SVERIGES
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PLOTPF
User's manual

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Institutionen för markvetenskap
Avdelningen för lantbrukets hydroteknik

Swedish University of Agricultural Sciences
Department of Soil Sciences
Division of Agricultural Hydrotechnics

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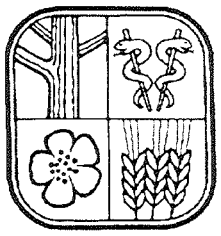

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Table of contents

Background

PLOTPF has successively been developed from a simple version with the main objective to plot the pF-curve on Tektronix devices to the present version also including data editing options as well as retrieval and storage in a data base format. The first version of the program was available on PDP-computers which later on was transferred to VAX and PRIME. The present version is only available for IBM-PC compatible computers using graphic adapters such as: Hercules, CGA, MCGA, EGA and VGA.

To handle the graphic outputs special utility programs named CTEK, PTEK and STEK are developed. These programs are part of the Pgraph package and they are described in detail in the manual and help library for the Pgraph program.

The present version of this program version was developed in August 1993. Details concerning new options in the program are found in the news section of this report.

Purpose

PLOTPF was developed for:

- Handling soil properties in a data base format
- Providing an easy way of selecting input data to the SOIL model
- Providing an easy way of modifying and changing soil properties
- Estimation of coefficients in the Brooks & Corey expression of the water retention curve.
- Showing soil properties in diagrams and tables

Program structure

Different menus give the user high flexibility and a number of options to enter commands. The options are arranged in groups covering:

- D -Definition of default values
- L - Listing of soil properties
- P - Plotting soil properties
- C- Changing or adding data
- F - Transferring of information between different file formats and data base
- E - Exit from the program

An overview of the submenues to this groups of options are given below:

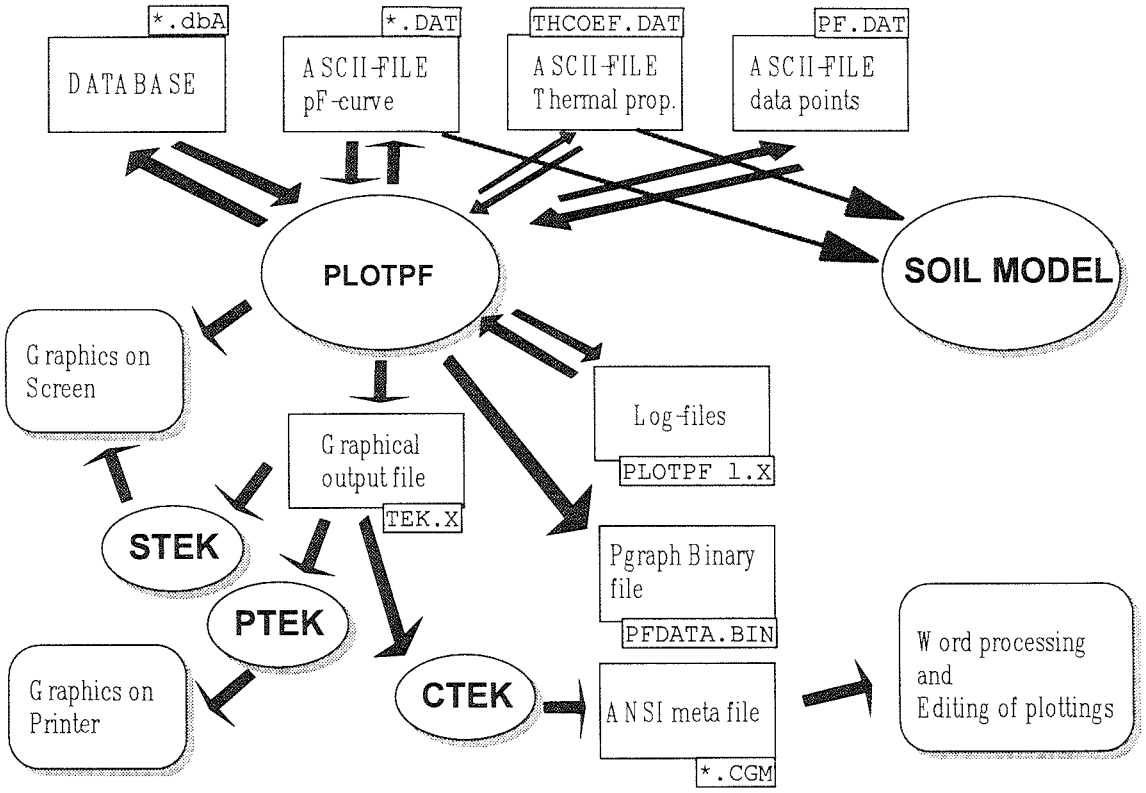
DEFAULT	LIST	PLOT	CHANGE	FILES	EXIT
1-Prof1 files	1-Data values	1-$\psi(\theta)$	1-Profiles	1-pF curve IN	1-log
2-Prof1 no	2-Prof data base	2-$k(\theta)$	2-Layers	2-pF curve OUT	2-quit
3-Prof1 layers	3-Comments	3-$\psi(\theta)$,$k(\theta)$	3-Fitting	3-pF data OUT	
4-Prof2 files	Layers	4-T(logθ)	4-Measured pF	4-Pgraph OUT	
5-Prof2 no		5-T(θ)	5-Texture	5-pF data IN	
6-Prof2 layers		6-$k_h(\theta)$	6-Save data	6-Sort data	
7-Label		7-$k_h(\theta)$ frozen	7-Delete Prof	7-Copy	
8-Unit k		11-$\psi(\theta)$ +data		8-$k_h(\theta)$ coef OUT	
9-Genuchten		12-$k(\psi)$			
	Profiles	21-$\psi(\theta)$			
		22-$\psi(\theta)$			
		23-$k(\psi)$			
		24-$k(\theta)$			
		25-Texture			

Initially PLOTPF will go through the default option enabling the user to specify a soil profile with a number of selected layers. After this session the "Enter command:" prompt appear and the user is free to select options from any of the available menus.

A letter, corresponding to the different groups listed above will result in a complete list of options available for that group. Valid commands are a letter followed directly by a number according to the figure above.

You can use the HELP utility (F1) at any stage in the program (see HELP).

File Structures and coupling to the SOIL model



The figure above shows how information is transferred to and from the PLOTPF program. The two bold arrows shows the necessary input for using the SOIL model. Note that the program is handling two profiles of soil properties in parallel.

Starting the program

PLOTPF can handle different input files. The two main files are either binary data base files which contains a complete description of soil properties from many different soil profiles or an ASCII-file which contains a set of parameter values for the hydraulic properties of one single soil profile. The later file is also one of the two necessary input files for the SOIL model.

The data base corresponds to two files named with extensions DBA and DBB. If you want to read from the data base you can specify the name of the data base (excluding the extension) on the command line:

PLOTPF PFPROF

will use the data base PFPROF as the source for the first profile in the profile. If you do not have an ASCII-file with soil properties you have to specify a data base name as input. In case you are also missing a data base the PLOTPF program will create an empty data base for your purpose.

If you want to read from an ASCII-file you will specify the full file name on the command line:

PLOTPF CLAY.DAT

will read from the file named CLAY.DAT as source for the first profile.

If the files can not be found PLOTPF will prompt you for entering new names or creating a data base. Once you have entered PLOTPF you can always define new data base files or ASCII-files as sources of data by the two options D1 and D4.

If thermal soil properties are to be plotted also the file THCOEF.DAT including the coefficients in Kerstens (1949) equations may be specified. This file which is the second necessary input file to the SOIL model may also be created by PLOTPF (F8). Default values according to Kerstens investigations are then selected.

Below the different options are described in more detail.

D - Define new default

•*D1 New input file for the first profile*

The option D1 should be selected when you want to define a new first soil profile from a new file. This is also the first session you automatically will go through when starting the program.

•*D2 First profile number*

You define a profile by two integer numbers: a profile number and a replicate number. If you do not know which profile to select you may use the L2 option to get information on which profiles that exist in the data base. In that case you can just pass this question without entering any numbers. If your input file is an ASCII-file the profile number in that file is given as default values.

Entered numbers should be separated by a comma.

•*D3 Layers for the first profile*

You define layers by entering a list of integer numbers. The layers are numbered from 1 to N, where N is the deepest layer in the profile. The number of layers and the depth of the deepest layers of each profile in the data base is given in the list you get when using the L2 option.

