IUCN Conservation Outlook Assessment 2017 **(archived)**
Finalised on 09 November 2017

Please note: this is an archived Conservation Outlook Assessment for Monarch Butterfly Biosphere Reserve. To access the most up-to-date Conservation Outlook Assessment for this site, please visit https://www.worldheritageoutlook.iucn.org.

Monarch Butterfly Biosphere Reserve

SITE INFORMATION

Country:
Mexico
Inscribed in: 2008
Criteria:
(vii)

Site description:
The 56,259 ha biosphere lies within rugged forested mountains about 100 km northwest of Mexico City. Every autumn, millions, perhaps a billion, butterflies from wide areas of North America return to the site and cluster on small areas of the forest reserve, colouring its trees orange and literally bending their branches under their collective weight. In the spring, these butterflies begin an 8 month migration that takes them all the way to Eastern Canada and back, during which time four successive generations are born and die. How they find their way back to their overwintering site remains a mystery. © UNESCO

SUMMARY

2017 Conservation Outlook

Critical

The conservation outlook for the property with respect to its outstanding natural phenomenon and flagship species is one of significant concern. While recent all-time lows in wintering population sizes may have been aggravated by severe weather conditions, there are broader trends of loss and degradation of breeding and feeding habitat in the United States of America and Canada due to the expansion of industrial agriculture and land development associated loss of host plants. While some of these concerns require management responses at a scale beyond site and even national level, even the factors that can be influenced at site level are not fully under control. Challenges on location include illegal logging, insufficiently regulated tourism and visitation and inadequate inter-institutional coordination. A team of authors behind a recent study concluded that the observable declines call into question the long-term survival of the monarchs' migratory phenomenon (Brower et al. 2012; Vidal and Rendon-Salinas 2014; Vidal et al. 2014). Clearly, a much stronger response is needed both locally and across the three range States, building upon encouraging existing efforts.

Current state and trend of VALUES

Critical
Trend: Deteriorating

While substantial progress has been achieved in reducing threats from logging, threats in the breeding and feeding habitats and along the migration in the US and Canada are of high concern. While recent all-time lows in wintering population sizes may have been aggravated by severe weather conditions, there are broader trends of loss and degradation of wintering habitat, breeding habitat in the USA and Canada due to the use of herbicides, expansion of industrial agriculture and land development associated loss of host plants. (35COM.Monarch.SPreport; Brower, 2012; Consultation form, 2012; Vidal and Rendon-Salinas 2014). Based on the monitoring of the overwintering habitats for

over a decade, it was concluded that the observable declines call into question the long-term survival of the monarchs' migratory phenomenon unless urgent measures are undertaken across its habitat and migration route (Brower et al. 2012; Vidal and Rendon-Salinas 2014; Vidal et al. 2014).

Overall THREATS

Very High Threat

The relatively small property consists of vulnerable and degraded fragments of once extensive montane conifer forests. Longstanding commercial logging into the recent past has transformed the landscape and illegal logging is still not fully under control. The combination of ongoing habitat loss and degradation, agricultural encroachment in the surroundings, insufficiently regulated and controlled tourism and visitation indicating capacity constraints and jointly amount to a very high degree of threat. Furthermore, there are serious concerns about the current and expected impacts of climate change and factors outside the property and beyond the control of management affecting the butterfly populations. There are 3 primary threats to the monarch butterfly in its range in North America: deforestation and degradation of forest by illegal logging of overwintering sites in México; widespread reduction of breading habitat in the United States due to land-use changes and the decrease of this butterfly´s main larval food plant (common milkweed [Asclepias syriaca]) associated with the use of glyphosate herbicide to kill weeds growing in genetically engineered, herbicide-resistant crops; and periodic extreme weather conditions throughout its range during the year, such as severe cold or cold summer or winter temperatures. These threats combined are responsible for the dramatic decline over the last decade in the number of monarch butterflies in the hibernation colonies in México, which reached a 20-year low during the 2013-2014 season (Vidal and Rendon-Salinas 2014; Vidal et al. 2014).

Overall PROTECTION and MANAGEMENT

Some Concern

There are encouraging management efforts which have resulted in recent improvements regarding illegal logging; however, illegal logging persists.

