Republic of the Philippines
Department of Environment and Natural Resources
Visayas Avenue, Diliman, Quezon City
Tel. Nos. (02) 8920-0689 / 8925-8275 / 0917-885-3367 / 0917-868-3367
Website: http://www.denr.gov.ph / E-mail: web@denr.gov.ph

MEMORANDUM

FOR/TO : The Director
Legal Affairs Service

The Assistant Director
Ecosystems Research and Development Bureau
Environmental Management Bureau
Forest Management Bureau
Land Management Bureau
Mines and Geosciences Bureau

Representative (Office of the Acting Head Executive Assistant)
Representative (Office of the Chief of Staff)
Representative (Office of the Undersecretary for Legal, Admin., Human Resources, and Legislative Affairs)
Representative (Office of the Undersecretary for Field Operations and Environment)
Representative (Office of the Undersecretary Policy, Planning and Int'l. Affairs)
Representative (Office of the Undersecretary for Finance, Information Systems and Climate Change)
Representative (Office of the Undersecretary for Enforcement, Solid Waste Management, Local Government Units Concerns and Attached Agencies)
Representative (Office of the Assistant Secretary for Policy, Planning and
Foreign-Assisted and Special Projects)
Representative (Office of the Assistant Secretary for Legal Affairs)
Representative (Office of the Assistant Secretary for Field Ops.-Luzon)
Representative (Office of the Assistant Secretary for Field Ops.- Visayas)
Representative (Office of the Assistant Secretary for Field Ops.- Eastern Mindanao)
Representative (Office of the Assistant Secretary for Field Ops. – Western Mindanao)
Representative (Office of the Assistant Secretary for Finance, Info. Systems and Mining Concerns)
Representative (Office of the Assistant Secretary for Enforcement)

MEMO NO. 2022 - 138

Representative (Office of the Assistant Secretary for Administration and Human Resources)
Representative (Legal Affairs Service)
Representative (Climate Change Service)
Representative (Strategic Communications and Initiatives Service)
Representative (Foreign Assisted and Special Projects Service)
Representative (River Basin Control Office)

FROM : The OIC-Director
Policy and Planning Service

SUBJECT : **REQUEST FOR CONCURRENCE OR COMMENTS TO THE TAMARAW CONSERVATION AND MANAGEMENT ACTION PLAN AND THE DRAFT DENR ADMINISTRATIVE ORDER RE: STRENGTHENING THE TAMARAW CONSERVATION PROGRAM AND PROVIDING THE IMPLEMENTATION MECHANISM THEREOF**

DATE : 11 MAR 2022

Pursuant to the agreements during Policy Technical Working Group Meeting No. 2022-03 held last March 09, 2022, may we request your concurrence or comments on the Tamaraw Conservation and Management Action Plan (TCMAP) and the Draft DENR Administrative Order (DAO) re: "*Strengthening the Tamaraw Conservation Program and Providing the Implementation Mechanism Thereof.*"

We would appreciate receiving your concurrence using the attached sheet or your comments on or before March 18, 2022. Should we fail to receive any feedback from your office by March 18, 2022, please allow us to conclude that the TCMAP and the draft DAO are acceptable to your office. Attached are the TCMAP and draft DAO for your review and perusal.

For your information and appropriate action, please.

GLENN MARCELO C. NOBLE

Republic of the Philippines
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CONCURRENCE SHEET

NAME	
OFFICE	
DESIGNATION/ POSITION	
CONTACT NO.	

Please check all that apply

☐	This certifies that I have read and understood the **Tamaraw Conservation and Management Action Plan (TCMAP).** I have no further comments and concur with the adoption and approval of the TCMAP.
☐	This certifies that I have read and understood the **draft DAO re: Strengthening the Tamaraw Conservation Program and Providing for the Implementation Mechanisms Thereof.** I have no further comments and concur with the draft DAO.

If you have comments, you may attach a file to this form or use the space provided below:

Comments/Recommendations	
Tamaraw Conservation and Management Action Plan (TCMAP).	

Draft DAO re: Strengthening the Tamaraw Conservation Program and Providing for the Implementation Mechanisms Thereof.	

