IUCN Conservation Outlook Assessment 2017 **(archived)**
Finalised on 08 November 2017

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

Yakushima

SITE INFORMATION

Country:
Japan
Inscribed in: 1993
Criteria:
(vii) (ix)

Site description:

Located in the interior of Yaku Island, at the meeting-point of the palaearctic and oriental biotic regions, Yakushima exhibits a rich flora, with some 1,900 species and subspecies, including ancient specimens of the sugi (Japanese cedar). It also contains a remnant of a warm-temperate ancient forest that is unique in this region. © UNESCO

SUMMARY

2017 Conservation Outlook

Good with some concerns

Overall, the conservation outlook for the site is positive but only on the assumption that the management regime and systems are updated, streamlined and operate more strategically. Boundary improvements would likely improve the value of the site as well as enhance the long-term optimism for a positive conservation outlook. Yakushima World Heritage Area in its present form and with its current inappropriate boundaries is like an island within an island; it is so inextricably linked, both physically and ecologically, with the surrounding forested lands that management will fail if confined to within the rather arbitrary boundaries of the site.
The site is very vulnerable to external threats from activities in surrounding lands and so management must be closely collaborative, if not integrated, across the boundaries. Threats of an ecological nature are already appearing and can be expected to increase over time, especially from invasive species (e.g. raccoon dog), overpopulation of native species (e.g. deer) and can only be effectively addressed with a holistic approach on a whole-of-island level.

Current state and trend of VALUES

Low Concern
Trend: Stable

Overall the values of the site appear stable but various indicators and threats are evident or emerging that suggests a longer term trend towards deterioration in some attributes and values. The longer-term prognosis needs to be taken seriously. There is a distinct risk that management focus will continue to be driven by visitor management issues and wildlife management (native and introduced) given insufficient attention. The existence of the invasive species, the Raccoon Dog (Nyctereutes procyonoides) on the island should be a warning of the need for control of invasive species and that must be done at a 'whole-of-island' level. The identification of excessive impact of deer (a local endemic

subspecies), die back of old-growth White Pine (Pinus amamiana) and spread of raccoon dog underline the potentially deteriorating state that demands a more proactive approach. In the absence of a systematic scientific monitoring programme, it may be difficult to identify changes underway.

Overall THREATS

High Threat

A number of the identified threats to the site's values and integrity are from natural processes (earthquake, typhoon, landslides). A number of identified threats and potential threats are problematic to assess for significance but never the less could become serious threats; it is these threats that require further research as a matter of priority (invasive species (e.g raccoon dog), air pollution, nematodes).
The biggest current threat so far is undoubtedly the threat posed by visitor impacts, which is exacerbated by a management regime that appears not to be fully meeting the challenge of increasing numbers and impacts. The management plan, albeit recently revised, does not appear to have been effective in guiding address of the visitor impacts issue. The continuing trend of decreasing visitation may be a response to overcrowding. Visitor experience needs to be monitored. Another major threat is the impacts of the overpopulation of deer (Yakushima sika) which is current and serious. Although it is being given attention the management response needs to be constantly monitored and adapted. Strategies to address any of the above-mentioned impacts from visitors, deer and raccoon dog will need to be at the level of the island as a whole, rather than being confined to the World Heritage site.

Overall PROTECTION and MANAGEMENT

Some Concern

For such a small site, the overall protection and management systems in place appear unnecessarily complex (tenure, management plan, zoning, management agency) and in the 20+ years since listing, only relatively minor changes have been made, mostly adding to the bureaucratic complexity rather than simplifying. The question arises as to whether these components of protection and management deliver a high order of protection and management. It is apparent that whilst there is a reasonable level of protection for the OUV of the site, there are on-going issues relating to visitor management and management

of the deer population.
The reality is that given the shape and boundaries of the site, it is vulnerable to external threats and effective management can only be achieved if there is a high level of coordination and collaboration on management of surrounding lands. This is especially the case with visitor management, feral species management and deer management.
There is considerable scope for improving protection and management. There is also a case for extending the property to include relevant forest areas to form a physically consolidated tract with greater opportunity for direct integrated management at the landscape scale. There is a clear need for systematic monitoring of values.

