PAPER • **OPEN ACCESS**

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To cite this article: I A Trofimov *et al* 2021 *IOP Conf. Ser.: Earth Environ. Sci.* **663** 012026

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Abstract. In order to study the spatial distribution of biological and ecological patterns on the territory of the Volga region and Western Kazakhstan, geobotanical indication of flooding and salinization of the lands these regions was carried out. Geobotanical indication is used in the study, assessment, mapping and monitoring of territorial complexes and their components and is based on the analysis of the relationships of the geographical envelope as a whole. The article is the result of many years of interdisciplinary research. It is based both on the data obtained by the authors as a result of agro-landscape and ecological zoning and in the course of field expedition research, and on the analysis of long-term series of statistical information and literature sources. Intensive economic activity that requires the use of large amounts water resources, against the background of modern climate changes, leads to waterlogging in large areas. The weakening or termination of economic activity, the decrease in the volume of water resources used under certain conditions leads to the spread of land salinization. Flooding and salinization of arid lands near reservoirs, channels, reclamation facilities, functioning and abandoned irrigation fields, etc. occupy significant areas and are of great importance as environmental problems in the Volga region and Western Kazakhstan. The most dynamic and fast-responding biotic component of ecosystems to the occurrence of flooding and salinization is vegetation.

In order to study the spatial distribution of biological and ecological patterns on the territory of the Volga region and Western Kazakhstan, geobotanical indication of flooding and salinization of the lands these regions was carried out. Geobotanical indication is used in the study, assessment, mapping and monitoring of territorial complexes and their components and is based on the analysis of the relationships of the geographical envelope as a whole.

The article is the result of many years of interdisciplinary research. It is based both on the data obtained by the authors as a result of agro-landscape and ecological zoning and in the course of field expedition research, and on the analysis of long-term series of statistical information and literature sources.

Water is one of the most important components of the biosphere, a necessary resource for the existence of humans and all living organisms. Water is necessary in the implementation of economic activities in agriculture, industry, energy, providing household needs.

On the other hand, water use can lead to "water environmental problems", negative consequences for human life and sustainable management.

Intensive economic activity that requires the use of large amounts of water resources, against the background of modern climate changes, leads to waterlogging in large areas. The weakening or termination of economic activity, the decrease in the volume of water resources used under certain conditions leads to the spread of land salinization.

Thus, as a result of irrational land and water use in the Aral sea basin, large-scale negative environmental consequences have occurred. The best agricultural lands were degraded, salted and put out of circulation, unique lands of the Delta plains were subjected to desertification, and the Aral sea disappeared irrevocably.

Biotic components of ecosystems, by their responses to changes in the quantity and quality of water resources, make it possible to detect the spatial distribution of water environmental problems.

Flooding and salinization of arid lands near reservoirs, channels, reclamation facilities, functioning and abandoned irrigation fields, etc. occupy significant areas and are of great importance as environmental problems in the Volga region and Western Kazakhstan.

The most dynamic and fast-responding biotic component of ecosystems to the occurrence of flooding and salinization is vegetation.

Over a long period of research, a vast amount of information has been accumulated on the impact of reservoirs, natural reservoirs, channels, reclamation facilities, and irrigation fields on the environment. It has received fairly complete coverage in scientific publications [1–7].

The following factors determine the impact of the environment on vegetation: location in the topography, soil and hydrological conditions. They, in turn, are derived from the climatic conditions, topography, parent species, flora and fauna of the surrounding territories, and the direct impact on vegetation of animals and humans [8–13].

The study of components of natural complexes in areas experiencing different impacts (flooding and assessment of the depth and extent of changes in the direction of hydro-morphization) is carried out on the basis of a system of indicators and criteria and specially developed scales. As well as in areas with saline ground water and (or) saline soils in arid conditions, where salinization of territories is observed [14–19].

In the Arsenal of geobotanical indication, an important role is played by the assessment of environmental conditions for vegetation, which we conducted using L G Ramensky's ecological scales. In L G Ramensky's ecological scales, the response of vegetation and individual plants to changes in soil, hydrological and other conditions of their habitat is taken as a basis. This reaction is expressed in the change of plant communities and changes in the abundance of each plant, depending on the change (increase or decrease) in the severity of the environmental factor [20].

