Field-Map using in Ukraine
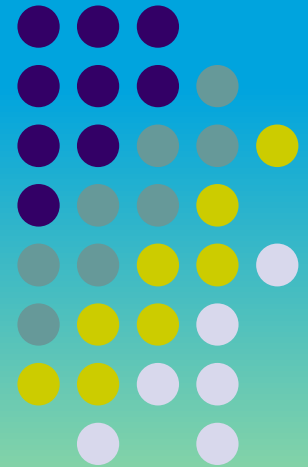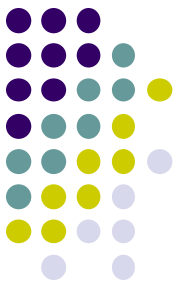
Ihor Buksha, Tetiana Pyvovar

Ukrainian Research Institute of Forestry and Forest Melioration, Kharkiv

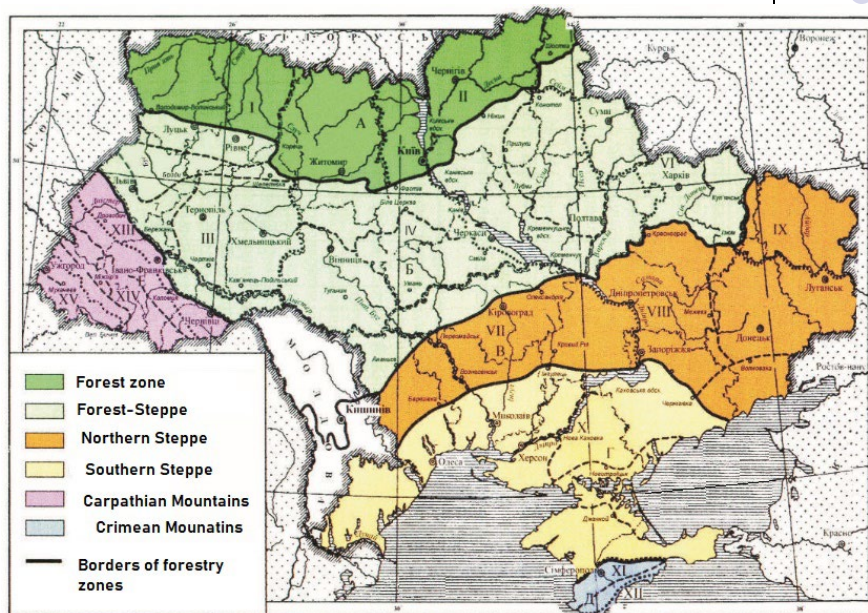# Part I: General overview of Field-Map using in Ukraine

- Briefly about Forestry of Ukraine

- History of Ukrainian cooperation with IFER

- Field-Map in Ukraine – the past and current

- Practical works in 2021-2022:
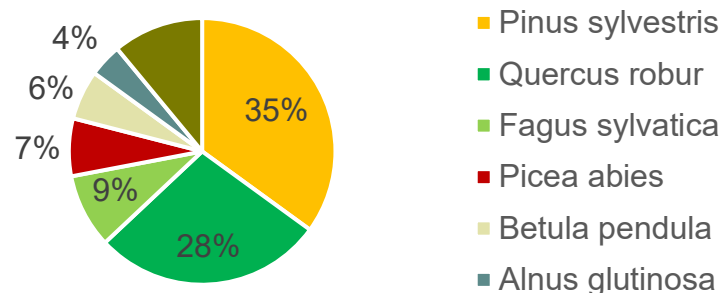Field data collection for preparation of the Forest Management Plan
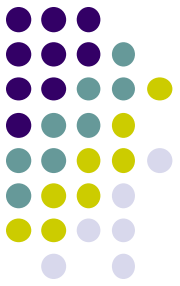
Briefly about Forestry of Ukraine

- Total area of forest lands – 10.4 mln. ha; area of forests – 9.6 mln. ha (15.9% of the country area);

- State owned forests – 73%;

- Coniferous – 43.6%, hardwood – 40.2%, softwood broadleaves and shrubs – 16.2% ;

- Average growing stock – 225 m3 / ha ;

- Total growing stock – 2.15 billion m3.

Legend:
- Forest zone
- Forest-Steppe
- Northern Steppe
- Southern Steppe
- Carpathian Mountains
- Crimean Mounatins
- Borders of forestry zones

Main tree species of Ukraine, %

- 35% Pinus sylvestris
- 28% Quercus robur
- 9% Fagus sylvatica
- 7% Picea abies
- 6% Betula pendula
- 4% Alnus glutinosa

Source: SFRA-2011

The Czech-Ukrainian project "TechInLes" 2004-2010

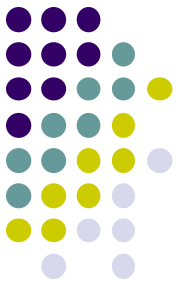**Phase 1:** **Transfer of advanced methodological and technological knowledge in the field of inventory and monitoring of forest ecosystems (TechInLes) - 2004-2006.**

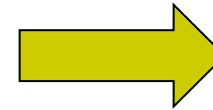**Phase 2: Cooperation in Inventory of Forest Ecosystems (TechInLes-2) - 2008-2010.**
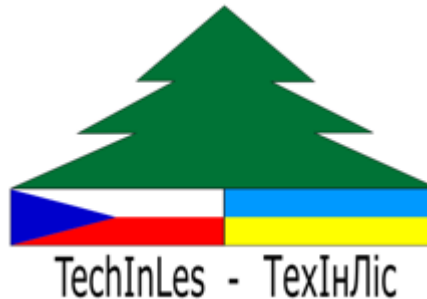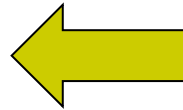
The main directions of the TechInLes-I:

Sample based inventory for forest management units and national parks

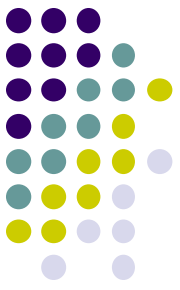Development technology for NFI and FMP in Ukraine

Inventory and mapping of city parks and gardens

TechInLes - ТехІнЛіс

Stand precutting assessment, evaluation of stand assortment structure

The main topics of TechInLes-II:

- Development of **information standard** and **exchange format** for forestry of Ukraine

- **Sample based forest inventory** on the local, regional levels (pilot)

- Forest **management planning** (pilot experiments)

- Account of wood resources (**precutting assessment** and assortments)

- Integration and analysis of field data for **forest health monitoring**

- Conversion of data for **preparation of forestry GIS** on Transcarpathian (439,8 thous. ha)

- FM technology **support of education** on forestry faculties in 3 Universities (Kyiv, Lviv, Kharkiv)

