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Visit Sites Monitoring at the Chimborazo Fauna Production Reserve - Ecuador and its contribution to the fulfillment of conservation objectives

Monitoreo de los sitios de visita de la Reserva de Producción de Fauna Chimborazo - Ecuador y su contribución al cumplimiento de los objetivos de conservación

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Abstract

The income from tourism in Ecuador contributes with 10% to the national budget, and it is the economic support of 1.5 million people. Specifically, the Chimborazo Fauna Production Reserve (RPFCH) presented a 47% annual tourist growth from 2010 to 2017. Due to this growth, the tourism activity took a strategic regulatory role, being necessary to apply planning and governance tools that contribute to the management of the destination, having as a priority, the biodiversity conservation. Consequently, the main objectives of this research were to monitor the RPFCH visit sites to determine in what proportion, its tourist activity contribute to the fulfillment of the conservation objectives of the protected area and to establish improvement actions. For this purpose, the development of the tourism activity was monitored through visitor management scenarios. To fulfill the objectives of this research, the following main activities were developed: 1. Monitoring the development of the tourism activity through the visitor management scenarios and 2) Establishment of improvement actions for the RPFCH visitor management scenarios. The monitoring was carried out in three phases: 1. Validation of the RPFCH visitor management scenarios. 2. Determination of Acceptable Change Limit (ACL) indicators applying the methodology of Opportunity Range for Visitors in Protected Areas (ORVPA), and 3. Visitor management scenarios Monitoring. Ten visit sites were monitored:1 pristine, 6 primitives, and 3 natural rustics. Results showed that the tourist activity in the visit sites of the RPFCH contributed in an 80.8% to the fulfillment of the objectives of conservation of the protected area; so that, improvement actions were established.

Resumen

Los ingresos del turismo en el Ecuador contribuyen con el 10% del presupuesto nacional, y es el sustento económico de 1.5 millones de personas. Específicamente, la Reserva de Producción de Fauna Chimborazo (RPFCH) desde el 2010 hasta el 2017 presentó un 47% de crecimiento turístico anual. Desde este escenario de crecimiento, la actividad turística tomó un rol estratégico de regulación, siendo necesario aplicar herramientas de planificación y gobernanza que contribuyan a la gestión del destino, a un manejo adecuado de los visitantes en función de sus expectativas, y a la mitigación de sus potenciales impactos negativos; teniendo como eje la conservación de la biodiversidad. Por lo tanto, los principales objetivos de esta investigación fueron monitorear los sitios de visita de la RPFCH para determinar en qué proporción, su actividad turística contribuye al cumplimiento de los objetivos de conservación del área protegida y establecer acciones de mejora. Para esto, se monitoreo el desenvolvimiento de la actividad turística por medio de escenarios de manejo de visitantes. El monitoreo se desarrolló en tres fases: 1. Determinación de indicadores de Límites de Cambio Aceptable (LCA) aplicando la metodología de Rango de Oportunidad para Visitantes en Áreas Protegidas (ROVAP), 2. Monitoreo de escenarios de manejo de visitantes, y 3. Establecimiento de acciones de mejoramiento. Se monitorearon 10 sitios de visita: 1 prístino, 6 primitivos, y 3 rústicos naturales. Los resultados mostraron que la actividad turística en los sitios de visita de la (RPFCH) contribuyen en un 80.8% al cumplimiento de los objetivos de conservación del área protegida; para lo cual se establecieron acciones de mejora.

Keywords/Palabras clave

Monitoring; management; fauna; reserve; tourism/Monitoreo; administración;fauna; reserva; turismo

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1. Introduction

The concept of Protected Areas (APs) is old in the world. In the 60s, many of the developed countries already had complex systems, including most of the elements that are considered mandatory since the validity of the Convention on Biodiversity (1992). Protected areas appear in the United States with the creation of Yellowstone National Park, as a mechanism to protect representative natural and cultural elements (Dourojeanni, 2010).

