Soil name: Caroline

Overview

Caroline soils occupy about 6,400ha on the flood plains and low terraces of the Oreti River between Lumsden and Wallacetown. They are formed in alluvium derived from greywacke and schist rock. These soils are shallow to moderately deep, poorly drained, and have heavy silt loam to silty clay textures. A key feature of the Caroline soils is the presence of a thick, cemented ironstone pan in the subsoil. They are used for intensive pastoral farming for sheep, deer and dairy, with some cropping. The climate is cool temperate with regular rain, although more inland soils can be seasonally dry in some years.

Caroline profile

Physical properties

Caroline soils have a moderately deep rooting depth, with moderate plant available water, that is limited by the ironstone pan. The rooting depth may also be limited by poor aeration during wet periods due to the poor drainage and slow subsoil permeability. Textures are heavy silt loam to silty clay, with topsoil clay content of 25–30%. Topsoils are slightly gravelly, while subsoils are moderately to very gravelly above the extremely gravelly iron pan.

Fertility properties

Topsoil organic matter levels range from 5 to 8%; P-retention values 20–40% with pH values moderate throughout the profile. Cation exchange values are moderate to low with base saturation moderate in the topsoil but increasing down the profile. Available magnesium and potassium values are low. Reserve phosphorus levels are low. Micro-nutrient levels are generally adequate.

Associated and similar soils

Some soils that commonly occur in association with Caroline soils are:

- Dipton: occurs on terraces; shallow soil, poorly drained due to water perching on clay pan
- Gore: occurs on low terraces; shallow, well drained soil
- Winton: well drained, moderately deep to deep soil
- Northope: imperfectly drained, moderately deep to deep soil

Some soils that have similar properties to Caroline soils are:

- Lumsden: shallow soil, with no ironstone pan and silty textures
- Makarewa: moderately deep to deep soil, with no ironstone pan and silty clay textures
- Jacobstown: moderately deep to deep soil, with no ironstone pan and silty textures

Sustainable management indicators

Note: the vulnerability ratings given in the table below are generalised and should not be taken as absolutes for this soil type in all situations. The actual risk depends on the environmental and management conditions prevailing at a particular place and time. Specialist advice should be sought before making management decisions that may have environmental impacts. Where vulnerability ratings of Moderate to Very severe are indicated, advice may be sought from Environment Southland or a farm management consultant.

Vulnerability factor	Rating	Vulnerability compared to other Southland soils
Structural compaction	severe	These soils have a severe vulnerability to structural degradation by long-term cultivation, or compaction by heavy stocking and vehicles. This rating reflects the poor drainage and low to moderate P-retention.
Nutrient leaching	slight	These soils have a slight vulnerability to leaching to groundwater. This rating reflects the poor drainage, moderate water holding capacity and slow subsoil permeability. The shallow phase has a moderate vulnerability.
Topsoil erodibility by water	slight	Due to the moderate to high clay content, the topsoil erodibility of theses soils is slight. Erodibility is highly dependent on management, particularly when there is no vegetation cover.
Organic matter loss	severe	Vulnerability to long-term decline in soil organic matter levels is partly dependent on soil properties, and highly dependent on management practices (e.g., crop residue management and cultivation practices).
Waterlogging	severe	These soils have a severe vulnerability to waterlogging during wet periods. This rating reflects the poor drainage and slow subsoil permeability.

General landuse versatility ratings

Note: The versatility ratings in the table below are indicative of the major limitations for semi-intensive to intensive land use. These ratings differ from those used in the past in that sustainability factors are incorporated in the classification. Refer to the Topoclimate district soil map or property soil map to determine which of the soil symbols listed below are applicable, then check the versatility ratings for that symbol in the appropriate table.

CeU2 (Caroline undulating moderately deep)

Versatility evaluation for soil CeU2		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Arable	Limited	Inadequate aeration during wet periods; risk of short-term waterlogging after heavy rain.
Intensive pasture	Moderate	Inadequate aeration during wet periods; vulnerability of topsoil to structural degradation by cultivation and compaction
Forestry	Limited	Inadequate aeration during wet periods; potential flood risk.

CeU3 (Caroline undulating shallow)

Versatility evaluation for soil CeU3		
Landuse	**Versatility rating**	**Main limitation**
Non-arable horticulture	Limited	Inadequate aeration for sustained periods; restricted rooting depth
Arable	Limited	Inadequate aeration for sustained periods; risk of short-term waterlogging after heavy rain.
Intensive pasture	Limited	Risk of short-term waterlogging after heavy rain.
Forestry	Limited	Inadequate aeration for sustained periods; potential flood risk.

Management practices that may improve soil versatility

- Installation and maintenance of drainage networks with ditches, moles and tiles.
- Careful management of stocking and minimal cultivation when soils are wet
- Organic matter levels should be carefully maintained and enhanced
- Ripping of subsoil pan may be possible for deep rooting plants