

Економічні науки

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**SUSTAINABLE TOURISM IN U.S. NATIONAL PARKS AND
WILDLIFE AREAS: MANAGEMENT APPROACHES TO
REGULATING VISITOR PRESSURE AND PRESERVING
ECOSYSTEMS**

***Summary.** Every year, more than 300 million people visit U.S. national parks. Managing such large numbers of visitors without harming the environment requires specific solutions, and over the past century, these solutions have been compiled into a body of documented best practices. This article examines which approaches have proven effective, where unexpected consequences have arisen and what practical lessons can be learned from this experience by managers of protected areas. The role of travel agencies is also considered: data from three independent Ukrainian agencies showed a reduction in the number of incidents during trips of between 47% and 58% following the introduction of mandatory pre-departure briefings for clients. The article concludes that a combination of regulatory, educational and technological measures, aligned with continuous monitoring of the actual state of ecosystems, is key. The pre-departure preparation methodology developed by the author, formalized as the CXC-360 Visitor Preparation Framework, represents a scalable model applicable beyond the Ukrainian context.*

Key words: *sustainable tourism, U.S. national parks, visitor management, limits of acceptable change, environmental impact of tourism, pre-departure training for tourists, National Park Service.*

Introduction. The National Park Service Act, passed in the United States in 1916, assigned two fundamentally contradictory tasks to the newly created agency: preserving nature and cultural sites in their pristine state for future generations while ensuring they are accessible for the current generation to enjoy [1]. Over ninety years later, this contradiction has evolved from a rhetorical issue into a practical one. In 2024, the U.S. National Park System recorded 331.9 million recreation visits across all units. For comparison, this figure crossed the 300 million mark for the first time in 2015, and the slump caused by the pandemic in 2020–21 was followed by a sharp surge in demand after the pandemic, which outstripped the parks' ability to prepare for it [3; 18].

Park managers found themselves in a situation where traditional approaches were no longer sufficient. Parking lots in Arches were overflowing by 6 a.m., traffic jams formed in Zion's canyon, and in Yellowstone, tourists were entering geyser areas just to take selfies. Meanwhile, the National Park Service budget remained relatively stable, while staff numbers were being cut [18]. The problem lay not only in the number of visitors, but also in exactly where they were and how they behaved.

The National Park Service has accumulated more than a century of experience managing nature conservation areas in diverse climatic conditions. Several methodological approaches developed within this system have gained international recognition. The documentation of decisions made and their consequences makes American parks a convenient subject for comparative study: it is possible to compare which measures yielded the expected results and which required revision.

In this article, the author – drawing on practical experience in Ukraine's tourism industry – compares visitor management approaches used in U.S. national parks, evaluates their effectiveness, and assesses their suitability for sustainable park development.

This article examines the environmental impact of tourism on natural ecosystems, the management tools employed in response and their effectiveness. It also considers the impact of technology and educational programmes on visitor behaviour, and explores long-term strategies for conserving natural areas in the face of increasing demand.

Literature review. Research on the impact of tourism on natural ecosystems has been developing since at least the 1960s. The starting point for academic discussion was Wagar's work [5], in which he proposed the concept of the recreational carrying capacity of natural areas and defined it as the maximum number of visitors at which an ecosystem is capable of maintaining its functions. This approach has found widespread practical application, but criticism of it has proven well-founded. In a comprehensive review of recreational studies, Manning noted that carrying capacity depends on too many variables: type of activity, duration of stay, specific ecotope, and season [6]. The same number of people has a different impact depending on whether they walk along a paved path to an observation deck or a narrow trail through an alpine meadow.

In 1985, Stankey and colleagues developed the concept of acceptable change limits as a response to the limitations of numerical quotas [7]. A key shift in the concept is that management focus shifts from visitor numbers to the condition of the natural resource itself. The system requires the identification of measurable ecosystem condition indicators and threshold values for each. When an indicator value approaches the threshold, managers take action. Importantly, the set of measures is considered more broadly than simply reducing visitor numbers: opportunities for redistributing visitor flows or improving infrastructure are evaluated first.

Eagles, McCool, and Haynes systematized the principles of sustainable tourism planning in protected areas in the guidelines of the International Union for Conservation of Nature [8]. They emphasize that management decisions must be based on continuous environmental monitoring and take into account the views of local communities. Newsome, Moore, and Dowling summarized data on the mechanisms of tourism's direct physical impact on nature: soil compaction, erosion processes, and changes in vegetation cover [9]. Their analysis showed that the recovery of degraded areas in the alpine zone after the cessation of pressure takes 10 to 30 years, whereas degradation occurs much more rapidly.