The key component of Yellowstone National Park was that no permanent inhabitants were allowed within it, with the exception of park staff. This North American pattern of a pristine national park arose slowly at the beginning, but, in the early 1960s, many countries established national parks where they excluded people (Cifuentes et al., 2000). In 1969, the definition of "national park" of IUCN established that these areas should be relatively large and without material alteration by exploitation or by human being occupation (McNeely et al., 1994). More than 25,000 protected areas have been established until the early 1990s, covering more than 5 % of the globe. However, only 1470 of these protected areas are equal to the Yellowstone park model, while the rest of them have received different denominations (McNeely et al., 1994).

In Central America, protected areas have multiplied from only 30 in 1970 to more than 300 in 1987. The protection area reached approximately 8% of the territory of the region (Morales & Cifuentes, 1989). Until 1994, Central America has increased its protected areas, exceeding 16% of the Central American land territory (IUCN & IDB, 1993).

Today, almost all Latin American countries have formally established systems of protected areas that include policies, specific legislation, system plan, and even financial mechanism; being, Argentina the pioneer country in issues of protected areas systems in the region. In this context, the National Park Administration (APN) of Argentina started to manage the PAs as a system since 1934, which was renovated in 1972 (Dourojeanni, 2010). Ecuador is considered a mega biodiverse country because of the variety and variability of its landscapes, ecosystems and flora and fauna species (Yánez, 2016). For this reason, efforts have been made to protect local biodiversity through a national system of protected areas (ECOLAP & MAE (Ministerio del Ambiente del Ecuador), 2007).

The overall objective of Protected Areas (PA) around the world is to manage biological resources to protect biodiversity and the environmental services they provide. The national system of Protected Areas (SNAP (by the Spanish acronym)) of Ecuador is the set of protected natural areas that guarantee the coverage and connectivity of important ecosystems at the terrestrial, marine and coastal marine levels, their cultural resources and main water sources (MAE, 2017). The SNAP covers the four regions of the country with 59 protected natural areas, that extend in approximately 20% of the surface of Ecuador (MAE, 2020).

The general conservation objectives defined for the National System of Protected Areas are: 1. To conserve the biological diversity and genetic resources contained in the SNAP. 2. To provide alternatives for sustainable use of natural resources and the provision of environmental goods and services. 3. To contribute to the improvement of the population's quality of life (MAE, 2015a). One of these protected areas of Ecuador is the Chimborazo Fauna Production Reserve (RPFCH).

The Chimborazo Fauna Production Reserve (RPFCH) was created with Ministerial Agreement No. 437 of October 26, 1987 and published in Official Registry No. 806 of November 9 of the same year (MAE, 2014). The reserve is shared by the provinces of Chimborazo, Bolívar, and Tungurahua with a total area of 58560 hectares. The Chimborazo volcano is located in this area. This volcano, has a height, from sea level, of 6268 meters constituting the highest point on the planet, according to a study conducted by the Military Geographical Institute of Ecuador (IGM) with the help of the French Institute of Research for the Development (IRD) (Izurieta, 2016). Additionally, this area has exclusive biodiversity of flora and fauna, which is endemic, this is, it is unique on the planet.

Visitor management in PA (Abman, 2018; Blanco- Cerradelo et al., 2018; Watson & Hewson, 2018 y Graefe, Kuss, & Vaske, 1990) is a mechanism of planning, controlling, and regulating the tourism activity where spaces are generated to provide opportunities for public use, based on quality criteria of the visitor's experience, always respecting the conservation objectives (MAE, 2015a y Rainforest Alliance et al., 2010). Additionally, it allows us to conduct the visitor's behavior in order to achieve the maintenance of the naturalness and conservation scenarios in the visit sites (MAE, 2018).

In this context, MAE, through the Ministerial Agreement 100 and a policy of natural heritage governance, establishes the application of the Destination Management Methodology of Protected Areas, as the tool that contributes to the balance between the program planning of public use and tourism and the visitors' expectations (MAE, 2015b).

