

iemiscdata: Examples Using Manning's n

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Examples

The following examples show how to locate Manning's n using the `nchannel`, `npartfull`, `nmetapipe`, and `nsheetflow` tables provided in this package.

The examples make more sense if you have familiarized yourself with the `nchannel`, `npartfull`, and `nmetapipe` tables. There are instructions to view the tables, as a .pdf, in the [View-PDF-table-vignette](#).

Load the required packages

```
1 install.load::load_package("iemiscdata", "data.table", "iemisc", "rivr",
2 # load needed packages using the load_package function from the install.
3 # package (it is assumed that you have already installed these packages)
```

Example 1 (nchannel)

What is the maximum Manning's n value for a channel that has the following classification: “Natural streams - minor streams (top width at floodstage < 100 ft), Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages and bottom: gravels, cobbles, and few boulders?”

```
1 # Use grep to find the row number matching the given description Use
2 # nchannel$'Type of Channel and Description' to select the column to sea
3 # through Use nchannel[nlocation, 4] to select the row number from nloca
4 # and column 4 Similar steps are performed for each of these examples
5
6
7 # The 1st heading is 'Manning's n for Channels' The 2nd heading is 'Natu
8 # streams - minor streams (top width at floodstage < 100 ft)' The 3rd he
```

```

9 # is 'Mountain streams, no vegetation in channel, banks usually steep, t
10 # and brush along banks submerged at high stages' The 4th heading is 'bo
11 # gravels, cobbles, and few boulders'
12
13 data(nchannel, package = "iemiscdata")
14
15 # locate the row where 'Type of Channel and Description' == 'bottom: gra
16 # cobbles, and few boulders'
17 nlocation1 <- nchannel[nchannel$"Type of Channel and Description" %like%
18   ]
19
20
21 n1 <- nlocation1$"Maximum n"
22
23 n1

```

[1] 0.05

Example 2 (npartfull)

What is the minimum Manning's n value for a channel that has the following classification: "Closed Conduits Flowing Partly Full, Wood and Stave?"

```

1 # The 1st heading is 'Manning's n for Closed Conduits Flowing Partly Full
2 # 2nd heading is 'Wood' The 3rd heading is 'Stave'
3
4 data(npartfull, package = "iemiscdata")
5
6 # locate the row where 'Type of Conduit and Description' %like% 'Stave'
7 nlocation2 <- npartfull[npartfull$"Type of Conduit and Description" %lik
8   ]
9

```

```

10 n2 <- nlocation2$"Minimum n"
11
12 n2

[1] 0.01

```

Example 3 (nmetalpipe)

What is the Manning's n value for a channel that has the following classification: "Corrugated Metal Pipe, Corrugations 6x2 inches and 60" diameter?"

```

1 # The 1st heading is 'Manning's n for Corrugated Metal Pipe' The 2nd heading is 'Corrugations 6x2 inches' The 3rd heading is 'Corrugations 6x2 inches and 60" diameter'
2 # 'Corrugations 6x2 inches' The 3rd heading is 'Corrugations 6x2 inches and 60" diameter'
3 # 60\" diameter'
4
5 data(nmetalpipe, package = "iemiscdata")
6
7 # locate the row where 'Type of Pipe and Diameter and Corrugation Dimensions' is 'Corrugations 6x2 inches and 60" diameter'
8 # %like% 'Corrugations 6x2 inches and 60" diameter'
9 nlocation3 <- nmetalpipe[nmetalpipe$"Type of Pipe and Diameter and Corrugation Dimensions" == "Corrugations 6x2 inches and 60" diameter", ]
10
11
12 n3 <- nlocation3$n
13
14 n3

numeric(0)

```

Example 4 (nchannel) – From Reference 1 (compute_profile function)