Larson and colleagues conducted a systematic review of studies on the impact of recreational pressure on wildlife and found that this impact is more widespread and manifests at lower pressure levels than is commonly believed [12]. Predator populations living near tourist routes are observed to avoid sites optimal for foraging and shift their daily activity to nighttime, which affects the animals' energy balance and, in the long term, reproduction.

Ballantyne and Packer's study examines the relationship between tourists' ecological knowledge and their actual behavior [14]. The authors found that educational programs at visitor centers significantly increase awareness, but this proves insufficient to change behavior. Behavioral changes are more sustainable where infrastructure physically guides tourists in the right direction. This pattern is also confirmed in studies of environmental psychology, where it is described as the gap between intentions and actions in the absence of strong external reinforcement.

In 2023, Miller and colleagues conducted a systematic review of studies on visitor management in national parks [19]. According to their findings, mandatory advance reservation systems are most effective at mitigating peak visitor loads. At the same time, their implementation raises questions of equitable access: tourists without stable internet or the ability to plan a trip several months in advance find it harder to visit the park. Cerveny and colleagues described in

2022 that park managers viewed the post-pandemic surge in visitation as a qualitatively new challenge [18]. The chaotic influx of visitors in 2021–2022 was difficult to predict using standard forecasting methods, so traditional tools could not respond quickly enough.

Materials and methods. A variety of methods were employed in the study, including the analysis of scientific publications and regulatory documents from the National Park Service and the International Union for the Conservation of Nature, as well as a qualitative case-based analysis, in which documented management outcomes serve as empirical evidence for evaluating the applicability of theoretical frameworks. Publications were selected based on peer review status and chronological coverage. Priority was given to sources published after 2015, with earlier works included only when they form the basis for later research.

To illustrate theoretical propositions, specific management cases were examined based on documented results: These included Zion (transportation regulation), Arches and Mammoth Cave (advance reservations), Grand Canyon (overnight stay quotas in inner zones) and Olympic (wilderness management), as well as international examples. Cases were selected based on the availability of published or officially documented results. They are used as illustrative examples rather than units of statistical analysis [4]. Conclusions are drawn by identifying patterns and recurring outcomes across cases, rather than through statistical generalisation.

To assess the role of travel agencies, the practices of three independent Ukrainian travel companies that implemented a system of mandatory pre-departure briefings for clients were analysed. Data were obtained from operational reports and letters of support from the managers of these companies, which covered comparable seasonal periods before and after the system's implementation.

Results and discussion

1. The impact of tourist pressure on natural ecosystems. The physical impact of mass tourism on natural ecosystems has been well-documented in scientific literature.

Soil compaction caused by pedestrian traffic is one of the most well-documented processes. In Yosemite National Park, soil density on high-traffic trails increases 2–4 times compared to adjacent undisturbed areas: the soil loses its porosity and water permeability, plant root systems receive less oxygen, and surface runoff intensifies, accelerating erosion [9]. Relict alpine meadows in Rocky Mountain National Park proved particularly vulnerable: researchers observed signs of vegetation degradation in areas where hikers strayed just 2–3 meters from marked trails. Restoration of such areas without active management intervention takes 10 to 30 years, depending on the elevation zone and soil type [9].

Water bodies are subject to two types of pollution. Biological pollution stems from human waste and food scraps left near tourist campsites. In Glacier and Rocky Mountain National Parks, elevated levels of nitrates and phosphates have been recorded in small lakes located near popular camping sites: this stimulates the growth of cyanobacteria and reduces water clarity [17]. Chemical pollution is linked to ingredients in sunscreen and insect repellents that wash into the water while swimming.

The impact of tourist presence on wildlife is more complex than direct disturbance or feeding. Larson and colleagues documented that large predator in Yellowstone reduce their use of areas with high tourist traffic even when those areas are optimal in terms of food availability [12]. Constant contact with humans raises cortisol levels and increases metabolic costs associated with stress responses, which affects the survival of young animals and the overall health of the population. Animals that have become accustomed to feeding from tourists' hands or from trash sites pose a separate problem: changes in feeding behavior

are irreversible, and such animals are generally subject to removal from their natural habitat.

