NSW GOVERNMENT

Department of Planning and Environment

NSW Alpine Resorts Environmental Performance Report 2019–20

environment.nsw.gov.au

Cover photo: Walk from Mt Stilwell.

Acknowledgment of Country

The Department of Planning and Environment acknowledges the Traditional Owners and Custodians of the land on which we live and work and pays respect to Elders past, present and future.

Published by:

Environment and Heritage
Department of Planning and Environment
Locked Bag 5022, Parramatta NSW 2124
Phone: +61 2 9995 5000 (switchboard)
Phone: 1300 361 967 (Environment and Heritage enquiries)
TTY users: phone 133 677, then ask for 1300 361 967
Speak and listen users: phone 1300 555 727, then ask for 1300 361 967
Email: info@environment.nsw.gov.au
Website: www.environment.nsw.gov.au

Report pollution and environmental incidents
Environment Line: 131 555 (NSW only) or info@environment.nsw.gov.au
See also www.environment.nsw.gov.au

ISBN 978-1-922840-33-2
EHG2022/0264
June 2022

Find out more about your environment at:

www.environment.nsw.gov.au

Foreword

Kosciuszko National Park is home to New South Wales' 4 major alpine resorts – Perisher, Thredbo Alpine Resort, Charlotte Pass Snow Resort and Selwyn Snow Resort. In total, the alpine resorts cover a combined leased or licensed area of just under 3,000 hectares. The alpine resorts contain internationally significant natural values, including restricted habitats of threatened species and endangered ecological communities, while also being recognised for their important recreational values.

The NSW National Parks and Wildlife Service (NPWS) (part of the Department of Planning and Environment) is responsible for the implementation of the *Kosciuszko National Park Plan of Management 2006*. NPWS maintains oversight of environmental management within Kosciuszko National Park. It is responsible for ensuring all operators within Kosciuszko National Park undertake environmental management, monitoring and reporting in accordance with the plan of management and relevant tenure arrangements.

In addition to its oversight function, NPWS leads several environmental management and monitoring programs relevant to the alpine resorts and is responsible for delivering municipal services within Perisher (also referred to as the Perisher Range resorts – Perisher Valley, Smiggin Holes, Blue Cow and Guthega).

This Alpine Resorts Environmental Performance Report has been prepared by NPWS for the period between 1 March 2019 and 29 February 2020. It is based on information and environmental data provided by the 4 alpine resort operators – Charlotte Pass Snow Resort Pty Ltd, Kosciuszko Thredbo Pty Ltd, Perisher Blue Pty Ltd, and Selwyn Snow Resort Pty Ltd. It also includes information and environmental data gathered from NPWS programs and operations, along with contributions from club and commercial lodges within the Perisher Range resorts and Charlotte Pass.

This report demonstrates a commitment to the environment by the alpine resort operators, lodges and NPWS. Among other things, this commitment is shown through:

- ongoing weed control programs and water quality monitoring
- a significant reduction in pollution incidents during the 2019 snow season
- an increase in the use of renewable energy
- increased alpine resort collaboration on environmental awareness strategies through the Sustainable Snowies group.

NPWS would like to thank the alpine resort operators and lodges for their willingness to work collaboratively with us to ensure the significant environmental values of Kosciuszko National Park are maintained. Together, we strive for continuous improvement in our environmental management of the alpine resorts and aim to maintain those values for generations to come.

Mick Pettitt Director

Park Operations Programs

NSW National Parks and Wildlife Service Department of Planning and Environment

Contents

List of tables

List of figures

Executive summary

The effective performance of alpine resorts is critical to maintaining the cultural and environmental assets of Kosciuszko National Park. This NSW Alpine Resorts Environmental Performance Report 2019–2020 covers the period between 1 March 2019 and 29 February 2020. It combines information provided to the NSW National Parks and Wildlife Service (NPWS) by the alpine resort operators in their annual environmental performance reports. Information has also been obtained from the NPWS Perisher Team, which operates municipal services within the Perisher Range resorts, NPWS Resorts Environmental Services Team and from the club and commercial lodges that operate in the Perisher Range and Charlotte Pass snow resort.

The term 'Perisher Range resorts' refers to the resort areas of Perisher Valley, Smiggin Holes, Guthega, and Blue Cow and includes the operations of Perisher Blue Pty Ltd, NPWS and the various club and commercial lodges.

In accordance with management objective 12.1.1.8 of the Kosciuszko National Park Plan of Management key environmental reporting for the resorts, this report includes:

- water quality monitoring results
- measures applied to reduce air and noise pollution and improve scenic quality
- water conservation, energy conservation, waste minimisation, reduction in light spillage and scenic quality enhancement results
- human waste volumes treated at each of the sewage treatment plants
- quantities of rubbish and recyclable material collected and its ultimate destination
- remediation progress at contaminated sites
- information relating to the nature of pollution incidents, how they have been managed, and the corrective action taken to prevent their recurrence.

The performance of the alpine resorts in relation to Chapter 12 of the Kosciuszko National Park Plan of Management is summarised in Table 1. The key to the performance trends in Table 1 are as follows:

Significant improvement: This can be due to a single event or a steady upward trend.

No significant change: This can mean the objective continues to be achieved or may mean continued impairment or poor performance during the reporting period.

Decline in performance: This can be due to a single event or a steady downward trend.

Table 1 Summary of NSW alpine resorts environmental performance 2019–2020

Annual report requirement	Section in this report	Environmental performance 2019–2020	Trend 2017–18	Trend 2018–19	Trend 2019–20
Water quality monitoring results	Section 2	There were fluctuations in biological health and water quality within all sites (including control sites). Alpine resorts are continuing to work on improving water quality on an annual basis.	No significant change	No significant change	No significant change
Measures applied to reduce air and noise pollution to improve scenic quality	Section 8	Alpine resorts are continuing to implement a range of measures to maintain air quality, reduce noise pollution and improve scenic quality through weed management and rehabilitation.	Significant improvement	Significant improvement	No significant change
Water conservation, waste minimisation, energy conservation, reduction in light spillage and scenic quality enhancement results	Sections 2, 3, 7, 8 & 9	Alpine resorts have demonstrated their commitment to improving their energy and waste management through a range of implemented initiatives. Water conservation and waste reduction is a key focus area for improvement over the coming years.	No significant change	No significant change	Significant improvement
Human waste volumes treated at each alpine resort sewage treatment plant in Kosciuszko National Park	Section 4	Human waste volumes treated at each sewage treatment plant is monitored according to the respective NSW Environment Protection Authority (EPA) licence parameters by the alpine resorts and NPWS. Overall, the performance was consistent with previous years. However, Charlotte Pass Snow Resort was subject to formal compliance action by the EPA due to exceeding licence concentration limits and not fulfilling monitoring requirements.	No significant change	No significant change	Decline in performance
Quantities of rubbish and recyclable material collected and its ultimate destination	Section 3	Each alpine resort is responsible for managing rubbish and recyclable material and its ultimate destination. The magnitude of this task is increasing year on year with increased visitation. In response, waste minimisation techniques are regularly implemented, and alpine resorts are actively participating in waste reduction programs.	No significant change	No significant change	Significant improvement

Annual report requirement	Section in this report	Environmental performance 2019–2020	Trend 2017–18	Trend 2018–19	Trend 2019–20
Remediation progress at contaminated sites	Section 6	Potential for contaminated sites in the alpine resorts typically occurs around underground petroleum storage systems. There have been no reported major contamination events and all recommendations from underground petroleum storage system decommissioning reports are followed up to ensure they are implemented. NPWS audited underground petroleum storage systems for this reporting period.	 Significant improvement	 Significant improvement	 No significant change
Information about the nature of pollution incidents, how they are managed, and corrective action taken to prevent recurrence	Section 5	There have been various pollution incidents throughout the reporting period, the majority relating to small hydrocarbon spills. All minor spills appear to have been managed in a timely and appropriate manner and the number of hydrocarbon spills has significantly reduced compared to previous reporting years.	 Decline in performance	 No significant change	 No significant change

1. Introduction

This NSW Alpine Resorts Environmental Performance Report 2019–2020 for the period 1 March 2019 to 29 February 2020 provides a summary of reporting against the environmental quality requirements outlined by section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management across the alpine resorts in Kosciuszko

National Park. The report combines the information provided to National Parks and Wildlife Service (NPWS) by the resort operators via their annual environmental reporting with information from NPWS and independent operators.

To the best of our knowledge, the information provided for collation in this report has been provided in good faith and is true and correct.

This report aligns with specific Kosciuszko National Park Plan of Management requirements for annual reporting, as outlined in Chapter 12, Management Objective 12.1.1.8 of the plan of management. This is interlinked with the environmental quality section (section 11.6) of the plan of management.

Environmental quality refers to the natural attributes and parameters that lead to the environmental character and sustainable use of Kosciuszko National Park.

These have been identified in the plan of management as:

- water quality
- water consumption
- soil contamination
- waste generation
- energy consumption
- air pollution
- light pollution
- noise pollution
- scenic quality.

This report provides a summary of key environmental quality objectives for the alpine resorts as set out in section 11.6, Chapter 12 of the plan of management. In addition to those specific reporting requirements, the report includes details on the ongoing collaborative environmental management and regulatory work that the NPWS Resorts Environmental Services Team undertakes within the alpine resorts.

Selwyn Snow Resort Pty Ltd has not submitted data for this report. This was due to the devastation caused to Selwyn Snow Resort by bushfires in January 2020. The resort suffered extensive damage to buildings, snow-making equipment, power, and water, as well as loss of records and data relating to environmental management system reporting.

Since the January 2020 bushfires, Selwyn Snow Resort Pty Ltd has been working with the Department of Planning and Environment and NPWS to finalise plans and gain approval for rebuilding the resort to meet current standards and provide an enhanced guest experience. Selwyn Snow Resort is expected to reopen in June 2022.

Figure 1 Selwyn Snow Resort after the 2020 bushfires
Photo: A Murdoch/Blyton Group

Figure 2 Damage to a Selwyn Snow Resort T-bar after the 2020 bushfires
Photo: A Murdoch/Blyton Group

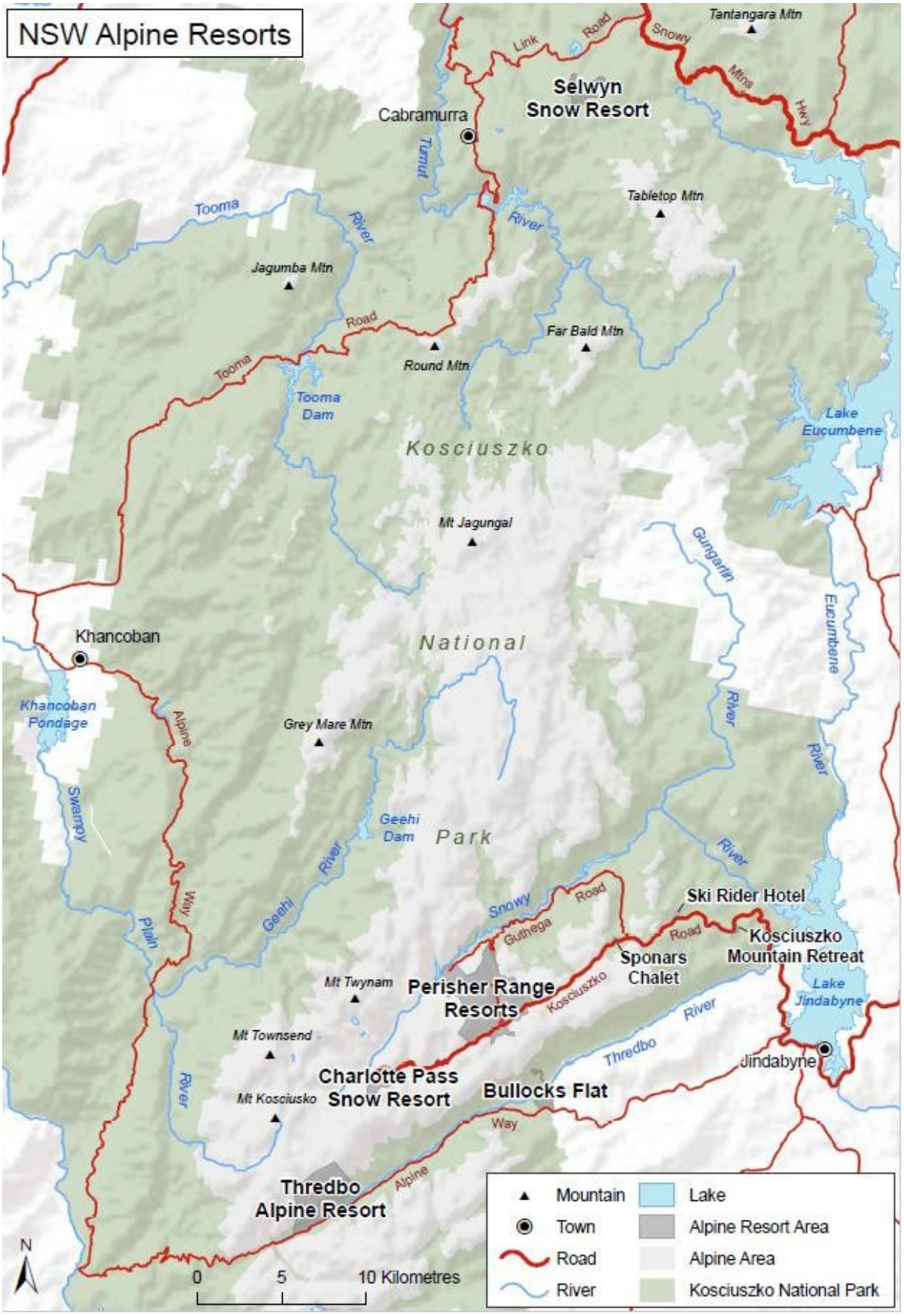

Figure 3 NSW alpine resorts location map

2. Water

This section reports on environmental quality as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management, which specifically requires the inclusion of water quality monitoring results and an outline of water conservation efforts.

The alpine streams in Kosciuszko National Park are located near the top of water catchments and provide water for lower catchment use, including for domestic and agriculture use and hydro electricity generation. These water catchment areas also support endemic and threatened vegetation communities, which include a rich diversity of freshwater and terrestrial biota.

Alpine resort operations, if not managed appropriately, could impact on both the availability of water resources and the biodiversity that relies on it. NPWS and the alpine resort operators are required to monitor water quality and consumption in accordance with regulatory requirements.

Figure 4 NPWS water quality monitoring program at Perisher Creek

2.1 Water quality monitoring

Biological, physical and chemical water quality monitoring is undertaken on:

- the Thredbo River around Thredbo Alpine Resort
- Spencers Creek, Rock Creek, Perisher Creek, Pipers Creek, Smiggin Tributary, Sawpit Creek, Farm Creek and Blue Cow Creek around Charlotte Pass Snow Resort, Perisher Range resorts, Sponars Chalet, Ski Rider Hotel and Kosciuszko Mountain Retreat.

Monitoring reports provide a 'stream health card' based on how the water quality measurements compare against the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZG 2018). Measurements include temperature, turbidity, total dissolved solids, electrical conductivity, pH, dissolved oxygen, and nutrients.

Reports also provide details of biological health based on several macroinvertebrate indices. These include taxa richness, EPT (*Ephemeroptera*, *Plecoptera* and *Trichoptera*) richness, relative abundance of major taxonomic orders, SIGNAL2 family score, and the Australian River Assessment System (AUSRIVAS) models.

