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Nature Conservation and Nature-Based Tourism: A Paradox?

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Abstract

Throughout the world, areas have been reserved for their exceptional environmental values, such as high biodiversity. Financial, political and community support for these protected areas is often dependent on visitation by nature-based tourists. This visitation inevitably creates environmental impacts, such as the construction and maintenance of roads, tracks and trails; trampling of vegetation and erosion of soils; and propagation of disturbance of resilient species, such as weeds. This creates tension between the conservation of environmental values and visitation. This review examines some of the main features of environmental impacts by nature-based tourists through a discussion of observational and manipulative studies. It explores the disturbance context and unravels the management implications of detecting impacts and understanding their causes. Regulation of access to visitor areas is a typical management response, qualified by the mode of access (e.g., vehicular, ambulatory). Managing access and associated impacts are reviewed in relation to roads, tracks and trails; wildlife viewing; and accommodations. Responses to visitor impacts, such as environmental education and sustainable tour experiences are explored. The review concludes with ten recommendations for further research in order to better resolve the tension between nature conservation and nature-based tourism.

Keywords

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Review

Nature Conservation and Nature-Based Tourism: A Paradox?

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Abstract: Throughout the world, areas have been reserved for their exceptional environmental values, such as high biodiversity. Financial, political and community support for these protected areas is often dependent on visitation by nature-based tourists. This visitation inevitably creates environmental impacts, such as the construction and maintenance of roads, tracks and trails; trampling of vegetation and erosion of soils; and propagation of disturbance of resilient species, such as weeds. This creates tension between the conservation of environmental values and visitation. This review examines some of the main features of environmental impacts by nature-based tourists through a discussion of observational and manipulative studies. It explores the disturbance context and unravels the management implications of detecting impacts and understanding their causes. Regulation of access to visitor areas is a typical management response, qualified by the mode of access (e.g., vehicular, ambulatory). Managing access and associated impacts are reviewed in relation to roads, tracks and trails; wildlife viewing; and accommodations. Responses to visitor impacts, such as environmental education and sustainable tour experiences are explored. The review concludes with ten recommendations for further research in order to better resolve the tension between nature conservation and nature-based tourism.

Keywords: nature-based tourism; recreation; conservation; environmental impacts; protected areas; review

1. Introduction

There is strong potential for a symbiotic relationship between tourism and natural area conservation. People enjoy visiting natural areas and engaging with wildlife [1]. Land managers seek to attract visitors to garner government and community support, goodwill, and financial revenue, which they can invest in natural areas to secure them from potentially more destructive types of land use [2]. Visitors that have an enriching experience with the natural environment during their travels may vest this goodwill to support its conservation [3]. A positive experience is also the prerequisite for future visitation or recommendation to others, especially if the individual benefits are long-lasting and transformative [4–6]. This cascades into further financial revenue and consolidates the merit of a particular tourism site for conservation. However, there is a dark side to allowing and encouraging visitation as opposed to setting aside an area as an uninhabited wilderness. Nature-based tourism may cause resource degradation, increased roadkill, disturbance of animals from important feeding and breeding sites, or inappropriate feeding, either intentionally or unintentionally, and other problems as described in monographs on the impacts of outdoor recreation and ecotourism [7] and wildlife tourism [8–10]. Logically the more attractive a site is, the more likely it is that it will be degraded. This, in turn, may diminish the quality of the experience, and thus, visitor satisfaction. Numerous studies [11–15] have expressed their concern about this issue. McArthur and Hall [16] described it as a paradoxical situation. Thus, the question arises as to whether tourism usage can in any circumstance be compatible with conservation. Is the reality that: While tourism purports to contribute to conservation, in practice, its actions destroy environments and it acts as nothing, but a slower force of degradation when compared to other exploitative land uses?

This review does not purport to provide a comprehensive answer to this question. However, there is a clear goal. To fully capitalize on the positive sides of tourism for protected areas or private lands, the degradation of resources needs to be constrained to ecologically acceptable levels, and to levels beyond visitor perception. To achieve that, we need to understand the relationship between visitor usage and environmental impacts, the management of this relationship, and the promotion of low-impact variants of visitor behavior. This is summarized in a conceptual framework (Figure 1) that focusses this review. Visitor activities, governed in the visitor domain, may affect the natural environment via four main pathways: Direct stimulation, harvesting, habitat alteration and the modification of biotic relationships. Such impacts are regulated by various factors, including management actions. The responses in the natural environment are various aspects of the biology of species that manifest according to the demographics of a species, and the structure of the community it resides in and resolve at the individual, population, or community level.

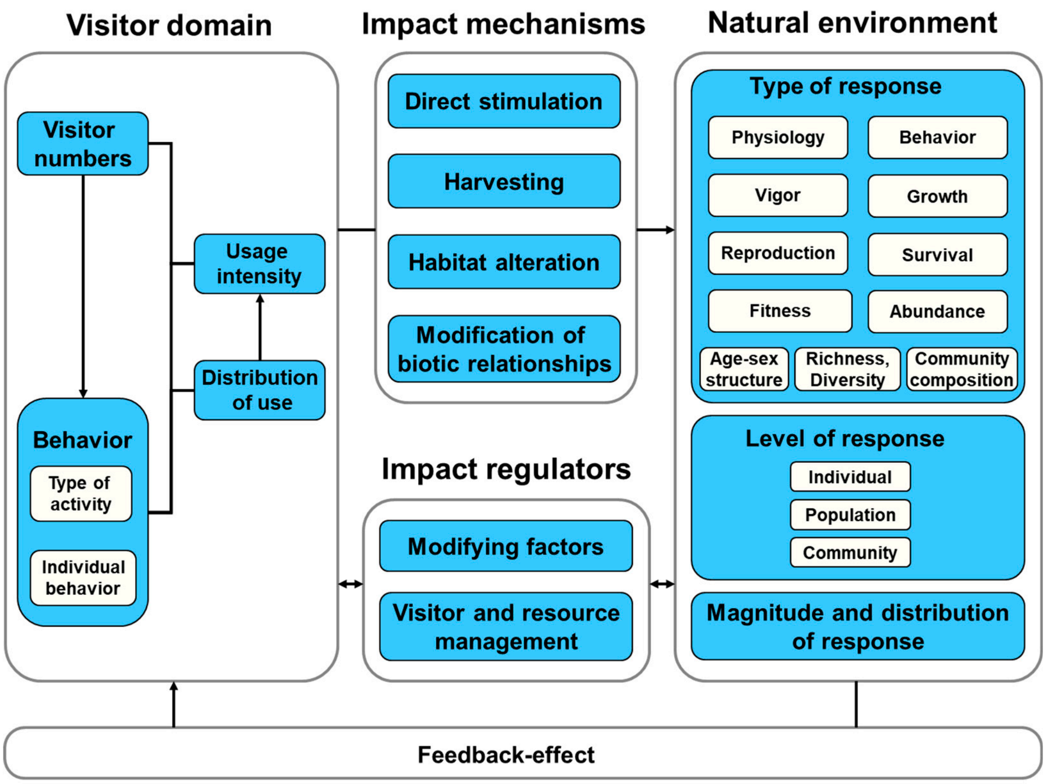

Figure 1. A conceptual framework of the relationship between visitors who engage in nature-based tourism activities and the natural environment.

Nature-based tourism can be broadly defined as visitation to a natural destination which may be the venue for recreational activity (e.g., adventure races in Brazil [17]) where interaction with the plants and animals is incidental, or the object of the visit to gain an understanding of the natural history of the destination (a form of ecotourism [18]) and to interact with the plants and animals. Interactions with wildlife (usually animals, but in some definitions plants and animals) can be non-consumptive (e.g., wildlife viewing [19]) or consumptive (e.g., recreational hunting [20]). The natural world is also a destination for volunteer tourism [21] where individuals engage as 'citizen scientists' recruited to research projects by investigators or organizations (e.g., the Earthwatch Institute with global reach—www.earthwatch.org). These interactions may include destructive sampling (e.g., cropping of plants to determine biomass). This review focusses on nature-based tourism where the visitor seeks interaction with the natural world and the consequences to wildlife are non-consumptive. Thus, we exclude adventure 'sports', hunting and fishing, and engagement in research. Research on the environmental impacts of nature-based tourism has biases in habitat (the terrestrial environment is over-represented relative to the marine environment [22]) and geography (USA and Australia are well-represented, whereas Africa and Asia are under-represented [23–25]). Thus, the research cited in this review reflects some of these biases. Furthermore, there are doubtless many negative impacts on the environment from nature-based tourism, for which only some have been well-documented. Thus, Bateman and Fleming [26] caution that there is often "a general assumption that animal species that face anthropogenic disturbance through tourism suffer some negative impacts as a result" and urge more thought to be put into research design and interpretation of results.

This review builds on a systematic quantitative review by Sumanapala and Wolf [25] on recreational ecology in this Special Issue. While the former study develops a quantitative snapshot, here we are presenting a detailed narrative review of the field. This is achieved in part by drawing from our combined experience of more than 50 years in the tourism and recreational field, including as academics, government researchers, and wildlife tourism practitioners. A particular focus is on 'exceptional' studies, highlighted to fill specific gaps in recreational ecology by Sumanapala and Wolf. This includes studies with a strong interdisciplinary focus (social and environmental science), and studies that reconcile visitor and environmental needs through carefully designed experiments to develop sustainable visitor experiences.

The review first examines how to identify tourism impacts and their mechanisms (i.e., the relationships between the visitor domain, impact mechanisms and the natural environment). Then the review examines how to manage tourism impacts by three actions (1) access regulation, (2) education based on visitor impact research and (3) the development of well-researched low-impact tour experiences that achieve high visitor satisfaction (i.e., impact regulators). The identification of visitor impacts, and their management is the vital step towards attaining compatibility between nature conservation and tourism, and ultimately towards sustainable tourism. We do not cover all elements of a tourism management plan and exclude subjects, such as political (e.g., public acceptability) and managerial (e.g., funding, staffing, policies) issues. The review concludes by addressing some limitations of current knowledge and proposes future research directions.