Separate your numbers by a comma. A sequence of layers may be specified by entering 1-5 instead of 1,2,3,4,5.

•*D4 New input file for the second profile*

Similar as D1 but valid as second profile.

•*D5 Second profile number*

Selection of a soil profile (as D2). In addition to the definition of a profile number also layers may be specified as in D6.

•*D6 Layers for the second profile*

Selection of soil layers only from the second profile.

•*D7 Label*

Each plot which will be the result of selecting P-options can either get a default label that corresponds to the name and the number of the selected profile or a label specified here by the user. If you do not specify a label here (just press "enter") and the default label will be used.

•*D8 Unit to be used when plotting hydraulic Conductivity*

Five different units can be selected

```
Select unit to be used when plotting hydraulic conductivity
(0)   cm / minute
(1)   cm / hour
(2)   mm / day
(3)   cm / day
(4)   m  / second                    Answer (0-4):0
```

The default unit is cm / minute.

•*D9 The use of Genuchtens equations instead of Brooks and Corey*

This option is only preliminary and no export of data can be made to ASCII-file for simulation with the SOIL model. The three new coefficients which are used by Genuchtens are α, n and m. The equation for effective saturation θ_e is given as follows:

$$\frac{\theta-\theta_r}{\theta_s-\theta_r} = \frac{1}{(1+(\alpha\psi)^n)^m}$$

In PLOTPF the coefficients are named GA, GN and GM the can be entered by using the C2 option. Plottings are made using Genuchten equations until this option is changed back to Brooks and Corey.

L Listings

•*L1 Present parameter values for selected layers*

The list on the screen is similar as the one you found in the SOILX.SUM file when you run the SOIL model.

•*L2 Profile descriptions*

By specifying different characteristics you can get a list of profiles in the data base that satisfy your interest. A complete list of the entire data base is given if you do not specify any limits.

•*L3 Comments on soil properties*

If a file with specific comments exist it will be listed here. For your convenience remember to create files where you include information on how you have modified or adapted soil properties for you purposes. These files which all will get the file type extension .PFN can either be in your present directory or in the \SOIL directory. The name of a file with comments must be specified in the C1 option and saved in the data base (C6) before you can exit PLOTPF for preparation of the file.

C Change soil properties

•*C1 Change profile descriptions*

```
Which profile descriptor do you want to change ?
 0) Back to command level
 1) Profile number
 2) Replicate profile number
 3) Profile name
 4) County
 5) Coordinates
 6) File name with comments
 7) Mean texture composition
 Enter (0-7):
```

Here you can enter general information for a new profile or you may modify an existing profile. A good procedure when you will introduce new profiles with soil properties is to select an old profile with the appropriate number of layers from the data base and then change all the different characteristics including the profile number. Remember to make use of C6 before exiting from PLOTPF or before selecting a new profile number (D2).

•*C2 Change parameter values*

```
 Which parameter do you want to change ?
( 0) Back to command level
( 1) Upper limit for Brooks & Corey
( 2) Saturated conductivity (including macro pores)
( 3) Saturated conductivity (excluding macro pores)
( 4) Toutosity factor
( 5) Porosity
( 6) Wilting point
( 7) Air entry pressure
( 8) Pore size distribution index
( 9) Residual water content
(10) Upper boundary of soil layer
(11) Lower boundary of soil layer
 (12) alpha in Genuchtens equation
 (13) n     in Genuchtens equation
 (14) m     in Genuchtens equation
Enter (0-14):
```

Here you can modify all soil properties which defines the hydraulic properties. The effect of a modification of for instance the air entry pressure or the pore size distribution index can be visualised by using the plotting options (PX). After you have checked that your modifications gives the expected effect on you soil properties you can save the new values in the data base or write the information to an ASCII-file (C6).

•*C3 Change Brooks & Corey fitting*

This option make it possible to estimate new coefficients in the Brooks & Corey expression either from empirical functions based on the texture composition and the porosity or from data of water retention.

The empirical functions used to estimate the water retention and hydraulic conductivity are the ones proposed by Rawls & Brakensiek (1989). The textural composition must defined in the data base (see C5 option).

If data of water retention are used the coefficients in the Brooks & Corey expression are estimated by using least square fitting. In case of too few data points exist, in the given range, additional information on the residual water content or the air entry pressure may be given.

If the least square fitting does not gives a satisfactory curve you can always try to modify the curve by introducing your own estimate of the coefficients by using the C2 option.

•*C4 Change measured pF-curve*

```
Which measurement do you want to change ?
(0) Back to command level
(1) Number of tensions where the water content is measured
(2) Tensions where the water content is measured
(3) Water content at different tensions
Enter (0-3):
```

Here you can specify measured values or modify already existing values in the relationship between water tension and volumetric water content. First you define how many points that exist and at which tensions these points are

measured. This is valid for all layers in the soil profile and if there are layers which have other data points you can introduce missing values for these layers. Missing values are the default value for all water contents until you have entered your choice. If you want to change a water content from an old value to missing you do so by entering the value 0, which will be considered as missing. The measured values can be plotted (P11) or extracted to an ASCII-file (F3) after they have been stored in the data base (C6).

•*C5 Change texture*

```
Which textural class do you want to change ?
( 0) Back to command level
( 1) All classes cumulated values
( 2) All classes not cumulated
Enter (0-2):
```

Measured particle size distributions and loss on ignition are included in the data base to serve as reference values when searching for soil profiles or soil types. This means that you are recommended to include this information when it is available but also remember that you can define all necessary information for running the SOIL model by only defining the pF-curve and the unsaturated conductivity function. The texture data can either be given as accumulated or for each particle size class. Only particle size classes lesser than 2 mm are considered and the loss on ignition is considered as part of the total mass.

•*C6 Save data in data base or in an ASCII-file*

All information added by the use of options C1 to C5 will only be stored in the internal memory of the computer until you save the new information in the data base. If any of your new profile numbers has been changed you will create a new profile in the data base when using the C6 option. If you do not have changed the profile numbers or if you select a profile number that already exist you may overwrite old information in the data base.

Make sure that important information is not lost when overwriting old soil profiles!

Before exiting from PLOTPF the program will check if you have modified your data and an optional saving will be possible.

•*C7 Delete a profile from data base*

Your data base may include a number of profiles which you want to delete in order to minimise disk space requirements or other objectives. Use C7 to select profiles you want to delete and combine the use of C7 with F6 to compress your data base. If you select profiles from record numbers you can not know the exact number from the complete list in L2 but you can always use trial error technique and confirm deleting of a profile when your given record number correspond to the wanted data description.

F Creating new Files or reading new data

•*F1 Include data from file SOILP.DAT to data base*

If you have a SOILP.DAT file which contains soil properties that are not present in your data base you can include these soil properties from the SOILP.DAT file by using this option. Make sure that your profile numbers in the SOILP.DAT file do not exist in the data base as numbers representing another soil profile before including the SOILP.DAT file. If you after inclusion of a SOILP.DAT file want to complement with information about texture and measured values at the water retention curve you can do so interactively by using C4 and C5 or you may use a file named PF.DAT to include the same information by using F5.

•*F2 Extract data from data base to file SOILP.DAT*

By extracting a profile from the data base to a file named SOILP.DAT you have prepared for a SOIL simulation using properties given in the SOILP.DAT file. In the parameter file used by the SOIL model the profile number and the replicate number are represented by the parameters UPROF and UNUM. A detailed information on the format for the SOILP.DAT file are found in the HELP facility for the SOIL model.

•*F3 Extract measured data on texture and pF-curve from data base*

The measured values of water retention, texture and saturated hydraulic conductivity can be extracted from the data base to an ASCII-file named PF.DAT. The PF.DAT file may be used to transfer data from one data base to another if also the SOILP.DAT file is considered.

•*F4 Selected values to Pgraph-file (PFDATA)*

You can extract data from a number of different profiles (selected similar as when using L2) to a Pgraph-structured file in this option. This may be useful if you are interested in analysing relationships between different soil properties found in the data base, e.g. how pore size distribution index, air entry value varies with different textural composition.

•*F5 Include measured data on texture and pF-curve from ASCII-files*

You can include the data in the PF.DAT file (see F3) by using this option. If you also want to estimate the coefficients in the Brooks & Corey expression for the pF-curve you should use the C3 option after F5. You may also include the SOILP.DAT file (F1) after the use of F5 if you already have estimated coefficients.

