

Designation date: 18/10/2002 Ramsar Site no. 1232

Information Sheet on Ramsar Wetlands (RIS) – 2009-2014 version

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Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX.22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.
2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework and guidelines for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 17, 4th edition).
3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

1. Name and address of the compiler of this form:

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DD MM YY					
Designation date			Site Reference Number		

2. Date this sheet was completed/updated:

March 21 2012

3. Country: Palau

4. Name of the Ramsar site:

The precise name of the designated site in one of the three official languages (English, French or Spanish) of the Convention. Alternative names, including in local language(s), should be given in parentheses after the precise name.

Lake Ngardok Nature Reserve

5. Designation of new Ramsar site or update of existing site:

This RIS is for (tick one box only):

- a) Designation of a new Ramsar site or
b) Updated information on an existing Ramsar site
-

6. **For RIS updates only**, changes to the site since its designation or earlier update:

a) Site boundary and area

The Ramsar site boundary and site area are unchanged:

or

If the site boundary has changed:

- i) the boundary has been delineated more accurately ; or
- ii) the boundary has been extended ; or
- iii) the boundary has been restricted**

and/or

If the site area has changed:

- i) the area has been measured more accurately ; or
- ii) the area has been extended ; or
- iii) the area has been reduced**

** **Important note:** If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. **Map of site:**

Refer to Annex III of the *Explanatory Note and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

- i) a hard copy (required for inclusion of site in the Ramsar List): ;
- ii) an electronic format (e.g. a JPEG or ArcView image) ;
- iii) a GIS file providing geo-referenced site boundary vectors and attribute tables .

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park, etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site includes the entire protected Ngardok Nature Reserve and catchment of the lake and thus also includes several streams and small areas of riverine marsh and freshwater swamp forest as well. The site map (provided) shows the boundary of the Ngardok Nature Reserve in which the lake is lying. The site boundary is the same as the Nature Reserve boundary.

8. **Geographical coordinates** (latitude/longitude, in degrees and minutes):

Provide the coordinates of the approximate centre of the site and/or the limits of the site. If the site is composed of more than one separate area, provide coordinates for each of these areas.

07°31'00" N 134°36'00" E (approximate centre of the site)

9. **General location:**

Include in which part of the country and which large administrative region(s) the site lies and the location of the nearest large town.

The Ramsar Site is located about 4 km northwest of Melekeok town (population approximately 271) in Melekeok State, on the eastern side of Babeldaob Island, which covers 334 square kilometers (82,000 acres) accounting for over 80% of Palau's landmass. Melekeok State is centrally located on the eastern side of Babeldaob and covers approximately 27 square kilometers (6,800 acres). As of the 2005 national population census, Melekeok State has a population of 391.

10. Elevation: (in metres: average and/or maximum & minimum)

The lake lies at approximately 30 metres above sea level. The top of the catchment rarely exceeds 50m.

11. Area: (in hectares)

Total area = 500 ha

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

Lake Ngardok is the largest natural lake in the West Caroline Islands biogeographic region. The lake, wetlands, and upland forest provide habitat for endemic plants, wildlife, and birds that are found only in Palau. The endemic birds include the Palau Fruit Dove (*Ptilinopus pelewensis*), Palau Fantail (*Rhipidura lepida*), Palau Flycatcher (*Myiagra erythropis*), and the Palau Ground Dove (*Gallinolumba canifrons*). The lake and the marshes surrounding it are home to the CITES appendix 1-listed saltwater crocodile (*Crocodylus porosus*). The Ngerdorch River serves as a travel route for the crocodile from the lake to the sea. The Ramsar Site includes the entire protected Nature Reserve and catchment of the lake and thus also includes several streams and small areas of riverine marsh and freshwater swamp forest as well. The lake is particularly important to the small population of Melekeok State for control of floods and maintenance of water quality and it is the only important source of water supply for Melekeok State and the National Capitol of Palau. This site is significant because of its biodiversity and the habitat it provides for the endangered and endemic species found within.

13. Ramsar Criteria:

Tick the box under each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11). All Criteria which apply should be ticked.

