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Southern Cross University

The value of tourism and recreational services provided by Rocky Creek Dam

Prepared by Dr Mitchell Kirby

March 2021

Funding for this research was provided by Rous County Council

Disclaimer

The information contained in this publication is intended to help improve our understanding of and the management ecosystem services. It includes general statements based on scientific research. Readers are advised and need to be aware that the results are constrained within the methodology applied and that the values presented may be incomplete or unsuitable for use in specific situations. Before taking any action or decision based on the information in this publication, readers should seek expert professional, scientific, and technical advice.

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Executive summary

This research has been commissioned by Rous County Council (RCC) and conducted by Southern Cross University. The study itself is a response to RCC's interest in better recognising the non-market value of its assets—namely Rocky Creek Dam (RCD) and its ecosystem services. This philosophy matches with an increasing literature that supports the effort to account for and value nature. This movement has been crystallised by landmark international and intergovernmental efforts such as the Millennium Ecosystem Assessment (2005), The Economics of Ecosystems and Biodiversity (TEEB) (2010), and the System of Environmental-Economic Accounting (UN, 2012). This study represents the first effort of Rous County Council to value non-market services.

This study implements the travel cost methodology to determine the value of tourism and recreation to the site. This was done on the premise that the value of tourism and recreation is representative of the partial value of ecosystem services, such as biodiversity conservation, visual amenity, and cultural services. The travel cost method has been extensively used in the valuation of national parks and other natural assets which attract visitors for recreational purposes. The operating principle behind the method is that visiting recreational areas is mostly voluntary; therefore, the value of the services provided by an area is proportionate to the opportunity cost of visiting the area.

The study engaged a two-pronged on-site survey approach, where visitor information was collected through face-to-face interviews and visitation data was collected by a vehicle logger installed at the gate. A total of 202 people were interviewed, of which, after cleaning, 179 were used in model estimates. Model estimates were conducted using a negative binomial regression and include the following parameters: visitation data (the dependent variable), travel cost to RCD, travel cost to two substitute sites (Clarrie Hall Dam, NSW and Minyon Falls, NSW), individual visitor income, number of children who travelled on the trip, and several attributes regarding the planned activity (bushwalking/hiking/trail running, site seeing, picnic/BBQ, bird watching, and 'taking nature in').

A variety of results have been reported in this study. Total annual visitation to the site was calculated to be 39,512. Most visitors to the site (83%) live within 100 km of RCD. The most common activity at RCD is walking (and other similar forms), with 70% of the visitors indicating that is what they came to do. Other prominent activities include picnicking and BBQs, site seeing, bird watching and taking nature in. The community of visitors recognise the importance of having places such as RCD where they can get access to nature. Further, the peacefulness and the relaxing effects of visiting RCD were prominently recognised in interview responses. Interestingly, the most common response to questions regarding making improvements to RCD was that they should maintain the status quo and leave it as is. Other popular suggestions included providing water activities and a place to swim, providing a café or kiosk, improving track signage on walkways, and improving site accessibility (especially for wheelchairs).

The estimate for the total value of tourism and recreation values provided by RCD is $1.6 million dollars per annum. The study reports the median individual visitation to RCD is twice a year, and visitors derive on average $50.32 in consumer surplus per trip. This value does not suggest economic opportunity as a ticket price but recognises a partial value of the services

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provided by RCD. It should be helpful to the broader community—where a strong environmental ethos exists—where they now can have the knowledge that their interaction with the environment is instrumentally meaningful. Further, the identified value that RCD provides to the region, should act as a guide for future investment and maintenance of socio-environmental assets. As a conclusionary remark, it is worth reiterating that this value only represents a portion of the total economic value of the ecosystem services provided by RCD. To derive the total economic value, would of course require further work that utilise a suite of other methodologies.

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Introduction

Despite being unnatural, over time, water supply dams acquire natural amenity, which provide services beyond their primary purpose. These amenities are not dissimilar to those found on nature reserves and include biodiversity conservation, carbon sequestration, erosion control, and water purification (Balmford *et al.*, 2002; Loomis *et al.*, 2000). Additionally, these sites provide cultural services and attract recreational visitors who seek exposure to these unique environments (Heagney *et al.*, 2018). However, as there is no market for these services, their value is often under-recognised (Neher *et al.*, 2013).

For near half a century, the effort to value nature and ecosystem services has become both prominent and well justified (Neher *et al.*, 2013; MA, 2005; Costanza *et al.*, 1997; Westman, 1977). The rationale has been to generate a better and more comprehensive informational base for the formulation of policy and decision-making process (Turner *et al.*, 2003). Alternatively, it is to instrumentally recognise that which is intrinsically valuable. This movement has been crystallised by landmark international and intergovernmental efforts such as the Millennium Ecosystem Assessment (2005), The Economics of Ecosystems and Biodiversity (TEEB) (2010), and the System of Environmental-Economic Accounting (UN, 2012).

The general approach to valuing nature follows a taxonomy, the components of which add up to the total economic value (TEV) (Figure 1). Incidentally, only a small proportion of these values are revealed through market outputs. The remainder requires research and investigation to determine. Over the years, a variety of techniques have been developed that can be broadly categorised into stated preference (where respondents are asked to state a value) and revealed preference techniques (where value is revealed through consumer behaviour). As can be seen in Figure 1, different approaches are more appropriately applied to elicit different values.