A summary of the results from the relevant reports is given in the following sections.

Thredbo Alpine Resort

Biological and physical assessments of the Thredbo River around the Thredbo Alpine Resort are undertaken 4 times per year by Lhendup, Broadhurst and Clear from the University of Canberra Institute for Applied Ecology (2019 and 2020). Water quality is continually monitored to assess the effects of the Thredbo Village and associated sewage treatment plant on the Thredbo River.

Findings from May, August and November 2019 and February 2020 include the following:

- Data gathered on physical indicators shows fluctuations throughout the year. Temperature varies with season. All 4 sites shown in Figure 5 show similar temperature changes throughout the year. Slight variations are likely caused by the characteristics of each site, for example depth of the river and shade. Site 11, the reference site, showed elevated turbidity over guideline levels in May 2019, likely attributed to increased rainfall events in Autumn where there is increased erosion, run-off and upstream sediment being re-suspended. Site 12 showed slightly higher than average values of non-filterable residue in November 2019 and February 2020.
- Sites 11, 12 and 14 in May 2019 and all sites in August 2019 were outside guideline levels for dissolved oxygen. Readings of pH were relatively consistent across all sites. However, in February 2020 site 11, the reference site, was outside the guideline (more acidic). This suggests there is either some natural variation within the catchment having an influence on the readings further downstream, or the reference site is not appropriately located. Electrical conductivity was below the guideline and similar to the reference for the reporting year, except in August 2019 when site 13 was higher than the other sites, but still well within guideline levels.
- Ammonia (NH_3) levels spiked in August 2019. NH_3 is known to be toxic to macroinvertebrates. However, there is no direct guideline limit for NH_3-N. Total phosphorus was within guideline limits for the reporting period.
- There is evidence of consistent nutrient enrichment downstream of Thredbo Village and the sewage treatment plan, shown through elevated total nitrogen, nitrogen oxides and algae growth (Chlorophyll-a and AFDM). Periodic elevated total nitrogen and nitrogen oxide levels were detected at the reference site. This appears to be largely seasonal, with elevated levels in autumn and spring. This could also indicate that there is an upstream source of nutrient enrichment or the chosen reference site is not suitably located to provide an accurate reference.

- Since August 2017, algal biomass (ash-free dry mass) has been consistently higher at sites downstream of the Thredbo Village and sewage treatment plant compared to reference site 11 above the village. Levels of chlorophyll-a at sites downstream of the plant (13 and 14) have also been consistently elevated. These 2 indices may be due to nutrient enrichment from direct discharge from the treatment ponds. However, the increased chlorophyll-a at site 12 (downstream from the village but upstream from the treatment plant) suggest increased growth is, in part, due to other factors.
- The macroinvertebrate monitoring for the Thredbo River shows considerable variation across seasons and years in both the relative abundance of taxonomic groups and the AUSRIVAS scores. However, sites 12, 13 and 14 showed relatively consistent impairment (band B – significant impairment) using the AUSRIVAS Kosciuszko National Park–Thredbo riffle model. Despite this, all sites in November 2019 were scored as either more biologically diverse than reference (band X) or similar to reference (band A).

The water quality of the Thredbo River shows some seasonal variability across several indicators, influenced by the characteristics of and inputs from each of the sites and the surrounding landscape. However, there is evidence of consistent influences from stormwater run-off and other inputs from Thredbo Village and the sewage treatment plant, shown through consistent nutrient enrichment and macroinvertebrate population impairment at the 3 downstream sites. Further investigation is needed to determine potential sources and identify possible rectification measures. These measures could include the:

- addition of a reference site further upstream
- addition of an extra site in between site 11 and site 12
- introduction of monthly nutrient sampling and recording of accompanying water quality measurements at all sites.

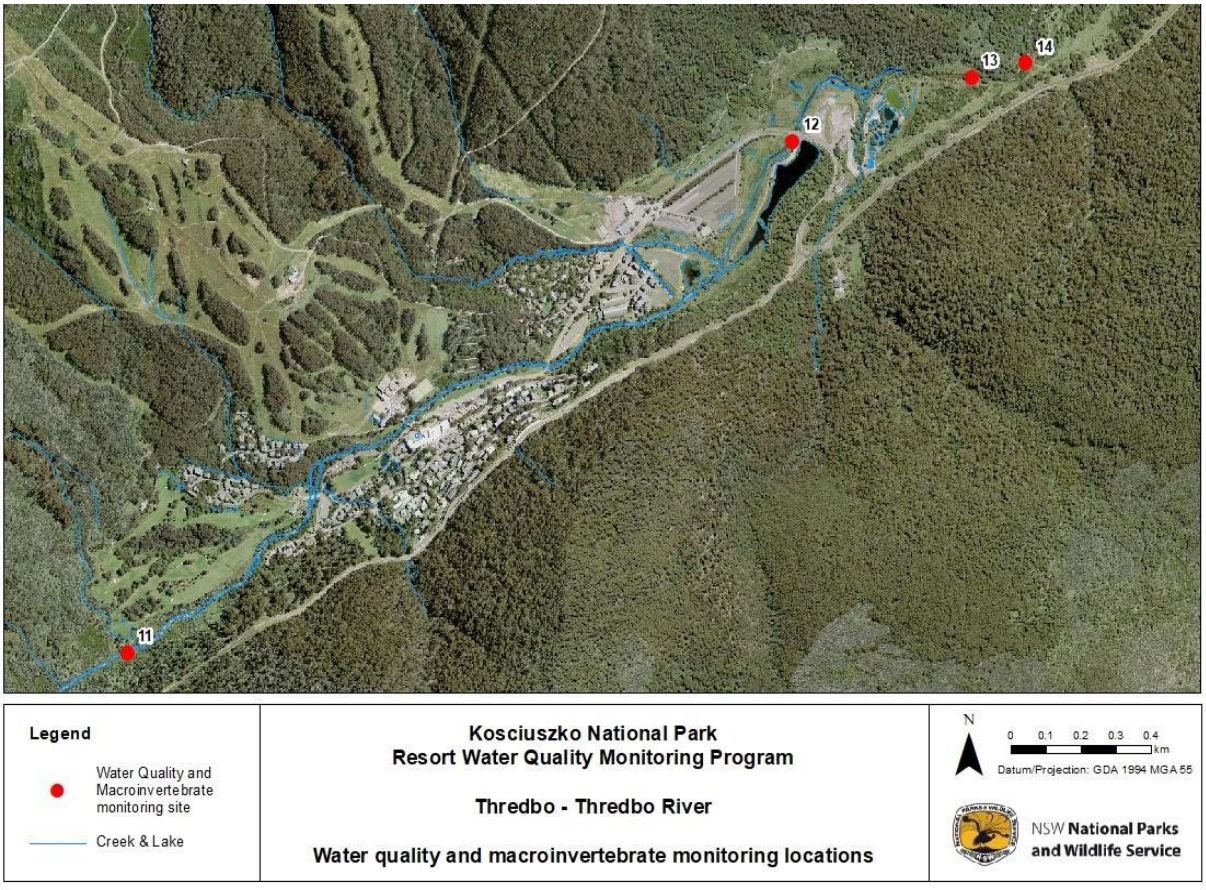

Figure 5 Water quality monitoring sites around Thredbo Alpine Resort

Perisher Range resorts and Charlotte Pass Snow Resort

The biological and physical condition of the waterways with potential to be influenced by the Charlotte Pass Snow Resort and Perisher Range resorts is monitored by NPWS in conjunction with the Environment, Energy and Science group within the Department of Planning and Environment. The information in the following sections is summarised from the annual Kosciuszko National Park Resorts River Quality and River Health Report Cards (2019 and 2020).

Biannual monitoring occurs in autumn and spring at a total of 18 sites within the Perisher Range resorts areas. This is supplemented with additional fortnightly sampling during winter and spring at 16 sites along Rock, Perisher, Pipers, Smiggin, Diggers and Sawpit creeks.

Figure 6 Snow covered Spencers Creek, Charlotte Pass

Charlotte Pass Snow Resort – Spencers Creek

- Total nitrogen and Ammonia were detected outside guideline limits downstream of the Charlotte Pass Snow Resort sewage treatment plant (site 107) in autumn 2019, while only total nitrogen was outside guideline limits in spring. There may be some natural nitrogen sources within the catchment, however, nitrogen oxides were highest at the downstream site, suggesting the treatment plant discharge contributes nitrogen to Spencers Creek and elevates the concentration above natural levels.
- Macroinvertebrates scored band B (significant impairment) at all sites except 106 (below the village, but above the treatment plant), which scored band A (similar to reference) in autumn 2019. The results show fewer macroinvertebrate families than expected, indicating potential prolonged impacts to water quality. Above average rainfall in March and May 2019 may have influenced the abundance and diversity of macroinvertebrate communities by displacement. It is also likely that macroinvertebrates have been directly impacted by exposure to nutrient-enriched conditions over winter from a combination of natural and anthropogenic sources.

Overall, the water quality variables measured by the Department of Planning and Environment in autumn and spring 2019 were predominately ‘good’. However, there were periods of ‘poor’ conditions not captured as part of the program but indicated by sewage treatment plant discharge monitoring. Upgrades to the Charlotte Pass Snow Resort sewage treatment plant should be considered a high priority, along with an increased frequency of nutrient sampling at all sites to better understand the impacts of treatment plant discharge on the health of the receiving ecosystem. Following the reporting period, treatment plant upgrades were initiated. Further information is given in section 4.2.

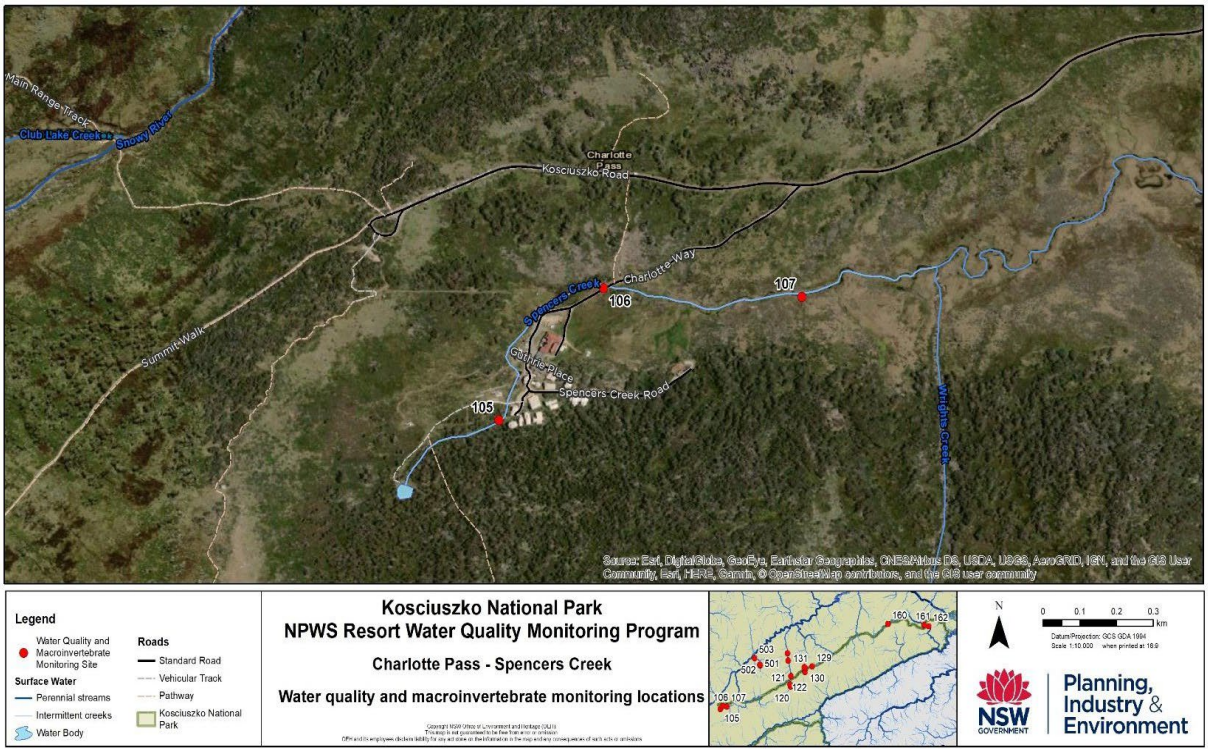

Figure 7 Water quality monitoring sites around Charlotte Pass Snow Resort

Perisher Valley – Rock Creek and Perisher Creek

- Total nitrogen was marginally outside guidelines at site 122 (below Perisher car park, shown in Figure 8), suggesting some impact is likely from the alpine resort area and car park. Elevated total nitrogen and total phosphorus in autumn and nitrogen oxides in spring at sites downstream of the sewage treatment plant suggest impact from Perisher Valley treatment plant (NPWS operated) discharge. Electrical conductivity and turbidity have been consistently within guidelines since 2016. However, both variables display a slight increasing trend downstream of Perisher Valley and the treatment plant. The high rainfall in autumn is likely to have influenced the slightly elevated nutrients and electrical conductivity recorded in May 2019 through increased stormwater discharge from the alpine resort area and treatment plant.
- Rock Creek scored band B (significant impairment) by AUSRIVAS at site 120 in autumn. Site 121, downstream of the weir, scored band A (similar to reference) in autumn and spring. A disparity in habitat condition may explain fewer macroinvertebrate families observed in autumn, when water quality was ‘good’. Fewer macroinvertebrate families were observed downstream of Perisher Valley (site 122) in autumn 2019. However, macroinvertebrate composition was within the expected range in spring 2019, which may be due to an improvement in total nitrogen concentrations at the time of sampling. Perisher Creek sites 123 and 124 were scored as band A (similar to reference) in autumn and spring.