The best conservation strategies to augment the capacity of the monarch butterfly to respond to unpredictable and changing climate-related conditions are

to protect its habitat from direct human disturbances, such as illegal logging in Mexico and habitat loss and degradation in the US and Canada, and to restore its habitat in the 3 countries. A strategy needs to be devised and implemented as a matter of urgency to address the socioeconomic and environmental problems and opportunities of both the Monarch Butterfly Biosphere Reserve and the region as a whole. Long-term investment in sustainable economic activities, such as ecotourism and production of trees should be better coordinated with the financial support provided by private donors and the Monarch fund. Simultaneously, a year-round and effective on-the-ground surveillance and law-enforcement strategy is required to avoid the resurgence of large-scale logging and to stop small-scale logging. Implementation of a comprehensive, regional plan to create (and maintain) new and better job opportunities, improve and expand basic education for children and youth, improve basic services (e.g., sanitation, electricity, and water), all of which should be in partnership with the people living in the region and take full account of their needs and aspirations, should be a priority.

Although the concentrated nature of monarch use of wintering habitat makes it easy to quantify the loss of this habitat, it is important to remember that the majority of monarchs that winter in Mexico depend on habitat in the US and Canada for breeding and migrating. Concomitant with overwintering habitat loss, there have been large losses of breeding and migrating habitat. The direct relation between the loss of milkweed host plants in agricultural areas in the United States and the number of monarchs wintering in Mexico has been clearly documented. Thus, it is important that citizens, local, state, and federal government agencies; nonprofit organizations; and private donors in the US and Canada restore and protect habitat within their own territories.

FULL ASSESSMENT

Description of values

Values

World Heritage values

▶ **The most dramatic known manifestation of the phenomenon of insect migration**
Criterion:(vii)

While substantial progress has been achieved in reducing threats from logging, threats in the breeding and feeding habitats and along the migration in the US and Canada, as well as from inadequate coordination among the approximately 60 entities participating in management of the property are of high concern. While recent all time lows in wintering population sizes may have been aggravated by severe weather conditions, there are broader trends of loss and degradation of wintering habitat, breeding habitat in the US and Canada due to the use of herbicides, expansion of industrial agriculture and land development associated loss of host plants. (35COM.Monarch.SPreport; Brower, 2012; Consultation form, 2012, Vidal and Rendon-Salinas 2014). Based on the monitoring of the overwintering habitats for over a decade, t it was concluded that the observable declines call into question the long-term survival of the monarchs' migratory phenomenon (Brower et al. 2012; Vidal and Rendon-Salinas 2014; Vidal et al. 2014).

Other important biodiversity values

▶ **Other international designations**

The Park lies within a Conservation International-designated Conservation

Hotspot, a WWF Global 200 Eco-region, a BirdLife-designated Endemic Bird Area. The three components constitute the core zones of a UNESCO Biosphere Reserve (UNEP-WCMC, 2011).

Assessment information

Threats

Current Threats

Very High Threat

Current threats to the property's OUV from large scale loss and degradation of forests, ongoing illegal small-scale logging, poorly managed tourism, challenges in terms of inter-institutional coordination and cooperation.

▶ Logging/ Wood Harvesting

Very High Threat
Inside site, localised(<5%)
Outside site

From 2001 through 2013, 1254 hectares were deforested in the monarch reserve, 934 ha were degraded, and 126 ha were affected by climatic conditions (Vidal et al 2014). Of the total 2195 ha of affected (deforested and degraded forest) area, 2066 ha were affected by illegal logging: 1507 ha by large-scale logging and 558 ha by small-scale logging.
Mexican authorities effectively enforced efforts to protect the monarch reserve from illegal logging, particularly from 2007 to 2012. Those efforts, together with the decade-long financial support from Mexican and international philanthropists and businesses to create local alternative-income generation and employment, resulted in the decrease of large-scale illegal logging from 731 ha affected in 2005-2007 to 9 ha affected in 2013, although small-scale logging is of growing concern (Vidal et al. 2014). However, despite those efforts 32.47 hectares were affected by illegal logging, mainly small-scale logging, between 2014 and 2017.
The forests most affected by illegal logging throughout the years are those in

colonies Crescencio Morales, El Rosario, Nicolás Romero, La Mesa, Cerro Prieto, and San Juan Xoconusco.

► Livestock Farming / Grazing

High Threat
Inside site, extent of threat not known
Outside site

Agricultural use continues to threaten the property in multiple ways. Agricultural encroachment in the buffer zones reduces the extent of available forest habitat required by the butterfly colonies. Grazing and associated intentional burning increases the risk of forest fires. Furthermore, water diversion for agriculture is reported to be a concern (Brower, 2013; UNEP/WCMC, 2011). The situation is complicated due to the tenure arrangements which include land rights within the property. The forests in the buffer zones have been, and continue to be, degraded significantly by unsustainable forest exploitation, fires, grazing, and agricultural expansion, all of which would eventually play a key role in further degrading the already degraded and particularly vulnerable core zones (Vidal et al. 2014).