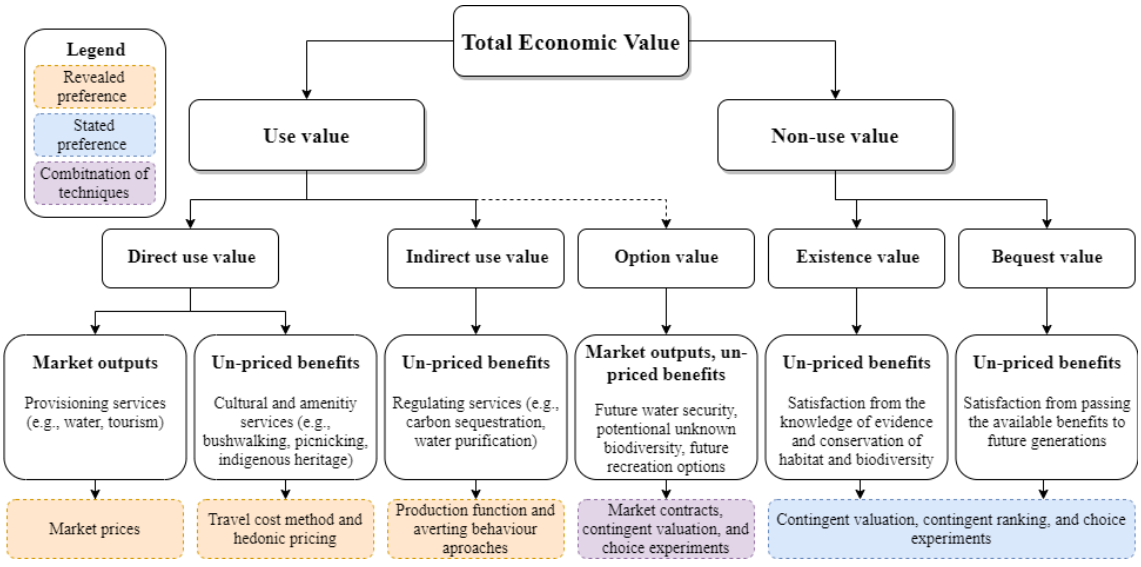

Figure 1: A taxonomy for economic values, with example values for a water supply dam and valuation techniques, amended from Rodrigues, et al (2013).

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Opened in 1953, Rocky Creek Dam (RCD) has supplied drinking water to the Northern Rivers Region for many decades. In addition to water supply, the site has also provided many built and natural amenities which attract visitors to the site, these include signposted walking tracks through rainforest, alongside the dam and across boardwalks, an open park area with grassy slopes and picnic tables, a covered multi-use/dining area, information boards and leaflets, outdoor BBQs, a playground, toilets, and a carpark. These services have been maintained and provided by the water utility provider, Rous County Council. Over the years, the RCD recreational area has been refurbished several times to upgrade the facilities and mitigate damages to the dam. To this date, no efforts have been made to identify the value of the cultural and recreational services provided by the site.

Aim of the study

The aim of this study is to determine a monetary value that represents the contribution of cultural and recreational services provided by RCD to the region. This study represents the first effort of Rous County Council to value non-market services.

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Methods

The travel cost approach

This study uses an individual travel cost model to elicit the value of visiting Rocky Creek Dam. Originally penned by Hotelling (1949) in a letter and later formalised by Clawson (1959), the travel cost method is a commonly used technique for calculating the value of things that do not have a market (Smith & Kaoru, 1990). The travel cost method is considered to be a low-cost solution among other valuation methods (e.g., contingent valuation) and has been extensively used in the valuation of national parks and other natural assets which attract visitors for recreational purposes (Heagney *et al.*, 2019; Neher *et al.*, 2013; Englin & Mendelsohn, 1991; Smith & Kaoru, 1990).

As visiting recreational areas is mostly a voluntary action, the method assumes the value of the services provided by an area is proportionate to the opportunity cost of visiting the area. For example, factoring in the costs associated with travel, as well as the value of one's time when visiting the site. In general, the travel cost model is a function of

$$(1) \qquad r = \beta_{tc_r}.tc_r + \beta_{tc_s}.tc_s + \beta_y.y + \beta_z.z$$

where r is the number of trips taken by a person in a season to the site, and tc_r is the return trip cost of the visiting the site, tc_s is the return trip cost of visiting a substitute site, y is income and z is a vector of demographic variables believed to influence the number of trips (β is the model coefficient).

The seasonal aggregate value (AS) of the site was derived as a function of total trips taken to the site, and the individual consumer surplus, here taken after (Neher *et al.*, 2013; Parsons, 2003):

$$(2) \qquad AS = \frac{1}{-\beta_{tc_r}}.TRIPS$$

where $TRIPS$ is the total number of day trips to the site over a given period.

Rocky Creek Dam visitation data

Visitation data was collected through two on-site sampling processes. The first involved recording the number of vehicles that entered the site across a given period, the second aimed to gather information from the visitors about themselves, their journey, and their site preferences.

Vehicle counts were achieved using a pneumatic vehicle logger that was installed 50 meters from the Dam's entrance on the only road into and from the site. The vehicle logger was installed on Thursday, August 20th, 2020 and was removed on Monday, January 11th, 2021. This provided a full 24 hr count of vehicles entering and leaving the site from August 21st – January 10th.

Visitor information was collected across eight days through a series of voluntary face-to-face interviews. Interviews took approximately15 mins to complete and were often conducted with a group of visitors who arrived together in the same car or convoy. Interview questions targeted information useful to the TCM, e.g., about the origin of the trip, the purpose of visiting the site,

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whether it was the primary purpose of the trip, the number of people in each vehicle, income, and other personal demographics (see Appendix 1 for full interview question list). Further, data was supplemented with visual observations, for example, when cars arrived and departed the site. Notably, the survey was subject to ethics approval by the Southern Cross University Human Research Ethics Committee (approval number: 2020/115).

To account for variation in visitor demographics across different seasons as well as between weekdays and weekends, the survey strategy targeted a combination of dates that incorporated these attributes. As such, surveying was split across two seasons—Winter and Summer—and targeted two consecutive weekdays and two consecutive weekend days from each season (Table 1). Further, an effort was made to account for variation in visitor demographics between early morning and late afternoon. This was done by targeting these periods across alternate days across the survey period. In total, the survey targeted 26 hrs in Winter and 28 hours in Summer. As the interviews were undertaken by a single researcher, survey recapture was consciously avoided.

Table 1: Summary of surveying design for visitor interviews.

	Day	Time
Winter		
27th August 2020	Thursday	09:00 – 17:30
28th August 2020	Friday	07:00 – 11:30
29th August 2020	Saturday	07:00 – 16:00
30th August 2020	Sunday	10:00 – 14:00
Summer		
1st December 2020	Tuesday	07:00 – 14:00
2nd December 2020	Wednesday	10:00 – 17:00
5th December 2020	Saturday	10:00 – 17:00
6th December 2020	Sunday	07:00 – 14:00

Regarding the interview process, on-site visitors were invited to participate upon arrival or during their time on-site. First-time visitors were given the opportunity to explore and use the site before being re-engaged for an interview before their leaving. With consent, interviews were conducted immediately with visitors familiar with the site.

