Current Trends in Natural Sciences Vol. 7, Issue 13, pp. 211-220, 2018

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

THE STATE OF VEGETATION IN THE STANDS ESTABLISHED ON DEGRADATED LANDU IN THE HILLY AREA OF TRANSILVANIA

Mircea C. Moldovan [1,3], Liviu C. Boca [1], Tudor I. Lungu [1], Vasile Simonca [1,3], Tatiana Blaga[2], Ioan Tăut [1,3*], Marcel Dîrja [3]

[1] National Institute for Research and Development in Forestry (INCDS) "Marin Drăcea" S.C.D.E.P. Cluj, România
[2] National Institute for Research and Development in Forestry (INCDS) "Marin Drăcea" Branch Bacău, România
[3] University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca,
Calea Mănăştur 3-5, 400372, Cluj-Napoca, România

Abstract
In the past, Transylvania was an area of high afforestation, in 1919 having a surface of about four million hectares. Due to the need to expand agricultural areas, accessible ones have been deforested, with some of them degrading as a result of intense and irrational grazing.
In order to ensure that the degraded areas are not totally unproductive, in the 1970s, they have been afforested, many of them being made with resinous, even in situations where the ecological group provided for other solutions.
A number of six sample surfaces were taken into study, in which measurements were taken to track the growth of stands on degraded lands. These stands suffer from isolated windfall and crown breaks, due to the fact that the silvicultural operations are performed at a lower frequency than the production stands.
Comparing the data obtained, it was found that the most healthy stands are in the Săvădisla, Sic and Sărmaşu areas, while in the Filitelnic area the trees are affected by isolated windfall and tops and crowns breaks. For tree damage to occur at the lowest possible frequency, strict silvicultural operations required for each stage of development is necessary.

Keywords: degraded lands, stands, vegetation, windfall.

1. INTRODUCTION

In the past, Transylvania was an area of high afforestation, in 1919 having a surface of about four million hectares (Sabău, 2016). Due to the need to expand agricultural areas, especially with the establishment of the communist regime, accessible ones have been deforested. Over time, the areas used as pastures have deteriorated due to the increased number of animals and intensive and sometimes irrational grazing. Today, out of the total of 10 million hectares, the total area of Transylvania, 3732417,306 hectares are covered by forests, 3940187 hectares of agricultural land out of which 19,120 hectares of degraded lands (www.anpm.ro).
Degraded lands are those lands that, over time, have lost all or part of their productive capacity due to natural causes most often generated by water, wind and high temperature differences, amplified by human activities, such as grazing and soil work, made in intensive and irresponsible way.

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

The most widespread types of soil degradation encountered in Romania are erosion processes, which consist in the entrainment of soil or rock particles by water, called hydric or pluvial erosion or wind, called windy erosion (Dîrja et al., 2008)

Because these degraded areas not to be totally unproductive, since the 1970s, they have been afforested. Because at that time the cellulose industry was growing, the afforestation of the degraded land was made with resinous, fast-growing species outside the natural area, even in situations where the environmental group provided for other solutions.

Since most of these stands are composed of pines, spruce and other resinous, with ages between 30 and 50 years, III-V production classes and low quality wood, in recent years they have been slightly neglected by foresters in many cases tending operations are carried out with a very low intensity. Because of this, but also because of the drought in recent years, many stands are becoming increasingly affected by drying, diseases and pests, which requires a follow-up of their evolution either from the moment of planting, where the technical documentation of that period still exists, either from now on.

2. MATERIALS AND METHODS

The data covered by this paper were collected in the National Forestry Inventory (NFI). Initiated in 2006, it was designed as a continuous forest inventory (CFI) with a five-year periodicity, based on systematic sampling, combining repeated measurements into permanent sample plots with temporary sample plots, and is an IFN in two stages (forest assessments and measurements on orthophotomaps and then on field). NFI covers evenly the entire territory of the country, being built on the 4 × 4 km network in the hill and mountain area and 2 x 2 km in the plain area due to the very low coverage of forest vegetation (Figure 1).