Since its conception, the Protected Areas (PA) have been linked to tourism (Blanco-Cerradelo et al., 2018). At the same time, tourism is a key component that contributes to the conservation and sustainability objectives of these natural areas (Abman, 2018; Blanco-Cerradelo et al., 2018; Watson & Hewson, 2018 y Reck & Martínez, 2010). This link is even recognized by the nations. For example, the Constitution of Ecuador of 2008, in its article 405, guarantees the preservation of biodiversity and the maintenance of ecological functions (Constitution of the Republic of Ecuador, 2008). In 2012, the Ministry of Environment of Ecuador (Ministerial Agreement 006) declared free admission to PA (MAE, 2012).

The decision of free admission had a positive impact for PA visitation. A 58% growth trend in the visitation to PAs of Ecuador was recorded between 2012 and 2017 (MAE, 2017). Specifically, the Chimborazo Wildlife Production Reserve (RPFCH) presented a 47% annual tourist growth from 2010 to 2017 (MAE, 2017).

Due to the increase of visitations to PAs, the tourism activity required regulatory strategies; being necessary to apply and / or create planning and governance tools that contribute to the management of the destination; to a territory planning and to an adequate management of visitors according to their expectations; and mainly, to the mitigation of potential negative impacts; having as a goal the biodiversity conservation (Centro para el Manejo de Áreas Protegidas, 2007).

Therefore, the main objectives of this research were to monitor the RPFCH visit sites to determine in what proportion, its tourist activity contribute to the fulfillment of the conservation objectives of the protected area and to establish improvement actions.

2. Methods and Materials

This is a field research, at an exploratory, descriptive, analytical, and prospective level. It is also a quantitative research because it used quantitative methods for data collection and analysis. For the theoretical

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part of this research, a literature review was carried out. This research was conducted in the public use and tourism zone of the RPFCH, in the provinces of Bolívar, Tungurahua and Chimborazo of Ecuador.

To fulfill the objectives of this research, the following main activities were developed: 1. Monitoring the development of the tourism activity through the visitor management scenarios and 2) Establishment of improvement actions for the RPFCH visitor management scenarios.

2.1. Scenario Monitoring

The monitoring was carried out in three phases: 1. Validation of the RPFCH visitor management scenarios. 2. Determination of Acceptable Change Limit (ACL) indicators applying the methodology of Opportunity Range for Visitors in Protected Areas (ORVPA), and 3. Visitor management scenario Monitoring.

2.1.1. Validation of the RPFCH visitor management scenarios

Visit sites were evaluated and described in scenarios through 3 environments: 1) Biophysics, 2) Social, and 3) Management; based on the Opportunity Range for Visitors in Protected Areas (ORVPA) methodology (Centro para el Manejo de Áreas Protegidas, 2007), in: Pristine Scenario (PS), Primitive Scenario (PMS), and Natural Rustic Scenario (NRS). Subsequently, one PS, six PMS and three NRS were prioritized through a filter of external assumptions.

2.1.2. Determination of Acceptable Change Limit (ACL)

Next, ACL indicators (Stankey & McCool, 1992) were determined by selecting key elements of the visit sites, by environment, factor, and attribute of the biophysical, social, and management fields. Then, standards were established by adapting the proposals of the Destination Management Methodology of Protected Areas (MAE, 2015b).

2.1.3. Visitor management scenario Monitoring

Finally, ten visit sites were monitored:1 pristine, 6 primitives, and 3 natural rustics. The monitoring period was executed in 2015 and 2016, in two moments: 1) baseline through direct observation and 2) subsequent records about the baseline and new problem points. Data was calculated in relation to changes from the baseline.

2.2. Actions

The establishment of improvement actions was carried out through an analysis of cause, problem, effect, and solution; from the scenario/site of visit to the environment. Later the Problem-Solution-Action compatibility was analyzed.