Finally, it was observed that large groups of students on excursion arrived via bus, data on their arrivals was collected via the risk assessments they had submitted to Rous County Council. As the purpose of these trips are primarily for educational reasons, the students' visitation to the site was held outside the main estimates. Further, as it is hard to determine whether they are making a choice to visit the site—i.e., it may be more a factor of the parents' choices—children are not often included in TCM estimates.

Driving costs and other out-of-pocket expenses

The cost of travel to the site was determined by several procedures, the first involved establishing the most direct route from a visitor's usual place of residence and the origin of the days trip to RCD; travel time and travel distance was calculated as a round trip (with a few exceptions to nomads and free campers). This was done using Google Maps Distance application programming interface.

The next step involved distinguishing between single and multi-purpose travel. This was determined primarily by interview data, where respondents were asked to indicate if visiting RCD was the primary purpose of the trip. Where data was missing, similarly to Heagney *et al.* (2019), a threshold travel time of four hours (round trip) was used to categorise visits. Travel time below this threshold was categorised as a single-purpose day visit, while visits with travel time exceeding this threshold were categorised as overnight trips.

Trip-attribution was determined by interview data, where respondents were asked to indicate what other plans they had on their trip, as well as the total length (in days) of their trip. Travel costs were directly attributed to single-purpose trips. For multi-purpose day trips, cost-attribution was divided among the list of other activities that they had planned for the journey. For multi-purpose overnight trips, cost-attribution was divided by the length of the trip multiplied by a factor of four, e.g., for a trip of three days, cost attribution would be divided by twelve (3 x 4). The rationale for applying this factor is that across a given day there is a limited opportunity to undertake activities. In this case, it has been determined by the possibility to complete an activity across roughly four four-hour time periods (e.g., 7-11, 11-3, 3-7, & 7-11).

Driving costs were estimated based on average fuel consumption rates for passenger vehicles provided by the Australian Bureau of Statistics (2020) (11.1 litres per 100 km) and the average fuel price in the region $1.18 provided by the Australian Institute of Petroleum (2020). Finally, driving costs were divided by the number of adults in the vehicle.

The cost of accommodation for overnight trips was estimated at $168.27 per night based averages reported by the Australian Bureau of Statistics (2016b) and multiplied by the length of trip. Exceptions were made for people who indicated that they were staying with friends and family and for free-campers (i.e., people travelling and staying in Van). In this instance, a nominal cost was applied based on the average daily spending on food (~$13 per day). Accommodation costs were divided by the number of adults in the vehicle. Other food costs were not included in calculations, unless indicated by the respondents.

Finally, other costs indicated by the visitors' response to being asked whether they stopped and purchased any goods or services along the way, were included in travel costs. These costs were divided by the number of adults in the vehicle.

Opportunity cost of time

The opportunity cost of time was determined by a proportionate factor of visitor income (1/3 the visitors hourly wage). This proportion was guided by outputs from Amoako-Tuffour and Martínez-Espiñeira (2012). They comment that: "*a low opportunity cost of travel time is likely to apply particularly to sites that, due to their remoteness and the appeal of the surrounding areas, require a long trip through areas that might provide a positive utility from traveling"*; which is befitting of Northern Rivers region. Visitor wages were determined by interview data, and where no income was provided the minimum wage ($19.84 per hour) was substituted, except for retirees, which was estimated based on the average pension (~$860 per fortnight). Opportunity cost of time was applied to both travel time and time at site. Retirees, full-time parents and the unemployed were not included in calculations for time spent at the site, despite receiving an income through either a pension, welfare, or other means. This was based on the argument that visitors in this category were not trading the opportunity to work to be at the site. However, calculations for the cost of travel time were implemented. This was decided based

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on a general avoidance to travel. This was incorporated in the estimates as a function of income effects (Smith *et al.*, 1983). Further, as Fezzi *et al.* (2014) suggest retirees as the factor behind people 60 and over having a 30% lower value of travel time than younger people, retired visitors value of time travel were down weighted accordingly.

Analytical approach and model selection

In preparation for analysis, incomplete data cases were removed, and the discrete variables were normalised through subtracting the mean and dividing by the standard deviation. To reduce the effects of avidity bias—i.e., capturing a higher proportion of regular visitors than non-regular visitors—a -10% correction was applied to count data (the number of annual visits). Binary categorical data remained untreated. In total, data for 179 individuals was used in the model estimates. Estimates were conducted using a zero truncated negative binomial regression—where the number of annual visits was the dependant variable. The advantages of this model account for over dispersed data, and biases associated with on-site sampling and count data, i.e., per individual visitation was always greater than zero (Parsons, 2003; Creel & Loomis, 1990).

Model parameters considered in the analysis included several demographic, and trip related variables, in addition to the dependant variable annual visits. Model selection involved testing a total of 13 models and was based on the corrected second-order bias correction of Akaike's Information Criterion (AICc) (Table 2) (the full list of model parameters can be seen in Appendix 2 and full model selection Appendix 3) (Burnham *et al.*, 2011).The model with the best goodness of fit, included the following variables, travel cost to Rocky Creek Dam, travel cost to two substitute sites (Clarrie Hall Dam, NSW and Minyon Falls, NSW), respondent income, number of children who travelled on the trip, and several attributes regarding the planned activity (bushwalking/hiking/trail running, site seeing, picnic/BBQ, bird watching, and 'taking nature in').

Table 2: Summary of model selection process.

Negative Binomial Regression						
N = 179 Model Number	ln*L*	K	Inf.Cr.AIC	AIC/N	AICc	ΔAICc
1	-443.07	16	918.10	5.13	918.65	30.33
2	-469.45	15	968.90	5.41	969.38	81.07
3	-440.75	17	915.50	5.11	916.11	27.80
…	-446.22	18	928.40	5.19	929.09	40.78
10	-432.01	12	888.00	4.96	888.31	0.00
11	-459.64	14	947.30	5.29	947.72	59.41
12	-457.61	14	943.20	5.27	943.62	55.31
13	-455.59	14	939.20	5.25	939.62	51.31

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Results and discussion

Visitor numbers

A total of 9,680 vehicles were counted across the study period. A summary of the average vehicle counts by day in the month, reveals consistent visitation across the months suggesting little influence of season on visitation, there is however a noticeable dip in visitation in December (Table 3). This is likely a function of substantial rainfall during that month (>250 mm) and would be worth investigating further (see Appendix 4). Visitation during the weekends is substantially higher than during the weekdays, where it is nearly double the value, Sundays also appear to be busier than Saturdays. The average daily vehicle count is 48.8 (±25.6).