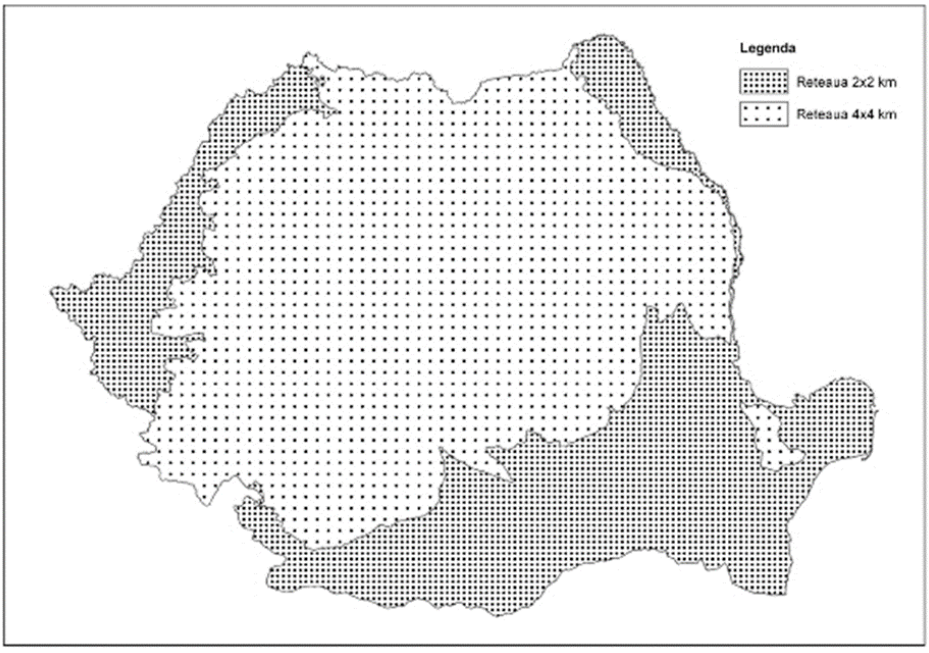

Figure 1. Sample plots placed on the map

In 2012, the first NFI cycle was completed, and in autumn 2013 was starting the second cycle, the field phase of this cycle being completed in October 2017.

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Once photographed by the co-ordinating team, samplings are sent to the 21 teams in the country to be coverd on field inventory. Each sampling has a square shape with a 250 m side, with a circular sample area in each corner (Figure 2).
A sample surface consists of 7 circles of different radius (Figure 3), in each being measured and described some particularities of the surface.
Also, each line describes the accessibility and boundaries of the stands.

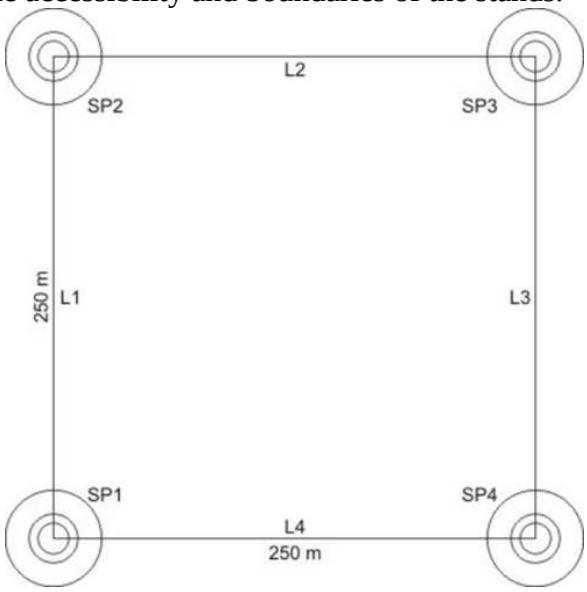

Figure 2. Structure of a sampling

Thus in the circle with a radius of 7.98 meters (200 square meters) the trees between 56mm and 285mm are measured, the dead wood fell to the ground, the stubs and the indicator flora. In the circle with a radius of 12.62 meters (500 square meters) the trees are measured over 285 mm, and in the circle with a radius of 25 meters (2000 square meters) are described forest sites, the soil, the forest edge and the increment core are harvested, when the surface is in the forest.