3. Results

3.1. Scenario Monitoring

3.1.1. Validation of visitor management scenarios

Taking into account biophysical, social and management environment; the evaluation, description and prioritization of scenarios for visiting sites determined: (see table 1).

Table 1
Assessment of attractions, visit sites, and ORVPA scenarios

Attraction	Category	Hierarchy	Visit Site	ORVPA Scenarios	Prioritized for monitoring
Nevado Chimborazo	78	IV	Laguna Cóndor Cocha	Primitive	SI
			Sendero	Primitive	SI
			Refugio Carrel	Natural Rustic	SI
Carihuayrazo	50	II	Carihuayrazo	Pristine	SI
Templo Machay	50	II	Templo Machay	Primitive	SI
Árbol Solitario	28	II	Árbol Solitario	Primitive	SI
Hieleros del Chimborazo	61	III	Hieleros	Primitive	SI
Bosque de Polylepis	49	II	Bosque de Polylepis	Primitive	SI
Cañon de la Chorrera	46	II	Chorrrera	Primitive	NO
Cullqui Surcuna	25	I	Cullqui Surcuna	Primitive	SI
Cuartel de Los Incas	25	I	Cuartel de los Incas	Natural Rustic	SI
Yana Rumi	25	I	Yana Rumi	Primitive	NO
Cóndor Samana	34	II	Cóndor Samana	Pristine	NO
Yura Uksha	25	I	Yura Uksha	Natural Rustic	NO
Cunuc Yacu	39	II	Cunuc Yacu	Natural Rustic	NO

Source: (Vaca, 2016).

Due to the obtained categorization of ROVAP scenarios, key factors and their attributes were determined by adapting the tools proposed in the Destination Management Methodology of Protected Areas (MAE, 2015b) (see table 2).

Table 2
Key Factors adapted from the Destination Management Methodology of Protected Areas (MAE, 2015b)

Environment	Factor	Attribute
Biophysical	Erosion, channels and cracks	% Land depth/ amplitude
	Vegetation Alteration	% Vegetable cover
	Trail Amplitude	Distance of land visibly altered
Social	Use of unauthorized spaces	Number of complaints or evidences
	Number of encounters among groups at the same time	Number of encounters and records
	Visitor Satisfaction	Optimum % of visitor satisfaction.
	Group size per person	Number of people
Management	Quantity of inorganic waste	Amount of inorganic waste
	Vandalism	Number of affectations
	Alternate trails	Number of occurrences
	Infrastructure condition	Number of maintenance requirements
	Transport violations	Number of committed offenses

Source: (Vaca, 2016).

3.1.2. Determination of Acceptable Change Limit (LCA) indicators

Standards of maximum change limit were determined by adapting the tools proposed in the aforementioned Methodology (see table 3).

Table 3
ACL Standards adapted from the Destination Management Methodology of Protected Areas (MAE, 2015b)

Indicators	ACL				
	PS	PMS	NRS	Rural	Urban
Biophysics environment					
Erosion	10%	10%	15%	15%	15%
Vegetation Alteration	10%	10%	15%	15%	15%
Channels and cracks	0	0	0	0	0
Trail Amplitude	0	50 cm (in 5 sites of frequent use)	75 cm (in 8 sites of frequent use)	120 cm (in 5 sites)	300 cm (in 5 sites of frequent use)
Social environment					
Use of unauthorized spaces	0 evidences and complaints	0 0 evidences and complaints	0 0 evidences and complaints	0 0 evidences and complaints	0 0 evidences and complaints
Number of encounters among groups at the same time	0	5	5	10	20
Visitor Satisfaction	90%	90%	85%	80%	80%
Group size per person	5	6	6	10	(+) 10
Management environment					
Quantity of inorganic waste (Kg)	0 records	0 records	1 Kg	3 Kg	5 Kg
Vandalism (Number of affectations)	0 records	0 records	0 records	0 records	0 records
Alternative trails	0	0	1	2	3
Transport violations	0	0	1	3	5
Infrastructure condition/maintenance	It does not apply	It does not apply	4 times a year	4 times a year	4-6 times a year

Source: (MAE, 2015b).