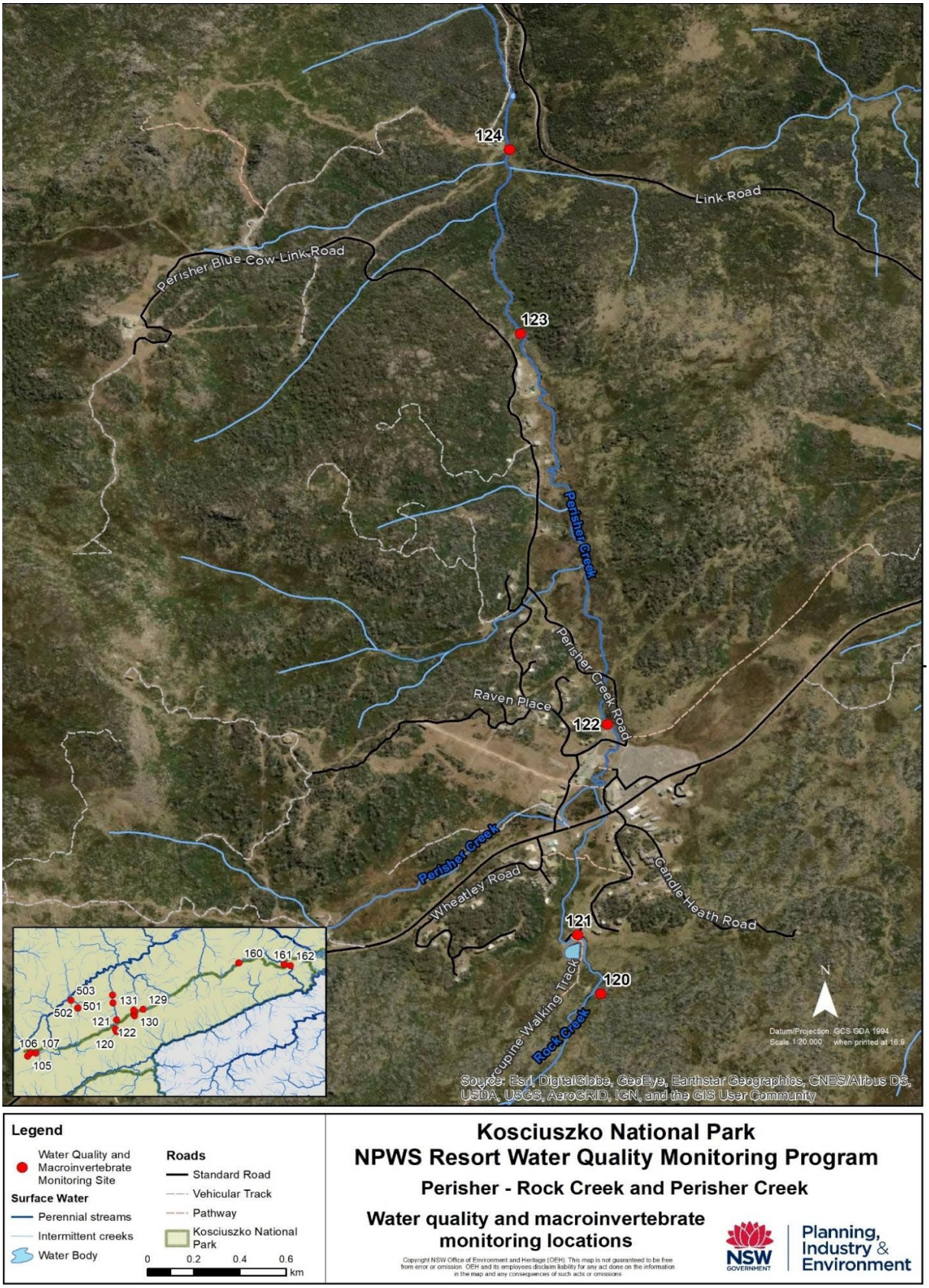

Figure 8 Water quality monitoring sites around Perisher Valley main car park

Overall, Rock Creek upstream of the alpine resort area exhibited ‘good’ water quality across all variables measured in autumn and spring. Perisher Creek sites scored ‘moderate’ to ‘poor’, with the most impacted site (123) located downstream of Perisher sewage treatment plant. This indicates that there are ongoing influences from stormwater and wastewater discharge from the alpine resort area and treatment plant impacting water quality to varying degrees. It is recommended to implement more frequent nutrient sampling along Rock and Perisher creeks to identify and implement measures to improve the quality of discharge entering the waterway.

Guthega – Farm Creek and Blue Cow Creek

Guthega has 2 sites on Farm Creek (501 and 502) shown in Figure 9. An additional site (503) on Blue Cow Creek upstream of Guthega Pondage was added in Spring 2019. Site 503 is at lower elevation and is intended to help understand water quality issues in the Blue Cow Creek and Farm Creek catchments that may be related to the Guthega–Blue Cow area of the alpine resort. Site 501 on Farm Creek upstream of the weir will be discontinued because there has been negligible difference in water quality and macroinvertebrate condition since it was first sampled in 2004.

- Farm Creek water quality results for 2019 continue to indicate very good water quality, with all sites within guideline limits. Blue Cow Creek water quality was assessed as good in spring 2019, with all indicators similar to those measured at the Farm Creek sites. Ongoing monitoring of the Blue Cow Creek site is needed to better understand the water quality and potential issues over time.
- The 2019 monitoring of Farm Creek captured an increase in the number of macroinvertebrate families at 501 and 502, which was scored by AUSRIVAS as band A and X respectively in autumn, and band A (similar to reference) at 502 in spring. The macroinvertebrate community at the Blue Cow Creek site (503) scored lower than the Farm Creek sites for all indices. The taxa richness and EPT richness and ratio indices at site 503 were considerably lower than site 502, as was the AUSRIVAS score. However, the SIGNAL2 score was only slightly lower at site 503. As the water quality results did not indicate any issues at site 503, the results suggest that pollution may not be a driving factor of the lower richness. Rather, it may be a result of the harsher hydraulic habitat at site 503. Continued monitoring at the Farm Creek site 502 and site 503 on Blue Cow Creek will provide more data to accurately assess this new site and reveal if the lower index scores are consistent.

Overall, the water quality in both Blue Cow and Farm Creeks is excellent, with all indicators within guideline limits. The AUSRIVAS results further indicate that the streams are in optimal condition, with these creeks providing an example of undisturbed ecosystems.

Ongoing monitoring of sites 502 and 503 is recommended to better understand the water quality and macroinvertebrate community and identify any potential issues that might emerge over time.

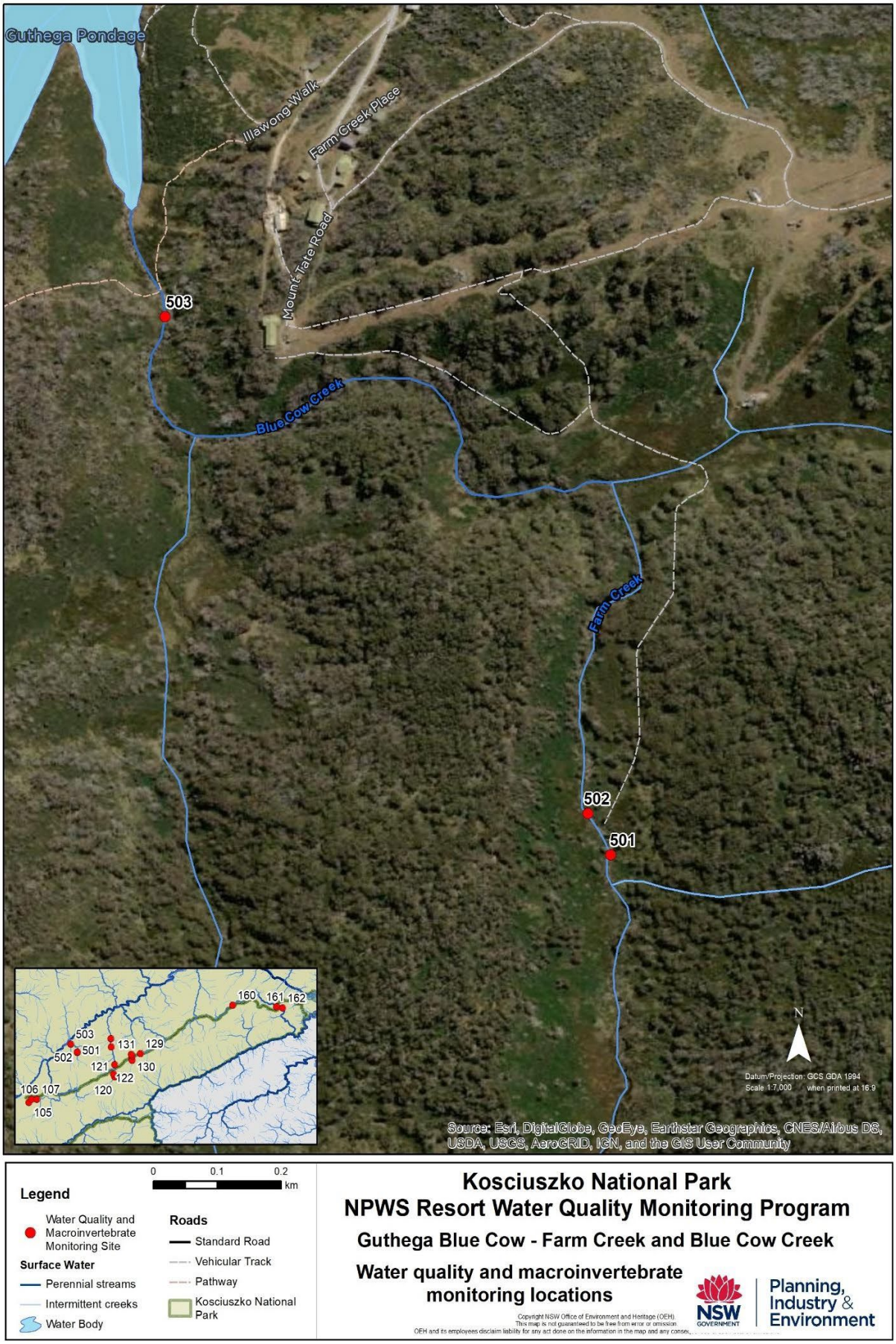

Figure 9 Water quality monitoring sites around Guthega Resort area

Figure 10 Guthega Pondage

Smiggin Holes – Pipers Creek and Smiggin Creek

- Total nitrogen and nitrogen oxides concentrations were outside guideline limits at all sites except site 128A in autumn 2019, with nitrogen oxides levels generally double the guideline limit. The higher concentrations of both total nitrogen and nitrogen oxides were captured at sites around and below the Smiggin Holes area of the alpine resort, the Smiggin Holes workshop and Kosciuszko Road. All water quality variables were within guideline limits in spring, except for nitrogen oxides in the 2 Smiggin Creek sites.
- Elevated electrical conductivity (salt) levels were detected below the Smiggin Holes area of the alpine resort, with highest concentrations found downstream of the Pipers Creek and Smiggin Creek confluence, below Kosciuszko Road.
- Macroinvertebrate taxa richness was highest at the upstream Pipers Creek sites (128 and 128A), and lowest at the Smiggin Creek tributary site downstream of the Smiggin Holes area of the alpine resort and Kosciuszko Road (site 130). All sites had increased macroinvertebrate richness in 2019, except site 128 upstream on Pipers Creek. The AUSRIVAS assessment scored the 3 sites on Pipers Creek (site 128, 128A and 129) as band A (similar to reference) or band X (better than reference), except for site 128A in autumn (band B) and 129 in spring (band B). The sites on Smiggin Creek (sites 130 and 131) scored poorly at both the autumn and spring sampling, with scores of band B (significant impairment) and one score of band C (severe impairment) at site 130 in autumn.
- Additional metal, oil and grease sampling takes place around the Smiggin Holes area of the alpine resort to investigate contamination from road and impervious surface run-off. The results found aluminium was slightly outside the guideline limit of 0.055 mg/L at all sites in 2019, including Pipers Creek upstream of Smiggin Holes. While this suggests that background levels may be high, the concentration was highest at site 131 downstream of the Smiggin Holes car park, suggesting some contamination run-off from paved surfaces. Again, this could be due to high rainfall in March and May 2019, prior to autumn testing. Zinc was slightly outside the guideline limit at site 128A, upstream of the

Smiggin Holes area of the alpine resort, in autumn. Sodium levels were elevated at sites 130 and 129, downstream of the Smiggin Holes area of the alpine resort and Kosciuszko Road. Though there is no guideline value for sodium, this suggests that sodium from the car park and Kosciuszko Road is entering Smiggin Creek and Pipers Creek. Oil and grease results were below the detection limits for all sites.

- An eDNA investigation of the elevated nutrient concentrations in the waterways around and below the Smiggin Holes area of the alpine resort was carried out in spring 2019. This consisted of the collection of in-situ water quality measures and samples for analysis of metals, oils and grease, E. coli, total coliforms and eDNA. While the results of this investigation found elevated nutrient levels, low enterococci counts were detected, indicating little animal use other than by some bird species. This also indicates that the source of the elevated nutrient levels is not human sewage from damaged or leaking pipes.

The water quality score has fluctuated at all Smiggin Holes area sites over time but sites upstream on Pipers Creek have consistently scored better than the downstream sites.

Given that nutrient and salt concentrations were considerably less at the Pipers Creek reference sites (128 and 128A), it is likely that the Smiggin Holes area of the alpine resort (including car park, workshop and nearby areas of Kosciuszko Road) is contributing to nutrients and salts in the waterways.

The lower scores in all metrics used to assess macroinvertebrate communities in Smiggin Creek, despite predominately 'good' water quality in autumn, suggests the contaminant run-off from the resort and paved surfaces predominantly occurs throughout the winter season. Pipers Creek downstream of the Smiggin Holes area of the alpine resort (site 129) has improved in overall BioScore since 2018. However, it has been consistently lower than the upstream Pipers Creek sites, also suggesting possible impact from the resort and roads.

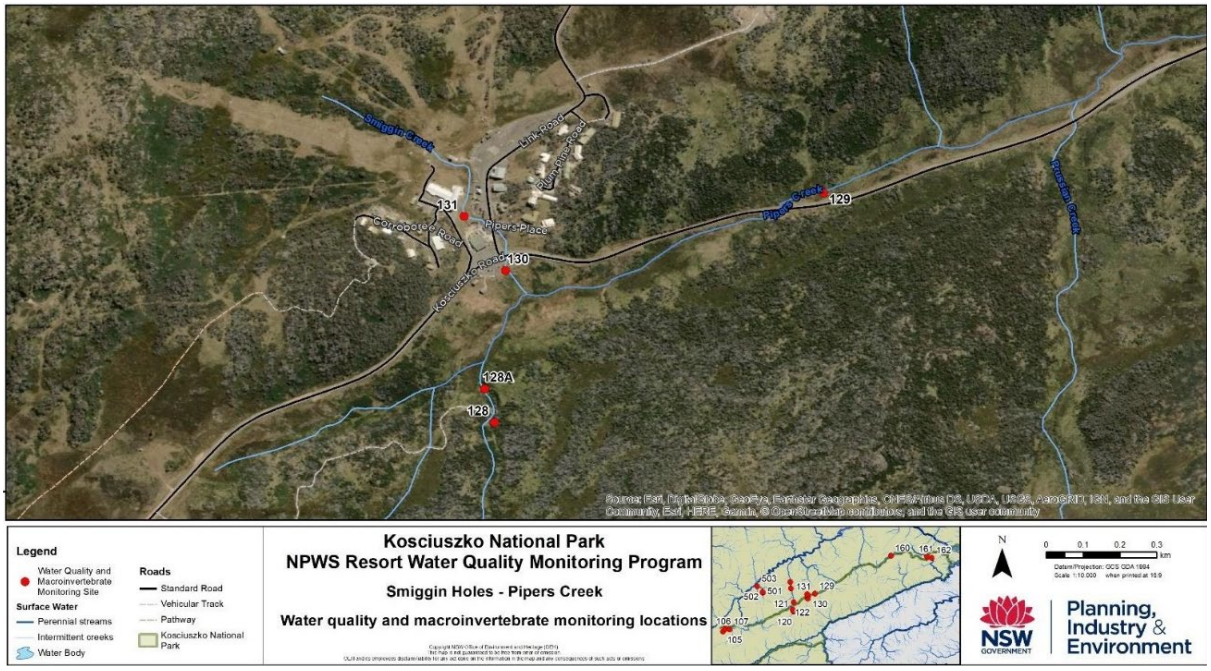

Figure 11 Water quality monitoring sites around Smiggin Holes Resort area

Sponars Chalet – Diggers Creek

Diggers Creek has one monitoring site which is part of the NPWS winter water quality monitoring program. During winter 2019, turbidity levels remained within the guideline but varied throughout the year. Higher turbidity generally coincided with precipitation events. Electrical conductivity was also within guideline levels, with elevated levels detected (still within guideline levels) during or immediately after precipitation events.

