

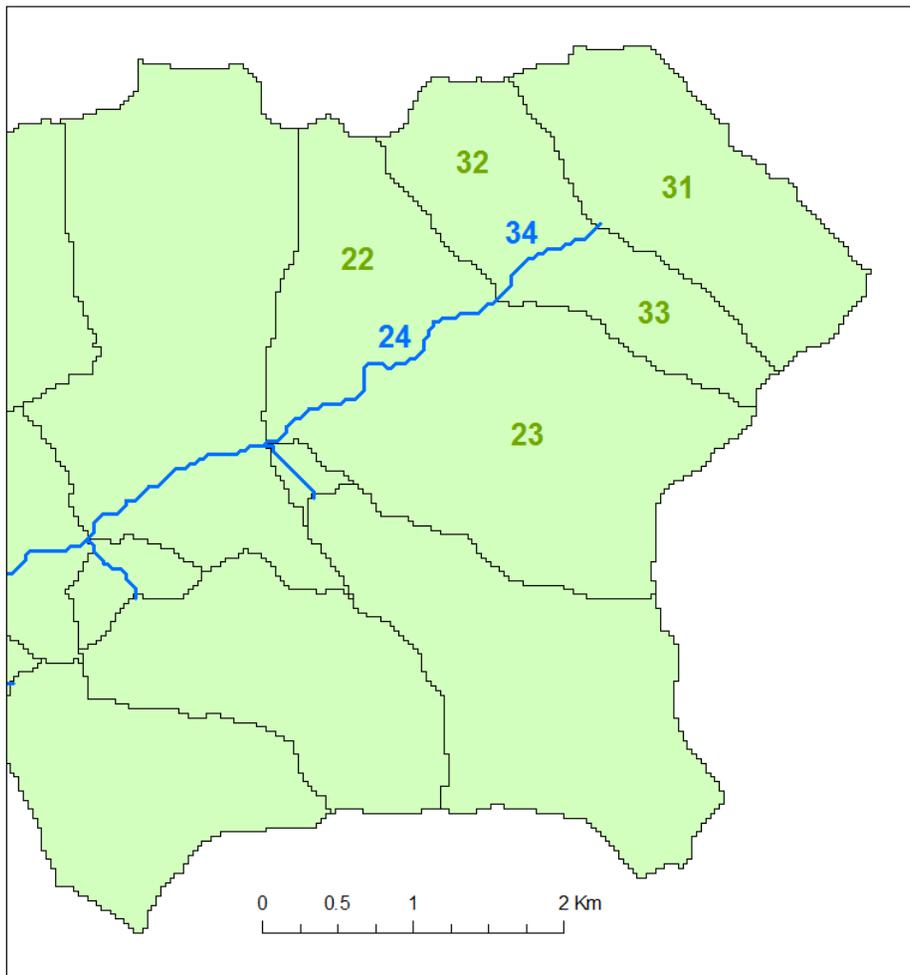
Introduction to AGWA2
The Automated Geospatial Watershed Assessment Tool

Working with the KINEROS model outside of AGWA

Introduction	In this exercise you will modify KINEROS parameter files and run KINEROS outside of the AGWA environment.
Goal	To familiarize yourself with KINEROS input and output files.
Assignment	Extract a subwatershed from a KINEROS parameter file, insert a pond element, subdivide a plane element into a cascade of planes and adjust erosion parameters to reflect cover and management practices.

Part 1: Extract a subwatershed from the parameter file s2.par

The subwatershed we will be extracting from s2.par consists of 2 channel and 5 plane elements:

