Selection of locations for insect monitoring in oaks

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Contents

Set up a cache variable for saving intermediate work. Set it to false to use stored intermediates. Set to TRUE to rerun from scratch.

```
cache_var <- FALSE
```

```
con <- NinaR::postgreSQLConnect()
```

Plan

From Rannveig's notes.

Vi skal trekke 150 eiker (100 til overvåkingen, men må ha ekstra for å justere i forhold til logistikk, grunneiertillatelse og i felt feks om noen trær er borte) fra de 600 ARKO-eikene (657 minus «gone» og «not found» i 2019), etter følgende kriterier:

Doblet sannsynlighet for å trekke trær med omkrets over 200 cm.

Andel eiker i vårt utvalg speiler fordelingen blant alle ARKO-eiker; hvis det feks er 20% i Vestland, 30% i Agder, 30% i V/T, 20% i Viken, så skal overvåkingseikene fordeles etter samme andeler.

Maks 2 overvåkingstrær per ARKO-rute.

Da hule eiker i utgangspunktet er relativt jevnt fordelt mellom skog og åpent landskap, regner vi med at dette vil reflekteres i utvalget av overvåkingstrær uten å legge inn noe styrende kriterium for dette. Vi sjekker om vi har tilfredsstillende fordeling av eiker i skog og utenfor skog totalt og i hver region etter å ha trukket et sett overvåkingstrær.

Etter å ha gjort et utvalg sjekker vi fordeling i forhold til ulike parametre (feks hulrom, vedmuld, barktype, treform), særlig hvor mange A-eiker som er representert.

In addition to this, we only will consider squares with a single tree if that square isn't too far away from other squares (other chosen squares?)

Jens interpretation

It's not that straightforward to meet all these criteria, with an 'automatic' algorithm. Need to set up a random draw with a set total size, that is weighted on tree diameter, allows up to 2 trees per square, only takes squares if they are closer to other squares than a set distance.

Apropos "double probability to draw a tree > 200 cm in circumference". This can be interpreted in several ways. There are slightly more trees above the treshold, so a random sample will produce a higher probability of large trees anyway. We could interpret it as drawing double the amount of large trees (>200cm) than smalller.

After some thinking, I will try this algorithm, based on a random draw of trees, with later filtering:

1. Order the trees randomly. I.e., draw a random order of all trees, with probablities based on tree diameter.
2. Note the distance for each square to the closest square.
3. Note the (randomly drawn) order of trees within each square.
4. Note the randomly drawn order of squares.
5. Record the total number of trees within each square.
6. Discard trees with order > 2.
7. Discard squares with total number of trees <2 & distance_to_nearest_neighbor < distance_limit (Note that actually should depend on that the other squares are selected the same year. This get's complex.)

Load the source excel-file

```
loc_raw <- openxlsx::read.xlsx("../rawData/Oak_2017data_2019resurveydata.xlsx") %>%
  as_tibble()

loc_raw
```

```
## # A tibble: 657 x 47
##    row_number RuteID RuteJA TreID Antall Verdi Omkrets Synlig_~1 Hulhe~2 Hulhe~3
##         <dbl>  <dbl> <chr>  <chr>  <dbl> <chr> <chr>   <chr>     <chr>   <chr>
##  1          1      7 Nei    7_01       1 A     332     JA        1615    2
##  2          2     23 Nei    23_1       1 C     225     NEI       <NA>    <NA>
##  3          3     23 Nei    23_2       1 C     205     NEI       <NA>    <NA>
##  4          4     24 Nei    24_10      1 B     300     JA        <NA>    2
##  5          5     24 Nei    24_2       1 B     237     JA        100     2
##  6          6     24 Nei    24_3       1 C     230     NEI       <NA>    <NA>
##  7          7     24 Nei    24_4       1 C     222     NEI       <NA>    <NA>
##  8          8     24 Nei    24_5       1 C     216     NEI       <NA>    <NA>
##  9          9     24 Nei    24_6       1 B     245     JA        2750    2
## 10         10     24 Nei    24_7       1 B     320     NEI       <NA>    <NA>
## # ... with 647 more rows, 37 more variables: Vedmuld <chr>, Treform <chr>,
## #   Barktype <chr>, Mosedekning <chr>, Vitalitet <dbl>, Kulturspor <chr>,
## #   Omgivelser <chr>, Renskog <chr>, Mestskog <chr>, Noeskog <chr>,
## #   PlasseringAR5 <chr>, Forskrift_gammel <dbl>, Forskrift <dbl>, Vern <chr>,
## #   Gjenvoksing <dbl>, Gjenvoksing2 <dbl>, Skjøtselsbehov <chr>,
## #   UTM32_X_koordinat <dbl>, UTM32_Y_koordinat <dbl>, Kommune <dbl>,
## #   Områdenavn <chr>, Nøyaktighetsklasse <dbl>, Utvalgt.Natur.type <chr>, ...
```

Filter out trees that is gone or not found in 2019.

```
loc <- loc_raw %>%
  filter(
    Gone != 1,
    Not_found != 1
  )

nrow(loc)
```

```
## [1] 600
```

```
loc %>%
  group_by(Omkrets > 200) %>%
  summarise(no = n())
```

```
## # A tibble: 3 x 2
##   `Omkrets > 200`    no
##   <lgl>           <int>
## 1 FALSE             269
## 2 TRUE              329
## 3 NA                  2
```