FULL ASSESSMENT

Description of values

Values

World Heritage values

► Forests of outstanding natural beauty

Criterion:(vii)

An outstanding feature of Yakushima World Heritage site is the remnant old-growth forests of often very large and aesthetically impressive conifers, in particular the Japanese Cedar, some of which are thousands of years old. This is a now rare and outstanding example of the original primeval cedar forests that were once extensive in Japan (SoOUV, 2013). The very high rainfall results in a mantle of mosses through the forests, enhancing their natural beauty; the very wet conditions mean that the forests are often shrouded in mist, adding to the romance for the visitor to these ancient forests. The numerous large cedar trees, the largest of which are known as 'Yakusugi', are revered by the Japanese community and are sought out as special attractions by visitors, probably representing the main attractions for the many tourists that visit the site. The lowland evergreen broadleaved forest (dominated by evergreen oaks, Lauraceae and Distylium racemosum) is also visually distinct and readily viewed from the road.

► Outstanding scenic beauty

Criterion:(vii)

Yakushima World Heritage site embraces some of the more spectacular mountainous landscape that dominates this small island, the central peak rising to almost 2,000 metres from the surrounding sea. The multiple rocky peaks and sculpted granite outcrops are subtended by fast running streams

created by the abundant rainfall, cutting deep rocky gorges down to the sea. The largely treeless summits, often blanketed in snow during winter, provide for extensive views across the whole of the forested island to the sea beyond.

► An island ecosystem with an unbroken sequence of old-growth forests from subtropical to cool-temperate climate

Criterion:(ix)

Yakushima is an island ecosystem with high mountains––a characteristic rare in the region at around 30 degrees north latitude. It contains a unique remnant of a warm-temperate primeval forest which has been much reduced elsewhere in the region (SoOUV, 2013). The insular nature combined with the very rugged terrain has ensured survival of a full sequence of vegetation from the alpine vegetation of the summits down to warm temperate rainforest that extends down to sea level. Much of the conservation value of the site is reflected in the 200 plant species that have the southern limit of their natural distribution on the island. (WCMC Data Sheet 1993)
The property is very important for scientific studies on evolutionary biology, biogeography, vegetation succession, interaction of lowland and upland systems, hydrology, and warm-temperate ecosystem processes (SoOUV, 2013).

► A diverse biota exhibiting significant endemism

Criterion:(ix)

Yakushima is an island ecosystem that supports a comparatively diverse biota, comprising some 1,900 species and subspecies of flora (94 of which are endemic), 16 mammal species (including three endemic subspecies) and 150 bird species and more than 1900 species of insect. Of the plants, there are more than 600 species of moss recorded, testament to the wet forest environment. (Management Plan 1995) The biota demonstrates a significant degree of endemism, evidence of on-going evolution during relatively long-term isolation from other landmasses. (WCMC Data Sheet 1993; SoOUV)

Assessment information

Threats

Current Threats

High Threat

Major tourism visitation is creating unacceptable levels of impacts on vulnerable parts of the natural environment and evidence suggests that management is not fully meeting the challenge of the visitor numbers or impacts. It is apparent that the population level of the deer is excessive and threatening important plants, although remedial action is now being taken. Progress achieved in that regard needs to be closely monitored.
Management needs to factor in the natural processes of typhoons and landslides to avoid exacerbating the impact.
The threat of air pollution and invasive species is present but not yet adequately understood. Combating the threat of nematodes and any other threats to endangered locally endemic Pinus amamiana needs further research.

► Avalanches/ Landslides

Low Threat
Inside site, localised(<5%)

Landslides are relatively common on steep terrain but can be regarded as a largely natural process. Roads may aggravate the impact (Yukiyoshi Teramoto and Etsuro Shimokawa 2009, Yakumonkey Guidebook).

