Southland is like Swiss cheese

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Much of what is now agricultural lowland in Southland was wetland prior to European settlement. The drainage of 'excess' water is basic to the socio-economy for agriculture, urban settlement and flood protection.

Historic drainage

Drainage works began relatively ad hoc in the mid-19th century but started to be coordinated in the mid-1940s. Extensive and contiguous networks of surface and sub-surface drains now connect paddocks to modified rivers.

Sub-surface and surface drain construction

Sub-surface drains are comprised of pipes buried about 0.7m below the surface, and are commonly referred to as 'tile' drains. The 'tiles' are typically fed by a shallower network of non-lined 'mole' drains. Together these are called 'mole-pipe' networks. Surface drains are excavated by a digger.

Drains as pollutant sources and conduits

Drains can be both a source and a conduit for pollutants. For example, 'mole' drains are a small tunnel formed in subsoils and can degrade by soil slaking, thus becoming a sediment source. Surface drains can also be a source when cleared to maintain flows. High concentrations of suspended sediment downstream of clearing activities have been measured.

Monaghan et al. (2016) reported that 62% and 25% of surplus rainfall from a grazed pasture site was discharged via mole-pipe drainage and surface runoff, respectively. Mole-pipe drains were a significant conduit for contaminants (nitrogen, phosphorus, sediment, microbes). Loads, concentrations and pathways varied between contaminant, surface treatment and according to the timing of rainfall.

Drains as pollutant 'sinks'

Little is understood about the accumulation of pollutants in mole-pipe networks, however surface drains in Southland are a known 'sink' for sediment. Sources of this sediment include surface erosion, mole drain erosion and drain bank slumping.

Calculations from routine drain clearing indicate that this deposited sediment could represent a significant proportion of a catchment's sediment budget.

Drain maintenance

Tile drains can be low maintenance or require hydraulic clearing from time-to-time. Moles drains can persist for decades or can require reforming more frequently.

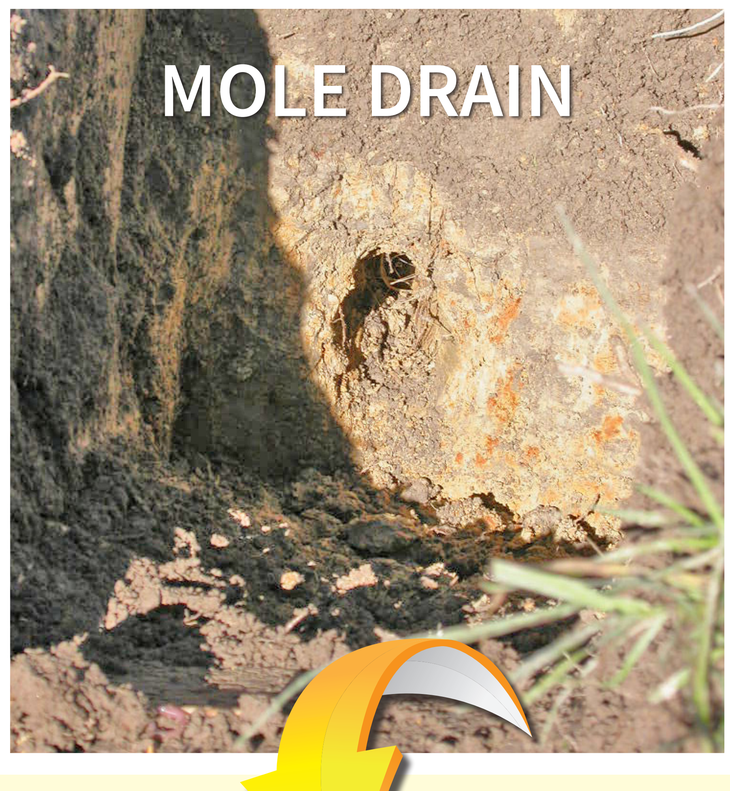
The 10% of all surface drains that Environment Southland maintains are mechanically cleared on 1, 2, 3 and 5-year rotations, depending on the location. The remaining 90% of surface drains in the region are maintained by landholders.

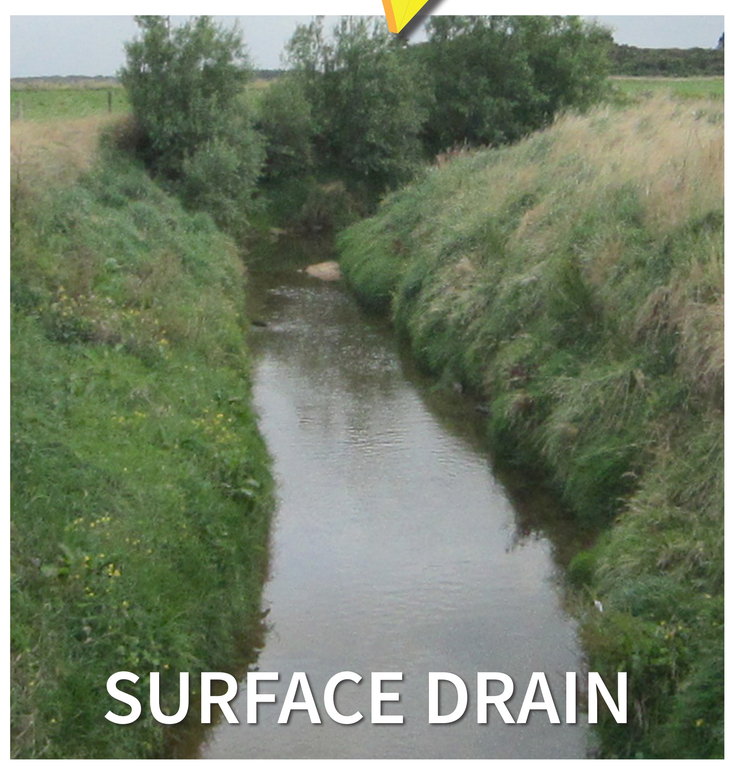
Statutory obligations

Landholders are required by law to provide 'outfall' for upstream neighbours. Environment Southland is similarly required by law to maintain 1034 km of surface drains (about 10% of total surface drains) and most main stem river channels to ensure efficient drainage.

Conclusions

- Contemporary livelihoods, industry and day-to-day life in Southland are hugely dependent on the historic and maintained drainage networks.
- The drainage of Southland has hugely influenced regional hydrology and has contributed to making a 'leaky' landscape.
- Waterborne pollutants travel with runoff and drainage water and therefore the drainage of Southland likely plays a significant role in water quality outcomes.





Further information

Monaghan, R., Smith, L. and Muirhead, R., 2016. Pathways of contaminant transfers to water from an artificially-drained soil under intensive grazing by dairy cows. Agriculture, Ecosystems & Environment, 220: 76-88.

Pearson, L., 2015. Artificial sub-surface drainage in Southland; Technical Report, Environment Southland, Invercargill.

Background image shows a recently installed tile drain network in the Mataura catchment, Southland.