The spread of alien plant species occurs through the transport of seeds on the soles of shoes, in tire treads, and in the folds of hiking gear. Once introduced into the natural environment, alien plants often displace native species, forming monodominant communities that are less suitable for the native fauna. The National Park Service has included invasive species in its list of the five main threats to the parks' natural resources [13]. To limit seed transport, some parks have implemented shoe inspections and footbaths to clean soles at the entrance to particularly vulnerable areas. These interconnected impacts - physical, biological, and behavioural – confirm that visitor pressure cannot be managed through any single mechanism alone.

2. From population limits to resource condition management.

Management methodologies in the field of natural park conservation have undergone a significant evolution over the past forty years.

Early approaches boiled down to setting maximum daily or seasonal visitor limits. Manning demonstrated that this approach is based on a false assumption: that the impact of tourist pressure is proportional to the number of people, regardless of all other conditions [6]. In reality, the decisive factors are the distribution of visitor flow in space and time, the type of visitor activity, the condition of the ecosystem during a specific season, and the behavioral characteristics of the tourists themselves.

The concept of thresholds for acceptable change, proposed by Stankey and colleagues [7] and officially adopted by the National Park Service, addresses this problem by refocusing monitoring. Managers no longer ask "how many people can be allowed in?" but instead track a set of indicators of the natural resource's condition. A threshold value is set for each indicator. Examples of such indicators include: the percentage of areas with damaged vegetation along a specific trail, water turbidity in selected mountain lakes, the width of off-trail trampling zones

near overnight campsites, and the frequency of unauthorized campfires. Reaching the threshold value triggers a review of management measures. The first consideration is the redistribution of visitor flows and infrastructure improvements. Quantitative visitor limits remain a last resort, not the first response to deteriorating indicators.

In the practice of the National Park Service, this concept is integrated into master management plans. Each park area has its own set of performance indicators corresponding to its recreational use. The thresholds are higher for areas with developed infrastructure as they are designed to accommodate large groups of visitors. In contrast, the thresholds for wilderness areas are lower, and exceeding them may result in restrictions on the number of permits issued or the closure of a specific section. This division enables mass tourist flows to be concentrated in more resilient areas, thereby protecting vulnerable sections from excessive pressure.

3. Regulatory and infrastructure tools for managing visitor numbers.

The National Park Service employs a wide range of specific management strategies.

Mandatory advance reservation systems with time slots have proven to be an effective tool for parks with significant access bottlenecks. After mandatory reservations were introduced at Arches (2021), the parking lot stopped filling up before the start of the main tourist day. The federal platform Recreation.gov processed over 10 million reservations in 2022 [2]. Miller and colleagues note that this tool is both the most effective and the most controversial: it puts visitors without stable internet access and those whose travel style involves spontaneous decisions at a disadvantage [19].

The mandatory shuttle system at Zion is the most frequently cited example of transportation-based visitor management. Since 2000, tourists have been required to leave their cars at the canyon entrance during the tourist season and use a free shuttle. The number of private cars in the canyon has decreased by

90%, dust and noise levels on the trails have dropped, and parking lines have disappeared [8]. At the same time, tourist satisfaction has increased: without the need to search for parking and without car traffic on the roads, the walking experience in the park has improved significantly. The system now transports over 5 million passengers per year. This demonstrates that infrastructure-based behavioural nudges can achieve compliance levels that voluntary guidelines rarely reach.

In the Grand Canyon, overnight stays in the park’s interior zones are allocated through a permit system distributed via a lottery four months in advance. The number of permits is set separately for each route and corresponds to the estimated carrying capacity of that area’s ecosystem. Demand exceeds supply by a factor of ten: obtaining a permit for popular routes along the canyon is a task for which some tourists plan their trip a year or two in advance. The Park service views this level of demand as evidence of the experience’s value, rather than a problem to be solved by increasing the quota. The tenfold excess of demand over supply suggests that perceived scarcity itself becomes part of the value proposition, without undermining conservation goals.

Zoning with differentiated access regimes is applied in most large parks. Areas with developed tourist infrastructure accommodate the main flow of visitors and are designed for paved trails, overlooks, and visitor centers. There are specific rules for wildlife zones, including mandatory permits for overnight stays, a ban on campfires, a requirement to use bear-proof food containers and restrictions on access to certain areas during specific seasons. Strictly protected zones are closed to visitors and reserved for research and park staff. In Yellowstone and Grand Teton, their boundaries are defined in management plans and updated as new data becomes available.

Table 1 illustrates the main regulatory and infrastructure tools used by the U.S. National Park Service to manage visitor numbers, as well as their mechanisms of implementation and observed effects.