•F6 Compress and sort profile numbers in the data base

When using this option the program have to allocate free disk space for sorting your old data base. Therefore you should always make sure that such disk space is available before using F6.

•F7 Copy data from one data base to another

Makes it possible to copy data from one data base to another. The two data bases must be defined by using the two options D1 and D4 before this operation. Transfer of data can be in two direction, with different given restrictions. The target data base may by newly created using the D1 or D4 options.

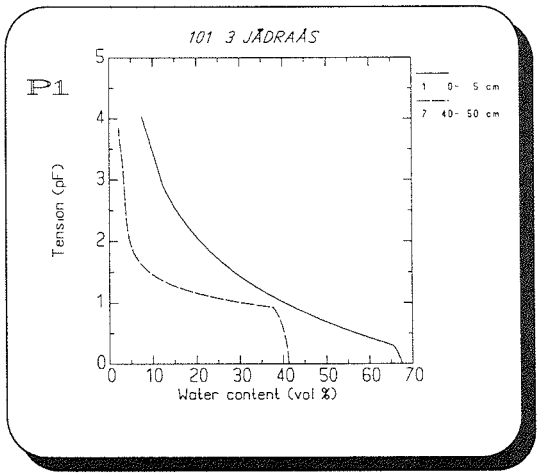
•F8 Create an ASCII-file with thermal properties

The file correspond to the default values of thermal properties as used by the SOIL model. This file is used both by PLOTPF for plotting thermal properties and by SOIL as input for simulation. The file name is THCOEF.DAT.

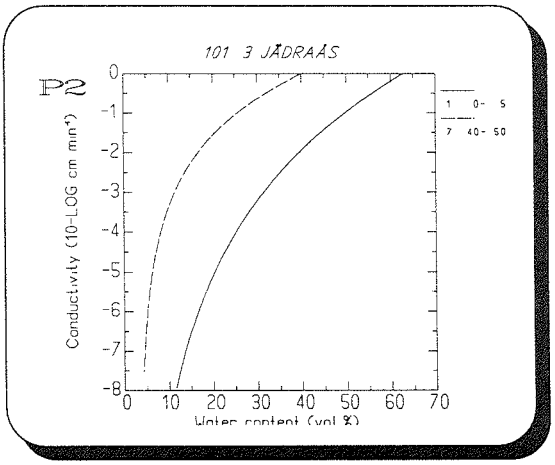
P Plotting

```
Variable versus volumetric water content
P1 - pF curve                          P2- Unsaturated conductivity
P11- pF curve (measured points)        P3- (1) and (2) together
P4 - Freezing point depression         P5- (4) with linear-scale
P6 - Thermal conductivity (unfrozen) P7- Thermal conductivity
(frozen)

Variable versus water tension
P12- unsaturated conductivity

Depth profiles of water content at different tensions:
P21- including solid volume            P22- only pore volume

Depth profiles of unsaturated conductivity:
P23- at different tensions             P24- at different water contents
P25- Textural composition
```

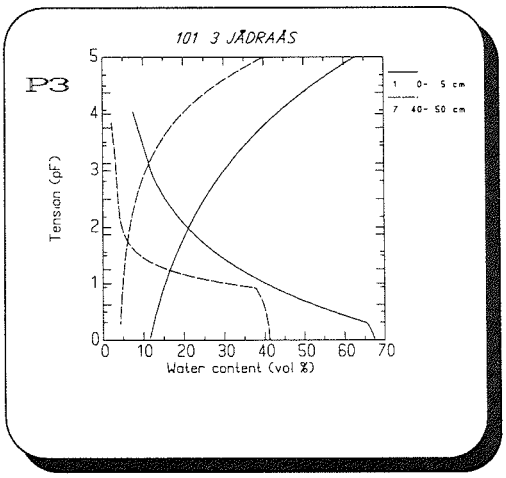
- *Examples of pictures*



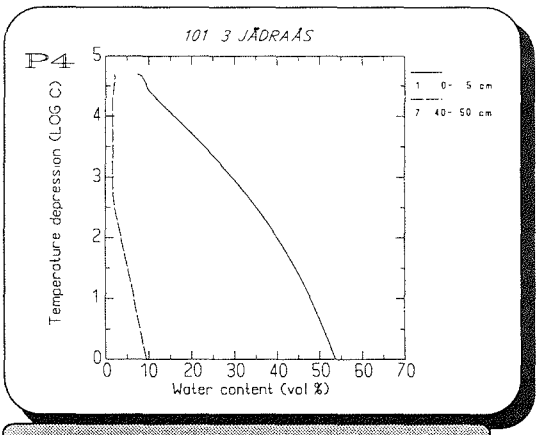
pF-curve from two layers



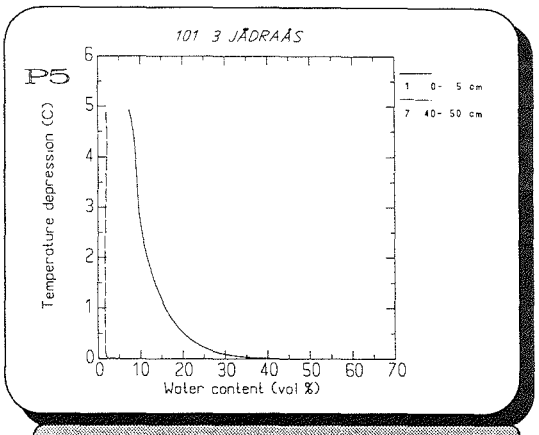
Unsaturated conductivity two layers, f(water content)



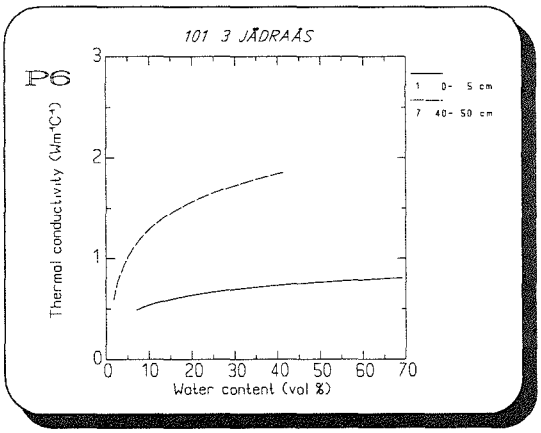
pF curve and Unsaturated conductivity together



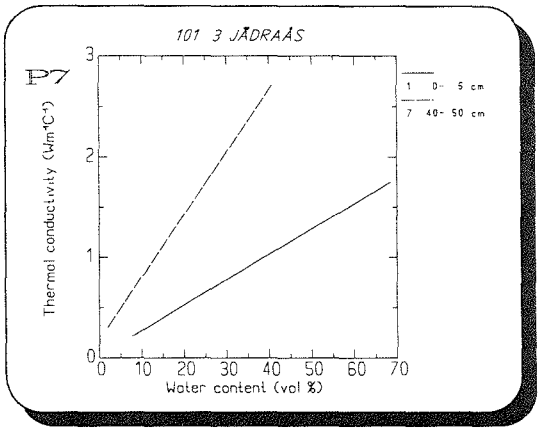
Freezing point depression logarithmic scale