► Tourism/ visitors/ recreation

High Threat
Inside site, scattered(5-15%)
Outside site

The property is a major tourist attraction with a great potential for local economic benefits, conservation financing and visitor education. The potential has not been fully realized and concerns about damage and disturbance caused by tourists persist. The numbers and behavior of visitors threatens the monarch colonies (Vidal and Rendon-Salinas 2014). Groups of tourists have been seeing approaching the colonies too close, breaking the butterfly clusters and forcing them to move to areas nearby. This has been repeatedly documented in colonies that are open to tourists (Cerro Prieto, Sengio, El Rosario, El Capulín, La Mesa, and San Mateo Almomoloa) and in colonies not open to tourists (the federal property, and the Michoacán state property) (Vidal and Rendon-Salinas 2014). Since monarchs apparently do not feed when they overwinter in Mexico, they depend on their lipid reserves, and when the butterflies are disturbed regularly by tourists throughout the season, they are forced to fly more often and spend their energy reserves,

which would affect their ability to migrate north.
Tourists may also increase the risk of accidental fires. While progress has been achieved in managing tourism, remaining constraints include insufficient specialized staff and capacity, inadequate visitor facilities and conclusive impact assessments (35com.Monarch.SPreport; Consultation form, 2012). Many communities benefit from monarch-associated tourism: 87,335 people visited (November to March) the different colonies in 2002-2003, 133,263 in 2003-2004, 126,896 in 2004-2005, 54,515 in 2011-2012 and 72,591 in 2012-2013 (Vidal et al. 2014).

► Habitat Shifting/ Alteration

Very High Threat
Inside site, throughout(>50%)
Outside site

Climate change and extreme weather conditions are already affecting the property, but also the butterfly habitat across the US and Canada. In combination with the effects of longstanding commercial logging and illegal logging, droughts and increased temperatures have contributed to insect infestations while severe storms have toppled trees; and provoked landslides, floods, erosion, and sedimentation of water courses (35COM.SPreport; Carranza Sánchez, 2010).
Between 2009 and 2011, 115 hectares of forest in the monarch reserve were affected by floods, strong winds, droughts, and fires, and 29 ha more were affected by drought and parasitic plants in 2012 and 2013 (Vidal et al. 2014). In addition, 2.81 ha were affected by drought in 2014-2015, 60.38 ha were affected by storms, strong winds and drought in 2015-2016, and 15.15 h were affected by strong winds and drought in 2016-2017 (personal observations; www.wwf.org.mx).
Severe rain, snow and freezing temperatures caused mass mortalities of monarchs in the overwintering sites in 1981, 1992, 2002 and 2004, but particularly in March 2016 when probably millions of butterflies died. These events can have very serious impacts on an already diminished overwintering population.

► Other

Very High Threat

Inside site, extent of threat not known
Outside site

It is important to understand that factors beyond the control of site management and even directly the State Party can fundamentally influence the key natural phenomenon making the site so exceptional. The monarch butterfly is susceptible to habitat change, climate change and agrochemicals throughout its range, including migration corridors.
Widespread reduction of breeding habitat, particularly in the Corn Belt region of the US due to land use changes and the decrease of this butterfly's main larval food plant (common milkweed, Asclepias syriaca) associated with the use of glyphosate and other herbicides are also responsible for the dramatic decline in the number of monarchs in the hibernation colonies in Mexico (Vidal and Rendon-Salinas 2014; Vidal et al. 2014).
The decline of monarchs has been caused by the reduction in milkweed in the US due to the increase use of genetically modified crops and land-use change; thus, reducing the negative effects on these host plants on the breeding grounds is therefore the top conservation priority to slow or halt population decline of monarchs in North America (Flockhart et al. 2014).

Potential Threats

Very High Threat

It is important to understand that factors beyond the control of site management and even directly the State Party can fundamentally influence the key natural phenomenon making the site so exceptional. The Monarch Butterfly is susceptible to habitat change, climate change and agrochemicals throughout its range, including migration corridors.

► Mining/ Quarrying

High Threat
Outside site

There have been several attempts (April 2005, May 2007, and more recently in November 2013) by the mining company Industrial Minera Mexico ("Proyecto Angangueo") to re-activate the exploitation of copper, zinc, silver and gold.
On 23 June 2016, the State Party provided a response to a letter from the World Heritage Centre regarding information about plans for reopening of a

copper mine in the vicinity of the property, confirming the following (http://whc.unesco.org/en/soc/3559):