SIGNATURE/DATE

Republic of the Philippines
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DENR ADMINISTRATIVE ORDER
NO. 2022-_____

SUBJECT: STRENGTHENING THE TAMARAW CONSERVATION PROGRAM AND PROVIDING THE IMPLEMENTATION MECHANISM THEREOF

Pursuant to Republic Act (RA) No. 9147 (Wildlife Resources Conservation and Protection Act), RA No. 7586 [National Integrated Protected Areas System (NIPAS) Act as amended by RA No. 11038 (Expanded NIPAS Act)], Presidential Proclamation No. 273 (Declaring October as the Tamaraw Month), Department of Environment and Natural Resources (DENR) Administrative Order (DAO) No. 2019-09 (Updated National List of Threatened Philippine Fauna and their Categories), DAO No. 2016-12 (Adopting the Philippines Biodiversity Strategy and Action Plan), DAO No. 2005-26 [Transferring the Tamaraw Conservation Program from the Protected Areas and Wildlife Bureau to DENR MIMAROPA Region through Provincial Environment and Natural Resources Office (PENRO) Occidental Mindoro], the following guidelines are hereby promulgated to strengthen the program for the conservation and management of the critically endangered and endemic Tamaraw (*Bubalus mindorensis*):

SECTION 1. Basic Policy. It is the policy of the State to conserve and protect the country's wildlife resources, especially threatened endemic species, for the benefit of the present and future generations. Towards this end, the DENR shall endeavor to implement a comprehensive conservation and management strategy to ensure the protection of the critically endangered and Mindoro Island endemic Tamaraw from the risk of possible extinction.

SECTION 2. Objectives. This Order shall have the following objectives:

2.1 To strengthen the comprehensive conservation and management strategy for the Tamaraw that engages the support of stakeholders from the government sector, indigenous peoples (IP) groups, business sector, and civil society, towards the protection of existing habitats, establishment of corridors, and addressing the various threats to the survival of the Tamaraw;

2.2 To enhance the institutional coordinating and support mechanisms towards the efficient administration of the DENR's Tamaraw Conservation Program (TCP); and

2.3 To ensure adequate political support for the effective implementation of the projects and strategies under the Tamaraw Conservation and Management Action Plan.

SECTION 3. Adoption of the Tamaraw Conservation and Management Action Plan. To effectively address the conservation and management of the Tamaraw, the strategies and programs in the Tamaraw Conservation and Management Action Plan (TCMAP), attached as Annex "A" hereof, is hereby adopted for the implementation and guidance of all concerned. The TCMAP provides for a ten (10) year action plan that includes the following strategies:

3.1 Provision of an effective coordination and support mechanism which includes the establishment of a Tamaraw coordinating body and the alignment and harmonization of the TCMAP with the plans and programs of stakeholders;

3.2 Intensification of Information, Education and Communication with consistent messages to IP groups, civil society organizations, and the general public to proactively support the program for the Tamaraw;

3.3 Strategic interventions for the existing populations in Mts. Iglit-Baco Natural Park (MIBNP), Mt. Calavite Wildlife Sanctuary (MCWS), Upper Amnay Watershed,

and Aruyan-Malati Tamaraw Reservation with the vision to increase the current estimated Tamaraw population; and

3.4 Strategic actions to support the expansion of the Tamaraw population to suitable habitats.

The DENR MIMAROPA Region in coordination with the Biodiversity Management Bureau (BMB), shall review and update if necessary, the TCMAP, every five (5) years. Such updated TCMAP must be endorsed by the Tamaraw Conservation Coordinating Council (TC3) created in Section 4 hereof. The BMB and DENR MIMAROPA Region shall monitor and evaluate the implementation of the TCMAP, annually.

SECTION 4. Creation of the Tamaraw Conservation Coordinating Council. The TC3 is hereby created and shall exercise the function of governance, implementation, and policy recommendation on Tamaraw conservation and management in the Island of Mindoro.

4.1 **Composition of the TC3.** The TC3 shall be chaired by the RED, DENR MIMAROPA Region and the Vice Chair shall be elected among the members. It shall be composed of the following members:

4.1.1 Protected Area Superintendent (PASu), MIBNP
4.1.2 PASu, MCWS
4.1.3 Representatives, Provincial Government offices of Occidental and Oriental Mindoro
4.1.4 Municipal Local Government Units (LGUs) concerned;
4.1.5 Members of the House of Representatives (of the Congressional Districts of Mindoro Occidental and Oriental);
4.1.6 Representative, National Commission on Indigenous Peoples (NCIP);
4.1.7 Representatives, Indigenous Peoples tribal groups (one each from Buhid, Tau-Buid, Iraya, Bangon, and Alangan tribes);
4.1.8 Representative, Academe in the Island of Mindoro; and
4.1.9 Representative, locally-based conservation Non-Government Organizations (NGOs).