2. Identification of Visitor Impacts and Impact Mechanisms

There are two main methods of investigation of impacts used by researchers: Observational (comparing across time or space with no experimental manipulation of habitat features or human activity) and manipulative (where one or more factors are deliberately altered between treatments to assess their effects).

2.1. Observational Studies

To better manage nature-based tourism activities, the effectiveness of management interventions at reducing environmental impacts needs to be assessed. This requires that impacts are reliably identified. This is challenging because of the great diversity of species involved, and the variation of responses within species with different developmental histories. It can also be complicated by difficulties in determining whether one is looking at the effects of tourism or some other correlated factor. The occurrence of some environmental changes is undoubtedly a product of human activity, such as tourism disturbance. For instance, the presence of petroleum residue in samples of otherwise undisturbed lake water can be ascribed to tourism usage without the assessment of sites that lack tourism usage (controls) because the concentrations would inevitably equal zero at the latter [27]. In contrast, to identify tourism-induced changes in most other environmental variables their conditions need to be compared either between different sites that vary in their tourism usage or between different points in time at the same sites where the usage varies over time. This may involve intermittent changes, such as Ranaweerage et al.'s [28] observations of elephant behavior in Sri Lanka when tourists were present or absent, finding that the frequency and duration of alert, fear, stress and aggressive behaviors were significantly higher in the presence of tourists and occurred at the cost of feeding time, and that such changes were especially associated with tourist behavior, vehicle noise, close distances and time of the tour. Classical comparisons are between sites with no usage and sites with some usage or between sites before and after the commencement of usage (e.g., experimental studies of trampling impacts on vegetation [29]). A combination of these comparative approaches leads to what is known as BACI (Before/After, Control/Impact) design.

However, control sites or records prior to tourism establishment do not always exist, and sampling designs must adapt to this. For example, impacts can be defined as differences in environmental variables between high vs. low (instead of 'no') usage sites [30]. We hereafter refer to this design as a 'hi-lo impact study'. The hi-lo impact design can be extended by an additional comparison, for example between vegetation and soil samples taken at different distances to the source of the disturbance; based on the assumption that resources at close distance will be impacted more than those at further distances [31]. The hi-lo impact studies of Wolf and colleagues detected significant tourism impacts on vegetation [31] and bird communities [32] in an arid rangeland ecosystem of high relief, dissected by intermittently flowing creeks, in the Flinders Ranges National Park of South Australia. High usage was related to altered species composition, decreased total plant cover, increased non-native species cover, increased or decreased plant diversity depending on the distance to the disturbance, increased soil compaction and decreased bird numbers and bird species richness. Further, the ecological effect zone of vegetation impacts extended up to 5 m from recreational tracks. This increased to 50 m through the self-perpetuation of impacts from high usage roads to neighboring creek beds.

The success of hi-lo impact studies to detect visitor impacts depends partially on the magnitude of the difference in the usage intensity between high and low usage sites: The impacts should increase as the difference in the usage intensity ('amount of use') increases. However, little is known about the actual form of this dose-response relationship, and therefore, about the rate of increase. Findings from trampling studies and campsite impact assessments suggest that the dose-response relationship (Figure 2a) can be curvilinear (asymptotic) rather than linear [33]. Accordingly, the biggest increase in impact occurs at small increases in usage. As the usage intensity increases the rate of increase in impact decreases. A threshold is passed once substantial impacts have occurred, and any further increase in usage will cause only minimal additional impact. For instance, comparatively low levels of trampling may cause substantial changes in vegetation, such as species replacement and reduction in total plant cover. High levels of trampling, however, may cause little additional change in vegetation because disturbance-sensitive species have been replaced with more resistant species. In its most extreme expression, no plant cover remains that could be affected by trampling, so that nothing changes [7,33] even if usage increases dramatically. Similarly, Marion and Cole [34] found that rapid changes in soil and vegetation conditions occurred when campsites were initially opened to use whilst they stabilized with on-going disturbance. Differences in impacts were not linearly proportional to differences in the amount of use. For instance, whilst their high usage sites were camped on 5–10 times more often than their low usage sites, the mean campsite area and non-vegetated area were only 2.9 and 3.3 times greater, respectively. Declining rates of campsite expansion at higher usage levels were said to arise because the increase in visitor usage affected mostly specific areas within a campsite (e.g., picnic tables) where levels of impact increase towards their maximum. Alternatively, Growcock [35], who studied the impacts of camping and trampling in Australian alpine and sub-alpine ecosystems, presented evidence for a logistic relationship (Figure 2b) where low levels of recreational use do not cause significant damage until a primary threshold is reached. Such a threshold to disturbance was found for vegetation communities with high resistance against initial damage [36,37]. The secondary threshold that Growcock [35] postulated is the equivalent to the single threshold in Cole's [33] model.

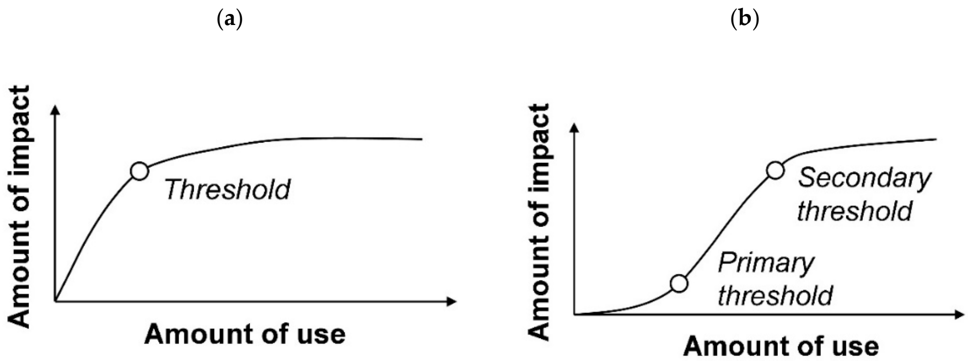

Figure 2. The (**a**) curvilinear (modified after [33]) or (**b**) logistic (modified after [35]) relationship between amount of use (usage intensity) and amount (magnitude) of impact.

Monz and colleagues [38] have questioned whether these curvilinear relationships are adequate to describe all tourism impacts. They find utility in describing some vegetation responses, but recommend linear, exponential or step function models to describe other ecosystem responses. For example, a step function better describes the response of wildlife, especially birds, to visitor approach. At some threshold distance, the bird changes state and takes flight, and then changes state again, such as perching at a perceived safe distance [10]. These other models open up alternative responses to manage the use-impact relationship.

A failure to detect a difference in a resource variable that abides by the described dose-response relationships means that either (1) tourism usage does not influence the variable in question (no matter how much usage increases) or (2) tourism usage does influence the particular variable, but the increase in usage from a low to a high state did (in this instance) not cause an additional impact because the increase (a) was too small and/or (b) elicited a disproportionately low response in impact. The latter situation arises when low, and high usage values precede the first threshold in Growcock's [35] model or when they surpass the second threshold in Growcock's [35] model or the single threshold in Cole's [33] model; that is, when these values are located on the part of the dose-response curve with the weakest rate of increase. The situation is complicated because the amount of use at which the thresholds occur may differ between dependent variables. For example, vegetation height is often noticeably impacted on by trampling long before vegetation cover or composition change [39].

Further, while either of these models may be applicable to tourism impacts on soils and vegetation, they may not be valid for the many impacts on wildlife [38]. For example, the effects of human presence can be subtle. One study of nesting albatross in New Zealand [40] showed no discernible impact from the presence of tourists, but a longer-term analysis of data revealed gradual, but significant changes in the breeding colony, with a shift to what may be suboptimal nesting sites. Thus, the lack of a difference in the response variable should not be prematurely interpreted as an indication of its immunity against visitor disturbance.

The ability of hi-lo impact studies with a nested structure to detect impacts also depends on how well the usage, determined for the whole study site/whole-plot, characterizes the conditions in the sub-plots. For example, in Wolf and Croft [31] the soil and the vegetation at different distances to the recreational tracks (hiking and roads) in the Flinders Ranges National Park were (due to their immobility) consistently exposed to different sub-plot levels of disturbance. Therefore, vegetation sampled in the first meter beside low usage roads was under low usage at the whole-plot level, but under high usage at the sub-plot level. The result was no significant difference in the percentage of total plant cover and soil compaction in the first meter beside high and low usage roads, but these values differed significantly from those at further distances beside low usage roads. This study also demonstrated that sub-plot variation in tourism disturbance levels could increase when other types of disturbance exert their influence. This was exemplified by the susceptibility of the naturally disturbed banks of creek beds to further disturbance influences (e.g., increase of non-native species) that had likely originated at the immediate tracksides. In regards to the proper determination of usage intensity levels of the whole-plot units, Wolf and colleagues [32] demonstrated that the close surroundings need to be accounted for as well. For instance, the open space of campsites (Figure 3) adjacent to the study sites was linked to bird community changes on the study sites. In conclusion, care should be taken that the experimental design of a hi-lo impact study considers all the relevant on- and off-site dimensions of tourism disturbance, as well as additive/synergistic effects of other types of disturbance that may affect whole-plot disturbance levels and/or may increase sub-plot variation in disturbance levels.

Figure 3. Entry to the camping ground in Flinders Ranges National Park, South Australia (Image: D.B. Croft).

