



**CASE STUDY:**

# Lake Clearwater Firebreak

To support staff in assessing a firebreak  
and its value as a risk reduction tool

**Author: Wildfire Specialist Graeme Still**

# Contents

3	Background
7	Reason for Assessment
8	Hazards
9	Fire Behaviour Assessment
11	Lake Clearwater Firebreak Implementation
12	Additional Mitigations



## Background

### Lake Clearwater

Located an hour drive northwest of Ashburton, Lake Clearwater and Lake Camp are two Ashburton Lakes located in the Hakatere Conservation Park, separated by Hakatere Potts Road. Nestled between the lakes on the side of Lake Clearwater is a holiday community of 168 baches (huts) and a camping ground.

The average number of visitors per hut is between two and five, with weekends and summer months being the busiest times. At its peak, the settlement population can increase to around 3000, including campers around the Lake Camp shoreline.

Motor-powered craft and dogs are not permitted on Lake Clearwater as it is a wildlife reserve but the adjacent smaller Lake Camp can be used by motor-powered watercraft. In addition to boating activities, there are several nature walks, mountain biking tracks, and the lakes are a popular fishing destination.

Road access to Lake Clearwater is approximately 38km past Mount Somers Village, the last half being unsealed gravel.

There is no cellular communication in the area, and only a limited number of hut owners have landlines. There is a public telephone near the cattle stop on Hakatere Potts Road where 111 calls can be made.

### Aerial View

Lake Clearwater is located in the Ashburton Lakes Basin. This montane, mainly tussock grassland basin, is nestled between the Southern Alps and the Main Divide, and the foothills that separate the basin from the Mid Canterbury Plains. It is bordered in the North by the Rakaia River, and in the South by the Rangitata River, and is split by the South Ashburton River.

Most of the basin is part of the Hakatere Conservation Park and includes the twelve Ashburton Lakes. The area includes some developed farmland, tussock grassland, wetlands and braided rivers bordered by hills and mountains. The elevation of the surrounding peaks is generally between 500 and 2500m, with most peaks between 1300 and 2000m high. Mt Arrowsmith, the highest peak in the district, lies on the Northwestern edge of the area and rises to 2781 metres.

## Location



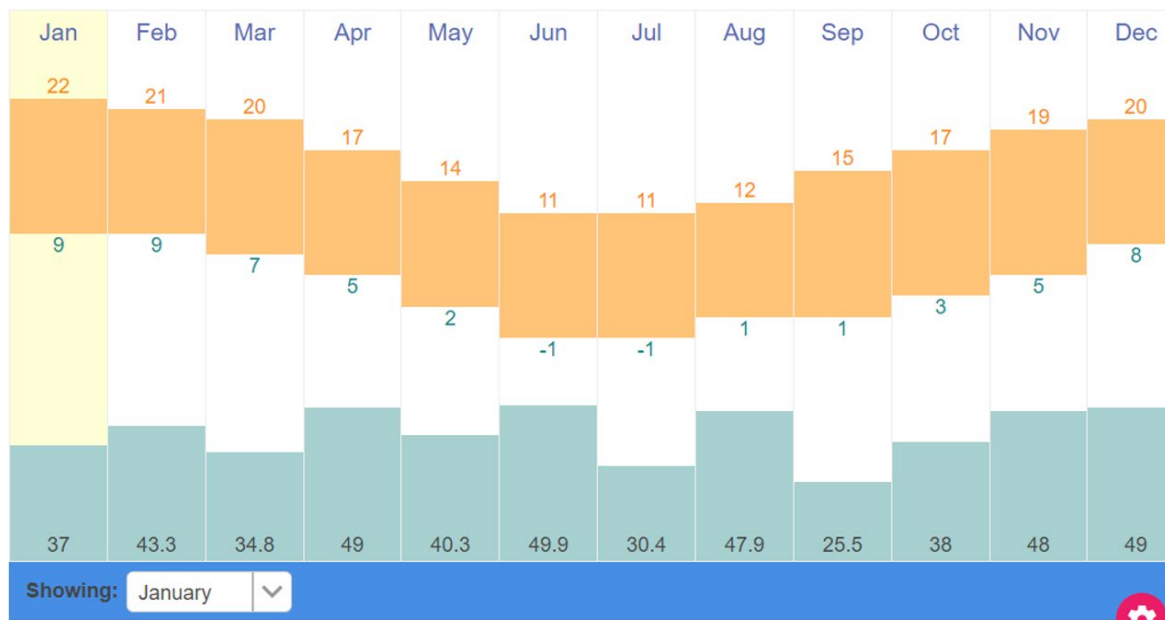
## Response Capability

Lake Clearwater is 76 km from central Ashburton and the Ashburton Fire Station. It takes approximately an hour to make the journey and would take longer for a fire appliance. There is a volunteer brigade at Methven (63 km) and a rural brigade Mt Somers (38 km). Lake Clearwater has a small volunteer rural brigade, none of which are permanent residents, so they are only available when they are at Lake Clearwater. There could be a situation when a fire may occur with no volunteers present, posing a risk of delay for significant suppression in the early stages with responders as mentioned some distance away.