► Air Pollution

High Threat
Inside site, extent of threat not known

Research has detected fall out from air pollution allegedly derived from China (Fackler 2013).
There is debate about the role of the air pollution on the threatened Yakushima white pine (Pinus amamiana) - an endangered species - that are

dying. Studies show some evidence of aerosol and dust impact on Yakushima but do not suggest it as the cause of death of P. amamiana trees (Nakano et al, 2017). A more likely cause of death is nematodes (Gymnosperm Database 2017).

► Hyper-Abundant Species

High Threat
Inside site, widespread(15-50%)
Outside site

The deer population, in the opinion of some, is over-abundant and damaging natural values. Remedial action is now being taken (Japan Forestry Agency in Fackler 2013); Stakeholder consultation 2017).

► Tourism/ visitors/ recreation

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

It is evident that there is an ongoing and growing problem with managing the concentrated impact of a large number of visitors to the area (Periodic Report 2003, Forbes 2011), notwithstanding that visitor numbers have declined from a peak in 2008.

Potential Threats

Low Threat

The 'octopus' shape of the property, with long narrow 'arms' and an exceptionally high perimeter to area ratio means that the area is very vulnerable to the impacts of threats emanating from adjacent lands. There is a clear case for review of the boundaries and simplification of forest management on the island. Fortunately most of the adjacent lands are public lands but a different management regime applies and there is never-the-less some potential for threats to arise from these adjacent lands. Some adjacent areas of plantations in these forests raise the real possibility of logging well into the future.
The deer population of course knows no boundaries and the population within the site and associated impacts is very dependent on the management of deer on surrounding lands. The mobility of the deer means that deer control in reality is not within direct control of the site management and must depend on

a cooperative whole-of-island approach; a landscape or ecosystem level of management. Indeed the sire represents such a small proportion of the island that deer culling in forests outside the site should be adequate to reduce impacts within the site.

► Logging/ Wood Harvesting

Low Threat
Inside site, scattered(5-15%)

There are significant areas of cedar plantations established that may attract future logging operations when plantations are mature (Forbes 2011, Google Earth imagery 2014).

► Invasive Non-Native/ Alien Species

Data Deficient
Inside site, throughout(>50%)

The raccoon dog (Nyctereutes procyonoides) is now well established on the island but the nature of the ecological impact is not clear, and there is no evidence of research or control efforts (NIES 2014).

► Earthquakes/ Tsunamis

Low Threat
Inside site, localised(<5%)

Although Yakushima appears to be geologically stable, surrounding regions are prone to volcanism and earthquakes which can impact on Yakushima and create landslides on the steep topography (Google Earth earthquake data base 2017).

► Storms/Flooding

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

Yakushima is within the northern hemisphere typhoon zone and is occasionally hit by typhoons that bring strong winds and cause landslips (Witham 2014) and damage to trees (Bellingham et al., 1996; Takashima et al., 2009), which can be regarded as a largely natural process (which is nevertheless likely to become more intensive and more frequent with the

onset of climate change).

Protection and management

Assessing Protection and Management

► Relationships with local people

Some Concern

Local government is not integrated into management of the site but in more recent documentation appears to be consulted (Periodic Report 2003, WHC Website 2014). Information available is not adequate to fully assess this issue but it is apparent that there is significant involvement of local people in at least tour guiding businesses. There are concerns about the lack of a certification of guides to ensure strong and consistent messaging to visitors about the site and local culture. It is also apparent that local people were not involved in management planning. In future, it would be desirable to provide more direct participation in on-going planning and management.

► Legal framework

Some Concern

For such a relatively small World Heritage site, the number of different legal statutes that apply seems unnecessarily complex. Enforcement is the responsibility of respective different agencies, there appears to be little inter-agency delegation and so this complicates enforcement (Management Plan 1995 and 2012, Periodic Reporting 2003).