• “The mine is located within the buffer zone of the Monarch Butterfly Biosphere Reserve; however, its operation was suspended in 1990;
• In 2005, the company Industrial Minera México presented an Environmental Impact Statement for exploration, extraction and processing of minerals in the area (Project Angangueo) which was approved by the General Directorate of Environmental Impact and Risk on conditions that the project would need to receive authorization for land use change;
• In 2014, a request for land use change on 6.96 ha of forest area was submitted by the company to the Secretariat of Environment and Natural Resources (SEMARNAT)and was forwarded to the National Commission for the Protection of Natural Areas (CONANP) for their technical evaluation. CONANP concluded that the proposal was incompatible with the conservation objectives of the Reserve and therefore, SEMARNAT did not authorize the request for land use change. However, a new request can be submitted by the company. In February 2016, a meeting was held between the company and different authorities to “streamline procedures to begin construction and operation of mining exploitation in Angangueo within the MBBR”;
• A Special Group was established by the Advisory Council of the biosphere reserve to assess the issue of possible mining, and consultations were held with various experts. The main conclusions were that the current project proposal lacked risk assessment and a remediation plan” (UNESCO, 2017).

Protection and management

Assessing Protection and Management

► Relationships with local people

Some Concern

Almost all of the property is located on communal lands or private property. Conservation and management programs must be implemented through cooperative activities with the landowners. Considerable efforts have been underway to promote alternative livelihood projects, environmental education and training, compensation schemes for conservation,

reforestation, and voluntary surveillance to halt illegal logging (Vidal and Rendon-Salinas 2014; Vidal et al. 2014; 35COM.Monarch.SPreport). The government's payment for environmental services, and the financial support from Mexican and international philanthropists and businesses that helped to create alternative incomes and employment for local communities, together with the Monarch Fund, have played a key role to reduce illegal logging by providing incentives for the communities to protect their forests.
Conflicts remain in terms of the use of the "ejido" lands within the property. Given widespread rural poverty, incentives to log and collect firewood remain high. There are also concerns about benefit-sharing in the realm of tourism. About 27,000 people live in 93 agrarian communities within the reserve's buffer zones, 40 (38 agrarian communities, one federal property, one state property) of which are located primarily in 10 municipalities, including Angangeo, Contepec, Ocampo, Zitácuaro, Donato Guerra, San Jose del Rincón, and Villa de Allende. More than 1 million people live around the reserve. Formerly based on mining and forestry, the economy of the monarch butterfly region faces serious economic challenges, mostly in the form of scarce and poorly paid jobs that encourage many to migrate seasonally to neighboring Mexican states and the United States (Vidal et al. 2014) or even to pursue illegal logging as a short-term option to cope with the dire economic conditions, particularly in Michoacán. Basic services are concentrated in town centers and many villages lack electricity and water and use firewood as their main source of fuel. Local people work in agriculture, livestock production, and forestry sectors. All these possess a challenge for the long-term conservation.
Dire regional social and economic problems remain, and they must be addressed to ensure the reserve's long-term conservation.

► Legal framework

Some Concern

Building upon earlier national designations, in 2000, the "Reserva de la Biosfera Mariposa Monarca" was established and in 2007 the same area was formally designated as a biosphere reserve under UNESCO's Man and the Biosphere (MAB) Programme. In 2008, the cores zones of the biosphere reserve were inscribed as a World Heritage property. Law enforcement, especially with respect to illegal logging, has been an on-going challenge and has included the Army, Federal Environmental Police, State Police of

Michoacán and Mexico, and local communities (UNEP-WCMC, 2011; 35COM.SPreport; www.wwf.org.mx). Of 19 butterfly colonies reported to date, 14 are in the federal Reserve and thus protected, 3 are in a protected area in Estado de Mexico, and 2 are in Michoacán state and not protected (Vidal and Rendon-Salinas 2014).

► Enforcement

Serious Concern

From 2001 through 2012, 1254 ha of forest within the Reserves' core zones were deforested and 925 ha were degraded by illegal logging activities. Of the total 2179 ha of affected area, 2057 ha were affected by illegal logging: 1503 ha by large-scale logging and 554 ha by small-scale logging. Mexican authorities effectively enforced efforts to protect the monarch reserve, particularly from 2007 to 2012. Those efforts, together with the decade-long financial support from Mexican and international philanthropists and businesses to create local alternative-income generation and employment, resulted in the decrease of large-scale illegal logging from 731 ha affected in 2005–2007 to none affected in 2012, although small-scale logging is of growing concern (Vidal et al. 2014).
Between 2014-2016, 30.92 hectares were illegally logged in the core zone; actions were taken by the federal government and in August 2016 with the first group (80 elements) of the Environmental Gendarmerie was permanently installed in the core zones. In coordination with the Federal Attorney for Environmental Protection (PROFEPA), they have carried out operations at strategic sites to dismantle illegal sawmills and have patrolled the core zones (State of Conservation Report by the Government of Mexico 2017). To be added
However, despite these important efforts by the Mexican government, 32.47 hectares were affected by illegal logging, mainly small-scale logging, between 2014 and 2017.