Table 1

**Key regulatory and infrastructure tools for managing visitor numbers in
U.S. national parks**

Tool	Implementation Example	Mechanism	Observed Effect	Limitations
Advance reservation system (timed entry)	Arches National Park	Visitors book entry time slots in advance via a centralized platform	Reduces peak congestion; prevents early-day parking overflow	Limits access for spontaneous visitors; dependent on internet access
Shuttle-based access restriction	Zion National Park	Private vehicle access restricted; visitors use mandatory shuttle	Up to 90% reduction in private cars; improved air quality and visitor experience	Reduced flexibility; dependence on transport schedule
Permit system with quota and lottery	Grand Canyon National Park	Limited permits allocated per route based on carrying capacity, often via lottery	Protects sensitive ecosystems; controls overnight use intensity	High competition; long-term trip planning required
Zoning with differentiated access regimes	Yellowstone National Park / Grand Teton National Park	Spatial separation of high-use, restricted, and protected areas	Concentrates impact in resilient zones; preserves sensitive habitats	Requires continuous monitoring and enforcement
Seasonal and temporary closures	Joshua Tree National Park / Shenandoah National Park	Temporary restrictions during nesting or recovery periods	Low-cost, targeted protection of vulnerable ecosystems	May reduce visitor access unpredictably

Taken together, these cases illustrate that no single tool is universally effective: success depends on the specific bottleneck – whether access, behaviour, or spatial distribution and the infrastructure available to address it.

Seasonal closures of specific areas during the nesting season or vegetation recovery period are a relatively low-cost and targeted tool. Joshua Tree and Shenandoah National Parks implement such temporary restrictions annually, with

the list of areas and closure dates adjusted based on field monitoring data from the current season.

4. Minimizing impact at the visitor behavior level. Regulating the number and distribution of tourists solves only part of the problem. The impact also depends on how each individual behaves.

The "Leave No Trace" principles of responsible behavior in nature were developed by the nonprofit organization LNT Center for Outdoor Ethics and adopted by the National Park Service as a standard. The seven principles cover preparation for outdoor excursions, trail etiquette, waste management, safe use of fire, and interaction with wildlife. The principles are designed for a broad audience: they can be explained in a few minutes to any tourist, regardless of their level of preparation [10].

The physical design of trails and rest areas directly shapes the tourist's route. Boardwalks in wet areas keep people on a narrow path and protect the surrounding soil. A well-marked trail with a clear surface reduces the temptation to seek a shortcut through untouched areas. Signs explaining why a certain area is closed and what happens to the vegetation when it is trampled provide a specific reason, rather than just a demand. Such an environment reduces the number of violations more effectively than general calls to follow the rules.

Restoring degraded areas is part of the National Park Service's documented restoration mandate (NPS Management Policies, 2006). Unauthorized trails are closed, native plant species are planted in eroded areas, and areas undergoing restoration are temporarily fenced off. Olympic National Park restored several areas along the Pacific coast in the 2010s after clearing illegal camps. Vegetation cover recovered in about three years, which is a relatively rapid result for coastal ecosystems.

"Dark Sky" programs are a distinct example of how limiting one type of human impact can enhance tourism appeal. Artificial lighting disrupts the navigation of nocturnal insects and birds, disorients sea turtles, and alters the

behavior of many mammals [12]. Capitol Reef National Park in Utah, for instance, achieved certification in 2023 following the installation of warm-spectrum LED fixtures, and reported a 40% reduction in measured light pollution levels.

5. Tourist education: where the gap between knowledge and behavior arises. The educational impact on tourists is an important but difficult-to-measure component of the management toolkit.

The National Park Service conducts over 40,000 ranger-led tours each year. Research confirms that ranger-led programs, where explanations are tied to specific sites and species that visitors see firsthand, yield a more lasting cognitive effect than exhibit displays in visitor centers [14]. The “Junior Ranger” program for children, which served close to 384,000 participants in parks in recent years, fosters a connection with nature at an early age. Wassmer and Ardoin tracked groups of program participants 10–15 years later and found that former participants were more likely to exhibit pro-environmental behavior in adulthood compared to a control group [15].

At the same time, Ballantyne and Packer documented a persistent gap between knowledge and action [14]. Hikers who completed the educational program are better able to explain the consequences of feeding wild animals, but when faced with actual contact with an animal, a significant portion of them still tend to offer food. The authors explain this by noting that the behavioral impulse arises before the conscious application of acquired knowledge. Closing this gap requires repeated reinforcement at a time as close as possible to the decision-making moment: through reminders directly on the trail, not just at the visitor center.

