ANALYSIS OF LAND WITH SELF-GROWING TREES IN LITHUANIA

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Abstract
The research is analysis of forest cadastre plots in Lithuania, which are not on forest land, but are covered with forest. The research was carried out in Dubrava regional division of the Lithuanian State Forest Enterprise. The study covers the forest districts of Eželis, Karmėlava, Padauguva, Sitkūnai and Vaišvydava. The main aim of the article is analysis of self-growing forest growth on non-forest land. Data from the Forest Cadastre of Lithuania (non-forest plots covered with forest) were used for the research. In this research were analyzed orthophotographic maps of different periods (1995-2023), soil spatial data and other spatial data set. 135 non-forest land plots covered with forest in the Forest Cadastre, with a total area of 146 ha were found after analyzing 5 forest districts. Reasons of self-growing is land abandonment, small plots sizes, less productivity of the land and lack of land reclamation.
Key words: Self-growing trees, Forest cadastre, Land abandonment

Introduction

Although abandoned and unused plots of land in Lithuania are decreasing every year, the problem of abandoned lands still remains. Abandoned lands are overgrown with self-growing trees, which, under favorable conditions, grow into young trees. Lithuania is located in the geographical zone of mixed forests, so there are favorable climatic conditions, environment and soil for the growth of forests. Semi-natural forests are the most common in Lithuania. If people did not use the land for at least a decade, a young forest would begin to form on it, and if nothing was done at all, the entire undeveloped land area of Lithuania would be covered with forest in a few decades (Mozgiris, 2021). When examining the state of forestry at the national level, it is observed that the loss of forest land and the problems of sustainable forest management are related to the difference between developed and developing countries and the amount of land under management (Siry et al., 2015). The Kyoto Protocol of the United Nations General Convention on Climate Change takes into account that the preservation of forestry and the increase of forest areas are of particular importance for mitigating climate change. The need to reduce carbon dioxide is driving competitive policies at the European Union level for greater forest development and protection (Wydra, 2013).

In various strategic programs of the country, in territorial planning documents, the country's aspirational forest cover rate does not correspond to the real possibilities of increasing the forest cover. The 18th Government of the Republic of Lithuania program provides that in 2024 the country's forest coverage must reach 35 percent (now 33.7%). In order to realize this goal, 85.5 thousand ha must be introduced within every years of new forests. Part of this area will be achieved through the accounting of self-growing young trees that have grown on non-forest land. Self-growing tree regrowth on non-forest land and accounting of these areas for forest takes place every year from 2.8 to 7.2 thousand ha area (according to the data of the National Forest Inventory). Forest thinning or spontaneous regeneration is forest regeneration, establishment without human help or by applying measures that promote forest thinning (Forestry..., 2019). On the basis of the data of the inventory of non-forest land areas covered with trees, the areas covered with trees will be entered into the Forest Cadastre, full protection and management of new forests will be ensured, the area covered with forests in the country will increase by 3000 ha (State Forestry..., 2023). This study will aim to assess the reasons that could determine the circumstances of the formation of forested plots.

Research object – self-growing trees growing on non-forest land.

Research aim – to carry out an analysis of land wiht self-growing trees in the part of the Dubrava regional division of the Lithuanian State Forest Enterprise.

To achieve the goal, the following tasks are set:

1. Using forest cadastre data, determine the areas of non-forest land overgrown with self-growing trees.
2. To analyze the reasons for the overgrowth of the land with self-growing trees.

Non-forest land overgrown with trees is included in the forest land as a forest, if after the inventory, the growing tree species, their density, quality and location comply with the Forest Restoration and Planting Regulations, approved by the Minister of the Environment of the Republic of Lithuania in 2008 April 14 by order No. D1-199 "On approval of forest restoration and planting regulations" requirements. When

these requirements are not met, private non-forest land overgrown with self-growing trees is included in the accounting of forest land in accordance with the description of the procedure for planting forests on private non-forest land, approved by the Minister of Agriculture of the Republic of Lithuania and the Minister of the Environment of the Republic of Lithuania in 2004 March 29 by order No. 3D-130/D1-144 "On the approval of the description of the procedure for planting forests on private non-forest land". This procedure does not apply when self-growing tree stands grow in the territories of cultural heritage objects or cultural heritage sites of other purpose or conservation purpose land, except in cases where they are requested to be included in the accounting of forest land by the owner of private land or the trustee of state land.

When an inventorization of self-growing trees with an average age of less than 20 years is carried out, the overgrown non-forest land publishes the inventory data on the website and, within 6 months from their publication, informs the landowners and trustees of the state land in writing about the possibility of including the non-forest land owned by them or managed by the right of trust to the accounting of forest land by entering it in the State Cadastre of Forests. The following land plots were selected for the study, information about which is provided in the Forest Cadastre.