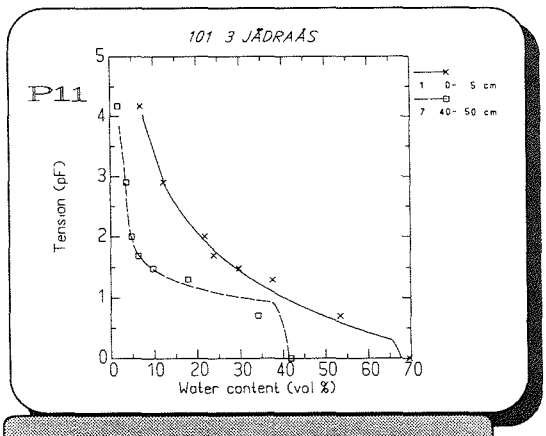
Freezing point depression linear scale



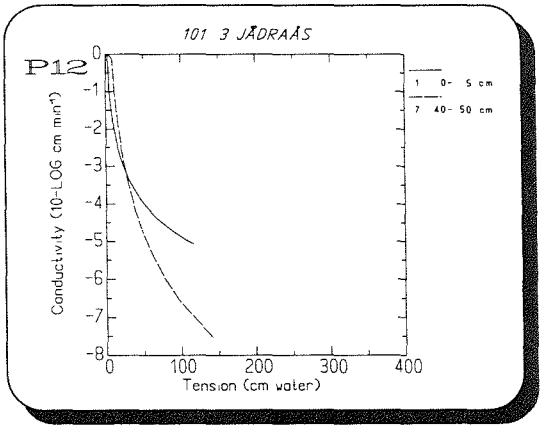
Thermal conductivity unfrozen soil



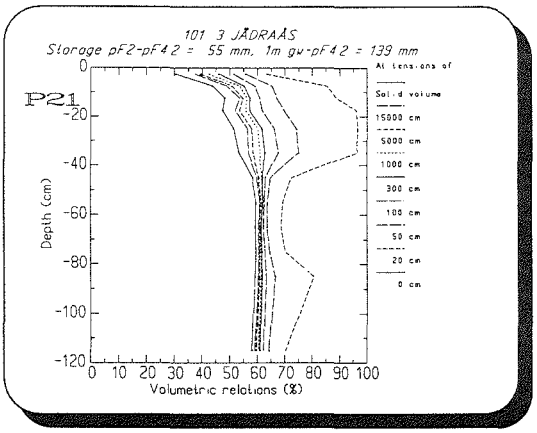
Thermal conductivity frozen soil



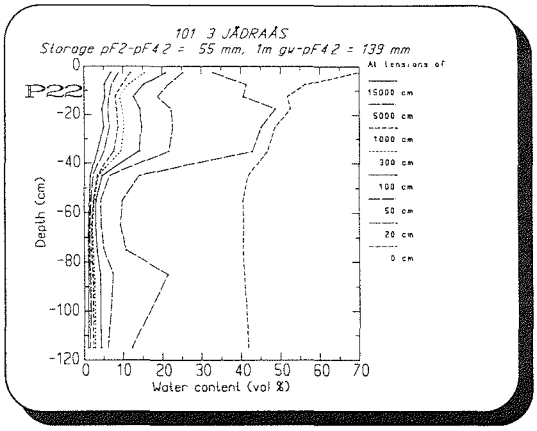
pF-curve including measured points



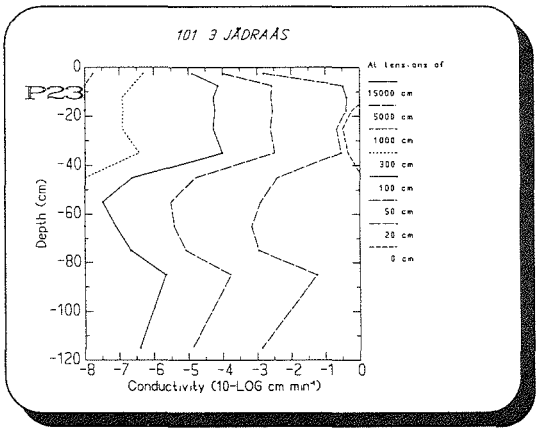
Unsaturated conductivity f(water tension)



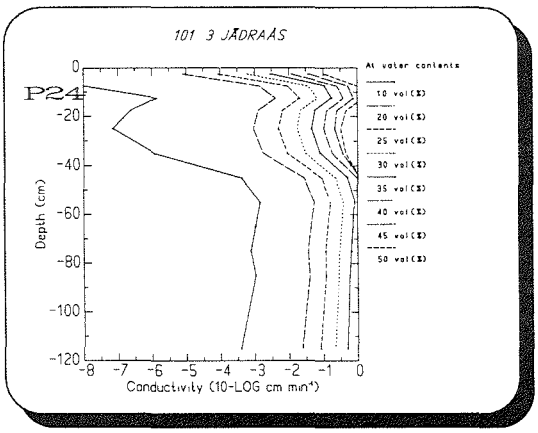
Volumetric relations (solid volume + water)



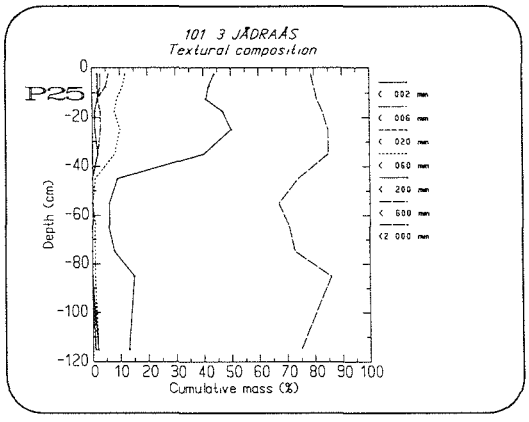
Volumetric relations (water content)



Unsaturated conductivity at different tensions



Unsaturated conductivity at different water contents



Textural composition

Exit from program

```
E1 Keep log file (PlotpF.LOG)          E2 Delete log file
```

News

Important changes in new versions will be mentioned here.

•*June 88*

A bug in the F4 option was corrected.

•*October 88*

The most important difference compared to the old version of PLOTPF is that the data base names now are different (see Input file). You have to rename old data base files before using then new PLOTPF program.

In addition the new program makes it possible to handle properties from two soil profiles simultaneously and independently. The two soil profiles can be retrieved from two different sources and the data can be modified and stored in any data base defined as source/target (D7 and D8). It is also possible to copy data from one data base to another (F7).

A bug in the F3 option was also corrected.

•*August 90*

A new option D9 introduced which allows different choice of units for the plotting of hydraulic conductivity

•*October 90*

New possibilities for entering new profiles or layers to a data base were introduced. These possibilities are part of the old options (D2,D3 and D5,D6). In case a profile or a layer is specified, which is not in the present data base, they may optionally be added. The new properties can be taken as default values chosen from 3 different soil types or they can be estimated from the empirical functions of Rawls & Brakensiek (1989).

The empirical functions of Rawls & Brakensiek can also be used to estimate the hydraulic properties from the textural compositions that is specified in the data base (see option C3).

Improvements were also introduced for how to enter the file names of data bases. A pop up menu may be used to find the appropriate files names.

•*August 91*

A bug deleted that caused problem when using the F2 option in case of incomplete information about measured data of water retention.

•*August 93*

The input file definition when starting the program has been changed considerable. Flexible names are now allowed for the ASCII-file SOILP.DAT and saving can be directly to an ASCII-file without any prior storing of data in a data base. The profile number (UPROF) and replicate number (UNUM) is read from the input ASCII-file and they are used as default values.

The default menu D has been changed.

The use of Genuchtens equations has been introduced as an option within the PLOTPF program. However, they can still not be used by the SOIL model.

PLOTPF checks if soil properties have been modified during running PLOTPF and an optional saving before exiting the program is asked for.

Problems

If you get problems, find bugs or just want to report an interesting phenomena please let us know about it. Write to:

Per-Erik Jansson
Department of Soil Science
Swedish University of Agricultural Sciences
P.O. Box 7014
S-750 07 Uppsala
Sweden

Help

Help is available (almost) everywhere. Just type F1 and you are transferred to HELP. In HELP, typing a single "ESC" takes you one help level up or to PLOTPF if at lowest level. You select topics by moving around using the arrow keys and pressing "ENTER" at the selected topic. Typing "F1" takes immediate you back to PLOTPF.

Commands

All commands/instructions to PLOTPF can either be given interactively or read from a file. To save your commands in files you can either extract information from the PLOTPF_L.XX file which contains all commands given prior the run of the model or you can echo your commands during a subsession by using the right arrow followed by any file name (ex. >ANSWER1). All the preceding commands will then be written to the file ANSWER1.IN until you enter a new right arrow ">". To read information from a file you just type: @ANSWER1 which will redirect reading from the keyboard to the file named ANSWER1.IN until an end of file is reached. After this the program starts to read instructions from the keyboard again.

References

Rawls, W. J. and D. L. Brakensiek 1989. Estimation of Soil Water Retention and Hydraulic Properties. In: H.J. Morel-Seytoux (Ed.) Unsaturated Flow in Hydrologic Modelling, Theory and Practice, 275-300. Kluwer Academic Publishers.

Appendix 1 - Tutorial

This tutorial assumes you have installed the PLOTPF programme on you computer and that you have two sample data bases:

The first is called PFPROF with soil properties from 230 soil profiles and the other is called SITEPROF with 6 soil profiles. A complete list of these soil profiles are given in appendix 2. example can be read and followed.