Finally, a critical decision in a hi-lo impact study concerns the choice of visitor variables to monitor for the determination of usage levels. Hi-lo impact studies often neglect visitor monitoring in favor of resource monitoring, and rely on monitoring visitor numbers without accounting for variation in visitor behavior. Wolf and colleagues [30] compared 11 visitor variables, and this comprehensive approach made it possible to identify the 'culprit' portion of visitors that was responsible for impacts. They further compared the advantages and disadvantages of four visitor monitoring techniques: Namely, the direct monitoring of visitor uses by staff observers, the assessment of proxy variables from which past and present use can be inferred, GPS tracking of visitors and the survey of visitors by an interview-based questionnaire. GPS tracking proved the most reliable technique and the most efficient at data gathering. Thus, one can ask a tourist what they want to do at the beginning of an experience, what they have done at the end of the experience, but what they actually experience gives the most valuable insight.

The methodology for monitoring tourist behavior has advanced greatly, with many tourists bearing geographically enabled devices of increasing sophistication and accuracy. Much of this spatial information is volunteered and shared publicly leading to unobtrusive observation [41]. A more structured approach to spatial data collection of visitor use can be achieved through the application of public participation geographic information systems [42]. This enables spatially-explicit participatory planning for managing visitors in ecologically sensitive places like national parks [42]. It can be used not only to enhance the experiences of a user group, but also to resolve potential conflicts between different user groups [43].

2.2. Manipulative Studies

Observational approaches further our understanding of long-term visitor impacts on the environment, but causal relationships are best resolved by manipulative experiments. For example, the nature and strength of trampling impacts on vegetation and soils by hikers are best resolved by experiment, such as manipulating the number of passes made by hikers (e.g., References [29,44]).

The environment from a tourism perspective is not just the drape of the landscape with its substrates and vegetation, but also the animals that inhabit it. There have been many experimental studies to predict short-term behavioral impacts of visitor observations on wildlife. Many of these estimate flight initiation distance (FID) (e.g., Reference [45]). There is even a tool to predict this for Australian birds [46]. Some studies examine a broader repertoire of behavioral change (e.g., with marine mammals [47,48]). The inherent strength of manipulative experiments is that specific disturbance stimuli can be tested, as they are controlled at will, and related to specific short-term behavioral responses in wildlife. Further, variants of visitor behavior can be rated as more or less intrusive, based on the notion that the greater the perceived risk from the disturbance, the stronger is the elicited response in wildlife [49]. Altogether, this reveals cause-response relationships and some of the disturbance mechanisms that underlie long-term changes in wildlife [50].

Giese [51] conducted research on visitor approach to incubating Adélie penguins in Antarctica to ascertain the minimum safe distance people can approach breeding penguins before the behavior and physiology of the birds were affected, and whether breeding success was affected by recreational visits. Approaches to 30 m had no measurable effect. Approaching to 15 m had no visible effect on behavior, but did elevate heart rates significantly above resting rates. Approaches to 5 m prompted more vigilant behavior that progressed to standing up, which causes cold air to make contact with eggs. The latter is a potentially lethal result for the embryo. Overall, breeding success at regularly disturbed sites was reduced.

Wolf and Croft [52] studied how variants of visitor approach behavior affect the behavior of two kangaroo species (Red Kangaroo *Osphranter rufus* and Euro *O. robustus erubescens*) in the arid rangelands of Australia. Kangaroos reacted to an approaching human with vigilance and/or flight, and low-impact types of approach were identified based on a whole suite of response variables, such as the length of the flight path. The study also revealed qualitative differences of the approach variants, that were likely responsible for the perceived risk level of the disturbance, and consequently, the type and magnitude of the response. These included the predictability, continuity, directness and change of direction in the approach and any behavior added onto the baseline approach behavior, such as talking during the approach. Particular care was taken to clearly define and explain the approach treatments to encounter previous criticism that it is difficult to make generalizations regarding the importance of external variables to wildlife responses between studies, partially because they fail to present the necessary detail to make inferences about communalities [53].

Most animal behavioral studies are conducted during daytime, but night-time tours are offered in many national parks (e.g., Kruger National Park in South Africa, many Australian sites as marsupials are predominantly nocturnal). Wolf and Croft [54] determined how different qualities of light created a gradient in adverse response in numerous mammal and bird species in a setting in the Australian arid rangelands. For example, the white and red light of the same photometric intensity elicited similar adverse behavior, albeit the latter was slightly less intrusive; and the least intrusive and most rewarding observation was attained with a night vision device (NVD) enhanced by infrared light.

The great challenge for a manipulative visitor impact study is to achieve a realistic simulation of actual visitor-wildlife encounters. The more realistic, the more personalized the educational message will be. This challenge was addressed in Wolf and Croft [52] by thoroughly observing tourist approach behavior prior to the decision on which approach treatments to test. That way a behavioral repertoire of the whole range of approach variants was compiled and even some approach styles, not previously considered (e.g., stop-and-go with switchbacks), were exposed and subsequently tested. However, the richness of such a repertoire normally surpasses the number of variants that can be tested. Certain variants need to be selected as treatments; for instance, based on the potential to uncover disturbance mechanisms with them, the frequency with which they occur, the potential for translating the results into instructions on low-impact behavior and the usefulness of the results for tourism stakeholders. In Wolf and Croft [52], only a selection of the complete repertoire of observed visitor behavior was presented. Most of the additional behavior was not examined as the study was scientific in nature, and thus, intended to uncover disturbance mechanisms rather than test random behavioral variants, even if that could have advanced visitor management too. The most common approach variants among hiking and driving tourists were tested so that final recommendations for low-impact behavior would be applicable to a wide audience. The tested treatments were also chosen for the ease (e.g., 'stay on-trail/you may go off-trail', 'do not/you may talk') of translating them into guides on low-impact behavior. The choice of treatments for nocturnal observation in Wolf and Croft [54] was largely driven by an initial discussion with tour operators/guides and considerations of what tour experiences may excite visitors. In conclusion, manipulative visitor impact studies benefit from compiling a repertoire of actual visitor behavior from which to choose treatments that balance scientific and managerial outcomes.

2.3. The Disturbance Context

Both observational and manipulative visitor impact studies need to account for the disturbance context [55]. A variety of factors can modify the susceptibility of flora or fauna to tourism disturbance, such as the time of day, night or year of observations, given the variation in growing conditions for plants, and the activity and breeding periods of animals. In animals, treatments may covary with factors, such as the species, the sex class of the individual, weather conditions (wind speed) and the structure of the vegetation in which it resides.

A factor that consistently influences the reaction to the disturbance is the species of the disturbed subject, whether plant or animal [31,32]. In some studies, impacts on a diverse flora can be simplified by examining functional traits, such as plant height, leaf area and dry matter content [56]. In Wolf and colleagues' studies disturbance elicited pronounced changes in community composition, due to the fact that some plant [31] and bird [32] species were either attracted or repelled from disturbed sites, whilst other species did not exhibit any significant changes in abundance. Some of the underlying reasons for these differences in response include ecological properties of invasive, non-native plants vs. native plants or of bird species that preferred to utilize high vs. low habitat strata. In one of Wolf and Croft's manipulative studies [52], species also influenced the reaction to the disturbance with Red Kangaroos exhibiting a higher sensitivity than Euros. Austin and Ramp [57] showed significant plasticity in the response of another kangaroo species (Eastern Grey Kangaroo *Macropus giganteus*) dependent on whether their prior experience to human approach was benign or harmful.

One important habitat factor that modifies the susceptibility to tourism disturbance is the vegetation structure. For example, Wolf and colleagues [32] study of bird communities inhabiting ecosystems adjacent to high or low tourist usage sites in the Flinders Ranges National Park found that the structural and floristic complexity of the vegetation was a stronger determinant of bird abundance than tourist usage. This study demonstrated that the disturbance context (sites with well-developed shrub and tree layers) could be a more important predictor of the dependent variables (bird abundance and species richness) than the actual disturbance (tourist usage) itself. This was corroborated in a study by Pavey and Nano [58] in arid Central Australia. Importantly, vegetation variables moderated some of the negative effects of high usage on birds. For instance, the decrease in the number of individuals recorded along high usage roads was mitigated to insignificant levels at sites with the best-developed shrub and tree layer. Similarly, kangaroos, on approach at the same study site, reacted less sensitively in areas with better cover [52]. These patterns were attributed to the better protection or more promising resource conditions of better-vegetated areas that animals leave reluctantly despite disturbance. Other influential factors were the wind speed and timing of the observation. Generally, calm conditions decreased the susceptibility to the disturbance. Viewing/approach of kangaroos was less intrusive/more rewarding in the evening (compared to mornings), and nocturnal observations were less intrusive/more rewarding early at night (compared to late at night) [52,54].

Thus, visitor impact studies should account for the disturbance context because (1) it reduces the variation in the data set, and thus, increases the probability to expose significant visitor impacts, (2) it aids in developing recommendations for low-impact behavior (e.g., when and where should visitors observe wildlife without profoundly disturbing it) as the disturbance context may modify the outcome of the visitor-environment interaction, and (3) it can determine which variables (e.g., only the reactive species) to record during a resource monitoring program. Importantly, not only the main effects should be considered, but also interaction effects between the modifying factors, and between them and the visitor disturbance (e.g., following statistical procedures in Reference [59]). For example, in Wolf and Croft [52] the species of the disturbed subject interacted with one of the approach treatment levels: Red Kangaroos had to move further during their flight to gain meters of safety distance, when they were approached off-trail, but not on-trail. Euros, on the other hand, had to move similar distances independent on whether the approach took place on- or off-trail.

2.4. Management Implications of Detecting Impacts and Understanding Their Causes

The knowledge acquired on visitor impacts along recreational trails can be incorporated into monitoring programs of visitor usage and resource conditions which should be integral to tourism planning frameworks. For example, Wolf and colleagues [32] identified plant and bird indicator species and other tourism-sensitive variables (such as the percentage of plant cover), and these deserve particular attention in a monitoring program as they indicate on-site usage conditions and changes over time. Moreover, such findings provide some guidance on where, namely within the ecological effect zone, to monitor resource variables. Monitoring programs then confirm the effectiveness of certain management actions or signal that management needs to be adapted to contain impacts within acceptable limits.