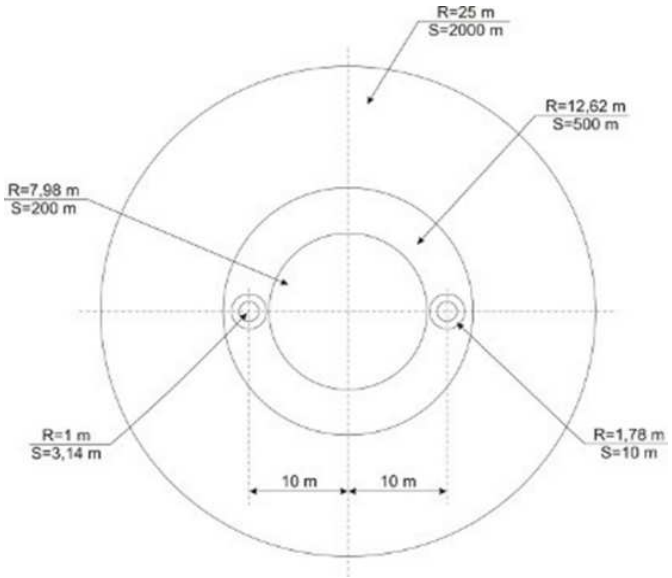

Figure 3. Composition of a sample surface

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences Vol. 7, Issue 13, pp. 211-220, 2018

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

There are two concentric circles located 10 meters east and west of the center of the sample plot (CSP), where regeneration is measured. In circles with a radius of 1 meter, seedlings between 10 and 50 cm high are measured, and in circles with a radius of 1.78 meters the regeneration is measured over 50 cm high, with a diameter of less than 56 mm (http://roifn.ro/site/despre-ifn/). Field data collection was made with modern devices, such as Vertex for heights, a field computer with built-in GPS for data recording, and caliper graduated from millimeter to millimeter for diameters.

Of the total of samplings inventory, six samples plots from four samplings were taken to study the state of vegetation in forests planted on degraded land, former farmland. These areas have been inventoried two in 2011 and three in 2012 for the first NFI cycle and in 2017 for the second NFI cycle. (Figure 4) as follows:

- in 2012 and 2017 in the sampling 11041028 SP 2 in the Filitelnic area, Figure 5;
- in 2011 and 2017 in sampling 11077118 SP 3 in Săvădisla area, Figure 6;
- in 2012 and 2017 in sampling 11085058 SP 3 and 4, in Sărmaşu area, Figure 7;
- -in 2011 and 2017 în sampling 11101082 SP 2 and 3, in Sic area, Figure 8.

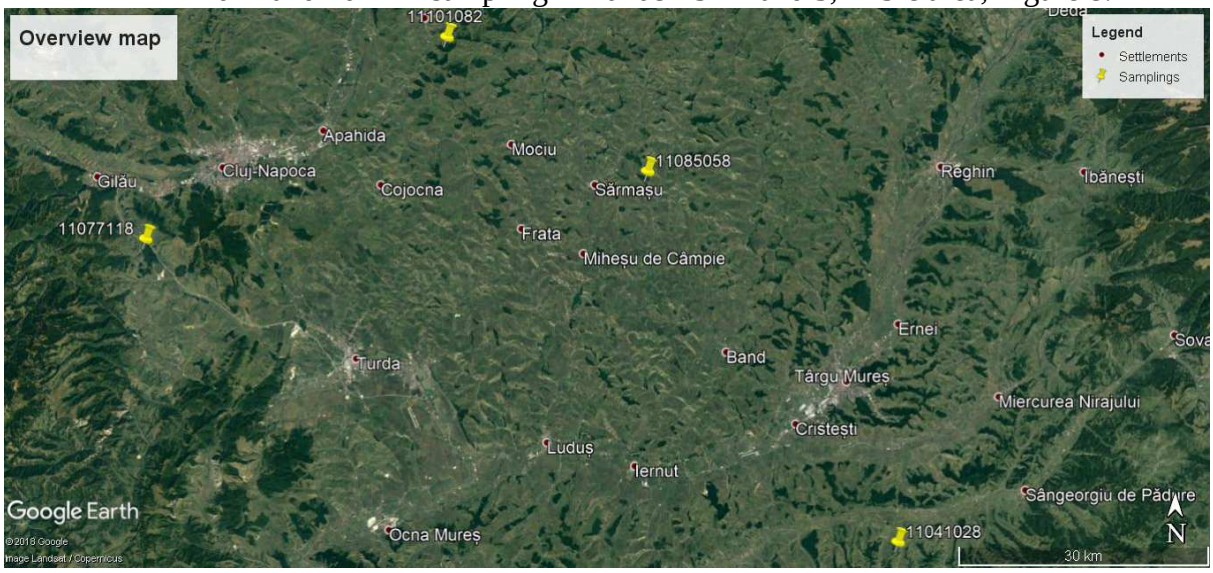

Figure 4. Overview map

Figure 5. Sampling 11041028, Filitelnic area

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Figure 6. Sampling 11077118, Săvădisla area