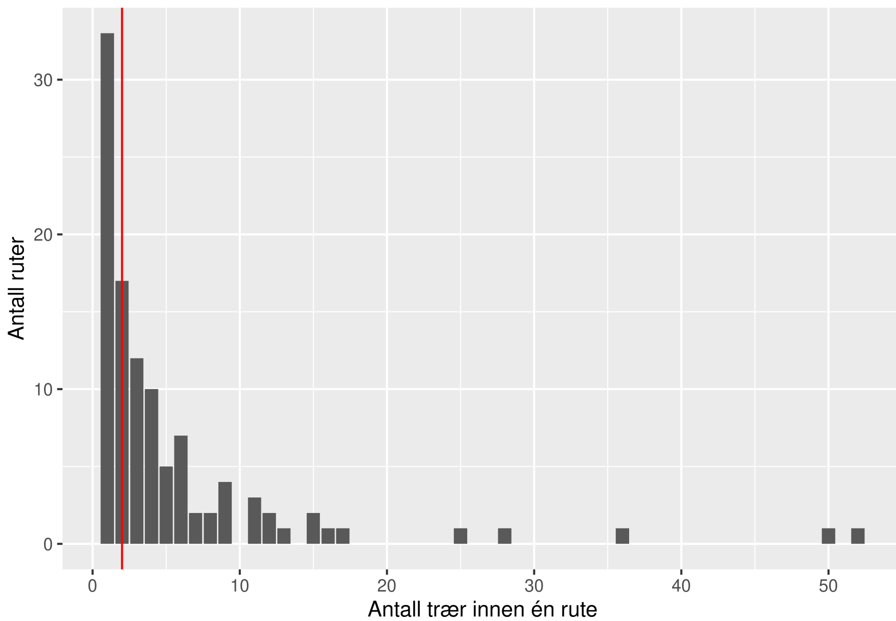
A quick look at the distribution of trees

```
no_rute <- loc %>%
  summarise(no_rute = n_distinct(RuteID)) %>%
  pull()

squares <- loc %>%
  select(RuteID) %>%
  distinct() %>%
  pull()
```

```
loc_with_at_least_two <- loc %>%
  group_by(RuteID) %>%
  summarise(no_trees = n()) %>%
  filter(no_trees > 1) %>%
  summarise(n_distinct(RuteID)) %>%
  pull()
```

We have 107 distinct survey squares (SSB) to choose from. But only 74 survey squares with at least 2 trees (if we want to restrict it to that).

```
loc %>%
  group_by(RuteID) %>%
  summarise(no_trees = n()) %>%
  ggplot() +
  geom_bar(aes(x = no_trees)) +
  geom_vline(aes(xintercept = 2),
    col = "red"
  ) +
  xlab("Antall trær innen én rute") +
  ylab("Antall ruter")
```



Add info on distance to other squares

Add a column with distances to the other squares (if we want to use squares with only 1 tree, if they are close enough to other squares)

Make an SF object (create a geometry).

```
loc_sf <- loc %>%
  st_as_sf(
    coords = c(
      "UTM32_X_koordinat",
      "UTM32_Y_koordinat"
    ),
    crs = 25832
  )
```

Get the ssb square geometries (from the gisdata database).

```
ssb_500m <- read_sf(
  con,
  Id(
    schema = "ssb_data_utm33n",
    table = "ssb_500m"
  )
) %>%
  st_transform(crs = 25832)
```

```
cand_ssb_500m <- ssb_500m %>%
  st_join(loc_sf,
    left = FALSE
  ) %>%
  mutate(ssbid = as.character(ssbid)) %>%
  select(ssbid) %>%
  distinct()

system("mkdir -p out")

save(cand_ssb_500m,
  file = "out/cand_ssb_500m.Rdata"
)
```

```
load(file = "out/cand_ssb_500m.Rdata")
```

Get the distance to the nearest neighbor ssb square.

```
cand_ssb_500m <- cand_ssb_500m %>%
  mutate(nearest_dist = st_distance(., cand_ssb_500m[st_nearest_feature(cand_ssb_500m), ], b

cand_ssb_500m %>%
  select(ssbid, nearest_dist) %>%
  arrange(nearest_dist)
```

```
## Simple feature collection with 105 features and 2 fields
## Geometry type: MULTIPOLYGON
## Dimension:     XY
## Bounding box:  xmin: 304498.2 ymin: 6429778 xmax: 622204.1 ymax: 6842370
## Projected CRS: ETRS89 / UTM zone 32N
## # A tibble: 105 x 3
##    ssbid          nearest_dist                                             geom
##    <chr>                   [m]                               <MULTIPOLYGON [m]>
##  1 20830006464000            0  (((435998.5 6442574, 435954.1 6443071, 436451.1 ~
##  2 20835006463500            0  (((436539.8 6442121, 436495.5 6442618, 436992.4 ~
##  3 20605006483000          499. (((411948.5 6459458, 411904.1 6459955, 412400.9 ~
##  4 20610006482000          499. (((412534.3 6458509, 412489.9 6459006, 412986.7 ~
##  5 21035006539000          499. (((449693.8 6518953, 449649 6519450, 450146.1 65~
##  6 21040006540000          499. (((450101.4 6519991, 450056.7 6520488, 450553.7 ~
##  7 21720006586000          499. (((513594.4 6571828, 513549.5 6572326, 514046.8 ~
##  8 21730006586000          499. (((514589.1 6571918, 514544.1 6572416, 515041.4 ~
##  9 21965006564500         1117. (((539896 6552641, 539851.2 6553139, 540348.6 65~
## 10 21980006563500         1117. (((541478 6551781, 541433.2 6552278, 541930.6 65~
## # ... with 95 more rows
```