The citizen science apps iNaturalist and eBird allow tourists to photograph plants and birds they see along the trail. The app automatically identifies the objects and uploads the photo with coordinates to a shared scientific database. Researchers note that participants in such programs behave more carefully during

subsequent outings: a person who has just carefully photographed a rare plant is less likely to step on it a few meters further on.

The consistent finding across studies is that knowledge alone is insufficient to change behaviour at the moment of decision. Effective visitor management must therefore work at multiple points: before arrival, during the visit through on-trail reminders and physical design, and through repeated engagement such as citizen science programmes. Educational interventions are most effective when they are proximate in time and place to the behaviour they seek to influence.

Figure 1 illustrates how the gap between environmental knowledge and actual behavior emerges during the visitor experience, and which interventions are used to address it.

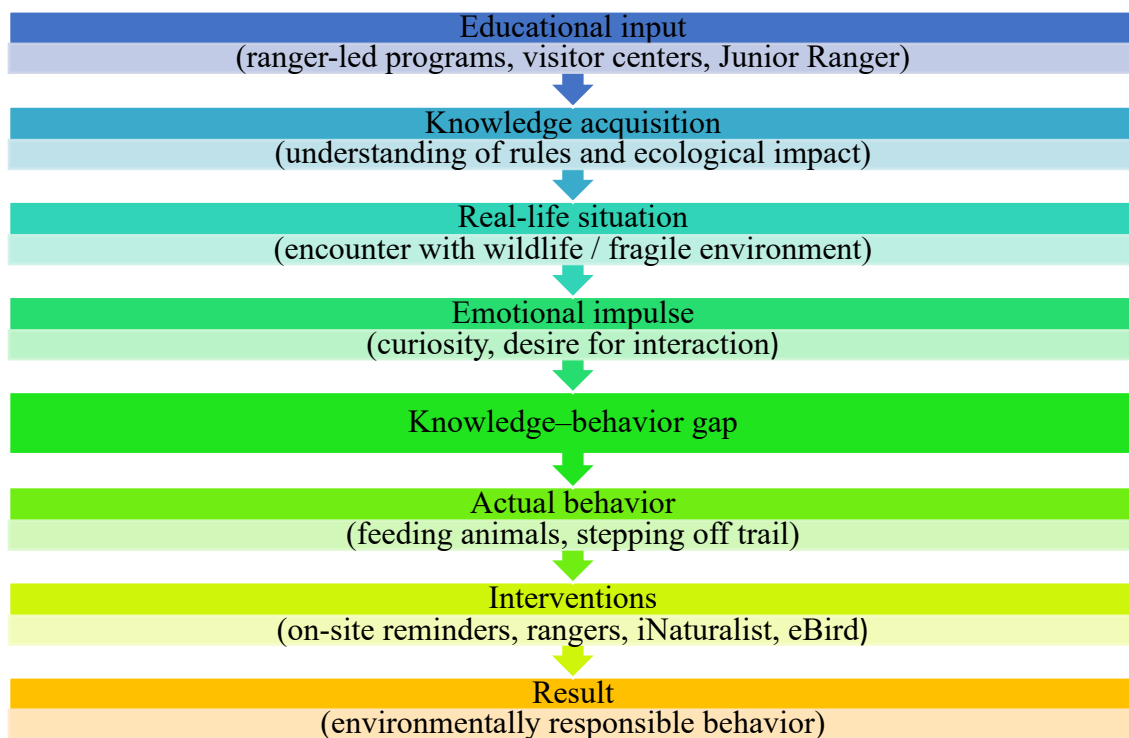


Fig. 1. The knowledge – behavior gap in tourist decision-making and mechanisms for its reduction

6. The role of travel agencies in encouraging responsible visitor behaviour.

While park administrations control visitor behaviour after arrival, travel agencies represent an earlier and underutilized point of intervention in the visitor management chain. [Disclosure: the author founded More Turiv agency (2017–2023), which provides the practitioner data discussed below].

Agencies have the opportunity to shape visitor behavior at a much earlier stage: before purchasing tickets, before packing gear, before crossing the park gates. A well-prepared tourist better understands why certain rules exist, is less likely to stray from trails in search of the “perfect shot,” knows what to do in an emergency, and is less likely to require rescue operations, which themselves cause additional damage to the ecosystem.