- 4x4 Fire Appliance
- Communications Equipment
- Water Pumps and Hoses
- Road Cones and Safety Barriers
- Hand Tools
- Satellite Phone
- First Aid Equipment
- Off Grid Electricity and Water

## Average Temperature and Rainfall

Based on weather reports collected during 2005–2015.



### January Climate & Weather Averages in Lake Clearwater

High Temp: 22 °C	Precipitation: 37.0 mm	Wind: 10 km/h
Low Temp: 9 °C	Humidity: 74%	Pressure: 1011 mbar
Mean Temp: 16 °C	Dew Point: 11 °C	Visibility: 23 km

## Climate

The elevation of Lake Clearwater is 600m above sea level, and the proximity to the Alps, means that the temperatures in colder months (May- Oct) will regularly drop below 0 degrees. The summer months are the hottest with temperatures reaching the mid-twenties and the annual precipitation is 493 mm per year. The area is also subject to strong westerly and easterly winds year-round.

## Fire Danger Rating

Mount Summers Remote Weather Station (RAWS) has provided climatology data that shows the Lake Clearwater area on average experiences 13.7 days of Very High to Extreme fire danger days using the predominant grass fuel classification. In a bad season this could reach 30 days.



## Vegetation Types

The most dominant plant feature in the Ashburton Lakes and Hakatere Conservation Park is the vast tussock fields of Fescue, Red Tussocks and Carex Sedges. There are also other grassland varieties and pasture in the surrounding areas due to farming operations. There is very little indigenous forest or scrub in the area.

## Hut Attributes

Huts are built from basic materials, with no insulation and no power connections, each reliant on solar, or wind generated power. The majority of hut holders lock and leave them for six to seven months of the year, choosing to use them during the warmer months (Nov-March).

Whilst well maintained, the huts would be susceptible to and sustain fire as most are constructed from materials that would easily ignite. Further, they are in close proximity and would likely be an exposure risk without the intervention of suppression activities.

Each hut has its own form of collecting and storing rainwater. The rainwater is not deemed 'potable' (fit for drinking) therefore occupants must either take enough fresh drinking water into the settlement, for the length of their stay or install a filtration system. As previously noted, there is also no cell phone signal and internet connectivity is extremely limited.



## Reason for Assessment

The Lake Clearwater Hutholder's Association in collaboration with the Ashburton District Council, Civil Defence, Department of Conservation and Fire and Emergency had identified a number of risks in the event of a significant wildfire as part of a wider Lake Clearwater Community Emergency Plan.

The Fire and Emergency Ashburton Risk Reduction team suggested that this would be a good test case to trial the Firebreak Guide and Assessment Template to validate their plan and to pilot the proposed Firebreak process. Wildfire Specialist Graeme Still, Project Lead on the Firebreak Policy project led the pilot.

# Hazards

## Lake Clearwater Community Hazards

- The number of inhabitants at Lake Clearwater and the surrounding Hakatere Conservation Park swells significantly (to approximately 3000) during long weekends and over summer months
- Chance of unwanted ignition due to vehicles parked on unkempt, dry long grass is high
- Construction of huts and various heating methods could pose a fire hazard
- External gas bottles attached to most huts
- Usage of BBQs and external cooking methods
- Visitors lack of awareness to fire danger risk and appropriate mitigations for activities during high fire danger
- Possibility of spark and heat generating activities (mowing, construction work)
- High levels of dead fuel surrounding the area of the lakes
- Ongoing issue with campers lighting fires in the campsite next to the community despite fire ban/permits being in place
- High volume of recreational vehicles in use (4x4, quad bikes, dirt bikes etc.).

## Hakatere Conservation Park Hazards

- High volume of recreationalists, campers, trampers and visitors using the area during hot, dry summer months
- Chance of unwanted ignition due to recreational vehicles (4x4, quad bikes, dirt bikes etc.) parked on unkempt, dry long grass is high
- Visitors lack of awareness to fire danger risk and appropriate mitigations for activities during high fire danger
- Possibility of spark and heat generating activities (stone strike, vehicles etc.)
- High levels of dry tussock and dead fuels in the Conservation Park
- Ongoing issue with campers lighting fires in the campsite next to the community despite fire ban/permits being in place
- Area is subject to strong winds from the northwest regularly throughout the year.