Understanding PLOTPF

The menus are simple and in most case you find the way to run the PLOTPF program by your own intuition. You should be aware about some common features. Unfortunately the menus do not allow you to move backward. Use the "return/enter" button to go forward. If the program prompts you with something you do not know the meaning of - you can always try to use a single "return" and the program use default values. If you want to go from one sub-menu to the menu at the level above also use "single returns".

Starting PLOTPF

Change you current working directory to a directory (PF) where you have the following files:

SITEPROF.DBA	**A data base file which is created, reac and edited by PLOTPF only. Do not try to modify this file with any other program.**
SITEPROF.DBB	**A data base file (as above)**
CLAY.DAT	**An ASCII-file with soil properties for the SOIL model**
PF.IN	**Input file with commands for running the PLOTP and making a sample of plots.**

In another directory named \MODEL\DEMO\PFBASE a full data base of soil properties exists.

PFPROF.DBA	**A data base file which is created, read and edited by PLOTPF only. Do not try to modify this file with any other program. This data base contains 249 soil profiles, about 2000 soil layers**
PFPROF.DBB	**A data base file (as above)**
B205_1.PFN ...	**All files with the extention name PFN are ordinary text files which contains comments about specific soil profiles. This comments can be read by PLOTPF using the L3 option.**

Start the program by typing its name PLOTPF. If the program does not respond check your installation and make sure that the PLOTPF.EXE and the PLOTPF.HLP file are in a directory to which there is a path in your autoexec.bat file.

Accept all default values suggest by the program and answer with single "returns". To specify input file select the data base SITEPROF. Do this by typing its name without extension or use the F2 button and the cursor key to select the data base. The file name can either be entered on the command line or when PLOTPF prompts for it.

Do not answer anything concerning initial question concerning selection of a specific soil or label on the plottings. After you have reached the basic level of PLOTPF, **Enter command:,** you can see the different sub-menues by entering the first letter of each heading.

Note that the only way to exit from the program is by the two commands E1 and E2. Exit and start PLOTPF a number of times using different exit commands to understand the log-file utility.

Also start PLOTPF by specifying the ASCII-file CLAY.DAT as input. Note that you will get default values that corresponds to the profile identification included in that file.

Running the program with a log file

Try to run the program with one of the log-files you created when you used the E1 option above.

```
PLOTPF -fplotpf_L.01
```

will run the program again without displaying information on the screen.

```
PLOTPF -d -fplotpf_L.01
```

will run the program and display all information on the screen.

After you have tested this with your own log-file you can also try to use the PF.IN file in your working directory in a similar way.

```
PLOTPF -fPF.in
```

The result of this command will be a number of files named **TEK.XX** where XX is a consecutive number.

To examine this file you will use the STEK program. STEK will display the graphic information on the screen. Use the command:

```
STEK 1-6
```

to display picture 1 to 6. Use PageUp and Pagedown buttons to move between pictures Use the Escape button to escape from STEK program.

You can also try to use PLOTPF and the PF.IN file together with the demo switch -d. In this case no files will be created, instead the pictures and addition text will be displayed on the screen. The additional text, shown within frames, is added to a previous log-file using a special format code. You can see this codes by viewing the PF.IN file on your screen. In this way you can create you own demos. The same will work for the Pgraph program.

Plotting properties from a single soil layer

Start PLOTPF and select a data base as source file. Specify a profile number from the list of profiles available from that data base (see Appendix 2) and a

layer. You can also get a list of the database on the screen by using the L2 option. When PLOTPF has accepted your suggestions the following commands will consider your entered numbers as default values for the first profile. You may change the values by using the D2 and/or D3 commands in the default menu.

Try to use the different plot options P1 - P3, P6-P7 and P11.

Plotting properties from multiple soil layers

This is very easy and similar as when you plot from a single layer. You just have to specify more than one layer using the D3 command. You specify a sequence of layers by using the minus sign prior the highest number given. This is especially useful if you would like to plot a whole soil profile using P21 - P25 options.

Plotting properties from two different sources

You can work with two sets of data separately. Try to specify one addition profile by using the D4 options. As default the second source will be an asscii file named SOILP.DAT. If you do not change the source for the second profile PLOTPF will try to read from this file. You may want to change to the same source as the first profile. It is sometime very useful to have the same source for both the first and second profile in PLOTPF if you would like to modify your soil properties. You can change one profile at a time and exactly compare it with the unchanged profile. Note that the second profile is plotted with small symbols on the lines to distinguish it from the first profile.

Use the P11 options to plot the same layer using the two profiles in PLOTPF with the same source. You can then compare the fitting with the measured data points.

Modifying fitting to improve the agreement between measured points and functions used by PLOTPF

To modify the fitting of one profile and keep the second try to use the C options. In the C options you can modify all information in the data base both measured points and fitted functions. Use the C2 options to modify the shape of the second profile and keep the first profile unchanged. To understand the different functions and parameters for hydraulic soil properties you can study details given in the technical description of the SOIL model.

Saving information in a data base

If you have changed information in any of the C1 - C5 options you have to store this information in a data base if you would like to keep it for further work. This is done by using the C6 options. Note that you can overwrite old information or create new records in the data bases defined. If you want to create a new record make sure that you have selected an identification of the profile (C1) that does not exist in the data base.

Save your modified soil with a new replicate site number in your local data base SITEPROF. After you have saved the information in the data base you can retrieve it by using the D2-D3 or D5-D6 options.

Creating soil properties for a site not investigated

It is not unusual that you would like to make simulation but you are lacking information about the detailed soil water characteristics used by the SOIL model. In such a case it may be useful to estimate the soil water characteristics from empirical functions. PLOTPF may help you in doing this.

Create a new soil by using the D2 or D5 options when you have a data base specified as source for the first or second profile. Specify a number that not exist in the data file list. You can examine the data base list from the L2 options prior you enter D2 or D5 to make sure that you select an unused number.

The new functions for hydraulic soil properties are either based on 3 "type-soils" or by the functions proposed by Rawls and Brakensiek (1989). Specify a range of properties for different layers to see how the soil water characteristic functions are influenced by different soil properties as for example the sand content.

Adding soil properties for an investigated site which is not in the data base

This is a task that normally takes a little more time if it should be made carefully using measured data points from many different levels. To minimise the work you may enter data from one single profile with one single layer. Use the D2 or D4 option to define a new profile in a similar way as above. Make sure that you have a data base defined as input file to one of the two profiles used by PLOTPF. You will initially get default values that corresponds to "type-soils" or to values from the empirical functions proposed by Rawls and Brakensiek (1989). It is a good idea to compare these estimates with you own values to know if your investigated soil corresponds to a normal case or not.

We suggest that you enter pF-data, volumetric water contents (per cent of total volume), from one layers given in the tables below:

	CLAY soil	Tension at which the water content is measured				
Upper level	Lower level	150 m	50m	10m	0.05 m	0 m
0	10	22	29	37	40	43
10	20	27	34	42	43	46

	SAND soil	Tensions at which the water content is measured							
Upper Level	Lower level	150 m	8 m	1 m	0.5 m	0.3 m	0.2 m	0.05 m	0 m
0	10	1.1	2	3.7	4.3	8	15.5	33	40.5
10	20	5	9	14.5	23.8	33.5	39.6	40.8	48.6

with the textural data (per cent of total mass) as:

Soil	Upper	Lower	<.002	.002-0.006	.006-0.02	.02-0.06	.06-0.2	.2-.6	.6-2	Organic M
CLAY	0	10	38	18	15	15	3	3	3	5
	10	20	55	13	13	13	2	0	1	3
SAND	0	10	1	0	2	7	40	35	13	2
	10	20	0	0	0	1	7	65	26	1

First add the measured pF curve by using the C4 options and then the textural composition by using the C5 options. Fill in appropriate general information about the profile by using the C1 options. After that you can estimate coefficients for the water retention curve by using the C3 option. Compare your estimated functions with the measured points by using the P11 command.

The problem of finding the best fitted function to the measured pF-data is many time very complicated. In some case as for the clay soil in the example above it is hard to guess about the curve in regions where there are no measured points. You have to specify values of the residual water content and the air entry value according to you own ideas. For the sand soil the problem will be quite different. Here a restricted range of the pF-curve may be specified for fitting the curve in a region which is of the highest interest for your investigation. Note that you have problems to represent the region close to saturation in both soils.