A practical example of systematic pre-departure preparation is documented in the work of the travel agency “More Turiv” (Dnipro, Ukraine, 2017–2023). The agency's founder, Marina Oznobishyna, developed the CXC-360 Visitor Preparation Framework - a structured pre-departure preparation methodology that included a mandatory 60–90-minute session with clients before each trip. The session program covered rules of conduct at the specific destination, local cultural norms, safety protocols, procedures for lost documents, the process for activating insurance coverage, and responsible behavior toward the natural environment. The methodology also included a 22-point document checklist and standardized communication scripts for agency staff [20].

The effectiveness of the approach is confirmed by data from three independent agencies that implemented this methodology between 2017 and 2021. In all three agencies, the number of emergency calls from customers during trips decreased by approximately half: by 47% in one agency and by 58% in another compared to the previous season. Complaints related to misunderstandings regarding local cultural norms and rules of conduct decreased by 57–73%. The number of errors in documentation processing decreased at one

agency from 6.3% to 1.4% of the total number of bookings. The proportion of customers returning for repeat bookings increased from 21–25% to 35–44% [20]. These figures are drawn from internal company records confirmed by letters of support [20] and cannot be independently verified through peer-reviewed sources; they are presented as practitioner evidence and should be interpreted accordingly.

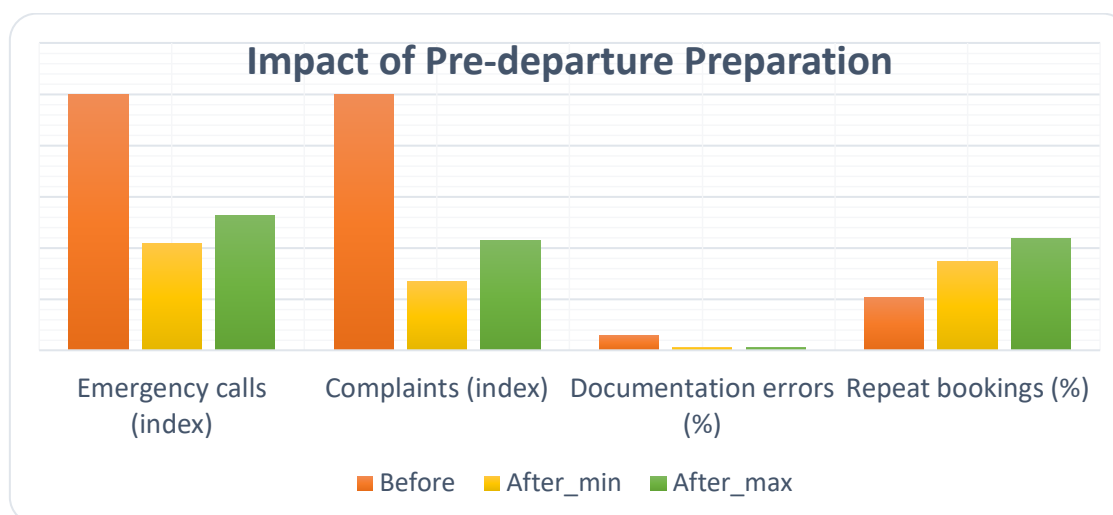


Fig. 2. Changes in key indicators after pre-departure preparation

Responsible tour operators in the nature tourism sector have long practiced limiting group sizes to 8–12 people for routes within park interiors, selecting routes with lower tourist pressure, and providing mandatory pre-trip briefings. Some companies donate a percentage of the tour cost to nature conservation funds. However, Mowforth and Munt caution that environmental rhetoric in tourism marketing often outpaces actual practices, and independent verification of companies' environmental claims covers only a small share of the market [11]. The gap between declared and actual environmental responsibility remains one of the industry's key challenges. These findings align with Ballantyne and Packer's [14] observation that behavioural change is more durable when reinforced at the point of decision, rather than only at an earlier instructional stage.

7. Digital monitoring and control tools. In the past decade, new tools have made it easier to monitor visitor numbers and manage pressure on popular sites.

Visitor counters installed along trails and at key points in the park collect data in real time. When combined with geographic information systems, this data enables the creation of heat maps of visitor load and tracks its distribution throughout the day and across seasons. Managers can see where queues form, where trails are wearing out faster, and where visitors are leaving the route in large numbers [16].

Satellite monitoring of vegetation cover based on multispectral imagery allows for the detection of early signs of degradation without the need for extensive field surveys. The Normalized Difference Vegetation Index (NDVI) changes even before degradation becomes visible during a ground inspection. This makes it possible to take preventive measures before the damage becomes significant [16].

Traffic forecasting algorithms analyze weather, days of the week, distance from previous holidays, social media activity, and search query data. A few weeks in advance, they can predict peak days with sufficient accuracy to adjust the number of rangers on trails and set reservation limits in advance [16].