Further, the establishment of cause-response relationships, such as between different accesses (e.g., hiking or driving) and visitor and resource impacts, can influence decisions on management strategies or actions for access regulation. For example, Ballantyne and Pickering [60] compared the impacts of access to an urban forest in subtropical Eastern Australia along formal or informal recreational trails.

Both had significant effects: Formal trails in their construction and maintenance and informal trails in their intense use and consequent widening. These both had implications for management to retain high conservation value. Similar studies have been conducted in sites with various access, such as on foot, on mountain bikes or on horses in Australia and the USA [61]. Experiments are necessary to separate cause from correlation in effects (e.g., experimental trampling in tall alpine herbfields and sub-alpine grasslands in Australia [62]). Finally, knowledge on low-impact visitor behavior can be implemented into environmental education and the provision of sustainable tour products as discussed in the following.

3. Regulation of Access to Visitor Areas

3.1. Effects of Different Access Modes on Visitor Impacts

A major challenge for land managers is to select the strategies and attendant actions that will be most effective in preventing or mitigating visitor impacts. Marion and Farrell [63] recommended that scientists assist managers in the selection and evaluation of the success of management actions and help establish the causal relationships between usage and impacts. A road and trail system is a common spatial containment strategy [64] for visitor use. Each of these access modes has been studied in some detail. Roads have often been studied in the context of changes in the vegetation on the verge, propagation of weeds, roadkill of wildlife and inappropriate driver behavior in protected areas (e.g., References [65–68]). Such are the magnitude and pervasiveness of the impacts of roads in natural landscapes that a discipline of 'road ecology' has been spawned to study them (e.g., Reference [65]). Environmental impacts of trails have been studied in the context of trail type (e.g., Reference [69]), and the mode of progression along the trail (such as in hiking, bike riding, horse riding [61]) along with their impacts in many landscapes [23]. Less commonly have the effects of both access modes been compared in one site.

Wolf and colleagues' study of tourism in the gorges of the Flinders Ranges National Park in South Australia found strong effects of access mode. These included (1) the type, magnitude and spatial distribution of visitor usage [30], (2) the type, magnitude and spatial distribution patterns of long-term impacts on vegetation [31] and bird [32] communities, and (3) visitor approach behavior, as well as the type and magnitude of associated short-term behavioral responses of individual kangaroos [52].

The visitor monitoring study [30] substantiated that the type of access to a gorge profoundly influenced visitor usage of gorges: The respective, inter-site differences in usage attained discrimination of both vehicle and hiker gorge sections into high or low usage, but the nature of the usage differences was a function of the access mode. Gorges with vehicle access attracted the main influx of campers, and while most people explored these gorges from the beginning to the opposite end, only some of the multiple sites were selected for camping. In gorges with hiker access, the pattern was exactly opposite. Here, within-gorge visitation varied strongly as sites towards the middle or opposite end of the more accessible entrance point were substantially less frequented as visitors usually remained within a few kilometers from where they had accessed a gorge. Camping usage was highly sporadic. For both modes of access, the percentage of stoppers and their stop-time varied distinctly between sites. The fact that some sites were more heavily used than others was expected, as visitors tend to aggregate in the same places (see discussion of wildland recreation in the USA [70]) for reasons of accessibility/convenience or suitability of sites for various activities. Even so, the distribution of high usage sites depended on the access mode to gorges: High usage sites were concentrated at the beginning of hiker gorges, but scattered throughout the entire length of vehicle gorges. Consequently, in the case of vehicle gorges variation in visitor usage was very small-scale; that is, gorge sections only a few hundred meters apart attracted very different levels of visitor attention—which future visitor monitoring has to account for. The observed changes in visitor behavior are likely relevant for roads and trails in general, and not exclusively for those traversing gorges, as long as they are accessible only from a few (typically two) sides and provided that the properties of the visitor market (preference for:

Scenic driving over hiking, shorter hikes in multiple locations rather than long hikes in one location, camping at sites with vehicle access) resemble those ascertained for the Flinders Ranges.

The edge and immediate hinterland of roads in this region were subjected to a different disturbance regime than along trails. High usage sites along roads were exposed to camping usage, which is a temporally extended form of usage where visitors engage closely with their environment. This was rare along hiking trails. Further, visitors travelling on roads were maneuvering vehicles which may be more perilous (vehicle collisions) or perturbing to the environment, due to the noise and weight of the vehicle; particularly in high usage sites where stopping or camping visitors frequently seek off-road parking and get in and out of their vehicles. Roads that receive frequent usage require maintenance, which typically affects the surroundings more than the maintenance needed for well-used trail sections. Finally, if high usage alters vegetation communities differently along roads than trails (e.g., more pronounced roadside changes and habitat modifications, due to campgrounds), then that may have secondary effects on the fauna like bird communities.

Tourism impacts were greater and more pervasive along roads in the Flinders Ranges. Not only did the immediate roadside effects pervade the ecosystem further (by 1–4 m) than trailside effects, but impacts also invaded other disjointed (on average at a 50 m distance) sites with susceptibility to disturbance. Thus, the potential of impacts to self-perpetuate throughout the ecosystem was a function of the access mode. Like vegetation communities, bird communities reflected the different environmental conditions of roads compared to trails. High usage significantly decreased the number of individuals and the species richness of the bird community along roads, whereas along high usage trails only the latter occurred and to a slightly lesser extent. Bird community changes between high and low usage sites were also more pronounced along roads than trails.

The access mode also affected how driving and hiking tourists who interacted with kangaroos approached wildlife [52] during encounters and the short-term responses of the wildlife. Some on-trail approach styles were more typical for drivers and others were more typical for hikers. These differences mainly accrued because visitors driving a vehicle experience their environment at a greater speed and from a more secluded position. Consequently, many of them overlook wildlife beside roads entirely so that they pass-by without watching, or they spot wildlife too late so that they have to turn back to watch. Moreover, visitors who have already encountered numerous kangaroos along the route may decide that stopping the vehicle for yet another kangaroo is not worth the effort. Drivers are generally less inclined to stop during their approach and typically approach in a continuous motion. Hikers are physically more absorbed by their environment and often notice wildlife from a far distance where much of the observation takes place. If they approach to observe from a closer vantage point, then frequently an intermittent approach is chosen. In that study, an off-trail approach always took place by foot, whether by driving and hiking tourists. Given that the kangaroo study only tested selected approach styles, the whole scope of differences in kangaroo response, due to different access modes was not evaluated. However, the findings based on the selected approach treatments revealed that the responses to vehicles were less overt than to hikers as fewer kangaroos changed their behavior and took flight at all. These results, though, were weighed up against the overall traffic volume. Vehicles might have elicited a milder immediate response from individual kangaroos, but may have had a greater cumulative impact, since the volume of vehicle traffic exceeded pedestrian traffic in that study area. Interestingly, stop-and-go motion only mitigated the impacts of hiking, but not driving tourists. This demonstrates that, if managers provide different access modes to visitor areas, they need to adapt their recommendations for low-impact behavior accordingly.

3.2. Managing Access and Associated Impacts

These findings have practical implications for the management of visitor access. Where road access is granted, one can expect a greater anthropogenic disturbance and associated resource impacts than along trails. Impacts may be addressed at the level of the attraction (1) through spatial segregation (via zoning and closure), and (2) the site-level within the attraction (i.e., along access trails and at nodes where visitors aggregate) via spatial segregation, containment and configuration strategies [64] as explained in the following.

Spatial segregation delineates where and what type of usage is allowed via zoning and closure and is a common management practice to protect some resources or areas from visitor impacts or to separate potentially conflicting types of use (e.g., Reference [43]). Zoning is also a common means of accounting for differences in the impacts associated with different modes of travel/access. A survey of U.S. National Park managers [64], for instance, revealed that spatial segregation was frequently practiced to protect sensitive areas or to separate incompatible types of activities. A good example where zoning is applied is the Great Barrier Reef in Australia [71]. The Great Barrier Reef Marine Park has been zoned into sections that may be reserved for preservation and scientific research, closed seasonally to protect nesting turtles and birds, and open to recreational or commercial fishing, or open only to non-consumptive tourism activities like diving tours. Compliance with the zoning restrictions is practiced through a system of permits to tourism operators.

3.2.1. Roads and Trails

Spatial segregation of different access options in the terrestrial environment could vary the ratio between attractions (or sections within attractions) that contain a road, a trail or neither, and thus, balance environmental protection with visitor needs. In this manner, different visitor expectations can be accounted for. For example; different visitors may prefer the exercise and companionship along hiking trails, the solitary adventure of going off-trail or the comfort and safety cocoon of driving along roads. The strategic placement of zones where access is restricted is critical as it affects visitor compliance and satisfaction. Generally, a local prohibition on motor vehicles or any access is more easily justified if there are other parts where public access and motor vehicles are permitted. Maintaining, for instance, the farther sections of a hiker attraction towards the less favored access points should meet acceptance among the public as visitor demand to travel in these areas is low. However, the convenience of protecting areas that are not in demand by visitors should not distract from protecting biologically important areas.

Even though large parts of wilderness should remain undisturbed by tourism traffic, trails need to be delineated and hardened where use is frequent to avoid the development of informal trails [70]. The provision of trails constitutes the most common form of spatial containment applied in protected areas, namely the concentration of visitor usage on the trail [64,72]. Wherever access trails are built, they should adhere to optimum trail design to facilitate on-trail and to prevent off-trail usage [73]. Such an educated choice in the layout of recreational facilities is referred to as 'spatial configuration' [64]. For instance, to minimize soil erosion, trail grades should be kept below 10%, and trails should be orientated at an oblique angle to the prevailing slope (reviewed in [74]). Well-designed trails prevent the pervasion of usage in off-trail areas, trail braiding and soil erosion. Trails in poor condition may result from a bad choice in location, design failures, a lack of maintenance, or from overuse [70,75].