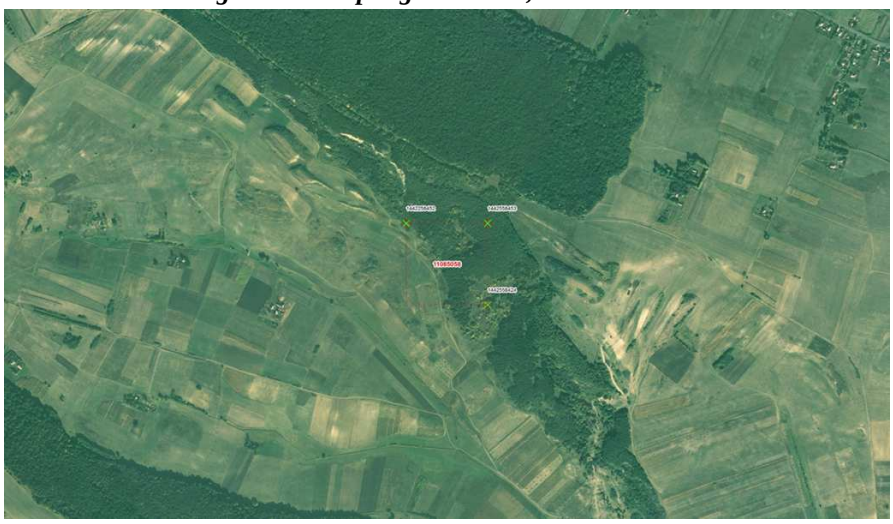

Figure 7. Sampling 11085058, Sărmaşu area

Figure 8. Sampling 11101082, Sic area

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

3. RESULTS AND DISCUSSION

As a result of the measurement of the surfaces, the data collected on the areas that were in natural forests or outside the forest fund were excluded, and there were positive differences between growths and negative differences due to disturbing factors that led to broken tree tops, crowns, that led to tree drier as follows:

- In the sampling 11041028, SP 2, in the area of Filitelnic, 19 trees were inventoried in 2011, the mean of the diameters being 190 mm and mean heights 155 dm. In 2017, 24 trees were identified, with a mean diameter of 177 mm and mean height of 131 dm. This difference in minus is due to dry trees, shrinked and broken tops on most trees (Figure 9).
- In the sampling 11077118, SP 3, in Săvădisla area, in 2011 were inventoried 16 trees, the mean of the diameters being 116 mm and mean height 106 dm. In 2017 were identified 24 trees, average diameter being 137 mm and mean height 118 dm. Average growth in diameter is de 3,5 mm/year and average growth in height is 2 dm/year (Figure 10).
- In the sampling 11085058, SP 3, in Sărmaşu area, in 2012 were inventoried 25 trees, the mean of the diameters being 165 mm mean height 154 dm. In 2017, were identified 29 trees average diameter being 183 mm and mean height 161 dm. Trees have grown up to 3.6 mm / year in diameter and 1.4 dm / year (Figure 11).
- In SP 4 of the sampling in the Sărmaş area, the number of trees was kept at the two measurements, meaning 7, in 2012 the mean of the diameters being 207 mm and the one of the heights of 120 dm. In 2017, the average of the diameters is 235 mm and the height of 140 dm. Trees have grown an average of 5.6 mm / year in diameter and 4 dm in height (Figure 12).
- In sampling 11101082, SP 2, From the Sic area, 43 trees were identified in 2011, with the average diameter of 120 mm and the mean height of 138 dm. In 2017, the number of inventory trees was 49, with mdan diameter of 121 mm and mean height of 135 dm. Trees have grown on average by 1 mm per year in diameter and by 0.3 dm per year. This surface was invaded by the hornbeam, most of the pine trees suffering from ruptures of tops and crowns, some of them drying (Figure 13).