The National Park Service mobile app displays current parking lot occupancy and recommends alternative routes with lower visitor volumes. This allows some tourists to adjust their plans on their own while still en route to the park, reducing crowding at the most popular sites without administrative coercion. Digital tools are most effective not as standalone solutions, but as enablers of more targeted and timely administrative decisions. Their primary value lies in reducing the lag between observed pressure and managerial response - a gap that traditional seasonal planning cannot close.

International experience of regulating tourism in protected areas. The approaches used in the US can be compared to those used in other countries to address the issue of tourist pressure through various management models.

The Galápagos Islands (Ecuador) limit the annual tourist influx to approximately 200,000 people and require all groups to be accompanied by licensed guides. 97% of tourism revenue remains in the local economy. Under these conditions, the islanders have a direct stake in preserving nature: it is their primary source of income, and any deterioration in its condition immediately affects their earnings. Distributing tourism revenues to benefit local communities transforms environmental restrictions from external requirements into socially acceptable rules.

Table 2 summarizes the main international approaches to regulating tourism pressure in protected areas, highlighting their mechanisms and observed effects.

Table 2

International approaches to regulating tourism in protected areas

Location / Country	Management Model	Key Mechanism	Observed Effect	Specific Feature
Galápagos Islands (Ecuador)	Strict visitor limitation + guided access	Annual cap (~200,000 visitors); mandatory licensed guides	Reduced uncontrolled tourism pressure; high ecosystem protection	97% of tourism revenue remains in the local economy
Costa Rica	Market-based environmental certification	Voluntary certification based on environmental standards	Forest cover growth (21% → ~57% by 2017)	Economic incentives drive conservation
Bhutan	High-value, low-volume tourism	Sustainable Development Fee (historically \$200/day in 2022; current rate: \$100 per person per night)	Reduced mass tourism; higher per-visitor revenue	Focus on fewer but higher-value visitors
New Zealand	Quota-based premium access system	Limited permits; advance booking required	Controlled visitor numbers; reduced trail pressure	High pricing supports infrastructure

Costa Rica has established a nationwide system of voluntary certification for tourism companies based on their compliance with environmental standards. The country's forest cover increased from 21% in 1987 to approximately 57% by 2017: forest restoration occurred in parallel with the growth of tourism revenues and largely due to the economic value of pristine natural landscapes for the tourism industry [11]. This example shows that the economic logic of nature conservation can be a more powerful driving force than regulatory enforcement.

Bhutan applies a Sustainable Development Fee to all tourists. The rate was \$200 per person per night in 2022, and has since been revised to the current \$100 per person per night. This mechanism keeps mass tourism in check and attracts travellers who plan their trips in advance. Visitor numbers stay low, while revenue is maintained and pressure on natural and cultural sites is reduced.

New Zealand operates the Great Walks system of premium hiking trails, which have strict quotas and require advance booking. Quotas are set individually for each trail based on an assessment of the ecosystem's carrying capacity. The cost of the trip is kept deliberately high to allow for funding of infrastructure maintenance and to partially offset management costs, thereby reducing reliance on government subsidies. Across these four models, a common pattern emerges: the most durable conservation outcomes occur where economic incentives for local communities are aligned with conservation goals, rather than relying solely on regulatory enforcement. The choice of mechanism - quota, price filter, or certification - matters less than whether it is locally legitimate and financially sustainable.

8. The economic dimension of conserving natural areas. Justifying the costs of protecting national parks requires taking into account a broader range of economic impacts than just entrance fees.

Tourists visiting U.S. national parks spend over \$29.0 billion annually in surrounding communities and support more than 340,000 jobs [3]. The spending multiplier in such regions is estimated to range from 1.5 to 2.5: every dollar that

enters the local economy further stimulates demand in related supply and service sectors. In communities near Yellowstone National Park, Grand Canyon National Park, and Everglades National Park, tourism makes up about 40–70% of the local economy. It influences income and jobs, so local communities have a direct interest in how tourism evolves.

Protected natural areas are often assessed by visitor numbers and tourism revenue, but this captures only part of their role. Beyond tourism, they provide key ecosystem services, including water regulation, carbon storage, and biodiversity support. The value of these functions often exceeds tourism income, yet it rarely appears in budget decisions, leaving conservation undervalued in policy debates.

9. Long-term conservation strategies for protected natural areas.

Decisions about a single season or route tell only part of the story, as they sit within a much broader strategy.