The Council may invite representative(s) from the non-DENR key stakeholders as resource person(s).

4.2 **Duties and Responsibilities of the TC3.** The TC3 shall perform the following duties and responsibilities:

4.2.1 Provide oversight functions on the implementation of the TCP activities and TCMAP in the whole Island of Mindoro;
4.2.2 Decide on matters, issues, and concerns on Tamaraw conservation, and if within a protected area, shall be in close coordination with the Protected Area Management Board (PAMB);
4.2.3 Create a thematic or site-based group(s), as needed;
4.2.4 Provide administrative and political support to the implementation of projects and interventions under the TCMAP;
4.2.5 Invite barangay LGUs in case of certain issues affecting their areas of jurisdiction;
4.2.6 Arrange, negotiate for, accept donations, grants, loans, and other funding from domestic and foreign sources to carry out the activities and purpose of the TC3 and TCP;
4.2.7 Recommend actions to offices concerned in case of pressing issues and concerns; and
4.2.8 Perform such other powers and functions as may be necessary.

The TC3 is authorized to engage relevant government agencies, and instrumentalities in mobilizing technical and financial resources to implement the

programs and projects envisioned in the TCMAP, including the establishment and operation of the Tamaraw Conservation and Research Center (TCRC) as per Section 6 hereof.

The TC3 shall convene at least twice a year. The Tamaraw Conservation Program Office, as provided in Section 5.1 hereof shall serve as the TC3 Secretariat.

To ensure science-based interventions and decisions on the conservation of the Tamaraw, the TC3, through its Chair shall seek the advice from expert organizations such as: Ecosystems Research and Development Bureau (ERDB); Philippine Veterinary Medical Association; International Union for Conservation of Nature Asian Wild Cattle Specialist Group; and other experts from the academe and conservation organizations.

SECTION 5. Institutional Arrangements for the Implementation of the TCP and the TCMAP. To provide adequate administrative support in the implementation of the TCP and the TCMAP, the following are the complementary and supportive roles of the following offices relative thereto:

5.1 **The Tamaraw Conservation Program Office.** The current unit implementing the TCP shall now be recognized as the Tamaraw Conservation Program Office (TCPO) and shall act as the implementing arm of the TC3 on the conservation and management of the Tamaraw population in the whole Island of Mindoro, especially in the implementation of the TCP activities and TCMAP. The TCPO shall perform the following functions:

5.1.1 Prepare the Annual Work and Financial Plan (WFP) for the TCP based on the priority activities in the TCMAP for approval of the DENR MIMAROPA RED through PENRO Occidental Mindoro;

5.1.2 Take the lead in the implementation of the TCP WFP in coordination with stakeholders, e.g., LGUs, Protected Area Management Board(PAMB)/PASu concerned, ...etc.;

5.1.3 Assist in the mobilization of resources to augment government resources in financing the activities under the TCMAP;

5.1.4 Develop activity proposals and projects in pursuit of the strategies in the TCMAP;

5.1.5 Recommend management interventions including policies and guidelines needed to address/resolve pressing issues and facilitate implementation of activities under the TCMAP;

5.1.6 Initiate coordination mechanism and necessary arrangements with the PAMB, through its PASU, for collaborative conservation of Tamaraw populations within protected areas and facilitate integration and harmonization of TCMAP in the Protected Area Management Plan (PAMP) of concerned protected areas;

5.1.7 Manage the TCRC in coordination with the Protected Area Management Office (PAMO) of MIBNP;

5.1.8 Serve as Secretariat of TC3;

5.1.9 Prepare and submit quarterly and annual reports on the conservation of the Tamaraw to the RED through the PENRO Occidental Mindoro; and

5.1.10 Perform other duties that may be assigned by the TC3.

5.2 **The DENR-MIMAROPA Region.** The DENR-MIMAROPA Region through PENRO-Occidental Mindoro shall exercise overall supervision and management of the TCPO pursuant to DAO No. 2005-26. As such, it shall:

5.2.1 Assign a senior permanent technical staff to serve as a full-time Program Leader who shall be directly responsible for the day-to-day operations and management of the TCPO. Where possible, assign permanent staff to support the manpower requirements for the operations of the TCPO;

5.2.2 Include in its annual budgetary proposal the financial requirements for the operations of TCPO;

5.2.3 Approve and/or endorse administrative and financial documents pertaining to the operation of the TCPO, including the hiring of contractual staff, following the existing DENR Manual of Authorities;