Figure 12 Water quality monitoring site near Sponars Chalet

Ski Rider Hotel and Kosciuszko Mountain Retreat – Sawpit Creek

- Autumn sampling found total nitrogen concentrations were above guidelines at all sites, with the highest concentration recorded at site 160 (reference site) but improved in spring 2019 for the first time since 2016. Results for ammonia and nitrogen oxides were within guidelines for all Sawpit Creek sites, which suggests minimal nutrients from wastewater in the creek. This indicates that the elevated total nitrogen may be from natural or undetermined sources, with the creek potentially characterised by high nitrogen concentrations fluctuating on a temporal scale. Total phosphorus measured just slightly above the guideline downstream of the Ski Rider Hotel (site 161) in autumn.
- There was a slight trend of increasing electrical conductivity from upstream to downstream, with the highest value recorded at the downstream site (162). This may indicate some impact from Ski Rider Hotel, the Kosciuszko Mountain Retreat and run-off from road surfaces. Electrical conductivity is consistently elevated above guideline trigger levels in this creek, being generally more than double the electrical conductivity recorded around the alpine resorts. Turbidity readings were generally within guideline limits, except for sites 161 and 162 in spring. This ‘moderate’ turbidity may be from surface run-off from open dirt roads within the campground area after rainfall. However, overall, the level of turbidity recorded is not a major cause for concern due to the reading being only slightly above the guideline.
- All 3 Sawpit Creek sites had taxa richness and EPT richness above the guidelines, with the lowest ratio recorded at the reference site (160) upstream of Ski Rider Hotel and the Kosciuszko Mountain Retreat. The macroinvertebrate community was determined by AUSRIVAS as band X (more biologically diverse than reference) at site 160 in autumn and band A (similar to reference) at all other Sawpit Creek sites in autumn and spring. The sampling and analysis of the macroinvertebrate community at Sawpit Creek indicates good water quality and habitat conditions, these results suggest Ski Rider Hotel and the Kosciuszko Mountain Retreat have not impacted the sensitive macroinvertebrate taxa downstream.

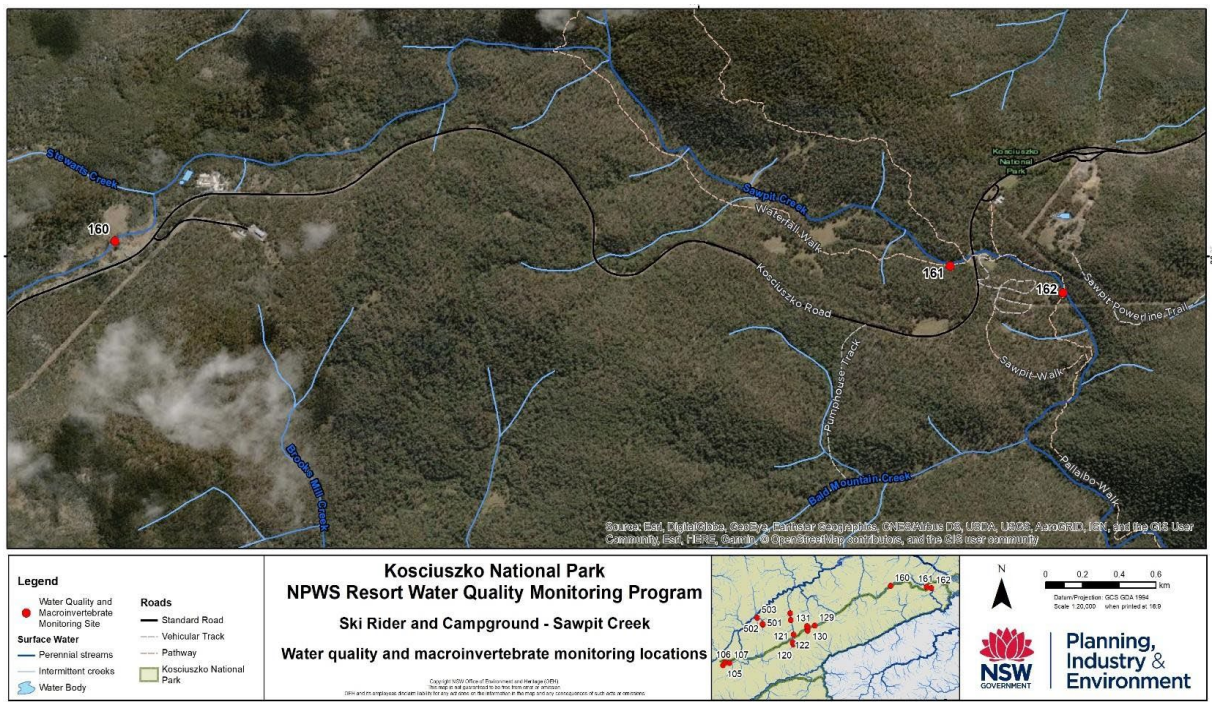

Figure 13 Water quality monitoring sites around Ski Rider Hotel and Kosciuszko Tourist Park

The overall water quality score of Sawpit Creek has generally indicated moderate condition, with an increasing trend over time. The combined macroinvertebrate indicator BioScore has fluctuated, but predominantly rated as good condition. This indicates that the Ski Rider Hotel and Kosciuszko Mountain Retreat are having minimal impact on the waterway.

However, the increasing salt concentration may be an issue in the future. A detailed assessment of the conductivity of the waterway is recommended to help understand the pathways of salt into Sawpit Creek and to inform management in the future.

2.2 Water conservation

Water conservation in the alpine resort operators' premises and on ski slopes is dependent on interrelated factors that include visitor numbers and behaviour, infrastructure, maintenance, weather conditions and the extent of snowmaking.

The alpine resort operators and NPWS are committed to increasing the sustainability of the alpine resorts through campaigns aimed at reducing water consumption. The alpine resort operators have implemented initiatives such as:

- installing low-flow showers, waterless urinals, dual-flush toilets, and water-efficient washing machines at Thredbo Alpine Resort and the Perisher Range resorts
- adding mulch to landscaped and rehabilitated sites, which reduces the summer watering requirements, and watering these sites in the evening to reduce evaporation
- using straw bales and sediment retention fences to reduce impact on water quality while construction is carried out in the alpine resorts.

2.3 Management response and review

- Increased frequency of nutrient sampling of some creeks will be implemented as part of the monitoring program by the NPWS Resorts Environmental Services Team's and the Department of Planning and Environment's Environment, Energy and Science branch. This will help understand the impacts caused by run-off and sewage treatment plan inputs. Better identification of the source of impacts will allow them to be reduced or better managed.
- There should be increased frequency and extent of monitoring of the Thredbo River, in the vicinity of the Thredbo Alpine Resort. This should be focussed on further investigation of the elevated water quality and biological indices within the Thredbo River. Again, better identification of the source of impacts will allow them to be reduced or better managed.
- NPWS, in consultation with Transport for NSW, should continue to investigate the use of salt on the main roads of Kosciuszko National Park (including Kosciuszko Road and Alpine Way) by Transport for NSW and its effect on water quality.

Figure 14 Perisher Creek

3. Waste

This section reports on environmental quality as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management. Specifically, this section details the quantities of collected rubbish and recyclable material generated in the alpine resorts, their ultimate destination, and the management of litter.

Ongoing management of solid waste generated within the alpine resorts is linked to the levels and availability of recycling and reuse of materials. NPWS and the alpine resort operators are working to increase levels of recycling within the alpine resorts and have implemented various waste minimisation improvements during the reporting period.

3.1 Waste production

Each alpine resort operator monitors their waste production and the destination of waste produced. The main waste collection streams include general waste to landfill, paper and cardboard recycling, glass bottles, cans, and plastic recycling, organics recycling, and cooking oil recycling. Alpine resort operators report further waste information based on their specific waste management practices and methods of disposal.

Waste volumes fluctuate depending on visitation numbers and the amount of construction activity in the alpine resort areas over a reporting period. Within the alpine resort areas, individual lodge construction projects are managed separately to alpine resort operations and lodge construction contractors are required to remove and dispose of any waste generated by their development. Information about such waste is not reported to the alpine resort operators or NPWS.

Figure 15 NPWS waste collection vehicle

Thredbo

General waste from the Thredbo Alpine Resort is disposed of at Snowy Monaro Regional Council's Cooma landfill facility. Recycling materials are transported to a commercial recycler and processed for further use. Scrap metal is collected and either reused on site or is transported to Cooma for recycling. Food organics are composted on site, with the food organics program expanded during the reporting period to include club lodges and apartments, as well as restaurants and lodges with commercial kitchens.

An overview of Thredbo's waste production is provided in Table 2 and Table 3. The overall trend shows a decrease in total waste generated. However, along with the decreased volume there was also a decrease in recycling rate. Building waste volumes sent to landfill increased significantly, with no recycling of that material.

Organics recycling decreased in the reporting period due to a problem with the Thredbo organics machine. NPWS understands that a new machine was purchased after the reporting period, which will help increase the recycling of food waste.

Table 2 Thredbo Alpine Resort waste figures (tonnes)

Waste type (tonnes)	2017–18	2018–19	2019–20
Putrescible/Landfill	643.18	597.25	572
Building waste landfill (furniture, timber, skis & snowboards)	15.74	33.5	84.8
Building waste recycled	0.00	0.00	0.00
Co-mingled recycling	192	168.48	156.68
P&C recycling	69.14	70.16	71.64
Organics recycling	8.939	5.902	5.293
Cooking oil recycling[1]	10.35	10.8	9
Green waste (woodchipped & reused)	10	34	0.00
Steel recycling	32.79	0.00	0.00
Battery recycling	0.00	0.00	0.00
E-Waste recycling	0.00	0.00	0.00
Total waste	982.14	920.09	899.41
Total recycling	323.22	289.34	242.61
% Recycling	33%	32%	27%

Table 3 Thredbo Alpine Resort recycling (units)

Waste type (units)	2017–18	2018–19	2019–20
Rubber (including tyres)	All recycled	All recycled	All recycled
Mobile phones	0	14	17
Ski school uniforms	0	150	165

[1] For cooking oil, litres x 0.9/1000 = tonnes

Perisher Ski Resort – Bullocks Flat and Blue Cow

Waste from Blue Cow in the Perisher Range resorts is managed directly by Perisher Blue Pty Ltd (Perisher Ski Resort) and is transported via the Skitube to Bullocks Flat where the general waste, recycling and organics are collected by Snowy Monaro Regional Council. Perisher also has systems in place to recycle waste generated by staff, including electronic waste, mobile phones and printer cartridges.

An overview of Perisher's Blue Cow and Bullocks Flat waste production is provided in Table 4. Overall, total waste generation has more than halved since 2017 while the recycling percentage has significantly increased. The reduction in waste generation is largely due to a reduction in general waste and building waste. Recycling rates for co-mingled waste (glass bottles, cans and plastic recycling) has stayed relatively stable, whereas organics recycling has increased, and rubber and e-waste recycling vary year on year.

Table 4 Perisher waste figures, Bullocks Flat and Blue Cow (tonnes)

Waste type (tonnes)	2017–18	2018–19	2019–20
Putrescible/Landfill	44.8	43	28.5
Building waste landfill	113.49	11.52	0.68
Building waste recycled	3.51	19.85	0.00
Comingled recycling (including P&C)	14.6	16.02	13.3
Organics recycling	0.00	2.56	9.9
Steel recycling	0.00	0.00	0.00
Battery recycling	0.00	0.00	0.00
E-waste recycling	0.774	1.59	00.75
Rubber (including tyres) recycling	2.56	1.816	1.7
Total waste	179.73	96.36	54.83
Total recycling	21.44	41.84	25.65
% Recycling	12%	43%	47%

Perisher Range resorts and Charlotte Pass Snow Resort

Perisher Range resorts and Charlotte Pass Snow Resort waste is primarily managed by NPWS' Perisher Services Team through the waste transfer station at Perisher Valley. This does not include commercial bulk or hazardous waste, which is removed directly by the resort operator or individual lodges and their contractors. General waste is disposed of at Snowy Monaro Regional Council's Jindabyne landfill facility and recycling is collected by a licensed waste contractor and transported to a materials recovery facility in Canberra, ACT. In some specific areas of Perisher Valley – Smiggin Holes and Charlotte Pass – an organic waste collection service operates in the snow season, with this material transported to Sawpit Creek for processing into compost by NPWS.

An overview of Perisher Range resorts and Charlotte Pass Snow Resort waste production during the reporting period can be found in Table 5.

Overall, putrescible waste has slightly decreased, and recycling has increased since 2017, except for organics recycling, which decreased. The 2018–19 reporting year has the lowest total waste and recycling figures in tonnes. This could be due to lower visitation during winter 2018.

Table 5 Perisher Range resorts and Charlotte Pass Snow Resort combined waste figures (tonnes)

Waste type (tonnes)	2017–18	2018–19	2019–20
Putrescible/Landfill (including asbestos)	478.26	471.78	434.16
Building waste landfill (furniture, timber, skis & snowboards)	0.00	0.00	0.00
Building waste recycled	0.00	0.00	0.00
Co-mingled recycling	134.93	115.39	170.82
P&C recycling	58.26	44.27	83.48
Organics recycling	80	80	54.37
Cooking oil recycling[2]	14.74	11.85	14.44
Steel recycling	0.00	0.00	4.3
Battery recycling	0.00	0.00	0.00
Total waste	766.19	723.29	761.81
Total recycling	287.93	251.51	327.41
% Recycling	38%	35%	43%

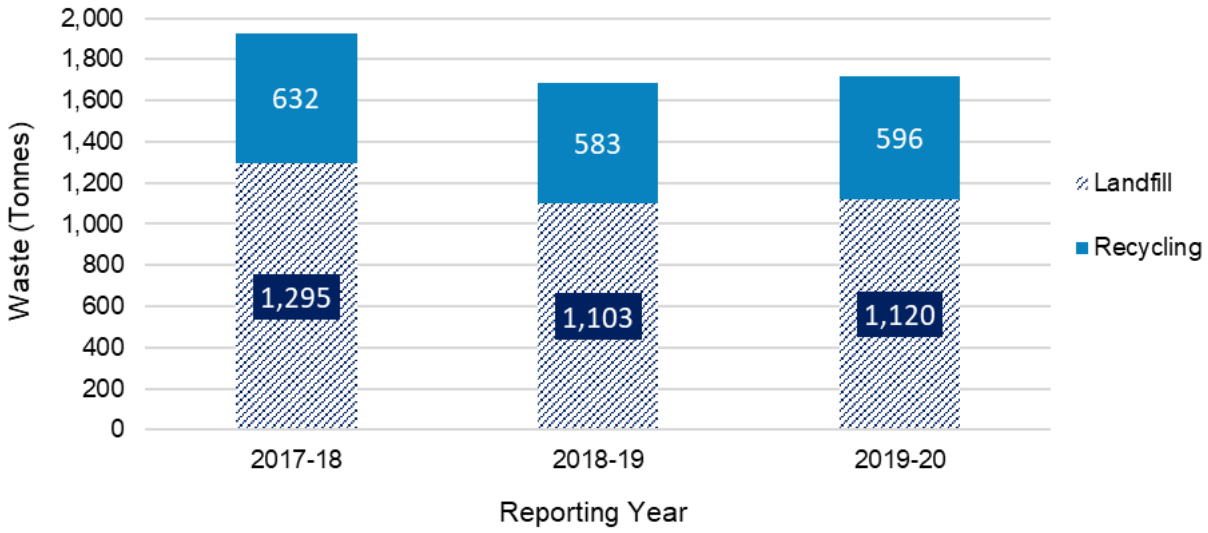

Figure 16 Total waste generated by the alpine resorts for the period 2017 to 2020

The total waste figure includes domestic waste and building waste (where figures were provided) for Perisher Range resorts, Charlotte Pass Snow Resort and Thredbo Alpine Resort.