1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Criterion 1

Lake Ngardok is the largest natural freshwater lake in the biogeographic region of West Caroline Islands and the riverine marsh and freshwater swamp forest found within the site are representative of these wetlands types within this biogeographic region.

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

West Caroline Islands

b) biogeographic regionalisation scheme (include reference citation):

Ecoregion 830 in [Freshwater Ecoregions of the World \(Robin Abell et al. 2008\)](#)

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Climate

Palau has a wet tropical climate, with little seasonal variation in temperature. The mean daily temperature throughout the year averages about 80° F (27°C) with a daily range of about 10° F (7° C). Rainfall averages about 144 inches (370 cm) per year (US Army, 1956).

Geology and soils

Like many Pacific Islands, Babeldaob is of volcanic origin. The lake and adjacent marshes/swamp forests are located within a depression and there is a suggestion that Lake Ngardok was originally created by a natural dam formed by deposits of clay eroded during heavy rains. The soils around the lake are very deep and poorly drained. They formed in alluvium washed from upland soils derived dominantly from volcanic rock and in deposits of organic matter derived dominantly from wetland grasses and sedges. The most common soils in Ngardok Nature Reserve are upland soils, which are made from highly weathered volcanic material.

Hydrology

Water flows out of Lake Ngardok and into the Ngerdorch River. The Ngerdorch River flows through Melekeok and Ngchesar states for about 12 kilometers (7.4 miles) before reaching the mangroves and the sea on the coast of Ngchesar, eastern Babeldaob. The southern end of the Reserve is a part of a large freshwater marsh along the Ngerdorch River. Water in the marsh is between 3 to 10 feet (1 to 3 meters deep) (Bright 1979). Water quality testing has been performed by The Palau Environmental Quality Protection Board, but the USGS study in 1996 is the most comprehensive water quality study available. This study estimated the lake's volume to be about 34 million gallons (128,000 cubic meters) although other studies estimated the volume to be smaller (e.g. US Army 1956). Also through this study, rainfall and lake-elevation data collected from April 1996 to March 1998 indicated that lake levels correlated to rainfall values with lake elevation rising rapidly in response to heavy rainfall and then returning to normal levels within a few days. A floating mat of reeds, which covered 58 percent of the lake surface area at the time of the bathymetric survey, makes true storage capacity difficult to estimate.

Water-quality sampling during April 1996 and November 1997 indicated that no U.S. Environmental Protection Agency primary drinking-water standards were violated for analyzed organic and inorganic compounds and radionuclides. With suitable biological treatment, the lake water could be used for drinking-water purposes. Temperature and dissolved oxygen measurements indicated that Lake Ngardok is stratified. Given that air temperature on Palau exhibits little seasonal variation, it is likely that this pattern of stratification is persistent. As a result, complete mixing of the lake is probably rare. Near anaerobic conditions exist at the lake bottom. Low dissolved oxygen (3.2 milligrams per liter) measured at the outflow indicated that

water flowing past the outflow was from the deep oxygen-depleted depths of the lake (Yeung and Wong, 1999).

A 2006 survey of the Reserve found that USGS water quality monitoring equipment was no longer functioning and beyond repair (Booth, 2007).

17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, and climate (including climate type). The rain forests that form the majority of the Nature Reserve (and catchment) are on upland very deep, well drained soils, which are made from highly weathered volcanic material. They are very easily eroded and when washed into the water, remain suspended, making the water cloudy. Thin organic soils cover the forested areas of the Reserve, formed by decomposing roots and leaf litter derived from forest. Grassland areas tend to have even thinner, less fertile organic soils. Smith (1983) gives detailed maps of all the soils in the Reserve. Over 90% of the Lake Ngardok watershed is classified as highly or very highly erodible due to its slope and soil type (USDA SCS, 1991). There are various areas inside the Reserve and along its boundaries where active erosion is taking place. A 2003 Conservation Plan (DeMeo, 2003) outlined priority areas for reforestation to reduce erosion. The total area of the catchment is approximately 405 hectares.

