Database Report

Technical Changes in 2021

ICP Forests Database Report under the UNECE Convention on Long-range Transboundary Air Pollution (Air Convention)

United Nations Economic Commission for Europe (UNECE)
Convention on Long-range Transboundary Air Pollution (Air Convention)
International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests (ICP Forests)

http://icp-forests.net

Contact

Programme Co-ordinating Centre of ICP Forests
Kai Schwärzel, Head
Thünen Institute of Forest Ecosystems
Alfred-Möller-Str. 1, Haus 41/42
16225 Eberswalde, Germany
Email: pcc-icpforests@thuenen.de

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CONTENTS

INTRODUCTORY REMARKS

This document is supposed to give a quick overview of relevant database changes in the period 2019 – 2021. Editorial changes (e.g. language improvements) are not mentioned here.

Most of the changes come from the manual revision in 2019.
In addition, some changes were needed to correct wrong implementations from the past.
Such changes which do not affect the monitoring itself are marked with "database maintenance" in the document.

Please take into consideration, that this report can represent just an intermediate status.
The current specifications are always documented under: https://icp-forests.org/documentation.

SYSTEM INSTALLATION (LEVEL I AND II)

Forms PL1 / PLT (Plot description)

https://icp-forests.org/documentation/Surveys/Y1/PL1.html | https://icp-forests.org/documentation/Surveys/SI/PLT.html

New column

- relocated_plot: In case a new plot is installed in order to replace another one, the number of the replaced plot is to be reported.
  E.g. Plot number 33 has been destroyed by a storm, then a replacement plot was installed with code 100 at a different location. The attribute PLT.relocated_plot of the new plot 100 has to be filled with 33.

Mandatory

Following attributes have changed from optional to mandatory in accordance to the manual:

- plot_size: plot area, at least 0,25 ha, does not include the area of the buffer zone

Forms ST1 / STA (Stand description)

https://icp-forests.org/documentation/Surveys/Y1/ST1.html | https://icp-forests.org/documentation/Surveys/SI/STA.html

New columns

- cutting_year: Unless the stand is managed to keep a permanent cover of adult trees, the year of the final cutting must be approximately estimated (while assuming that no unplanned disturbance will destroy the stand earlier).
- canopy_gaps: Stand heterogeneity is evaluated with the cumulated area of large gaps in the canopy (gaps larger than those caused by thinning operations) due to e.g. storm damages.
- stand_rotation: The stand rotation number aims to count the successive tree populations that have been monitored in the same plot area. It starts from 1 with the first forest stand monitored since plot installation.
- code_notimb_util_buffer: Non-timber utilization in the buffer zone
- code_manage_intensity_buffer: Intensity of management in the buffer zone

Mandatory Level II

Following attributes have changed from optional to mandatory for Level II plots in accordance to the manual:

- top_height: Mean height of the 100 trees with the largest diameter at breast height (dbh) per ha
- det_top_height: Determination of top height
- cov_layers: Coverage tree layers

Renamed columns

OLD	NEW
code_notimb_util	code_notimb_util_plot
code_manage_intensity	code_manage_intensity_plot
code_manage_method	code_silvicult_system

New dictionary categories

Changes indicated with green colour in tables

- d_prev_landuse: Previous land use
  https://icp-forests.org/documentation/Dictionaries/d_prev_landuse.html

Code	Description	From_year	To_year
1	Farmland, cropland	1984	
2	Grassland	1984	
3	Pasture, including silvo-pastural systems	1984	**2020**
3.1	Shrubland, including heathland / moors	1984	
4	Drained wetland	1984	**2020**
4.1	Wetland	1984	
5	Primary forest	1984	
5.1	Forest and woodland (other than primary forest)	1984	
6	Other	1984	
7	Reclaimed land from mining or industrial activities	1984	
9	Unknown	1984	

Dictionary renamed

OLD	NEW
d_manage_method	d_silvicult_system

Form TCO (Tree coordinates - Level II only)

https://icp-forests.org/documentation/Surveys/SI/TCO.html

The form already existed for many years, but data has not been submitted so far. The form can be used to submit following information:

- exact coordinates of trees as relative positions to the centre of the plot
- numbers used for a specific tree in surveys conducting data on tree level (It is known that a tree might have differing numbers in surveys. Having all numbers used for a tree level information can be brought together over different surveys.)
- information if a tree is inside or outside of the main plot

Form EVE (Forest events - Level II only)

https://icp-forests.org/documentation/Surveys/SI/EVE.html

New Form

- EVE: Management operations and natural disturbances: All noticeable forest management operations and all natural causes of tree losses in Level II plots since plot installation – and even from earlier if the information is available – must be listed, dated (as precisely as possible) and documented (as far as known), so that they can be taken into account as potential explanatory factors of ecosystem responses. This information must be updated at least every 5 years.

