

# Curve Number Graphs

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Data for curve number graph

```
# create a sequence of precip from 1 to 300 mm by 1 mm increments
# create data for all of the curve numbers and make a long dataframe
cn_data <- data.frame(precip_mm = seq(from = 1, to = 300, by = 1)) %>%
  mutate(cn_20 = 20, cn_25 = 25, cn_30 = 30, cn_35 = 35, cn_40 = 40,
         cn_45 = 45, cn_50 = 50, cn_55 = 55, cn_60 = 60, cn_65 = 65,
         cn_70 = 70, cn_75 = 75, cn_80 = 80, cn_85 = 85, cn_90 = 90,
         cn_95 = 95, cn_100 = 100) %>%
  gather(key = cn, value = cn_value, -precip_mm) %>%
  mutate(S = 25400/cn_value - 254) %>%
  mutate(Q = ifelse(test = precip_mm > 0.2 * S,
                    yes = ((precip_mm - 0.2 * S)^2)/(precip_mm + 0.8 * S),
                    no = 0)) %>%
  mutate(Q = round(Q, 3)) %>%
  mutate(cn = paste('CN', cn_value))

# this is a little verbose but works
cn_points <- cn_data %>% filter(precip_mm >= 170 & precip_mm <= 190) %>%
  filter(precip_mm == 190) %>%
  arrange(desc(cn_value)) %>%
  mutate(point_placement = 180) %>%
  mutate(point_placement_increment = 6.25) %>%
  mutate(point_placement_final = cumsum(point_placement_increment) + point_placement) %>%
  mutate(point_placement_final = round(point_placement_final, 0))

# create a new set of points for angled labels
new_points <- cn_points %>% select(cn, cn_value, point_placement_final)

# combine the new points with all of the data to find the slope at the new points
new_points_data <- left_join(cn_data, new_points) %>%
  filter(precip_mm >= (point_placement_final - 5) & precip_mm <= (point_placement_final + 5)) %>%
  group_by(cn) %>%
  # calculate max and min for slope
  mutate(max_p = max(precip_mm), min_p = min(precip_mm),
         max_q = max(Q), min_q = min(Q)) %>%
  mutate(rise = max_q - min_q,
         run = max_p - min_p) %>%
  mutate(slope = rise / run) %>%
  # convert slope of lines to degrees
  mutate(degrees = atan(slope) * 180/pi) %>%
  filter(precip_mm == point_placement_final) %>%
  ungroup()
```

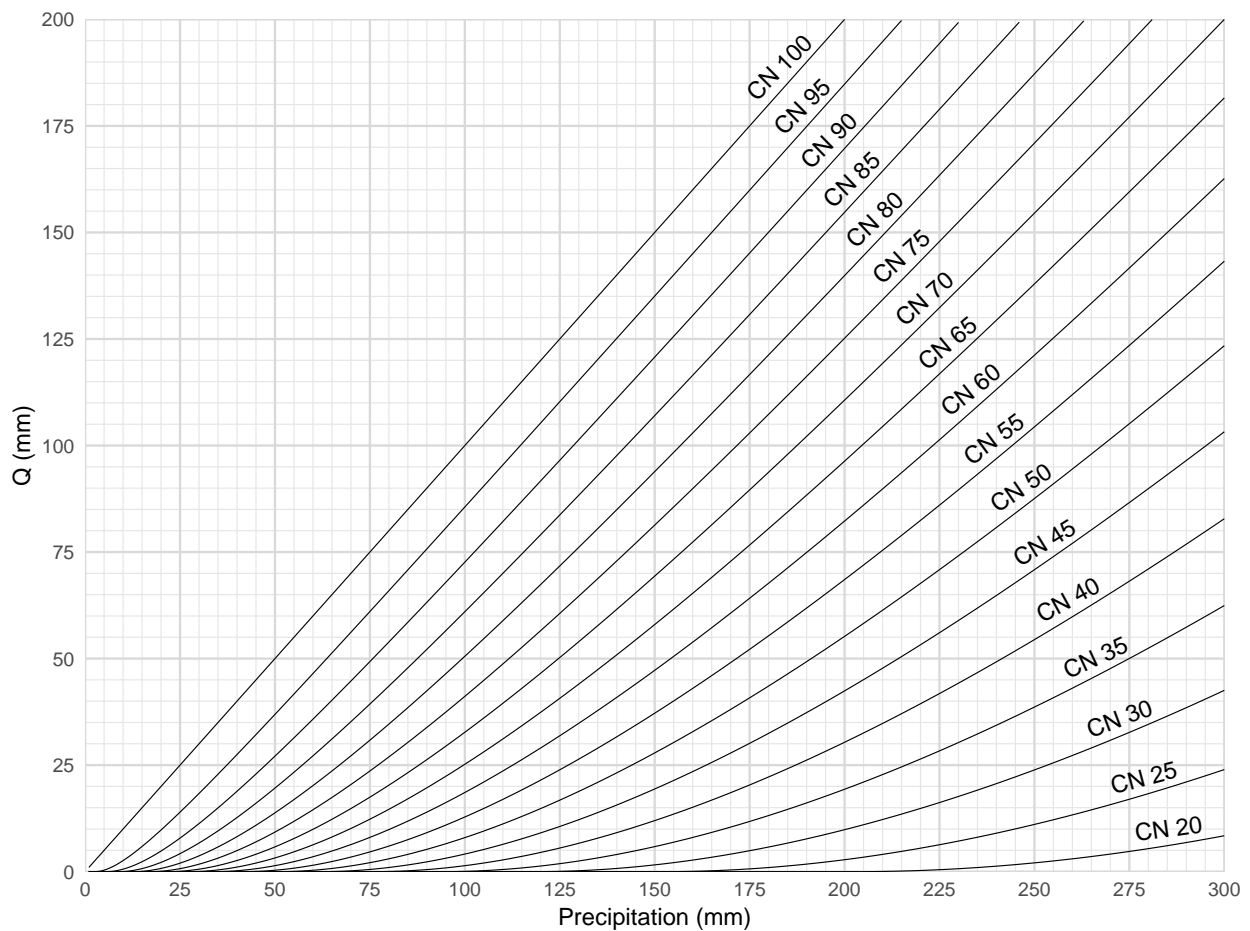
Curve number graph

```
ggplot(data = cn_data, aes(x = precip_mm, y = Q, group = cn)) +
  geom_line(size = 0.25) +
```

```

#theme_bw() +
theme_minimal() +
geom_text(data = new_points_data, aes(x = precip_mm, y = Q, label = cn, angle = degrees),
          vjust = -0.5, check_overlap = TRUE) +
scale_y_continuous(breaks = seq(from = 0, to = 300, by = 25),
                   limits = c(0, 200), expand = c(0,0),
                   minor_breaks = seq(0, 200, 5)) +
scale_x_continuous(breaks = seq(from = 0, to = 300, by = 25),
                   limits = c(0, 300), expand = c(0,0),
                   minor_breaks = seq(0, 300, 5)) +
labs(x = 'Precipitation (mm)', y = 'Q (mm)') +
theme(plot.margin=margin(t=0.3,r=0.5,b=0.1,l=0.1,unit="cm"),
      panel.grid.major = element_line(colour = "grey85"),
      panel.grid.minor = element_line(colour = "grey90"))

```



Save the curve number graph to a file.

```

ggsave(file = 'curve_number_graph.pdf', width = 20, height = 13, units = 'cm')
ggsave(file = 'curve_number_graph.tiff', width = 20, height = 13, units = 'cm')

```