► Enforcement

Data Deficient

Insufficient information available.

► Integration into regional and national planning systems

Data Deficient

Available documents fail to reveal what if any links there are between the

property and regional/national planning systems.

► Management system

Some Concern

Article 3: "The Committee (Yakushima World Heritage Liaison Committee) shall be composed of the following organizations:
• Kyushu District National Parks and Wildlife Office
• Kumamoto Regional Forestry Office
• Kagoshima Prefecture
• Kagoshima Prefecture Board of Education
In addition, the Committee may decide to ask representatives of the local governments of Yakushima-cho to attend Committee meetings to express their opinions." (Management Plan 2012).
Notwithstanding some small but significant changes in the Management Plan (2012), the management system for Yakushima remains overly complex and detached from the local community. Local Governments on the island "may" be consulted, far from being active partners in management. The combination of multiple legislative mechanisms, a complex composite management agency, a management plan that provides only limited and outdated guidance, unnecessarily complicated sub-tenures (Yakushima Wilderness Area, Yakushima National Park, Special Natural Monument, Biosphere Reserve and Yakushima Forest Ecosystem Reserve), an overly complicated zoning plan and multiple agency field operations in such a relatively small site appears inefficient and cumbersome. It is apparent that the management system has failed to anticipate and be innovative in responding to increasing visitor pressures and other emerging threats such as raccoon dog, air pollution, and nematodes (Management Plan 1995 and 2012, Forbes 2011). It is time for an integrated management plan for all publicly owned forests on Yakushima of which the World Heritage site is but part.

► Management effectiveness

Some Concern

Management appears to have limited effectiveness in responding to threats, in particular management of increasing visitor numbers and impacts. Management appears overly reactive rather than proactive (Forbes 2011,

Management Plan 2012). The reasons for the fall in visitor numbers deserves research in case it is a dissatisfaction with quality of experience, expense, poor facilities etc.

► Implementation of Committee decisions and recommendations

Some Concern

The original evaluation recommended "Suggestions for improvements to the boundaries and strengthening the management of the site should be sent to the Japanese authorities along with noting concern over the impacts on the site from tourism." (IUCN Evaluation, 1993). No improvements in the boundaries have been forthcoming. The concerns over the impacts on the site from tourism appear to have only increased, even after a trend of decline in numbers since 2008 (Forbes 2011). Expansion of the World Heritage site and/or greater integration of ecological and visitor/tourism management could be beneficial for the island ecosystem as a whole and to spread visitor impacts.

► Boundaries

Some Concern

It is likely that if Yakushima were nominated in the present, the current boundaries would be rejected as inappropriate. The boundary appears mostly illogical when related to the landscape, topography, conservation attributes and manageability. It also fails to include some attributes that would make a valuable contribution to the integrity of the site.
The need for boundary review was noted at the time of original listing (IUCN Evaluation 1993) but no improvements have been achieved in the 20+ years since listing and remains a concern more than ever.

► Sustainable finance

Some Concern

It is apparent that there are some issues with funding, not the least of which is the lack of direct repatriation of visitor fees to park management. Funding for management is dependent upon separate funding of the various participating agencies rather than an allocation direct to the property (Forbes 2011). A donation system has been initiated (Stakeholder consultation, 2017).

► Staff training and development

Some Concern

Staffing numbers are not revealed in the Periodic Reporting but are reportedly limited to a total of 3 persons from different agencies. The one important admission in the Periodic Reporting was the inadequate level of staffing. No data was available regarding training and in Periodic Reporting the State Party advises that there are no needs for training. On this basis, staff training and development is assessed as being of some concern, however, more information is needed.

► Sustainable use

Some Concern

There are concerns about the sustainability of tourism use, notwithstanding that visitor numbers have peaked in 2008 and are now in decline. There would need to be commensurate improvements in management of impacts. Perhaps too much tourism is being (or allowed to be) concentrated into the site instead of being spread to other outstanding attractions on the island. An island level integrated tourism management plan would help.