In addition to the pF-curve the SOIL model also need data on the saturated and unsaturated hydraulic conductivity. Normally the Saturated conductivity is available from measurements. For the sample soils we have the following values (cm/hour):

Clay 0-10	Clay 10-20	Sand 0-10	Sand 10-20
27	0.6	18	78

Values of saturated conductivity is entered by using the C2 option. Note that the unit of the hydraulic conductivity can be changed by using option D8. You have to specify one value which represents the total pore system (SATCT) and one value which exclude the contribution from macro pores (SATC). Normally only the value from the entire pore systems are available from stand measurement methods. The value of SATC can be considered as an matching parameter that makes the unsaturated conductivity to match measured points. Alternatively it can be estimated by calibrating the model using field or laboratory measurements of soil moisture dynamics. In normal case you will always start with putting the value of SATC and SATCT equal if you do not have other information. Values of saturated hydraulic conductivity can also be estimated by functions of Rawls and Brakensiek when using the C3 option for estimating the pF-curve from the textural composition.

Creating an input files to the SOIL model

After you have found a reasonable pF-curve for your soil you can save the information in a data base and as an ASCII-file. Note that the measured data points are only possible to save in a data base format. You are therefore recommended to first save the complete information in a data base and after that you can save the pF-curve to an ASCII-file. The site number will correspond with the UPROF parameter and the replicate profile number will correspond with the UNUM parameter in a parameter file to the SOIL model. You can either use the save option C6 or the file transfer option F2 to create the input file of hydraulicproperties to the SOIL model. To create an input file with thermal properties you use the F8 option.

Running the SOIL model with data from PLOTPF using PREP

A simple simulation using the properties defined by you can easily be made after you have created ASCII-files with hydraulic and thermal soil propreties.

Start PREP by typing:

PREP SOIL

and specify the names of necessary files in the File menu. You have to specify the name of the hydraulic soil property file if you have given it a name which differs from the default name SOILP.DAT. In addition to the two files of soil properties PREP will also prompt you for a translation file and a parameter file.

The translation file is by default called SOIL.TRA and it is found in the directory \MODEL\EXE or a sample directory like \SOIL\DEMO\SOIL if you have an ordinary installation of SOIL on you computer. To specify this file you can use the F2 button to move around in the directory structure on your computer in a similar way as you use F2 to find files in PLOTPF.

The parameter file is a file which contains other necessary information for running the SOIL. If you would like to run the model with the default values given after you have specified the rest of the files names you can enter the Execute menu and Select: **Write parameter file** and specify a file name. PREP will then create a parameter input file with the name specified by you and adding the extension PAR. After this file has been created you can move back to the FILE menu and specify the name of your parameter file. All the necessary input files for making a simulation will be ready. Check that each file has a checkmark to the left.

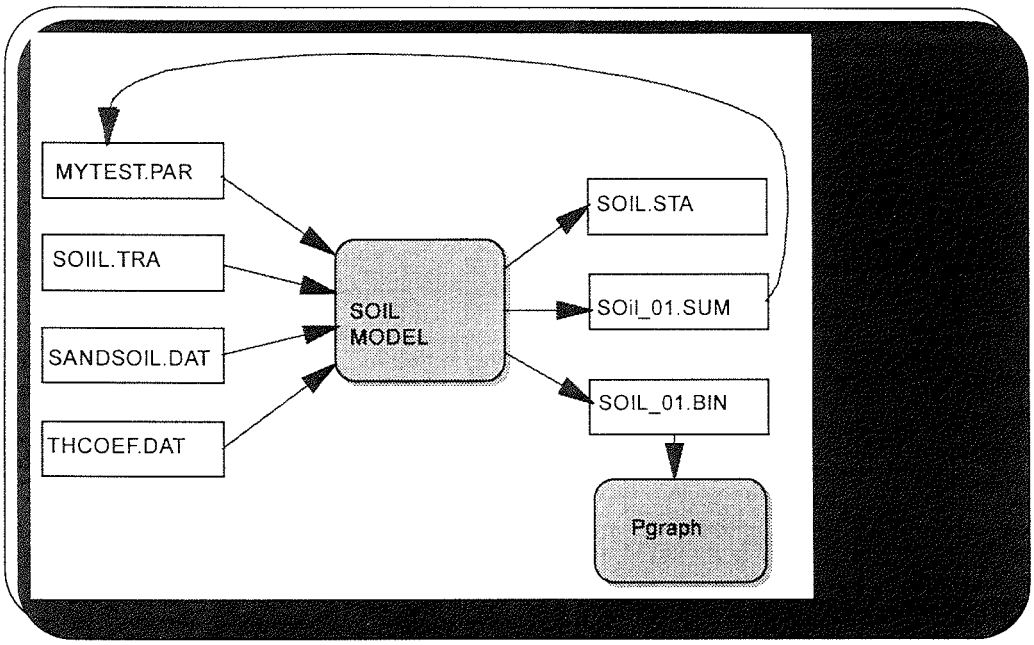
If you want to run the model you also have to select some output variables. To do so you enter the Output menu and indicate which outputs you would like to study. Note that it is not possible to run the model without selecting any outputs.

The SOIL model can either start in interative mode by using the run option in the Execute menu. Another choose may be to write a new parameter file after outputs has been specified and exit prep. The simulation can then be started at the DOS command level by typing:

PREP SOIL XXXX -b

where XXXX is the parameter file name. -b is a swich which indicates that PREP will run the SOIL model in batch mode.

The minimum number of Input files and output files when running the SOIL by default values of switches and parameters are shown below. The parameter file has been named to MYTEST and the file with hydraulic soil properties to SANDSOIL.DAT. The SOIL.STA is a file used by PREP to count the simulations. The output file with the SUM extension is an ASCII-file that include all necessary information for making a new run with the model. If it is renamed to an extension PAR it can be used as parameter file. The output file with the BIN



extension can only be read by Pgraph. Use PG or PGDEMO to read information from that file and make the presentation that is appropriate for your simulation.

Use Pgraph and make plotting of the results on your screen. Pgraph has a similar command rules as PLOTPF and it is easy to try different plotting. The help works in a similar way and the graphical output has the same format as for the PLOTPF.

Appendix 2 - List of soil profiles in data bases

Local data base SITEPROF

				Topsoil			Subsoil				
Site	Rep	Name	C	Cl	Sa	Org	Cl	Sa	Org	Layers	Depth
1	1	Öjebyn	B	6	76	2	14	58	1	6	60
25	1	Lanna	R	37	10	8	58	4	4	10	100
25	6	Lanna	R	37	9	7	58	3	3	12	195
48	8	Ultuna	C	22	59	3	71	4	2	10	100
101	3	Jädraås	X	2	87	3	0	97	1	12	120
188	1	Lanna	R	37	10	8	58	4	4	10	100

Global data base PFPROF

				Topsoil			Subsoil				
Site	Rep	Name	C.	Cl	Sa	Org	Cl	Sa	Org	Layers	Depth
1	1	Öjebyn	B	6	76	2	14	58	1	6	60
1	2	Öjebyn	B	31	13	5	25	5	2	9	100
2	1	Röbäcksdalen	A	9	12	5	10	6	2	10	100
2	2	Röbäcksdalen	A	8	26	5	9	8	2	10	100
2	3	Röbäcksdalen	A	10	6	7	11	8	2	10	100
2	4	Röbäcksdalen	A	8	12	5	12	5	3	10	100
2	5	Röbäcksdalen	A	7	18	5	11	7	3	10	100
2	6	Röbäcksdalen	A	8	16	5	10	6	3	10	100
2	7	Östteg	A	3	84	3	1	95	1	6	60
3	1	Grubbe	A	2	82	4	0	88	0	10	100
3	2	Grubbe	A	0	48	52	2	57	2	10	100
4	1	Offer	Y	30	7	7	34	6	3	10	100
5	1	Nordvik	Y	32	9	7	31	7	2	10	100
5	2	Nordvik	Y	7	50	3	17	21	2	10	100
6	1	Ås	Z	-1	105	-1	-1	105	-1	10	100
7	1	Sigsta	X	30	5	12	19	10	2	8	100
7	2	Sigsta	X	-1	-1	-1	5	44	2	2	90
8	1	Sörväna	X	32	7	6	-1	-1	-1	3	30
8	2	Sörväna	X	27	6	9	-1	-1	-1	2	20
9	1	Ygsbo	X	24	5	5	-1	-1	-1	3	30
9	2	Ygsbo	X	18	3	11	20	1	1	8	100
9	3	Sävstaås	X	-1	105	-1	-1	105	-1	10	100
10	1	Vassbo	W	30	6	6	44	4	2	10	100
10	2	Vassbo	W	0	34	66	24	11	34	10	100
11	1	Kloster	W	27	5	5	39	5	2	13	145
12	1	Älvgården	W	11	12	4	6	13	2	10	100