Table 3: Average vehicle counts by weekday across sampled period.

	Mon.	Tue.	Wed.	Thu.	Fri.	Sat.	Sun.	Total
August								
Average	31.5	44.0	30.0	35.0	33.5	74.5	99.5	53.4
Stdev	3.5				7.8	31.8	4.9	30.0
September								
Average	30.8	38.6	47.2	30.3	31.8	70.8	89.3	48.0
Stdev	6.2	16.3	11.7	8.9	5.4	28.1	29.7	26.2
October								
Average	50.3	34.8	35.5	31.8	35.2	58.4	84.5	46.7
Stdev	43.2	11.1	10.0	12.1	11.5	30.1	30.5	27.7
November								
Average	36.6	42.0	36.8	38.5	36.0	83.3	81.6	51.2
Stdev	7.2	9.6	7.6	4.7	3.8	18.6	33.2	25.4
December								
Average	54.8	46.4	36.2	43.6	27.8	48.0	46.8	43.2
Stdev	39.6	18.7	17.5	14.4	11.6	27.2	24.2	22.0
January								
Average	64.0	52.0	50.0	37.0	52.5	70.0	90.5	62.9
Stdev					36.1	12.7	7.8	21.9
Total								
Average	42.7	41.4	39.3	36.2	34.8	66.1	79.5	48.8
Stdev	26.0	13.7	12.3	10.9	12.8	25.9	29.6	25.6

The data from the interviews reveals that the average number of visitors per car is 2.4 (±1.2); where on average there are 2 (±0.9) adults and 0.4 children (±0.8) per vehicle (Table 4. Multiplying the average number of visitors per vehicle and correcting for staff visitation (four vehicles per day), produces an estimated 39,512.9 (± 11,173.6) total annual visits to RCD (Table 4). It is worth noting that this value includes vehicles arriving to the site and leaving immediately—which is arguable whether this counts as visiting the site or not. It does however support the idea that there is a positive utility in driving to the site.

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Table 4: Summary of visitation data,

	Average	Stdev
Visitors per vehicle	2.4	1.2
Adults per car	2.0	0.9
Children per car	0.4	0.8
Vehicles per day	48.8	25.6
Staff vehicles per day	4.0	0.0
Visitors per day	108.2	30.6
Adult visits per day	91.4	23.4
Visits per year	39,512.9	11,173.6
Adult visits per year	33,395.9	8,542.3

By subtracting vehicle counts exiting the site, from the cumulative sum of vehicle counts entering the site and multiplying that by the average number of visitors per car, it is possible to estimate the total number of visitors at the site for a given time in the day. Further, considering that the site was frequently visited by the operators of the site a correction factor of -10% was applied. This was determined by the average ratio of staff cars to visitors, at a rate of four staff cars per day. The results reveal that on average visitation is at its highest during the middle of the day, with a peak average concurrent visitation of 39 visitors (at 12:00pm on the weekends), while during the weekdays the peak average concurrent visitation occurs sooner with 17 at 10:00 am.

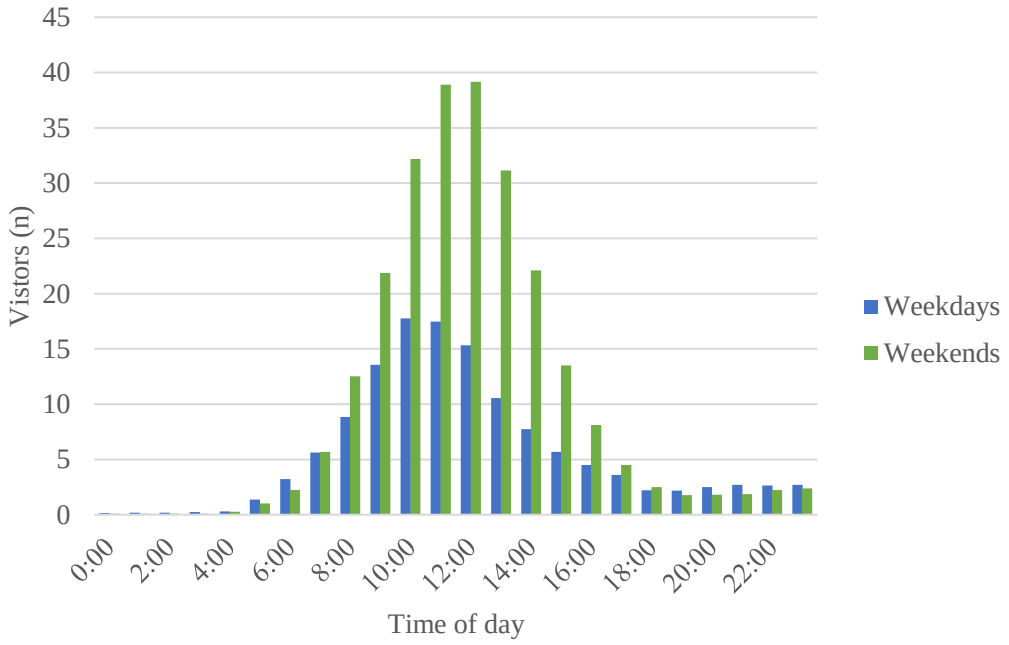

Figure 2: Average concurrent visitor numbers for weekdays and weekends

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Visitor demographics and information

Where visitors came from

Visitors to Rocky Creek Dam came from a variety of locations and travelled as far as from Darwin (3624 km by road) and Adelaide (2087 km by road) (Figure 3). 83% of the visitors' point of origin was within 100 km by road. Lismore was identified as the biggest contributor to visitation making up 16% of the sample.