5.2.4 Coordinate with other agencies (Local Government Units, Philippine National Police, National Bureau of Investigation...etc.) to assist in the conduct of investigation, and population surveys;

5.2.5 Monitor and validate accomplishments of the TCPO and submit to the Secretary through the BMB, quarterly reports, and annual report on the conservation of the Tamaraw; and

5.2.6 Monitor, review and provide recommendations to facilitate the implementation of TCMAP.

5.3 **The Protected Area Management Offices.** The PAMOs concerned shall ensure that adequate measures and interventions for the conservation and management of the Tamaraw as identified in the TCMAP are in accordance with set standards and guidelines (e.g. monitoring methods) and are integrated into the PAMP. Further, the PAMO shall ensure that the Tamaraw is considered as among the priority species for monitoring and as an indicator for effective protected area management. The PAMO shall maintain close collaboration with the TCPO in carrying out Tamaraw conservation and management activities.

The institutional arrangement diagram on the implementation of the TCP and the TCMAP is attached as Annex "B".

SECTION 6. Establishing the Tamaraw Conservation and Research Center. A TCRC is hereby established and to be managed by the TCPO to provide a science-based approach for the conservation of the Tamaraw. The TCRC shall:

6.1 Serve as a national conservation research center for the Tamaraw in the areas of Conservation Genetics, Reproductive Sciences, Disease Management, ...etc.;

6.2 Promote conservation and research of the Tamaraw; and

6.3 Subsume the operation of the existing Tamaraw Gene Pool Farm located in Sitio Canturoy, Barangay Manoot, Rizal, Occidental Mindoro, within MIBNP to pursue the envisioned plan for an enhanced Tamaraw population management, and conservation and protectionof other endemic species of the Island of Mindoro.

The TCRC shall coordinate with ERDB in the conduct of research activities on the Tamaraw and in addressing the research needs for the species.

SECTION 7. Transitory Provision. Within one (1) year from the effectivity of this Order, the DENR MIMAROPA Regional Office, in coordination with the BMB, shall prepare the human resource requirements, including plantilla positions for the TCPO for submission to the Department of Budget and Management, through the DENR.

SECTION 8. Funding. The DENR MIMAROPA Region shall include in their annual budget request the fund allocations for the effective implementation of the TCMAP, the TCRC, and the operation of the TCPO.

The DENR shall include in its priorities the funding for the operations of the TCRC, which may include budget for Personnel Services, Capital Outlay and Maintenance and Other Operating Expenses.

SECTION 9. Separability Clause. If any part of this Order is held invalid or unconstitutional, the other portions or provisions hereof which are not affected shall continue in full force and effect.

SECTION 10. Repealing Clause. All Orders and similar issuances, or parts thereof, inconsistent herewith, are hereby revoked, amended or modified accordingly.

SECTION 11. Effectivity. This Order shall take effect fifteen (15) days after its publication in a newspaper of general circulation and upon acknowledgement of receipt of a copy thereof by the Office of the National Administrative Register.

