Abstract. The article gives a review of contemporary state of rangeland ecosystem of Kyzyl-Kum desert, degradation level of vegetation cover having progressive character. Main reason of occurrence of degradation processes is human activity, continuous and unsystematic livestock grazing. Degradation of vegetation covers 35.7% of the total territory of the country. Degraded areas around watering wells has been increased up to 0.5 mln. ha., formed huge areas dominated with unpalatable plants (*Peganum harmala*) around settlements and watering wells. There is 1 mln. ha of mobile sands. Presence of the mobile sands threatens the bordering zones of rangelands. For last 5 years, the vegetation productivity has been decreased from 2.4 c/ha up to 1.8 c/ha or to 21% as a result of rangeland degradation.

Principles and technologies of rational utilization of Kyzyl-Kum desert rangelands have been developed one of which is the application of schemes of rational utilization of rangelands offered by N.T. Nechaeva and I.A. Mosolov during 50th years of last century – a strongly recommended one-season utilization of sandy rangelands. Application of rational utilization systems of rangelands is possible only by the transition to utilization of rangelands at the community level, and through the establishment of “Rangeland User Associations” whose functions are followings:

- Assignment of agreements for allocation of necessary rangeland areas
- Conducting the monitoring of contemporary state of rangelands, development the plans of systematic and rational utilization of forage resources
- Control the systematic and rational utilization of rangelands
- Conducting the measures on improvement of rangelands (rehabilitation measures)
- Organizing forage production in the local condition
- Application the progressive feeding technologies and maintenance of livestock animals
- Rational utilization of forage resources, etc.

Rehabilitation measures on degraded rangelands allow restoring the vegetation cover, improving the forage quality and rangeland production. Most perspective rehabilitating plants for the improvement of rangelands of sandy desert are: *Haloxylon persicum*, *Salsola paletziana*, *S. richteri*, species of *Calligonum* from shrubs; *Halothamnus subaphylla*, *Kochia prostrata*, *Ceratoides ewersmanniana*, *Astragalus villosissimus* from semi shrubs; *Astragalus agameticus* and *Alhagi pseudalhagi* from perennial herbaceous plants.

Organizing the irrigated forage production in Kyzyl-Kum desert using the artesian drainage water allows to produce 20-140 c/ha of high quality hay from important fodder plants, and 35-90.7 c/ha hay from halophyte plants on salt affected lands. These measures allow reducing the grazing pressure on sandy rangelands, increase stability the ecosystem of sandy rangelands which all promote the rational utilization of natural resources and sustainable development of desert-rangeland livestock husbandry.

Key words: Kizilkum, sandy desert, rangelands, degradation, rangeland rotation, vegetation cover, rehabilitation, seasonal grazing.

BOTANICAL-GEOGRAPHIC DIVISION OF THE TURAN DESERTS AS THE BASE OF SUSTAINABLE NATURE USE

© 2010. I.N. Safronova

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Abstract. N.T. Nechaeva believed that in order to be successful in restoration of natural potential of plant cover it is necessary to reveal the essential regularities of structure and dynamics in various types of pastures.

The synthesis of knowledge of plant cover is botanical-geographic division of territory at the base of vegetation maps. The first division of the zone of temperate deserts was proposed in 1947 on the map of geobotanical division of the USSR. In 1994 the map of botanical-geographic division of deserts in Kazakhstan and Middle Asia based upon small-scale vegetation map was published.

The great actual material obtained for 60 years, the analysis of numerous maps and literature issues, data of interpretation of small-scale space photos permitted to diverge from some traditional ideas on regularities of desert vegetation, to correct the zonal, subzonal, provincial limits and boundaries of circuits.

The wide recognition of the desert vegetation type, closed to that of V.B. Sochava, was accepted. The idea of the zonal features of plant communities not only on plains but in some other environments was expressed long ago. On the above map it was shown that the edaphic variants are specific for each subzone. It was determined that latitudinal features are inherent also in azonal vegetation of solonchaks, sands and river valleys. The role of ephemers and grasses in desert zone on plains of Caspian region and Turan was appraised another way.

As a result it was succeeded to compile the more detailed map of vegetation division than earlier one. This map presents nearly twice more circuits than map of geobotanical regionalization of the USSR (1947), maps by N.A. Rubtsov (1952), E.P. Korovin (1962) and some more than map by B.A. Bykov (1975).

This map emphasizing the specificity of different desert regions will be undoubtedly useful for the economic use of the territory.

Key words: maps, subdivision, desert type of vegetation, latitudinal subzones, edaphic variants, provinces.

ROLE OF ANIMAL PASTURE AND STEPPE FIRES IN THE NITROGEN AND ASH ELEMENTS CYCLING IN THE PASTURE ECOSYSTEMS

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Abstract. In the steppe ecosystems reduced due to unfavorable hydrothermal conditions activity of decomposers (microorganisms and soil invertebrates-saprophages) and sufficiently high productivity of grass vegetation is a reason of intensive accumulation of plant mort mass, which retains and excludes from biological cycling large amount of elements of plant nutrition, and first of all, available forms of nitrogen. In the steppe zone of Russia, Ukraine the material of steppe mat keeps about 50-160 kg/ha of nitrogen and 400-950 kg/ha of mineral compounds. Accumulation of plant mort mass is inevitably accompanied by steppe fires with all consequences for the biological cycling followed. In these conditions the activity of animal phytophages especially phytovorous mammals, which play roles of decomposers, is of great importance. Due to the activity of pasture mammals the compounds of nitrogen from plants consumed by animals, return to the soil in the available for plants forms. Each year pasture mammals return to the ecosystem about 15 kg/ha of available forms of nitrogen, that is close to the values of microbial fixation. In the case of steppe fires all amount of nitrogen from above-ground phytomass (about 200 kg/ha in our conditions) is taken out from the ecosystem with fire and is totally lost for biological cycling. These losses are almost equal to the values of microbial nitrogen fixation. Mineral (ash) elements from the plant mass nearly totally and in available for

plants return to the soil after burning and again are included into biological cycling. Pasture animals provide higher rate of biological cycling, prevent accumulation of plant mort mass, and oppose the losses of nitrogen due to steppe fires.

