

COMPARISON OF GPS DEVICES USED IN TURKISH FORESTRY PRACTICES

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Terrestrial methods are being used to obtain most of the base layering for the forestry studies in Turkey, nowadays. Topographic methods are being developed accordingly with developing technological opportunities, and computer based digital systems are being preferred instead of mechanical measurement instruments that were used in the past. Global positioning systems developed for gathering the spatial data as satellite based, are one of the latest steps in this technology. In the present study, possibilities of utilization from this technology were investigated within the context of forestry, and the performance of hand-held GPS, DGPS, DGPS-CORS and Total Station devices were examined through areas chosen to represent dense forest / foliage habitat, open habitats and timber/forest line. According to the results, PGA-1 DGPS CORS type GPS is the most accurate one for all three habitat types. It was most accurate in open habitat as the error margin in dense foliage was 3,41 m in horizontal and 3,88 m in vertical; 0,06 m in horizontal and 0,05 m in vertical for open habitat; 0,62 m in horizontal and 1,16 m in vertical for timber line habitat.

Key words: Forest surveying, Cadaster, Global Positioning System

The Forestry Faculty area of Istanbul University at the European side of province of Istanbul was determined as study area for the present study. As mentioned above, one of the aims of the study is to reveal the suitable global positioning system and equipment for forestry activities. In the scope of this aim, three study region were chosen with different qualifications within the study area.

As is known, the global positioning system receivers calculate the coordinates of the current point by analysing the data received from the satellites in the orbit of the earth. Therefore, in order to perform the measurement, it would be the ideal setting if the top of the receiver is as open as possible. This kind of condition is most of the time hard to come by within the forests. In this study, the testing areas were chosen to represent three most common conditions in the forest habitats. These are chosen as:

Testing area which represents dense foliage habitat (Figure 1)

Testing area which represents open habitat (Figure 2)

Testing area which represents timber line that is between forest and open area (Figure 3)



Figure 1. Ground measurements in three settings

Test area representing dense foliage habitat includes various types of coniferous and broad-leaved species planted through reforestation efforts as well as the natural structure of the Belgrade Forest. This structure of the forested area presents a mixed stand. Parking area within the faculty campus was chosen as the most suitable place for open habitat testing area since it is planned to represent the measurements in the forest openings (meadows, pastures, etc.). A forest to residential transition area was also chosen to represent the timber line habitat as the most suitable place for its structure.

Measurements under the dense foliage produced the total RMSE of:

- PGA-1 DGPS CORS, 3,41 m; GRS-1 DGPS, 7,82 m; hand held GPS 5,53 m in horizontal
 - PGA-1 DGPS CORS, 3,88 m; GRS-1 DGPS, 9,65 m; hand held GPS, 5,45 m in vertical
- under open habitat:
- PGA-1 DGPS CORS, 0,06 m; GRS-1 DGPS, 2,03 m; hand held GPS, 4,35 m in horizontal
 - PGA-1 DGPS CORS, 0,05 m; GRS-1 DGPS, 2,01 m; hand held GPS 5,35 in vertical
- under timber line:
- PGA-1 DGPS CORS, 0,62 m; GRS-1 DGPS, 4,27 m; hand held GPS, 4,23 m in horizontal
 - PGA-1 DGPS CORS, 1,16 m; GRS-1 DGPS, 6,97 m; hand held GPS 4,53 m in vertical

Based upon the above results, both under the dense foliage and timber line, cost, accuracy and time saving ability of DGPS CORS is well above of any other means so it would be an ideal solution for projects requiring precision.