Get some background geometries.

```
regions <- read_sf(
  con,
  Id(
    schema = "insect_survey",
    table = "new_landsdel"
  )
)

south <- regions %>%
  filter(!(fylke %in% c("Trøndelag", "Nordland", "Troms og Finnmark")))
```

Join the locations with the ssbids and distances.

```
loc_sf <- loc_sf %>%
  st_join(cand_ssb_500m,
    left = TRUE
  )
```

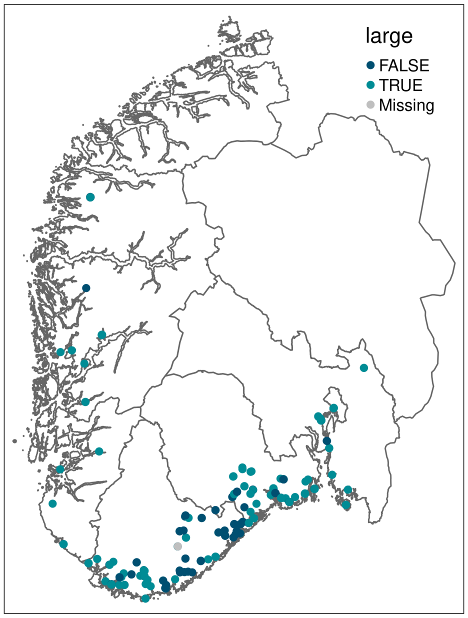
```
loc_sf %>%
  select(ssbid, nearest_dist)
```

Add large/small tree category.

```
loc_sf <- loc_sf %>%
  mutate(large = Omkrets > 200)
```

```
# tmap_mode("view")
tm_shape(south) +
  tm_borders() +
  tm_shape(cand_ssb_500m) +
  tm_borders() +
  tm_shape(loc_sf) +
  tm_dots(
    col = "large",
    size = 0.1,
    palette = ninaPalette()
  )
```

```
## Warning: palette colors names missing for FALSE, TRUE. Therefore, palette color
## names will be ignored
```



Draw random selection of trees

```
largest_dist_to_neighbor_m <- 30000 # as the bird flies (might be longer on roads)
```

Draw random order.

```
set.seed(12345)

tree_sel_random_order <- loc_sf %>%
  filter(!is.na(large)) %>% # Must know the diameter
  mutate(sel_prob = ifelse(large, 2 / 3, 1 / 3)) %>% # double the probability for large tre
  slice(sample(1:n(), n(), prob = sel_prob)) %>%
  ungroup() %>%
  mutate(rand_selection_order = row_number())
```

Note tree order within squares, total amount of trees within square, and (random) rute order. Order it after square random order and tree random order within squares.

```
# This was surprisingly tricky. Needed to make a character factor to be able to preserve the

tree_sel_random_order <- tree_sel_random_order %>%
  group_by(RuteID) %>%
  mutate(
    tree_order_within_square = row_number(),
    no_trees_within_square = n()
```

```
  ) %>%
  ungroup() %>%
  mutate(rute_id_rand_order = forcats::fct_inorder(paste0("rute_", RuteID))) %>%
  group_by(rute_id_rand_order) %>%
  mutate(rute_id_order = cur_group_id()) %>%
  arrange(
    rute_id_order,
    tree_order_within_square
  ) %>%
  ungroup() %>%
  mutate(selection_order = row_number())
```

```
tree_sel_random_order %>%
  st_drop_geometry() %>%
  select(
    RuteID,
    rute_id_rand_order,
    rute_id_order,
    tree_order_within_square,
    no_trees_within_square
  )
# %>%
# print(n = 80)
```

Add a note if single trees are farther away than distance limit.

```
tree_sel_random_order <- tree_sel_random_order %>%
  mutate(
    single_and_lonely = no_trees_within_square < 2 &
      nearest_dist < units::set_units(largest_dist_to_neighbor_m, "m"),
    fylke_navn = "",
    kommune_navn = "",
    kommune_no_2022 = ""
  ) %>%
  select(
    selection_order,
    rand_selection_order,
    rute_id_order,
    tree_order_within_square,
    single_and_lonely,
    no_trees_within_square,
    RuteID,
    everything()
  )
```