The total recycling figure includes co-mingled waste (glass bottles, cans and plastic recycling), paper and cardboard, organics, cooking oil, green waste, steel, batteries, e-waste and rubber (where figures have been provided) from Perisher Range resorts, Charlotte Pass Snow Resort and Thredbo Alpine Resort.

Overall, a total of 35% of all domestic waste was recycled from all alpine resorts during 2019–20 reporting year. The overall recycling rate has increased by 2% since the 2017–18 reporting year.

[2] For cooking oil, litres x 0.9/1000 = tonnes

3.2 Waste minimisation

Increasing visitor numbers to the alpine resorts each year, including more visitation outside the snow season, is resulting in higher waste production volumes. As such, it is becoming progressively more important to better manage waste and to develop cost-effective waste minimisation practices.

NPWS works alongside the alpine resort operators and independent lodges to improve waste management. Various projects have been undertaken in the reporting period by the alpine resort operators.

Thredbo Alpine Resort initiatives

In 2019, 165 Thredbo Ski School uniforms were returned to the manufacturer, PURE. PURE recycle these uniforms to make new outerwear for their customers to purchase.

Kosciuszko Thredbo, Thredbo Alpine Resort community members and the chamber of commerce have formed the Thredbo Sustainability Team. The Thredbo Sustainability Team aims to improve sustainability and environmental engagement in the village, with a key focus on increased recycling.

To expand food recycling throughout the village, Kosciuszko Thredbo and Lantern Apartments ran an organics recycling trial. Kitchen caddies and compostable bin liners were purchased for individual apartments, organics recycling signage was produced, and the apartment manager trained the cleaning team. The trial provided useful information about how to store the bin liners and the extra time staff needed to clean the apartments. The trial also found very low contamination rates. The trial enabled Kosciuszko Thredbo to engage with other managed apartment operators to encourage further uptake of organics recycling.

Perisher Ski Resort initiatives

Awareness of waste management amongst guests and staff has increased with the promotion of Perisher's ‘EpicPromise Commitment to Zero’ goal, which aims to reduce waste to landfill.

As part of implementing EpicPromise, Perisher has removed single-use food service items from Blue Cow. Instead of offering single-use cups, plates, and cutlery for the 2019 snow season, Perisher swapped to reusable cutlery and crockery. This significantly reduced waste generation by Blue Cow Bistro and provided guests with a better experience.

Perisher also created several waste sorting stations at Blue Cow Bistro, providing staff and guests with an area to properly separate their waste into landfill, co-mingled recycling, and food waste recycling. The sorting stations are user friendly with clear, concise signage.

Charlotte Pass Snow Resort initiatives

Charlotte Pass Snow Resort focused on waste management in staff accommodation facilities during the 2019 snow season. Additional recycling containers and educational signage was installed in staff accommodation areas and the staff accommodation manager monitored recycling to provide information and encourage improved recycling rates.

Figure 17 Blue Cow Bistro waste sorting station

3.3 Litter management

Littering continues to be a significant problem in the alpine resorts. In response, NPWS and all resort operators actively promote litter reduction campaigns and undertake litter pickups.

- In 2016, Perisher Ski Resort developed snow sport-specific litter prevention messaging for the Perisher Range resorts. Perisher's signage can be seen at the main entrance of the resort at Perisher Valley and on lift towers.
- NPWS and Perisher Ski Resort both hold annual clean-up days at the end of the snow season. During the reporting period, NPWS held its 'Snow-side clean-up' day in September 2019, which focused on the Perisher Valley car park area. A total of 32 people attended the clean-up, including volunteers and NPWS and Perisher staff. In total, 220 kilograms of litter was collected, comprising 170 kilograms of waste and 50 kilograms of recycling. Perisher organised a staff clean-up in November 2019 and collected a total of 347 kilograms of litter from Perisher Range resort areas. Table 6 shows the breakdown of litter collected.
- Each year, Kosciuszko Thredbo register for Business Clean Up Australia Day. Staff are invited to take time out of their day to litter pick around their workplace. Some 27 Thredbo Alpine Resort staff joined the clean-up in February 2020. Together they collected 8 bags of general waste and 3 bags of recycling, which were then disposed of appropriately.
- In September 2019, Perisher Ski Resort, Kosciuszko Thredbo and NPWS provided financial support to registered charity Seaside Scavenge to run the annual Jindabyne Lakeside Scavenge. The Lakeside Scavenge is a free community clean up and waste education event. In total, 570 kilograms of litter was collected from the lake foreshore including 320 kilograms of general waste, 100 kilograms of scrap metal and 150 kilograms of recycling.

- The Sustainable Snowies group was established in October 2019 with the aim of fostering improved sustainability within the Snowy Mountains region by building partnerships between local businesses, government (including NPWS) and the community, and developing environmental projects that benefit the region socially and economically. Initial Sustainable Snowies meetings identified single-use products and litter as key issues for all parties.

Table 6 Waste collected during the 2019 Perisher post-winter clean-up day

Litter collected	Waste (kg)
Timber	50
Scrap Metal	15
Cardboard and Paper	2
Glass and plastic	50
Landfill	230
Total	**347**

3.4 Management response and review

- Alpine resort operators are encouraged to continue to maintain a detailed waste register for the purposes of annual waste tracking. It would also be beneficial to periodically undertake waste audits to assess areas for improvement, for example where a waste stream could be removed, reduced, or recycled.
- Continued education of staff and visitors will help increase recycling rates and reduce contamination.
- Windblown rubbish continues to be an issue in all alpine resort areas. Further community awareness initiatives and clean-up days are needed, with support from the alpine resort operators and NPWS. Sustainable Snowies could potentially be used as a forum for progressing this work.

Figure 18 Litter pick under the Kosciuszko Express chairlift
Photo: Thredbo Resort

4. Sewage treatment plants

This section reports on environmental quality as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management. It addresses the volume of human waste treated by each of the sewage treatment plants in an alpine resort area as well as addressing treatment plant incident management issues.

The management of human waste generated by visitors in Kosciuszko National Park poses both water safety and water quality issues. The NSW Environment Protection Authority (EPA) is the responsible regulatory authority for the sewage treatment plants within Kosciuszko National Park. This report considers 5 licensed sewage treatment plants within the alpine resorts of Kosciuszko National Park – those at Sawpit Creek and Perisher Valley (operated by NPWS), Thredbo Alpine Resort, Bullocks Flat (operated by Perisher Resort) and Charlotte Pass Snow Resort.

Biosolids from Thredbo and NPWS-operated sewage treatment plants continue to be diverted to a land rehabilitation project near Berridale and are also used by local farmers for soil conditioning. In accordance with EPA guidelines, the biosolids are directly ploughed into the soil as a fertiliser for stock fodder crops. Bullocks Flat biosolids are transferred to the Jindabyne treatment plant and Charlotte Pass Snow Resort biosolids are transferred to Berridale or Cooma treatment plan for further processing. A summary of the biosolids produced throughout the reporting period from each plant can be found in Table 7.

Table 7 Alpine resort biosolid quantities 2017 to 2020

Sewage treatment plant	2017–18	2018–19	2019–20
Charlotte Pass	58 kilolitres (wet)	64 kilolitres (wet)	91 kilolitres (wet)
NPWS Perisher Valley	40.5 dry tonnes	28.3 dry tonnes	52.65 dry tonnes
NPWS Sawpit Creek	1.35 dry tonnes	1.98 dry tonnes	1.6 dry tonnes
Perisher Bullocks Flat	92.64 kilolitres (wet)	65 kilolitres (wet)	126 kilolitres (wet)
Thredbo Village	20.82 dry tonnes	53.61 dry tonnes	55.38 dry tonnes

Figures from the Clivus Multrum composting toilet system previously installed at Selwyn Snow Resort are unavailable due to bushfire damage to the resort. Demolition of associated infrastructure has occurred in preparation for rebuilding.

4.1 Sewage treatment plant incidents

Annual reports submitted to the EPA for Thredbo, Bullocks Flat (Perisher Resort), Charlotte Pass, and Perisher Valley and Sawpit Creek (NPWS) sewage treatment plants indicate various non-compliances with the environment protection licences (EPL) issued under the NSW *Protection of the Environment Operations Act 1997.*

The following is an outline of these non-compliances reported on the EPA's Protection of the Environment Operations Act public register.

Kosciuszko Thredbo Pty Ltd, Thredbo Village Sewage Treatment Works EPL no. 1599:

- During the 2019–20 reporting period, there were 3 individual non-compliances with the relevant EPL. The licence limit was exceeded once each for concentration of total ammonia (NH_3), load limit for oil and grease, and total phosphorus.

Perisher Blue Pty Ltd, Bullocks Flat Terminal Sewage Treatment Plant EPL no. 2274:

- During the 2019–20 reporting period, a total of 10 non-compliances with the relevant EPL were reported for the Bullocks Flat sewage treatment plant. EPL reporting periods differ from the reporting periods for this report, with 9 of these non-compliances being in the December 2018 to December 2019 EPL reporting period and one non-compliance being in the December 2019 to December 2020 period.
- All 10 non-compliances were for faecal coliforms not being monitored at environmental monitoring points 3 and 4 due to an administrative and chain of custody error.

Charlotte Pass Snow Resort Pty Ltd, Charlotte Pass Village Sewage Treatment Plant EPL no. 1591:

- Charlotte Pass Snow Resort sewage treatment plant had a total of 196 non-compliances with the relevant EPL between March 2019 and February 2020:
    - 193 non-compliances were for exceeding the concentration limits for biological oxygen demand, total phosphorus, nitrogen (ammonia), total nitrogen, suspended solids and faecal coliforms. The licensee took appropriate action for faecal coliforms, the other non-compliances are under investigation by the EPA.
    - The remaining 3 non-compliances were for monitoring requirements not having been fulfilled. The EPA is monitoring future compliance with this condition of the relevant EPL.
- A Protection of the Environment Operations Act Section 91 notice requiring ‘clean-up action’ was issued to Charlotte Pass Snow Resort Pty Ltd on 9 August 2019. The notice stated that the licensee has discharged high ammonia effluent to the environment on several occasions between 10 July 2019 and 29 July 2019, exceeding the licence limit (above the 90th and 100th percentile concentration limit stated within EPL no. 1591).

NPWS, Perisher Sewage Treatment Plant EPL no. 1797:

- Between March 2019 and February 2020, Perisher Valley sewage treatment plant had 5 non-compliances with the relevant EPL. Three non-compliances were for discharge point one exceeding the 90th percentile for phosphorus, and twice for exceeding the volume limit of 2,000 kilolitres per day at discharge point one. Appropriate action has been taken by NPWS as licensee for all non-compliances.

NPWS, Sawpit Creek Sewage Treatment Plant EPL no. 447:

- The 2019–20 period did not record any licence discharge limit non-compliances with the relevant EPL.

4.2 Management response and review

- In response to poor performance during 2019–20, the EPA imposed 2 pollution reduction program licence conditions on Charlotte Pass Snow Resort sewage treatment plant as part of the relevant EPL.
- These conditions required Charlotte Pass Snow Resort Pty Ltd to perform sewage treatment plant upgrade works for the 2020 snow season and to review and update plant operating procedures.
- In December 2020, the EPA removed the pollution reduction program licence condition for upgrade works to the Charlotte Pass Snow Resort sewage treatment plant as these works had been completed by the licensee. Later, in March 2021, the licensee submitted its updated treatment plant operations procedure to the EPA. The EPA considered the updated operations procedure to be appropriate, resulting in the relevant pollution reduction program condition being removed from the EPL in April 2021.

5. Pollution incidents

This section reports on environmental quality as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management. It includes information about pollution incidents in the alpine resorts, corrective action taken, and how incidents were managed with a view to preventing a recurrence (see also section 4 for sewage treatment plant incidents and licensing non-compliances).

The alpine resort operators, and NPWS in its operations, have a responsibility to prevent leaks, spills and unlicensed discharges. Where incidents occur, this responsibility extends to managing and remediating in an environmentally sensitive manner. The main sources of potential pollution in the alpine resorts are:

- transportation, storage and use of hydrocarbons and chemicals
- operation and management of sewage treatment plants
- stormwater run-off from roads and carparks
- vehicles, including snow grooming machines
- waste and litter.

Table 8 outlines the nature of pollution incidents across the reporting period. Most incidents were minor, involving a small amount of clean-up and no material harm to the environment.

Figure 19 Contaminated snow near Charlotte Pass turning circle

Table 8 Pollution incidents recorded in NSW alpine resorts 2019–20

Nature of Incident	Summary of incidents	Number and significance	Incident closed?	Management and corrective actions
Cooking oil spill	Cooking oil overflowed when filling fryer.	1 Minor	Yes	Spill kit was used to contain and absorb the spill. There was improvement in communication between staff on closing and opening shifts about filling the fryer.
Cooking oil spill	Cooking oil leaked due to hole in fryer	1 Minor	Yes	Spill kit was used to contain and absorb the spill. The fryer was repaired. Staff will undertake pre-shift checks prior to pouring oil into fryers.
Suspected rat poison	Contractors found suspected rat poison on top of a fridge	1 Minor	Yes	Hospitality manager was made aware. Cleaners were asked to attend and clean-up. Environment manager will review induction material and ensure poisons are addressed adequately.
Hydrocarbon spills and contamination	Hydraulic hose breaks and diesel leaks mostly from minor breakdowns of snow grooming machines resulted in spilling hydrocarbons onto snow. All individual incidents were less than 10 litres.	6 Minor	Yes	Spills happened during winter on snow. Standard Perisher Blue Pty Ltd procedure is to collect contaminated snow and melt through workshop filtration system. Maintenance work is carried out to repair blown hose.
Hydrocarbon spills and contamination	Loose fitting on snow grooming machines resulted in the spilling of hydrocarbons on snow.	1 Minor	Yes	Spill occurred during winter. Standard Perisher Blue Pty Ltd procedure is to collect contaminated snow and melt through workshop filtration system. Maintenance work is carried out to repair loose fitting.
Hydrocarbon spills and contamination	Unknown quantity of fuel leaked from groomer sitting at the Summit Chairlift unload during summer. Leak caused by a cracked fuel line.	1 Minor	Yes	This was a summer incident. S200 Oil Gone (which encapsulates hydrocarbons) was applied and an inspection carried out of the site, which showed no visible impacts.
Diesel spill	Over-snow vehicle was moved in the Perisher snowmaking shed. The operator noticed 2 litres of diesel had leaked onto the floor.	1 Minor	Yes	Spill kit was used to contain and absorb the spill. Maintenance was carried out on over snow vehicle.