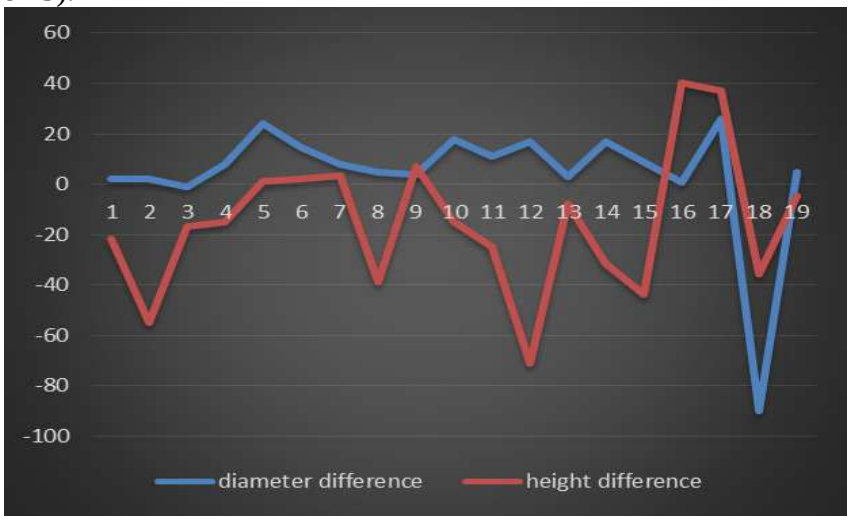

Figure 9. Growth differences in 2017 compared to 2011, 11041028, sp 2

- In SP 3 in the Sic area, in 2011 36 trees were inventored, with the average diameter of 140 mm and the mean height of 139 dm. In 2017, there are 45 trees identified, with average diameter of

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

157 mm and mean height of 158 dm. Trees have grown from 2011 to 2017 on average by 3 mm per year in diameter and by 3.2 dm per year in height (Figure 14).