3.1.3. Visitor management scenario Monitoring

The monitoring of Indicators is presented by visitor management scenarios, showing average data of the distinct points of sampling in the different environments and their respective indicators (see figure 1).

The following colors have been assigned: 1) red for the indicators that exceed the ACL, 2) yellow for the indicators that coincide with the ACL and 3) green for the indicators that are below the ACL, at different scales for each scenario. In addition, each of the indicators has received a detailed abbreviation at the end of the graph (see figure 1, annexed 1).

Furthermore, the monitoring of PS, PMS, and NRS indicators can be summarized in the following table: (see table 4).

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Table 4
Summary of Indicator monitoring

Scenario	Visit Place	Indicator Total	Indicators that fulfill the ACL	% of fulfillment
EP	Carihuayrazo	8	6	75
EPM	Laguna Cóndor Cocha	10	7	70
	Templo Machay	9	7	78
	Árbol Solitario	10	10	100
	Bosque de Polylepis	10	9	90
	Hieleros	8	7	88
	Cullqui Surcuna	9	8	89
ERN	Sendero	9	6	67
	Cuartel de los Incas	8	7	88
	Refugio Carrel	8	5	63
			Average	**80.8**

Source: (Vaca, 2016).

The RPFCH has a potential focus on adventure and nature (Vaca, 2016); within the degree of naturalness of the visiting sites, one PS, six PMS and three NRS have been established. The monitoring of scenario indicators determined that the PS: Carihuayrazo met 75% of the ACL, the six PMS: 1) Laguna met 70% of the ACL, 2) Templo Machay met 78% of the ACL, 3) Árbol Solitario met 100% of the ACL, 4) Bosque de Polylepis fulfilled with 90% of the ACL, 5) Hieleros met 88% of the ACL, and 6) Cullqui Surcuna met 89% of the ACL; The three NRS: 1) Sendero del R. Carrel al Whymper fulfilled 67% of the LCA, 2) Cuartel de los Incas fulfilled 88% of the ACL, and 3) Refugio Carrel fulfilled 71% of the ACL.

3.2. Actions

A summary table of the analysis Cause, Problem, Effect, Solution (CPES) is presented, based on Tierra (2010) that was carried out in each of the scenarios where the indicators that did not fulfill the ACL were considered (see table 5).

The analysis, presented in (figure 2), denotes the relationship of the problem with the identified solution and the corrective action that is required.

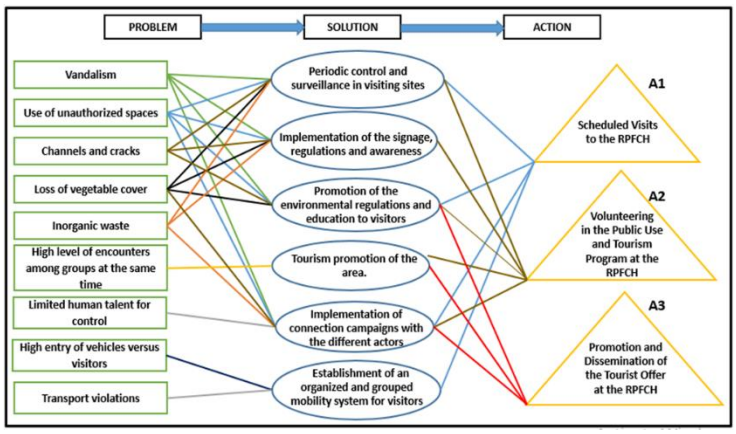

Figure 2. Compatibility analysis of Problem - Solution – Action
Source: (Vaca, 2016).