Nature of Incident	Summary of incidents	Number and significance	Incident closed?	Management and corrective actions
Litter complaint	A complaint was received from a member of the public on the Department of Planning and Environment's 'Environment' line regarding distribution of polystyrene cups from a noodle promotion at Bullocks Flat.	1 Minor	Yes	The Environment and Waste Officer discussed viable alternatives to polystyrene cups with the marketing department. There is ongoing consultation between the environmental and marketing departments on procurement and partnership strategies.
Oil present in Guthega sewage treatment plant pump station.	Visual inspection by NPWS staff of the Guthega Sewage Pump Station showed oil presence in the well.	1 Moderate	Yes	Staff and NPWS inspected the site. A field tech was called to pump oil out of the pump station well and vertical gravity separators pump well. Several inspections were carried out to check functioning of different aspects of the pump station, as well as connecting pump station alarms to supervisory control and data acquisition.
Village vehicle leak	A Manitou coolant pipe burst in Thredbo Alpine Hotel stores loading dock area. Drains located at loading dock run directly to Thredbo River.	1 Moderate	Yes	Spill kit was used to contain and absorb the spill. Used absorbent items were disposed of at the waste transfer station. Maintenance checks were carried out on the Manitou.
Cleaning chemical spill	There was a 3-in-1 cleaning product spill caused by a knocked over bottle in chemical refill area.	1 Minor	Yes	Spill kit was used to contain and absorb the spill. Used spill kit items where bagged, labelled and disposed of at the waste transfer station.
Cleaning chemical spill	Bleach cleaning chemical tap was not completely closed resulting in a slow leak into a drip tray, which eventually overflowed.	1 Minor	Yes	Absorbent pads were placed on floor to capture spilled bleach. Most was contained in drip tray that was then poured back into a bottle. Staff were told to store the bleach container upright in future. Chemical absorbent pads were left in the bottom of the drip try as additional precaution.
Soda ash leak	Soda ash (disodium carbonate) tank valve leaked into bunded area at the Thredbo sewage treatment plant and caused a slight leak into stormwater.	1 Minor	Yes	Valve was immediately isolated and corrected. The majority of solution was contained in the bunded area, which was pumped into an equalisation basin. There was a change in procedure to keep an operator with the tank while filling soda ash.
Sewage reticulation system	There were 2 separate dry weather overflow events, one lasting 15 minutes, the other lasting 2 hours.	2 Minor	Yes	Line was cleared using sewer jetter and the overflow stopped. Lines checked for additional damage using a camera.

Nature of Incident	Summary of incidents	Number and significance	Incident closed?	Management and corrective actions
Sewage reticulation system	Dry weather overflow, 6-day duration.	1 Moderate	Yes	The underground sewage line was broken and was discharging. The sewage line was excavated to find the break, and repairs made to the join as well as the broken inspection opening. Once fixed the sewage line was checked with a camera to confirm repairs were holding.
Asphalt removed from carpark surfaces	The asphalt removed from carpark surfaces as an unintended consequence of snow clearing activities remains an ongoing issue for the alpine resorts and NPWS.	Ongoing	No	The Perisher snow clearing manual has been reviewed, with additional snow stockpile areas identified to minimise potential impacts in the waterways and riparian areas. This will require NPWS to continue to monitor the stockpiled snow sites.
Total	**–**	**21 Incidents**	**–**	**–**

5.1 Management response and review

- Only 7 snow grooming machine incidents were reported over snow season 2019. This was significantly fewer than the 61 incidents in snow season 2018. This may indicate that alpine resort operations staff have developed better maintenance schedules for their over-snow machines.
- NPWS is planning to review and update its environmental incident management procedures and protocols in consultation with the alpine resorts. The objective is to improve the timeliness of notification of incidents and the ongoing management of corrective actions.

Figure 20 Snow mobile refuelling station, Perisher loading dock

6. Contamination

This section reports on environmental quality as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management. Specifically, it details remediation progress at contaminated sites within the alpine resorts.

6.1 Underground petroleum storage systems

The potential presence of contaminated sites within the alpine resorts is mainly associated with past or ongoing storage of hydrocarbons and in-situ underground petroleum storage systems (UPSS).

In 2019, NPWS became the appropriate regulatory authority for UPSS tanks within Kosciuszko National Park, with the NSW EPA remaining the appropriate regulatory authority for UPSS owned by NPWS or associated with its operations. This happened because of the introduction of the NSW *Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019 (POEO UPSS Regulation).*

During the 2019–20 reporting year, NPWS staff undertook onsite audits of various UPSS sites operated by the alpine resorts. The following sections summarise the state of UPSS sites within the alpine resort areas of Kosciuszko National Park that were subject to the POEO UPSS Regulation during the period.

Thredbo Alpine Resort

Two UPSS sites then subject to the POEO UPSS Regulation were operated in the Thredbo Alpine Resort, with 6 tanks in total and a combined capacity of 165,000 litres. Kosciuszko Thredbo operates Thredbo Mountain Cat Shed. The Thredbo Service Station is operated by a sub-lessee.

Thredbo Mountain Cat Shed UPSS site was audited during the reporting year, with the audit finding that the 3 tanks were generally well maintained. It was identified that the fuel system operations plan needs to be updated to comply with the POEO UPSS Regulation and to reflect the infrastructure currently in place at the site.

Thredbo Service Station UPSS was audited in October 2020[3]. The audit found that improvements in record retention would be needed to comply with the POEO UPSS Regulation. This included developing a written procedure for sampling groundwater monitoring wells, printing loss-monitoring reports and groundwater monitoring results, and storing this information in the fuel system operations plan. The operator is progressing these remedial actions and NPWS will monitor progress in future audits.

There are 30 known additional UPSS sites in the Thredbo Alpine Resort that were not subject to the POEO UPSS Regulation during the reporting period. These sites are (or were) predominantly used for the storage of heating oil by lodges and other sub-lessees. Of these sites, 17 UPSS have been removed, with many occurring before the validation stipulation of POEO UPSS Regulation, and a further 13 UPSS still require their status confirmed for decommissioning and validation purposes.

With application of the POEO UPSS Regulation likely to expand, NPWS, in consultation with Kosciuszko Thredbo, is in the process of following up with all sub-lessees to ensure compliance with the POEO UPSS Regulation across Thredbo Alpine Resort.

Perisher Ski Resort

Perisher Blue Pty Ltd operates 5 UPSS sites subject to the POEO UPSS Regulation, containing 17 storage tanks with a total capacity of approximately 477,000 litres. This

[3] UPSS inspections occurred across 2 reporting periods. For consistency in reporting, NPWS has included some audits that were undertaken after February 2020 in this report.

includes a 73,000 litre heating oil tank at Blue Cow terminal and one 5,400 litre waste oil tank at Smiggin Holes workshop.

All 5 UPSS sites operated by Perisher were audited in March 2020[4]. The audits identified that all UPSS sites had an automatic tank gauge loss monitoring system, leak detection ground water monitoring wells and appropriate fuel system operations plans in place. The audits recommended that the fuel system operations plans be updated to include an index and amendments register to assist in tracking changes that might occur to UPSS infrastructure over time. All sites operated by Perisher demonstrated satisfactory compliance with POEO UPSS Regulation requirements.

Charlotte Pass

Charlotte Pass Snow Resort Pty Ltd operates one UPSS site with 3 diesel tanks holding a total capacity of 30,000 litres. The Charlotte Pass Snow Resort site was audited in February 2020. The auditor provided a report with feedback on improvements needed to comply with the POEO UPSS Regulation. Feedback included loss monitoring records being stored with the fuel system operations plan and improvement to record keeping for both staff training and the UPSS maintenance schedule.

There is one additional known UPSS site in Charlotte Pass Snow Resort that was not subject to the POEO UPSS Regulation during the reporting period. The site was used for heating oil and is the responsibility of a sub-lessee. The tank remains in situ but is not in use.

NPWS and Perisher Range lodges

NPWS has 2 UPSS sites in Perisher Valley. Site one consists of one 10,000 litre unleaded petrol tank and one 5,000 litre diesel tank. This site is leased to and managed by Hans Oversnow Pty Ltd during the snow season. The second UPSS site is at the Perisher Valley sewage treatment works and consists of one 2,000 litre diesel tank used for a backup generator. The EPA is the appropriate regulatory authority for UPSS sites owned or operated by NPWS.

There are an additional 35 known UPSS sites in the Perisher Range resorts that are the responsibility of lessees and were not subject to the POEO UPSS Regulation during the reporting period. Of these, 9 are still active and used for storing heating oil, 16 have been removed (some validated or having been removed prior to validation requirements) and a further 10 require further investigation as to whether they are in use or require decommissioning and validation.

6.2 Management response and review

- UPSS should not be used unless a fuel system operations plan has been developed to reflect current infrastructure and the requirements of the POEO UPSS Regulation.
- The monitoring and reconciliation of inventory and monitoring of leak detection systems such as groundwater monitoring wells must happen in line with the requirements of the POEO UPSS Regulation.
- Any new UPSS proposed to be installed in the alpine resorts must comply fully with the requirements of the POEO UPSS Regulation and associated Australian Standards.
- As a new, appropriate regulatory authority for UPSSs, the NPWS must develop its understanding and regulatory capacity in relation to this equipment and how it is governed by the POEO UPSS Regulation. This is particularly the case as the scope of UPSS to which the POEO UPSS Regulation applies is expected to expand for future reporting periods.

[4] UPSS inspections occurred across 2 reporting periods. For consistency in reporting, NPWS has included some audits that were undertaken after February 2020 in this report.

7. Energy consumption and conservation

This section reports on environmental quality as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management. Specifically, the section deals with energy consumption and associated conservation initiatives.

7.1 Resort energy consumption and energy saving initiatives

Table 9 shows the energy consumption for the alpine resorts:

- Energy figures are for resort operations only and do not include lodges.
- The liquid petroleum gas (LP gas) figures are based on deliveries. Some bulk LP gas containers hold sufficient capacity for more than one season. Gas consumption is also influenced by temperature variations.
- Many factors influence energy consumption in the alpine resorts including variations in:
  - temperature and humidity (snowmaking relies on cold dry air)
  - maximum snow depth
  - snow fall
  - timing and quantity
  - weather patterns
  - visitor numbers
  - fuel conversions
  - vehicle fleet adjustments.

Table 9 Energy consumption in NSW alpine resorts 2019–20

Energy	Thredbo	Perisher Ski Resort	NPWS Perisher	Charlotte Pass	Total
Electricity (kilowatt hours)	9,209,398	11,613,665[5]	199,762	793,955	21,816,780
Diesel (litres)	322,463	534,042	34,776	70,500	961,781
Petrol (litres)	20,274	61,809	112	1,820	84,015
LP gas (litres)	711,274	638,150	116,731	1,627	1,467,782
Heating Oil (litres)	0	63,175	0	22,200	85,375

Thredbo Alpine Resort

From 1 July 2019, Kosciuszko Thredbo signed an agreement with Red Energy to provide Thredbo Alpine Resort's major operations with electricity from renewable sources, primarily the Snowy Hydro scheme. Electricity from renewable sources supplied by Red Energy made up 89.7% of the electricity used by Kosciuszko Thredbo operations during the 2019–20 reporting period.

[5] Energy consumption for the period March 2019 to February 2020 includes The Station Resort and Jindabyne properties.

Solar panels on the Thredbo Leisure Centre generated 136,627 kWh of energy. This supplied the Thredbo Leisure Centre with 23.8% of its annual energy requirements. Kosciuszko Thredbo continues the incremental roll out of energy saving initiatives, for example energy saving devices are installed as and when old devices fail.

Perisher Ski Resort

Perisher operations are heavily reliant on cold winters. With the changing climate, it is increasingly important for Perisher to reduce its energy consumption and carbon footprint. Perisher aims to achieve this through improvements to heating, lighting, and energy management systems. In 2019, 88 solar panels and a 27-kW solar inverter were installed at Bullocks Flat Skitube Terminal. The system is designed to supply the majority of summer electricity consumption at the facility and to supplement winter energy consumption.

Continued actions towards renewable energy will help Perisher reach their 2030 net zero emissions target.

Charlotte Pass Snow Resort

In 2019, Charlotte Pass Snow Resort started an LED light changeover program across its managed buildings. Lights that required replacing were prioritised for the upgrade.

7.2 Management response and review

- It is positive to see alpine resort operators choosing to use energy from renewable sources, whether that be through energy agreements or directly through the installation of solar panels. This practice should continue and be expanded.
- Energy consumption figures will continue to be monitored to ensure energy savings initiatives are being implemented. Given the range of variables that influence energy consumption in the resorts, the effectiveness of measures taken to enhance energy efficiency are only likely to become apparent over longer timescales.

Figure 21 Solar panels on the Thredbo Leisure Centre
Photo: Thredbo Resort

8. Environmental quality

This section reports on various environmental quality measures as per section 11.6 and Chapter 12 of the Kosciuszko National Park Plan of Management. Environmental quality includes weed management, rehabilitation of disturbed sites and controls on development. It also includes measures applied to preserve scenic quality, improve air quality and reduce noise pollution within alpine resorts.

Maintaining and improving the environmental quality of alpine landscapes is a key objective of the plan of management and remains a high priority for NPWS and the alpine resort operators themselves. The alpine resorts, with assistance from NPWS, aim to limit their impact on the natural environment and improve environmental integrity where possible via the responsible management of new development, rehabilitation and weed control.

8.1 Development applications

Development consent under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is needed for most development within the alpine resorts. Specific considerations for development are set out in the NSW *State Environmental Planning Policy (Kosciuszko National Park – Alpine Resorts) 2007* (Alpine SEPP). The Department of Planning and Environment acts as the consent authority for development applications, with NPWS acting as a referral agency. NPWS assists the Department of Planning and Environment's Alpine Resorts Team with assessment and recommending conditions on matters relevant to NPWS statutory responsibilities and expertise. NPWS often provides advice to proponents on these matters in advance of their submission of a development application that, among other things, provides an avenue for influencing development in an environmentally responsible manner.

Under the EP&A Act and Alpine SEPP, development applications are submitted by proponents to the Department of Planning and Environment. Each development application is referred to NPWS for comment along with its accompanying documentation, including a statement of environmental effects. To inform our comments, NPWS assesses the statement of environmental effects and other application documentation, paying particular attention to:

- potential impacts of the development on flora and fauna, including threatened species or their habitats, and the extent to which the proponent has addressed any requirements of the NSW *Biodiversity Conservation Act 2016*
- potential impacts of the development on heritage, including Aboriginal cultural heritage and historic heritage
- general environmental quality issues including potential for spread of weeds, odour and noise intrusion, or impacts on scenic values such as whether the development will impact the skyline or be visible from the Main Range or major roads such as the Alpine Way
- consistency of the development with the plan of management and tenure arrangements that NPWS administers for the site
- various factors NPWS must consider as a provider of municipal services in some alpine resorts and administrator of various functions ordinarily associated with local government.

During the reporting period, NPWS received referrals and assisted the Alpine Resorts Team with assessment of 40 development applications, valued at more than $39,000,000.

Proposed developments varied in complexity, with 27 associated with renovation and redevelopment of visitor accommodation and 7 larger projects associated with upgrading snow sport infrastructure within the alpine resorts. In addition, there were 3 development applications submitted for telecommunications infrastructure, 2 for mountain bike trails and one for tree removal (Major Project Assessments, Alpine Projects, 2021).

8.2 Noise pollution

NPWS works with the Department of Planning and Environment to identify potential adverse noise impacts from development and to avoid or mitigate those impacts. This primarily occurs through the development assessment and conditioning process under the EP&A Act and Alpine SEPP. For example:

- all outdoor events, such as concerts, require a noise management statement as part of the planning process that assesses the likely level of noise, the potential impact on residents and guests, and sets out a complaint response procedure
- construction hours are specified to reduce the impact of noise on nearby businesses, residents, and guests.

8.3 Air quality

Since 2009, Kosciuszko Thredbo has partnered with GreenFleet to offset the CO_2 emissions generated by the Thredbo Alpine Resort vehicle fleet. This includes all snow cats, resort courtesy buses and work vehicles. In 2019–20, Kosciuszko Thredbo sequestered 1,016.68 tonnes of CO2e through the GreenFleet program. Since 2014, Kosciuszko Thredbo has provided guests the opportunity to offset emissions caused by their trip to the snow.

During 2019–20, 1,436 guest contributions were made.