This gives us 30 single trees farther away than 3×10^4 meters to other surveyed squares.

```
tree_sel_random_order %>%
  filter(single_and_lonely) %>%
  select(
    RuteID,
    rute_id_rand_order,
    rute_id_order,
    tree_order_within_square,
    no_trees_within_square
  )
```

```
## Simple feature collection with 30 features and 5 fields
## Geometry type: POINT
## Dimension:     XY
## Bounding box:  xmin: 304977 ymin: 6442025 xmax: 574419 ymax: 6678309
## Projected CRS: ETRS89 / UTM zone 32N
## # A tibble: 30 x 6
##    RuteID rute_id_rand_order rute_id~1 tree_~2 no_tr~3         geometry
##     <dbl> <fct>                  <int>   <int>   <int>      <POINT [m]>
##  1    445 rute_445                   3       1       1 (462600 6461819)
##  2    230 rute_230                   8       1       1 (412960 6458942)
##  3    165 rute_165                  21       1       1 (517631 6530234)
##  4     35 rute_35                   27       1       1 (408877 6453442)
##  5    262 rute_262                  28       1       1 (504991 6575610)
##  6    438 rute_438                  38       1       1 (485619 6480188)
##  7    177 rute_177                  47       1       1 (562559 6549777)
##  8     40 rute_40                   54       1       1 (436656 6442542)
##  9     69 rute_69                   55       1       1 (514813 6572424)
## 10    239 rute_239                  67       1       1 (449725 6504552)
## # ... with 20 more rows, and abbreviated variable names 1: rute_id_order,
## #   2: tree_order_within_square, 3: no_trees_within_square
```

Save this complete list for QGIS. Also do some PostGIS stuff.

```
# Need my permissions
my_con <- dbConnect(Postgres(),
  host = "gisdata-db.nina.no",
  dbname = "gisdata"
)

dbWriteTable(my_con,
  name = Id(
    schema = "hule_eiker_insekt",
    table = "oak_sel_random_order"
  ),
```

```
  value = tree_sel_random_order,
  overwrite = TRUE
)

dbSendStatement(
  my_con,
  "
              ALTER TABLE hule_eiker_insekt.oak_sel_random_order
              ADD PRIMARY KEY(row_number);
              "
)

dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN geom Geometry(Point, 25832);
  "
)

dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN geom_25833 Geometry(Point, 25833);

  "
)

dbSendStatement(
  my_con,
  "
              UPDATE hule_eiker_insekt.oak_sel_random_order
              set geom = geometry::Geometry(Point, 25832),
              geom_25833 = ST_Transform(geometry, 25833)::Geometry(Point, 25833)
              "
)

dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  DROP COLUMN geometry;
  "
)
```

```
dbSendStatement(
  my_con,
  "
                CREATE INDEX ON hule_eiker_insekt.oak_sel_random_order USING Gist(geom);
                "
)

dbSendStatement(
  my_con,
  "
                CREATE INDEX ON hule_eiker_insekt.oak_sel_random_order USING Gist(geom_25833
                "
)
dbSendStatement(
  my_con,
  "
UPDATE hule_eiker_insekt.oak_sel_random_order oak
set fylke_navn = f.navn
FROM \"AdministrativeUnits\".norway_counties_fylker_polygons_2020 f
WHERE ST_Intersects(oak.geom_25833, f.geom)
                "
)

dbSendStatement(
  my_con,
  "
UPDATE hule_eiker_insekt.oak_sel_random_order oak
set kommune_navn = f.navn
FROM \"AdministrativeUnits\".norway_municipalities_kommuner_polygon_2020 f
WHERE ST_Intersects(oak.geom_25833, f.geom)
                "
)

dbSendStatement(
  my_con,
  "
UPDATE hule_eiker_insekt.oak_sel_random_order oak
set kommune_no_2022 = f.kommunenum
FROM \"AdministrativeUnits\".norway_municipalities_kommuner_polygon_2020 f
WHERE ST_Intersects(oak.geom_25833, f.geom)
                "
)


dbSendStatement(
```

```
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order ADD COLUMN east_west text;
  "
)

dbSendStatement(
  my_con,
  "
UPDATE hule_eiker_insekt.oak_sel_random_order oak
set east_west = CASE
WHEN fylke_navn IN ('Oslo', 'Vestfold og Telemark','Viken')
THEN 'east'
ELSE 'west'
END;

"
)


dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order ADD COLUMN lon_lat_25833 text;
  "
)

dbSendStatement(
  my_con,
  "
                UPDATE hule_eiker_insekt.oak_sel_random_order
                SET lon_lat_25833 = round(ST_X(geom_25833)::numeric, 6) ||
                  ',' || round(ST_Y(geom_25833)::numeric, 6)
                "
)


dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN matrikkel_no text;
  "
)
```

```
dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN grunneier text;
  "
)


dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN grunneier_telefon text;
  "
)

dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN grunneier_epost text;
  "
)

dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN grunneier_adresse text;
  "
)

dbSendStatement(
  my_con,
  "
  ALTER TABLE hule_eiker_insekt.oak_sel_random_order
  ADD COLUMN kommentar text;
  "
)


dbSendStatement(
  my_con,
  "
```

```
  GRANT ALL ON TABLE hule_eiker_insekt.oak_sel_random_order TO \"oyvind.hamre\"
              "
)

dbSendStatement(
  my_con,
  "
  GRANT ALL ON TABLE hule_eiker_insekt.oak_sel_random_order TO \"rannveig.jacobsen\"
              "
)

dbSendStatement(
  my_con,
  "
  GRANT ALL ON TABLE hule_eiker_insekt.oak_sel_random_order TO gisuser;
              "
)

dbSendStatement(
  my_con,
  "
   UPDATE hule_eiker_insekt.oak_sel_random_order o
   SET matrikkel_no =  teig.kommunenummer || ';' ||
    REPLACE(teig.matrikkelnummertekst, '/', ';')

   FROM matrikkeleneiendomskartteig.teig teig
   WHERE ST_Intersects(o.geom_25833, teig.omrade)

                "
)


dbSendStatement(
  my_con,
  "
                DROP TABLE IF EXISTS hule_eiker_insekt.oak_sel_random_order_backup;
                "
)

dbSendStatement(
  my_con,
  "
               CREATE TABLE hule_eiker_insekt.oak_sel_random_order_backup
               AS TABLE hule_eiker_insekt.oak_sel_random_order WITH DATA;
```

```
                  "
)
```

Test results of filtering out a set of trees

Here we consider only the first 2 trees within each square, plus the single trees that are not isolated. Then we take the first 100 rows (trees).