► Integration into regional and national planning systems

Some Concern

An Advisory Council, made up of 21 representatives of rural cooperatives, communities and NGOs, has been established to assist CONANP in implementing the Management Program and Annual Operational Plans. At a

broader scale, a Regional Committee has been established to integrate the efforts of the States of Michoacán and México and 27 municipalities in developing and implementing a regional land use plan. The work of the Advisory Council and Regional Committee was originally complemented by Annual Regional Fora, which include all interested stakeholders and serve to share information, coordinate activities, and inform Annual Operational Plans. However, at the time of evaluation no Regional Fora had been undertaken in the previous years (IUCN, 2008).
A Trinational Working Group, established by Canada, Mexico and the USA in 2014, developed short- and long-term targets and activities for preservation of the migration of the monarch butterfly (State of Conservation Report by the Government of Mexico 2017).

► Management system

Some Concern

The Monarch Butterfly Biosphere Reserve is managed by CONANP assisted by 46 federal and state agencies. In addition, 13 NGOs and academic institutions and the Monarch Butterfly Trust Fund (co-managed by the Mexican Fund for Nature and WWF-Mexico) provide inputs to management. Management is guided by a Management Program, a general document that lays out policies on sustainable development, wildlife management, public use, scientific research and monitoring, operations and law enforcement, rather than specific prescriptions for management. The document forms the basis for the Annual Operational Plans that are used to guide the day-to-day management activities of the many organizations involved (IUCN, 2008; 325COM.Monarch.SPreport; 35COM.Monarch.SOC).

► Management effectiveness

Data Deficient

Overall data on management effectiveness is not available, but the increasingly successful response to illegal logging serves as an indicator of recent enhancements in terms of management effectiveness (35COM.Monarch.SPreport; Brower, 2010).
The National Commission on Natural Protected Areas (CONANP) has finalized or is finalizing a thoughtful evaluation of the effectiveness of all or most federal protected areas, through its Sistema de Informacion, Monitoreo y

Evaluacion para la Conservacion (SIMEC, https://simec.conanp.gob.mx/evaluacion). However, that information has not became publicly available as of 31 August 2017.

► Implementation of Committee decisions and recommendations

Some Concern

As recently as 2010, a World Heritage Committee decision (34COM 7B.35) had noted with concern ongoing illegal logging within the property triggering a reactive monitoring mission. The subsequent Committee decision in 2011 (35COM 7B.32) requested the State Party to implement the recommendations of the above mentioned reactive monitoring mission. The focus of the implementation is on benefit-sharing with communities and tourism (35COM.Monarch.SPreport; 35COM.Monarch.SOC).

► Boundaries

Some Concern

The property’s boundaries are defined by Presidential Decree declaring a biosphere reserve at the national level in 2000. The three defined core zones of the biosphere reserve constitute the property while the two buffer zones of the biosphere reserve also serve as the buffer zones of the property. Jointly, the core zones cover 14 of the historically-recorded overwintering colonies of the eastern population of the Monarch Butterfly. The remaining populations hibernate in 5 colonies outside the property and some colonies have been lost altogether (Brower, 2013; Vidal and Rendon-Salinas 2014; Vidal et al. 2014). While the boundaries of the property are adequate for the protection of around 80% of the overwintering population of the monarch butterfly, the overwintering colonies outside the property should be considered as a serial extension in the future (IUCN, 2008). The boundaries of the small core zones of the biosphere reserve are not demarcated on the ground. This represents a significant problem for the protection and management of the core zones

► Sustainable finance

Some Concern

Financing has been provided by several federal, state and international sources from governments, private sector, philanthropists and civil society. While the diverse funding sources are positive, challenges exist in terms of

inter-institutional coordination. The Monarch Butterfly Fund (MBF), established and managed by the Mexican Fund for Nature and WWF-Mexico has a long term endowment which has been supported by the federal and state governments, civil society (international and national), and individual donors (35COM.Monarch.SPreport; www.wwf.org.mx).

► Staff training and development

Some Concern

Several programs have contributed to staff training and development, but given the around 60 entities of federal and state government institutions, and civil society organizations that are involved in management), the training and development of staff remains a considerable challenge. This holds true in particular as regards specialized capacities for monitoring of the butterfly overwintering colonies, tourism, and visitor management (IUCN, 2008; 35COM.Monarch.SPreport).

► Sustainable use

Some Concern

Significant funding has been provided to work with local and indigenous communities in the core and buffer zones of the biosphere reserve to develop a wide range of activities as alternatives to logging of the core zones, i.e. the property (35COM.Monarch.SPreport). Financial support by national and international organizations and private sector is significant (see, for example, the WWF-Carlos Slim Foundation Alliance and WWF-Telcel monarch program; www.wwf.org.mx).