Methodology of research and materials

In the course of the work, normative documents were analyzed, scientific literature was analyzed on the topic. "Non-forest plots covered with forest" parcels in the spatial data set of the Forest Cadastre of the Republic of Lithuania are selected for analysis. This is an area of non-forest land covered with self-growing trees, the average age of which is up to 20 years. During the investigation, it will be determined how many such areas meet these criteria. Also, what were the reasons that could have led to the growth of self-growing trees outside the forest land.

The following spatial data are used to determine the reason for the growth of self-growth:

- Forest cadastre data;
- ORT10LT (2021-2023 years), ORT10LT (2018-2020 years), ORT10LT (2015-2017 years) ORT10LT (2012–2013 years), ORT10LT (2009–2010 years), ORT10LT (2005–2006 years), ORT10LT (1995–1999 m.) – digital raster orthophoto maps of the Republic of Lithuania territory;
- AŽ_DRLT - Spatial data collection of abandoned lands in the territory of the Republic of Lithuania,
- Dirv_DR10LT – soil assessment layers and soil spatial data set of the territory of the Republic of Lithuania,
- Mel_DR10LT – set of land reclamation condition and waterlogging spatial data of the territory of the Republic of Lithuania,
- Data of the Crop Fields Database
- GRPK – Spatial data set of (geo) reference base cadastre,
- Real estate cadastre map.

The research is carried out in the part of the Dubrava regional division of the State Forestry Authority of the Lithtuanian State Forest Enterprise, which includes the Ežerelis, Karmėlava, Padauguva, Sitkūnai and Vaišvydava forest districts.
The research was carried out by analyzing spatial data. The analysis is presented as a generalization of spatial data in search of causes to determine the reasons for the growth of the self-growing trees.

Figure 1. Study area (compiled by the authors)

Discussions and results

Various spatial data sets in the Lithuanian Spatial pnformation portal are analyzed. Orthophotographic maps of different years are visually evaluated. Forest cadastre data (non-forest plots covered with forest), orthophoto maps of different periods (1995-2023), soil spatial data set, land reclamation status and waterlogging spatial data set were used for the research. After analyzing 5 forest districts, 135 non-forest land plots covered with forest were found in the Forest Cadastre, with a total area of 146 ha.

The article provides some visual examples of the study. Analyzing the data of the orthophotographic maps of different periods, the overgrowth of the territory with wild plants was determined in the orthophotographic map of 2009-2010 (Figure 2). Although the area is dominated by sand, part of it is reclaimed.

Figure 2. Spatial data of plot No. 3 (2009-2010; 2018-2020; 2021-2023 years data) (compiled according to: Lithuanian spatial..., 2023)

The 2018-2020 are especially dense self-growing trees, and the area overgrown in the last year has been managed and the inventory will be carried out on the spot, and the territory will no longer have self-growing trees. Another example of area that has been cleared of the forest and the timber removed is presented in Figure 3.
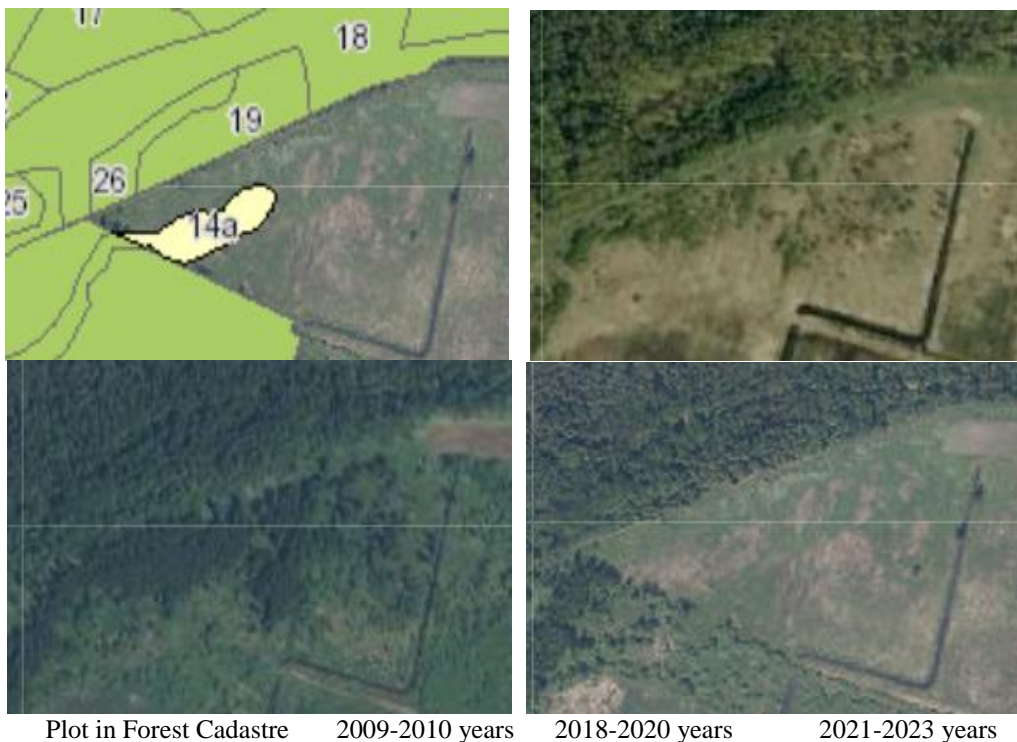
Plot in Forest Cadastre   2009-2010 years   2018-2020 years   2021-2023 years