As well as offsetting CO_2 emissions, Kosciuszko Thredbo is working towards reducing emissions. Investments have been made in solar powered streetlights on Friday Drive and solar panels on the Thredbo Leisure Centre, and Kosciuszko Thredbo has signed an agreement with Red Energy to source much of its major resort operations electricity needs from renewable sources.

Perisher Ski Resort has set an ambitious zero net emissions by 2030 target. It aims to achieve this by increasing energy efficiency, purchasing renewable energy and investing in programs such as tree planting. In 2019, Perisher installed solar panels on Bullocks Flat Skitube Terminal, which helps reduce emissions from operation of that facility.

Further information on these topics is available in section 7 of this report, which relates to energy consumption and conservation.

8.4 Rehabilitation

Kosciuszko Thredbo staff planted a total of 4,100 eucalypts, shrubs, and grasses in the reporting period. The plants were used for revegetation works during construction of the Ricochet mountain bike trail and Flow mountain bike trail upgrades, in-fill planting of batters on the Downhill and Flow mountain bike trails and offset works associated with the Merritts Gondola construction.

Through the Perisher Ski Resort summer rehabilitation program, Perisher staff and contractors planted 6,200 eucalypts, grasses and mixed heath plants during the reporting period.

No rehabilitation was undertaken by Charlotte Pass Snow Resort during the reporting period.

Annually, NPWS undertakes or supports extensive rehabilitation on Kosciuszko National Park areas within and surrounding the alpine resorts. In the 2019–20 reporting period, NPWS staff planted 4,390 native tube-stock plants for rehabilitation purposes in Perisher Valley. NPWS also assisted lodges in both Perisher Range resorts and Charlotte Pass to create and implement rehabilitation plans for their leasehold areas. This includes assistance with initial weed spraying and provision of mulch, compost, tree guards, local native tube-stock and grass seed. Lodge operators and members then provide the labour necessary to replant targeted areas and maintain plantings. During the 2019–20 reporting period, 11% of lodges planted native trees or shrubs with a total of 500 tube-stock, including native heath and snow gums.

8.5 Weed management

Thredbo Alpine Resort

During the 2019–20 reporting period, the ongoing Thredbo village and mountain weed management program included:

- 477 contractor hours targeting blackberry (*Rubus fruticosus*), holly (*Ilex aquifolium*), apple trees (*Malus pumila*) and other non-native trees
- 70 contractor hours targeting milfoil (*Achillea millefolium*), St John's wort (*Hypericum perforatum*), great mullein (*Verbascum thapsus*), vipers bugloss (*Echium vulgare*) and soft rush (*Juncus effusus*)
- 36 staff hours targeting milfoil (*Achillea millefolium*), thistle sp., vipers bugloss (*Echium vulgare*) and soft rush (*Juncus effusus*).

Perisher Range resorts

During the 2019–20 reporting period, Perisher Ski Resort and NPWS conducted the following weed control work around the Perisher Range resorts:

- approximately 30 hours of soft rush (*Juncus effusus*) control and replacement plantings with native species (200 x Carex sp.) funded by environmental research and rehabilitation contributions payable by Perisher under the relevant tenure arrangements for the resort
- more than 50 hours by Perisher staff and contractors at Blue Cow targeting problem areas of St. John’s wort (*Hypericum perforatum*) through spraying and hand removal – ongoing works are planned in this area
- at least 20 contactor and 15 Perisher staff hours spraying vipers bugloss (*Echium vulgare*), milfoil (*Achillea millefolium*) and wintercress (*Barbarea vulgaris*).
- 61 NPWS and contractor hours targeting vipers bugloss (*Echium vulgare*), wintercress (*Barbarea vulgaris*), cocksfoot (*Dactylis glomerata*) and thistle sp.

Charlotte Pass Snow Resort

During the 2019–20 reporting period, Charlotte Pass Snow Resort staff carried out approximately 30 hours of weed management work targeting cocksfoot (*Dactylis glomerata*), milfoil (*Achillea millefolium*), wintercress (*Barbarea vulgaris*), vipers bugloss (*Echium vulgare*) and great mullein (*Verbascum thapsus*) predominately along roadsides.

Lodge-based weed control

Each lodge is responsible for maintaining its leasehold area, including undertaking weed control. The dominant weed species affecting lodge leaseholds are timothy-grass (*Phleum pratense*), cocksfoot (*Dactylis glomerata*) and milfoil (*Achillea millefolium*).

Common weed control methods are chemical spraying, whipper-snipping, dead-heading and hand pulling. During the 2019–20 reporting period, 52% of the lodges in the Perisher Range and Charlotte Pass Snow Resort areas undertook weed control.

Weed prevention

Weed management is time-consuming and expensive. Investigating opportunities for weed prevention is important. NPWS and the University of Wollongong, with support from Kosciuszko Thredbo, installed a boot hygiene station at the top of the Kosciusko Express chairlift in Thredbo Alpine Resort. Hygiene stations are designed to ensure that contaminants such as weed seeds and spores are removed from hiking boots and therefore

reduce the spread of weeds along popular hiking trials. University of Wollongong staff and students conducted behaviour studies relating to use of the hygiene station throughout the summer season.

8.6 Management, review, and response

- Weed management programs across all alpine resorts must continue, as well as increasing education around weed prevention for staff and visitors.
- NPWS should create and supply lodges with a ‘lodge weed manual’. This would help Perisher Range resorts and Charlotte Pass Snow Resort lodge operators and members identify common and persistent weeds and provide advice on removing them from lodge lease areas.
- NPWS should promote and continue its Lodge Rehabilitation Plan program including its advisory role and supply of rehabilitation materials.
- NPWS should continue its work with the Alpine Resorts Team in ensuring thorough assessment of development applications on biodiversity, environmental quality, environmental health and heritage grounds, and to assist in ensuring development within the alpine resorts occurs in an environmentally responsible manner.

Figure 22 NPWS assisting with lodge rehabilitation in Perisher Valley
Photo: Valhalla Lodge

9. Reporting environmental performance

Environmental management system reporting is a requirement under management objective 10.2.1(1) of the Kosciuszko National Park Plan of Management. In 2019, NPWS engaged a consultant group to review its environmental management system data collection and reporting processes and help prepare the 2018–19 annual report. As a result, NPWS has refined the Annual Resorts Environmental Performance Report to report more specifically against the requirements of Chapter 12.1.1.8 of the plan of management. During 2019 and 2020, NPWS has worked to streamline environmental reporting for lodges in the Perisher Range resorts and Charlottes Pass through the EarthCheck system. Additionally, the 4 alpine resorts must report their 2020–21 environmental performance through the EarthCheck system. NPWS has worked with EarthCheck to develop NPWS-specific criteria that the resorts are required by the plan of management to report against annually.

9.1 Thredbo Alpine Resort

Kosciuszko Thredbo have partnered with EarthCheck since 2012. The EarthCheck program aims to improve environmental performance across 12 key performance areas and provides certification under EarthCheck's Destination Standard (2015). Kosciuszko Thredbo submits benchmarking data annually to EarthCheck, including information about energy and water usage, waste generation and sustainability policies. EarthCheck then conducts an onsite audit to verify the data provided. The onsite audit provides valuable feedback to Kosciuszko Thredbo on ways it can continue to improve its operations. In 2020, Thredbo Alpine Resort was awarded EarthCheck silver certification for the fourth consecutive year.

9.2 Perisher lodges and Charlotte Pass lodges

The term 'Perisher lodges' is used to refer to the 120 ski club lodges, chalets and commercial lodges in the Perisher Range resorts leased directly from NPWS. Perisher lodges have been reporting on their environmental performance since the early 2000s through the Perisher Range Resorts Environmental Management System. Originally, each lodge filled out a lodge workbook and submitted it to NPWS. In 2006, the reporting approach was revised to use the EarthCheck online system.

Charlotte Pass Snow Resort has 13 lodges. Three are owned and managed by the alpine resort operator Charlotte Pass Snow Resort Pty Ltd. The other 10 lodges are sub-leased by clubs and commercial operators from the alpine resort operator. Charlotte Pass lodges first reported on their environmental performance in 2018–19. NPWS provided each lodge with a login to the EarthCheck online portal where operators/members answer a set of questions relating to their environmental performance throughout the reporting year.

Lodges at the Perisher Range resorts and Charlotte Pass submitted an individual annual report for the 2019–20 reporting period. EarthCheck generates a 'performance report' for each lodge to show their individual performance compared to previous years. The 133 lodge results are also compiled to generate an 'all lodges report' that provides a summary of environmental performance for the 2019–20 reporting period and is included as Appendix A to this report.

NPWS uses EarthCheck as a reporting platform only for benchmarking against industry standards. Certification is not sought for Charlottes Pass or the Perisher Range resorts against the EarthCheck Destination Standard.

9.3 Management response and review

- In total, 133 lodges are reporting to NPWS annually on their environmental performance. There are 3 accommodation providers still to be included in 2020–21 annual environmental management system reporting. NPWS is working with EarthCheck to provide logins for each of these providers.

- For the 2020–21 environmental management system reporting period, all alpine resort operators and lodges (other than Thredbo Alpine Resort sub-lessees) will submit their data via the EarthCheck online system. Kosciuszko Thredbo will continue its certification with EarthCheck and have additional criteria to report on for NPWS. Charlotte Pass Snow Resort Pty Ltd, Selwyn Snow Resort Pty Ltd and Perisher Blue Pty Ltd will report on the NPWS criteria. However, these entities will not undergo an EarthCheck audit or gain EarthCheck certification.

Figure 23 Jerrabomberra Lodge, Charlotte Pass

10. Monitoring, research, and resort community liaison projects

10.1 Threatened species population programs

The Saving our Species team within NPWS is primarily responsible for threatened species monitoring and management within the alpine resorts. Annual programs are conducted to monitor the health of threatened species populations including the mountain pygmy-possum (*Burramys parvus*), broad-toothed rat (*Mastacomys fuscus*), Guthega skink (*Liopholis guthega*), Perisher wallaby grass (*Rytidosperma vickeryae*) and the anemone buttercup (*Ranunculus anemoneus*).

Broad-toothed rat

Monitoring of the broad-toothed rat has been continuous across several sites for over 30 years. Broad-toothed rats are trapped to monitor their numbers, demographics and health of the population. Monitoring sites are at Smiggin Holes, Perisher Creek (within the alpine resort area near Perisher's Ridge Chair), Rainbow Lake, Horse Camp Hut and Whites River Hut. There has been a significant overall decline in population over the years. Recent broad-toothed rat population numbers are shown in Table 10.

Figure 24 Artificial habitat structures for board-toothed rats

Outside of the alpine resort areas, large areas of known and likely broad-toothed rat habitat were directly and severely impacted by the 2019–20 bushfires. Positively, fresh scats and runways have been recorded at some sites. However, almost no evidence of the species has been found at previously known population sites. Artificial habitat structures were designed and established in previously known sites outside of alpine resort areas using recycled walking track materials (see Figure 24). Unfortunately, monitoring found no conclusive habitation results.

The Saving our Species team, in conjunction with the University of Canberra and other collaborators, is working towards developing a scat genotyping protocol. This would allow broad-toothed rat scats to be collected and analysed to gain population information. The technology will allow broader species sampling, provide a wider range of demographic data, and will be more time efficient and less stressful for animals without the requirement to trap them.

Mountain pygmy-possum

Numerous mountain pygmy-possum monitoring sites are located within the alpine resort areas of the Perisher Range (Blue Cow) and Charlotte Pass Snow Resort. Population data has been collected annually since 1985 and has demonstrated an overall declining trend. Stochastic events such as bushfire, drought and feral predation correlate with significant fluctuations in annual population data. Table 10 demonstrates a slight decline in population from 2017 to 2020.

In addition to mountain pygmy-possum population monitoring, predator control actions are undertaken each year, specifically feral cat and fox trapping and baiting. Fox trapping began in 1998 across all sites and feral cats have been trapped at Perisher Range resorts since 2002, Charlotte Pass Snow Resort since 2004 and at Whites River since 2011. Remote cameras are also set up each year across predator trap sites to observe cats. The images are cross-referenced with trapped individuals.

Although parts of the known mountain pygmy-possum habitat around Cabramurra in the vicinity of Selwyn Snow Resort were severely impacted by the 2019–20 bushfires, trapping shortly after the fire found a high number of healthy individuals at these sites. Because mountain pygmy-possums create nests deep within the boulder-fields, many were not directly impacted by the bushfire event itself, but rather susceptible to lack of food and water resources for the regeneration period after the event. NPWS began a supplementary feeding program across some sites concurrently with trapping to observe the population numbers and conditions. Longer-term trapping results will determine the success and overall outcomes of the feeding program.

Table 10 NPWS Saving our Species program population numbers of broad-toothed rat and mountain pygmy-possum since 2017

Animal	2017	2018	2019
Broad-toothed rat Monitored annually in April	5 animals trapped across 3 sites	38 animals trapped across 4 sites (Smiggin Holes, Rainbow Lake, Perisher Creek and Horse Camp Hut)	8 animals trapped across 3 sites (Perisher Creek, Smiggin Holes and Whites River Hut)
Mountain pygmy possum Monitored annually in November and December	190 animals trapped across 5 sites including 63 at Blue Cow and 38 at Charlotte Pass	119 animals trapped across 3 sites in southern Kosciuszko National Park, including 54 at Blue Cow and 45 at Charlotte Pass	123 animals trapped across 4 sites including 50 at Blue Cow, 18 at Paralyser, 28 at Charlotte Pass and 27 at Summit Road

Perisher wallaby grass

Perisher wallaby grass is known to be widely dispersed throughout the alpine resort areas. It is found in drainage areas and along creeks, often in conjunction with sphagnum and carex bog sites. However, being a very small and delicate plant, it is not readily identified, especially out of flowering season.

NPWS Saving our Species team began monitoring Perisher wallaby grass in 2017. There are 2 monitoring sites, one within Perisher (anthropogenic interface) and one on Betts Creek (remote), established to find out the potential impact of human disturbance. However, with only 5 years of plot counts and observations, there is no clear trend, with fluctuations recorded across plots and across both sites. Longer-term data will be needed to establish any such trends.

Figure 25 Flowering wallaby grass heads

10.2 Mountain bike trail monitoring

The mountain biking season in Kosciuszko National Park occurs during the summer months, with the track monitoring program conducted at the season opening and season closing for the Kosciuszko Thredbo-operated Thredbo Mountain Bike Park and the NPWS-operated Thredbo Valley Track.

The Thredbo Mountain Bike Park program consists of monitoring the Kosciuszko Flow and Thredbo Downhill trails and is conducted as a joint monitoring program with staff from Thredbo Alpine Resort and NPWS. Thredbo Valley Track monitoring covers the entire track and is conducted internally by the NPWS Resorts Environmental Services Team on a biannual basis. Monitoring generally focuses on sustainable trail construction and erosion-related issues, but also identifies the presence and distribution of pest flora species.

Thredbo Mountain Bike Park

The monitoring relevant to this reporting period was undertaken in May at the close of the 2018–19 season, and in December 2019 at the opening of the 2019–20 season.

The post season monitoring in May 2019 found fewer waypoints than in May 2017, as shown in Table 11. Fewer waypoints indicate an improvement in the trail condition through better trail management.

Table 11 Number of waypoints identified in biannual track monitoring program

No. of waypoints	May 2017	May 2019
Kosciuszko Flow Trail	260	213
Thredbo Downhill Trail	212	186

The most prevalent issue identified on both trails in the May 2019 monitoring event was the occurrence of water channelling.