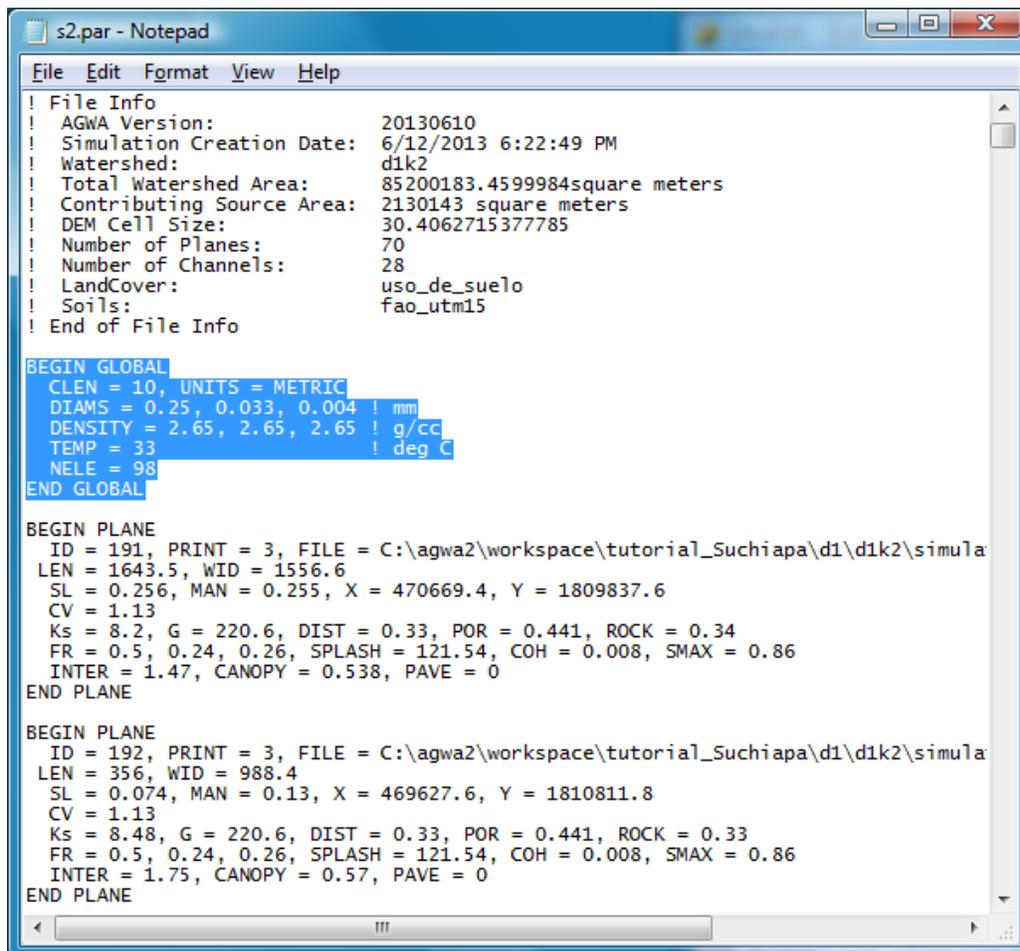


Open **Notepad** (see *Programs->Accessories*, it would be helpful to send it to the *Desktop* as a *shortcut*).

Select *File->Open*, navigate to *C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulations\s2*, set the file name filter to "All Files (*.*)", and select s2.par

The first 12 lines of the file describe how the watershed was delineated, discretized and parameterized by AGWA. Note that the lines begin with an ! - this indicates a comment and any information following an ! is ignored by the input parser.