Current use of Field-Map in Ukraine: for research, education and practice


Research

Field-Map technology

Practice

Education
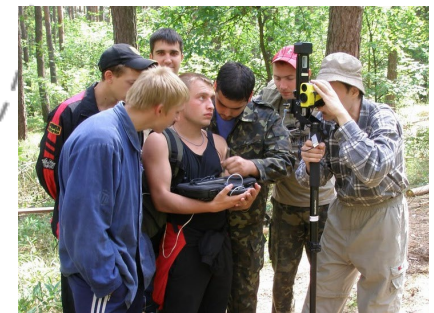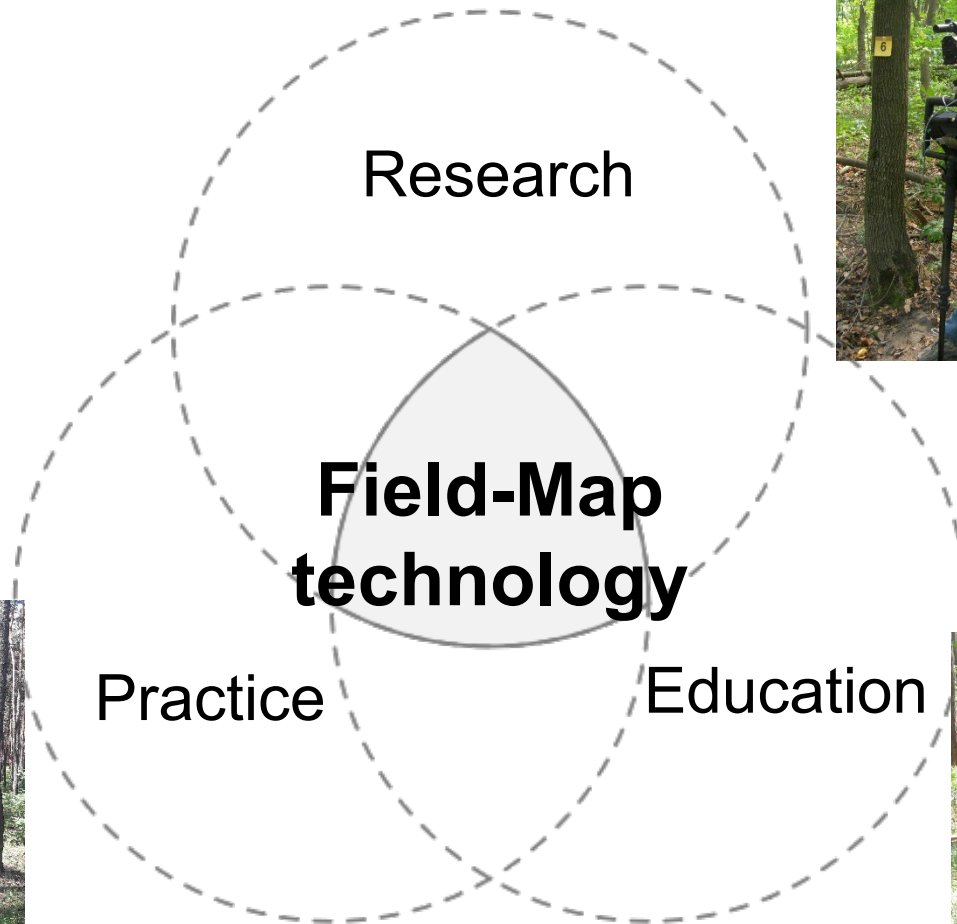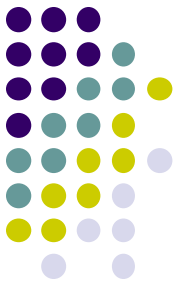
Now:11 Field-Map technology sets in Ukraine
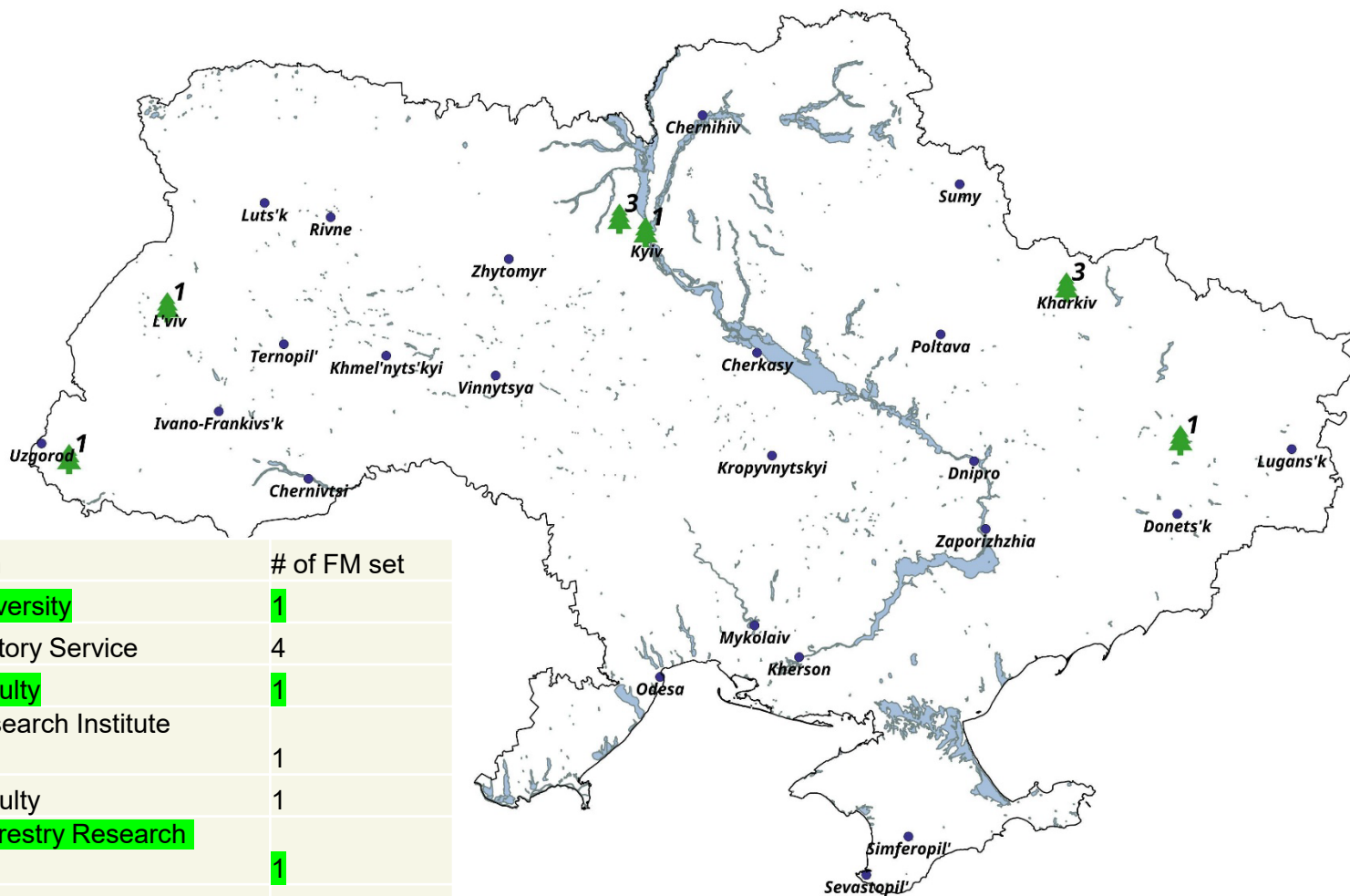
City	Organisation	# of FM set
Lviv	Forestry University	1
Irpin	Forest Inventory Service	4
Kyiv	Forestry Faculty	1
Kharkiv	Forestry Research Institute (URIFFM)	1
Kharkiv	Forestry Faculty	1
Ivano-Frankivsk	Mountain Forestry Research Institute	1
Mukacheve	Forestry Research Station	1
Kharkiv	Urban Forestry Department	1
Kramatorsk	Department of Ecology	1
Total		11