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

A study of the changes in the extent of marsh reed (*Hanguana malayana*) in 2003 indicated that reed extent had increased between 1992 and 2003, reducing the surface area of the lake (Ongalibang, 2003). It is unclear by how much the surface area of the lake has been reduced by the presence of this marsh reed, however, the USGS (1999) estimated that the reed covered about 58 percent of the surface area of the lake. The area of open water has been reduced over the years by the spread of this reed, although the cause of its spread is not currently known.

In 2007 Melekeok State joined forces with Ngaremlengui State to form the Babeldaob Watershed Alliance (BWA). Nine states have since joined the BWA and they have changed their name to Belau Watershed Alliance. The BWA mission is to protect, restore, and conserve water resources in Babeldaob. Melekeok and Ngaremlengui's protected areas now protect the upper ridge that forms part of the western boundary of the Reserve.

The lake is a significant water source for the State of Melekeok and the national capitol of Palau and plays a important role for control of floods and maintenance of water quality. The area around the lake was farmed during the Japanese period (1914-1945) and older residents of Melekeok recall there used to be a small village with a school. During that period the lake was presumably used for domestic water supply and for irrigation.

19. Wetland Types

a) presence:

Circle or underline the applicable codes for the wetland types of the Ramsar "Classification System for Wetland Type" present in the Ramsar site. Descriptions of each wetland type code are provided in Annex I of the *Explanatory Notes & Guidelines*.

Marine/coastal: A • B • C • D • E • F • G • H • I • J • K • Zk(a)

Inland: L • M • N • Q • P • Q • R • Sp • Ss • Tp Ts • U • Va •
Vt • W • Xf • Xp • Y • Zg • Zk(b)

Human-made: 1 • 2 • 3 • 4 • 5 • 6 • 7 • 8 • 9 • Zk(c)

b) dominance:

List the wetland types identified in a) above in order of their dominance (by area) in the Ramsar site, starting with the wetland type with the largest area.

O>M>Tp>Xf; but the catchment, i.e the majority of the area, is covered with tropical rain forest.

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

The Reserve contains a range of vegetation types, including upland tropical rainforest, lowland rainforest, grassland, marsh and swamp forest (Cole *et al* 1987). Honigman and Division of Conservation and Entomology (1997) give a list of plants found in the Reserve in a 1992 survey.

Upland forest occupies most of the Ngardok watershed and harbors a wide variety of native and endemic species. One of the most common tree species that makes up the upper canopy is *kelel a charm* (*Campnosperma brevipetiolata*). Others include *bkau* (*Parinari corymbosa*), *ukall* (*Serianthes kanehirae*) and *btachesked* (*Calophyllum inophyllum var. wakamatsui*) (Cole *et al* 1987).

The freshwater marsh ecosystems around the lake and along the river downstream of the lake are important habitats for birds, crocodiles, frogs and other wetland species. The main marshland plant species are the sedge *bakkellild* (*Sceleria laevis*) and *cheuais* (*Hanguana malayana*) (Honigman and Division of Conservation and Entomology 1997).

In the Reserve's grassland areas, soils are very low in nutrients and organic matter. Only some grasses and ferns survive, such as *udel* (*Ischaemum*) grass and *Itouch* (*Gleichenia linearis*) fern as well as the *Ongor ra ked* (*Pandanus*) species characteristic of the western Caroline Islands (Cole *et al* 1987).

There are some bare parts of the Reserve where no vegetation grows at all due to poor soils, disturbance, rapid erosion, fire or a combination of these factors. Melekeok State Government and the Bureau of Agriculture have carried out reforestation in some parts of the Reserve since 1993 using *Acacia* trees. Because of the unfertile nature of these exposed soils, reforestation attempts can be difficult and laborious. Priority areas for reforestation are outlined in the 2003 Conservation Plan (DeMeo, 2003; Appendix 3).

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14, Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Costion (2008) described the Reserve as a “hotspot” for native vegetation in Micronesia with a native vascular plant species count of approximately 724 species with high orchid diversity, important *Pandanus* marsh and the presence of the uncommon endemic *Rauwolfia insularis* tree Kitalong and Holm (2004).