Select the GLOBAL parameter block:



```
s2.par - Notepad
File Edit Format View Help
! File Info
! AGWA Version: 20130610
! Simulation Creation Date: 6/12/2013 6:22:49 PM
! Watershed: d1k2
! Total Watershed Area: 85200183.4599984square meters
! Contributing Source Area: 2130143 square meters
! DEM Cell Size: 30.4062715377785
! Number of Planes: 70
! Number of Channels: 28
! LandCover: uso_de_suelo
! Soils: fao_utm15
! End of File Info

BEGIN GLOBAL
CLEN = 10, UNITS = METRIC
DIAMS = 0.25, 0.033, 0.004 ! mm
DENSITY = 2.65, 2.65, 2.65 ! g/cc
TEMP = 33 ! deg C
NELE = 98
END GLOBAL

BEGIN PLANE
ID = 191, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simula
LEN = 1643.5, WID = 1556.6
SL = 0.256, MAN = 0.255, X = 470669.4, Y = 1809837.6
CV = 1.13
Ks = 8.2, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 1.47, CANOPY = 0.538, PAVE = 0
END PLANE

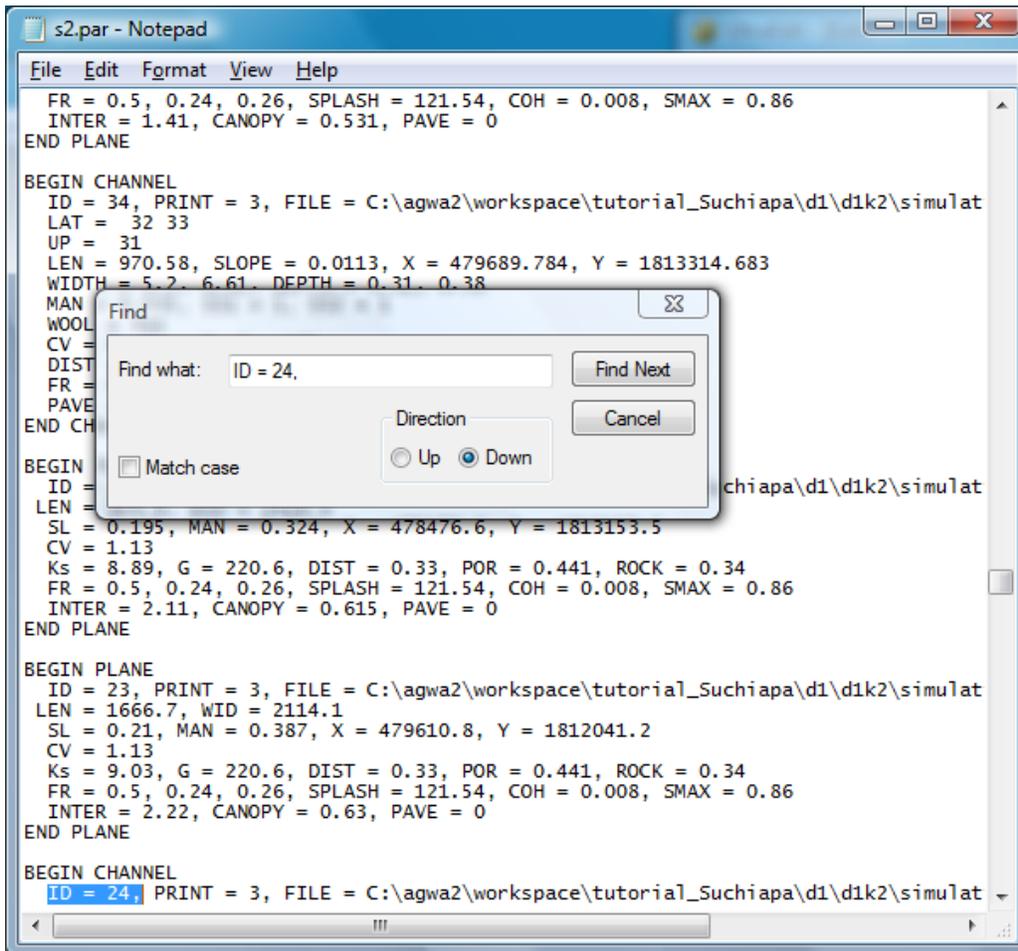
BEGIN PLANE
ID = 192, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simula
LEN = 356, WID = 988.4
SL = 0.074, MAN = 0.13, X = 469627.6, Y = 1810811.8
CV = 1.13
Ks = 8.48, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.33
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 1.75, CANOPY = 0.57, PAVE = 0
END PLANE
```

Select *Edit->Copy*

Open a new instance of **Notepad** (Untitled).