Example to compute the “gradually-varied flow profile of a prismatic channel” with these channel conditions used to find Manning’s n (normal): “Natural streams - minor streams (top width at floodstage < 100 ft), Excavated or Dredged Channels, Earth, straight, and uniform, & clean, recently completed.”

```
1 # The 1st heading is 'Manning's n for Channels' The 2nd heading is 'Natu
2 # streams - minor streams (top width at floodstage < 100 ft)' The 3rd he
3 # is 'Excavated or Dredged Channels' The 4th heading is 'Earth, straight
4 # uniform' The 5th heading is 'clean, recently completed'
5
6
7 # Using the data for the M1 profile example in rivr's compute_profile, e
8 # for the value of n to find the channel condition
9
10 # locate the row where 'Type of Channel and Description' == 'bottom: gra
11 # cobbles, and few boulders'
12 nlocation4 <- nchannel[nchannel$"Type of Channel and Description" %like%
13   ]
14
15
16 n4 <- nlocation4$"Maximum n"
17
18 n4
```

```
[1] 0.02
```

```
1 compute_profile(0.001, n4, 250, 2.7, 1.486, 32.2, 100, 0, stepdist = 50,
```

Simulation type:
Gradually-varied flow

Call:
compute_profile(So = 0.001, n = n4, Q = 250, y0 = 2.7, Cm = 1.486,
g = 32.2, B = 100, SS = 0, stepdist = 50, totaldist = 3000)

Channel geometry:

So:0.001

n :0.02

B :100

SS:0

Model specification:

delta.x :50

channel.length:3000

normal.depth :1.05

critical.depth:0.579

Data:

x : num [1:61] 0 -50 -100 -150 -200 -250 -300 -350 -400 -
450 ...

z : num [1:61] 0 0.05 0.1 0.15 0.2 0.25 0.3 0.35 0.4 0.45 ...

y : num [1:61] 2.7 2.65 2.6 2.56 2.51 ...

v : num [1:61] 0.926 0.943 0.96 0.978 0.997 ...

A : num [1:61] 270 265 260 256 251 ...

Sf: num [1:61] 4.43e-05 4.70e-05 4.99e-05 5.30e-05 5.64e-
05 ...

E : num [1:61] 2.71 2.72 2.72 2.72 2.72 ...

Fr: num [1:61] 0.0993 0.102 0.1049 0.1078 0.1109 ...

Example 5

What is the critical y (critical flow depth) for this cross-section (from Example 4)?

```
1 # Let's assume that the channel from Example 4 has a trapezoidal shape w
2 # slope of m (see below).
3
4 m <- 1/0.8390996
```

```

5
6 critical_y <- Manningtrap_critical(Q = 250, b = 100, m = m, Sf = 0.001,
7   type = "symmetrical", critical = "accurate", output = "data.table")

```

Flow IS in the rough turbulent zone so the Gauckler-Manning-Strickler equation is acceptable to use.

This is subcritical flow.

The critical flow depth is 0.579.

Example 6 (nsheetflow) – Modified from Example 3-1 of Reference 2

“Segment AB: Sheet flow; dense grass; slope (s) = 0.01 ft/ft; and length (L) = 100 ft. Segment BC: Shallow concentrated flow; unpaved; s = 0.01 ft/ft; and L = 1,400 ft. Segment CD: Channel flow; Manning’s n = .05; flow area (a) = 27 ft²; wetted perimeter (pw) = 28.2 ft; s = 0.005 ft/ft; and L = 7,300 ft.”

Obtain Manning’s n for Segment AB.

```

1 # Given 'dense grass', the table has 'Dense grasses'
2
3 # locate the row where 'Surface description' %like% 'Dense grass'
4 nlocation5 <- nsheetflow[nsheetflow$"Surface description" %like% "Dense
5
6
7 n5 <- nlocation5$"n *1"
8
9 n5

[1] 0.24

```

References

Reference 1

`rivr`: Steady and Unsteady Open-Channel Flow Computation, <https://CRAN.R-project.org/package=rivr>

Reference 2

United States Department of Agriculture Natural Resources Conservation Service Conservation Engineering Division, “Urban Hydrology for Small Watersheds Technical Release 55 (TR-55),” June 1986, page 3-4, <https://web.archive.org/web/20230810204711/https://directives.sc.egov.usda.gov/OpenNonWebContent.aspx?content=22162.wba> [Recovered with the Internet Archive: Wayback Machine]

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