# Fire Behaviour Assessment

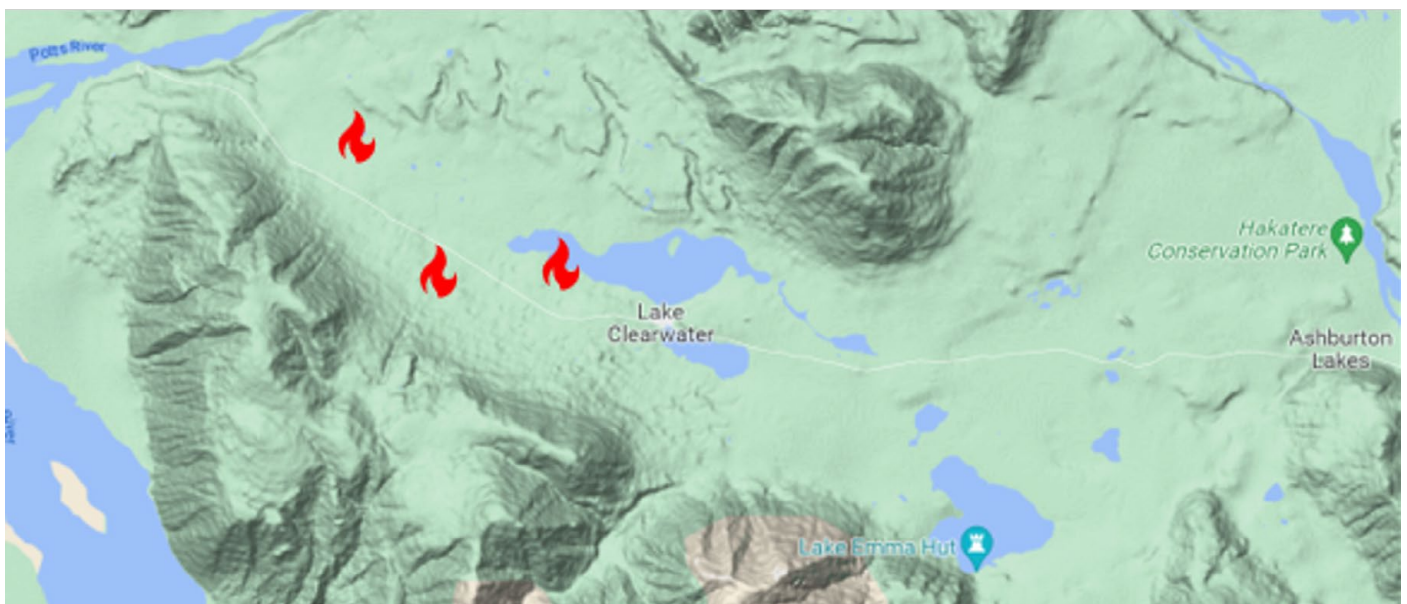
The fire behaviour assessment was based on a scenario with a fire starting on the western tussock fields with a north westerly wind. Of greatest concern is a moderate to strong wind, where a grass fire would have potential to travel quickly towards the community with little to no warning time to affect an adequate response, especially during an elevated fire danger day.

Another possible scenario was a grassfire starting on the eastern side of the Hakatere Conservation Park travelling towards the community. However, the roads surrounding the eastern side of the community travelling towards Ashburton and Lambie's Lagoon would provide a natural break to a grassfire slowing its approach to the community.

## Potential Fire Behaviour

Two scenarios were tested. Both assessments used low and high fire behaviour modelling to inform the potential consequences.

- Scenario 1: based on lighter winds and a lower curing value of the tussock
- Scenario 2: based on stronger winds and a higher curing value of the tussock



## Potential Fire Behaviour

Assessing how a fire may behave. Use the NZ Fire Behaviour Toolkit or the Fire Behaviour Manual to calculate these values

Potential Source of Ignition	<p>What are the most likely sources of ignition?</p> <p>1. Escaped fire or ember transfer from campsites at the western edge of Lake Clearwater or from Potts River Campsite</p> <p>2. Accidental ignition from recreationalists or vehicles</p>
Fuel Type	<p>Enter the appropriate fuel type for the area: Tussock Grassland</p>
Fuel Height (m)	<p>What is the height (and percent cover) of the fuel between the likely ignition and the asset at risk?</p> <p>Tussock height is around 30cm and is at approx. 60% – 70% cover in the approach to the community from the western edge of Lake Clearwater</p>
Available Fuel load (t/ha)	<p>What is the calculated available fuel load? Approx. 13 ton per hectare</p>
Wind Speed (km/h)	<p>What is the average windspeed of the area?</p> <p>Scenario 1: 10 kmph - 20kmph</p> <p>Scenario 2: 30 kmph - 40kmph</p>
Fine Fuel Moisture Code (FFMC)	<p>What is the average Fine Fuel Moisture Code from the nearest RAWS? 89</p>
Initial Spread Index (ISI)	<p>What is the likely average Initial Spread Index (based on the average wind speed and FFMC above)?</p> <p>Scenario 1: 2</p> <p>Scenario 2: 9</p>
Buildup Index (BUI)	<p>What is the average Buildup Index value? 30</p>
Slope	<p>Calculate the slope of the area in degrees or by using rise over run</p> <p>Slope is very gentle sloping down towards the township, approx. .05 (5 degrees)</p>
Rate of Spread (m/h)	<p>What is the calculated rate of spread of a potential fire?</p> <p>Scenario 1: 50% Curing, ROS: 15 m/ph</p> <p>Scenario 2: 90% Curing, ROS: 1,297m/ph</p>
Head Fire Intensity (kW/m)	<p>What is the calculated potential Head Fire Intensity?</p> <p>Scenario 1: Head Fire Intensity: 90 kW/m</p> <p>Scenario 2: Head Fire Intensity: 8500 kW/m</p>
Flame Length (m)	<p>What is the calculated potential Flame Length?</p> <p>Scenario 1: Flame Height: 0.7m; Flame Angle: 90, Flame Length: 0.7m</p> <p>Scenario 2: Flame Height: 0.7m; Flame Angle: 20, Flame Length: 2m</p>