Figure 3. Spatial data of plot No. 14a (compiled according to: Lithuanian spatial..., 2023)

Self-growing trees growth and changes in use over three different time periods are shown in the figure above, composed of orthophoto images. How self-growing trees spread and how the territory was organized and returned to agricultural activities can be seen. The territory is reclamated, next to the forest, it is dominated by peat. The registered plot in it is currently without self-growing trees.

Another example is presented, where the plots in the forest cadastre are actually used for agricultural activities, and crops are grown and declared (Figure 4).

Figure 4. Spatial data of plots No. 10, 11, 19, 30, 32 (compiled according to: Lithuanian spatial..., 2023)

In Padauguva forest district, near Dubysa, as many as 5 parcels are included in forested areas. Analyzing the data, it was found that the growth of self-growing trees in the plots marked with number 11 and 19 can be seen in the orthophoto maps of 2005-2006. The rest of the plots start to be overgrown with wild plants later, and their overgrowth can be seen on the 2009-2010 maps. At the moment, there are no self-growing trees on the plot marked with number 30, agricultural activities are carried out. In plot 32, only part of the plot is left with self-growing trees, in more than 70 percent of the land there ar agricultural activities. Winter crops are grown in them and they are declared. Therefore, the accounting of these areas is completely wrong. In plots numbered 10, 11 and 19 sufficiently dense self-growing trees, which are interspersed with forests, and will be counted as forests in the future can be seen.

Forest cadastre data is constantly updated after receiving data, information and documents from forest managers and other data providers about the completed inventory of forest plots, implemented economic measures, changes in ownership, administrative boundaries and other changes, newly introduced and self-grown forests. However, in Sitkūnai forest district, large non-updates of data are recorded (example in Figure 5).

Figure 5. Spatial data of plots (compiled according to: Lithuanian spatial..., 2023)

In the picture, there are 17 plots that are classified as forested areas in the forest cadastre, but woody vegetation is visible in only two, the other 15 plots are cultivated land, and some areas are declared. Analyzing in which period these areas could have been included as covered by forest, only the orthophoto maps of 2009-2010 have self-growing trees visible in the areas. Such areas have already been organized according to the data of the 2015-2017 orthophotographic map, but they are still included in the forest cadastre accounting. Another example with cadastral data error in Figure 6.

Figure 6. Spatial data of plots No. 4, 37 and 38 (compiled according to: Lithuanian spatial..., 2023)

There are no reclamation systems in the analyzed area. Area soil assessment up to 29.6. Plot No. 4 does not have any vegetation. Plot No. 38 is already covered with vegetation on the 1995-1999 orthophoto map - it has been more than 20 years for the self-growing trees and they had to be accounted for as forest. Plot No. 4 was never covered with woody plants, which is another error in the cadastral data. The reasons for the abandonment of plots 37 and 38 are the areas near plantations, where the spread of seedlings can easily take place. The plots are not suitable for agricultural activities, not relclamated. During the analysis, intensively overgrown plots on non-forest land can be seen, which will be counted as forest during the next inventory, if the owners do not remove the self-growing trees (Figure 7).

Figure 7. Spatial data of plot No. 12 (2005-2006; 2015-2017; 2021-2023 years data) (compiled according to: Lithuanian spatial..., 2023)

The plot is currently fully overgrown, the vegetation that may be present in it, judging by the spatial data, meets the criteria of the forest. The forestation of this area, as in the cases mentioned above, occurred due to unsuitable conditions for agricultural activities - the area is not reclamated, it is separated from the existing fields by a ditch and it is inconvenient to enter it, and also the seeds carried by the wind from the nearby forest helped the self-growing trees to plant more quickly.
Systematized study information is presented in Table 1.