This can be filtered in QGIS with "tree_order_within_square<=2 OR (no_trees_within_square<2 AND single_and_lonely IS FALSE)"

```
tree_sel_test <- tree_sel_random_order %>%
  filter(tree_order_within_square <= 2 |
    (no_trees_within_square < 2 & !single_and_lonely)) %>%
  slice(1:100)
```

Trestørrelse

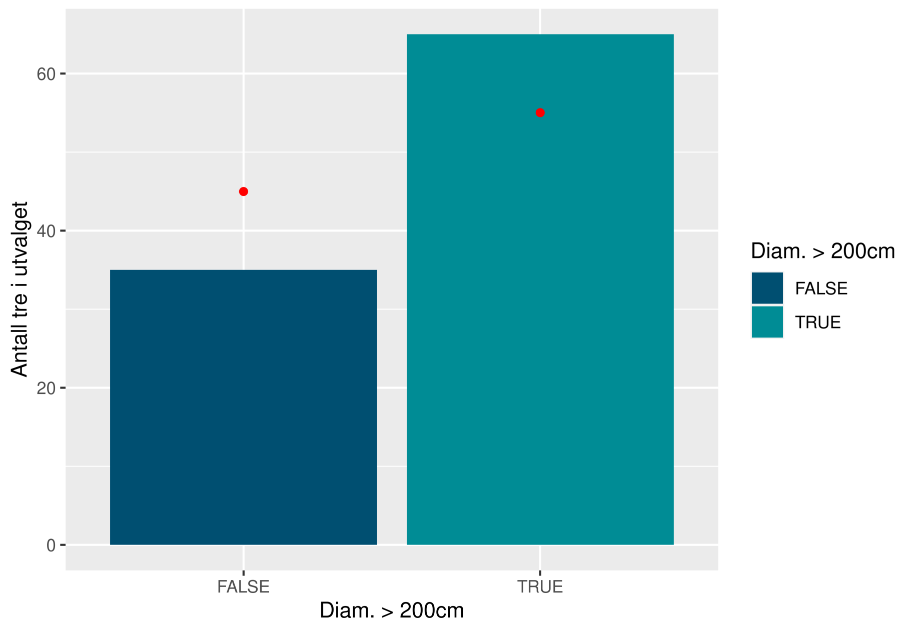
```
n_tree_size <- tree_sel_test %>%
  st_drop_geometry() %>%
  group_by(large) %>%
  summarise(no_trees = n())

n_tree_size
```

```
## # A tibble: 2 x 2
##   large no_trees
##   <lgl>    <int>
## 1 FALSE       35
## 2 TRUE        65
```

```
n_tree_size_exp <- tree_sel_random_order %>%
  st_drop_geometry() %>%
  group_by(large) %>%
  summarise(no_trees = n()) %>%
  ungroup() %>%
  mutate(no_trees_perc = round((no_trees / sum(no_trees) * 100), 2))


n_tree_size_exp
```

```
## # A tibble: 2 x 3
##   large no_trees no_trees_perc
##   <lgl>    <int>         <dbl>
## 1 FALSE      269          45.0
## 2 TRUE       329          55.0
```

```r
ggplot(n_tree_size, aes(y = no_trees, x = large)) +
  geom_bar(aes(fill = large),
    stat = "identity"
  ) +
  geom_point(aes(y = no_trees_perc, x = large),
    data = n_tree_size_exp,
    col = "red"
  ) +
  scale_fill_nina(name = "Diam. > 200cm") +
  ylab("Antall tre i utvalget") +
  xlab("Diam. > 200cm")
```



Of these first 100 prioritized trees, we have 35 small trees, and 65 small. Pretty close to double the amount of larger trees. The red dots show the expected number of large and small, if we had choosen them randomly. Good enough?