Table 5
CPES Analysis

Cause	Problem	Efect	Solution
Lack of information on tourism regulations	Use of unauthorized spaces	Scenario degradation	Control and surveillance in visiting sites.
Lack of control staff	Vandalism	Scenario degradation	Promotion of the environmental regulations and education to visitors
Information about the tourist offer is missing.	Channels and cracks	Scenario degradation	Implementation of connection campaigns with the different actors.
Lack of control staff	Loss of vegetable cover	Scenario degradation	Implementation of the signage, regulations and awareness.
Lack of information on tourism regulations	Inorganic waste	Environmental pollution	Environmental education aimed at visitors.
Information about the tourist offer is missing.	High level of encounters among groups at the same time	Scenario degradation	Tourism promotion of the area.
Limited resources for management	Limited human talent for control	Poor management	Implementation of connection campaigns with the different actors.
Lack of information on tourism regulations	High entry of vehicles versus visitors	Environmental pollution	Establishment of an organized and grouped mobility system for visitors
Lack of tourist signage	Transport violations	Mobility insecurity in the PA.	Establishment of an organized and grouped mobility system for visitors

Source: (Vaca, 2016).

Three actions to improve the reserve management were established, which included 1) Scheduled Visits, 2) Volunteering, and 3) Promotion and Dissemination of the Tourist Offer. With these actions, it is expected to reduce by 80, 50 and 75% respectively, the amount of inorganic waste, the incidence of vandalism, the use of unauthorized spaces, the loss of vegetable cover, the entry of organized groups without a guide, alternate trails, channels and cracks, and transport violations.

4. Discussion

Similar works that monitor the visit sites and the analysis of the level of contribution to the conservation objectives are scarce. However, some research papers propose the application of Acceptable Change Limit indicators (Torres, 2017; Gómez, Sánchez, & Gutiérrez-Fernández, 2016; Martínez, 2014 y Caicedo, 2014). For instance, Torres' work (2017) titled "*Indicadores para un sistema de monitoreo de impactos del turismo mediante Límites de Cambio Aceptable en la laguna de Quilotoa, Reserva Ecológica Ilinizas*"; establishes that the impacts of the tourist activity on the site according to the LCA methodology were: presence of garbage on the trail and the beach area, graffiti, landslides on the trail, vegetation destruction by unauthorized people, fires caused by tourists and visitor dissatisfaction; causing natural scenario deterioration.

The establishment of the thirteen indicators helped in the initial recognition of impacts on the ecosystem, the quality of the visit and, above all, appreciating tourism management. It also allowed to set quick and simple actions to be carried out provisionally, such as closures with physical means, implementation of momentary signs and environmental remediation cleanups. Likewise, the determination of standards allowed to execute the measurement under real conditions with basic techniques; allowing that together, with the key actors, conditions that are under their control and intervention be detected, without modifying the quality of the visit.

From the results, it was proved that in the PS, the CC and IW indicators exceed the ACL; while EGST, Va, VA, UUS, VSR, and GSPP satisfactorily meet the ACL, this is, their results are lower than the ACL. In the PMS, it is usually observed that VA, UUS, IW and Va indicators are above the ACL; while CC, TA, EGST, AT, VSR, and GSPP record results equal to or less than the ACL. In the ERN, the CC, UUS, and TV indicators are frequently over the ACL, while TA and AT, Erosion, EGST, VSR, GSPP, IW, and IC, record results equal to or less than the ACLs conveniently.

Recapitulating, the EPM-Solitary Tree meets 100% of the ACL established, being the scenario with the ideal range; this due to its visit is specialized and because signage was implemented with the support of the municipal government. While, in the ERN, Carrel Shelter achieved 63% of the ACLs, being the scenario with the lowest results; this due to the high disorderly influx of visitors, since it exists an easy access to this site. Different results were observed in the work of Gómez, Sánchez, & Gutiérrez-Fernández (2016). The implementation of the ACL methodology on the Lagunas de Siecha trail in the Chingaza National Natural Park showed damage to the site that exceed the acceptable change limits, mainly affecting its vegetation (Espeletia grandiflora and E. argéntea) due to its susceptibility to trampling. Only one path complied with LCA, thanks to the formulation and implementation of management measures (Gómez, Sánchez, & Gutiérrez-Fernández, 2016).