The recommendations for improvement from this report included:

- removal of soil deposited on adjacent vegetation due to water-induced erosion and the investigation (and rectification where possible) of the point sources of soil
- continuing stabilisation and rehabilitation of track verges
- continuing implementation of rider control measures to avoid trail widening
- protecting exposed tree roots and tree bases
- treating all identified weeds adjacent to the tracks.

The pre-season monitoring event for the 2019–20 season was conducted in December 2019, approximately 2 weeks after the Cannonball MTB Festival, later than the usual pre-season timing. To some extent, the findings from this inspection are not directly comparable to the results from previous inspections. The most common issue presenting along the length of both trails was erosion, such as braking bumps, perhaps from increased trail usage associated with the festival.

The recommended actions for improvement from this report include:

- implementing batter and embankment stabilisation works on all exposed batters and embankments, including planting with suitable indigenous plant species
- continuing maintenance of all plantings for a minimum of 5 years after planting
- implementing the monitoring and maintenance actions set out in the Thredbo mountain bike trail management plan to address the issues identified in the report.

Thredbo Valley Track

The monitoring of the Thredbo Valley Track during the period relevant to this report was conducted in December 2019, after the start of the 2019–20 mountain biking season. The monitoring detected a total of 502 waypoints on the upper Thredbo Valley Track (Thredbo Village to Bullocks Flat), while the lower Thredbo Valley Track (Bullocks Flat to Gaden Hatchery) had a total of 436 waypoints. The most prevalent issue along the entire track was exposed tree roots. Weeds were the second most observed issue.

The priority recommendations for improvement from this report include:

- stabilising and revegetating all areas of exposed and unstable batters, embankments, and soil adjacent to the track
- delineating the track tread in areas of widening track and closing off alternate tracks
- reinstating water management measures such as roll-overs, out-sloping and knicks as a component of the track maintenance program
- implementing a comprehensive weed control program along the length of the track.

NPWS endeavours to be as consistent as possible in its timing for pre- and post-season monitoring to allow better comparison of results. However, avoiding adverse weather is a key factor in determining exactly when this monitoring occurs. With assistance from Kosciuszko Thredbo, NPWS will also expand its biannual track monitoring program to encompass all gravity-focused trails within the Thredbo Mountain Bike Park.

Figure 26 Recording monitoring points on a new gravity trail in the Thredbo Mountain Bike Park

Photo: Thredbo Resort

10.3 Pest control programs

Pest animal control programs run within and adjacent to the alpine resorts and include the control of foxes, cats and rabbits, which have been identified as primary pests within the alpine resort areas.

Foxes and cats

- Strategic fox baiting has been carried out since 1996 and is now coordinated by the NPWS Saving our Species team. This occurs in areas adjacent to Thredbo Alpine Resort, Charlotte Pass Snow Resort and the Perisher Range resorts.
- A cooperative trapping program between the alpine resort operators and NPWS for the control of cats and foxes is carried out over both the snow season and the summer months. Thredbo Alpine Resort undertakes its trapping program between June and October long weekend, with all 2019–20 figures shown in Table 12.
- The ‘see a cat, catch a cat’ program is run throughout the year in the Perisher Range resorts, encouraging the reporting of sightings from resort and lodge staff as well as members of the public. The NPWS Perisher Team and Perisher alpine resort operator work cooperatively to respond to any sightings. In addition, the NPWS Perisher Team conduct a winter trapping program throughout Perisher Valley and surrounds.
- A soft-jaw trapping program is conducted throughout the summer months with a focus on the mountain pygmy-possum habitat areas within the Perisher Range resorts and Charlotte Pass Snow Resort. This program targets both cats and foxes to minimise the impacts of predation on the core populations within these alpine resort areas.

Rabbits

Rabbit control is undertaken throughout the summer months using a range of control techniques including on-ground shooting and ground baiting.

- An on-ground shooting program is conducted on an annual basis within the Perisher Range resorts throughout the summer months, commencing in February. This program is carried out by a contractor on behalf of NPWS, taking place mid-week in the afternoons and evenings. NPWS carries out pre- and post-program monitoring of rabbit numbers, involving spotlight monitoring along transects within each of the alpine resort areas.
- In November 2019, Thredbo Alpine Resort undertook a rabbit baiting program using Pindone. Thredbo Alpine Resort and NPWS staff carried out initial spotlighting to assess number of rabbits and high-density locations. Wire mesh bait stations were temporarily in place in locations around the Thredbo Village and lower mountain, with free feeding carried out and remote sensing cameras in place to assess what animals were taking the feed. Once it was determined that no other species would be impacted by the poison, Pindone-coated oats were put under the bait stations every 3 days for a period of 2 weeks. Once the 2-week poison program was complete, all remaining Pindone coated oats were removed and destroyed. Spotlighting was carried out after the bait program to reassess the rabbit population. There was a substantial drop in the overall rabbit population within the areas baited and monitored.

Wasps

European wasps were an issue in Thredbo Village during the 2019–20 summer months. A total of 5 bait stations containing Fipronil baits were installed throughout the village. NPWS supplied the baits and Hammond Pest Management was contracted by lodges and Kosciuszko Thredbo to treat active nests.

Table 12 Pest control in 2019–20

Resort	Cats (cage/soft-jaw trapping)	Foxes (soft-jaw trapping)	Rabbits (ground shooting)
Thredbo Alpine Resort (operator-managed program)	20	0	0
Perisher Range (NPWS-managed program)	22	3	11
Charlotte Pass (NPWS-managed program)	3	0	0
Total	**45**	**3**	**11**

10.4 Research initiatives

In 2019, the University of Canberra continued research into the impacts of salinisation of alpine waterways through the introduction of salt into the landscape from road clearing and de-icing. This built on previous studies conducted in 2017 and 2018. The work was conducted in the upper reaches of the Thredbo River by Sal Wilkinson and investigated the concentration of salt required to induce a drift response in various species of macroinvertebrates. The research findings have not yet been published.

10.5 NPWS resort projects

NPWS has been involved with the following projects during the 2019–20 reporting period:

- the NPWS Lodge Rehabilitation Plan program for weed control and planting, implemented at lodges across the Perisher Range resorts and at Charlotte Pass Snow Resort
- environmental education programs including displays, workshops, activities and presentations conducted by the Resorts Environmental Services Team as part of the annual community events calendar – details are provided in the following sections.

Back to Perisher event

- The annual fun run was held on a new route from Perisher Valley to Blue Cow and return. The new route reduced potential safety and traffic management issues by avoiding Kosciuszko Road
- Easter egg hunt and duck race
- Guided walk to Blue Lake on Easter Monday

Perisher Peak Festival

- Snake Tails reptile show
- NPWS Aboriginal Discovery Rangers and NPWS WilderQuest activities
- LAOKO BBQ fundraiser
- NPWS displays, giveaways and information

Snowy Ride November 2019

- Animal trapping and release with kids
- Presentation to kids and their families

Resort Round-up

- Publication of Resort Round-up, a biannual newsletter published by NPWS. The newsletter includes news from the alpine resorts and NPWS, as well as safety alerts, wildlife and environment information for the alpine resort communities (search for ‘alpine resort round-up’ on the NSW Environment publications website to read past issues)

The Resorts Environmental Services Team also provided continued assistance and guidance on the following aspects of alpine resort environmental management:

- trapping and release of native mammals in resort buildings, including kitchens, lodges, machinery sheds and roofs – Elliot traps are the preferred method of capture, with local release sites used
- numerous possum boxes installed in trees in areas adjacent to high-risk buildings, such as lift terminals
- delineation of ‘snow push’ sites to provide the Perisher Range resorts operator with ‘best practice’ methods for positioning and storing highly contaminated snow scraped off carparks and roads. The aim is to minimise hydrocarbons and sediment entering waterways directly
- continuing assistance to lodges in the Perisher Range resorts and Charlotte Pass Snow Resort for bushfire hazard mitigation, including assistance with establishing asset protection zones and hazardous tree assessments.

11. References

Australian River Assessment System (AUSRIVAS), eWater and Australian Government, www.ausrivas.ewater.org.au/index.php/home

ANZG (2018) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra ACT, Australia, www.waterquality.gov.au/anz-guidelines

Biodiversity Conservation Act 2016 No 63, https://legislation.nsw.gov.au/view/html/inforce/current/act-2016-063

Contaminated Land Management Act 1997 No 140, https://legislation.nsw.gov.au/view/html/inforce/current/act-1997-140

DEC (Department of Environment and Conservation NSW) 2006, *Kosciuszko National Park Plan of Management 2006 (as amended in 2010 and 2014)*, Department of Environment and Conservation NSW, Sydney, www.environment.nsw.gov.au/research-and-publications/publications-search/kosciuszko-national-park-plan-of-management

DPIE (Department of Planning, Industry & Environment) 2019 & 2020, *Kosciuszko National Park Resorts River Water Quality and River Health Report Cards.*

EarthCheck 2015, *Destination Standard 2.0*, available at: https://earthcheck.org/media/4099/earthcheck-destination-standard-version-20-jan-2015.pdf

Environmental Planning and Assessment Act 1979 No 203, https://legislation.nsw.gov.au/view/html/inforce/current/act-1979-203

Lhendup U, Broadhurst B and Clear R (2019) *Biological assessment of the Thredbo River, August 2019*, report prepared for Kosciuszko Thredbo Ltd by the Institute for Applied Ecology, University of Canberra, ACT.

Lhendup U, Broadhurst B and Clear R (2019) *Biological assessment of the Thredbo River, May 2019*, report prepared for Kosciuszko Thredbo Ltd by the Institute for Applied Ecology, University of Canberra, ACT.

Lhendup U, Broadhurst B and Clear R (2019) *Biological assessment of the Thredbo River, November 2019*, report prepared for Kosciuszko Thredbo Ltd by the Institute for Applied Ecology, University of Canberra, ACT.

Lhendup U, Broadhurst B and Clear R (2020) *Biological assessment of the Thredbo River, February 2020*, report prepared for Kosciuszko Thredbo Ltd by the Institute for Applied Ecology, University of Canberra, ACT.

NSW Government Planning and Environment, *Major Project Assessments, Alpine Projects*, viewed 9 September 2021, http://majorprojects.planning.nsw.gov.au/page/development-categories/part-4-projects/alpine-projects/

NSW EPA (2020) *Guidelines for implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2019,* NSW Environment Protection Authority, Sydney, https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/contaminated-land/20p2700-underground-petroleum-storage-systems-guidelines.pdf

NSW EPA, *POEO Public Register, Licences, applications and notices search*, viewed July 2021, https://apps.epa.nsw.gov.au/prpoeoapp/

Protection of the Environment Operations Act (1997) No. 156. NSW Government, https://legislation.nsw.gov.au/view/html/inforce/current/act-1997-156

Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation (2019) No.411, NSW Government, https://legislation.nsw.gov.au/view/html/inforce/current/sl-2019-0411

State Environmental Planning Policy (Kosciuszko National Park – Alpine Resorts) (2007) https://legislation.nsw.gov.au/view/html/inforce/current/epi-2007-0643

Appendix A. Summary of 2019–20 environmental management system results

Table 13 2019–20 environmental management system results – summary of all lodges

Environmental management system target	2017–18 performance indicator	2017–18 target status	2018–19 performance indicator	2018–19 target status	2019–20 performance indicator	2019–20 target status
1. Lodges only using local native plants for landscaping	–	No data collected	–	No data collected	–	No data collected
2. All lodges located in high-priority areas on the Perisher Rehabilitation Plan to have rehabilitation plans developed for their lease area	Improving	Below target	Improving	Below target	Improving	Below target
3. No lodges using baits, snares, traps or rat poison as a pest control measure without NPWS approval	Improving	Below target	Improving	Below target	Improving	Below target
4. 60% of lodges undertaking weed control	Declining	Below target	Improving	Below target	Improving	Below target
5. 100% of hydrocarbon storage tanks/containers compliant with statutory requirements and managed appropriately	Declining	Below target	Improving	Below target	Declining	Below target
6. 100% redundant hydrocarbon storage tanks/containers decommissioned and sites validated	Improving	Below target	Declining	Below target	Improving	Below target
7. Zero pollution incidents	Steady	Met target	Declining	Below target	Improving	Met target
8. 100% of significant pollution incidents reported to NPWS	–	No data collected	–	No data collected	–	No data collected

Environmental management system target	2017–18 performance indicator	2017–18 target status	2018–19 performance indicator	2018–19 target status	2019–20 performance indicator	2019–20 target status
9. 100% of significant pollution incidents managed in a timely manner	–	No data collected	–	No data collected	–	No data collected
10. 100% of lodges that store chemicals/fuel to have well equipped spill kits	Improving	Below target	Declining	Below target	Declining	Below target
11. 100% of lodges that store chemicals/fuel clearly displaying Perisher Range and Charlotte Pass Lodge incident procedure	Improving	Below target	Declining	Below target	Declining	Below target
12. 100% of grease traps working effectively	Improving	Below target	Improving	Below target	Improving	Below target
13. Reduce amount of CO_2 equivalent emitted per visitor night	Declining	Below target	Steady	No data collected	Steady	No data collected
14. Less than 10% of lodges using open fireplaces as their primary source of heating	Improving	Met target	Improving	Met target	Improving	Met target
15. Less than 20% of lodges using ODS (ozone depleting substance) appliances	Improving	Below target	Improving	Below target	Improving	Below target
16. Reduce the amount of waste produced	–	No data collected	–	No data collected	–	No data collected
17. 100% of lodges recycling	Improving	Met target	Steady	Met target	Steady	Met target
18. Lodges recycling more than 50% of total waste	Declining	Met target	Improving	Met target	Declining	Met target

Environmental management system target	2017–18 performance indicator	2017–18 target status	2018–19 performance indicator	2018–19 target status	2019–20 performance indicator	2019–20 target status
19. Energy use per visitor night to be better than Perisher Range and Charlotte Pass lodge sector average (based on 2018 benchmarking report)	Declining	Below target	Improving	Met target	Improving	Met target
20. More than 5% of total energy used to come from renewable sources	Improving	Below target	Steady	No data collected	Steady	Below target
21. Less than 200 litres of water used per visitor night	Declining	Met target	Steady	No data collected	Steady	Met target
22. More than 90% of lodges implementing water saving measures	Declining	Below target	Improving	Below target	Declining	Below target
23. 100% of lodges regularly inspecting their lease area for erosion problems	Improving	Below target	Declining	Below target	Improving	Below target
24. 100% of lodges with erosion issues taking actions to prevent and manage the erosion	Improving	Below target	Improving	Below target	Improving	Met target
25. 75% of lodges educating guests and staff about Perisher Range and Charlotte Pass cultural heritage values	Improving	Below target	Improving	Below target	Improving	Met target
26. 100% of lodges have lease areas free from excess building materials, equipment, garbage, weeds and other items that negatively affect scenic value	Steady	Met target	Declining	Below target	Improving	Met target
27. 100% of staff trained regarding environmental management system	Improving	Below target	Declining	Below target	Declining	Below target

Environmental management system target	2017–18 performance indicator	2017–18 target status	2018–19 performance indicator	2018–19 target status	2019–20 performance indicator	2019–20 target status
28. 100% of organisations with fully implemented environmental management systems for their operations within Perisher Range resorts and Charlottes Pass Snow Resort	↑ Improving	✕ Below target	↑ Improving	✕ Below target	↓ Declining	✕ Below target
29. 100% of lodge committees annually review and discuss their environmental risks	↓ Declining	✕ Below target	↑ Improving	✕ Below target	↓ Declining	✕ Below target