GROWTH AND INCREMENT (LEVEL II)

FORM IPM (Periodic measurements)

https://icp-forests.org/documentation/Surveys/GR/IPM.html

New columns

- code_diameter: Exact diameter measurement method, coded in d_diameter
  https://icp-forests.org/documentation/Dictionaries/d_diameter.html
- code_volume: Exact volume definition, coded in d_volume
  https://icp-forests.org/documentation/Dictionaries/d_volume.html

PHENOLOGY (LEVEL II)

Overall

https://icp-forests.org/documentation/Surveys/PH/index.html

New dictionary category

Changes indicated with green colour in tables

- d_event: A new phenological phase 'fruiting' is introduced as an optional parameter
  https://icp-forests.org/documentation/Dictionaries/d_event.html

Code	Description	From_year	To_year
1	Flushing	1984	
2	Colour changes	1984	
3	Leaf/needle fall	1984	
4	Leaf or crown damage	1984	
5	Other damage	1984	
6	Lammas shoots / secondary flushing	1984	
7	Flowering	1984	
8	Fruiting	1984	

Dictionary updates

Changes indicated with green colour in tables

- d_event_score: Due to the introduction of the new phenological phase 'fruiting' the score descriptions were updated as well
  https://icp-forests.org/documentation/Dictionaries/d_event_score.html

Code	Description
6.0	Flowering / Fruiting / Damage absent
7.0	Flowering / Fruiting / Damage present
7.1	Flowering / Fruiting sparse (optional)
7.2	Flowering / Fruiting moderate (optional)
7.3	Flowering / Fruiting abundant or mast (optional)

Form PLP (Registration of trees)

https://icp-forests.org/documentation/Surveys/PH/PLP.html

New dictionary categories

Changes indicated with green colour

- d_visible_crown: New category 'Total crown including isolated branches' was added
  https://icp-forests.org/documentation/Dictionaries/d_visible_crown.html

Code	Description
1	Top of the crown
2	Middle of the crown
3	Top and middle of the crown
4	Whole crown
5	Total crown including isolated branches

- d_direction: New category 'All sides' was added
  https://icp-forests.org/documentation/Dictionaries/d_direction.html

Code	Description	From_year	To_year
1	North	1984	
2	North-east	1984	
3	East	1984	
4	South-east	1984	
5	South	1984	
6	South-west	1984	
7	West	1984	
8	North-west	1984	
9	All sides	1984	

GROUND VEGETATION (LEVEL II)

Form PLV (Plot file)

https://icp-forests.org/documentation/Surveys/GV/PLV.html

New columns

- shrub_low_cover: Shrub low sublayer cover (only ligneous and all climbers) > 0.5 m and ⩽ 2 m height. Has to be reported in % of total area, e.g. 10,5.
- shrub_high_cover: Shrub high sublayer cover (only ligneous and all climbers) > 2 m and ⩽ 5 m height. Has to be reported in % of total area, e.g. 20,0.

OZONE INJURY (LEVEL II)

Form PLL (Plot file)

https://icp-forests.org/documentation/Surveys/OZ/PLL.html

New columns

- code_precision_level (database maintenance): The number of sampled rectangles in LESS sites are determined on behalf of a specified error level. Before 2011 experts could choose between the error levels 10% and 20%. The higher the error level, the less rectangles are sampled. In 2011 the 20% error (code = 20) was permanently skipped, because it led to a too low number of sampled rectangles, thus with lowly reliable results. Consequently since 2011 only an error level of 10% is valid. In this context the attribute code_precision_level has been removed from the form, because it was regarded as needless, for as long as only one value is valid anymore. However, in order to keep up comparability with past assessments before 2011, when both error levels were valid, it is necessary to still hold this information (harmonization over time).
  Therefore, the column code_precision_level was introduced again in form PLL in year 2021. The existing data gap for the years between 2011 and 2020 has been filled with code 10 by PCC (= error level 10%)
- length_less: Total length of light exposed edge

Form LSS (Light exposed sampling site)

https://icp-forests.org/documentation/Surveys/OZ/LSS.html

New column

- code_aspect: Exposition of each assessed rectangle, based on d_direction
  https://icp-forests.org/documentation/Dictionaries/d_direction.html

Column moved

- code_perenial_annual (database maintenance): The attribute lss.code_perenial_annual was valid from 2002 to 2010 and finally removed from the data model in 2011. It described if the observed plants had an annual growth (value 'A') or were perennial ('P'). In order not to lose the gathered information, it was decided to move it to the dictionary d_species_list (https://icp-forests.org/documentation/Dictionaries/d_species_list.html) in the new column 'perennial_annual'. In LSS the same plant species may occur several times throughout the countries and years, and hereby may show different growth habits (annual and perennial). This has led to following rules for the move of this data:
  - 'A' for plant species, which have been assigned in LSS as 'annual' only
  - 'P' for plant species, which have been assigned in LSS as 'perennial' only
  - 'PA' for plant species, which have been assigned in LSS as both 'perennial' and 'annual'.