8

Field-Map in National forest monitoring program (since 2005)
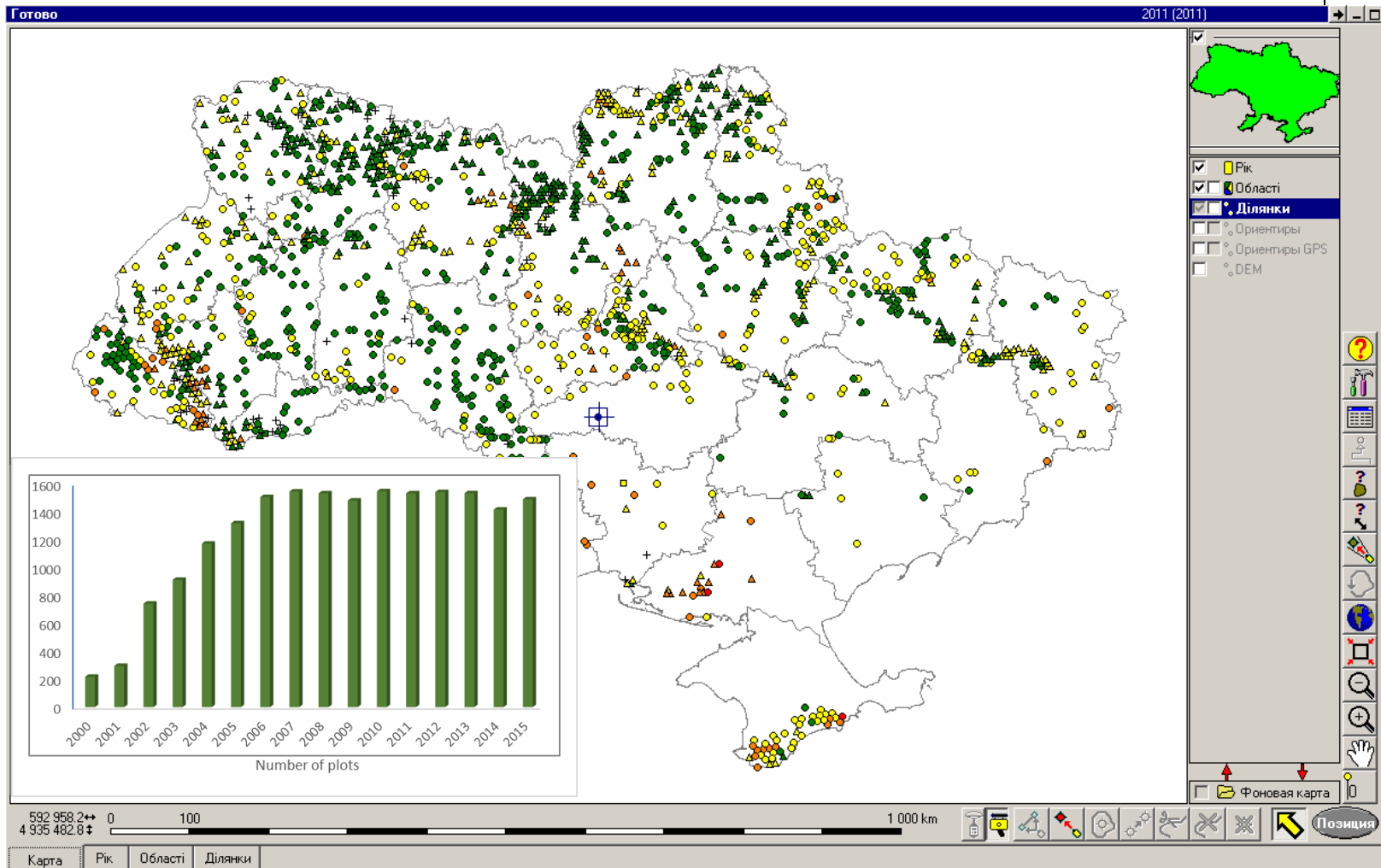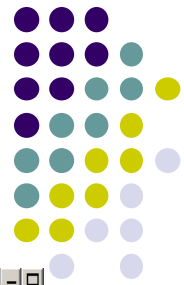
Standing timber volume assessment and assortment

By model trees (-)
By assortments tables (--)
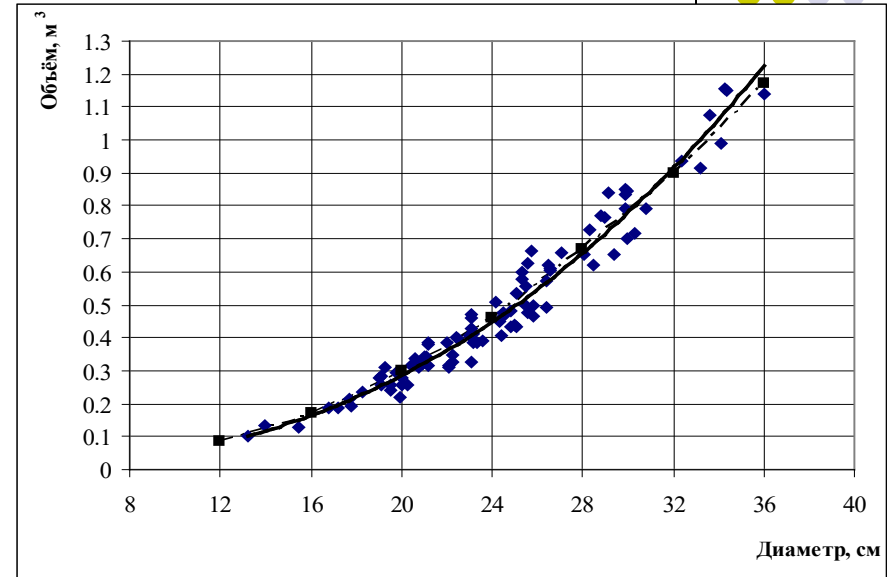
Volchansky forestry enterprise, Rubezhansky forestry, compartment 34