Different access modes are prone to suffer from different problems. The choice to build a road (and its various forms of improvement) needs to be carefully deliberated, as roads and the maintenance that they require can be more disturbing to the environment than walking trails [8]. Thus, even without the usage that typically follows the establishment of a road, the physical properties of the road are more intrusive. The planning of roads also needs to address additional challenges, such as permitting wildlife to cross safely. Importantly, access roads near campsites require particular attention as campsite impacts usually affect the hiking trails leading to and from the campsites [31,70].

3.2.2. Wildlife Viewing

Controlling visitor behavior during wildlife encounters can be achieved by zoning access (which determines the principal transport and approach style of visitors) or placing constraints on visitor behavior within the site. For example, visitors to protected areas with dangerous animals may be confined to the road network in their own or a tourist vehicle (Figure 4a) and cannot alight from the vehicle except at a few designated sites (e.g., toilets or viewing hides). This is typical of National Parks in South and East Africa. For colonial species that aggregate at specific sites, visitors may be constrained by a barrier around the site (Figure 4b) or at a viewing platform. For some species, such as marine mammals, visitors may be constrained to a minimum approach distance through a code of practice that is usually prosecuted by a tourism operator (e.g., approach limit for whale watching vessels [48]). In other instances, there may be no constraints (Figure 4c) except the visitor's adherence to roads and/or a formal trail network. Here the control of visitor behavior during wildlife encounters should be directed by environmental education drawing on resources where best practice is framed by scientific investigation (e.g., professional societies, such as Wildlife Tourism Australia—see https://www.wildlifetourism.org.au/conservation/policies/).

Figure 4. (**a**) Wildlife safari vehicles in Okanjima Game Reserve Namibia, (**b**) Cape Fur Seals are viewed from behind a stone wall in the Cape Cross Seal Reserve Namibia, (**c**) Striped Mongoose freely interact with unconstrained visitors in the Waterberg Plateau National Park Namibia, (**d**) wildlife viewing platform within fenced Halali Camp in Etosha National Park Namibia (Images: D.B. Croft).

3.2.3. Accommodation

Accommodation of day and overnight visitors is a significant challenge for land managers. Stopping (lay-offs and rest areas), picnic and camping areas, and more formal accommodations, inevitably impact environmental values through construction and operation. Once constructed, there is also the problem of increased waste (impacting wildlife through pollution or eating inappropriate items). This can be mitigated by secure rubbish disposal bins divided according to recyclable materials, in some cases (especially eco-lodges) by banning the use of single-plastic bottles or bags, or by clearly warning all users (as is done in most national parks) that rubbish must be taken home with them. Light and sound pollution can also affect wildlife, and must be addressed by developers of accommodation.

For instance, Ware et al. [76] demonstrated that experimental traffic noise significantly degraded the habitat for migratory birds in America.

Spatial containment strategies can direct visitors to designated locations by providing parking bays or information signs along the route [77,78]. Fire grates and picnic tables in designated areas can also result in aggregation of visitors and keep other areas undisturbed [64]. However, such actions are somewhat contentious and must be subtle enough so as not to detract from the wilderness experience by creating obtrusive infrastructure. In some instances, they may open a window to the wilderness with an abutting viewing platform as found in the rest camps of Etosha National Park in Namibia (Figure 4d).

Environmental impacts may be contained through the provision of sought-after resources. For example, fire grates, tables, ablutions, flat and well-drained campsites and shade persuade visitors to use a designated area rather than the immediate surroundings [70]. Site selection is also important. Marion and Farrell [63] found that hillside campsites contained usage well and that the steep off-site topography was more effective than management regulations or educational messages at containing usage on-site. Vegetation should not be excessively cleared as such an action is likely to adversely affect sought-after wildlife, such as birds [32]. Instead, small secluded camping or formal accommodation bays surrounded by vegetation could be provided contributing to privacy, and therefore, increasing the chance that solitude-seeking visitors share campgrounds.

3.3. Environmental Education Based on Visitor Impact Research

Environmental education has many values, including a greater appreciation of wildlife by the public, both intellectually and emotionally, and enhanced understanding of their ecological needs. It is also crucial for managing visitor impacts as it disseminates knowledge acquired in visitor impact research and can inform visitors (or tourism operators and other stakeholders) about (1) the range of impacts of their own actions, (2) alternative low-impact behavior, (3) the compatibility of low-impact behavior and satisfying viewing experiences, (4) the reasons for particular management actions, and additionally (5) it can abate unnecessarily high visitor expectations. In a large protected area, where visitor compliance is virtually impossible to monitor, effective visitor education to stimulate self-restricted behavior is particularly important. Alcock [79] even emphasized that education is the most important wildlife management strategy because it decreases adverse visitor behavior, which often arises more from ignorance than deliberate destruction. Likewise, Hammitt and Cole [70] argued that, as long as impacts are not unavoidable (e.g., plant removal during the construction of infrastructure), education can alleviate many problems otherwise caused by illegal, careless, unskilled, and uninformed actions. Surprisingly, environmental education is a yet underutilized management strategy [80,81]. However, not all education initiatives are successful, and it takes some strategy to increase their success. Orams [82] (p. 295), for instance, tested the effectiveness of an education program for managing tourists at an Australian holiday resort where visitors can interact with wild dolphins. His findings suggest that certain education strategies are particularly powerful. In contrast, Stamation and colleagues [3] found education in whale-watching experiences, although well-intentioned, had little long-term effect in securing knowledge and conservation outcomes. A crucial component of the program is to describe the specific environmental problems/issues that are relevant to the particular tourism experience and then suggest simple solutions and actions for each visitor to take against these problems.

However, even though tourists have the cognitive ability to notice and distinguish their impacts [83], they are often not aware how strongly their activities affect wildlife and their habitat, and so greatly underestimate their own impact [84]. There is also a clear subjectivity as to what type of impacts are (or are not) noticed. Studies on human perception of the environment have revealed that the ability to notice 'wear-and-tear' impacts is less developed than the sensitivity to impacts resulting from overt pollution (litter, human waste) and vandalism [85].

If people understood what impact they have on wildlife in the short- and long-term, then many of them may be more likely to comply with low-impact behavior; particularly if they are instructed on behavioral alternatives. Visitor surveys and observations of visitor behavior allow managers to personalize the educational message [6]. This is another crucial factor that increases the chance of successfully motivating environmentally responsible behavior [82].

Importantly, people need to be informed that their behavior also affects their own observation experience [86]. This may be the easiest way to encourage visitor compliance. Research can give clear indications on when, where and how to observe particular wildlife in order to be less intrusive as compared to alternative techniques. When wildlife is less disturbed, they normally allow for closer and longer-lasting observations that are more rewarding to the tourist [87,88].

Even though visitors can be motivated to behave in a self-responsible manner, management actions may have to be taken at times. To increase support and understanding among the public, explanations should be given about the reasoning behind these actions because otherwise they may not be well perceived by visitors and contribute as much or more to their dissatisfaction than the degradation of resources. For instance, visitors that come to a National Park to enjoy the solitude and freedom, for which the region is marketed, may be disappointed to find out that they are not allowed to camp wherever they like or use resources, such as firewood. This may frustrate them more than, say finding sites with weed invasion or erosion, that they potentially facilitate. If reasons are not provided, instructions not to feed wildlife may be perceived by visitors as unimportant or as authorities being mean spirited and restricting the pleasure of both visitor and animal. As a consequence, they may report to others that local park management is unnecessarily restrictive, simply because visitors are not informed about the reasons for the restrictions. For the same reason, they may also refuse to abide by park rules. Thus, land managers need to be aware that both the degradation of environmental conditions or actions taken against them can compromise the reciprocal relationship between visitors and their natural destinations [5].

Another means to increase visitor satisfaction is to manage unnecessarily high expectations. Like other customers, tourists have formed expectations about the wildlife they will see and the tour experience itself. These need to be met or exceeded for the contented customer to promote the product to others [89]. Alternatively, valid and convincing reasons need to be given for expectations not always being met (e.g., "less bird species will be seen in winter", or "to see species 'x' often requires long, quiet and patient searches at night or at dawn"). This requires strategic communication to convey, and if needed, to shift the perceptions of the benefits to be attained through a specific tourism experience [90].

3.4. Sustainable Tour Experiences

Probably the most important element of a successful environmental education program is to give visitors the opportunity to take actions 'on the spot' [82]. The participation in activities based on a framework, like that proposed for night-time observation tours in Wolf and Croft [54], allows visitors to act on the motivation created by the educational content of the tour experience. Further, whilst it is more difficult to animate visitors to adhere to a certain code of conduct when they visit natural areas or observe wildlife on their own, tour operators that provide specially designed low-impact wildlife tours have the opportunity to showcase low-impact behavior actively. The demand for these tours is substantial as travelers seek the assistance (e.g., expertise and safety) provided by tour operators and guides in their aspiration to view wildlife in their natural habitat. Thus, private landowners can also engage in low-impact tourism and offer guided 'eco'-tours.

Even though tour operators would likely benefit from the cooperation and knowledge of scientists in their desire to provide tours that are minimally intrusive to wildlife, few of them ask scientists for help. Rodger and colleagues [91], for instance, surveyed Australian wildlife tour operators in Tasmania, Western Australia and the Northern Territory to assess the importance of science in their business and found that few tour operators engage with scientists. Where scientists were involved, they mainly contributed general information and interpretation, but none of them conducted impact assessments of the actual wildlife viewing activities.

This review argues that there is a significant benefit from an interdisciplinary approach combining social and environmental science. Evidence can be gathered from tourists and the natural environment to reconcile any tension leading to adverse use. Sustainable tourism experiences require carefully designed experiments to guide tourism operators and site management in this direction (as recommended in a recent review of visitor attraction management [92]).