It was also observed that the indicators varied their resulting measure by seasonal changes, this is, when there is less influx of visitors, when staff is assigned for control patrols, when provisional signage is implemented and when the staff complies with information protocols about behavioral norms. It is important to consider compliance with the frequency and season of monitoring, understanding that during holidays and weekends the visit increases by 500 % and 250 % correspondingly. The exaggerated increase in tourists increases the degree of degradation of the site. Martínez (2014), in his study "*Propuesta de validación para la aplicación de la Metodología LAC (Límites de Cambio Aceptable) en los senderos del Parque Recreacional y Bosque Protector Jerusalem*" determined that there are areas with special biodiversity in good condition due to they are remote places with little relative public access. Therefore, in places with a greater influx of people, there is a greater degree of degradation of the landscape.

Subsequently, based on the results and the factor that can affect the variation of results, improvement actions were proposed for each of the scenarios where the indicators did not comply with the ACL. In this context, in phase 3: Action 1 aims to manage visitors and generate tourist services through organized tours. Action 2 plans to involve society through volunteer spaces where knowledge and experiences are generated in the handling and management of visitor management scenarios, achieving strategic allies. Finally, Action 3 seeks to develop and disseminate material with information on tourist offer and regulations, that permit to have a planned, ordered and instructed visit in the protected area.

It is therefore, essential to apply the improvement actions stated here, which are aligned with the conservation objectives of the protected area, that indicate that ecosystem resources must be maintained, by taking care of them and developing them under ecological parameters. Likewise, it is important to establish infrastructure and necessary services for tourism and research, to contribute to the improvement of the living standard of people in the area.

4.1. Conclusions

It was found that the scenarios met the ACLs in percentages ranging from 63% to 100% during the studied period; concluding that the tourist activities in the visiting sites of the RPFCH contributed 80.8% to the fulfillment of the conservation objectives of the protected area. Consequently, it was necessary to propose improvement actions.

It is recommended to carry out the improvement actions proposed here to meet the conservation objectives of the protected area, to decentralize and energize the tourist activities in the different visit sites; and to change management modality, from a reconstructive modality to a preventive one. Also, given the tourism potential in the area, the RPFCH should reconsider the management category of the protected area in the prioritization of resources and activities. In addition, due to the considerable tourist influx, a system of visitor compensation should exist for the opportunities, facilities and services available.

Additionally, as a future work, it is recommended to replicate the monitoring to the visitor management scenarios, after the application of the proposed improvement actions and perform the analysis of the postoperative results.

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Abbreviation

RPFCH	(Acronym in Spanish) Chimborazo Fauna Production
ACL	Acceptable Change Limit
PS	Pristine Scenario
PMS	Primitive Scenario
NRS	Natural Rustic Scenario
RS	Rural Scenario
UBS	Urban Scenario
ORVPA	Opportunity Range for Visitors in Protected Areas
VMP	Visitor Management Plan
VA	Vegetation Alteration
CC	Channels and Cracks
TA	Trail Amplitude
UUS	Use of Unauthorized Spaces
EGST	Encounters of Groups at the Same Time
AT	Alternate trails
VSR	Visitor Satisfaction Rate
GSPP	Group size per person
IC	Infrastructure Condition
IW	Inorganic waste
Va	Vandalism
TV	Transport Violations
BE	Biophysics Environment
SE	Social Environment
ME	Management Environment
BL:	Baseline
M1:	Monitoring 1
M2:	Monitoring 2
M3:	Monitoring 3
M4:	Monitoring 4
M5:	Monitoring 5