The revealed regularities of vegetation relationships with other components of the biogeocenosis (natural-territorial complex) make it possible to determine the other components of the plant Association as one of the components. As a result, geobotanical indication provides the possibility of knowing the whole complex of phenomena, their physical and geographical content. This makes it possible to accurately assess the practical value of land, its appropriate use and improvement.

As a result of studying the spatial distribution of biological and ecological patterns on the territory of the Volga region and Western Kazakhstan, the authors established geobotanical indicators of flooding and salinization of the lands these regions.

Geobotanical indicators of land flooding, flooding and salinization include the following main indicators (table 1):

- Main phytocenoses,
- Main plants,
- Soil moisture and salinity according to L G Ramensky scales.

Table 1. Geobotanical of flooding and salinization of lands the Volga region and Western Kazakhstan**.**

Indication objects	**Geobotanical indicators**		
1. Lands with episodic inundation by atmospheric and flowing water, constant and slightly variable moisture, with loamy saline soils	The main phytocenoses	The main plants	Soil moisture and salinity according to L G Ramensky scales
	White wormwood, white wormwood-cereals, white wormwood- pyrethrum	White and Austrian wormwood, desert wheatgrass, fescue, feather grass, hairy sedge, narrow-leaved sedge, pyrethrum tysyachelistnika, yarrow, whitebug, burachok desert	Humidification is semi-desert, desert-steppe (18–30), weak and medium saline soils (17–21)
2. Land with episodic heating by atmospheric and flowing water, constant and slightly variable moisture, with loamy soils with strong salinity and salt	Black wormwood, white wormwood, wormwood-cereal, wormwood-twig, camphor, wormwood-camphor, wormwood-biyurgun	Black and white wormwood, camphorosma, prutnyak, fescue, oarticle, leafless and saline anabizis, annual hodgepodge, petrosimonias, prickly-leaved bedbug	Humidification is semi-desert (17–29), soils are weak, medium, and strongly saline (17–23)
3. Lands with episodic and short-term flooding by atmospheric waters, weakly variable moisture, saline soils and solonetz	Solyanka, saline wormwood, saline wormwood-cereal-saltwort	Saline wormwood, oarticle, rattle, annual hodgepodge, petrosimonia, sveda	Humidification is desert-steppe, dry-steppe (22–37), medium-, strongly-, and sharply saline (20–24)
4. Land with short-term flooding by atmospheric and flowing water, soil and water are not saline	Wheatgrass, fescue, wheatgrass, cereal, cereal-forb, cereal-wormwood	Crested wheatgrass, fescue, creeping wheatgrass, thin-legged slender, feather grass of hairwort and Lessinga, narrow-leaved sedge, Austrian wormwood, tenacious woodruff	Humidification dry-steppe, meadow-steppe (30–52), unsalted or slightly saline soils (14–19)
5. Land with short-term flooding by atmospheric and flowing water, not flooded or slightly flooded with fresh or brackish ground water at a depth of 2-5 m, slightly saline soils	Licorice, licorice-cereal-forb	Licorice naked, creeping wheatgrass, crested wheatgrass, cinquefoil forked	Humidification is steppe, meadow-steppe (40–50), unsalted or slightly saline soils (14–19)
6. Land with short-term	Dzhantak, djantak-	Dzhantak (camel	Humidification is dry-