JIM O. SAMPULNA
ActingSecretary

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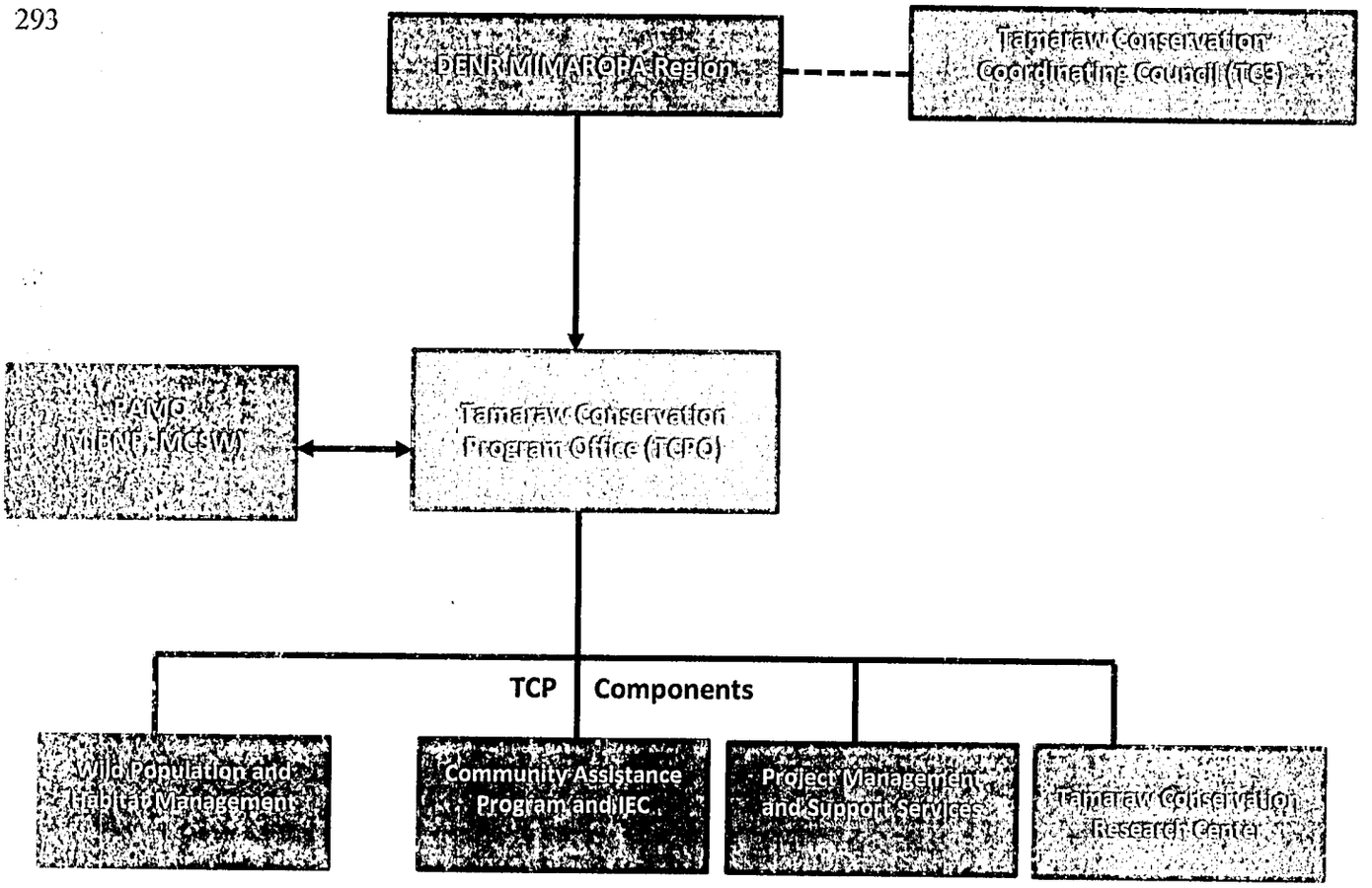
ANNEX "B"

INSTITUTIONAL ARRANGEMENTS ON THE IMPLEMENTATION OF THE TAMARAW CONSERVATION PROGRAM AND THE TAMARAW CONSERVATION MANAGEMENT AND ACTION PLAN



TAMARAW

Conservation and Management Action Plan 2021-2030

Acknowledgements

Photo Credit (front cover): Mindoro Biodiversity Conservation Foundation. Inc.

Implementation of actions recommended in the TCMAP is monitored through the DENR-Tamaraw Conservation Program (TCP). For further details contact: tamarawconservationprogram.mdo@gmail.com

A DENR initiative, in collaboration with the IUCN SSC Asian Wild Cattle and Conservation Planning Specialist Groups.

Recommended citation: DENR (2021). Tamaraw Conservation and Management Action Plan 2021 – 2030. Department of Environment and Natural Resources-Biodiversity Management Bureau, Philippines.