## Scenario 1 Conclusion

Scenario 1 highlights a more common situation the community may face due to a fire in the western tussock grassland. Due to the lower level of curing, softer wind, slower rate of spread and lower head fire intensity, the risk and impact of a fire at this level would be low. There would be ample time for the community/responders to react to this event and suppress the fire in a timely fashion.

## Scenario 2 Conclusion

Scenario 2 highlights a more devastating scenario which aligns with the 13.7 days that occur on average throughout the year where the level of curing of tussock is higher and the wind speed significantly stronger. This scenario has a significantly faster rate of spread and high head fire intensity. Due to these factors, the risk of significant consequences to the Lake Clearwater community is high, due to the reduced time for the community/responders to suppress, and the shorter time for the community to evacuate.

Considering the potential impact of a fast-moving fire on the community under this scenario, a firebreak would be an appropriate mitigation to give the community and responders time to react and potentially suppress a fire.



## Lake Clearwater Firebreak Implementation

The community has been working closely with Fire and Emergency, the Department of Conservation, and the Ashburton District Council to improve the protections and reduce the risk of fire. This group came up with a unique solution based on the needs of the community and the variables of the land as follows:

A mown grass strip of approximately 10m wide on the western edge of the community was seen as the most appropriate type of break for the following reasons:

- They have the equipment and the desire to maintain this type of break and the community will ensure that the grassed strip is mowed regularly
- It is a non-invasive option that helps to maintain the natural beauty of the area
- This option is easier to maintain and is not prohibitively expensive for the community to maintain
- It does not drastically change the environment

The community investigated other constructions of firebreaks, but those were less desirable. A traditional mineral earth firebreak was also considered but:

- Would be much more costly to implement and maintain
- Would impact the natural beauty of the area and create dust in high winds
- Could impact the ecology of the tussock
- The tussock would encroach onto the break over time requiring reconstruction
- A mown grass strip was comparably as effective as a mineral earth firebreak in this scenario

To improve the effectiveness of the break, there will be communication with Council and property owners to maintain or remove the fuel loading along the western edge of their boundary. There also was a suggestion to modify the fuel by the addition of a sprinkler system along the break. The addition of the sprinkler has several added benefits:

- Regular use will modify the fuel to reduce its level of curing during dry months, making it less flammable
- Can also be used in the event of a fire as a soaking system, protecting both the community and the surrounding area
- During a fire with high winds, the moisture carried on the winds may help to reduce spotting both inside the community, and into the conservation park
- Reduces the need for a wider mown strip thus reducing maintenance along with a better probability of holding a ground fire through these fuels.

The sprinkler line will be 270m in length extending to the edge of Hakatere Potts Road on the western side of the existing line of pine trees on the western edge of the village, tying off with Lake Clearwater itself, basically running East to West. It is proposed to bury all piping and the only above ground infrastructure will be the pump shed and sprinkler heads.

Both the mown grass strip and the sprinkler system was agreed upon by Fire and Emergency, the Ashburton District Council, the Department of Conservation, and the Lake Clearwater Hut Holders Association.

# Additional Mitigations

There are a range of other hazards that create fire risk for the community, along with the firebreak there is a number of other mitigations planned.

- Increase the number of “Total Fire Ban” and “Light No Fire Signs” at recreation access points and “Gas Cooker Only” signs at campgrounds
- Engaging and educating with the public more regularly through awareness events
- Removal of all dead fuel around the lakes that people would use to create bon fires.

## Further Information

For any further information or questions on this case study, or the use of firebreaks as a Risk Reduction tool, please contact the National Wildfire Team: [wildfire@fireandemergency.nz](mailto:wildfire@fireandemergency.nz).