Table 1

Plots in State forest cadaster of data on land wiht self-growing trees

Forest district, land area	Number of plots	Plot area, ha	The plot has never been overgrown with self-growing trees	The plot has been arranged, the former self-growing trees have been cleared	Overgrown with self-growing trees
Ežerėlis 18762 ha	8	3.6811		3	5
Padauguva 37209 ha	23	22.6600		4	19
Vaišvydava 35538 ha	16	15.1481	1	6	9
Sitkūnai 42946 ha	39	38.2848	1	20	18
Karmėlava 17932 ha	49	66.0852		7	42
Total:	**135**	**145.8592**	**2**	**40**	**93**

After the analysis, two errors were found, when the plots were marked as covered by forest in the Forest Cadastre, but when examining the orthophoto maps from 1995, none of them showed signs of forest cover with trees. Plot owners must inform the forest cadastre administrator - the State Forestry Service about inaccuracies in accordance with the description of the procedure for submitting data to the state forest cadastre of the Republic of Lithuania, recording and changing them. Of the 135 forest plots found in the cadastre, 40 were returned to agricultural (or other) activities. There is no vegetation in them. Plot sizes are given in Figure 8.
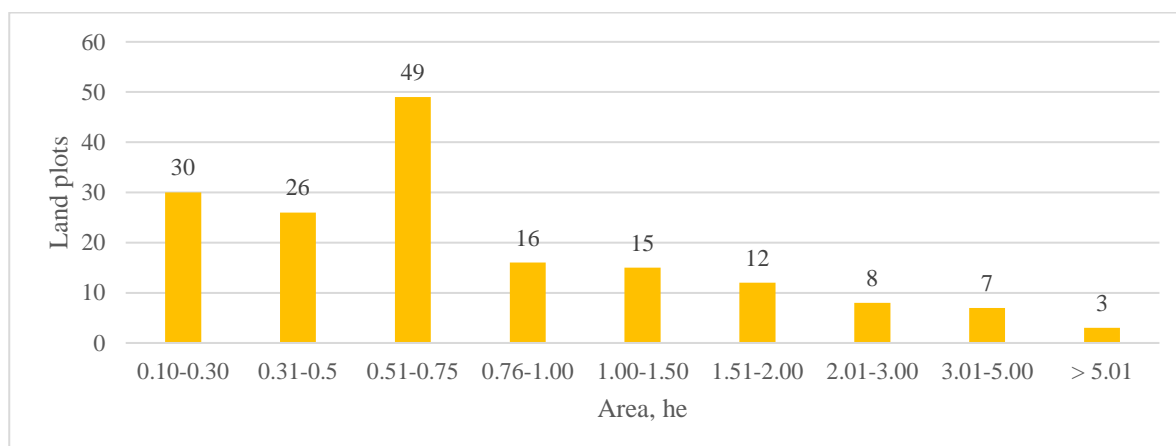

Figure 8. Land plots distribution by area, hectares (compiled by the authors)

The plots covered with self-growing trees are not large, most of the plots are less than 50 ares, there is one plot with a size of 13 ha. This is a plot of land very close to Kaunas, Karmėlava forest district, it is in peat land, unsuitable for work, not reclamated, unsuitable for agricultural activities. Plots covered with self-growing trees are most often located on not reclamated land (Figure 9).
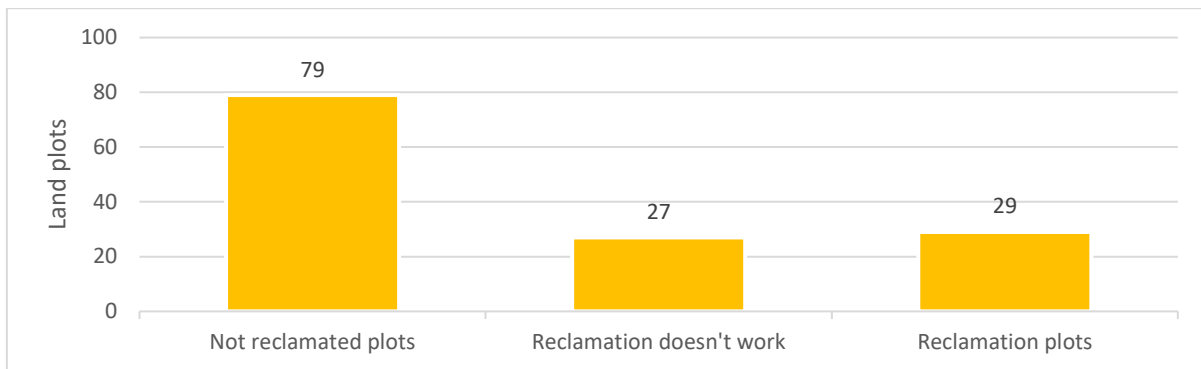
Figure 8. Allocation of plots according to land reclamation (compiled by the authors)

