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## RESULTS OF FOREST PATHOLOGICAL SURVEY OF TUGAI FORESTS IN THE FLOODPLAIN OF THE SYRDARYA AND ILE RIVERS

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**Abstract:** This article presents the results of a reconnaissance and detailed forest pathological survey of tugai forests of the floodplain of the Syrdarya and Ile rivers. The studies were carried out at KSU “Otyrar forestry” along the floodplain of the Syrdarya River and KSU “Bakanas forestry” along the floodplain of the Ile River. The reconnaissance surveillance was carried out by an overground visual method from May to September 2021. Also, detailed surveys of the infestation and degree of damage to trees and shrubs by insect pests were carried out. According to the survey results, the sanitary condition of tugai forests is satisfactory. At the same time, the average degree of damage by leaf-gnawing and gall-forming pests of *Populus diversifolia* and *Eleagnus angustifolia* is more than 50%, which confirms the need for forest pathological monitoring.

**Key words:** Tugai forests, floodplain river, forest pathological survey, pests, diseases, forest plantations, insects, degree of damage.

### Introduction

Tugai forests are among the most degraded forest types in countries where they represent a significant part of the state forest lands, namely in Azerbaijan, Kazakhstan, Turkmenistan, and Uzbekistan. In Soviet times, areas occupied by tugai forests were destroyed for agriculture. The subsequent increase in water withdrawal from rivers for irrigation has led to a decrease in river flow and seasonal flooding, increasing their degradation. The remaining tugai forests are under increased pressure because of tree felling, firewood and livestock grazing. Tugai forests are one of the most important ecosystems in the region and provide vital ecosystem functions in drylands, because of which there is a significant increase in the need for their urgent restoration [1].

Tugai forests always have their own special microclimate, which significantly distinguishes them from ecosystems located around deserts. Tugai forests are called oases of deserts [2]. They do not form continuous forests along the river, but grow in a narrow, intermittent band, interspersed with open meadow spaces and reed thickets.

Due to the frequent changes in the river and the accumulation of new deposits, there are changes in the water table, which leads to a natural change of vegetation. Narrow bands along the coastal drifts, as well as flat depressions of floodplains, flooded by spring flood waters, are usually occupied by thickets of shrubby willows. In more elevated places, the first terraces are occupied by the plantations of the Russian olive (*Elaeagnus angustifolia*). The second terraces with undulating relief are usually occupied by the sparse plantations of the Turanga which is *Populus diversifolia* and *Populus pruinosa*. The soils under such plantations are alluvial-meadow loamy or silty-sandy loamy saline. The ground waters here are at a depth of 2-3 meters. On the second terraces there are dense, difficult-to-pass thickets of salt tree (*Halimodendron halodendron*) and tamarix. Among the tugai forests, a special place is occupied by the floodplain of the Charyn River in the Almaty region, where relict plantations of Sogdian ash grow on alluvial meadow soils [3].

Among shrub vegetation in tugai forests, you can find, in addition to tamarix, and salt tree, also goat's-wheat (*Atraphaxis*), barberry, sea buckthorn. Many different herbs and lianas are also found in tugai: reed, kender, licorice, cattail, reed grass, clematis, blackberry, and chiy (*Achnatherum*). In total, about 600 plant species grow here [4].

The main reason for the anthropogenic degradation of tugai in Central Asia is the regulation of river flow, which leads to a change in the flood flooding regime (usually leading to a decrease in flood water content), a change in the character and renewal of tugai tree-shrub and herbaceous communities. Climate change, along with anthropogenic regulation of runoff, is also the main reason for the widespread degradation of relict tugai ecosystems in Central Asia, since the main trends in climate change (an increase in temperatures and a decrease in precipitation in the warm half of the year, in summer and autumn, as well as a lengthening of the warm period) contribute to an increase in the desiccation of floodplains. and delta areas during the growing season.

### **Materials and methods of research**

The study of increasing resilience, restoring tugai forests and afforestation in the southern regions of Kazakhstan is based on information from literary sources and scientific works. The studies of foreign scientists were also studied [5-9].

The purpose of forest pathological survey and forest pathological monitoring is collection and analysis of information on the sanitary state of forests (size and degree of littering, drying out, pollution) and forest pathological state of forests (area of foci and degree of damage, damage by pests), modern detection, assessment and forecast of changes in sanitary and forest pathological state of forests and ensuring sanitary safety in forests.

Special observation over forest pests is carried out to timely detect their mass reproduction, predict the development of foci and plan extermination measures. Forest pest surveillance is subdivided into reconnaissance and detailed surveillance.