Isolerte trær

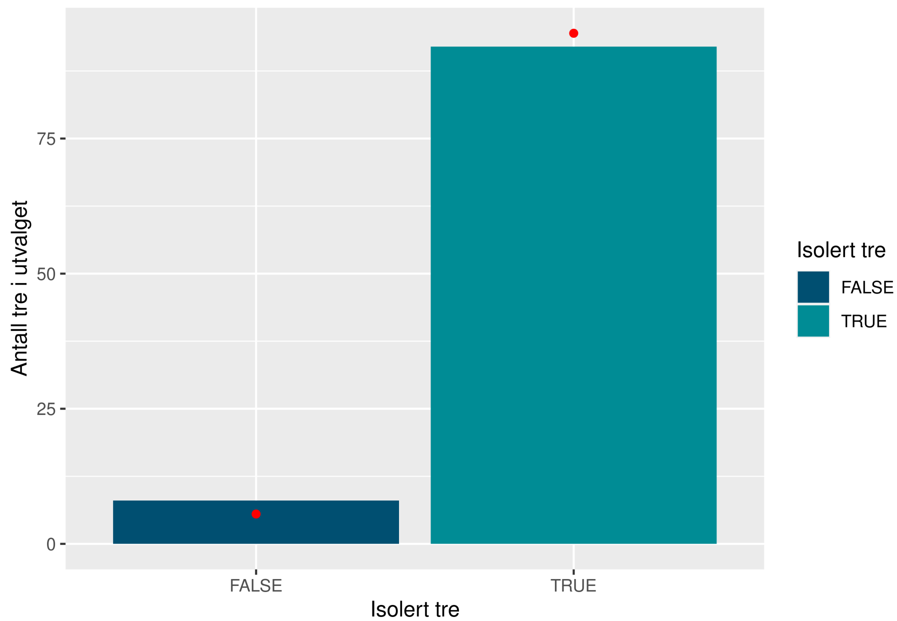
```r
n_isolated <- tree_sel_test %>%
  st_drop_geometry() %>%
  group_by(no_trees_within_square > 1) %>%
  summarise(no_trees = n())

n_isolated
```

```
## # A tibble: 2 x 2
##   `no_trees_within_square > 1` no_trees
##   <lgl>                           <int>
## 1 FALSE                               8
## 2 TRUE                               92
```

```
n_isolated_exp <- tree_sel_random_order %>%
  st_drop_geometry() %>%
  group_by(no_trees_within_square > 1) %>%
  summarise(no_trees = n()) %>%
  ungroup() %>%
  mutate(no_trees_perc = round((no_trees / sum(no_trees) * 100), 2))


n_isolated_exp
```

```
## # A tibble: 2 x 3
##   `no_trees_within_square > 1` no_trees no_trees_perc
##   <lgl>                           <int>         <dbl>
## 1 FALSE                              33          5.52
## 2 TRUE                              565         94.5
```

```
ggplot(n_isolated, aes(y = no_trees, x = `no_trees_within_square > 1`)) +
  geom_bar(aes(fill = `no_trees_within_square > 1`),
    stat = "identity"
  ) +
  geom_point(aes(y = no_trees_perc, x = `no_trees_within_square > 1`),
    data = n_isolated_exp,
    col = "red"
  ) +
  scale_fill_nina(name = "Isolert tre") +
  ylab("Antall tre i utvalget") +
  xlab("Isolert tre")
```



Verdi-kategorier, fordeling

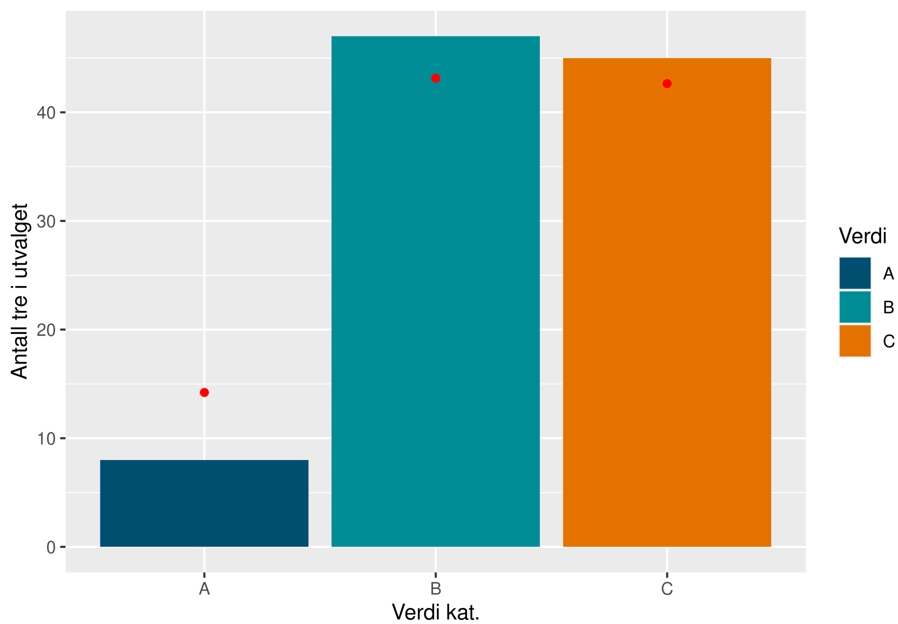
```
n_verdi <- tree_sel_test %>%
  st_drop_geometry() %>%
  group_by(Verdi) %>%
  summarise(no_trees = n())

n_verdi
```

```
## # A tibble: 3 x 2
##   Verdi no_trees
##   <chr>    <int>
## 1 A            8
## 2 B           47
## 3 C           45
```

```
n_verdi_exp <- tree_sel_random_order %>%
  st_drop_geometry() %>%
  group_by(Verdi) %>%
  summarise(no_trees = n()) %>%
  ungroup() %>%
  mutate(no_trees_perc = round((no_trees / sum(no_trees) * 100), 2))


n_verdi_exp
```

```
## # A tibble: 3 x 3
##   Verdi no_trees no_trees_perc
##   <chr>    <int>         <dbl>
## 1 A           85          14.2
## 2 B          258          43.1
## 3 C          255          42.6
```

```
ggplot(n_verdi, aes(y = no_trees, x = Verdi)) +
  geom_bar(aes(fill = Verdi),
    stat = "identity"
  ) +
  geom_point(aes(y = no_trees_perc, x = Verdi),
    data = n_verdi_exp,
    col = "red"
  ) +
  scale_fill_nina(name = "Verdi") +
  ylab("Antall tre i utvalget") +
  xlab("Verdi kat.")
```