CONTENT

ACRONYMS AND ABBREVIATIONS

ADSDPP	Ancestral Domain Sustainable Development and Protection Plan
AIS	Alien Invasive Species
AMTR	Aruyan-Malati Tamaraw Reservation
AWCSG	IUCN SSC Asian Wild Cattle Specialist Group
BIOFIN	Biodiversity Finance Initiative
BLGU	Barangay Local Government Unit
BTCC	Barangay Tamaraw Conservation Council
BMB	Biodiversity Management Bureau
CADT	Certificate of Ancestral Domain Title
CBD	Convention on Biological Diversity
CCI	Centre for Conservation Innovation
CCTU	Center for Conservation of Tropical Ungulates
CENRO	Community Environment & Natural Resources Office
CPSG	IUCN SSC Conservation Planning Specialist Group
CR	Critically Endangered
DA	Department of Agriculture
DAF	D'ABOVILLE Foundation and Demo Farm Inc
DENR	Department of Environment & Natural Resources
DOST	Department of Science and Technology
DOT	Department of Tourism
DPWH	Department of Public Works and Highways
ENIPAS	Expanded National Integrated Protected Areas System
ERDB	Ecosystems Research and Development Bureau
FPIC	Free and Prior Informed Consent
GWC	Global Wildlife Conservation
ICCA	Indigenous and Communities Conserved Areas
IEC	Information Education and Communication Campaign
IPMR	Indigenous Peoples Mandatory Representation
IPs	Indigenous Peoples
IPRA	Indigenous People's Rights Act
IUCN	International Union for the Conservation of Nature
KMFI	Kalikasan Mindoro Foundation, Inc.
LCA	Local Conservation Areas
LGU	Local Government Unit
MBCFI	Mindoro Biodiversity Conservation Foundation Inc
MCWS	Mount Calavite Wildlife Sanctuary
MENRO	Municipal Environment and Natural Resource Office
MOA	Memorandum of Agreement

MIBNP	Mounts Iglit-Baco Natural Park
MIMAROPA	Administrative region comprising: Mindoro (divided into Occidental Mindoro and Oriental Mindoro), Marinduque, Romblon and Palawan.
MPDO	Municipal Planning and Development Office
NCIP	National Commission for Indigenous Peoples
NEDA	National Economic and Development Authority
NGO	Non-Governmental Organization
NIPAS	National Integrated Protected Areas System
NLNP	Naujan Lake National Park
OECM	Other Effective Area-Based Conservation Measures
OMSC	Occidental Mindoro State College
PA	Protected Area
PAGMP	Protected Area General Management Plan
PAMB	Protected Area Management Board
PAMO	Protected Area Management Office
PGOM	Provincial Government of Occidental Mindoro
PNP	Philippine National Police
PPDO	Provincial Planning and Development Office
PASU	Protected Area Superintendent
PCC	Philippine Carabao Center
PENRO	Provincial Environment and Natural Resources Office
PHVA	Population and Habitat Viability Assessment
PLGU	Provincial Local Government Unit
PVA	Population Viability Analysis
SAR	Search and Rescue
SMART	Spatial Monitoring and Reporting Tool
SOP	Standard Operating Procedure
SPPF	Sablayan Prison and Penal Farm
SPZ	Special Protection Zone
SSC	Species Survival Commission (of IUCN)
TBC	To be confirmed
TCP	Tamaraw Conservation Program
TESDA	Technical Education and Skills Development Authority
TCMAP	Tamaraw Conservation and Management Action Plan
TWG	Technical Working Group
WEO	Wildlife Enforcement Officer
WWF-Phil.	Worldwide Fund for Nature – Philippines
WRS	Wildlife Reserves Singapore
ZSL	Zoological Society of London

EXECUTIVE SUMMARY

The Tamaraw (*Bubalus mindorensis*) is a dwarf buffalo endemic to the island of Mindoro in Philippines. The species is classified as Critically Endangered under DENR Administrative Order No. 2019-09[1] and on the IUCN Red List of Threatened Species ™. In 1996, the Philippines hosted a Population and Habitat Viability Assessment (PHVA) for Tamaraw providing guidance to the Tamaraw Conservation Program of the DENR, which led to positive results for the species especially in Mts. Iglit-Baco Natural Park (MIBNP). The 2018 Tamaraw Conservation Planning Workshop was the second PHVA to be held for the species and was organised with the aim of replicating these successes at other sites across Mindoro.

Over the last century, Tamaraw numbers have declined from thousands to just a few hundreds. While in 1987, the species was still present at seven sites, recent studies have confirmed only four: MIBNP (N=400-500), Upper Amnay Watershed Region (N=10-60), the Aruyan-Malati Tamaraw Reservation (N=3-15), and Mount Calavite Wildlife Sanctuary (MCWS) where a recent survey confirmed presence of an estimated 4-6 individuals.

Without urgent action, Tamaraw are likely to disappear from Aruyan-Malati and MCWS in the short-term and the future for the population in Upper Amnay is uncertain without interventions. Focused conservation attention in the past two decades has led to consistent growth of the MIBNP population, however even here, the space occupied by Tamaraw appears to have contracted in the past 30 years and without additional action its future is not secure. For the long-term security of the species, the Mts. Iglit-Baco population must be protected from poaching and managed in a way that will maximize population growth, so that it can provide a source of Tamaraw to supplement existing sites (such as Aruyan Malati or MCWS) or to establish new ones.

