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Gradient analysis of saline groundwater dynamics along spatial transects in the Chaco

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Introduction The transitional zone between the dry and the semi-humid Chaco is characterized by a high table of saline groundwater .Dryland salinity is commonly observed at the edges of seasonally inundated grasslands in landscape depressions without external runoff (so called water camps) surrounded by native drought deciduous thorn bush .So far , little information had been available on groundwater characteristics (depth and conductivity) as related to soil salinity .

Materials and methods At Campo Maria ($22°5'$ S lat . $59°3'$ W long .) , depth of water table and groundwater conductivity were measured every two weeks for $2\,^1/_2$ years , beginning in July 2002 , using perforated observation tubes installed along two spatial gradients (Glatzle *et al* . 2001) : One from the centre of a water camp across the saline belt at its edge to an adjacent pasture established on previously cleared bushland , the other one from the sown pasture right into the bush .Every September and February soil cores were extracted to 80 cm depth to measure soil humidity and conductivity .

Results and conclusions Depth of water table varied strongly following precipitations at all sites .Infiltrating rain water diluted temporarily the saline groundwater under pasture and produced the necessary hydrostatic pressure to raise the watertable under adjacent bushland , while conductivity under bush remained at a constant high level (Figure 1) .Obviously rain water never infiltrated to the groundwater table under bush .This and low mean soil humidity (Table 1) suggest high transpiration rates and considerable rain water interception by bush (Wiebe 2003) .Sweet runoff water accumulated in the water camp , whereas under the saline belt mean depth of the watertable (115 cm) with medium conductivity was ideal for capillary ascension of saline groundwater , indicated by high average soil humidity (Table 1) .Obviously native chacoan bush fulfils a crucial role in keeping the saline groundwater table at a safe distance from the soil surface .

Figure 1 *volution of electrical conductivity (above left : mS/cm) and depth (below left : meters) of groundwater during a $2\,^1/_2$ years measuring period (from July 2002 on) at representative sites : Water camp , saline belt at the edge of the water camp , pasture , transition pasture-bush , and bush .The bars represent rainfall events (both graphs at the right : mm) .*
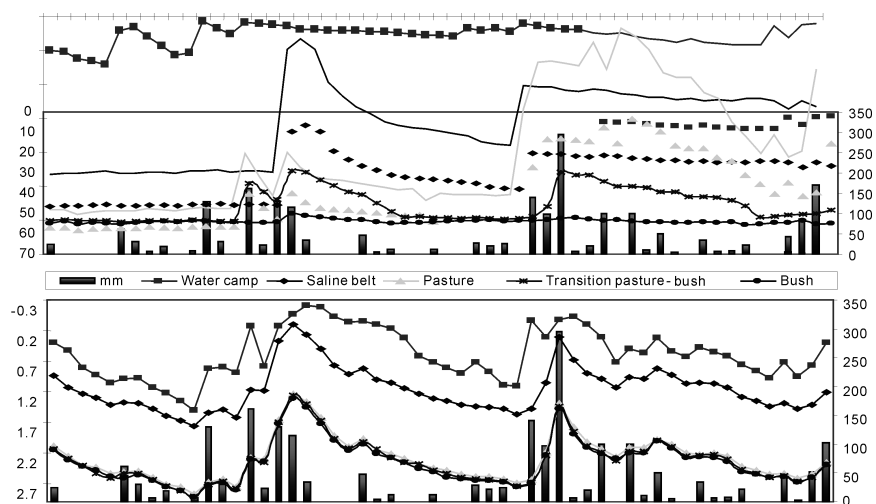

Table 1 *Mean values of parameters measured over $2\,^1/_2$ years .*

Site	Soil surface a .s .l .(m)	Water-table a .s .l .(m)	Depth of water-table (cm)	Groundw .conduct . (mS/cm)	Soil humid . (%)
Water camp	109 .6	109 .02	58	5 .6	15 .0
Saline belt	110 .0	108 .85	115	31 .5	11 .7
Pasture	111 .1	108 .77	229	40 .1	9 .5
Transition Past .-Bush	111 .1	108 .73	233	45 .9	8 .5
Bush	111 .1	108 .70	236	53 .8	8 .5
Mean	110 .6	108 .80	174	35 .4	10 .6