The site supports a number of tree species endemic to Palau such as *Tilol* (*Garcinia matsudai*), *Ksid* (*Fragraea ksid*), *Btachesked* (*Calophyllum inophyllum var. wakamatsui*), and *Chersachel* (*Horsfieldia palauensis*).

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in 14. Justification for the application of the Criteria) indicating, e.g., which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Holm et al (2008) have identified eight Important Bird Areas (IBAs) for Palau and the Nature Reserve is included in the Middle Ridge (PW002) IBA with the Palau Fruit Dove (*Ptilinopus pelewensis*) being an iconic species of A2 ranking (restricted range). The Pacific Black Duck (*Anas superciliosa*), the only resident duck in Palau may be sometime using the lake.

Ngardok Lake also supports the following threatened, endangered, and culturally significant bird species such as *biib* (Palau fruit dove, *Ptilinopus pelewensis*), the uncommon *laib* (Nicobar pigeon, *Caloenas nicobarica*), and one of the rarest birds in Palau, *debar* (common moorhen, *Gallinula chloropus*), omekrengukl (Palau ground dove *Gallicolumba canifrons*), chesuch (Palau Owl, *Cettia annae*), and the charmbedel (Palau Greater White-eye, *Megazosterops palauensis*)

Mammals

Palau's only endemic mammal is the *olik* (a subspecies of the Marian fruit bat, *Pteropus mariannus pelewensis*). It occurs in the Reserve although the location of roosting sites and the numbers or condition of the population is not known. Wiles, Engbring and Otobed (1997) found some of the largest counts of their 1991 fruit bat survey in the area along the border between Melekeok and Ngiwal up to the *Rael Kedam* ridge, which is partly included in the Reserve.

Birds

There are 151 different species of birds recorded in Palau, of which 51 species nest and live in Palau all year round and as many as 12 are endemic. There are more bird species in Palau than in the Micronesian islands to the east, due to the relative proximity of land masses and the diversity of geology and habitats in Palau (Engbring 1988; Holm et al 2008).

In a field survey of the Reserve in 1992, Honigman and Division of Conservation and Entomology (1997) identified 16 species of birds. The birds observed include the *biib* (Palau fruit dove, *Ptilinopus pelewensis*), the uncommon *laib* (Nicobar pigeon, *Caloenas nicobarica*), and one of the rarest birds in Palau, *debar* (common moorhen, *Gallinula chloropus*). Many other bird species use the lake and the surrounding area as a breeding and foraging habitat.

Amphibians and Reptiles

Various species of snakes and lizards also occur in the Reserve, but no comprehensive surveys of these animals have been undertaken. The snakes that have been recorded elsewhere in Babeldaob include the *nguis* (Palau tree snake, *Dendrelaphis lineolatus*), *bersoeb* (Pacific Island boa) and the Brahminy blind snake (*typhlops braminus*) (ITPI 1977). Skink species that also occur include the *chemaidechedui* (emerald or green skink, *Lamprolepis smaragdina*) and the endemic pandanus skink (*Aulacoplax leptosoma*) which can be found in the crowns of pandanus trees (ITPI 1977).

There is a large population of frogs around the lake, but they have not been studied. The Palauan endemic frog *dechdedch* (*Platymantis pelewensis*) lives in the Reserve, as it is very common throughout Palau (ITPI 1977). Bright (1979) observed the introduced marine toad (*Bufo marinus*) at Lake Ngardok.

Lake Ngardok provides crucial habitat for the endangered *ius* (saltwater crocodile, *Crocodylus porosus*). Crocodile numbers in the whole of Palau are currently estimated to be fewer than 150 animals. A survey in 1991 counted 17 crocodiles in the lake area, which was one of only two of

the viable populations found in the whole of Palau, along with Peleliu (Messel and King 1991). Female crocodiles nest in the vegetated wetlands close to secluded freshwater ponds and rivers. Studies by Peter Brazaitis (1998) found that the likely dispersal routes for crocodiles moving to adult habitats are overland to the east and southeast ends of the Reserve, towards the coastal mangrove habitats on the border of Melekeok and Ngiwal and south. Some crocodiles may move along the southwestern routes of the Ngerdorch river systems, particularly using shallow flood plains and protected edges of river banks. Brazaitis (1998) reported that the peak breeding, reproduction, and dispersal season was during the rainy months from June to September.