Plassering

```
n_plass <- tree_sel_test %>%
  st_drop_geometry() %>%
  group_by(PlasseringAR5) %>%
  summarise(no_trees = n())
```

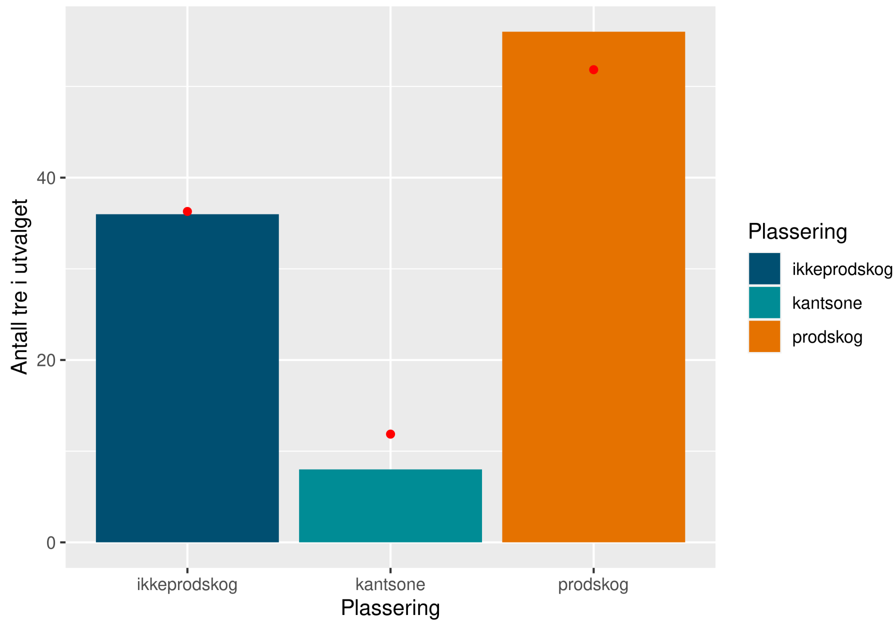
```r
n_plass
```

```
## # A tibble: 3 x 2
##   PlasseringAR5 no_trees
##   <chr>            <int>
## 1 ikkeprodskog        36
## 2 kantsone             8
## 3 prodskog            56
```

```r
n_plass_exp <- tree_sel_random_order %>%
  st_drop_geometry() %>%
  group_by(PlasseringAR5) %>%
  summarise(no_trees = n()) %>%
  ungroup() %>%
  mutate(no_trees_perc = round((no_trees / sum(no_trees) * 100), 2))


n_plass_exp
```

```
## # A tibble: 3 x 3
##   PlasseringAR5 no_trees no_trees_perc
##   <chr>            <int>         <dbl>
## 1 ikkeprodskog       217          36.3
## 2 kantsone            71          11.9
## 3 prodskog           310          51.8
```

```r
ggplot(n_plass, aes(y = no_trees, x = PlasseringAR5)) +
  geom_bar(aes(fill = PlasseringAR5),
    stat = "identity"
  ) +
  geom_point(aes(y = no_trees_perc, x = PlasseringAR5),
    data = n_plass_exp,
    col = "red"
  ) +
  scale_fill_nina(name = "Plassering") +
  ylab("Antall tre i utvalget") +
  xlab("Plassering")
```