Cutting area - 0.9 ha

Accounts trees - 94

Deviations sum of volumes defined by

Field-Map before logging and after logging - 0.2%

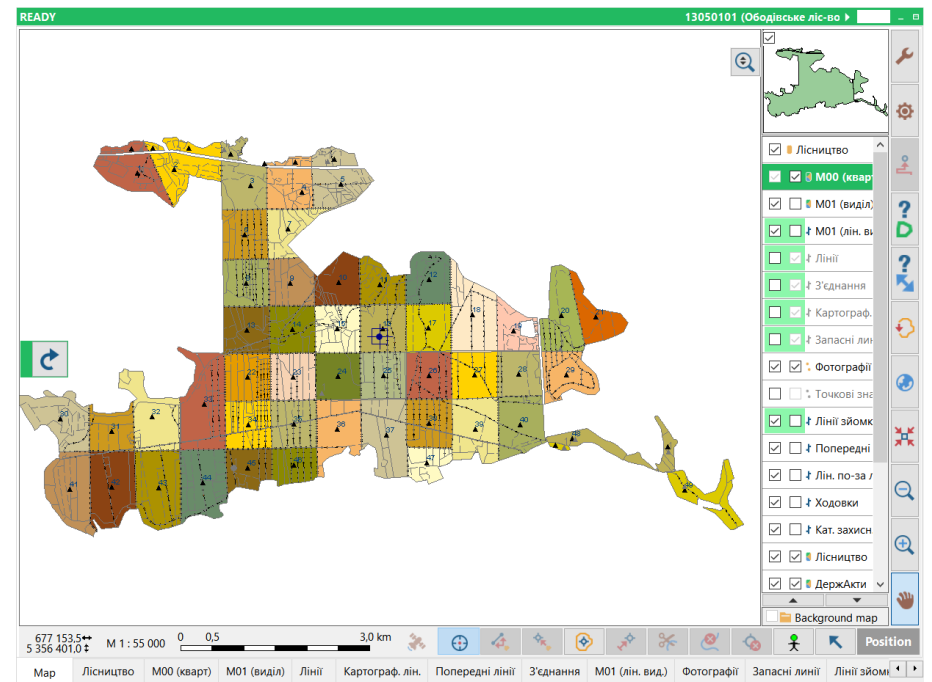# Using of Field-Map for inventory of Urban Forests and Parks

Support of the forest management planning (FMP) in 2021-2022: Field data collection for preparation of the FMP

1. Adaptation of the Field-Map project to the requirements of legislation and forest management in Ukraine.

2. Complete preparation of reference information (taxation and cartographic databases, orthophoto plans) to add to the Field-Map project

3. Creation of the Field-Map project for field works on stand-wise forest inventory in a forestry enterprise in Ukraine fully adapted to the working conditions in Ukraine.

Support of the forest management planning (FMP) in 2021-2022: Field data collection for preparation of the FMP (cont.)

4. Technical support from IFER and URIFFM of field work using Field-Map.

5. Training of Lisproect specialists on the use of the 19th version of the Field-Map.

6.Supply of equipment (notebook, field computer with WINDOWS-10 (Microsoft Surface Go 2), GPS receiver) and Field-Map licenses.

7. Transferring in 2022 of the additional 6 sets of field equipment and Field-Map licenses to Ukrainian Lisproject.

8. Field data processing.

Stand wise forest inventory UkrTax – pilot study in 2021
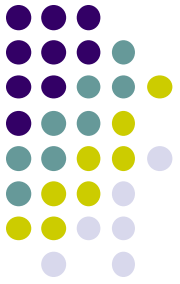
- In the Obodivsky subunit of the Bershadske State Forestry Enterprise of Vinnitsia oblast from 21.10 to 30.11.2021

- The result is a complete forest inventory description and cartographic materials for forest management in the Obodivske subunit.

Stand wise forest inventory on the base of Field-Map application "UkrTax" in 2022

- In 2022 the team is planning to conduct stand wise forest inventory using FM application UkrTax and prepare the Forest Management Plan for Horodok State Forestry Enterprise.

- Two sets of the field equipment were donated from IFER to Ukrainian Lisproekt.

- Four sets of the field equipment is under preparation to donate from Czech Foresters to Ukrainian Lisproekt.

Several facts on current situation in Forestry of Ukraine

- 82.5 th km2 of country area – are mined
- on 2.9 th km2 of forest lands (45 forestry enterprises) – were active military actions,
- 1.5 th km2 of forest lands are occupied
- 4,5 th forest employees are in Armed Forces of Ukraine
- 17 forest employees dead, 16 severely wounded.
- 470 cars were given to army needs
- Destroyed infrastructure – buildings, roads, bridges, cars and equipment

Території України, які внаслідок широкомасштабної агресії РФ є вибухонебезпечними (обстежувані та підтверджені небезпечні райони) та потребують гуманітарного розмінування

Загальна площа небезпечних (забруднених вибухонебезпечними предметами) районів України щонайменше 82 525 км²

Умовні позначення:
- Підозрювані та підтверджені небезпечні райони України
- Небезпечні райони тимчасово окупованих територій Донецької та Луганської областей
- Тимчасово окупована територія АР Крим

* орієнтовний підрахунок станом на 21 березня 2022 року

Розроблено експертною групою Асоціації саперів України у відповідності до IMAS 08.10