Fish

No comprehensive studies on fish have yet been undertaken in Lake Ngardok and its outlet, the Ngerdorch River. Studies on freshwater habitats elsewhere in Babeldaob have shown that at least 40 species of fish need freshwater to survive (Bright 1979), and there are at least two endemic freshwater fish species (Gobies, *sicyopus sp.* and *Redigobius boriae*) (Bright and June 1981). The largest fish in Palauan freshwater is the *kittel* (freshwater eel, *Anguilla marmorata*), of which the largest recorded specimen measured 3.7 feet (1.2 meters) (Bright and June 1981). Bright (1979) identified two species of freshwater fish in Lake Ngardok – *Kublia rupestris* and *Puntius sealei*. More recent fish surveys carried out on Babeldaob by Keith et al (2011) have provided updated information.

Invertebrates

Little information is available on the terrestrial and aquatic invertebrates (such as snails, worms, shrimp and clams) of Lake Ngardok, the Ngerdorch River or the surrounding watershed. Bright (1979) gives a list of insects, water mites, crustaceans and mollusks found in the lake and mentions that there are at least 18 species of shrimp and crab in Palauan freshwater habitats, including some endemic species. Rundell (2005) found 11 species of land snails during a rapid assessment of the Reserve.

23. Social and cultural values:

- a) Describe if the site has any general social and/or cultural values e.g., fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values:

Lake Ngardok has a long history of importance to the people of Melekeok and the neighboring states. Legends about the lake's creation and stories about its use date back many generations. It could well have been used for water supply during times of extreme drought for as long as people have lived in Babeldaob. Some people have said that the name *Ngardok* originally came from the words *ngar* (living) and *dok* (a spring). Hence, the name *ngardok* means "living spring".

- b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning?

If Yes, tick the box and describe this importance under one or more of the following categories:

- i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

- ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:
- iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:
- iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

a) within the Ramsar site:

The land within the site is public land. In December 1997, Melekeok State enacted Melekeok State Public Law (MSPL) 4-21 establishing the Ngardok Nature Reserve, later amended in 1999 (MSPL 4-32). Melekeok State has regularly confirmed the status of Ngardok Nature Reserve as a protected area, and in 2008 the site became the first member of Palau's Protected Areas Network.

b) in the surrounding area:

The surrounding area is all public lands.

25. Current land (including water) use:

a) within the Ramsar site:

Strictly a reserve used for educational awareness and scientific research. Water is sustainably extracted from the lake for Melekeok state and the National Capitol water supply.

b) in the surroundings/catchment:

All reserve area so there are no forms of land use present.

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

a) within the Ramsar site:

There are a number of threats to the environment in the Reserve. The main potential and actual threats are:

Human intrusions and disturbances

Large numbers of visitors may lead to erosion of footpaths and trampling of the lake and river edges, setting of wildfires, trash, poaching and harassment of wildlife, and damage to vegetation.

Biological Resource use

Prohibited harvests (poaching) of the Micronesian Pigeon is a threat. Hunting of crocodiles may be a threat. Gathering of marsh plants beyond subsistence levels may also pose a threat.

Natural System Modifications (fire and water extraction)

Fire is a major threat to the Reserve because fire in a rainforest will kill all the trees, plants and animals. The fire also scorches the soil and destroys all its organic matter, leaving the soil bare. If heavy rainfall then occurs, the topsoil is washed into the waterways leaving bare infertile patches. Grass may grow on the site and the forest may never recover. In the Ngardok Nature Reserve, large patches of bare areas are presumed to have resulted from fires.