► Education and interpretation programs

Data Deficient

If the two major visitor centres on the island and their associated education programmes are used to judge off-site education and interpretation, it is impressive. However, given the large number of tour guides operating in and adjacent to the site, it is not possible to judge the quality and effectiveness of education and interpretation on site.

► Tourism and visitation management

Some Concern

Management of tourism in the property is admitted by the State Party (Periodic Reporting 2003) to be an issue, especially on the mountain trails. It is also independently identified as an issue (Forbes 2011).
Trampling of vegetation, crowding on trails and similar issues have been documented by both State Party and in published papers and online visitor

reviews. Recent documentation suggests the issue is on-going. The Yakushima Association for the Promotion of Ecotourism was launched in 2009. (Ministry of Environment 2014) However, the objective of the organisation is described as “…the institution of ecotours that gives visitors a real feel for the long-held lifestyles and traditions that still remain in the settlements on the island." The association also said to serve as a means for promoting the decentralization of use that is currently concentrated in the mountainous areas (Ministry of Environment 2014).
It is apparent that there are on-going problems with visitor management, both in terms of quality of experience and avoidance/minimization of impacts. The standard of presentation of off-site attractions is mostly very limited, detracting from the overall island visitor experience and from the World Heritage site image as there is limited distinct definition for the casual visitor between the World Heritage site and the rest of the island.

► Monitoring

Some Concern

Documentation indicates that participating agencies do some monitoring such as visitor numbers. No evidence was located to suggest that there is a formal monitoring program linked to the management plan or similar. Indeed, the management plan (2012) is of a type that it is not readily apparent just what monitoring priorities should be. (The management plan is more a 'strategic directions' document with little prescriptive instruction or prioritizing)

► Research

Some Concern

There is increasing evidence of a management driven research agenda but most research activities appear opportunistic. Some useful intersections have occurred, for example, air pollution and death of endangered white pine, and investigation of aerosol and pollution carried from mainland Asia.

Overall assessment of protection and management

Some Concern

For such a small site, the overall protection and management systems in place

appear unnecessarily complex (tenure, management plan, zoning, management agency) and in the 20+ years since listing, only relatively minor changes have been made, mostly adding to the bureaucratic complexity rather than simplifying. The question arises as to whether these components of protection and management deliver a high order of protection and management. It is apparent that whilst there is a reasonable level of protection for the OUV of the site, there are on-going issues relating to visitor management and management of the deer population.
The reality is that given the shape and boundaries of the site, it is vulnerable to external threats and effective management can only be achieved if there is a high level of coordination and collaboration on management of surrounding lands. This is especially the case with visitor management, feral species management and deer management.
There is considerable scope for improving protection and management. There is also a case for extending the property to include relevant forest areas to form a physically consolidated tract with greater opportunity for direct integrated management at the landscape scale. There is a clear need for systematic monitoring of values.

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

Some Concern

Most of the lands adjoining the site are owned and or administered by one or more government agencies (Ministry of the Environment, the Forestry Agency) The World Heritage Centre's website records that "In 2012, Kagoshima Prefecture and Yakushima Town joined as the management authorities, and the Plan was revised." However, the revised management plan records differently, that
"The Committee (Yakushima World Heritage Liaison Committee) shall be composed of the following organizations (all government):
• Kyushu District National Parks and Wildlife Office
• Kumamoto Regional Forestry Office
• Kagoshima Prefecture
• Kagoshima Prefecture Board of Education"
Further, Yakushima Town (know prior to 2007 as the two towns of Kamiyaku-cho and Yaku-cho) is not a part of the Committee and involvement is at the discretion of the Committee -"may decide to ask representatives of the local

governments of Kamiyaku-cho and Yaku-cho to attend Committee meetings to express their opinions."
The revised management plan provides some opportunity for coordination and collaboration but does not assure coordination and collaboration across boundaries to address external threats.