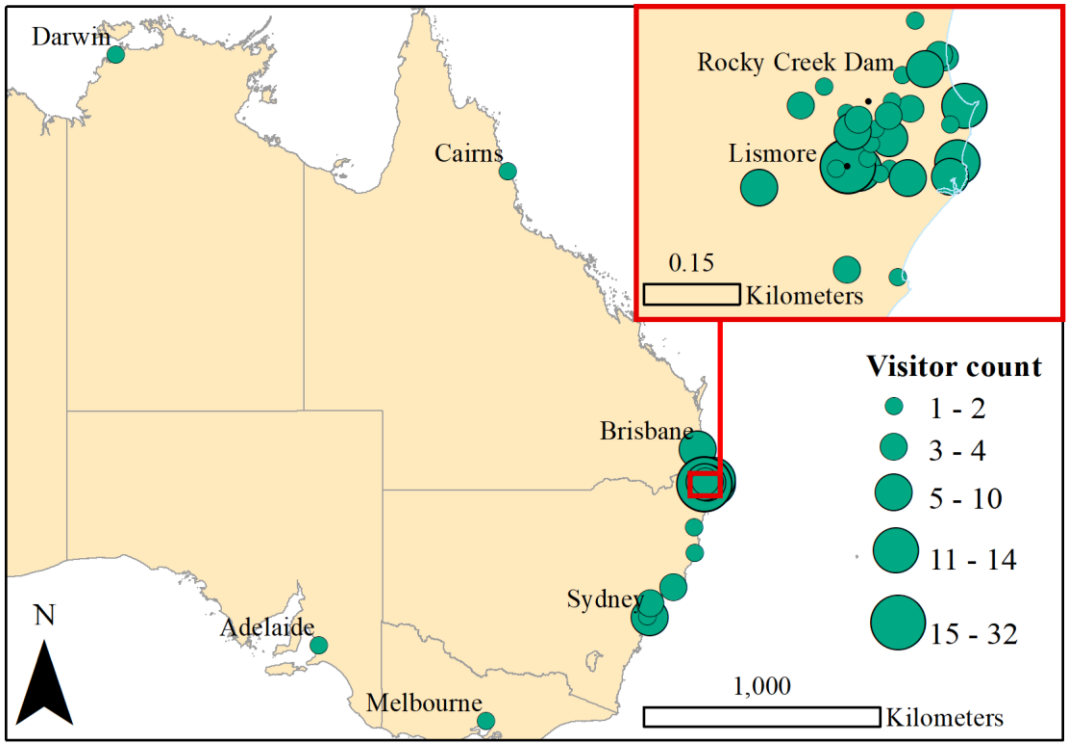

Figure 3:The extent of visitor origins and visitor counts (n=200).

Demographics

Across the survey period, more females (54%) than males (46%) visited the site. This is slightly disproportionate to the national averages (50.7% female to 49.3% male)(ABS, 2016a). Most visitors to the site were between the ages of 26 and 35 (19%), which is in line with national averages (ABS, 2016a). The least visited demographic was between 16 and 25 years of age (8%). The median annual income was between $31,200 - $41,599, this also matches with the national median (ABS, 2016a). Whilst the most popular income bracket was $20,800-$31,199 (32%). This is likely a function of the high number of retired and student visitors, and employment disruption caused by COVID-19.

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Table 5: Summary of visitor demographics

	Count	Percentage
Sex (adults only)		
Female	96	54%
Male	83	46%
Age		
<16	37	17%
16-25	18	8%
26-35	40	19%
36-45	34	16%
46-55	22	10%
56-65	32	15%
>65	33	15%
Annual Income (adults only)		
Negative income	0	0%
Nil income	0	0%
$1-$10,399	2	1%
$10,400-$15,599	0	0%
$15,600-$20,799	22	12%
$20,800-$31,199	58	32%
$31,200-$41,599	8	4%
$41,600-$51,999	21	12%
$52,000-$64,999	17	9%
$65,000-$77,999	15	8%
$78,000-$103,999	22	12%
$104,000 or more	14	8%

Regarding the frequency of visitation to the site, most visitors (46%) claimed to be first time visitors. Another 13% of respondents, who had visited the site before, claimed to visit the site less than once a year (Table 6). This means that more than 50% of the interviewees had visited the site only once in the last year. 19% of respondents claimed to have visited the site once or twice in the previous year. The proportion of respondents declines substantially as the frequency of visitation increases. This suggests that the site is used regularly by only a small number of people. Perhaps this is a function of access to the site, where the is a small number of residents who live close to the site. For instance, this study sampled four visitors who lived within 10 km of the site, together their average stated annual visitation is 106 times per year (Appendix 5).

Table 6: The frequency of visitation of interview respondents

Frequency of visitation	Count	Percentage
Daily	2	1%
1-2 times a week	11	5%
3-4 times a week	2	1%
1-2 times a month	9	4%
3-4 times a year	11	5%
5-6 times a year	9	4%
1-2 times a year	39	19%
< Once a year	27	13%
First time	92	46%
Total	202	100%

What they came to do

Respondents listed a variety of activities which they had planned to do while visiting the site. A summary of their full responses to the interview question can be seen in the word-cloud below (Figure 4). Word-clouds show more frequently used words in larger font. Frequently mentioned activities include bushwalking, picnicking and BBQs, watching. From this data, responses were recoded into several activity groups, from which count data can be reported (Figure 5). Nine different categories were created, -walking, picnics and BBCs, site seeing, 'take in nature', bird watching, dog walking, to use playground equipment, swimming, and other. Take in nature was created as a separate group than site seeing, as it reflects an extension beyond simply visual amenities—this is also reflected in the statements about the value of the site (Figure 6).

Figure 4: Summary of activities before coding

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From 181 responses, the most common activity at RCD is walking (and other similar forms), with 126 visitors indicating that is what they came to do (70% of the visitors). 39% of the respondents came to the site for a Picnic or BBQ. Interestingly, swimming was mentioned as a planned activity (n=7), yet it is not an activity available at the site. It is most likely that this was a misconception among first time visitors.

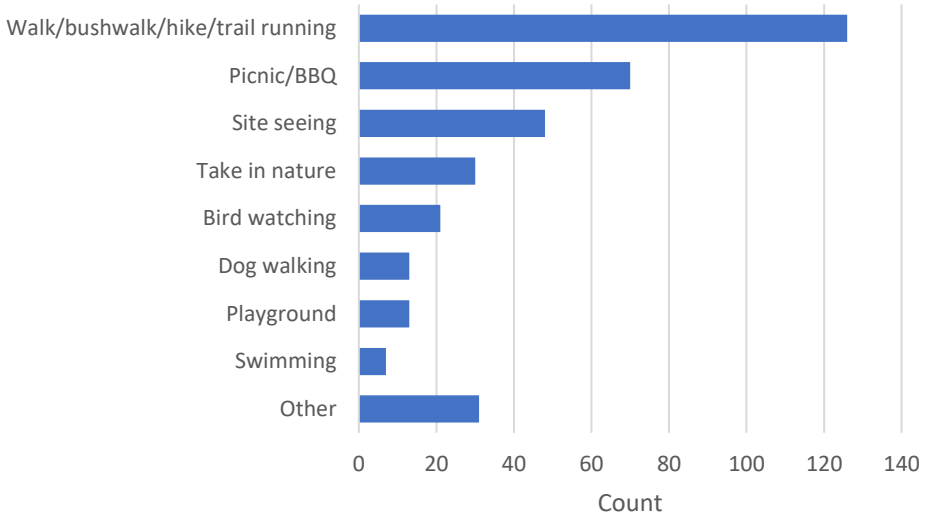

Figure 5: Summary of activities by the numbers (n=181).