13	1	Uddeholm	S	19	5	5	17	4	1	10	100
14	1	Apertin	S	20	20	5	23	10	2	12	135
15	1	Lindesnår	S	10	14	5	14	8	1	16	210
19	1	Nuntorp	P	28	6	6	32	10	1	10	100
19	2	Nuntorp	P	39	10	5	48	3	2	10	100
20	1	Rävsmåla	K	1	83	8	1	84	7	5	70
21	1	Forstena	P	48	4	8	61	2	4	10	100
22	1	Tingvall	O	19	29	6	22	40	2	15	195
23	1	Bro	O	27	17	4	29	25	1	15	195
24	1	Gunnarstorp	R	46	7	6	56	4	2	10	100
25	1	Lanna	R	37	10	8	58	4	4	10	100
26	1	Djupedal	R	8	48	4	16	19	2	15	195
27	1	Kobonäs	R	4	82	5	0	98	0	10	100
28	1	Gammalstorp	R	32	8	5	44	6	2	10	100
29	1	Klagstorp	R	24	27	5	35	9	2	14	140
29	2	Klagstorp	R	24	26	5	35	6	3	14	140
30	1	Stensfält	R	71	3	7	77	1	4	14	140
30	2	Stensfält	R	69	4	6	64	1	3	14	140
31	1	Ryholm	R	35	6	15	74	2	4	12	135
31	2	Ryholm	R	11	32	44	30	11	2	10	100
32	1	Vrå Nolgården	R	61	12	7	82	1	4	10	100
36	1	Kyrkeby	T	45	9	4	49	6	2	10	100
36	2	Kyrkeby	T	47	7	5	62	3	3	10	100
37	1	Fellingsbro	T	38	17	6	62	4	4	10	100
38	1	Vasselhyttan	T	34	4	13	43	3	4	10	100
39	1	Näs	U	39	6	4	34	3	1	10	100
40	1	Bengtsbo	U	57	8	7	69	4	5	4	40
41	1	Harnesta	U	49	3	5	58	2	2	10	100
41	2	Harnesta	U	54	4	7	55	5	4	10	100
42	1	Valla	C	51	4	7	52	6	4	10	100
42	2	Valla	C	41	13	6	47	14	4	10	100
43	1	Högby	C	42	11	4	42	14	3	14	140
43	2	Högby	C	31	20	4	46	9	3	14	140
43	3	Högby N	C	25	29	2	40	14	3	12	120
43	4	Högby V	C	26	23	3	43	12	3	12	120
44	1	Skillsta	C	41	22	5	72	2	4	10	100
45	1	Grävsta	C	28	19	4	32	17	3	10	100
46	1	Marsta	C	37	13	5	36	12	3	14	175
47	1	Kjettslinge-80	C	8	56	2	2	82	1	3	50
47	2	Kjettslinge-80	C	22	34	7	5	72	1	4	50
47	3	Kjettslinge-80	C	14	55	4	-1	-1	-1	4	30
47	4	Kjettslinge-80	C	19	41	6	20	35	2	2	40
47	5	Kjettslinge-80	C	18	55	0	6	86	0	2	40
47	6	Kjettslinge-K0	C	22	29	5	45	8	3	5	33
47	7	Kjettslinge-K120	C	14	56	4	41	15	2	6	44
47	8	Kjettslinge-Gv	C	18	39	6	45	19	2	12	95
47	9	Kjettslinge-Lv	C	21	33	4	23	52	1	7	53
47	11	Kjettslinge-Mean	C	-1	-1	-1	-1	-1	-1	5	120

47	13	Kjettslinge-Mean	C	-1	-1	-1	-1	-1	-1	5	120
48	1	Ultuna	C	36	19	4	36	13	3	10	100
48	2	Ultuna	C	34	25	4	43	14	2	10	100
48	4	Ultuna	C	47	26	4	69	2	3	15	195
48	5	Ultuna	C	14	69	3	28	58	2	8	100
48	6	Ultuna	C	12	73	3	32	46	2	10	100
48	7	Ultuna	C	49	26	5	59	1	5	10	100
48	8	Ultuna	C	22	59	3	71	4	2	10	100
48	9	Ultuna	C	49	13	7	38	27	3	14	140
48	10	Ultuna	C	51	12	8	42	20	4	14	140
48	11	Ultuna	C	40	27	4	55	20	2	10	100
48	12	Ultuna	C	43	25	5	73	6	3	10	100
48	13	Ultuna	C	40	16	4	54	9	3	10	100
48	14	Nontuna	C	11	78	3	29	45	3	15	195
48	15	Nontuna	C	5	88	2	13	79	2	15	200
48	16	Nontuna	C	9	77	2	5	87	1	10	100
48	17	Kungsängen	C	45	6	10	49	8	6	10	100
48	18	Ultuna	C	45	6	10	49	8	6	14	140
49	1	Säby	C	16	30	6	32	8	3	11	10
49	2	Säby	C	16	32	5	31	9	3	9	100
49	3	Lövsta	C	39	26	3	41	19	3	10	100
49	4	Kungshamn	C	4	87	2	1	94	1	6	60
49	5	Kungshamn	C	16	65	4	38	31	3	8	80
50	1	Thorsätra	C	45	7	7	45	10	5	10	100
50	2	Thorsätra	C	29	52	6	48	25	3	10	100
50	3	Thorsätra	C	22	50	4	46	36	3	9	90
50	4	Thorsätra	C	47	23	6	64	17	4	10	100
50	5	Thorsätra	C	58	10	7	68	4	4	9	100
51	1	Krusenberg	B	28	44	4	36	38	3	7	70
51	2	Krusenberg	B	35	38	5	-1	-1	-1	2	20
51	3	Krusenberg	B	39	32	5	-1	-1	-1	2	20
51	4	Krusenberg	B	44	27	5	-1	-1	-1	2	20
51	5	Krusenberg	B	29	50	4	46	36	3	6	60
51	6	Moralund	B	0	44	56	50	3	12	8	80
51	7	Moralund	B	0	53	47	49	2	13	8	80
52	1	Vattmyren	C	0	93	2	0	94	1	6	60
52	2	Risinge	C	40	26	6	63	3	5	6	60
53	1	Sättra	B	8	77	4	1	85	2	6	60
54	1	Nyckelby	B	37	18	5	-1	-1	-1	3	30
55	1	Edeby	D	60	3	7	65	0	3	12	135
56	1	Vallby	D	-1	-1	-1	61	5	5	6	190
57	1	Ökna	D	16	9	3	11	14	1	6	60
57	2	Ökna	D	41	22	4	63	6	3	6	60
58	1	Häradshammar	E	75	1	4	74	1	4	10	100
59	1	Västerby	E	65	5	9	76	1	3	5	50
59	2	Västerby	E	58	4	12	-1	-1	-1	3	30
60		Björstrop	K	0	0	1	0	0	1	5	50
60	1	Ullevi	E	45	18	7	64	8	4	5	50