Карта опасных территорий Украины. Изображение: facebook.com/Ukrainiansappers

Source: https://www.silvarium.cz/lesnictvi/ukrajinsti-lesnici-...
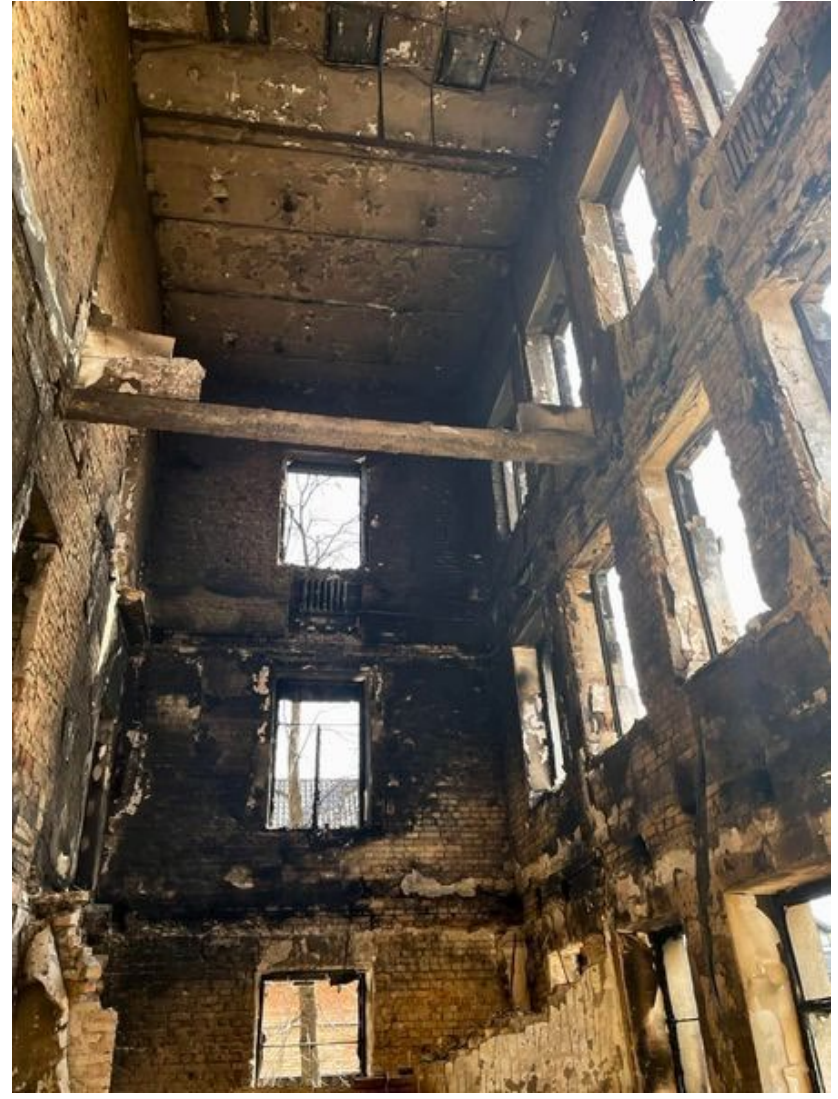https://korrespondent.net/ukraine/4459221
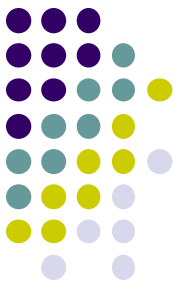
Current situation in forestry research and forest management planning of Ukraine

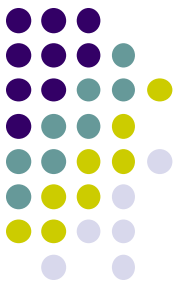Trostyanets forestry research station in 2021 (above) and in 2022 (below)

Building of Ukrainian forest management planning organization (Lisproject), April 2022

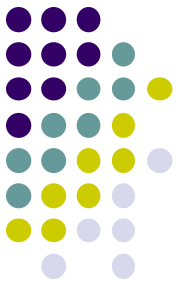# Part II: Steps towards NFI in Ukraine

Part II: Steps towards NFI in Ukraine

- Pilot studies: inventory of NNP "Gomolsha forests"

- Regional forest inventories in Ivano-Frankivsk and Sumy oblasts

- National Forest Inventory in Ukraine - current situation
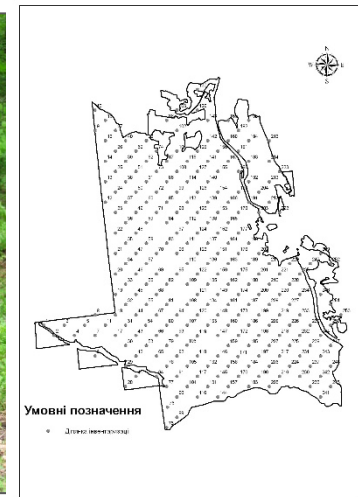
Pilot study: sample based inventory of NNP "Gomolsha Forests" (Kharkiv oblast)

Two forest inventories
- in 2005 and 2009 on 3377,3 ha,
Field-Map was used for:
- designing a network (350x350 m, 253 plots);
- creating a database structure;
- field observations;
- data processing and analysis (Field-Map Inventory Analyst and Scripting).

Methodology and plot design

- Circular inventory plot R=12.62 m (area 500 m2). Trees were evaluated on concentric circles.
- Circle 1 (R=3 m) DBH >7 cm
- Circle 2 (R=7 m) DBH >12 cm
- Circle 3 (R=12.62 m) DBH>25 cm.

Regeneration was assessed on three circular sites (R=1.15 m).
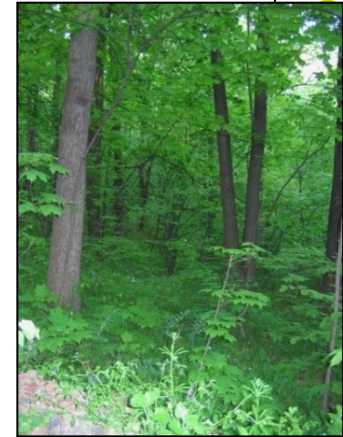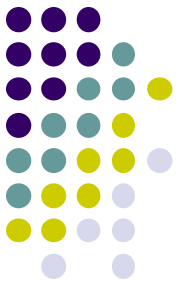
Field work included:

search for sites on the ground using GPS;

description of the site, forest stand, vegetation;

mapping, measuring and describing trees; description of regeneration,

measurement and description of dead wood.

In 2009 detailed description of ground vegetation on sample plots and registration of wild animals signs were added in the methodology.
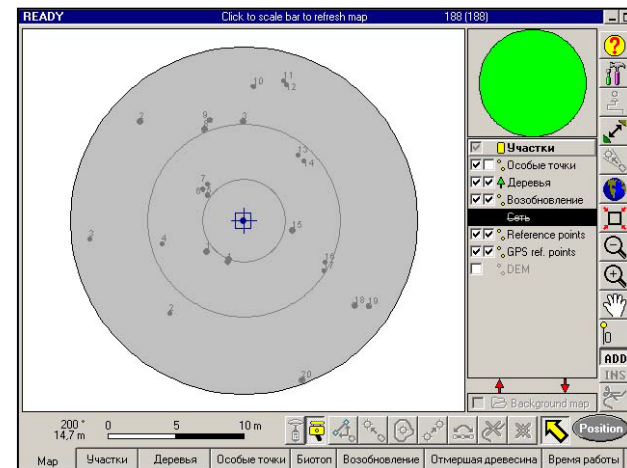
Results of the pilot study

• For the first time in Ukraine the entire procedure of sample based forest inventory was tested - a network of forest inventory plots was designed for the NNP territory and 2 repeated surveys were carried out.