When the population migration occurs from Koror to Babeldaob, there will be greater demand for water. Taking water from the Reserve and Ngerdorch River beyond its natural output will

threaten the lake's ecological integrity and may have negative effects on the adjoining marshes and the swamp forests.

Geological events (erosion)

The Lake watershed is vulnerable to erosion, and there are several areas where erosion is a major concern. Severely eroded areas do not allow native plants to grow or provide habitat for animals. When soils are disturbed, especially during road construction, rain washes silt into the lake, the river below and out to the sea. This compromises the quality of the water for human consumption and will gradually fill in the lake and reduce its capacity to store water.

Invasive and other problematic species

Species introduced by visitors or the adjoining Compact Road are a threat as they may displace native vegetation or outcompete native animals. Feral pigs, cats, rats, and dogs are present in the Reserve and surrounding areas. Aquatic invasive species (plants and fish) could also be a problem. All these may negatively impact native species and water quality.

Climate change and severe weather

Changing climate may lead to a variety of outcomes. Drought may limit water resources, creating competition between human and natural uses. Extreme rainfall, on the other hand, may increase flooding and erosion. Either of these impacts may lead to a shift in natural vegetation and animals.

b) in the surrounding area:

The threats within the site (mentioned above) also affect the surrounding area

27. Conservation measures taken:

a) List national and/or international category and legal status of protected areas, including boundary relationships with the Ramsar site:

In particular, if the site is partly or wholly a World Heritage Site and/or a UNESCO Biosphere Reserve, please give the names of the site under these designations.

b) If appropriate, list the IUCN (1994) protected areas category/ies which apply to the site (tick the box or boxes as appropriate):

Ia ; Ib ; II ; III ; IV ; V ; VI

c) Does an officially approved management plan exist; and is it being implemented?:

Yes. The Management Plan outlines six goals:

1. To provide high quality water supply for the people of Melekeok State
2. To provide for the enjoyment and education of the people of Melekeok State, Palau and visitors to Palau
3. To maintain the ecological integrity of Lake Ngardok and the natural habitats it provides
4. To provide for the protection of the native plants and animals within the watershed
5. To provide opportunities for research on the organisms and natural systems within the watershed
6. To raise capacity for effective management of natural resources within the State.

Ecological targets in the reserve include thus native forest, some savanna species, freshwater – all types and communities, and harvested species of concern such as bats, birds, and crocodiles.

The Management Plan is a legal document and outlines a list of allowable, allowable-with-permit, and prohibited actions. An appendix outlines permit application procedures.

Although protected, the Reserve faces significant threats from human disturbances (both permitted and overuse), poaching, fire, water use, erosion, invasive species, and climate change. Management activities are designed to minimize or reverse threats.

A short analysis identifies strengths, weaknesses, opportunities, and threats for the Reserve. Weaknesses, such as inadequate staffing and financing, are addressed through proposed management actions.

The Plan builds on many past activities and existing structures and frameworks that have been developed in the past two decades. It depends heavily on the existing framework for authority, which has links between traditional and elected leadership and a Reserve Board and Staff. Key staff members are identified. An appendix lays out key roles and responsibilities for all management staff and authorities.

General strategies are identified to achieve goals. To obtain high quality water and maintain ecological integrity, erosion control and reforestation activities are planned. To increase enjoyment and education, visitor development is planned. Enforcement activities supported by key staff are also proposed in order to protect key species. Monitoring priorities and indicators are proposed as well as part of a scientific monitoring program.

The document is designed to be iterative and updated regularly as a tool for adaptive management. It includes procedures for reviewing and changing the plan.

Appendices include a list of regulations and permit procedures and fees; a time-bound strategic plan laying out goals, objectives, activities, lead people responsible, proposed timeframe, and indicators. This strategic plan is a key piece to understanding how the Reserve will change in the next five years. Another appendix identifies the roles of the key stakeholders, staff, and authority figures in Melekeok. Day-to-day responsibilities are also listed for some staff. Another appendix identifies proposed indicators to judge effective conservation.