Visible holes

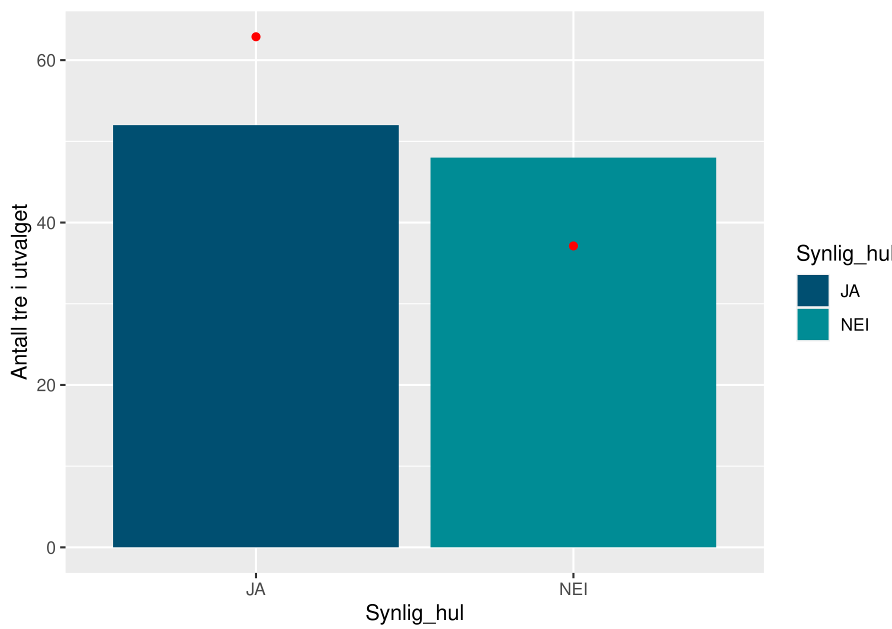
```
n_hole <- tree_sel_test %>%
  st_drop_geometry() %>%
  group_by(Synlig_hul) %>%
  summarise(no_trees = n())

n_hole
```

```
## # A tibble: 2 x 2
##   Synlig_hul no_trees
##   <chr>         <int>
## 1 JA               52
## 2 NEI              48
```

```
n_hole_exp <- tree_sel_random_order %>%
  st_drop_geometry() %>%
  group_by(Synlig_hul) %>%
  summarise(no_trees = n()) %>%
  ungroup() %>%
  mutate(no_trees_perc = round((no_trees / sum(no_trees) * 100), 2))


n_hole_exp
```

```
## # A tibble: 2 x 3
##   Synlig_hul no_trees no_trees_perc
##   <chr>         <int>         <dbl>
## 1 JA              376          62.9
## 2 NEI             222          37.1
```

```
ggplot(n_hole, aes(y = no_trees, x = Synlig_hul)) +
  geom_bar(aes(fill = Synlig_hul),
    stat = "identity"
  ) +
  geom_point(aes(y = no_trees_perc, x = Synlig_hul),
    data = n_hole_exp,
    col = "red"
  ) +
  scale_fill_nina(name = "Synlig_hul") +
  ylab("Antall tre i utvalget") +
  xlab("Synlig_hul")
```



Fetch the ssb info for the selection.

```
shortlist_ssb_500m <- cand_ssb_500m %>%
  filter(ssbid %in% tree_sel_test$ssbid)
```

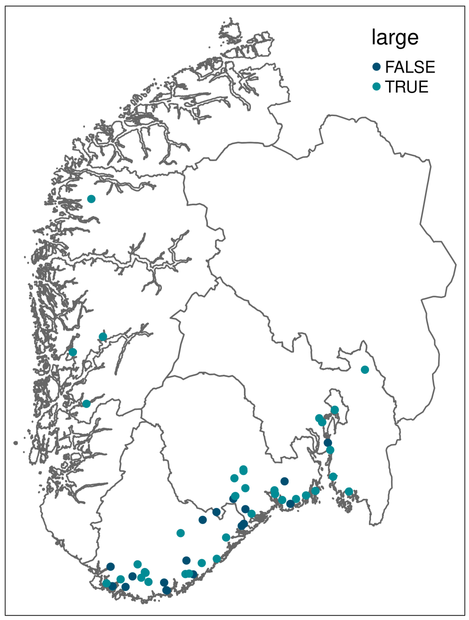
```
dbSendStatement(
  my_con,
  "
      DROP TABLE IF EXISTS hule_eiker_insekt.selection_ssb ;
      "
)


dbSendStatement(
  my_con,
  "
      CREATE TABLE hule_eiker_insekt.selection_ssb as

      SELECT distinct on(ssbid) s.ssbid, s.geom
      FROM hule_eiker_insekt.oak_sel_random_order o,
      ssb_data_utm33n.ssb_500m s
      WHERE o.ssbid::bigint = s.ssbid;
"
)


dbSendStatement(
  my_con,
  "
                ALTER TABLE hule_eiker_insekt.selection_ssb ADD PRIMARY KEY(ssbid);
                "
)

dbSendStatement(
  my_con,
  "
                CREATE INDEX ON  hule_eiker_insekt.selection_ssb USING Gist(geom);
                "
)
```

Take a look at the selection

```
# tmap_mode("view")
tm_shape(south) +
  tm_borders() +
  tm_shape(shortlist_ssb_500m) +
  tm_borders() +
  tm_shape(tree_sel_test) +
  tm_dots(
    col = "large",
    size = 0.1,
```

```
    palette = ninaPalette()
  )
```

```
## Warning: palette colors names missing for FALSE, TRUE. Therefore, palette color
## names will be ignored
```



Instruction for QGIS

Project "hule_eiker" at P:\153018_overvaking_av_insekter_i_hule_eiker\GIS.

Use the layer oak_sel_random_order.

Some new columns: 'selection_order': Use this order to select trees. This is a random order we can follow. 'rand_selection_order': the original random order (not sorted on RuteID, for documentation) 'rute_id_order': the order the squares appeared in the random sample 'tree_order_within_square': the (random) order of trees within each square. Use tree 1 & 2, but if needed higher numbers if we don't find tree no 1 and 2. 'single_and_lonely': Is the tree alone in its square and is the square > 30 000 km from the nearest square?

I have filtered the entire selection to only look at 2 trees or 1 tree if they are not isolated.

Filter = tree_order_within_square<=2 OR (no_trees_within_square<2 AND single_and_lonely IS FALSE)

If these trees are not enough, we can remove or change the 'tree_order_within_square<=2' to show more trees within each square.

Proposed work within qgis:

1. Sort the table on selection order. Start with tree 1 (selection_order = 1), show the info with the "i" button in QGIS.
2. Use the matrikkel_no with https://matrikkeldata.nina.no/ to get the owner.
3. Find the contact info for the owner.