• Valuable information on forest biodiversity and forest health, landscape typology and carbon sequestration on the territory of NNP was obtained at the time of its creation, and over 4 years.

• The used methodology approaches become the methodological base for pilot studies - regional forest inventories and further NFI development.
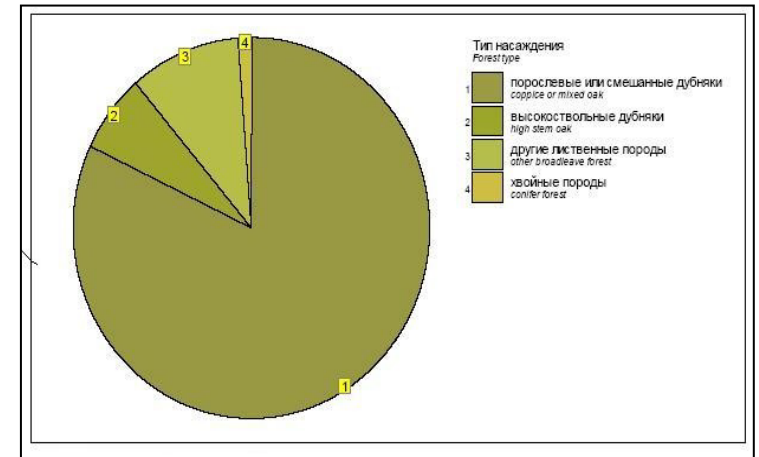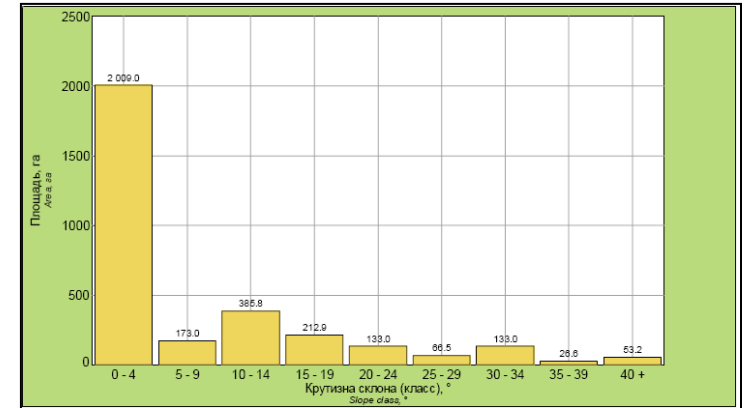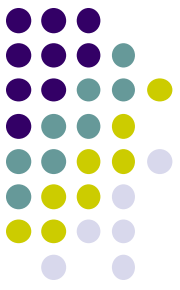
Pilot studies in 2008-2015: Regional forest inventories

Sumy oblast (23 832 km$_2$)
1. 2008-2012 – 1118 forest sample plots
2. 2013-2015 – repeated observations
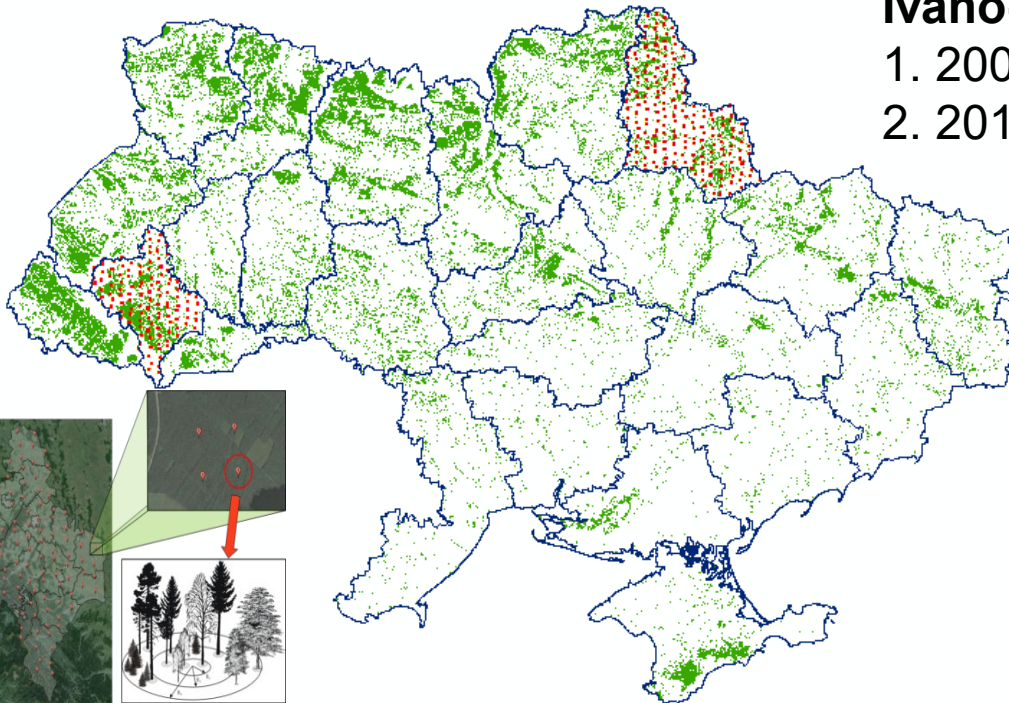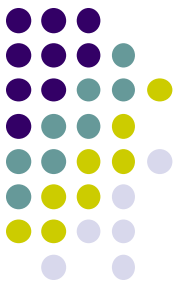
Ivano-Frankivsk oblast (13 927 km$_2$)
1. 2009-2013 – 879 forest sample plots
2. 2014-2015 – repeated observations

Source: nfi.org.ua

Main results of RFI

- Methodology + practice
- Statistical information on forest area distribution, growing stock , deadwood, average evaluation indicators, indicators of biodiversity and health condition of forests, natural regeneration of forests

Comparison of results of RFI with State forest accounting data

Oblast	Data source	Growing stock, mill m^3	Area, thous ha	Average growing stock, $m^3 \, ha^{-1}$
Sumy	Forest accounting data (2010)	109.23	425.0	257
	Regional forest inventory (2008-2012)	106.97 (95.99-117.95)	404.9 (370.0-439.7)	264
Ivano-Frankivska	Forest accounting data (2010)	156.26	571.0	274
	Regional forest inventory (2009-2013)	154.79 (135.72-173.86)	530.6 (481.0-580.0)	292

