



ForBio course: Introduction to GPS and GIS

Time: Monday 13th and Tuesday 14th October 2014, 10 to 16 each day.

Place: Botanical Museum (Lid building), Natural History Museum at the University of Oslo, Sars gate 1, 0318 Oslo.

Teacher: Dag Endresen, GBIF-Norway, Natural History Museum, University of Oslo
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Recommended course credits: 1 ECTS

Level: PhD-level course

Language of instruction: English

Capacity: 15 to 20 students

Admission deadline: 15.09.2014

Prerequisites: Basic knowledge in biology and basic computer skills. Previous experience with GIS software and R will not be expected.

Final evaluation: The students will be working in teams for parts of the time, and each team must deliver a report. Grade: Pass/fail. A ForBio certificate will be provided if passed.

Course materials: Quantum GIS can be downloaded here: <http://www.qgis.org/en/site/>
RStudio here: <http://www.rstudio.com/>

Course content: This training course will provide basic understanding of GPS devices and the recording of geographic coordinates during field work. We will also explore map-making using GIS tools such as Quantum GIS (QGIS) and R. The participants will learn how-to access and download species occurrence data from the GBIF (Global Biodiversity Information Facility) portal and how-to share and publish data from own field work to GBIF. Depending on interest we can also cover a very gentle introduction to analysis of spatial biodiversity data using R.

The course is based on lectures, computer exercises and field work inside the botanical garden of Oslo. The student might want to bring own laptop and perhaps a GPS device. Make sure that you have appropriate permissions on your laptop to install QGIS and RStudio, and, please, consider installing these software packages before the course starts.

Teaching program: Collecting GPS coordinates - A quick introduction to typical GPS units such as Garmin and setup for setting coordinate system and geodetic datum. It is very important that you record what coordinate system and datum you have set your GPS to use. Without this information, it

might be impossible to understand the coordinates you have collected in retrospect. In Norway the coordinate format called UTM (Universal Transverse Mercator) is popular. When using UTM, please, also record the UTM zone. Norway includes UTM zone 31N in the west to UTM zone 36N in the north-east. Simply using decimal degrees might be the most user-friendly option if you collect material in different parts of Norway and or in other countries. Please consider to ALWAYS use the standard geodetic datum WGS84 (World Geodetic System 84) (epsg: 4326 for WGS84 decimal degrees, epsg: 32633 for WGS84 UTM 33N). If you set your GPS to use another datum, the coordinates you collect could be interpreted wrong and up to hundreds of meters misplaced if you do not carefully note the datum you have used.

Student team exercise: Collect some geographical coordinates for a few given places inside the Tøyen Botanical Garden.

Useful information can be found here:

<http://en.wikipedia.org/wiki/GPS>

<http://en.wikipedia.org/wiki/WGS84>

<http://dagendresen.wordpress.com/2013/11/22/convert-coordinate-srs/>

Making maps, map projections - The earth has a sphere shape, while a map usually represents a 2 dimensional plane. When we want to visualize points on this sphere on a map, we need to choose a map projection approach. Different map projection approaches are useful for different purposes and uses of the map. All map projections will distort the map in some way or another. We will work with the QGIS software and RStudio and explore how-to visualize common spatial data such as point data, vector data and raster data. **Please consider installing the QGIS and RStudio software packages on your own laptop before the course starts.** Contact us by email if you have problems installing the software.

Student team exercise: Plot the coordinates collected in the Botanical Garden using a GIS software tool.

Useful information can be found here:

http://en.wikipedia.org/wiki/Map_projection

<http://en.wikipedia.org/wiki/Qgis>

http://en.wikipedia.org/wiki/R_%28programming_language%29

<http://www.rstudio.com/>

Introduction to biogeography and analyzing biodiversity data - The Global Biodiversity Information Facility (GBIF) provides free and open access to biodiversity data including the geo-referenced occurrences of species. Species occurrences are the so-called primary biodiversity data required for a wide set of biodiversity research topics, including species distribution modeling. You can share and publish species occurrence data that you collect in your own field work with support and assistance from the Norwegian GBIF node at the Natural History Museum in Oslo.

Student team exercise: Download species occurrence data from GBIF and plot points on a map using QGIS or R. Advanced: make a species distribution model using the dismo R-package and plot using QGIS or R.

Useful information can be found here:

<http://www.gbif.org/>

<http://www.gbif.no/>

<http://cran.r-project.org/web/packages/raster/vignettes/Raster.pdf>

<http://cran.r-project.org/web/packages/dismo/vignettes/sdm.pdf>

<http://www.molecularecologist.com/2012/09/making-maps-with-r/>