Only twenty-nine plots have reclamation systems, which according to Mel_DR10LT land reclamation state and waterlogging spatial data set of the territory of the Republic of Lithuania are operational. The research was conducted without evaluating the performance of the systems in nature. Soil spatial data sets were used to analyze the soil of the plots (Figure 9).
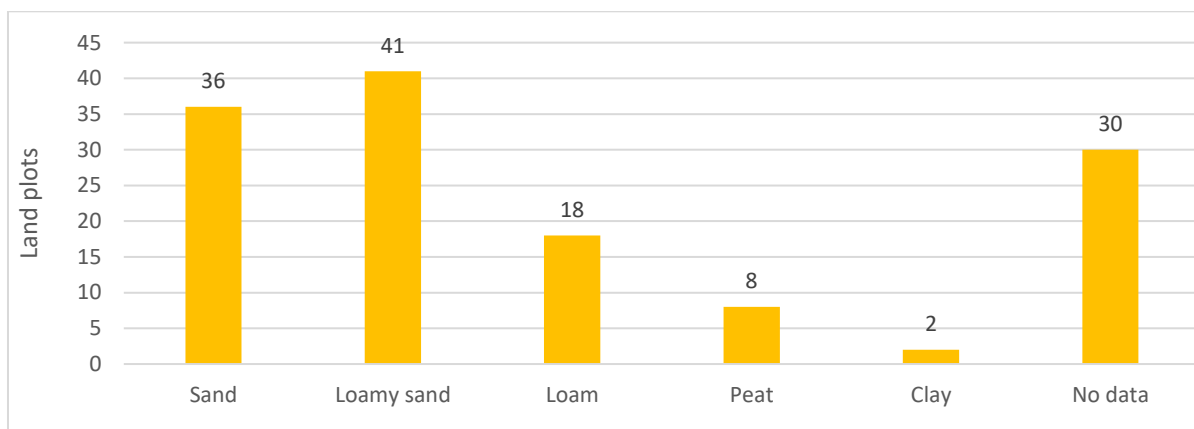

Figure 9. Classification of plots according to granulometric composition (compiled by the authors)

The forest is mainly covered with sand and loamy sand. Those lands that have not been used for their intended purpose for a long time and are covered with self-growing trees if the right conditions are created.

After the research, it can be said that such conditions can be: natural (slope of the plot, land quality, terrain, non-functioning/absence of reclamation systems), social (migration, level of old age of the population). How long the land has been abandoned, how the land areas are laid out, whether the configuration, sizes, and productivity of the land is convenient for cultivation are also important for self-growing trees.

Considering this, it is obvious that turning such lands into forest land is a good way when that land is not suitable for agricultural activities. If it is possible to use it for agricultural activities, it should always be done. Not only intensive, but also extensive land use is possible when it contains perennial meadows and pastures.

Conclusions and proposals

1. The research was carried out in the part of the Dubrava regional division of the State Enterprise, which includes the Ežerelis, Karmėlava, Padauguva, Sitkūnai and Vaišvydava forest districts. Forest cadastre data (non-forest plots covered with forest), orthophoto maps of different periods (1995-2023), soil spatial data set, land reclamation status and waterlogging spatial data set were used for the research. After analyzing 5 forest districts, 135 non-forest land plots covered with self-growing trees were found in the Forest Cadastre, with a total area of 146 ha. At the time of the investigation (january of 2023), 40 of the 135 plots in the forest cadastre have no vegetation, the self-growing trees there have been cleared and the timber removed. Two errors were found when the plots were marked as covered by forest in the Forest Cadastre, but when examining the orthophoto maps from 1995, no signs of forest cover with woody vegetation can be seen in any of them.

2. After conducting the investigation, it was established that the forest cover with self-growing trees of the territories occurred due to unsuitable conditions for agricultural activities - there is no land reclamation, or it does not work. In the plots near the forest, the seeds carried by the wind led to a faster planting of self-growing trees.

How long the land has been abandoned, how the land areas are laid out, whether the configuration, sizes, and productivity of the land is convenient for cultivation are also important for self-growing trees. Considering this, it is obvious that turning such lands into forest land is a good way when that land is not suitable for agricultural activities. Not only intensive, but also extensive land use is also possible when there are perennial meadows and pastures.

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