Thus, Wolf and Croft [54] used these methods to provide evidence on how wildlife tours/tour operators and participants can benefit from scientific assessments and how science can be advanced from research on wildlife tours. The study employed a three-tier approach to the tour design: (1) Initial input from tour operators/guides, (2) assessment of visitor needs via an interview-based questionnaire and (3) examination of the wildlife response to various observation conditions. The initial (informal) discussions with the tour operators/guides were essential in guiding the choice on the variants of the observed behavior to be tested. For instance, it was remarked upon that hiking experiences, and stationary observations at water tanks might be the best platform choices to view wildlife as they take visitors out of the car and into the environment. Further, one guide explained that he had trialed using a bat detector during his tours which apparently had captured considerable visitor interest. However, the detector had only been employed to make echolocation signals audible. This sparked the decision to exploit the potential of such a gadget more by using it for the identification of different species of bats, as well as the assessment of bat responses to different observation conditions. Finally, it became apparent that tour operators/guides were most concerned about the use of bright lights as they feared or had witnessed adverse responses of nocturnal wildlife to them. Consequently, an affordable non-intrusive alternative to conventional spotlights, namely the night-vision device, was researched in the study. The visitor survey, on the other hand, provided valuable insights on the desired qualities of the essential tour features, as well as features of the wildlife experience. This knowledge was used to evaluate the tour design from a tourist perspective (i.e., to maximize visitor satisfaction). Finally, the core of the study was the assessment of wildlife responses to different observation conditions. The knowledge acquired from this assessment was of most interest to the scientist (as cause-effect relationships were established), but also encompassed the main information for identifying low-impact, yet satisfying observation conditions. Thus, all the components of the study's methodology were crucial for the final recommendation of the tour design.

In conclusion, the benefits of this comprehensive approach are mutual. Tour operators that offer this kind of experience will likely achieve visitor satisfaction and protect the resources upon which their income depends. Also, tours that have been scientifically tested for adverse environmental effects and any such effects have been mitigated gain credibility as being a truly eco-friendly venture, which enhances their marketing potential. Visitors benefit from the enhancement of current viewing opportunities, protection of wildlife for future viewing and tour designs that cater to their needs. Scientists profit from research opportunities that advance knowledge in recreation ecology and tourism science. Finally, wildlife gains much-needed protection by means of an industry that strives to be sustainable.

4. Future Research Directions

Impacts of nature-based tourism activities are recognized, but may be poorly understood from both the perspective of the tour operator and the tourist. The land manager faces the challenge of promoting a satisfying experience, while mitigating (by prescription or action) environmental impacts and sustaining the environment for the protection that it is set aside for. Furthermore, they may need to satisfy inherent biases in the experiences that visitors seek, while managing for biodiversity rather than individual species. These are global issues, even if tourism pressure varies significantly between countries dependent on factors, such as climate, accessibility, infrastructure, cost, and political or social risk. We offer some direction for future research in the following.

(1) Research on visitor impacts on cryptic species, such as small reptiles [45], small ground-dwelling mammals or insects [93] is rewarding and important to the ecosystem as a whole, but they are not the primary focus of visitors to most natural destinations. In recreation ecology research there is a bias towards 'big' and attractive species, primarily mammals and birds, which receive much attention by tourists, and thus, have a great economic value to the tourism industry. The bias towards "valued ecosystem components" [94] or a general "taxonomic chauvinism" that may favor the publication of studies on 'popular' organisms [70] (p. 1) currently limits our understanding of the full scope of tourism impacts which likely extend to these other, neglected organisms. Ecotour operators may sometimes need reminding that minimizing a negative impact includes not only minimizing an impact on species of interest to tourists, but implies a responsibility towards the entire ecosystem.

(2) More knowledge needs to be gathered on the subtle, indirect and/or complex effects of tourism impacts. Impacts may be additive, or there may be synergistic effects of multiple types of disturbance [31] or tourism-induced changes in one ecosystem component cascade into other components (e.g., vegetation changes that impact on bird communities [32]).

(3) The gap between short-term physiological and behavioral effects manifested by wildlife encountered by tourists and the potential long-term effects for the individual, population and species needs to be bridged (e.g., increase prey vulnerability to predators [95], habituation [88]). There needs to be clarification on which short-term changes in wildlife in response to tourism activities are indeed a welfare concern [26], and more research into what short-term problems do actually lead to population decreases.

(4) Behavioral repertoires of visitors during wildlife encounters need to be researched and communalities exposed that are independent of the disturbance context. Therefore, the most common behavioral components of visitor behavior that occur in a particular situation (e.g., during encounters with free-ranging wildlife on travels in vehicles along roads, during encounters with habituated wildlife that may allow handfeeding, etc.) need to be identified. Then, the impacts of these behavioral variants on different wildlife species need to be assessed so that more widely applicable disturbance mechanisms can be postulated, and steps are taken to mitigate them where appropriate.

(5) More knowledge is needed on the factors that intervene in the relationship between visitor usage and the environmental response, such as the disturbance context. The wide range of tourism situations with their great variety of factors that potentially modulate the outcome of this relationship has been a great hurdle for recreation ecologists in finding general disturbance principles. Studies that focus on the disturbance context will be important. For instance, the same type of tourism disturbance could be tested under different environmental conditions. Research on the disturbance context has great potential to improve environmental education as it often allows managers to give recommendations on when and where to view attractions without causing much perturbation and achieving more satisfaction.

(6) A better understanding of the underlying reasons as to why a particular factor of the disturbance context (such as the species of the disturbed subject) modifies the usage-response relationship is essential. This, for instance, could help uncover mechanisms that drive sensitive species from impacted areas or attract others and therefore, allows predictions for a species with similar properties, even if its response has not been examined (bearing in mind that even closely related species may vary in their responses).

(7) Habituation of wildlife in relation to a disturbance context potentially mitigates impacts [88]. While tourists are watching wildlife, the wildlife is watching them. If the tourists behave in a consistent manner, then over time the wildlife may habituate to their presence. Even so, there may be physiological responses, such as increased heart rate, to the presence of tourists in the absence of overt changes in behavior [96]. To demonstrate how generalized the habituation may require experiments where variants in tourist behavior are simulated (e.g., size of the group approaching Australian sea lions [47]). Research to resolve the question if, when and why habituation to disturbance occurs (including why different species habituate more readily than others to human presence) advances knowledge on low-impact behavior, as well as basic behavioral ecology (e.g., optimal foraging theory, vigilance

behavior). This knowledge can help to predict which species are likely to be most sensitive to tourism in tourist destinations.

(8) The effectiveness of management interventions needs to be gauged (also in terms of visitor compliance) so land managers can make informed decisions on what the appropriate strategies/actions are in the respective situations. Further, the effectiveness of implementing multiple management actions simultaneously needs to be considered to resolve the question as to what combination gains the maximum effect.

(9) Further research on the follow-on effect of wildlife viewing, human wildlife interaction and visitor education is needed [3]. For example, is allowing some feeding or close approach to wildlife justified by, thus, enhancing the visitors' appreciation of the species and increasing the probability they will subsequently act more appropriately (e.g., do less harm by using less plastic) or support government conservation initiatives?

(10) Finally, as recreation ecology investigates the interface between tourists and the environment, research should focus on how to improve visitor experiences so that they marry sustainable resource usage with a sustainable (satisfying) visitor experience. Apart from the studies discussed here (e.g., References [52,54]), such research is largely lacking to date as a research gap analysis in recreational ecology has revealed [25]. For example, research can be directed to answer questions on optimal tour design, such as the best tour group size, the best frequency for repeating the tour at the same location without deterring wildlife, and necessary modifications depending on different tour group compositions (e.g., with clients of different age classes). The systematic collection of knowledge from experienced tour guides on how to behave during wildlife encounters could provide valuable complementary information in this sector of research.

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References

1. Higginbottom, K.; Northrope, C.; Green, R. *Status Assessment of Wildlife Tourism in Australia*; CRC for Sustainable Tourism: Gold Coast, Australia, 2001.
2. Steckenreuter, A.; Wolf, I.D. How to use persuasive communication to encourage visitors to pay park user fees. *Tour. Manag.* **2013**, *37*, 58–70. [CrossRef]
3. Stamation, K.; Croft, D.B.; Shaunhnessy, P.D.; Waples, K.A.; Briggs, S.V. Educational and conservational value of whale watching. *Tour. Mar. Environ.* **2007**, *4*, 41–55. [CrossRef]
4. Wolf, I.D.; Wohlfart, T. Walking, hiking and running in parks: A multidisciplinary assessment of health and well-being benefits. *Landsc. Urban Plan.* **2014**, *130*, 89–103. [CrossRef]
5. Wolf, I.D.; Ainsworth, G.B.; Crowley, J. Transformative travel as a sustainable market niche for protected areas: A new development, marketing and conservation model. *J. Sustain. Tour.* **2017**, *25*, 1650–1673. [CrossRef]
6. Wolf, I.D.; Stricker, H.K.; Hagenloh, G. Outcome-focused national park experience management: Transforming participants, promoting social well-being, and fostering place attachment. *J. Sustain. Tour.* **2014**, *23*, 358–381. [CrossRef]
7. Liddle, M. *Recreation Ecology: The Ecological Impact of Outdoor Recreation and Ecotourism*; Chapman and Hall: London, UK, 1997.
8. Newsome, D.; Dowling, R.K.; Moore, S.A. *Wildlife Tourism*; Channel View Publications: Clevedon, UK, 2005.
9. Green, R.; Higginbottom, K.B. *The Negative Effects of Wildlife Tourism on Wildlife*; CRC for Sustainable Tourism: Gold Coast, Australia, 2002; p. 205.