Several components of the Management Plan have yet to be developed. An Enforcement Plan must be developed in partnership with technical experts who understand laws and compliance. Similarly, the Monitoring Plan must also be finalized with the aid of technical experts, ideally in partnership with a national framework for monitoring. A Conservation Plan to guide erosion control measures will also be reviewed in the next year.

d) Describe any other current management practices: see previous section
Melekeok State Public Law (MSPL) 4-21 establishing the Ngardok Nature Reserve (amended in 1999 to MSPL 4-32) prohibits entry without a permit, hunting, fires, camping and littering within the reserve. A board walk and floating dock have been constructed to facilitate visits from schools and nature enthusiasts. (also see previous section).

Ongoing management activities within the reserve include:

- Ongoing Development of Visitor's Center
- Development of Interpretive Signs

- Development of native tree nursery
- Tree planting or re-vegetation of bare areas
- Additional surveys and water quality monitoring
- Enforcement assistance
- Funding assistance to fund Reserve Manager
- Additional training and capacity building for enforcement, monitoring, and modern management techniques
- Ecotour development
- Invasive species management
- Establish sustainable funding mechanisms

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

Very few of the activities in the Management Plan are currently funded, thus a proposed budget is included in the plan. Fundraising through sustainable financing mechanisms such as the Protected Area's Network (PAN) and visitor's fees will be pursued in order to make the plan a reality.

29. Current scientific research and facilities:

e.g., details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

The site serves as a scientific laboratory, with ongoing restoration activities carried out by the Lake Ngardok Nature Reserve Board such as replanting and re-vegetation of bare areas and invasive species management activities. These interventions can yield lessons applicable to the rest of Babeldaob.

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitors' centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

The Management Plan lays out activities of the Ngardok Nature Reserve Board and the Melekeok State Government. It does not expressly include other stakeholders, although these have been considered in drafting of the Plan. The relationship between the Board and the State is clearly defined in MSPL 4-32. There is a visitor's center/education facility at the site to facilitate visits from tourists, schools and nature enthusiasts.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

The Ngardok Nature Reserve is also unique within the PAN because it currently represents the only protected area that can fully support visitors and thus increase understanding of Palau's terrestrial biodiversity. A \$5.00 visitors fees is charged for entrance to the Reserve to generate revenues for maintenance and up keeping of the Reserve. The Ngardok Nature Reserve truly epitomizes the spirit of the PAN. As a fragile site, it will benefit from National assistance. As a living laboratory it will provide information to the rest of Palau. And finally, as a biological, ecological, and cultural gem, it will reflect the promise of a network that protects and celebrates the best that Palau has to offer the world. The main recreation activities at the lake include hiking and bird watching.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept of Agriculture/Dept. of Environment, etc.

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Governor, Melekeok State
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33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Lake Ngardok Nature Reserve Board

The Ngardok Nature Reserve Act of 1997 established the Reserve and the Ngardok Nature Reserve Board. The board determines the activities to be allowed within the nature reserve as well as overall sustainability issues of the lake and surrounding habitats of the nature reserve.

The Board and the State will seek assistance from other stakeholders and partners in implementation of the Management Plan. The Board will seek assistance from the Ministry of Justice to draft and implement the Enforcement Plan. The Board will continue to work with the Ministry of Natural Resources, Environment, and Tourism, Palau Conservation Society, Natural Resource Conservation Service, Environmental Quality Protection Board, and other partners to implement reforestation, education, and erosion-mitigation measures.

Although the Reserve Board and Governor are responsible for the long-term viability of the Ngardok Nature Reserve, daily implementation of existing and new plans will be the responsibility of the Reserve Manager. The Reserve Manager will work with the State and Partners to identify and manage funds to procure additional staff, including rangers, visitor's center attendant, nursery supervisor, and maintenance staff.

The current composition of the Board is:

- Kerungil Telei - Chair
- Edwin Polloi - Vice Chair
- Lukes Isechal - Secretary
- Umiich Sengebau - Member
- Kashgar Rengulbai - Member

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see 15 above), list full reference citation for the scheme.

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Government of Palau,(year), Palau National Biodiversity Strategy and Action Plan

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