

Table 3. Values of Manning's roughness coefficient (from Van Haveren, 1986)

Description of Channel	Minimum	Normal	Maximum
<b>A. Excavated or dredged</b>			
1. Earth, straight and uniform			
a. Clean, recently completed	0.016	0.018	0.020
b. Clean, after weathering	0.018	0.022	0.025
c. Gravel, uniform section, clean	0.022	0.025	0.030
d. With short grass, few weeds	0.022	0.027	0.033
2. Earth, winding, sluggish			
a. No vegetation	0.023	0.025	0.030
b. Grass, some weeds	0.025	0.030	0.033
c. Dense weeds or aquatic plants in deep channels	0.030	0.035	0.040
d. Earth bottom and rubble sides	0.028	0.030	0.035
e. Stony bottom and weedy banks	0.025	0.035	0.040
f. Cobble bottom and clean sides	0.030	0.040	0.050
3. Dragline-excavated or dredged			
a. No vegetation	0.025	0.028	0.033
b. Light brush on banks	0.035	0.050	0.060
4. Rock cuts			
a. Smooth and uniform	0.025	0.035	0.040
b. Jagged and irregular	0.035	0.040	0.050
5. Channels not maintained, weeds and brush not cut			
a. Dense weeds as high as flow depth	0.050	0.080	0.120
b. Clean bottom, brush on sides	0.040	0.050	0.080
c. Same as above at highest stage of flow	0.045	0.070	0.110
d. Dense brush, high stage	0.080	0.100	0.140
<b>B. Natural streams</b>			
1. Minor streams with width at flood stage < 100 ft			
a. Streams on plains			
(1) Clean, straight, full stage no rifts or deep pools	0.025	0.030	0.033
(2) Same as above but more stones and weeds	0.030	0.035	0.040
(3) Clean, winding, some pools and bars	0.033	0.040	0.045
(4) Same as above but some weeds and stones	0.035	0.045	0.050
(5) Same as above but lower stages, more ineffective slopes and sections	0.040	0.048	0.055
(6) Same as (4) but more stones	0.045	0.050	0.060
(7) Sluggish reaches, weedy, deep pools	0.050	0.070	0.080
(8) Very weedy reaches, deep pools or floodways with heavy stand of timber and underbrush	0.075	0.100	0.150
b. Mountain streams, no vegetation in channel, banks usually steep, trees and brush along banks submerged at high stages			
(1) Bottom consists of gravels, cobbles, and few boulders	0.030	0.040	0.050
(2) Bottom consists of cobbles with large boulders	0.040	0.050	0.070
(3) Bottom consists of large boulders and some large organic debris, sinuous flow	0.050	0.070	0.100
2. Floodplains			
a. Pasture, no brush			
(1) Short grass	0.025	0.030	0.035
(2) High grass	0.030	0.035	0.050
b. Cultivated areas			
(1) No crop	0.020	0.030	0.040
(2) Mature row crops	0.025	0.035	0.045
(3) Mature field crops	0.030	0.040	0.050

11.15 Values of the Manning Roughness Coefficient,  $n$  (continued)

Description of Channel	Minimum	Normal	Maximum
<b>c. Brush</b>			
(1) Scattered brush, heavy weeds	0.035	0.050	0.070
(2) Light brush and trees in winter	0.035	0.050	0.060
(3) Light brush and trees in summer	0.040	0.060	0.080
(4) Medium to dense brush in winter	0.045	0.070	0.110
(5) Medium to dense brush in summer	0.070	0.100	0.160
<b>d. Trees</b>			
(1) Dense willows, summer, straight	0.110	0.150	0.200
(2) Cleared land, tree stumps no sprouts	0.030	0.040	0.050
(3) Same as above, with heavy sprout growth	0.050	0.060	0.080
(4) Heavy stand of timber, a few downed trees, little undergrowth, flood stage below branches	0.080	0.100	0.120
(5) Same as above, but with flood stage reaching branches	0.100	0.120	0.160
3. Major streams with width at flood stage > 100 ft			
a. Streams on plains			
(1) Sand channels	0.025	0.035	0.045
(2) Boulder channels	0.028	0.040	0.045
(3) Vegetation-lined channels at flood stage	0.045	—	0.120
b. Mountain streams			
(1) Cobble bottom, no debris jams	0.028	0.035	0.040
(2) Cobble bottom with debris jams	0.032	—	0.060
(3) Bottom with large boulders, no debris jams	0.045	0.050	0.070
(4) Bottom with large boulders, debris jams in channel	0.050	—	0.100
<b>C. Channels in swales with vegetation</b>			
1. Depth of flow up to 0.7 ft			
a. Bermuda grass, bluegrass, buffalo grass			
(1) Height 2-4 in.	0.045	—	0.060
(2) Height 4-6 in.	0.060	—	0.090
b. Good stand, any grass			
(1) Height 6-12 in.	0.060	—	0.180
(2) Height 12-24 in.	0.180	—	0.300
c. Fair stand, any grass			
(1) Height 6-12 in.	0.050	—	0.140
(2) Height 12-24 in.	0.140	—	0.250
2. Depth of flow 0.7-1.5 ft			
a. Bermuda grass, bluegrass, buffalo grass			
(1) Height 2-4 in.	0.035	—	0.055
(2) Height 4-6 in.	0.040	—	0.060
b. Good stand, any grass			
(1) Height 6-12 in.	0.050	—	0.120
(2) Height 12-24 in.	0.100	—	0.200
c. Fair stand, any grass			
(1) Height 6-12 in.	0.040	—	0.100
(2) Height 12-24 in.	0.080	—	0.170