How visitors appreciate the site

Interviewees were asked to reflect on whether they thought RCD was a cultural asset of 174 who respondent to the question, not a single person disagreed (one was unsure however). Respondents were then asked to provide a reflection of the value of the place—and were asked to provide how it makes them feel. Due to interviews being transcribed from audio recordings, responses for this question were recorded per vehicle; 84 responses were provided. Across the responses a broad range of topics and values were raised. A summary of their response is contained within a word-cloud, which has been used to support a thematic analysis (Figure 6). Single words such as *important*, *place*, *nature*, *peaceful*, and *relaxed*, featured prominently in the responses. This presents a theme that the community recognises the importance of having places to access nature, such as that which RCD provides. This was supported in other comments regarding connecting to nature and is prevalent to planned activities to 'take in nature' (Figure 5). Additionally, a theme of the site's contribution to improved mental and general well-being was evident (n=5).

Commentary regarding the peacefulness of the site was also a prominent theme (n=12) and shows visitors recognise this as a key characteristic of RCD. Further, respondents were later asked if they would make changes to improve the site, where it was common to state that they did not want to disturb the peacefulness of the site. Similarly, many respondents provided that the place made them feel relaxed and or calm (n=13). Several individuals (n=9) recognised cultural values of indigenous and first nations people.

Figure 6: Summary of responses regarding the importance of RCD to the visitors

Suggestions to improve the site.

Visitors were asked if there were any services or improvements they would like to see added to the site. Similarly, to above, due to interviews being transcribed from audio recordings, responses for this question were recorded per vehicle; 89 responses were provided. A summary of the responses shows the most common response was to maintain the status quo, and not make any changes (n=33) (Table 7). A substantial number of visitors (n=21) suggested being able to swim or do other water activities would improve their visitation to the site. However, a few of these respondents made mention that they were aware of the reason they cannot swim and support that decision. A café or kiosk (n=10), improved signage on walkways (n=9), and improved pathways and accessibility particularly for wheelchairs (n=6) were also prominent requests. A full list of the individual response can be seen in Appendix 6.

Table 7: Summary of popular requests to improve RCD.

Maintain status quo	Water activities	Café/kiosk	Improved signage	Improved Accessibility
33	21	10	9	6

Model diagnostics

Model coefficients are presented in Table 8. A significant negative correlation between visitation and travel cost to the site was reported. This is consistent with economic theory and the broader travel cost literature. Additionally, estimates show a positive correlation between travel cost to one of the substitute sites, Clarrie Hall Dam, and visitation of RCD. This is also in line with the theory, where visitors are more likely to choose the least cost option. However, the same pattern was not observed for the second substitute site, Minyon Falls. Considering the proximity of the two sites, perhaps the travel costs a marginally similar between the two sites. It could be argued that there are site preferences for Minyon Falls over RCD—but this factor

is not present in the model. Anecdotes from the interviews suggest many visitors' (10% of the sample) primary purpose was to visit Minyon Falls. In this instance, trip-attribution may be a contributing factor to this result. Further, during summer sampling, Minyon Falls was closed due to undergoing works and many visitors to RCD had been diverted from there.

Table 8: Model coefficients and standard errors for model parameters.

VISITS	Coefficient		Standard Error
Constant	-1.57		1.23
Travel cost			
Travel cost round trip	-2.96	***	1.05
Travel cost substitute 1 (Clarrie Hall Dam)	5.15	***	1.89
Travel cost substitute 2 (Minyon Falls)	-4.35	**	2.13
Demographics			
Income	0.73	***	0.25
Number of children	0.28		0.34
Activities			
Bushwalking / Hiking / Trail running	1.72		1.09
Site seeing	1.22	**	0.59
Picnic / BBQ	-2.23		1.75
Bird watching	-2.45		1.78
'Take in nature'	1.15	***	0.39
Dispersion parameter for count data model			
Alpha	21.18	***	2.79

*** Significance at 1%, ** significance at 5%, * significance at 10%.

Regarding site activities, a significant positive correlation was observed for both visitors who came for site seeing and to 'take in nature'. The latter matches with a broad theme of people who appreciate the site for its serenity and made mention of the well-being aspects of visiting the site. The previous suggests there is high value placed on the visual amenity of the place. The lack of significant results for other activities may be a result of homogeneity in visitor preferences—notably 62% of respondents indicated they were visiting the site for bushwalking / hiking / trail running (Figure 5). A significant positive correlation was observed between income and visitation—though the power of this effect is small.

The value of tourism and recreation

The estimate for the total value of tourism and recreation values provided by RCD is $1.6 million dollars per annum. The study reports the median individual visitation to RCD is twice a year, and visitors derive on average $50.32 in consumer surplus per trip.

This is a lower, yet comparative estimate to the value of tourism and recreation provided by all NSW National Parks, where Heagney *et al.* (2019) estimate individual consumer surplus to be worth $90 for each visit, and make approximately 5 trips to national parks per year. In their study, they highlight that a few sites such as Royal National Park and Kosciusko National Park to have contributed substantially to the total aggregate value. Regarding comparisons in the number of trips per year, their studies higher value is likely a function of visitors having more sites to choose from (728 to be precise). Considering this, visitation of twice a year to a single

site is substantial. It is worth noting that there were a few avid visitors—who claimed to visit the site daily—thus here, the median visitor value was used. Further, the highly localised extent of visitors (83% within 100km of the site) provides for interpreting regular visitation of the site.