Source: nfi.org.ua

NFI pilot studies: Increment of stands of main tree species in in Ivano-Frankivsk and Sumy oblast, m³/ha per year

	Annual	Average
Spruce	13,1	6,5
Beech	13,1	5,6
Oak	8,0	3,5
Fir	14,0	5,5
Alder	6,0	5,1

	Annual	Average
Pine	10	5,4
Oak	8,5	5,1
Ash	9	4,8
Alder	9,1	3,9
Birch	7,1	3,8
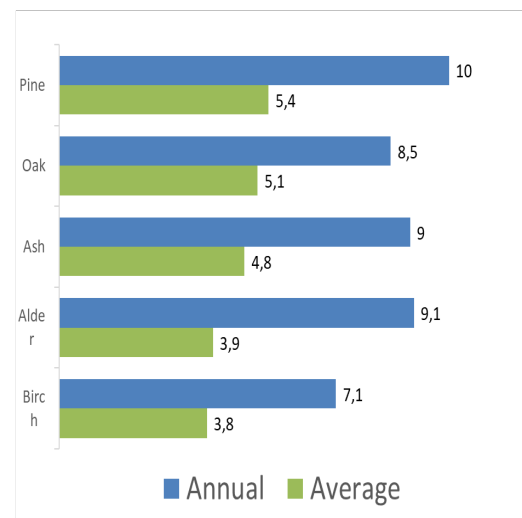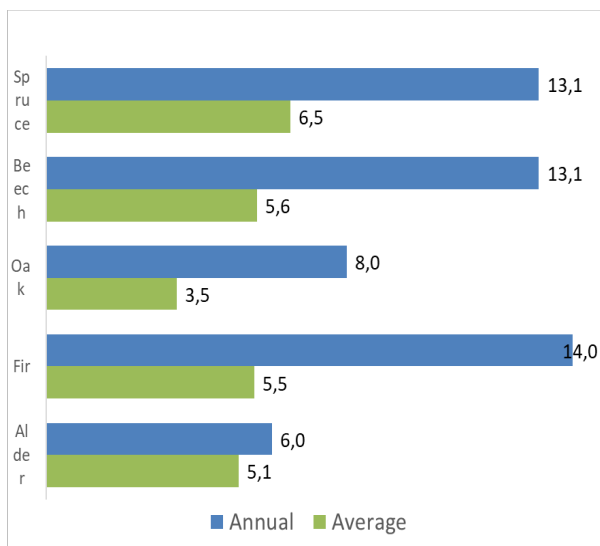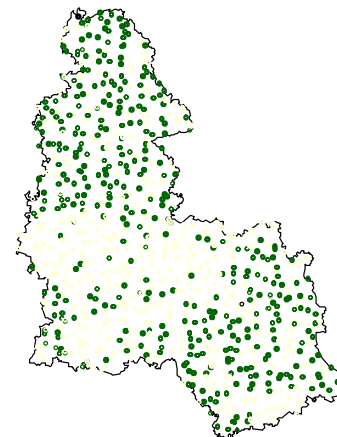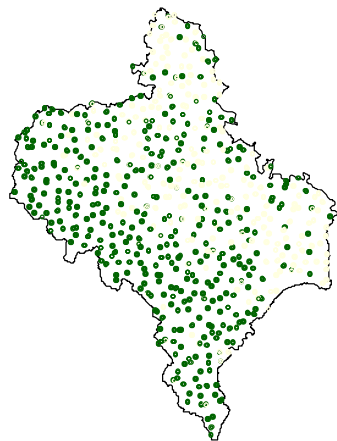
Source: nfi.org.ua
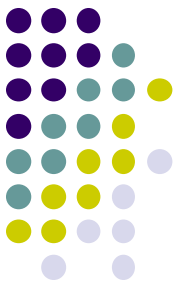
NFI Data collection in 2021

- In July 2021- the First cycle of NFI in Ukraine started.

- The inventory cycle is planned for the period 2021-2025.

- Field works were carried out by 8 inventory teams + 2 control teams.

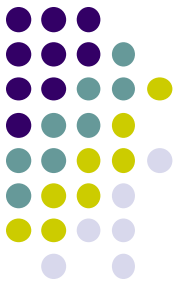- Generally on 909 inventory plots survey was carried out :

In Sumy oblast (North-East of Ukraine) – 219 plots;

In Kyiv oblast – 232 plots;

Ivano-Frankivsk oblast (West of Ukraine - Carpathian Mts) – 236 plots;

Cherkasy oblast (Central part of Ukraine) – 163 plots;

Mykolaiv oblast (South of Ukraine) – 59 plots.

NFI of Ukraine: Main features

- 6 year cycle = 5 years for field data collection + 1 year for reporting;

- Grid of inventory tracts randomly distributed in 4,95 km x 4,95 km inventory quadrats

- Projected number of forest inventory plots ~16,7 thousand;

- In Carpathian, Forests and Forest-steppe zones – annual field works on 2.8 thous. forest inventory plots (sampling 20%);

- In Steppe zone – during one year on 2,5 thous. forest inventory plots (sampling 100%)
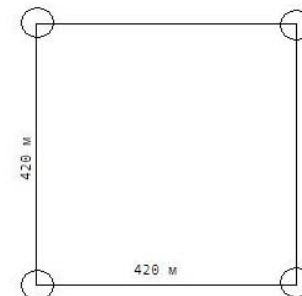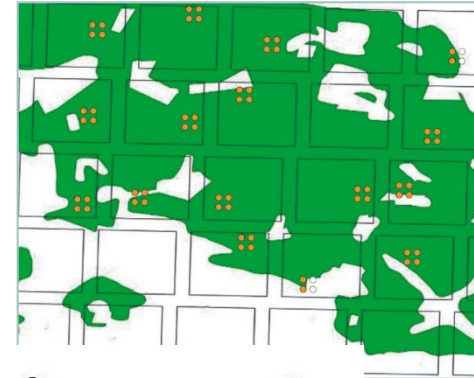
Inventory tract
420x420 m
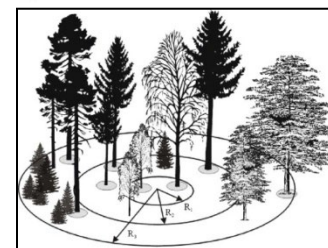
Inventory plot - R=12,62 m, area 500 m2
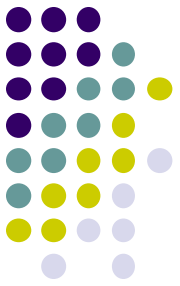
NFI methodology

Concentric circles.
1 (R=1,78 m) Dbh≥2 cm
2 (R=3,98 m) Dbh ≥6 cm
3 (R=8,92 m) Dbh ≥ 14 cm.
4 (R=12,62 m) Dbh ≥ 26 cm.