Select *Edit->Paste*

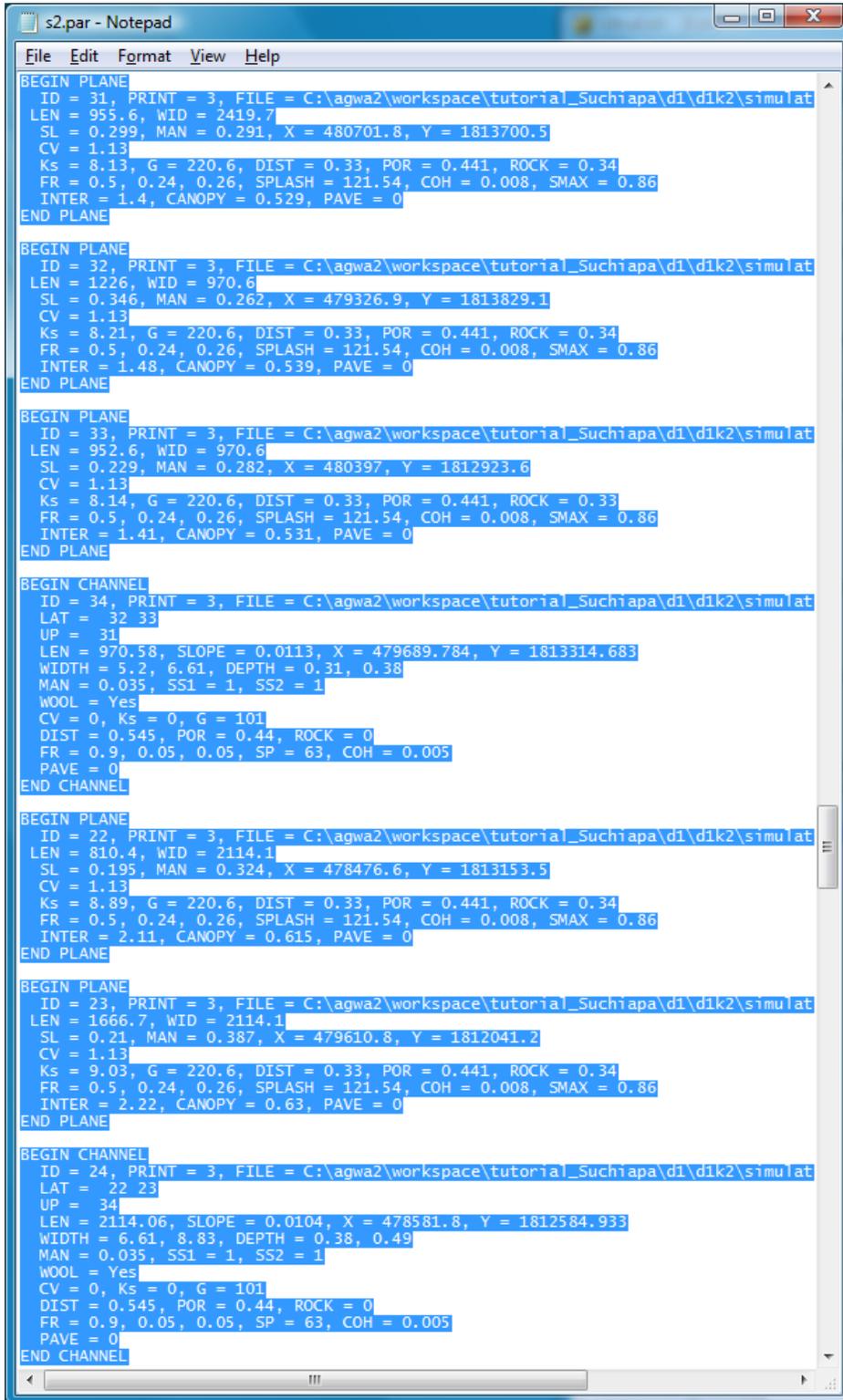
Return to s2.par, select *Edit->Find*, enter "ID = 24," then hit *Find Next*:



Dismiss the *Find* dialog window.

KINEROS processes elements in the order they appear in the parameter file, so upstream elements must precede any downstream elements they contribute to. Since the downstream end of channel element 24 is the outlet of the subwatershed, all of the upstream elements must precede it. "UP" indicates the element ID number of its upstream contributor, and for channels "LAT" indicates the lateral contributors

Starting at the END of the channel element 24 parameter block, move upward to select all of the elements of the subwatershed contributing to channel 24:

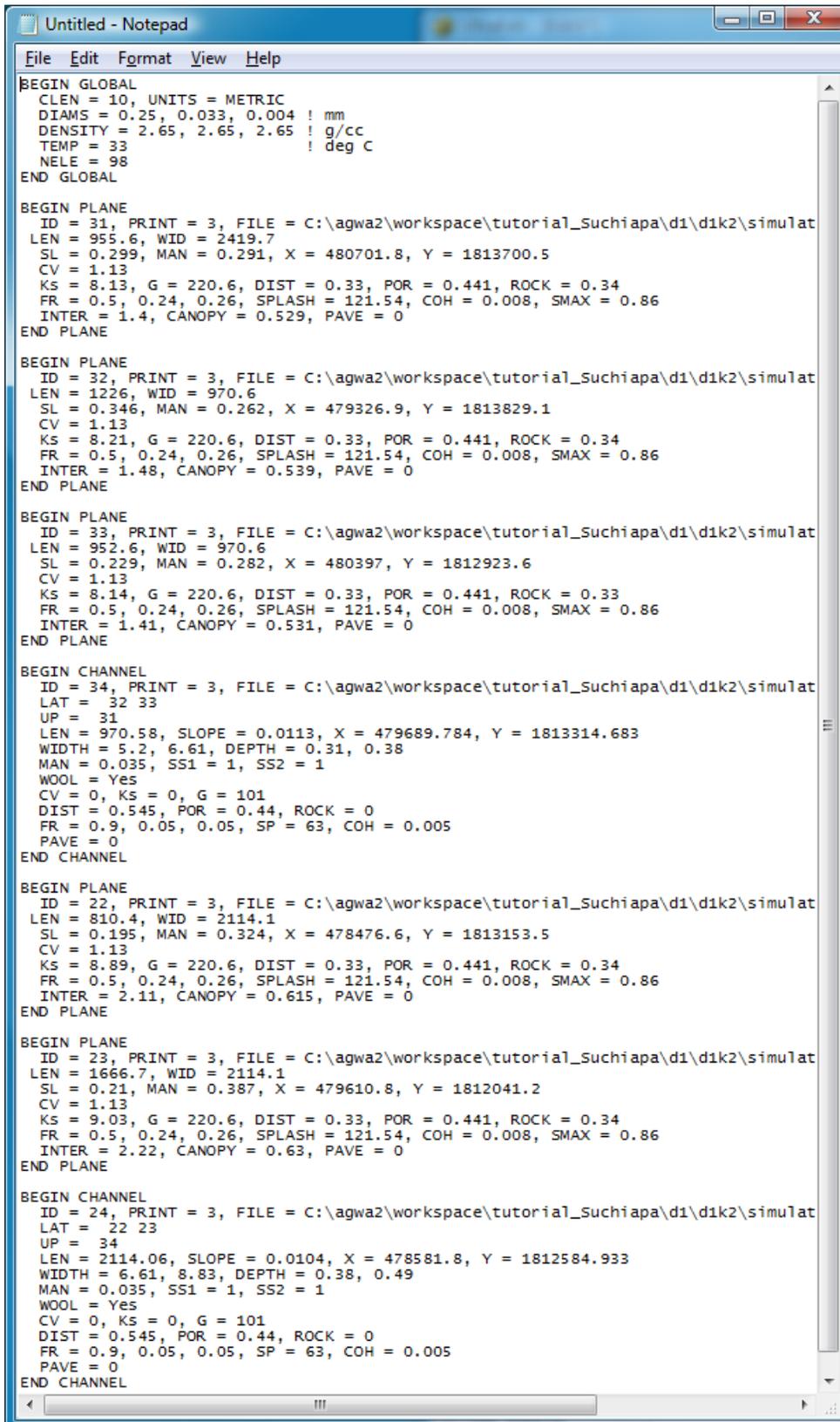


```
s2.par - Notepad
File Edit Format View Help
BEGIN PLANE
ID = 31, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LEN = 955.6, WID = 2419.7
SL = 0.299, MAN = 0.291, X = 480701.8, Y = 1813700.5
CV = 1.13
Ks = 8.13, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 1.4, CANOPY = 0.529, PAVE = 0
END PLANE
BEGIN PLANE
ID = 32, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LEN = 1226, WID = 970.6
SL = 0.346, MAN = 0.262, X = 479326.9, Y = 1813829.1
CV = 1.13
Ks = 8.21, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 1.48, CANOPY = 0.539, PAVE = 0
END PLANE
BEGIN PLANE
ID = 33, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LEN = 952.6, WID = 970.6
SL = 0.229, MAN = 0.282, X = 480397, Y = 1812923.6
CV = 1.13
Ks = 8.14, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.33
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 1.41, CANOPY = 0.531, PAVE = 0
END PLANE
BEGIN CHANNEL
ID = 34, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LAT = 32 33
UP = 31
LEN = 970.58, SLOPE = 0.0113, X = 479689.784, Y = 1813314.683
WIDTH = 5.2, 6.61, DEPTH = 0.31, 0.38
MAN = 0.035, SS1 = 1, SS2 = 1
WOOL = Yes
CV = 0, Ks = 0, G = 101
DIST = 0.545, POR = 0.44, ROCK = 0
FR = 0.9, 0.05, 0.05, SP = 63, COH = 0.005
PAVE = 0
END CHANNEL
BEGIN PLANE
ID = 22, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LEN = 810.4, WID = 2114.1
SL = 0.195, MAN = 0.324, X = 478476.6, Y = 1813153.5
CV = 1.13
Ks = 8.89, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 2.11, CANOPY = 0.615, PAVE = 0
END PLANE
BEGIN PLANE
ID = 23, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LEN = 1666.7, WID = 2114.1
SL = 0.21, MAN = 0.387, X = 479610.8, Y = 1812041.2
CV = 1.13
Ks = 9.03, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
INTER = 2.22, CANOPY = 0.63, PAVE = 0
END PLANE
BEGIN CHANNEL
ID = 24, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\dik2\simulat
LAT = 22 23
UP = 34
LEN = 2114.06, SLOPE = 0.0104, X = 478581.8, Y = 1812584.933
WIDTH = 6.61, 8.83, DEPTH = 0.38, 0.49
MAN = 0.035, SS1 = 1, SS2 = 1
WOOL = Yes
CV = 0, Ks = 0, G = 101
DIST = 0.545, POR = 0.44, ROCK = 0
FR = 0.9, 0.05, 0.05, SP = 63, COH = 0.005
PAVE = 0
END CHANNEL
```