The National Park Service has enshrined the principle of adaptive management in its general policy documents. Master management plans are revised based on the results of field monitoring, rather than according to a multi-year schedule. Climate change makes this flexibility even more critical: the species composition of plant communities is shifting, snow cover is disappearing earlier, and hydrological patterns are changing. Management decisions based on data from twenty years ago often describe a reality that no longer exists.

The Yellowstone to Yukon Conservation Initiative links protected areas through a system of natural corridors extending over 3,200 kilometres. Isolated parks are less able to adapt to climate change, since species confined to a single territory cannot shift their range as conditions change. For this reason, tourism needs to be managed not only within protected areas, but also along the corridors that connect them.

Long-term support for conservation depends on whether local communities' benefit from tourism and are involved in decisions. In the Maasai

Mara National Reserve, revenue-sharing and participation in advisory bodies increase support for conservation, even when it limits traditional land use. Without this involvement, the rules are often seen as external, and compliance falls.

Conservation programmes are more stable when they rely on several funding sources rather than government budgets alone. Entrance fees, corporate partnerships, endowment funds and ecosystem service payments all contribute to this. Parks with UNESCO World Heritage Sites status also operate under international oversight, which reduces the risk that conservation rules will be weakened for short-term economic interests.

Conclusions. Effective management of protected natural areas requires more than controlling visitor numbers: it involves distributing flows across space and time, guiding behaviour through physical infrastructure, and preparing visitors before arrival.

The concept of acceptable change limits has proven to be more practical than numerical limits for one key reason. A numerical quota applies a single limit across a park, despite large differences between areas. Trail-specific indicators give a clearer signal: once a threshold is crossed, managers know where to act. In a changing climate, decisions work better when they rely on measurements from specific locations.

A comparison of different approaches revealed several recurring patterns. The Galápagos' strict quota system, Bhutan's price filters and Costa Rica's certification system have all produced results in their respective contexts. In practice, these mechanisms rarely work the same way across different contexts and need to be adapted to local conditions. For park administrators, this means that borrowing a tool from another context requires first identifying whether the underlying conditions – enforcement capacity, visitor demographics, and infrastructure – are comparable. Public support for conservation grows when

local communities share in tourism revenues. If parks are perceived mainly as a source of restrictions, conservation tends to rely on external enforcement.

The findings of this study are of practical relevance to national park administrators, tour operators, and government bodies responsible for protected area policy.

Several questions in this area remain unanswered. What is the minimum duration and format of instruction that has a measurable impact on tourist behaviour in natural areas? Is there a link between the format of educational programmes in parks and the frequency of rule violations? A key question is how to present the value of ecosystem services in budget proposals in a way that fits legislative procedures. The practitioner data presented here is limited to three agencies; a larger sample under controlled conditions would allow these findings to be verified more reliably.

Author's original contribution. What was developed. The author developed the CXC-360 Visitor Preparation Framework – a structured pre-departure preparation system for tourists visiting protected natural areas. The framework consists of three components: a mandatory 60–90-minute briefing session covering destination-specific conduct rules, safety protocols, emergency procedures, documentation requirements, insurance activation, and environmental responsibility norms; a 22-point pre-trip document checklist; and standardized communication scripts for agency staff to ensure consistent delivery across different employees and trip types.

Novelty. Existing visitor management research focuses on interventions at or inside the destination: reservation systems, zoning, ranger programmes, on-trail signage. The CXC-360 framework places the primary intervention point at the pre-departure stage - before the client reaches the park, before behavioral impulses override learned norms. This is the earliest and most receptive moment for behavioral instruction. No comparable structured pre-departure framework

with documented multi-agency replication data has been identified in the reviewed literature.

How it differs from a standard briefing. A standard agency briefing covers logistics, visas, and insurance. The CXC-360 framework goes further: it integrates destination-specific ecological conduct norms, a structured emergency decision tree, cultural behavior protocols, and a checklist-based quality control mechanism. It is designed not as a one-time client conversation, but as a replicable system that can be implemented by any agency employee following the same script and checklist.

Practical significance. Implementation across three independent agencies produced measurable outcomes across three dimensions. Emergency calls from clients during trips decreased by 47–58% compared to the prior comparable season, indicating a direct reduction in on-trip incidents. Complaints related to cultural misunderstandings and conduct violations decreased by 57–73%, while documentation errors fell from 6.3% to 1.4% of all bookings. Finally, the framework was successfully replicated across three agencies in different Ukrainian cities with consistent results, confirming its transferability beyond its original operational context and its potential as a scalable visitor-preparation methodology.

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