State and trend of values

Assessing the current state and trend of values

World Heritage values

▶ **Forests of outstanding natural beauty**

Low Concern
Trend:Stable

For the majority of visitors to the site, the primary attraction is the aesthetics of the old-growth forests and especially large individual trees ('Yakusugi'). Whilst the forests and individual Yakusugi are much as at the time of listing, the visitor experience appears to have deteriorated somewhat as a result of crowding and associated impacts on the forest environment.
Whilst the old-growth Yakushima white pine (Pinus amamiana) have not featured much in the visitor mind, this rare local endemic tree is subject to significant dieback and the cause is not certain though the latest research suggests nematodes rather than air pollution (Nakano et al, 2012).

▶ **Outstanding scenic beauty**

Low Concern
Trend:Stable

For visitors to the site, the spectacular landscape would be little changed from the time of listing. The macro landscape is comparatively stable apart from the impacts of natural processes, especially landslides. At the local or micro level, there are localised and concerning changes associated with visitor and deer impacts, particularly in the high mountain section where there are reports of trampling, track erosion and changed drainage.

▶

An island ecosystem with an unbroken sequence of old-growth forests from subtropical to cool-temperate climate

Good
Trend:Stable

The site continues to exhibit its overlapping biotas from the Palearctic (mostly) and Oriental (some elements) realms, a rather robust value that would only be threatened by longer-term changes such as climate change or threats from invasive species or severe pollution. Overabundance of deer represents a threat.

► A diverse biota exhibiting significant endemism

High Concern
Trend:Stable

As an island ecosystem, Yaku Island (Yaku-shima) is vulnerable to threats from invasive species. Typically many islands in the world have had their ecosystems and biota seriously impacted by introduction/arrival of exotic species, in particular invasive species and Yakushima is unlikely to be an exception. Introduction of the predatory Raccoon Dog (Nyctereutes procyonoides) surely represents a serious threat to the biota of the island given the large biodiversity, including many local endemic taxa. Similarly, prevailing opinion is strongly in favour of recognizing an over-abundance of the Yakushima Sika deer (Cervus nippon yakushimae) and hence the potential for detrimental impact on the biota of the site/island. Regrettably, the management plan is silent on address of invasive species and impacts of deer. However, action is now being taken to reduce overall population of deer on the island.

Summary of the Values

► Assessment of the current state and trend of World Heritage values

Low Concern
Trend: Stable

Overall the values of the site appear stable but various indicators and threats are evident or emerging that suggests a longer term trend towards deterioration in some attributes and values. The longer-term prognosis needs

to be taken seriously. There is a distinct risk that management focus will continue to be driven by visitor management issues and wildlife management (native and introduced) given insufficient attention. The existence of the invasive species, the Raccoon Dog (Nyctereutes procyonoides) on the island should be a warning of the need for control of invasive species and that must be done at a 'whole-of-island' level. The identification of excessive impact of deer (a local endemic subspecies), die back of old-growth White Pine (Pinus amamiana) and spread of raccoon dog underline the potentially deteriorating state that demands a more proactive approach. In the absence of a systematic scientific monitoring programme, it may be difficult to identify changes underway.

Additional information

Benefits

Understanding Benefits

► Outdoor recreation and tourism

Yaku Island has become an increasingly attractive destination for tourists, both domestic and international. The Yakushima World Heritage Site is an important component of that tourism. The numerous walking trails on the island, including in the site, provide an abundance of opportunities for health related exercise.
The tourism clearly makes an important economic contribution to the local island population and extending to Kagoshima on the mainland.

► Wilderness and iconic features

The larger cedar trees, those considered to be over 1,000 years old, called "Yakusugi", are greatly revered and regarded as sacred by Japanese people. One consequence is that this generates substantial national tourism to the site, generating economic benefits to the island community through employment and provision of services. On the negative side, it places too

much emphasis on access to these ancient trees and requires 'site hardening' to minimise impact of concentrated visitation.