Reconnaissance surveillance is a visual method of detecting mass leaf-eating insects and their eye registration. During the reconnaissance survey in the state forestry institution, three areas of the same taxation composition with an area of at least 10 hectares are selected. The presence of pests in the plantations is judged by the most characteristic and simplest signs: the presence of insects at different stages of their development, the damage they cause, as well as characteristics specific to certain species: nests, feces, larvae, leaf bits. For each species, the lightest but most reliable signs are selected to ensure the correct recognition of the pest. Reconnaissance supervision with minimal labor and time costs allows to quickly identify foci of pests, to notice a sharp change in their number.

Accurate digital data on population dynamics can be obtained with detailed surveillance. In this case, it is most expedient to select areas of plantations in which an increased number of pests has been revealed by reconnaissance supervision. The area of each allotment, homogeneous in nature, should be at least 10 hectares. In the allotment, one permanent trial plot is laid with a size of at least 0.1 hectares (20x50 m). The main accounting period is autumn. Methods for recording a pest on a permanent test plot depends on its biology.

When considering pests wintering in litter or soil, the test plot is divided into 5 parts of 200 m<sup>2</sup> (20x10 m) and the next part is taken annually. The litter or soil is carefully examined to the depth of occurrence of the pest and not only individuals of one species, but also other detected pests, as well as pupae or cocoons, are selected. A common sign of pest detection is the droppings of their larvae. Wintering eggs are counted over the entire sample plot, the results are recalculated on average per tree and multiplied by the number of trees in the sample. The data on the number and condition of the pest obtained during the surveillance make it possible to assess the quantitative and qualitative indicators of its outbreak.

The question of carrying out the fight against leaf-eating insects is decided considering several circumstances - the state of the foci, natural and economic conditions. The most important is the average number of pests established during supervision and accounting. It is compared with the number that is critical for a given species, considering the age of the stands. The fight is prescribed if the threat of eating up the leaves of tree species is 50%. Assessment of the resistance of trees to pests and diseases in the presence of damage is carried out on the scale of A.Ya. Ogorodnikov [10].

## **Results**

The current state of tugai forests was characterized based on forest inventory materials of past and recent forest inventory, information from literary sources and scientific works, cartographic materials and the results of instrumental observations performed on permanent and temporary sample plots.

In 2021, the Almaty branch of Kazakh Scientific Research Institute of Forestry and Agroforestry named after A.N. Bukeikhan began to work on the development of scientific foundations for increasing resilience, restoring tugai forests and afforestation in the southern regions of Kazakhstan.

In the tugai forests of the floodplain of the Syrdarya and Ile rivers, forest pathological surveys and forest pathological monitoring are carried out, the purpose of which is to collect and analyze information on the sanitary (size and degree of littering, drying out, pollution) and forest pathological state of forests (areas of foci and degree of damage, damage by pests), timely detection of foci of insect pests, assessment and forecast of changes in the sanitary and forest pathological state of forests and ensuring sanitary safety in forests.

The reconnaissance surveillance was carried out in the tugai forests of the “Otyrar forestry” of the Turkestan region and the “Bakanas forestry” of the Almaty region (Figure 1). The reconnaissance survey was carried out on specially selected areas in plantations characteristic of the emergence of foci of harmful forest insects or by examination along special route routes crossing such plantations. The extent of damage to the stand is assessed using a tree condition category scale.

The results of the reconnaissance forest pathological survey of the tugai forests of the floodplains of the Syrdarya and Ile rivers are presented below in the (Table 1).



Figure 1 - Reconnaissance survey of tugai forests of the Ile River floodplain

Table 1 - Results of reconnaissance forest pathological survey of tugai forests of the floodplain of the Syrdarya and Ile rivers

KSU, Route number	Inspection method	Examination terms	Survey results	Damage degree
Otyrar forestry, Route No.1	Ground, visual	May-September	Found damage to trees by leaf-gnawing, gall-forming pests. There are dead standing trees.	4 - points - no more than ¼ part of plants are

				damaged (0.8)
Otyrar forestry, Route No.2	Ground, visual	May-September	Found damage to trees by leaf-gnawing, gall-forming pests. There are dead standing trees.	4 - points - no more than ¼ part of plants are damaged (0.8)
Bakanas forestry, Route No.3	Ground, visual	May-September	Found damage to trees by leaf-gnawing, gall-forming pests. There are dead standing trees.	4 - points - no more than ¼ part of plants are damaged (0.8)
Bakanas forestry, Route No.4	Ground, visual	May-September	Found damage to trees by leaf-gnawing, gall-forming pests. There are dead standing trees.	4 - points - no more than ¼ part of plants are damaged (0.8)

During the reconnaissance survey of tugai forests in the floodplain of the Syrdarya and Ile rivers, the presence of damage by leaf-gnawing and gall-forming pests was established. There are dead standing and dry-topped trees.

Also, in the tugai plantations of the floodplains of the Syrdarya and Ile rivers, a detailed forest pathological survey is carried out, that is, the fluctuations in the number of species of harmful forest insects under examination are clarified, the causes of these fluctuations are established, and based on the data obtained, short-term and long-term forecasts of the development of outbreaks of their mass reproduction are developed.