► Education and interpretation programs

Some Concern

A large number of projects have been undertaken related to environmental education for local communities. Guide training has been an important component (35COM.Monarch.SPreport; Consultation Form, 2012; www.wwf.org.mx).

► Tourism and visitation management

Some Concern

While coherent visitor programs and infrastructure are being developed and implemented, there is still a general lack of information available for visitors with respect to the basic natural history of butterflies and their environment, and appropriate behavior while approaching and viewing the butterfly colonies. It is of concern that the impacts of visitors on butterfly behavior are not fully understood and considered. The tourism season begins before colonies have had a chance to settle down in their selected hibernation areas and visitor movements can disturb them easily. While guide training programs are in place, there is no certification program and insufficient personnel are available to adequately manage and control tourism (35COM.Monarch.SPreport; Consultation form, 2012).

► Monitoring

Mostly Effective

Forest cover, forest condition, and monarch butterfly colonies are monitored on a regular basis by CONANP, WWF, jointly with scientists (IUCN Evaluation, 2008; 35COM.Monarch.SPreport; Carranza Sánchez, 2010; Vidal and Rendon-Salinas; Vidal et al. 2014).

► Research

Mostly Effective

The overwintering sites were a scientific mystery until 1975 when, after decades of butterfly tagging a site was last found on Cerro Pelón. Many studies have ensued, from North American universities, and more recently by Mexican scientists and conservation organizations (Vidal and Rendon-Salinas 2014). The nomination bibliography lists 120 papers and books on the subject. The butterfly species has prompted research into migration ecology, pest suppression, geo-magnetism and other factors influencing orientation, and their use as environmental indicators over its migration range (UNEP/WCMC, 2011). However, it is of concern that the impacts of visitors on butterfly behavior continue to be poorly understood.
According to the State of Conservation Report by the Government of Mexico (2017), there are currently five biological monitoring programs are being carried out, the two most important of which are the monitoring of monarch butterfly hibernation colonies and the monitoring of the forest cover in the Reserve`s core zones (both lead jointly by WWF-Mexico, the Monarch

Reserve and the National Autonomous University - UNAM; see Vidal and Rendon-Salinas 2014; Vidal et al. 2014).

Overall assessment of protection and management

Some Concern

There are encouraging management efforts which have resulted in recent improvements regarding illegal logging; however, illegal logging persists.

The best conservation strategies to augment the capacity of the monarch butterfly to respond to unpredictable and changing climate-related conditions are to protect its habitat from direct human disturbances, such as illegal logging in Mexico and habitat loss and degradation in the US and Canada, and to restore its habitat in the 3 countries. A strategy needs to be devised and implemented as a matter of urgency to address the socioeconomic and environmental problems and opportunities of both the Monarch Butterfly Biosphere Reserve and the region as a whole. Long-term investment in sustainable economic activities, such as ecotourism and production of trees should be better coordinated with the financial support provided by private donors and the Monarch fund. Simultaneously, a year-round and effective on-the-ground surveillance and law-enforcement strategy is required to avoid the resurgence of large-scale logging and to stop small-scale logging. Implementation of a comprehensive, regional plan to create (and maintain) new and better job opportunities, improve and expand basic education for children and youth, improve basic services (e.g., sanitation, electricity, and water), all of which should be in partnership with the people living in the region and take full account of their needs and aspirations, should be a priority.

Although the concentrated nature of monarch use of wintering habitat makes it easy to quantify the loss of this habitat, it is important to remember that the majority of monarchs that winter in Mexico depend on habitat in the US and Canada for breeding and migrating. Concomitant with overwintering habitat loss, there have been large losses of breeding and migrating habitat. The direct relation between the loss of milkweed host plants in agricultural areas in the United States and the number of monarchs wintering in Mexico has been clearly documented. Thus, it is important that citizens, local, state, and federal government agencies; nonprofit organizations; and private donors in the US

and Canada restore and protect habitat within their own territories.