There appears to be an on-going resentment in the island community about 'sharing' their cultural and spiritual attachment to the forest with visitors (Makoto Hagino 2016).
In the absence of data, it is difficult to establish the quality of tour guiding and whether this adequately represents the traditional culture of the island.

► Contribution to education

Several large and impressive visitor centres have been established on the island and are visited by most tourists to the island and the World Heritage Site. Emphasis in on education with a strong focus on the cedar forests, the WH site in particular. These facilities are also utilized for school education. These centres are an important complement to the WH site and provide great educational benefit to the wider population.

The several visitor centres on the island make a valuable contribution to education, especially education about the natural history of the island. The quality of education imparted by tour guides is unknown (data deficient).

Summary of benefits

By far the main source of benefits to the community is from tourism visitation to the site, tourism being driven by a combination of the 'Yakusugi' cedar trees and the spectacular mountain scenery. Benefits flowing to the Yaku Island community is primarily economic through the provision of services to visitors. Educational benefits are significant and closely associated with tourism to the site.

Projects

Compilation of active conservation projects

№	Organization/ individuals	Project duration	Brief description of Active Projects

1	Osamu Nagafuchi, University of Shiga, Japan	Environmental factors influencing the load of long-range transported air pollutants on Pinus amamiana in Yakushima Island.
2	Kagoshima Prefecture has formulated “Type II Specified Wildlife (Yaku-sika) Control Plan” covering the whole Yakushima Island in 2017 based on the Wildlife Protection, Control and Hunting Management Act.	A scientific panel to monitor and advise the Scientific Council on management of the Yaku-sika (deer)

Compilation of potential site needs

№	Site need title	Brief description of potential site needs	Support needed for following years
1	Investigation of the threats posed by invasive species (e.g. raccoon dog)	Island ecosystems are especially vulnerable to the impacts of invasive species, in particular carnivores. The existence of introduced species on Yakushima should be a matter of great alarm given the absence of any equivalent carnivore on the island. There is therefore an urgent need to research the population dynamics of this invasive species and to consider the prospects of eradication.	
2	Boundary Review	The need to review the boundary was identified in the original evaluation document but has to date not been conducted. It is evident that OUVof the site extends beyond the boundaries, that there is a need for much greater integration of management with surrounding lands and to adopt boundaries that are more credible and related to geographic features.	
3	Deer Management	Although a committee has now been established to guide management of over-abundance of deer, a greater need is monitoring to ensure the culling is not excessive and to identify any improvement in impacted areas within the site, especially in the alpine areas (Stakeholder consultation, 2017).	

REFERENCES

№	References
1	Alternative Tourism (2014) Yakushima Island: http://www.alternative-tourism.com/Japan/Tourism/Natural_pl…
2	Atsushi Kume, Osamu Nagafuchi, Suguru Akune, Nobutake Nakatani, Masaaki Chiwa, Kenshi Tetsuka, Environmental factors influencing the load of long-range transported air pollutants on Pinus amamiana in Yakushima Island, Japan,Ecological Research,Vol.25,No.1,pp.233-243,2010.01
3	Atsushi Takashima, Atsushi Kume, Shigejiro Yoshida, Takuhiko Murakami, Tsuyoshi Kajisa, Nobuya Mizoue Discontinuous DBH–height relationship of Cryptomeria japonica on Yakushima Island: effect of frequent typhoons on the maximum height. Ecological Research September 2009, Volume 24, Issue 5, pp 1003-1011
4	Bellingham, P.J., Kohyama, T. & Aiba, S. (1996) The effects of a typhoon on Japanese warm temperate rainforests. Ecological Research 11: 229-247.
5	David A. Hill (1999) Seasonal variation in the feeding behavior and diet of Japanese macaques (Macaca fuscata yakui) in lowland forest of Yakushima American Journal of Primatology Volume 43, Issue 4, pages 305–320, 1997 Article first published online: 6 Jan 1999
6	Fackler, Martin (2013) Scientist Says Pollution From China Is Killing a Japanese Island’s Trees. Yakushima Journal
7	Forbes, Glenn (2011) Yakushima: Balancing long-term Environmental Sustainability and Economic Opportunity http://www.k-junshin.ac.jp/juntan/libhome/bulletin/No42/for…
8	GEO 121 Wiki (2013) Yakushima, Japan https://sites.google.com/a/miamioh.edu/geo121f13/home/d2-ya…
9	Invasive Species of Japan (2014) - Raccoon Dog Nyctereutes procyonoides National Institute for Environmental Studies http://www.nies.go.jp/biodiversity/invasive/DB/detail/10310…
10	Kenji Suetsugu and Hirokazu Fukunaga (2016) Lecanorchis tabuawaensis (Orchidaceae) a new mycoheterotrophic plant from Yakushima Island, Japan PhytoKeys. 2016; (73): 125–135. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5109904/