During a detailed examination, several sites are selected for each type of pest, which are examined twice a year at a time frame set considering the biology of the pests. Planting areas are selected in which reconnaissance supervision revealed an increased number of pests. In the allotment, one permanent trial plot is laid with a size of at least 0.1 hectares (20x50 m). The main accounting period is autumn. Methods for recording a pest on a permanent test plot depends on its biology. When considering pests wintering in litter or soil, the test plot is divided into 5 parts of 200 m<sup>2</sup> (20x10 m) and the next part is taken annually.

During the detailed observation there were found that leaves of *Populus diversifolia* damage by leaf beetles. Foliage of *Eleagnus angustifolia* is damaged by leaf-gnawing insects. Root-gnawing pests (beetles) were found in insignificant quantities (less than 1 pc. per 1 sq. m.) (Figure 2). Also, according to the results of the detailed survey, the average degree of damage by leaf-gnawing and gall-forming pests of *Populus diversifolia* and *Eleagnus angustifolia* is more than 50%.



a



b



c



d

Figure - 2. Forest pathological monitoring in tugai forests of the floodplain of the Syrdarya and Ile rivers

**Discussion of the results and conclusion.** According to the results of the reconnaissance and detailed forest pathological survey, the sanitary condition of the tugai plantations is satisfactory. No active foci of pests and diseases were found. However, it is recommended to conduct forest pathological monitoring in the tugai forests.

In tugai forests, it is recommended to carry out silvicultural and forestry activities, including sanitary felling, cleaning up debris, selecting places for forest crops that meet the conditions for favorable plant growth, fulfilling agrotechnical conditions for growing and caring for crops, creating mixed and rapidly closing crops, and others. All these measures increase the resistance of forest plantations to damage by pests.

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# СЫРДАРИЯ ЖӘНЕ ІЛЕ ӨЗЕНДЕРІ ЖАЙЫЛМАСЫНДАҒЫ ТОҒАЙ ОРМАНДАРЫН ОРМАН ПАТОЛОГИЯЛЫҚ ЗЕРТТЕУ НӘТИЖЕЛЕРІ

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**Түйін.** Бұл мақалада Сырдария өзені мен Іле өзені жайылмасындағы тоғайлы ормандарды барлаушылық және орман патологиялық зерттеудің нәтижелері келтірілген. Аталған зерттеу Сырдария өзені жайылмасының бойындағы "Отырар орман шаруашылығы" КММ-де және Іле өзені жайылмасының бойындағы "Бақанас орман шаруашылығы" КММ-де жүргізілді. Барлаушылық қадағалауды тексеру барысында орман ішіндегі жер бетін визуальды тәсілмен жүргізілді. Екі аумақты зерттеу 2021 жылдың мамыр-қыркүйек айларында жүргізілді. Ағаштар мен бұталардың зақымдануын және зақымдану дәрежесін егжей-тегжейлі зерттеу сипатталды. Зиянкестердің әр түрі үшін бірнеше учаскелер таңдалды, олар зиянкестердің биологиясын ескере отырып белгіленген мерзімде жылына екі рет тексерілді. Зиянкестердің дамуының қысқы кезеңіне дайындалатын уақытқа болжау жасау кезінде қолданылатын індеттің сандық және сапалық көрсеткіштерін анықтай отырып есепке алу жүргізілді.

**Кілт сөздер:** тоғайлы ормандар, жайылма, орман патологиялық зерттеулер, зиянкестер, ауру, екпелер, жәндіктер, зақымдану дәрежесі.



## РЕЗУЛЬТАТЫ ЛЕСОПАТОЛОГИЧЕСКОГО ОБСЛЕДОВАНИЯ ТУГАЙНЫХ ЛЕСОВ ПОЙМЫ РЕК СЫРДАРЬЯ И ИЛЕ

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**Аннотация:** В данной статье приведены результаты рекогносцировочного и детального лесопатологического обследования тугайных лесов поймы рек Сырдарья и Иле. Исследования были проведены в КГУ «Отырарское лесное хозяйство» вдоль поймы р. Сырдарья и КГУ «Баканаское лесное хозяйство» вдоль поймы р. Иле. Рекогносцировочный надзор был проведен надземно-визуальным способом с мая по сентябрь 2021 года. Также были проведены детальные обследования зараженности и степени повреждения деревьев и кустарников насекомыми-вредителями. По результатам обследований, санитарное состояние тугайных лесов является удовлетворительным. При этом средняя степень повреждения листогрызущими и галлообразующими вредителями туранги Литвинова и разнолистной и лоха узколистного составляет более 50%, что подтверждает необходимость проведения лесопатологического мониторинга.

**Ключевые слова:** Тугайные леса, пойма реки, лесопатологическое обследование, вредители, болезни, лесные насаждения, насекомые, степень повреждения.