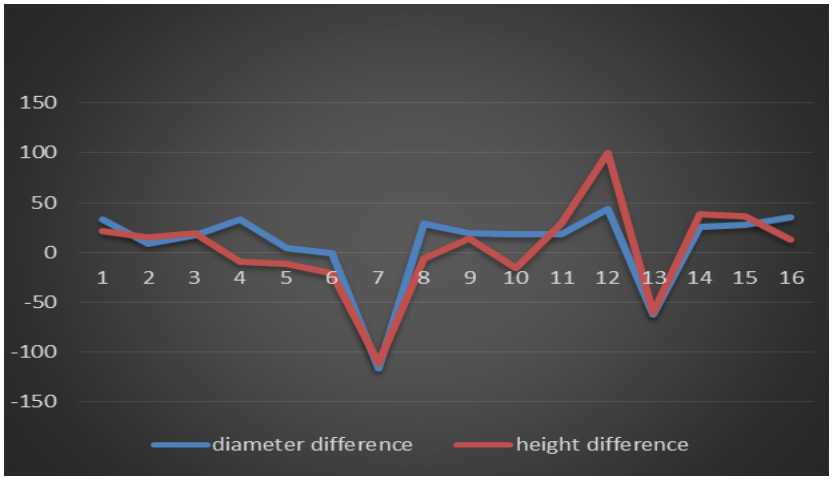

Figure 10. Growth differences in 2017 compared to 2011, 11077118, sp 3

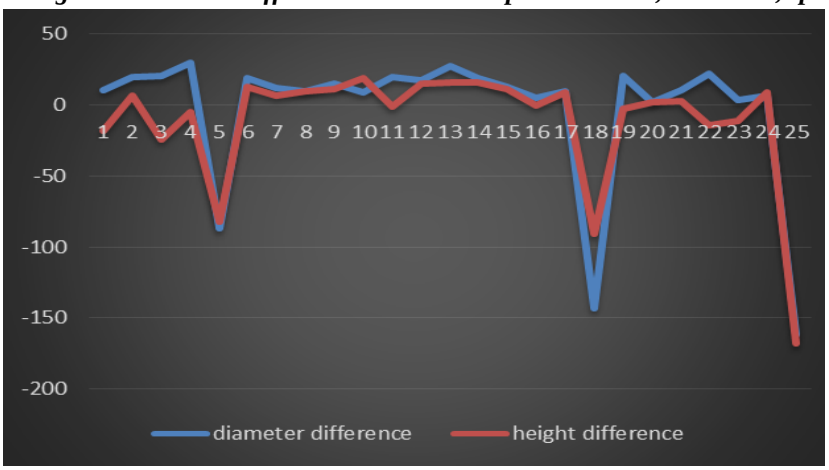

Figure 11. Growth differences in 2017 compared to 2012, 11085058, sp 3

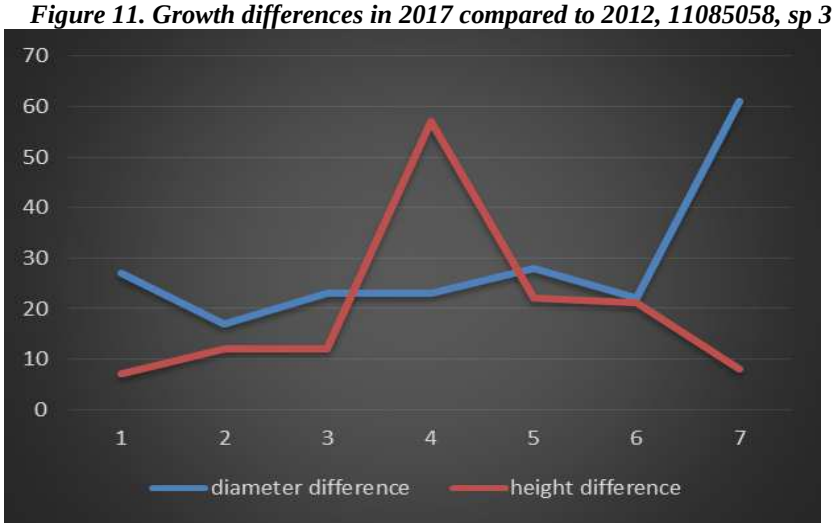

Figure 12. Growth differences in 2017 compared to 2012, 11082058, sp 4

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

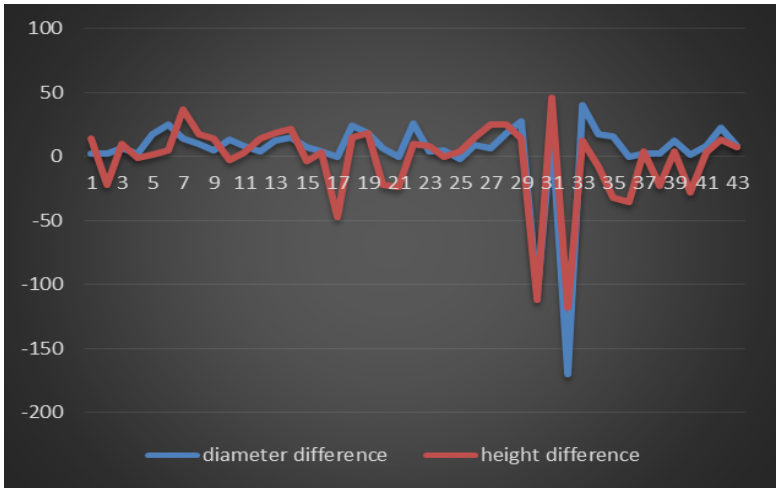

Figure 13. Growth differences in 2017 compared to 2011, 11101082, sp 2

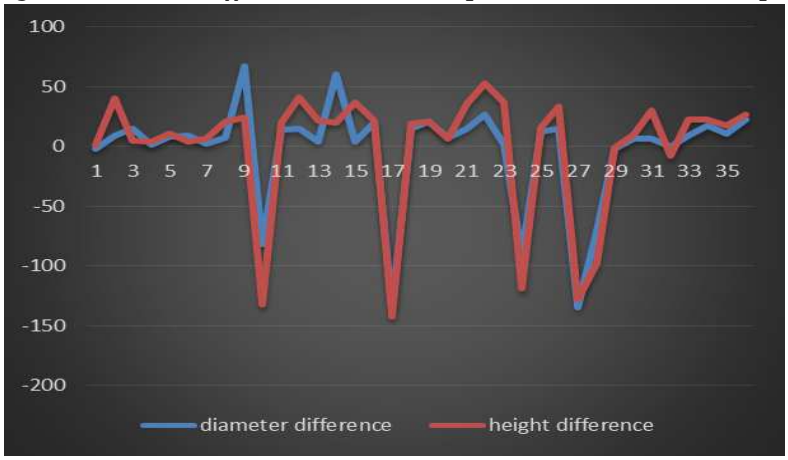

Figure 14. Growth differences in 2017 compared to 2011, 11101082, sp 3

Although the forests in the above areas have been planted and a target composition has been established, this is difficult to achieve in some areas due to natural selection and the installation of invading species. The areas where the invading species were expanded the most are Sic in the SP 2 and Săvădisla according to the following graphs:

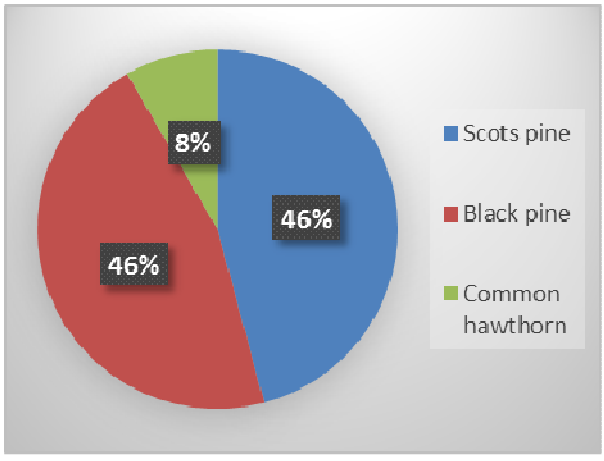

Figure 15. Distribution by species in 11041028, SP2

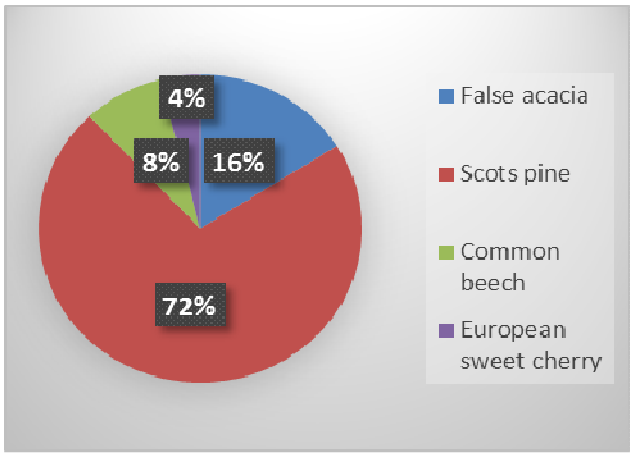

Figure 16. Distribution by species in 11077118, SP3

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

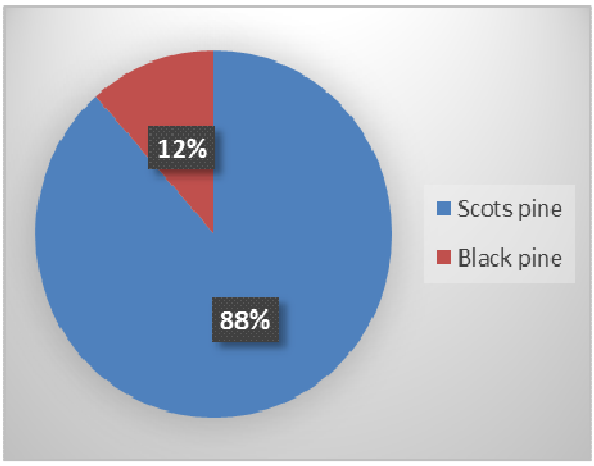

Figure 17. Distribution by species in 11085058, SP3

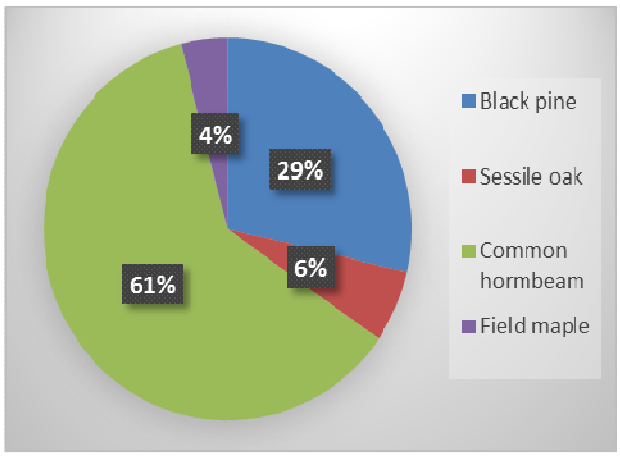

Figure 18. Distribution by species in 11101082, SP 2

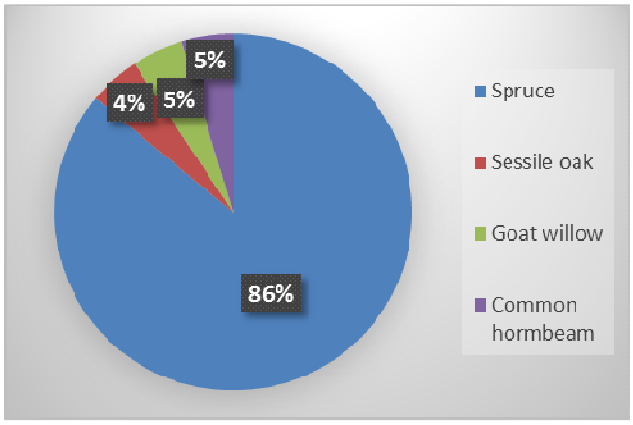

Figure 19. Distribution by species in 11101082, SP 3

4. CONCLUSIONS

In the sample plots studied, although they are on the same soil type (preluvosoil) and approximately at the same altitude, between 350 and 450 meters, between 35 and 50 years, have varied growths, being influenced by environmental factors present in each microclimate.

In SP 2 in the Sic area, pines, due to precarious tending operations, were easily overwhelmed by invasive species such as hornbeam or pioneer species (goat willow, field maple).

In the surface of the Filitelnic area, the trees suffer from broken tops and uprooting due to droughts of recent years, periods overlapping the needle change period. Also, the most common defects encountered in this area are bifurcations, due to grazing during seedlings youth. The trees with the least defects have been encountered in the Săvădisla area, being a submontane area, close to the natural area of the pines and the Sicul area, in the spruce area, this species being well vegetated outside the area up to old age.

5. RECOMMENDATIONS

Tending operations should be done in time and with intensity stipulated in the technical regulation available or according to forest specialists.

In cases where stands tend to be overwhelmed by invasive species, the periodicity of the silvicultural operations is reduced to minimum, according to technical standards in use, for holding back the invasive species.

*Corresponding author, E-mail address: ioan_taut90@yahoo.com

Current Trends in Natural Sciences (on-line)
ISSN: 2284-953X
ISSN-L: 2284-9521