  In addition, all plant species which are trees (listed in d_tree_spec) have been marked as perennial.

Overall

https://icp-forests.org/documentation/Surveys/OZ/index.html

Redundancy cleanup between species code and species name (database maintenance)

In LTF, OTS and LSS the observed species were described twice: first as a code (using codes from dictionaries d_species_list or d_tree_spec) and second using the scientific name (free text). In many cases these two statements did not match perfectly. Most of the times this was simply caused by typing errors in the scientific name, but however there are cases with different species given in the code and in the name column. Sometimes this was due to synonym names but sometimes there were clear contradictions between code and name.

In order to avoid such contradictions in future, only the species code shall remain and the scientific name column was removed from forms used for the data submission.

In the final database the scientific name columns are kept for the moment.

In case the code and the name both described the same species, the species name has been deleted. For unsolved cases where the code differs from the name both are kept.

Please download your data to check it for any unsolved cases.

Please solve those problems and resubmit the corrected survey years.

As soon as there are no more conflicts in the data, the name columns will be removed.

New dictionary columns

- d_species_list (database maintenance): On the suggestion of ozone chair there was a need to add certain plant characteristics for better analysis options. In detail it is about the woodiness of plants (woody or non woody), the plant type (broadleaf or conifer) and the type of leave loss (deciduous or evergreen). As a first start the values of the plants were already handed over to the PCC by Elena Gottardini.
  Now in d_species_list following three attributes have been added:
  - woody: W = Woody, NW = Not woody
  - plant_type: B = Broadleaf, C = Conifer
  - leaves_loss: D = Deciduous, E = Evergreen

  The attributes have been filled with the values from Elena Gottardini.
  In addition, all plant species which are trees (listed in d_tree_spec) have been marked as woody.
  !!! Please take note that current values are not complete and need to be doublechecked by a botanist. The PCC would welcome if experts from the community could give us feedback here and help to complete the list. !!!

  https://icp-forests.org/documentation/Dictionaries/d_species_list.html

SOIL (LEVEL I AND II)

New survey S1 (Level I)

https://icp-forests.org/documentation/Surveys/S1/index.html

The new survey Soil Level I has been implemented.

It uses the same structure as the Soil Level II survey.

As decided at the Expert Panel Meeting 2019, Bruno de Vos provided a harmonized dataset of all Level I Soil data available at the FSCC.

All partners are asked now to download and check their data from the ICP Forests data portal.

Corrections and additions should be resubmitted.

The survey can be used from now on to submit additional Soil Level I data if available.

Form PRF (Profile description)

https://icp-forests.org/documentation/Surveys/SO/PRF.html

New dictionary columns

- d_soil_adjective (database maintenance): Qualifier definitions used in the soil profile description come from the WRB (world reference base). Meanwhile the WRB has published several versions and some qualifiers are not valid anymore. For better documentation and control of the code's validity, in d_soil_adjective a column for each WRB publication was added, which currently are: FAO_1988, WRB_1998, WRB_2006_2007 and WRB_2014_2015 (see screenshot below).
  The new columns have a value of either 0 or 1, meaning the qualifier code is either not valid (= 0) or valid (= 1) in the respective WRB-version. As a source we used a list received from the panel chair Nathalie Cools.
  https://icp-forests.org/documentation/Dictionaries/d_soil_adjective.html

Dictionaries > d soil adjective

d_soil_adjective

Last change: 2021.8

CODE	DESCRIPTION	FROM_YEAR	TO_YEAR	FAO_1988	WRB_1998	WRB_2006_2007	WRB_2014_2015
a	Andic in GL, Aric in AT, Albic in all other RSGs	1984		1	0	0	0
aa	Aluandic	1984		0	0	1	1
aab	Taptaluandic	1984		0	0	1	0
ab	Albic	1984		0	1	1	1
AB	Albeluvisolic	1984		0	0	1	0

- d_soil_specifier (database maintenance): Comparable to the qualifiers (previous issue), also the specifiers are defined by the WRB (world reference base). Accordingly, also in d_soil_specifier a new column was added for each WRB publication, which are at current state: WRB_1998, WRB_2006_2007 and WRB_2014_2015 (see screenshot below).