▶ **Assessment of the effectiveness of protection and management in addressing threats outside the site**
Some Concern

Most threats originate outside the property. Of these, many can still be considered local challenges, and these have been the focus of most protection and management activities. However, probably the most important threat (destruction of breeding, feeding and migratory habitat) originate across the migratory route of the monarch, particularly in the US beyond national borders.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **The most dramatic known manifestation of the phenomenon of insect migration**
Critical
Trend:Deteriorating

While substantial progress has been achieved in reducing threats from logging, threats in the breeding and feeding habitats and along the migration in the US and Canada, as well as from inadequate coordination among the approximately 60 entities participating in management of the property are of high concern. While recent all time lows in wintering population sizes may have been aggravated by severe weather conditions, there are broader trends of loss and degradation of wintering habitat, breeding habitat in the US and Canada due to the use of herbicides, expansion of industrial agriculture and land development associated loss of host plants. (35COM.Monarch.SPreport; Brower, 2012; Consultation form, 2012, Vidal and Rendon-Salinas 2014). Based on the monitoring of the overwintering habitats for over a decade, t it was concluded that the observable declines call into question the long-term survival of the monarchs’ migratory phenomenon

(Brower et al. 2012; Vidal and Rendon-Salinas 2014; Vidal et al. 2014).

Summary of the Values

▶ **Assessment of the current state and trend of World Heritage values**

Critical

Trend: Deteriorating

While substantial progress has been achieved in reducing threats from logging, threats in the breeding and feeding habitats and along the migration in the US and Canada are of high concern. While recent all-time lows in wintering population sizes may have been aggravated by severe weather conditions, there are broader trends of loss and degradation of wintering habitat, breeding habitat in the USA and Canada due to the use of herbicides, expansion of industrial agriculture and land development associated loss of host plants. (35COM.Monarch.SPreport; Brower, 2012; Consultation form, 2012; Vidal and Rendon-Salinas 2014). Based on the monitoring of the overwintering habitats for over a decade, it was concluded that the observable declines call into question the long-term survival of the monarchs' migratory phenomenon unless urgent measures are undertaken across its habitat and migration route (Brower et al. 2012; Vidal and Rendon-Salinas 2014; Vidal et al. 2014).

▶ **Assessment of the current state and trend of other important biodiversity values**

Data Deficient

Trend: Data Deficient

Additional information

Benefits

Understanding Benefits

► Importance for research

The numerous studies on the species and its migration, as well as on working with the local ejidos and indigenous communities, have provided scientific insights into several fields, such as plant-animal interactions, migration ecology, interactions among stake-holders, etc..

► Outdoor recreation and tourism

Visitation to the site is significant and growing, and is an important source of income for local communities. Visitation to the site also benefits the regional and national tourism industry though its importance is relatively small compared to other tourism attractions.

► Water provision (importance for water quantity and quality)

The protection of watersheds upstream of communities and dams in the buffer zones is an important benefit, especially in the face of climate change (Caranza Sanchez, 2010). This include large neighbouring cities such as Toluca and even Mexico City.

Summary of benefits

The property provides major benefits through the conservation of a spectacular natural phenomenon, as a major touristic and scientific resource, and through watershed protection which is of importance to communities in the buffer zones of the property.- and to millions of people in nearby cities, including Mexico City. Scientific and socioeconomic importance.

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects
1	Alliance WWF-Telcel and Alliance WWF-Carlos Slim Foundation, Yves Rocher Mexico and France, WWF & Fondo Mexicano para la Conservación de la Naturaleza, A.C. (FMCN) WBF, Biocenosis		WWF-Telcel and WWF-Carlos Slim alliances – and their many national and international partners, have since 2003 support numerous sustainable development projects on communal tree nurseries, reforestation, eco-tourism, communal local surveillance, making and selling of handicrafts, etc., as well as monitoring of forest cover and monarch butterfly colonies. Monarch Butterfly Trust Fund Training of guides; training of environmental education teachers.
2	MBF, CONAFOR		Payments to landowners as compensation for conservation of private lands within the property; and reforestation.
3	Fondo Mexicano para la Conservación de la Naturaleza, A.C. (FMCN)		Restoration of landslide and erosion areas.
4	FONATUR		Improvement of tourism infrastructure in the buffer zone of the biosphere reserve.
5	CONANP/ PROCODES, PET		Sustainable tourism program, which supports the development of infrastructure and training of local communities inside the property.
6	Commission for Environmental Cooperation of North America (CEC; U.S.A, Canada, and Mexico)		Development and implementation of the North American Monarch Conservation Plan with a focus on (1) prevention of threats, mitigation, and control; (2) innovative cooperative agreements; (3) research, monitoring, evaluation and development of reports; and (4) education, training, and capacity building.
7	PROFEPA, MBF, PROCODES		Development of voluntary surveillance brigades to halt illegal deforestation.
8	MBF, Aztec Movement		Alternative livelihoods for communities in the Monarch Butterfly Biosphere Reserve.
9	Mexican Government		Many projects for many years. See State of the Conservation Report by the Government of Mexico (2017)