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Anexo 1

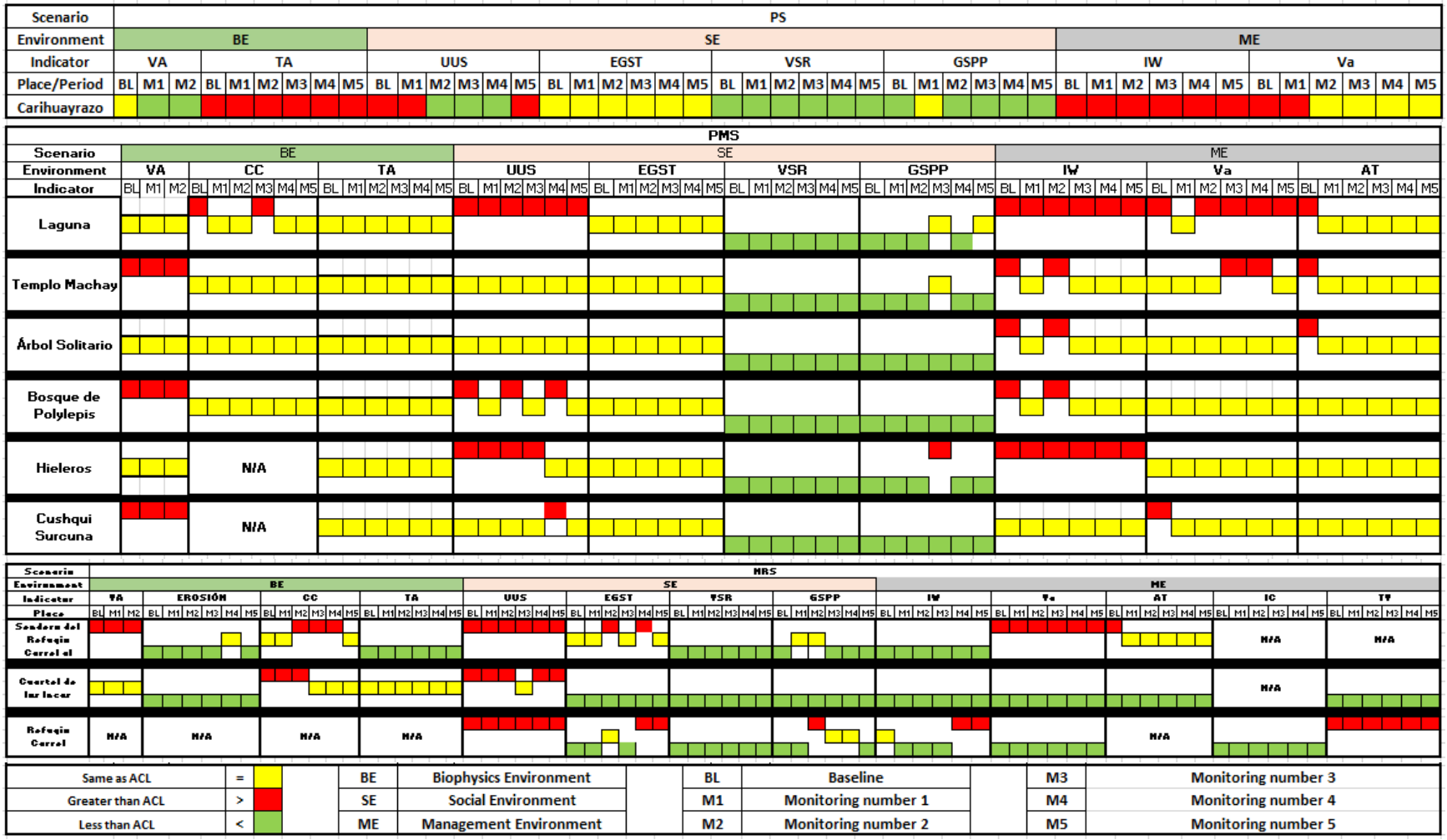

Figure 1. Survey of visitor management scenarios.
Source: (Vaca, P., 2016).