

Ki uta ki tai

A catchment-based approach

Ki uta ki tai is the recognition and management of the interconnectedness of the whole environment – from the mountains, springs and lakes, down the rivers to hāpua/lagoons, groundwater, wahapū/estuaries and to the sea. This catchment-based approach, and understanding the effects of the use and development of land on a whole-of-catchment basis, helps us to better manage our catchments in an integrated way.

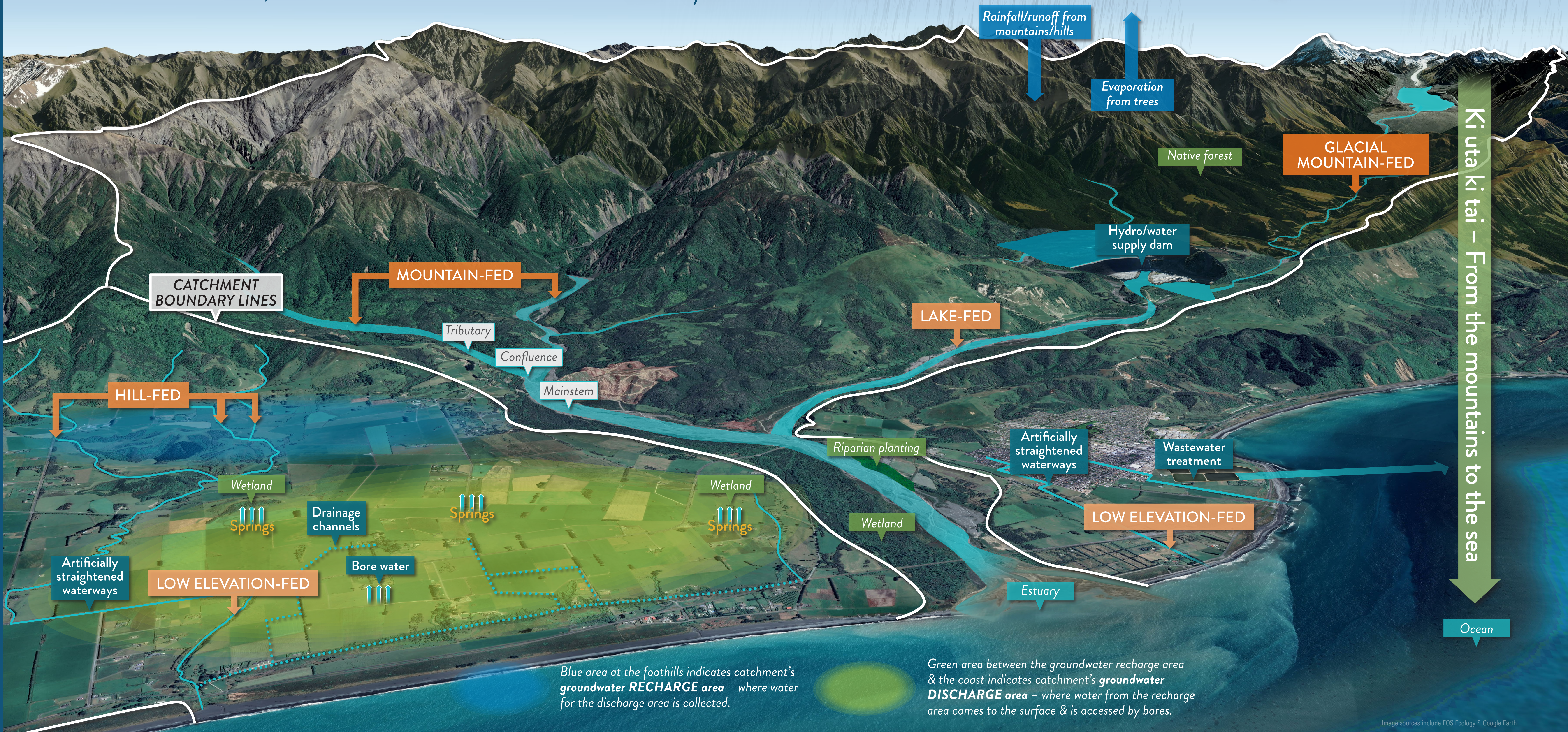
How a catchment works:

All rainfall in a catchment runs off the surface of the land (called surface water) and flows downwards towards the lowest point of the basin – which could be a stream, river or wetland. Every catchment or subcatchment has one major waterway (called the mainstem) that every other waterway flows into. These smaller waterways are called tributaries, and they carry water from all areas of the catchment – eventually merging together and flowing into the mainstem. Surface waterways can be classified by their main water source, which is often based on topography. The main sources of flow are glacial mountain, mountain, hill, low elevation, and lakes.

Catchments also include the water flowing below the ground (called groundwater). Groundwater gets filtered through porous underground materials, which is why it flows much more slowly than surface water. Rainfall increases the amount of groundwater by soaking through the land in a process called recharge. Groundwater can resurface to become surface water via springs. This happens in a number of ways depending on the geography and geology of the catchment.

Source of flows in freshwater catchment areas

This infographic summarises the natural processes that takes place within freshwater catchments, and the different sources of flow for waterways.



Waterway source of flow classifications					Other waterway types	
GLACIAL MOUNTAIN-FED	MOUNTAIN-FED	HILL-FED	LAKE-FED	LOW ELEVATION-FED	INTERMITTENT OR EPHEMERAL WATERWAYS	SPRINGS
						
Source of flow is from glacial mountain terrain. Strong seasonal pattern of flows: typically low flows in winter (when the water is locked up in ice) whilst high flows extend further into summer (when ice & snow is melting). High turbidity due to fine glacial sediment (known as 'glacial flour') in the water. Typically a more disturbed system with a high amount of large flow events: very frequent high flood flows lead to unstable substrates & channels with wide, active gravel bed flood plains.	Source of flow is from mountainous terrain without glaciers. Strong seasonal pattern of flows: typically low flows in winter (when water is locked up in snow) & high flows extend further into summer (when ice & snow is melting). Naturally high suspended solids & sediment load. Typically a more disturbed system with many large flow events: very frequent high flood flows means unstable substrates & channels with wide, active gravel bed flood plains.	Source of flow is from hill country terrain. Strong seasonal pattern: low flows in late summer, high flows in spring due to rainfall & snow melt. High to medium sediment loads depending on catchment geology & land use. Where the valley is broad so that the river channel is unconstrained, the channel morphology is characterized by unstable substrates & wide, active gravel bed flood plains; including braided river systems.	Source of flow is from large lakes. These have a more stable flow regime, low suspended solids & sediment load. Waterways fed by lakes typically have a stable channel & substrate, which may be 'armoured' (i.e. large stable stones) due to winnowing of fine material & lack of bed sediment supply (which is entrained in the lake).	Source of flow is from low elevation land. Very marked seasonal flow patterns: high in winter, low in summer. Low sediment supply. Often more stable, low-gradient, entrenched channels with low flow velocity & silty-sandy substrates. Water velocity during large flow events still remains low due to low channel slope.	Not all waterways are perennial (have water all year round). Some will dry up for parts of the year. Intermittent refers to waterways that flow seasonally (i.e., they flow every autumn & winter). Ephemeral refers to waterways that only flow for short periods of time, usually after rain events. It is sometimes hard to identify an intermittent/ ephemeral waterway if you are only seeing it during one season of each year – visiting a stream throughout the year will allow you to work out its flow permanency.	Springs (& spring-fed waterways) typically have a stable flow regime (with no or negligible flood flows), low nutrient status in hill & mountain areas, or higher nutrient status when in catchments draining pastoral areas.