Select *Edit*->*Copy*

www.tucson.ars.ag.gov/agwa
www.epa.gov/esd/land-sci/agwa/

Return to Untitled, select *Edit->Paste*:



```
File Edit Format View Help
BEGIN GLOBAL
  CLEN = 10, UNITS = METRIC
  DIAMS = 0.25, 0.033, 0.004 ! mm
  DENSITY = 2.65, 2.65, 2.65 ! g/cc
  TEMP = 33 ! deg C
  NELE = 98
END GLOBAL

BEGIN PLANE
  ID = 31, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LEN = 955.6, WID = 2419.7
  SL = 0.299, MAN = 0.291, X = 480701.8, Y = 1813700.5
  CV = 1.13
  KS = 8.13, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
  FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
  INTER = 1.4, CANOPY = 0.529, PAVE = 0
END PLANE

BEGIN PLANE
  ID = 32, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LEN = 1226, WID = 970.6
  SL = 0.346, MAN = 0.262, X = 479326.9, Y = 1813829.1
  CV = 1.13
  KS = 8.21, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
  FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
  INTER = 1.48, CANOPY = 0.539, PAVE = 0
END PLANE

BEGIN PLANE
  ID = 33, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LEN = 952.6, WID = 970.6
  SL = 0.229, MAN = 0.282, X = 480397, Y = 1812923.6
  CV = 1.13
  KS = 8.14, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.33
  FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
  INTER = 1.41, CANOPY = 0.531, PAVE = 0
END PLANE

BEGIN CHANNEL
  ID = 34, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LAT = 32 33
  UP = 31
  LEN = 970.58, SLOPE = 0.0113, X = 479689.784, Y = 1813314.683
  WIDTH = 5.2, 6.61, DEPTH = 0.31, 0.38
  MAN = 0.035, SS1 = 1, SS2 = 1
  WOOL = Yes
  CV = 0, KS = 0, G = 101
  DIST = 0.545, POR = 0.44, ROCK = 0
  FR = 0.9, 0.05, 0.05, SP = 63, COH = 0.005
  PAVE = 0
END CHANNEL

BEGIN PLANE
  ID = 22, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LEN = 810.4, WID = 2114.1
  SL = 0.195, MAN = 0.324, X = 478476.6, Y = 1813153.5
  CV = 1.13
  KS = 8.89, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
  FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
  INTER = 2.11, CANOPY = 0.615, PAVE = 0
END PLANE

BEGIN PLANE
  ID = 23, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LEN = 1666.7, WID = 2114.1
  SL = 0.21, MAN = 0.387, X = 479610.8, Y = 1812041.2
  CV = 1.13
  KS = 9.03, G = 220.6, DIST = 0.33, POR = 0.441, ROCK = 0.34
  FR = 0.5, 0.24, 0.26, SPLASH = 121.54, COH = 0.008, SMAX = 0.86
  INTER = 2.22, CANOPY = 0.63, PAVE = 0
END PLANE

BEGIN CHANNEL
  ID = 24, PRINT = 3, FILE = C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulat
  LAT = 22 23
  UP = 34
  LEN = 2114.06, SLOPE = 0.0104, X = 478581.8, Y = 1812584.933
  WIDTH = 6.61, 8.83, DEPTH = 0.38, 0.49
  MAN = 0.035, SS1 = 1, SS2 = 1
  WOOL = Yes
  CV = 0, KS = 0, G = 101
  DIST = 0.545, POR = 0.44, ROCK = 0
  FR = 0.9, 0.05, 0.05, SP = 63, COH = 0.005
  PAVE = 0
END CHANNEL
```