Regeneration - 2 circles (R=0,56 m).
Possibility to divide plot area on subplots according to land categories.

Підділянка 1
R= 3,98 м
S= 50 м²

Основна ділянка
R= 12,62 м
S= 500 м²

Підділянка 2
R= 1,78 м
S= 10 м²

Мікроділянка
R= 0,56 м
S= 1 м²

Підділянка 3
R= 7,98 м
S= 200 м²
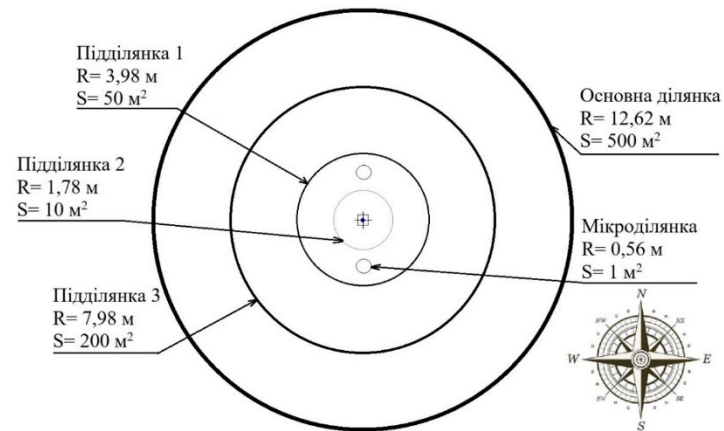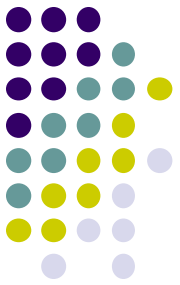
Main indicators

Plot: geographical characteristics, altitude, availability, etc. User information.

Subplot: land use category, category of forests, dominant species, origin, naturalness, forest type condition. Stand description: species, age. Relief, exposition and slope. soil characteristics.

Influence factor, type, degree, year of influence.

Ground vegetation and **shrubs** species and percentage.

Trees. Coordinates, species, dead trees, DBH, quality, Kraft class, tree fork. Health condition. Presence of damages (type, factor, place of damage, intensity).

Height of model tree, bases of living and dead crown, crown length, stump diameter, discoloration, defoliation.
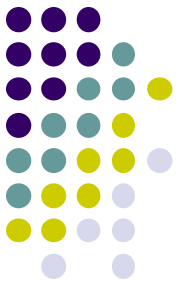
Age of tariff tree, increment for 5 and 10 years.

Regeneration. List of units by height classes (species, origin, diameter, age, number of living, type of damage, age)

Deadwood: species, length, diameters, decomposition stage

Stumps: (species, diameter, height, decomposition stage, type of rot and its location, age of felled tree).

Situation with NFI in 2022

NFI plan for 2022 – 4.5 thous. inventory plots.

The theoretical part of staff training was conducted in February 2022

Field training is scheduled on June

Field works can be conducted only in some regions of Ukraine, because of:

-    Danger for field teams – in areas of active military operations or temporary occupied areas;

-    Human capital - many forest specialists engaged in NFI are now in the Military forces of Ukraine.

-    Absence of financial support of NFI Center from State budget;

-    Material losses: main office of Ukrainian Lisproect, including NFI Center located in Irpin, was destroyed during military operations;
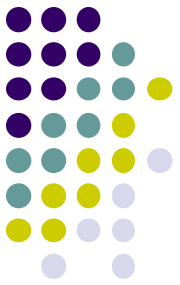
NFI data processing
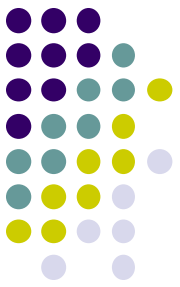
Data processing of first NFI data (2021) using Field-Map

- Data control (PM, DQT, FBDT)
- Data preprocessing

(FMIA, Scripting)

- Classification
- Reclassification
- Trees heights modelling
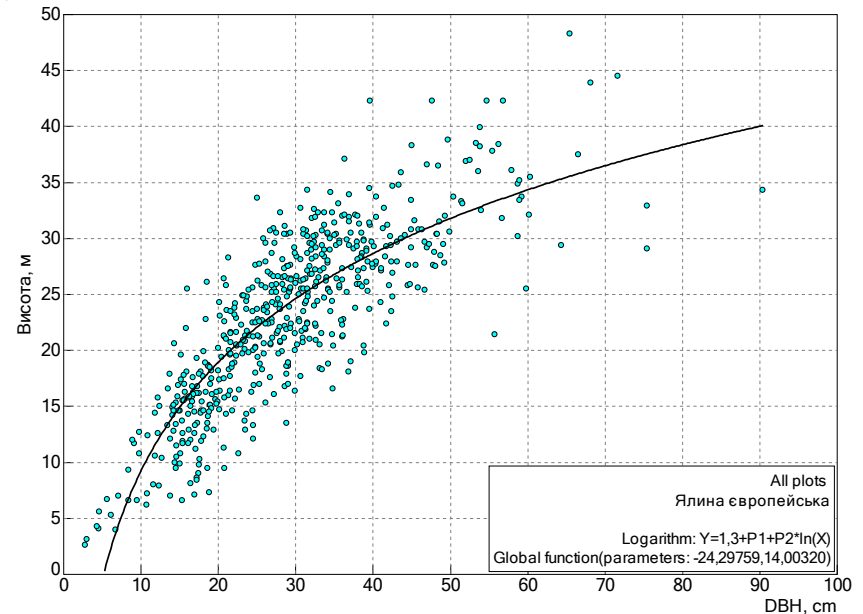
Expected NFI results

The technical documentation on NFI includes the list of 83 reporting tables, which are grouped into:

- forest area;
- growing stock of forest stands;
- volume and number of trees;
- increment, felling and mortality (after 2 cycles);
- average evaluation indicators of forest stands;
- indicators of biodiversity and biological sustainability of forests;
- indicators of health condition of forest stands;
- condition of tree seedlings and natural regeneration of forests.
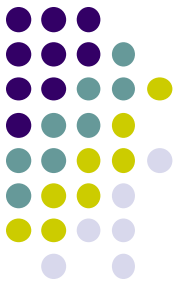
Acknowledgements

All our works mentioned in the presentation were conducted on the base of Field-Map technology due to methodological and technical support of IFER colleagues – Dr. Martin Černy, Ing. Petr Blažek, and other colleagues.

Thank you for attention!

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