Conclusions

This study provides an assessment of visitation to Rocky Creek Dam and estimates the value of the tourism and recreational services it provides. In the context of the study, it is important to highlight that this value does not necessarily suggest potential economic opportunity, it only identifies a partial value of the services provided by RCD. It should be useful to the broader community—where a strong environmental ethos exists. With the knowledge presented in this report, the community now have evidence that their interaction with the environment and RCD specifically, is instrumentally meaningful and so too are the services that RCD provides. Further, the identified value that RCD provides to the region, should act as a guide for future investment and maintenance of socio-environmental assets. As a conclusionary remark, it is worth reiterating that this value only represents a portion of the total economic value of the ecosystem services provided by RCD. To derive the total economic value, would require further work that utilise a suite of other methodologies.

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Appendices

Appendix 1 Interview questionnaire sheet

1. On this trip, where have you travelled from?
    a. Is this the same as your normal place of residence (the last 3 months)?
2. Is visiting Rocky Creek Dam the sole purpose of your trip or is it additional to other plans?
    a. What else have you planned?
3. How long did it take you to travel to the site (as a measurement of time)?
    a. What vehicle did you travel in?
4. Did you stop and purchase any goods or services along the way (e.g., food, trinkets, day spa or haircut)?
    a. Approximately how much did you spend (dollars)?
5. How many people travelled with you in the car?
6. What is the age of those you travelled with/what is your age (travelled with in the same car)?
7. Do you visit this site regularly?

    If yes
    a. When was the last time you visited?
    b. How often would you say that you visit the site across a year?
    c. What season do you prefer to travel here?
    d. What time of the day do you prefer?
8. What activities have you planned to do at Rocky Creek Dam today?
    a. Is that what you prefer to do when you visit here?
        i. What are your most preferred activities (in order)?
9. What is your occupation?
    a. How many hours do you work per week?
        i. (and the others in the car)
    b. What is your income per year?

Weekly Personal Income (or Annual Personal Income)

1	Negative income	7	$600-$799 ($31,200-$41,599)
2	Nil income	8	$800-$999 ($41,600-$51,999)
3	$1-$199 ($1-$10,399)	9	$1,000-$1,249 ($52,000-$64,999)
4	$200-$299 ($10,400-$15,599)	10	$1,250-$1,499 ($65,000-$77,999)
5	$300-$399 ($15,600-$20,799)	11	$1,500-$1,999 ($78,000-$103,999)
6	$400-$599 ($20,800-$31,199)	12	$2,000 or more ($104,000 or more)

        i. and the others in the car)
10. How long do you plan to stay at the site (would you mind letting me know when you leave)?
11. Are there any services or activities you wish were available on this site?
12. Do you feel the RCD recreational area is a cultural asset to the community in this region?
    a. Can you provide you describe the importance of this site to yourself?
13. Is there something you feel this place is missing or think could be done to improve your experience here?
    a. How likely would that change the number of times you visit in the year (quantify)?

The next questions are hypothetical. There is a proposed dam 10km downstream from here which, if approved, will provide access for water sports and other public facilities.

14. If the new dam were built, do you think this would affect the number of times you visit this site?

a. Which site would you be more likely to visit?

Appendix 2: Model parameters for model selection

Number	Model Parameters
	NEGBIN; Lhs=VISITS
1	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,SEX,A1,A2,A3,A4,A5,A6,A7,A_OTH
2	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,A1,A2,A3,A4,A5,A6,A7,A_OTH
3	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,SEX,NO_CHILD,A1,A2,A3,A4,A5,A6,A7,A_OTH
4	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,SEX,NO_CHILD,NO_IN_CA,A1,A2,A3,A4,A5,A6,A7,A_OTH
5	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,A1,A2,A3,A4,A5,A6,A7
6	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,A1,A2,A3,A4,A5
7	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,SEX,A1,A2,A3,A4,A5
8	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,SEX,NO_CHILD,A1,A2,A3,A4,A5
9	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,NO_CHILD,A1,A2,A3,A4,A5
10	;Rhs=ONE,TCR,TCS1,TCS2,INC,NO_CHILD,A1,A2,A3,A4,A5
11	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,A1,A2,A3,A4,A5,A6,A7
12	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,A1,A2,A3,A4,A5,A6,A_OTH
13	;Rhs=ONE,TCR,TCS1,TCS2,INC,AGE,A1,A2,A3,A4,A5,A7,A_OTH

TCR = Travel cost round trip RCD; TCS1= Travel cost substitute 1 (Clarrie Hall Dam); TCS2 = Travel cost substitute 2 (Minyon Falls); INC = Income; AGE = Age of visitor; SEX = Sex of gender (binary Female or not), NO_CHILD = Number of children accompanying visitor; A1 = Bushwalking / Hiking / Trail running; A2 = Site seeing; A3 = Picnic / BBQ; A4 = Bird watching; A5 = 'Take in nature'; A6 = Dog walking; A7 = playground equipment; A_OTH = Other activities.

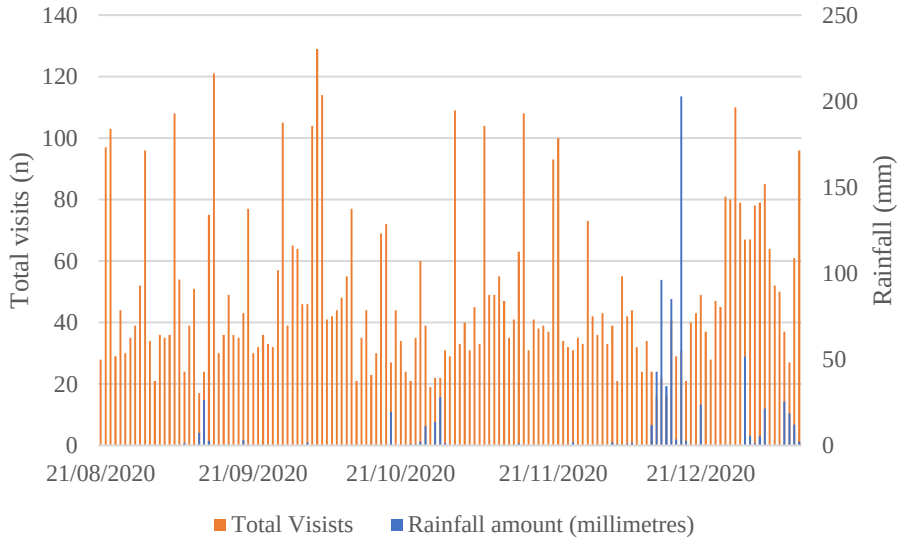
Appendix 3: Full model selection criteria