flooding by atmospheric and flowing water, not flooded or slightly flooded with fresh and brackish (rarely salty) ground water at a depth of 2-7 (10) m, slightly saline, sometimes saline soils	cereal-forb, djantak-wormwood	thorn), creeping wheatgrass, pinworm, narrow-leaved sedge, cinquefoil, wormwood	steppe, medium-steppe (25–39), slightly saline soils (16–18)
7. Land with moderate flooding by atmospheric and flowing water, weak or medium-thawed fresh or brackish ground water with persistent, sometimes weakly medium-level moisture, with saline, sometimes gleevatym soils	Wheatgrass, reed grass, wheatgrass-sedge, reed-sedge	Creeping wheatgrass, ground reed grass, common reed, Gerard's rush, common swamp, black-ear sedge	Humidification is wet-meadow (64–70), unsalted and slightly saline soils (12–19)
8. Land with a long and permanent inundation and (or) heavily flooded, with slightly varying degrees of hydration. Ground water is fresh or brackish. The soil is bare, not saline or slightly saline	Reed, bekman, reed-sedge-forb, bekman-sedge	Common reed, common beckmannia, Gerard's rush, common tunicate, black-ear sedge	Moistening is damp-meadow (77–88), unsalted and slightly saline soils (14–18)
9.land with short-term or moderate flooding, slightly- or medium-flooded. Humidification is medium to highly variable. The soil is saline.	Wheatgrass, wheatgrass-cereal-forb	Wheatgrass creeping and elongated, folded-leaved and spaced ratchets, Kermek Gmelin	Humidification is wet meadow (77–88), medium-saline soils (19–21)
10.Land with short - term and moderate flooding or slightly-and medium-flooded. Humidification is medium to highly variable. The soil is highly saline.	Azhrekovye, unclenaceous, cereal-forb	Azhrek (solonchak riparian), folded-leaved rattle, saline wormwood, Kermek Gmelin	Humidification is wet and wet-meadow (70–83), medium and strong saline soils (20–22)
11. Land with a short temporary and moderate or flooding and (or) low- and medium-flooded. Moisture is highly variable. The soil is very, very salty and saline.	Saline wormwood, obion, obion-wormwood, obion-cereals, tartar swine	Saline wormwood, obion (warty quinoa), Tatar quinoa, solonchak coastal, folded-thick rattle, kermek Gmelin	Humidification is dry and fresh-meadow (53–63), soils are strongly saline and saline (21–25)

12. Land with short-term and moderate flooding. Flooded to varying degrees. Moisture is highly variable. Salines.	Juice salty, tartar swallowtail, saltwort, swedaceous, sarsazan, obion	Annual solyanka, petrosimonia, tartar quinoa, svedy, herbaceous saltwort, sarsazan, obiona, frankenia	Moisture from semi-desert to fresh-meadow (16–60), strongly and sharply saline and saline soils (23–28)
13. Land with episodic and short-term flooding. Slightly flooded. Soils are non-saline or slightly saline	Wheatgrass, fescue, cereal-wormwood	Crest-shaped wheatgrass, fescue, creeping wheatgrass, bluegrass narrow-leaved, ground reed grass, Austrian wormwood, two-forked cinquefoil	Moisture is meadow-steppe (47–52), the soil is not saline (10–16)
14. Land with short-term and moderate flooding. Slightly-and medium-flooded. Average variable moisture content. The soil is not saline or slightly saline	Wheatgrass, wheatgrass-forbs, licorice, licorice-forbs	Wheatgrass creeping, licorice naked and hedgehog, awnless rump, fragrant bison, Jacob's groundwort, true bedstraw, two-forked cinquefoil	Moisture is meadow-steppe (47–52), the soil is not saline (13–16)
15. Land with short-term moderate flooding. Slightly flooded. The soil is saline	Azhrekovo-mortukovy with hodgepodge	Azhrek (coastal salt marsh), eastern and wheat mortars, annual hodgepodge, petrosimonia, svedy	Humidification is dry and medium steppe (35–46), weak and medium saline soils (17–22)
16. Land with short-term and episodic flooding. Not submerged or slightly submerged. The soil is saline	Dzhantak, djantak-wormwood	Camel thorn, wheatgrass, saline wormwood	Humidification is dry and medium steppe (38–47), medium-saline soils (19–22)
17. Land with short-term flooding by floodplain waters. Slightly flooded. Humidification is variable. Soils are slightly saline	Wheat grass, unclean, pork grass, cereal and forb	Wheatgrass creeping, ratchet spread, pork finger-like, ground reed grass, licorice naked, Tartar lettuce, Gerard's rush, saline wormwood, Kermek Gmelin	Humidification is meadow-steppe and dry-meadow (47–63), slightly saline soils (16–20)
18. Land with moderate and prolonged flooding. Medium-flooded. Humidification is variable. The soil is not saline	Wheat grass, reed grass, rump, cereal-forb	Wheatgrass creeping, awnless rump, ground reed grass, common reed, elecampane British. Yakov's groundwort, marshmallow officinalis, marsh sitnyag	Humidification is wet-meadow (64–67), slightly saline soils (14–16)