Table 1. Summary of current population size estimates, including estimates for 2050 without further conservation action, estimates for 2028 and 2050 with recommended action, and the major challenges to achieving these results.

	Current size	Future: no further action	Future: with recommended action		Major challenges (confirmed at the 2018 workshop)
Site	2018	2050	2028	2050	
Mts. Iglit-Baco NP	400 - 500	< 400	> 650[2]	> 1500	Space for further growth is now limited and may decline in future due to impact of fires and invasive plants and uncontrolled hunting from residing IP communities.
Upper Amnay	10 – 60	Uncertain	20 - 120[3]	Preliminary estimates suggest > 700 in total across these sites	Road development and resumption of mining could prevent population recovery. Current uncertainty about numbers, distribution and hunting intensity may hinder action.
Aruyan Malati	3-15	Poor			Too few animals. Little to no chance of recovery without supplementation.
Mount Calavite	4 – 6	Poor			Too few animals, if any. No chance of recovery without supplementation.

[1] *The DENR Administrative Order establishing the List of Terrestrial Threatened Species and Their Categories, and the List of Other Wildlife Species pursuant to Republic Act 9147 otherwise known as the Wildlife Resources Conservation and Protection Act of 2001.*

[2] Based on an ongoing but conservative growth rate (4% p.a.) from the mean of current estimates (N=450).

[3] Based on ongoing but conservative growth rate (4% p.a.) from the range of current estimates (N= 17 – 81)

Total estimates	417-581	>700	>2200

CHALLENGES TO TAMARAW RECOVERY AND CONSERVATION

Challenges to successful recovery and conservation of Tamaraw were identified under five broad themes: 1) Illegal activities; 2) Land-tenure and natural resource management issues; 3) Coordination challenges; 4) Development planning; and 5) Small population-related issues. The nature and extent of these challenges vary among remaining populations of Tamaraw and require site-specific solutions.

PRIORITIES FOR INDIGENOUS PEOPLES (IPS)

The future of the Tamaraw is inextricably linked to the way IPs will socially and culturally assimilate and manage the progressive modernizing trends and environmental issues that they are facing today. They are key partners in the TCMAP. The challenges ahead for the growing IP communities, in which long-standing traditional values and ways of life must be supported alongside these modernizing trends. Tamaraw conservation success will depend on managing the natural landscapes of Mindoro to allow sufficient space for Tamaraw and to ensure food security and social determination of residing IP communities.

IMPLEMENTATION

The establishment and empowerment of an effective coordinating body (Tamaraw Conservation Coordinating Council or TC3) was strongly recommended, along with the alignment of existing plans with the TCMAP. Of these, the **Management Plan for MIBNP and MCWS** are of particular importance.

RESEARCH

Research is an important component of the TCMAP. To give the Tamaraw the best chance of recovery it is recommended that academic institutions and NGOs with an interest in Tamaraw channel their efforts into the research priorities identified in the TCMAP.

PHILIPPINE BIODIVERSITY STRATEGY AND ACTION PLAN (PBSAP) 2015 – 2028

The PBSAP integrates the Philippines' obligations under the Convention on Biological Diversity (CBD) into its national development and sectoral planning frameworks. Implementation of the TCMAP would make a significant contribution to the PBSAP Target 1: "By 2028, the conservation status of nationally and globally threatened species in the country from 2016 levels is maintained or improved", and would also contribute to Targets 2, 7, 9-11, 14 and 19.

STRATEGY FOR THE TAMARAW META-POPULATION

The following strategy for ensuring a thriving Tamaraw Meta-population could take the current total Tamaraw numbers from **N > 500**, to **N > 700 by 2028,** and to **N > 2200 by 2050**.

1) **Increase space for Tamaraw in MIBNP by:**
    a. expanding the existing area available to Tamaraw, through increased protection and habitat restoration;
    b. opening up a "**Migration Corridor**" which links the "**Core Zone of Monitoring**" to a larger and more remote "**Expansion Area**" of suitable habitat;
    c. rehabilitating a "**Cattle Ranchland Area**" outside the "Core Zone of Monitoring", by: removing existing cattle ranchers; implementing livelihood projects for Buhid families currently reliant on cattle ranching in that area; restoring the land; and translocating Tamaraw into it.

d. updating and enforcing Tau-Buid and Buhid-designed customary laws and developing and sustaining land-use systems and traditional practices that are aligned with the TCMAP (using the ADSDPP and PAGMP mechanisms).
e. Reducing illegal hunting pressure from lowlanders and IPs through strict law enforcement in collaboration with concerned local government units, among other possible measures.