№	References
11	Kenji Suetsugua,*, Hirokazu Tsukayab and Hiroyoshi Ohashi (2016) (Sciaphila yakushimensis (Triuridaceae), a New Mycoheterotrophic Plant from Yakushima Island, Japan. Journal Japan Botany. 91: 1–6 (2016)
12	Mahoney, Paul (2013) The Anbo Forestry Railway 1923: A Cultural Heritage Values Assessment. Unpublished report.
13	Makoto Hagino (2016) The legal concept of ‘heritage’ in the world heritage convention: The case of Yakushima, Island. Journal of Marine and Island Cultures www.sciencedirect.com
14	National Institute for Environmental Studies (NIES). Invasive Species of Japan (2014) http://www.nies.go.jp/biodiversity/invasive/DB/detail/10310…
15	TOKUMARU, Hisae (2003) Nature Conservation on Yakushima Island : Kagoshima Prefecture’s Efforts. Nature Conservation Division, Kagoshima Prefectural Government Kagoshima
16	Takahiro Okano a,*, Hiroyuki Matsuda (2013 Biocultural diversity of Yakushima Island: Mountains, beaches, and sea. Journal of Marine and Island Cultures. Volume 2, Issue 2, December 2013, Pages 69-77
17	Takanori Nakano, Yoriko Yokoo, Masao Okumura, Seo-Ryong Jean,4and Kenichi Satake (2012) Evaluation of the Impacts of Marine Salts and Asian Dust on the Forested Yakushima Island Ecosystem, a World Natural Heritage Site in Japan. Water Air Soil Pollut. 2012 Nov; 223(9): 5575–5597
18	The Gymnosperm Database (2014) Pinus amamiana Yakushima white pine http://www.conifers.org/pi/Pinus_amamiana.php
19	Toshihiko Yonezawa1*, Akihiko Shinomiya2 and Hiroyuki Motomura3 (2010) Freshwater fishes of Yaku-shima Island, Kagoshima Prefecture, southern Japan. National Museum of Nature and Science, Tokyo
20	UNESCO World Heritage Centre (2014) Yakushima http://whc.unesco.org/en/list/662/
21	Witham, Clive (2014) Yakushima: A Yakumonkey Guide. Siesta Press
22	YAKUSHIMA - WORLD HERITAGE (includes annotated Google Earth image) Japan Ministry of Environment. https://www.env.go.jp/nature/isan/worldheritage/en/yakushim…
23	Yakushima World Heritage Area Management Plan (1995)

№	References
24	Yakushima World Heritage Area Management Plan (2012). https://www.env.go.jp/en/nature/wh/yakushima/index.html
25	Yukiyoshi Teramoto and Etsuro Shimokawa □□□□□□ (2009)(Journal of the Japanese Society of Coastal Forest) 8(2):92-97, 2009 Characteristics of slope failure and the effect of deforestation in a granite basin on Yakushima http://jscf.jp/Journal_PDF/JSCF08(2)/JSCF8(2)92-97E.pdf