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	Consolidating coordination and cooperation across the three range countries	Building upon existing agreements and cooperation, the consolidation of coordinated international efforts across North America is of critical importance.The Trinational Working Group, established by Canada, Mexico and the US in 2014, could play a major role to strengthen cooperation and joint conservation and scientific activities.	
2	Extension of the World Heritage property	The size of the property is small and it appears that the important additional wintering colonies of the Monarch Butterfly are highly vulnerable. Efforts to add the remaining wintering sites as components of an enlarged serial site deserve to be considered.	
3	Consolidation of Forest Restoration	The stunning rate of historic forest loss raises the question of reforestation and/or promotion of natural regeneration. The experience with reforestation is mixed and conventional efforts have often been met with limited success. Methods are needed to promote cheap and effective natural regeneration.	
4	NA	Consolidation of the monitoring of monarch butterfly presence and abundance in all Mexican sanctuaries and colonies	

REFERENCES

№	References
1	35COM.Monarch.SOC.
2	35COM.Monarch.SPreport.
3	Brower, L. P., Castilleja, G.; Peralta, A.; Lopez-García, J.; Bojorquez-Tapia, L.; Díaz, S.; Melgarejo, D.; Missrie, M. 2002. Quantitative changes in forest quality in a principal overwintering area of the Monarch Butterfly in Mexico, 1971–1999. Conservation Biology 16(2):346-359.
4	Brower, L.P. 2012. Report on 4 day visit to the Monarch Butterfly Biosphere Reserve. Memo.
5	Brower, L.P. 2013. Trip to the Monarch Butterfly overwintering site in Mexico (16 – 23 February 2013).
6	Brower, L.P.; Taylor, O.R.; Williams, E.H.; Slayback, D.A.; Zubieta, R.R.; Ramírez, M.I. 2012. Decline of monarch butterflies overwintering in Mexico: is the migratory phenomenon at risk? Insect Conservation and Diversity. Volume 5, Issue 2, pages 95–100.
7	Carranza Sanchez, J. Paniagua Ruiz, I.; Oceguera Salazar, K. A.; Ruiz Paniagua, L. 2010. Análisis del impacto por la 5ª tormenta invernal del 2010, en la Reserva de la Biosfera Mariposa Monarca ante el cambio climático global. Comisión Nacional de Áreas Naturales Protegidas.
8	Flockhart, D.T.T., J.-B. Pichancourt, D.R. Norris and T.G. Martin. 2014. Unravelling the annual cycle in a migratory animal: breeding-season habitat loss drives population declines of monarch butterflies. J. Anim. Ecol., 10.1111/1365-2656.12253
9	Fondo Mexicano para la Conservación de la Naturaleza – Comisión Nacional de Áreas Naturales Protegidas. 2010. Estimación y Actualización al 2009 de la Tasa de Transformación del Hábitat de las Áreas Naturales Protegidas SINAP I y SINAP II del FANP. Reserva de la Biósfera Mariposa Monarca.
10	Government of Mexico. 2017. State of Conservation Report by the Government of Mexico..
11	IUCN, 2008. World Heritage Nomination. IUCN Technical Evaluation of Monarch Butterfly Biosphere Reserve, Mexico. ID No. 1290.

№	References
12	Oberhauser, K.S.; Cotter, D.; Davis, D;, Décarie, R.; Behnumea, A.E.; Galino-Leal, C.; Gallina Tessaro, M.P.; Howard, E.; Lauriault, J.; Maczieski, W.; Malcolm, S.; Martínez, F.; González, J.M.; McRae, M.; Nernberg, D.; Pisanty-Baruch, I.; Ramírez, I.; Reyes, J.J.; Wilson, V. 2008. North American Monarch Conservation Plan. Commission for Environmental Cooperation, Montreal, Canada.
13	UNEP/WCMC. 2011. World Heritage Information Sheet.
14	UNESCO. 2017. Monarch Butterfly Biosphere Reserve Mexico
15	Venegas Pérez, Y., Rodríguez, S.; López, D.T. 2011. Análisis Base para el diseño de la Estrategia de Reforestación de la Reserva de la Biosfera Mariposa Monarca. Michoacán, México. Monarch Butterfly Fund – Dirección de la Reserva de la Biosfera Mariposa Monarca.
16	Vidal, O. and E. Rendon-Salinas. 2014. Dynamics and trends of overwintering colonies of the monarch butterfly in Mexico. Biological Conservation. Volume 180, December 2014, Pages 165-175
17	Vidal, O., J. López-García and E. Rendón-Salinas. 2014. Trends in deforestation and forest degradation after a decade of monitoring in the monarch butterfly biosphere reserve in Mexico. Conserv. Biol., 28 (2014), pp. 177-186.
18	World Heritage Website, 2012. http://whc.unesco.org/en/list/1290.