19. Land with prolonged flooding. Heavily flooded. Moisture is constantly stable or slightly variable. The soil is not saline	Beckmanniaceae, canary grass, large-grass, sedge, sedge-cereal, sedge-forb, sitnyag	Beckmannia, canary grass, black-headed and slender sedges, marsh tuberkamysh, meadow tea, marsh chase, common loosestrife	Humidification is wet meadow (77–83), the soil is not saline (10–14)
20. Land with a moderate and prolonged flooding, medium-, and highly flooded. Moisture is weakly and moderately variable. The soil is saline	Uncillaceous, uncillic-herbaceous, reed-lurker	Settled helpless, azhrek, common reed, ground reed, reed and prickly lurkers, sea tuber, Gerard's rush	Humidification is wet and wet meadow (64–80), medium and strong saline soils (20–24)
21. Land with a moderate and prolonged flooding, medium-, and highly flooded. Moisture is weakly and moderately variable. The soil is very saline	Saline, saline-cereal-forb	Soleros, svedy, reed and prickly lurkers, solonchakovaya aster, Tatar quinoa and warty	Humidification is wet and wet meadow (68–80), strongly-, sharply-saline and saline soils (22–26)
22. Land of long-term flooding, heavily flooded. Moisture is weakly and moderately variable. Low - and medium-saline soils	Two-strand-sitnyag, sitnyag-wheatgrass, tuber-chamois-sitnyag	Two-source, marsh and single-scaled grass, sea tuber, creeping wheatgrass, lake reeds, black-ear sedge, medicinal asparagus, plantain ditches, marsh chase	Moistening is damp meadow (77–88), soils are weak and medium – saline (17–21)
23. Land of constant flooding, strongly flooded. Moisture is constantly stable or slightly variable. The soil is not saline or slightly saline	Reed, cattail, reed, sedge, headless, cereal-forb	Reed, reed maces, lake reeds, sea tuberkamysh, barnacle, acute sedges, slender, two-source reed, umbrella umbrella, arrowhead, loosestrife, marsh chase, plantain dit	Humidification of marsh-meadow and bogs (89–103), the soil is not saline and slightly saline (8–19)

Geobotanical indication of flooding and salinization processes in the Volga region and Western Kazakhstan is necessary for the management of ecosystems affected by them.

The advantages of geobotanical indication of the processes of flooding, flooding and salinization of territories are simplicity and reliability in use, economy and efficiency of monitoring the state and dynamics of development of these processes.

The withdrawal of land from agricultural circulation caused by flooding and salinization of soils is a major environmental and economic problem in crop production and irrigated agriculture. Natural conditions of territories that are dangerous for the development of negative processes during irrigation: flat terrain, poor drainage, loess-like, clay saline marine deposits, excess of evaporation over moisture. Anthropogenic dangerous causes of land degradation are excessive irrigation rates that lead to rising ground water levels, flooding of adjacent land and salinization of soils.

Conclusions. Intensive human activities led to the emergence of waterlogging in large areas.The development of salinization, which accompanies moisture, caused the loss of soil fertility and the withdrawal of land from agricultural circulation. These processes are the main cause of modern water environmental problems in the Volga region and Western Kazakhstan.

Waterlogging and often accompanying salinization of the soil cause degradation and withdrawal of land from agricultural turnover, which reduces the efficiency of human economic activity in the agricultural landscape.

Geobotanical indication allows you to receive timely information about flooding and salinization of land for operational management of ecosystems.

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