



Open top culverts as an alternative drainage system to minimize ecological effects in earth roads.

Jose L. García, Jose Elorrieta, Jose C. Robredo, Ricardo García, Fernando García, and Martin C. Gimenez
(josel.garcia@upm.es)

During the last fifteen years a research team from School of Forestry at the Technical University of Madrid (Spain) has developed several competitive research projects regarding forest roads and open top culverts. A first approach was established with a prototype of 7 meters length in a hydraulic channel at the laboratory determining main parameters of different open top culverts in relation to different sizes of gravels and the self washing properties relationship with different slopes up to 8 %. The curves obtained may help to properly install these drainage systems avoiding maintenance costs. In addition more targeted pilot studies were developed in different forest earth roads in center and north Spain. The construction of the stations under study was financed by the U.P.M and the R&D National Plan. The main outcomes relates the low variation of humidity in a 20 m. wide range at both sides of the open top culverts and several considerations relating the angle of installation, the spacing of such drainage systems and the benefits against rilling along the roads. Also the erosion produced downhill was established and some construction methods to avoid adverse ecological effects. The diffusion of results includes congresses and a small booklet with a great acceptance in forestry services. Also a patent (ES 2 262 437) of an advanced model has been registered.