Select *File->Save As*, enter sub2.par, *Save as type: All Files (*.*)*, and make sure the path is *C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulations\s2*

You can close s2.par at this point.

In **Notepad**, Select *File->Open*, set the file name filter to *All Files (*.*)*, and select kin.fil

The kin.fil file is a comma-delimited file that specifies input files and other options to run the KINEROS program. In order from left to right:

1. Parameter file
2. Rainfall file
3. Output file
4. Title for the output file (must be enclosed in double quotes)
5. Duration of the simulation (minutes)
6. Time step (minutes)
7. Auto adjust computational time step to meet Courant criteria? (Y/N)
8. Simulate sediment? (Y/N)
9. Global parameter multiplier file (optional)
10. Include tabular summary at end of output file? (Y/N-optional)
11. Specify depth of initial soil moisture? (N/value-optional)

Change “s2.par” to “sub2.par” and “s2.out” to “sub2.out”, then *File->Save*

Open **Windows Explorer**, navigate to *C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulations\s2*

Double-click *Kineros2_AGWA.exe*

In **Notepad**, select *File->Open*, set the file name filter to *All Files (*.*)*, and select sub2.out

The output file consists of 4 sections. The first section echos the input from kin.fil and an optional global parameter multiplier file (not used in this case, so multipliers default to 1.0). The second section reports a summary for each element, including a volume balance error. The third section is a summary for the entire watershed, and the fourth section is a table of information for each element.

As an aside, note that the overall volume balance error reported on line 238 is 6%. In general, volume balance errors of much more than 1% may indicate a problem with the numerical solution. In particular, plane 23 has an error of 15%. In this case the problem is due to a steep slope and a long length relative to the number of finite difference nodes. A remedy would be to break the single plane into 2 or more planes, which will be illustrated later in this tutorial.