61	1	Hovgården	E	51	23	5	62	17	4	10	100
62	1	Tönnersa	N	5	88	1	3	90	2	10	100
62	2	Tönnersa	N	9	61	5	9	65	14	10	100
63	1	Lidhult	F	0	10	90	4	27	49	4	90
64	1	Åby	F	6	46	6	2	74	1	10	100
65	1	Ottarp	G	4	81	2	3	84	1	6	60
66	1	Stensryd	H	4	70	2	3	80	2	6	60
66	2	Stensryd	H	2	75	2	3	81	2	6	60
67	1	Lilla Åby	H	5	52	3	4	66	2	6	60
67	2	Lilla Åby	H	4	74	2	3	74	2	6	60
67	3	Lilla Åby	H	4	49	2	4	54	2	6	60
67	4	Stora Åby	H	4	81	2	3	87	2	6	60
68	1	Fredriksström	H	5	74	3	9	44	3	6	60
69	1	Ingelstorp	H	13	42	3	20	23	1	10	100
69	2	Ingelstorp	H	5	78	2	4	81	2	7	100
70	1	Stenstugu	I	4	91	3	7	72	13	10	100
71	1	Bara Myr	I	0	10	90	0	21	79	6	60
71	2	Bara Myr	I	0	62	38	0	87	13	10	100
71	3	Bara Myr	I	0	62	38	5	87	6	12	120
72	1	Lönhult	M	49	23	8	61	8	5	10	100
72	2	Lönhult	M	34	44	4	61	9	3	10	100
73	1	Västraby	M	28	40	4	42	18	3	10	100
74	1	Selleberga	M	9	58	5	8	61	4	8	80
74	2	Vramsvång	M	10	60	12	7	49	28	6	60
75	1	Västregård	M	11	58	10	12	54	7	6	60
75	2	Vallåkra	M	18	48	4	23	44	3	6	60
76	1	Säbyholm	M	37	29	6	38	22	4	10	100
76	2	Säbyholm	M	28	40	4	31	32	3	10	100
77	1	Rönneberga	M	12	51	18	9	56	17	6	60
78	1	Barsebäck	M	12	46	20	11	58	9	6	60
79	1	Marbäcksgården	M	6	80	1	9	76	1	6	60
80	1	Sventorp	M	18	49	4	28	35	3	5	50
81	1	Alnarp	M	8	81	3	5	89	0	10	100
81	2	Alnarp	M	12	65	2	11	67	1	10	100
81	3	Lönnstorp	M	-1	105	-1	-1	105	-1	10	100
82	1	Bunkeflo	M	13	62	3	14	60	2	6	60
83	1	Södergård	M	18	55	4	29	40	5	6	60
84	1	Övragård	L	60	6	9	57	4	6	10	100
84	2	Övragård	L	53	5	7	46	14	5	10	100
85	1	Ausås	L	5	86	2	9	77	2	10	100
86	1	Kungsgården	L	10	64	5	6	71	3	6	60
87	1	Strövelstorp	L	8	78	5	7	80	3	6	60
87	2	Dalsgård	L	8	81	2	13	62	2	6	60
88	1	Önnestad	L	33	10	5	21	29	2	6	60
89	1	Annedal	L	6	79	2	9	55	3	6	60
90	1	Annelund	L	8	78	3	6	76	2	6	60
90	2	Annelund	L	6	80	2	7	74	2	6	60
90	3	Brohem	L	6	81	3	6	75	2	6	60

90	4	Brohem	L	7	76	4	3	84	2	6	60
90	5	Brohem	L	2	95	1	7	85	2	6	60
90	6	Brohem	L	20	64	4	35	38	3	7	70
90	7	Ugerups Säteri	L	10	74	2	8	68	1	6	60
90	8	Ugerups Säteri	L	7	81	2	4	87	1	6	60
90	9	Ugerup	L	3	94	1	3	90	2	5	50
90	10	Ugerup	L	4	88	2	4	90	1	6	60
91	1	Härnestad	L	8	85	2	5	91	2	6	60
91	2	Härnestad	L	3	90	2	2	90	2	5	60
91	3	Härnestad	L	5	89	2	3	89	2	6	60
91	4	Härnestad	L	5	85	2	5	85	2	6	60
92	1	Tolegården	L	9	71	3	8	62	2	6	60
92	2	Tolegården	L	9	66	3	6	60	2	6	60
92	3	Tolegården	L	6	68	3	5	68	2	6	60
93	1	Tjörnedala	L	1	94	1	6	54	1	4	40
94	1	Ålyckan	N	4	81	5	1	97	1	4	70
94	2	Ålyckan	N	5	78	6	1	96	1	8	80
94	3	Ålyckan	N	5	78	6	1	95	1	6	80
94	4	Ålyckan	N	4	81	5	1	96	1	7	80
95	1	Långaveka	N	1	89	1	6	80	1	10	100
101	1	Jädraås	X	3	84	6	0	99	1	12	120
101	2	Jädraås	X	2	86	4	0	97	1	12	120
101	3	Jädraås	X	2	87	3	0	97	1	12	120
101	4	Jädraås	X	2	84	3	0	97	1	12	120
201	1	Siljansfors	W	2	43	24	3	56	2	12	61
201	2	Siljansfors	W	1	37	37	3	57	2	13	69
201	3	Siljansfors	W	2	62	1	1	43	34	8	60
202	1	Stråsan	W	2	45	28	4	65	0	11	100
202	2	Stråsan	W	3	44	28	3	68	0	11	100
203	1	Emmaboda	G	0	0	100	3	54	6	4	300
203	2	Emmaboda	G	2	53	4	4	56	2	5	400
203	3	Emmaboda	G	-1	-1	-1	3	57	1	3	200
204	1	Rävsmåla	K	2	23	29	4	45	7	6	75
204	2	Rävsmåla	K	2	27	40	4	46	4	7	75
204	3	Rävsmåla	K	2	38	42	5	61	5	6	75
205	1	Lund,Stäket	AB	4	40	28	25	27	0	7	450
205	2	Lund,Stäket	AB	4	42	26	21	28	0	5	450
205	3	Lund,Stäket	AB	3	39	26	2	56	0	5	450
205	4	Lund,Stäket	AB	2	49	27	2	61	0	6	450
205	5	Lund,Stäket	AB	1	66	27	4	66	0	6	450
205	6	Lund,Stäket	AB	3	36	25	21	38	0	5	450
206	1	Svartberget	AC	2	50	23	5	57	2	8	75
206	2	Svartberget	Ac	2	50	23	3	60	2	6	41
206	3	Svartberget	Ac	2	50	23	5	57	2	8	75
206	4	Svartberget	Ac	3	50	23	3	63	2	8	75
206	5	Svartberget	Ac	3	50	23	3	63	2	8	75
206	6	Svartberget	Ac	3	50	23	3	63	2	8	75
207	1	Tiveden	R	2	43	24	3	56	2	10	100

208	1	Skogaby	N	4	63	4	3	63	2	11	85
208	2	Skogaby	N	3	71	1	3	70	1	14	105
208	3	Skogaby	N	6	55	11	2	71	1	17	100
208	4	Skogaby	N	7	59	6	3	65	2	10	75
209	4	Flakaliden	Ac	7	59	6	3	69	1	6	60
210	1	Masbyn I1	T	0	0	0	0	0	0	11	112
210	2	Masbyn I2	T	0	0	0	0	0	0	8	82
210	3	Masbyn M1	T	0	0	0	0	0	0	15	152
210	4	Masbyn M2	T	0	0	0	0	0	0	13	132
210	5	Masbyn U1	T	0	0	0	0	0	0	20	202
210	6	Masbyn U2	T	0	0	0	0	0	0	13	132
211	1	Gårdsjö B1	O	5	16	53	14	33	4	8	58
211	2	Gårdsjö B2	O	10	14	5	14	8	1	8	58
500	1	Läsaryd	L	0	0	0	0	0	0	6	60
501	1	Furuby	L	0	0	0	0	0	0	6	60
502	1	Engaholm	L	0	0	0	0	0	0	6	60
503	1	Björstorp	L	0	100	0	0	100	0	6	60
503	2	Björstorp	L	0	100	0	0	100	0	6	60
503	3	Björstorp	L	0	100	0	0	100	0	6	60
504	1	Skogsdal	L	0	0	0	0	0	0	6	60
505	1	Skogsdalref	L	0	100	0	0	100	0	6	60
506	1	Broaryd	L	0	0	0	0	0	0	6	60
506	2	Broaryd	L	0	100	0	0	100	0	6	60
506	3	Broarydref	L	0	0	0	0	0	0	6	60
507	1	Badeboda79	L	0	0	0	0	0	0	6	60
507	2	Badeboda80	L	0	0	0	0	0	0	6	60
507	3	Badebodaref	L	0	90	10	0	90	10	6	60
508	1	Börringe	M	0	99	1	0	99	1	10	100
508	2	Börringe	M	0	0	1	0	0	1	10	100
701	1	Hellerud	A	-1	-1	-1	-1	-1	-1	4	0
702	1	Haug	A	-1	-1	-1	-1	-1	-1	4	0
703	1	Presterud	A	-1	-1	-1	-1	-1	-1	4	0

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