The new columns have a value of either 0 or 1, meaning the specifier code is either not valid (= 0) or valid (= 1) in the respective WRB-version. As a source we used a list received from the panel chair Nathalie Cools https://icp-forests.org/documentation/Dictionaries/d_soil_specifier.html

Dictionaries > d soil specifier

d_soil_specifier

Last change: 2021.8

CODE	DESCRIPTION	FROM_YEAR	TO_YEAR	WRB_1998	WRB_2006_2007	WRB_2014_2015
a	Ano-	1984		0	0	1
b	Thapto-	1984		1	1	1
c	Cumuli-	1984		1	1	0
d	Bathi- (1998) or Bathy- (2006,2007)	1984		1	1	1
e	Panto-	1984		0	0	1

New column

- eff_soil_depth: The effective soil depth replaces 3 attributes: rooting_depth, rock_depth and obstacle_depth. The effective soil depth is the depth from top of mineral soil to the continuous rock in cm. Use '999' to report depths known to be deeper than 100cm without knowing the exact depth.
  The previous three attributes will stay in the database for documentation, but cannot be resubmitted.

New tests

- Qualifiers and specifiers (database maintenance) will now be tested during a submission, if they match the given WRB-publication. In case of a mismatch, the system will respond with an error.

Columns moved

- code_humus, code_water (from PLS to PRF) (database maintenance): The attributes humus type (code_humus) and water availability (code_water) were considered as constant variables so far. Consequently, they were stored in the plot file (PLS) as a general characteristic for the whole plot. However, both attributes turned out to be variable in space and time on some plots. Thus both attributes, code_humus and code_water, have been moved now to the profile description (PRF) in order to store them more 'locally'. This happened in accordance with the following rules:

  Case 1: Code_humus and code_water were copied to all profiles which already existed in PRF at the respective plot and survey_year

  Case 2: For the rest of the profiles, having no matching plot and year in PRF, code_humus and code_water were copied into 'dummy lines'. These hold only a minimum of information: code_country, code_plot, survey_year, profile_pit_id, date_profile_desc. As a special feature, all these dummy lines have profile_pit_id '999' as a wildcard.

code_country smallint	code_plot integer	survey_year smallint	profile_pit_id character varying (4)	date_profile_desc date	code_water smallint	code_humus smallint
4	801	1996	999	1996-07-26	2	2
4	801	2012	2715	2012-10-10	2	3

Excerpt from so_prf: The 1st line is a dummy a line. It has been newly added, and all attributes are empty except for the ones shown in the screenshot. The 2nd line is regular, here just code_water and code_humus have been added.

Form SOM (Soil analysis)

https://icp-forests.org/documentation/Surveys/SO/SOM.html

New column

- P_ox: Acid ammonium oxalate extractable P (mg/kg)

SOIL SOLUTION (LEVEL II)

Forms SSM and SSO (Measurements)

https://icp-forests.org/documentation/Surveys/SS/SSM.html

Merged forms SSM and SSO (database maintenance)

The form SSO (optional measurements) has been merged into SSM (mandatory measurements). Both forms have been merged in the final dataset anyway in a form called "SSM". The submission of two separated forms which have to be merged caused several problems in the past. Merging optional and mandatory forms into one data form has been done for all surveys following this structure (e.g. deposition).

FOLIAGE (LEVEL I AND II)

New survey F1 (Level I)

https://icp-forests.org/documentation/Surveys/F1/index.html

Some countries do conduct the foliage survey on Level I plots regularly.

So far this data could not be submitted to the official ICP Forests database as there was no survey "Foliage Level I" implemented.

This survey has now been created and can be used also to submit data from the past.

!!! The PCC would like to encourage all partners to submit this data if available. !!!

Form LQA (Laboratory information)

https://icp-forests.org/documentation/Surveys/FO/LQA.html

New tests

All tests are documented here: https://icp-forests.org/documentation/Tests/FO.html#LQA

- pretreatment methods (database maintenance): The manual recommends certain pretreatment methods for the measurement of different elements.
  Now, tests will check if the combination of element and pretreatment method is reasonable. In dependence of the combination, the system will give …
  - a warning, if the combination is possible but not recommended, e.g. pretreat copper with open digestion PB02-PB06
  - an error, if the combination makes no sense, e.g. pretreat copper with open digestion PB07-PB08

  As a source, EP chair Alfred Fuerst contributed a table overview of all valid combinations. It is published as explanatory item 210 in the online documentation.
- determination methods (database maintenance): The same as with the pretreatment methods (previous issue), the manual also recommends certain determination procedures for the analysis of elements. Tests are checking now if the combination of element and determination method is reasonable. In dependence of the combination, the system will give …
  - a warning, if the combination is possible but not recommended, e.g. determine cadmium with ICP-AES (DB08-DB09)
  - an error, if the combination makes no sense at all, e.g. determine cadmium with an element analyser (DA01-DA05)

  Panel chair Alfred Fuerst contributed a table overview of all valid combinations.
  It is published as explanatory item 211 in the online documentation.