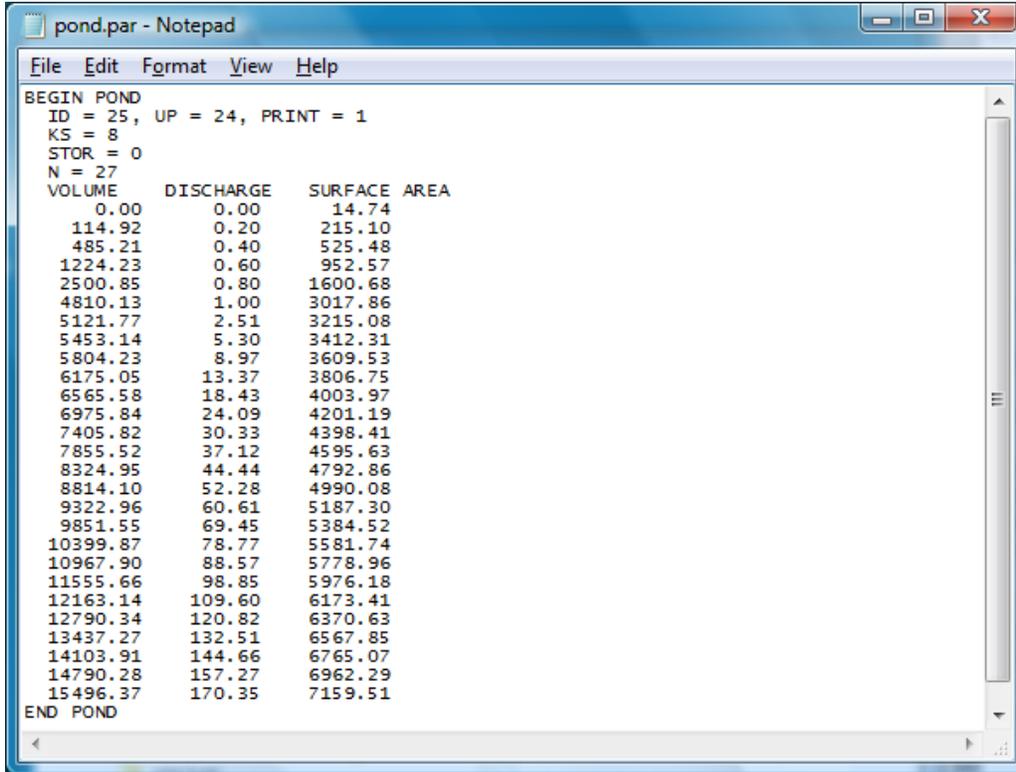
Part 2: Add a retention pond element at the outlet of the subwatershed

In **Notepad**, select *File->Open*, set the file name filter to *All Files (*.*)*, and select sub2.par

Open a new instance of **Notepad**, select *File->Open*, navigate to C:\AGWA2\gisdata\tutorial_Suchiapa\
C:\AGWA2\gisdata\tutorial_Suchiapa\, set the file name filter to *All Files (*.*)*, and select pond.par

Copy the contents of pond.par and paste it onto the end of sub2.par

Assign the pond element a unique ID number, and assign channel 24 as the upstream contributor:



```
pond.par - Notepad
File Edit Format View Help
BEGIN POND
ID = 25, UP = 24, PRINT = 1
KS = 8
STOR = 0
N = 27
VOLUME      DISCHARGE    SURFACE AREA
    0.00         0.00       14.74
   114.92        0.20      215.10
   485.21         0.40      525.48
  1224.23         0.60      952.57
  2500.85         0.80     1600.68
  4810.13         1.00     3017.86
  5121.77         2.51     3215.08
  5453.14         5.30     3412.31
  5804.23         8.97     3609.53
  6175.05        13.37     3806.75
  6565.58        18.43     4003.97
  6975.84        24.09     4201.19
  7405.82        30.33     4398.41
  7855.52        37.12     4595.63
  8324.95        44.44     4792.86
  8814.10        52.28     4990.08
  9322.96        60.61     5187.30
  9851.55        69.45     5384.52
 10399.87        78.77     5581.74
 10967.90        88.57     5778.96
 11555.66        98.85     5976.18
 12163.14       109.60     6173.41
 12790.34       120.82     6370.63
 13437.27       132.51     6567.85
 14103.91       144.66     6765.07
 14790.28       157.27     6962.29
 15496.37       170.35     7159.51
END POND
```

Select *File->Save As*, enter sub2-pond.par, *Save as type: All Files (*.*)*, and make sure the path is
C:\agwa2\workspace\tutorial_Suchiapa\d1\d1k2\simulations\s2

You can close pond.par at this point.

In **Notepad**, select *File->Open*, set the file name filter to *All Files (*.*)*, and select kin.fil

Change "sub2.par" to "sub2-pond.par" and "sub2.out" to "sub2-pond.out", then *File->Save*

In **Windows Explorer**, double-click Kineros2_AGWA.exe

In **Notepad**, select *File->Open*, set the file name filter to *All Files (*.*)*, and select sub2-pond.out

By comparing the summary output of channel 24 with the pond, we see that there was a small reduction in peak outflow rate (from 12 m³/s to 11.6 m³/s) and a significant reduction in sediment outflow (from 1,841,230 kg to 686,431 kg)