Current Trends in Natural Sciences (CD-Rom)
ISSN: 2284-9521
ISSN-L: 2284-9521

Replacement of stands that have not adapted to the microclimate in the planting area and suffer from stress factors every year.

6. REFERENCES

Alexe A., Milescu I. (1983). Inventarierea pădurilor [Inventory of forests]. eds Ceres, Bucureşti.

Bădescu, Gh. (1958). Lucrări folosite în ameliorarea terenurilor erodate şi corectarea torenților [Works used to improve eroded land and torrents]. eds Agro-silvică de Stat, București.

Biali, G. (2017). Cercetări privind extinderea proceselor de degradare a terenurilor agricole în pantă prin alunecări de teren în judetele Iași, Bacău și Vaslui [Research on the extension of land degradation processes in slope by landslides in the counties of Iasi, Bacau and Vaslui]. *Știința agricolă*, 1, 73-77.

Dîrja, M., Pepine, A. (2008). Ameliorații silvice: Îndrumător pentru întocmirea proiectului [Forest Amelioration: Guidance for the preparation of the project]. eds Todesco, Cluj Napoca.

Diana,, G. I., Dîrja, M., Colișar, A., & Ceuca, V. (2017). Solutions for the diminution of slope erosion by using ameliorative forest vegetation in the Basin Valea Gurghiului. *Journal of Horticulture, Forestry and Biotechnology*, 20(3), 22-26.

Neamțu, T. (1996). Ecologie, eroziune şi agrotehnică antierozională [Ecology, erosion and anti-erosion agrotechnics]. eds Ceres, București.

Moțoc, M., Trăşculescu, Fl. (1959). Reoziunea solului pe terenurile agricole şi combaterea ei [Erosion of soil on agricultural land and its combat]. eds Agro-silvică de Stat, Bucuresti.

Sabău, V. (2016). Statistica pădurilor din România pe anul 1929 [Forest statistics in Romania for the year 1929]. Bucovina Forestieră 16(1), 117-140.

Silvestru-Grigore, C.V., Dinulică, F., Spârchez, G., Hălălişan, AF, Dincă, L.C., Enescu, R.E., Crişan, V.E. (2018). Radial Growth Behavior of Pines on Romanian Degraded Lands. Forests, 9(4), 213.

http://roifn.ro/site/despre-ifn/

www.anpm.ro

*Corresponding author, E-mail address: ioan_taut90@yahoo.com