10. Steven, R.; Pickering, C.; Guy Castley, J. A review of the impacts of nature based recreation on birds. *J. Environ. Manag.* **2011**, *92*, 2287–2294. [CrossRef] [PubMed]
11. Budowski, G. Tourism and conservation: Conflict, coexistence or symbiosis. *Environ. Conserv.* **1976**, *3*, 27–31. [CrossRef]
12. Dearden, P.; Harron, S. Alternative Tourism and Adaptive Change. *Ann. Tour. Res.* **1994**, *21*, 81–102. [CrossRef]
13. Martin, B.S.; Uysal, M. An examination of the relationship between carrying capacity and the tourism lifecycle: Management and policy implications. *J. Environ. Manag.* **1990**, *31*, 327–333. [CrossRef]
14. Barros, A.; Monz, C.; Pickering, C. Is tourism damaging ecosystems in the Andes? Current knowledge and an agenda for future research. *AMBIO* **2015**, *44*, 82–98. [CrossRef]
15. Hughes, G. Environmental indicators. *Ann. Tour. Res.* **2002**, *29*, 457–477. [CrossRef]
16. McArthur, S.; Hall, C.M. *Heritage Management in Australia and New Zealand: The Human Dimension*; Oxford University Press: Melbourne, Australia, 1996.
17. Bartoletti, C.; Magro-Lindenkamp, T.C.; Sarriés, G.A. Adventure Races in Brazil: Do Stakeholders Take Conservation into Consideration? *Environments* **2019**, *6*, 77. [CrossRef]
18. Fennell, D.A. *Ecotourism*, 4th ed.; Routledge (Taylor & Francis Group): London, UK; New York, NY, USA, 2015.
19. Duffus, D.A.; Dearden, P. Non-consumptive wildlife-oriented recreation: A conceptual framework. *Biol. Conserv.* **1990**, *53*, 213–231. [CrossRef]
20. Lovelock, B. An introduction to consumptive wildlife tourism. In *Tourism and the Consumption of Wildlife: Hunting, Shooting and Sport Fishing*; Lovelock, B., Ed.; Routledge (Taylor & Francis Group): London, UK; New York, NY, USA, 2008; pp. 3–30.
21. Wearing, S.; McGehee, N.G. Volunteer tourism: A review. *Tour. Manag.* **2013**, *38*, 120–130. [CrossRef]
22. Burgin, S.; Hardiman, N. Effects of non-consumptive wildlife-oriented tourism on marine species and prospects for their sustainable management. *J. Environ. Manag.* **2015**, *151*, 210–220. [CrossRef] [PubMed]
23. Kling, K.G.; Fredman, P.; Wall-Reinius, S. Trails for tourism and outdoor recreation: A systematic literature review. *Tourism* **2017**, *65*, 488–508.
24. Pickering, C.; Rossi, S.D.; Hernando, A.; Barros, A. Current knowledge and future research directions for the monitoring and management of visitors in recreational and protected areas. *J. Outdoor Recreat. Tour.* **2018**, *21*, 10–18. [CrossRef]
25. Sumanapala, D.; Wolf, I.D. Recreational ecology: A review of research and gap analysis. *Environments* **2019**, *6*, 81. [CrossRef]
26. Bateman, P.W.; Fleming, P.A. Are negative effects of tourist activities on wildlife over-reported? A review of assessment methods and empirical results. *Biol. Conserv.* **2017**, *211*, 10–19. [CrossRef]
27. Buckley, R. Using ecological impact measurements to design visitor management. In *Environmental Impacts of Ecotourism*; Buckley, R., Ed.; CABI Publishing: Cambridge, UK, 2004; pp. 287–289.
28. Ramaweerage, E.; Ranjeewa, A.D.G.; Sugimoto, K. Tourism-induced disturbance of wildlife in protected areas. A case study of free ranging elephants in Sri Lanka. *Glob. Ecol. Conserv.* **2015**, *4*, 625–631. [CrossRef]
29. Hill, R.; Pickering, C. Differences in resistance of three subtropical vegetation types to experimental trampling. *J. Environ. Manag.* **2009**, *90*, 1305–1312. [CrossRef] [PubMed]
30. Wolf, I.D.; Hagenloh, G.; Croft, D.B. Visitor monitoring along roads and hiking trails: How to determine usage levels in tourist sites. *Tour. Manag.* **2012**, *33*, 16–28. [CrossRef]
31. Wolf, I.D.; Croft, D.B. Impacts of tourism hotspots on vegetation communities show a higher potential for self-propagation along roads than hiking trails. *J. Environ. Manag.* **2014**, *143*, 173–185. [CrossRef] [PubMed]
32. Wolf, I.D.; Hagenloh, G.; Croft, D.B. Vegetation moderates impacts of tourism usage on bird communities along roads and hiking trails. *J. Environ. Manag.* **2013**, *129*, 224–234. [CrossRef] [PubMed]
33. Cole, D.N. Impacts of hiking and camping on soils and vegetation: A review. In *Environmental Impacts of Ecotourism*; Buckley, R., Ed.; CABI Publishing: New York, NY, USA, 2004; pp. 41–60.
34. Marion, J.L.; Cole, D.N. Spatial and temporal variation in soil and vegetation impacts on campsites. *Ecol. Appl.* **1996**, *6*, 520–530. [CrossRef]
35. Growcock, A.J.W. Impacts of Camping and Trampling on Australian Alpine and Subalpine Vegetation and Soils. Ph.D. Thesis, Griffith University, Gold Coast, Australia, 2005.
36. Monz, C.A. The response of two arctic tundra plant communities to human trampling disturbance. *J. Environ. Manag.* **2002**, *64*, 207–217. [CrossRef]

37. Whinam, J.; Chilcott, N. Impacts after four years of experimental trampling on alpine/sub-alpine environments in western Tasmania. *J. Environ. Manag.* **2003**, *67*, 339–351. [CrossRef]
38. Monz, C.A.; Pickering, C.M.; Hadwen, W.L. Recent advances in recreation ecology and the implications of different relationships between recreation use and ecological impacts. *Front. Ecol. Environ.* **2013**, *11*, 441–446. [CrossRef]
39. Cole, D.; Bayfield, N. Recreational trampling of vegetation: Standard experimental procedures. *Biol. Conserv.* **1993**, *63*, 209–215. [CrossRef]
40. Higham, J.E.S. Tourists and albatrosses: The dynamics of tourism at the Northern Royal Albatross colony, Taiaroa Head, New Zealand. *Tour. Manag.* **1998**, *19*, 521–531. [CrossRef]
41. Norman, P.; Pickering, C.M. Using volunteered geographic information to assess park visitation: Comparing three on-line platforms. *Appl. Geogr.* **2017**, *89*, 163–172. [CrossRef]
42. Wolf, I.D.; Wohlfart, T.; Brown, G.; Bartolomé Lasa, A. The use of public participation GIS (PPGIS) for park visitor management: A case study of mountain biking. *Tour. Manag.* **2015**, *51*, 112–130. [CrossRef]
43. Wolf, I.D.; Brown, G.; Wohlfart, T. Applying public participation GIS (PPGIS) to inform and manage visitor conflict along multi-use trails. *J. Sustain. Tour.* **2017**, *26*, 470–495. [CrossRef]
44. Barros, A.; Pickering, C.M. Impacts of experimental trampling by hikers and pack animals on a high-altitude alpine sedge meadow in the Andes. *Plant Ecol. Divers.* **2015**, *8*, 265–276. [CrossRef]
45. Samia, D.S.; Blumstein, D.T.; Stankowich, T.; Cooper, W.E., Jr. Fifty years of chasing lizards: New insights advance optimal escape theory. *Biol. Rev. Camb. Philos. Soc.* **2016**, *91*, 349–366. [CrossRef]
46. Guay, P.J.; van Dongen, W.F.; Robinson, R.W.; Blumstein, D.T.; Weston, M.A. AvianBuffer: An interactive tool for characterising and managing wildlife fear responses. *AMBIO* **2016**, *45*, 841–851. [CrossRef] [PubMed]
47. Lovasz, T.; Croft, D.B.; Banks, P.B. Establishing tourism guidelines for viewing Australian Sea Lions *Neophoca cinerea* at Seal Bay Conservation Park, South Australia. In *Too Close for Comfort: Contentious Issues in Human-Wildlife Encounters*; Lunney, D., Munn, A.J., Meikle, W., Eds.; Royal Zoological Society of New South Wales: Mosman, Sydney, 2008; pp. 225–232.
48. Stamation, K.A.; Croft, D.B.; Shaughnessy, P.D.; Waples, K.A.; Briggs, S.V. Behavioral responses of humpback whales (*Megaptera novaeangliae*) to whale-watching vessels on the southeastern coast of Australia. *Mar. Mammal Res.* **2010**, *26*, 98–122. [CrossRef]
49. Gill, J.A.; Sutherland, W.J. Predicting the consequences of human disturbance from behavioural decisions. In *Behaviour and Conservation*; Gosling, L.M., Sutherland, W.J., Eds.; Cambridge University Press: Cambridge, UK, 2000; Volume 450, pp. 51–64.
50. Green, R.; Giese, M. Negative effects of wildlife tourism on wildlife. In *Wildlife Tourism: Impacts, Management and Planning*; Higginbottom, K., Ed.; Sustainable Tourism Cooperative Research Centre: Gold Coast, Australia, 2004; pp. 81–98.
51. Giese, M. Effects of human activity on Adélie Penguin *Pygoscelis adeliae* breeding success. *Biol. Conserv.* **1996**, *75*, 157–164. [CrossRef]
52. Wolf, I.D.; Croft, D.B. Minimizing disturbance to wildlife by tourists approaching on foot or in a car: A study of kangaroos in the Australian rangelands. *Appl. Anim. Behav. Sci.* **2010**, *126*, 75–84. [CrossRef]
53. Taylor, A.R.; Knight, R.L. Behavioral responses of wildlife to human activity: Terminology and methods. *Wildl. Soc. Bull.* **2003**, *31*, 1263–1271.
54. Wolf, I.D.; Croft, D.B. Observation techniques that minimize impacts on wildlife and maximize visitor satisfaction in night-time tours. *Tour. Manag. Perspect.* **2012**, *4*, 164–175. [CrossRef]
55. Steidl, R.J.; Anthony, R.G. Responses of Bald Eagles to human activity during the summer in interior Alaska. *Ecol. Appl.* **1996**, *6*, 482–491. [CrossRef]
56. Pickering, C.M.; Barros, A. Using functional traits to assess the resistance of subalpine grassland to trampling by mountain biking and hiking. *J. Environ. Manag.* **2015**, *164*, 129–136. [CrossRef] [PubMed]
57. Austin, M.C.; Ramp, D. Behavioural Plasticity by Eastern Grey Kangaroos in Response to Human Behaviour. *Animals* **2019**, *9*, 244. [CrossRef] [PubMed]
58. Pavey, C.R.; Nano, C.E.M. Bird assemblages of arid Australia: Vegetation patterns have a greater effect than disturbance and resource pulses. *J. Arid Environ.* **2009**, *73*, 634–642. [CrossRef]
59. Quinn, G.P.; Keough, M.J. *Experimental Design and Data Analysis for Biologists*, 3rd ed.; Cambridge University Press: Cambridge, UK, 2004.