Key words: steppe pastures, herbivorous mammals, nutrients cycling, stock of nitrogen in litter, readily hydrolyzable nitrogen, readily nitrifiable nitrogen, steppe burning, feces mass on pastures.

MODERN STRUCTURE AND DYNAMICS OF PLANT COMMUNITIES ON SOUTHERN BORDER OF DRY STEPPES OF THE CENTRAL MONGOLIA

© 2010. P.D. Gunin*, S.N. Bazha*, E.V. Danzhalova*, G. Tserenhand**, Yu.I. Drobyshev*, E. Ariunbold***

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Abstract. Research of steppe dominants' vitality has shown that *Allium polyrrhizum* was in the best position in the most of the surveyed communities of dry and desert steppes. *Allium polyrrhizum* have fast reaction to even small precipitations, so this species not only keeps its vital potential, but also shows ability to expansion of the area and gradual replacement of fodder cereals in vegetative communities. Only *Stipa krylovii*, *Stipa klemenzii* and *S. gobica* have still kept the potential of 4-5 species of cereals, which were dominants and codominants before in different communities. Species of *Stipa* can be restored under favorable conditions (decrease of pasturable loading, rotation of pastures and increase in atmospheric humidity).

The analysis of climatic conditions allows assuming that a climate aridization is occurring on the aimag's territory. However it would be erroneous to consider this factor is paramount in pastures degradation. Steadily increase of livestock's number is the main source of problems with the pastures degradation.

Key words: Dundgovi aimag of Mongolia, steppe ecosystems, climate aridization, degradation and desertification of pastureland, vitality.

FEATURES OF THE RESTORATION OF VEGETATION FALLOW LAND OF MEADOW STEPPES OF CENTRAL CHERNOSEMIE («KAMENAYA STEP», VORONEZH REGION)

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Abstract. Study of different stage of transformation of vegetation cover of hundred years old meadow-steppe fallow land to forest stand was held in "Kamennaya step" on territory of Dokuchaev Research Institute of Farming of Central Chernozem Belt (Voronezh region). The purpose of investigation was to obtain the average characteristic of practically dead maple forest and communities of natural small forests in steppe ravines. Maple forest grows in place of fallow land, which was withdrawn from contain of agricultural lands in 1908 and since 1912, the area has been under regime of absolute reservation. The meadow steppe was restored on this fallow land. Communities of *Bromopsis riparia*, *Calamagrostis epigeios*, *Festuca valesiaca* have appeared, which projective cover from the very beginning of 70th was varying from 80 to 90%. But to the end of 70th the most part of the area was occupied by forest shrubs groups. There is a maple forest on this territory in our days which density is 1, 0. 15 species of trees and shrubs were recorded there. *Acer tataricum* is a dominant of this community and *A. negundo* is co-dominant,

the projective cover of herbs is no more than 3%. *Crataegus curvisepala* and *Sambucus racemosa* predominate by numbers in shrub layer. The role of dying plant is rather high, instead of overgrows of trees and shrubs. It was important for us to compare natural small forest in steppe ravines and forest stand has formed on general phytocoenotic parameters. We have made a detailed description of two communities of small forest in steppe ravines. The floristic composition was determined and also number of general species (ind./ha), projective cover, morphometric characteristics, mass of dying plants. Two communities were described, one of them was *Acer platanoides*+ *Tilia cordata*+*Ulmus laevis*–*Aegopodium podagraria* and other was *Quercus robur*+*Acer platanoides*+*Tilia cordata*–*Aegopodium podagraria*. Maple tree predominate in the first community, but other species – *Acer platanoides*, in the composition of this forest community was recorded 3 different maple species. The projective cover of herbal layer reached about 70%. Oak (*Quercus robur*) is a dominant of second community and 2 maple species was marked there. Herbal projective cover in this community is in two less than in previous one. It appeared, that 2 species from 8 trees species are common with maple forest, which grows on fallow land.

Key words: restoration, fallow land, plant communities, vegetation dynamics.

INVASIONS OF *JUNIPERUS PSEUDOSABINA* FISCH. ET MEY. INTO SPARSE PSAMMOPHYTE COMMUNITIES ON THE TERRITORY OF THE CENTRAL MONGOLIA

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Abstract. Study of communities composed by *Juniperus pseudosabina* Fish. et Mey. in the Central Mongolia has shown that under contemporary conditions one can observe invasion of this species from mountain territories to plains, and the process is accomplishing by replacing of petrophyte ecobiomorphe with psammophyte one. From practical point of view, a feature of *Juniperus pseudosabina* to form monodominant communities on sands allow recommending it for phyto-amelioration works to fix sandy massifs.

Key words: invasion, *Juniperus pseudosabina*, pseudo-psammophyte, sands conserver.