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## FOREST COVER CHANGES ASSESSMENT USING AEROSPACE METHODS

**Abstract.** *Forest cover changes assessment was analyzed and assessed using satellite images. This analysis is supposed to be useful for local administration to manage the territory.*

**Keywords:** aerospace methods, forest cover, forest corridors, Fastiv Municipality, environmental conservation.

The study area is located in Fastiv Municipal Territorial Community, located in the Fastiv District of Kyiv Oblast, Ukraine, encompasses an area of 336.7 km² and had a population of 64,174 as of 2020. It was formed on June 12, 2020, by merging the city of Fastiv with several rural councils, including Borivska, Bortnykivska, Velykosnitynska, Veprytska, Malosnitynska, Motovylivska, Motovylivsko-Slobidska, Olenivska, and Fastivetska. The administrative center is Fastiv city.

Research Object: Changes in forest cover in the Southwestern part of Kyiv Oblast during the period of 2016-2023, with satellite images collected monthly each year.

Research Objective: To assess changes in forest ecosystems in the Southwestern part of Kyiv Oblast, adjacent to the Kyiv Polissia area (Fastiv region), using aerospace methods.

Trees play a crucial role in the health and well-being of our planet, serving as vital habitats for numerous plant and animal species and contributing to global biodiversity. They provide us with essential ecosystem services, supporting our daily lives and ensuring our comfort. Depending on where we live, our interactions with nature vary, whether it's a city park or a vast forest. These diverse yet similar ecosystems have different characteristics and purposes.

Forests are expansive regions covered with dense foliage, predominantly characterized by tall trees and rich biodiversity. They serve as critical habitats for many bird species, mammals, insects, and plants, playing a key role in preserving biodiversity. Forests also act as powerful allies in combating climate change by absorbing carbon dioxide from the atmosphere through carbon sequestration. Additionally, they regulate the hydrological cycle, mitigate soil erosion, and offer a wealth of forest resources, including timber, firewood, and medicinal herbs. However, forests face threats such as illegal logging, habitat degradation, and forest fires, which can seriously disrupt ecosystems and jeopardize their ecological resilience.

Forest corridors, also known as green belts, are narrow strips of foliage typically situated along riverbanks, highways, or agricultural spaces. These corridors serve as natural buffers, mitigating soil erosion, filtering pollutants, and facilitating wildlife movement and habitat connectivity. Besides their ecological functions, forest corridors enhance landscape aesthetics, provide shade and shelter, and improve microclimatic

conditions. They also play a crucial role in water resource management by capturing rainfall, limiting surface runoff, and replenishing groundwater reserves. However, forest corridors face challenges such as fragmentation and degradation due to human encroachment from urbanization and agricultural expansion.

Urban parks are green havens amidst bustling cities, comprising a blend of trees, lawns, gardens, and recreational areas. These green spaces offer urban residents numerous benefits, including opportunities for leisure, social interaction, and physical activity. Trees in urban parks play a vital role in mitigating the urban heat island effect, improving air quality, and enhancing biodiversity. Additionally, they assist in water resource management by reducing stormwater runoff, filtering pollutants, and replenishing groundwater. However, urban parks encounter issues such as spatial constraints, pollution, and inadequate maintenance, which can hinder their effectiveness. Common tree species planted in urban parks include maple, cherry, and magnolia, chosen for their ornamental appeal, shade provision, and resilience to urban conditions.

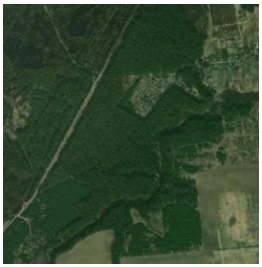
Advantages and Disadvantages:

- Forests: Advantages include biodiversity conservation, carbon sequestration, and provision of ecosystem services such as water resource management. However, they are vulnerable to threats like illegal logging and habitat degradation.

- Forest Corridors: Advantages include erosion control, habitat connectivity, and aesthetic improvement. They also contribute to water resource management by reducing runoff and filtering pollutants. Challenges may include fragmentation and degradation due to human activities.

- Urban Park Zones: Advantages include social and recreational benefits, improved air quality, and increased biodiversity. They also aid in water resource management by reducing stormwater runoff and filtering pollutants. Disadvantages may involve limited space and pollution.

Observing the majestic canopies of some trees, one may wonder, "How old is this tree?" It may seem that trees have always been and will always be in the same abundance and quality. However, the world is constantly changing, with fluctuations in forested areas. Demand increases every year, leading to more trees being cut down. The only solution is to plant young trees in these areas, but it takes at least 15 years for a tree to grow to a substantial size.



Fig, 1-a. Earth's surface, unclassified

Fig 1-b. Earth's surface classified by channels

We can follow the trend of forest cover changes with the help of Fastiv district. Acquired from satellite images using the Dynamic World satellite dataset, they offer near-real-time images of land-use and land-cover (LULC) dynamics on Earth's surface. These images are derived from Sentinel-2 L1C satellite imagery. This is what a snapshot of the earth's surface looks like without processing. This is an already declassified picture, each of the colors represents a different type of cover.

After we get the images, we can calculate the area of each of the landscape covers, so we can observe the trend of forest cover area change.

*Table 1*

The *t*able of changes in the forest cover of the Fastiv district for the period 2016-2023

| Years | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 |
|---|---|---|---|---|---|---|---|---|
| Trees ha | 67394,8 | 60799,7 | 69619,4 | 63237,8 | 62396,7 | 63203,2 | 62460,7 | 62837,3 |
| Coverage percentage | 38,87 | 35,07 | 40,16 | 36,48 | 35,99 | 36,46 | 36,03 | 36,25 |

As it seen from the graph (Fig. 1) the lowest indicators of wood cover were in 2017 and the largest forest cover was in 2018.

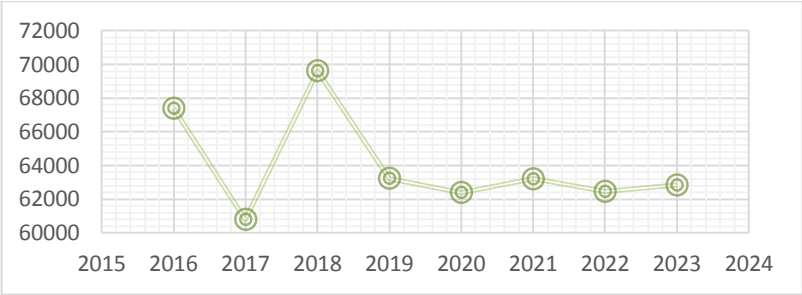



Fig. 1 - The trend of changes in the forest cover of the Fastiv district during 2016-2023

Since our country has embarked on the path of sustainable development, the wise use of resources ranks first among all 17 goals. After all, not being able to manage our own resources will not allow us to move forward and preserve the environment. Therefore, the involvement of local authorities, that is, the OTG, can help us with this. After all, they know better than anyone what exactly their territories need, and for more effective territory management, the classification of covers can help. Which in real time can show what and where it is. We can monitor the change trend since 2015, and based on the obtained data, we can predict future changes, prevent degradation or harmful successions. With a rational territory of each OTG, we will be able to improve the ecological condition in our country.

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