Negative Binomial Regression

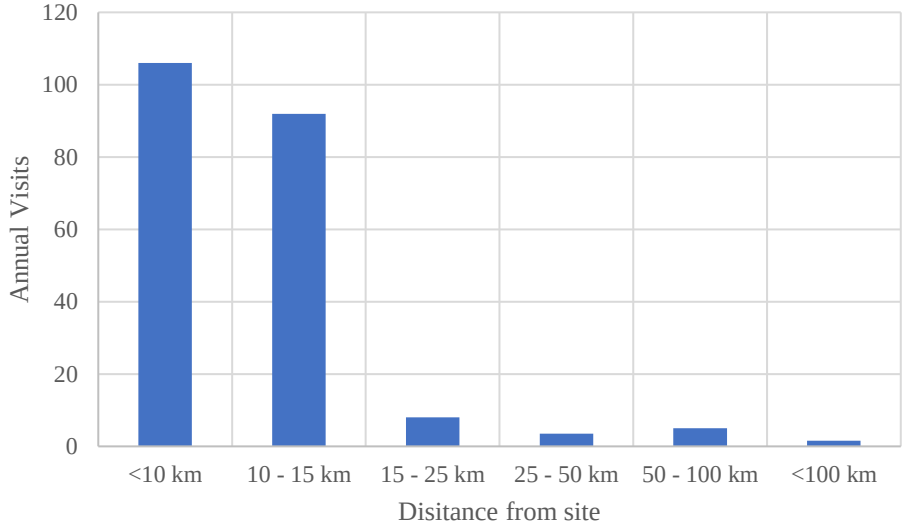
N = 179

Model Number	ln*L*	K	Inf.Cr.AIC	AIC/N	AICc	ΔAICc
1	-443.07	16	918.10	5.13	918.65	30.33
2	-469.45	15	968.90	5.41	969.38	81.07
3	-440.75	17	915.50	5.11	916.11	27.80
4	-446.22	18	928.40	5.19	929.09	40.78
5	-463.16	14	947.30	5.29	947.72	59.41
6	-494.33	12	950.30	5.31	950.61	62.30
7	-450.75	13	927.50	5.18	927.86	39.55
8	-476.52	14	981.00	5.48	981.42	93.11
9	-450.53	13	927.10	5.18	927.46	39.15
10	-432.01	12	888.00	4.96	888.31	0.00
11	-459.64	14	947.30	5.29	947.72	59.41
12	-457.61	14	943.20	5.27	943.62	55.31
13	-455.59	14	939.20	5.25	939.62	51.31

Appendix 4: Visitation and rainfall



Appendix 5: Average visitation by distance groups



Appendix 6: Full list of responses, regarding visitor suggestions for site improvements

Visitor response	Count
be great to get in the water,	1
be nice to go for a swim, paddle boat	1
better shade	1
better signposting (to know which way is further away, and those which return back, vending machine,	1
better/closer access from car park to car park (it's difficult to transport picnic gear)	1
cafe, fishing	1
cafe, or coffee van	1
cafe, somewhere to eat, would make me stay longer, it'd be great to swim	1

campground, swimming hole	1
camping, canoeing/kayaking, cafe swimming yes	1
canoeing (if it doesn't cause damage)	1
canteen	1
coffee shop,	1
coffee shop, distances on the signage, guidance on which way is back to the car park, clear pathways of fall danger	1
composting toilet at far end of park, maps along the way at a few intersections	1
dog bowl, dog poo bags, otherwise super well maintained dog poo bags	1
dog poo bags	1
drinking fountain closer to the water, vendor with cold drinks,	1
exercise equipment (pull up bars, push up benches)	1
fishing	1
happy how it is	1
happy so far	1
hot drinks, cafe	1
I like it how it is; little pontoon/jetty/board walk no unlikely	1
if anything, maybe some tour guides sealed pathways, concerns of tripping hazards yes	1
improve safter on spill way, swimming area	1
improved playground facilities (swings)	1
kayaking (although don't want to take away the quietness), better connected pathways for wheelchairs	1
kayaking, off the leash dog walking area, yes	1
keep it as natural as possible	1
keep it as natural as you can, better access to drop of cooking equipment, food and eskies	1
kiosk	1
kiosk, cold drinks	1
leave it as is dog faeces management	1
like how it is no, nature is the ultimate experience	1
more accessible pathways, for wheelchairs,	1
more information about plants and first nations	1
more play equipment	1
no	13
cover for cars	1
no don't want it to be overdeveloped, like the simplicity of the site, the ability to cross the overflow during flow	1
no don't want it to be overdone	1
no happy how it is	1
no happy with how it is, don't want shops, or herded, don't want it to be commercialised	1
no improved signage about what animals they can see, i.e., platypus	1
no interactive mapping apps	1
no, its beautifully appointed, great facilities, in favour of minimal structure	1
no, it's well maintained	1
No, kayaking would be nice, but understand that it is a drinking water catchment, more shade for tables	1
no less is better	1

no like it for the lack of services	1
no monitor free camping	1
no more covered tables, less understory clearing to improve bird watching, less chemical intensive weed control	1
no nice that there is dog walking, better more obvious pathways	1
no no	1
no no, leave it as is	1
no services improvements could be managing erosion	1
no, the occasional event	1
no things do come to mind, like kiosk or coffee stand may actually take away from the pristine experience, worried about litter, would like to see more obvious conservation measures, improved pathways i.e., clean up slippery gravel, manage dogs, concern over hidatus	1
no walking signs	1
no, it wouldn't spoil the place if there was a shop, resistence of commercialisation	1
not sure	1
place to eat, but concerned it would detract from the experience	1
place to swim	1
seating throughout the reserve, for bird watching, bird hide	1
swimming hole	1
swimming, everything else is fine	1
swimming, more information on the walking tracks, outdoor cinema, could be better known, better PR	1
tour guide, kiosk no	1
tour guide / ranger	1
wish I could swim, in some water hole	1
wish we could swim, kayaking	1
wish you could swim; like it how it is	1
would be nice to swim (aware of water quality) more information on the longer walks	1
yes	1
yes cafe, water, activities	1
yes, signage with photos of platypus on site	1
77	89