Form FOM (Foliar analysis information)

https://icp-forests.org/documentation/Surveys/FO/FOM.html

New tests

All tests are documented here: https://icp-forests.org/documentation/Tests/FO.html#FOM

- Plausible range tests (database maintenance): Foliar analysis information will be tested now for plausible ranges in more detail. There are three levels of checking:
    - General: the element's measurement has to be >0 or -1 (= below quantification limit) otherwise an error will be given
    - Specific: In dependence of tree species and leaves type, the measurements have to lie in a specific range, otherwise the system will give a warning.
    - Miscellaneous: If the tree species and / or leaves type is not available, then the value will be tested for a more general range.

    As data source, EP chair Alfred Fuerst elaborated a new list of plausible ranges based on current data. In accordance, the updated ranges are published in manual part XII, Version 2020-2 (annex II).

Merged forms FOM and FOO (Measurements) (database maintenance)

In level II, the form FOO (optional measurements) has been merged into FOM (mandatory measurements). Both forms have been merged in the final dataset anyway in a form called "FOM". The submission of two separated forms which have to be merged caused several problems in the past. Merging optional and mandatory forms into one data form has been done for all surveys following this structure (e.g. deposition).

LITTERFALL (LEVEL II)

Form LFM (Analysis information)

https://icp-forests.org/documentation/Surveys/LF/LFM.html

New columns

- Heavy metals: Five new columns were added for heavy metals: Arsenic - As (ng/g), Chromium - Cr (μ g/g), Cobalt- Co (μ g/g), Mercury - Hg (ng/g) and Nickel – Ni (μ g/g)

AIR QUALITY (LEVEL II)

Overall

https://icp-forests.org/documentation/Surveys/AQ/index.html

Tests updates

- Plausiblity limits: The plausibility limits of O3, NH3 AND NO2 (passive monitoring) were updated in AQB, AQP and COL.
  New limits are indicated with green colour:
  - O_3: 5 – **200** µg m^3
  - NH_3: **0.1** – 40 µg m^3
  - NO_2: 0.2 – **40** µg m^3

GROUND VEGETATION BIOMASS AND NUTRIENTS ANALYSES (LEVEL II)

Forms GBM and GBO (Measurements)

https://icp-forests.org/documentation/Surveys/GB/GBM.html

Merged forms GBM and GBO (Measurements) (database maintenance)

The form GBO (optional measurements) has been merged into GBM (mandatory measurements). Both forms have been merged in the final dataset anyway in a form called "SSM". The submission of two separated forms which have to be merged caused several problems in the past. Merging optional and mandatory forms into one data form has been done for all surveys following this structure (e.g. deposition).

CROWN CONDITION (LEVEL I AND II)

Forms TRE / TRC (Crown condition)

https://icp-forests.org/documentation/Surveys/C1/TRE.html | https://icp-forests.org/documentation/Surveys/CC/TRC.html

New dictionary categories

- d_crown_assess: A new category 'Upper two thirds of the crown' (code 6) has been introduced.
- d_social_class: A new category 'Other cases (trees growing in gaps etc.)' (code 9) has been introduced.

Forms TRF / TRD (Damage parameters)

https://icp-forests.org/documentation/Surveys/C1/TRF.html | https://icp-forests.org/documentation/Surveys/CC/TRD.html

Dictionary updates

- d_cause and d_cause_sc_name: Several damage causes could be defined using both variables in different ways. As a result the analysis of the dataset became difficult.
  Entries of both dictionaries have been harmonized so that each species is only available in one of them.

  All changes made to both dictionaries are documented here:
  https://icp-forests.org/documentation/Change_History/Change_of_dictionaries/index.html

  d_cause: https://icp-forests.org/documentation/Dictionaries/d_cause.html

  d_cause_name: https://icp-forests.org/documentation/Dictionaries/d_cause_sc_name.html
- d_damage_age: The description / definition (column: "long_desc") of code 1 and 2 has been updated.
- d_removal_mortality_ccgr:
  - Description of code 3 has been updated.
  - code 4 has been deactivated for both surveys CC and C1