60. Ballantyne, M.; Pickering, C.M. Differences in the impacts of formal and informal recreational trails on urban forest loss and tree structure. *J. Envrion. Manag.* **2015**, *159*, 94–105. [CrossRef]
61. Pickering, C.M.; Hill, W.; Newsome, D.; Leung, Y.-F. Comparing hiking, mountain biking and horse riding impacts on vegetation and soils in Australia and the United States of America. *J. Environ. Manag.* **2010**, *91*, 551–562. [CrossRef]
62. Pickering, C.M.; Growcock, A.J. Impacts of experimental trampling on tall alpine herbfields and subalpine grasslands in the Australian Alps. *J. Environ. Manag.* **2009**, *91*, 532–540. [CrossRef] [PubMed]
63. Marion, J.L.; Farrell, T.A. Management practices that concentrate visitor activities: Camping impact management at Isle Royale National Park, USA. *J. Environ. Manag.* **2002**, *66*, 201–212. [CrossRef]
64. Leung, Y.-F.; Marion, J.L. Spatial strategies for managing visitor impacts in National Parks. *J. Park Recreat. Adm.* **1999**, *17*, 20–38.
65. Lee, E.; Croft, D.B.; Achiron-Frumkin, A. Roads in arid lands: Issue, challenges and potential solutions. In *Handbook of Road Ecology*; Van de Ree, R., Smith, D.J., Grilo, C., Eds.; John Wiley & Sons Ltd.: London, UK, 2015; pp. 382–390.
66. Ramp, D.; Caldwell, J.; Edwards, K.; Warton, D.; Croft, D.B. Modelling of widlife fatality hotspots along the Snowy Mountains highway in New South Wales, Australia. *Biol. Conserv.* **2005**, *126*, 474–490. [CrossRef]
67. Ramp, D.; Wilson, V.K.; Croft, D.B. Assessing the impacts of roads in peri-urban reserves: Road-based fatalities and road usage by wildlife in the Royal National Park, New South Wales, Australia. *Biol. Conserv.* **2006**, *129*, 348–359. [CrossRef]
68. Ramp, D.; Wilson, V.K.; Croft, D.B. Contradiction and Complacency Shape Attitudes towards the Toll of Roads on Wildlife. *Animals (Basel)* **2016**, *6*, 40. [CrossRef] [PubMed]
69. Ballantyne, M.; Treby, D.L.; Quarmby, J.; Pickering, C.M. Comparing the impacts of different types of recreational trails on grey box grassy-woodland vegetation: Lessons for conservation and management. *Aust. J. Bot.* **2016**, *64*, 246–259. [CrossRef]
70. Hammitt, W.E.; Cole, D.N. *Wildland Recreation: Ecology and Management*, 2nd ed.; John Wiley and Sons: New York, NY, USA, 1998.
71. Driml, S.; Common, M. Ecological economics criteria for sustainable tourism: Application to the Great Barrier Reef and Wet Tropics world heritage areas, Australia. *J. Sustain. Tour.* **1996**, *4*, 3–16. [CrossRef]
72. Barros, A.; Marina Pickering, C. How Networks of Informal Trails Cause Landscape Level Damage to Vegetation. *Environ. Manag.* **2017**, *60*, 57–68. [CrossRef]
73. Ballantyne, M.; Pickering, C.M. The impacts of trail infrastructure on vegetation and soils: Current literature and future directions. *J. Environ. Manag.* **2015**, *164*, 53–64. [CrossRef] [PubMed]
74. Marion, J.L.; Leung, Y.-F. Environmentally sustainable trail management. In *Environmental Impacts of Ecotourism*; Buckley, R., Ed.; CABI Publishing: Cambridge, UK, 2004; pp. 229–243.
75. Monz, C. *Recreation Resource Assessment and Monitoring Techniques: Examples from the Rocky Mountains, USA*; NOLS Research Program Annual Report October 1999; NOLS Research: Leander Wyoming, USA, 1999; pp. 10–18.
76. Ware, H.E.; McClure, C.J.W.; Carlisle, J.D.; Barber, J.R. Traffic noise is a source of habitat degradation. *Proc. Natl. Acad. Sci. USA* **2015**, *112*, 12105–12109. [CrossRef]
77. Pearce-Higgins, J.W.; Yalden, D.W. The effect of resurfacing the Pennine Way on recreational use of blanket bog in the Peak District National Park, England. *Biol. Conserv.* **1997**, *82*, 337–343. [CrossRef]
78. Pearce-Higgins, J.W.; Finney, S.K.; Yalden, D.W.; Langston, R.H.W. Testing the effects of recreational disturbance on two upland breeding waders. *IBIS* **2007**, *149*, 45–55. [CrossRef]
79. Alcock, D. Education and extension: Management's best strategy. *Aust. Parks Recreat.* **1991**, *27*, 15–17.
80. Orams, M.B. A conceptual model of tourist-wildlife interaction: The case for education as a management strategy. *Aust. Geogr.* **1996**, *27*, 39–51. [CrossRef]
81. Orams, M.B. Using interpretation to manage nature-based tourism. *J. Sustain. Tour.* **1996**, *4*, 81–94. [CrossRef]
82. Orams, M.B. The effectiveness of environmental education: Can we turn tourists into 'greenies'? *Int. J. Tour. Res.* **1997**, *3*, 295–306. [CrossRef]
83. Hillery, M.; Nancarrow, B.; Griffin, G.; Syme, G. Tourist perception of environmental impact. *Ann. Tour. Res.* **2001**, *28*, 853–867. [CrossRef]
84. Taylor, A.R.; Knight, R.L. Wildlife responses to recreation and associated visitor perceptions. *Ecol. Appl.* **2003**, *13*, 951–963. [CrossRef]

85. Marion, J.L.; Lime, D.W. Recreational resource impacts: Visitor perceptions and management responses. In *Wilderness and Natural Areas in the Eastern United States: A Management Challenge*; Kulhavy, D.L., Conner, R.N., Eds.; Austin State University Center for Applied Studies: Austin, TX, USA, 1986; pp. 229–235.
86. Tablado, Z.; D'Amico, M. Impacts of Terrestrial Animal Tourism. In *Ecotourism's Promise and Peril: A Biological Evaluation*; Blumstein, D.T., Geffroy, B., Samia, D.S.M., Bessa, E., Eds.; Springer International Publishing: Cham, Switzerland, 2017; pp. 97–115.
87. Blumstein, D.T.; Anthony, L.L.; Harcourt, R.; Ross, G. Testing a key assumption of wildlife buffer zones: Is flight initiation distance a species-specific trait? *Biol. Conserv.* **2003**, *110*, 97–100. [CrossRef]
88. Samia, D.S.; Nakagawa, S.; Nomura, F.; Rangel, T.F.; Blumstein, D.T. Increased tolerance to humans among disturbed wildlife. *Nat. Commun.* **2015**, *6*, 8877. [CrossRef] [PubMed]
89. Söderlund, M. Customer satisfaction and its consequences on customer behaviour revisited. *Int. J. Serv. Ind. Manag.* **1998**, *9*, 169–188. [CrossRef]
90. Weiler, B.; Moyle, B.D.; Wolf, I.D.; de Bie, K.; Torland, M. Assessing the Efficacy of Communication Interventions for Shifting Public Perceptions of Park Benefits. *J. Travel Res.* **2016**, *56*, 468–481. [CrossRef]
91. Rodger, K.; Moore, S.A.; Newsome, D. Wildlife tours in Australia: Characteristics, the place of science and sustainable futures. *J. Sustain. Tour.* **2007**, *15*, 160–179. [CrossRef]
92. Leask, A. Visitor attraction management: A critical review of research 2009–2014. *Tour. Manag.* **2016**, *57*, 334–361. [CrossRef]
93. Ciach, M.; Maślanka, B.; Krzus, A.; Wojas, T. Watch your step: Insect mortality on hiking trails. *Insect Conserv. Divers.* **2017**, *10*, 129–140. [CrossRef]
94. Ward, T.J.; Jacoby, C.A. A strategy for assessment and management of marine ecosystems in Jervis Bay, a temperate Australian embayment. *Mar. Pollut. Bull.* **1992**, *25*, 163–171. [CrossRef]
95. Geffroy, B.; Samia, D.S.M.; Bessa, E.; Blumstein, D.T. How Nature-Based Tourism Might Increase Prey Vulnerability to Predators. *Trends Ecol. Evol.* **2015**, *30*, 755–765. [CrossRef] [PubMed]
96. Ellenberg, U.; Mattern, T.; Seddon, P.J.; Jorquera, G.L. Physiological and reproductive consequences of human disturbance in Humbolt penguins: The need for species=specific visitor management. *Biol. Conserv.* **2006**, *133*, 95–106. [CrossRef]