2) **Support growth in the Upper Amnay population by:**
   a. surveying the number and distribution of Tamaraw;
   b. increasing monitoring and protection, initially through a composite team of TCP rangers and local IP volunteers from the Alangan Tribe (the Katutubong Bantay Tamaraw);
   c. reconciling the interprovincial cross-road project's economic objectives with social and environmental safeguards;
   d. with IP stakeholders, formulating and incorporating into the ADSDPP a comprehensive area management plan for the upland forest, both to protect the head water of the two concerned watersheds and key Tamaraw habitat;
   e. engaging Mangyan Alangan community members as collaborators within a mixed monitoring and protection team.

3) **Re-establish Aruyan-Malati as a Tamaraw site by:**
   a. declaring the Aruyan Malati as Critical Habitat for Tamaraw;
   b. formulating and Implementing a Critical Habitat Management Plan;
   c. integrating agro-forestry farming technology with the current farming practices of the Tau Buid;
   d. training and deploying sufficient rangers;
   e. translocating Tamaraw from suitable sources, to be identified through a feasibility study of appropriate options.

BOX 1. Immediate Priorities for the Tamaraw Meta-population:

1. Establish and empower a TCMAP coordinating body.
2. Review and reconcile existing plans with the TCMAP.
3. Train, equip and deploy sufficient rangers at remaining Tamaraw sites.
4. Review and improve the current Tamaraw count method at MIBNP and implement site appropriate count methods meta-population wide.
5. Pursue the removal of ranchers from MIBNP.
6. Address the potential impact of road development at Upper Amnay.
7. Declare Aruyan Malati as Critical Habitat for Tamaraw.
8. Undertake a scientific survey at Mount Calavite.
9. Conduct a feasibility study on the potential of re-establishing a captive breeding program for the Tamaraw.
10. Conduct a feasibility study on Tamaraw translocation, including the potential sources of Tamaraw for supplementation of sites.
11. Develop a Tamaraw translocation program to facilitate recovery of the species.
12. Secure resources and political will for the Tamaraw meta-population.
13. Identify additional areas of potentially suitable habitat, for inclusion in the Tamaraw meta-population.

4) **Re-establish Mount Calavite and/or other potential Tamaraw sites through:**
   a. surveying to establish:
      i. presence/abundance and distribution of Tamaraw;

ii. core zones and areas of suitable habitat;
iii. location of land used for farming;

b. formulating, through a stakeholders' participatory approach, and implementation of community-based resource management and conservation plans:
   i. protection against illegal logging and poaching;
   ii. sustainable livelihoods compatible with traditional ways of life;
c. integration of Tamaraw conservation and protection into the Mount Calavite Wildlife Sanctuary Management Plan;
d. translocation of Tamaraw from suitable sources, to be identified through a feasibility study of appropriate options.

Successful implementation of this strategy is contingent on successful resolution of issues related to land tenure and use, ongoing consultation and engagement with stakeholder agencies and communities, installing and enforcing a sufficient level of protection for Tamaraw and its habitats, and on generating sufficient resources and political support to proceed. A summary of major activities and timelines for this strategy are shown below and full details are included in the sections that follow.

SUMMARY OF MAJOR ACTIVITIES AND TIMELINES, 2021-2030

Activity	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Coordination & Communication										
1) Establishment of an effective coordinating body and mechanisms to ensure adequate conservation action.										
2) Alignment with the TCMAP of existing plans of stakeholder agencies and harmonization of the development and communication of any new plans.										
3) Intensification of Information, Education and Communication campaigns, with consistent messages to IPs, civil society organisations and the general public, to proactively support action and behavior change for Tamaraw.										
Meta-population Management										
4) Review and improvement of current count methods and establishment of meta-population wide reporting on key parameters to support effective management.										
5) Confirmation of the locations of all remaining Tamaraw.										
6) Securing adequate resources and political will.										
7) Implementation of strategies to maximise the capacity of existing sites.										
8) If agreed to be needed, establishment of an *ex situ* conservation breeding program for Tamaraw in Mindoro.										
9) Initiation of a Tamaraw translocation program to facilitate recovery of the species.										

Activity	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
10) Mobilization for Tamaraw of additional, previously unconsidered sites in Mindoro.										
MIBNP-Core Zone of Monitoring (connects to Migration Corridor)										
11) Phasing out of burning.										
12) Harmonization of ADSDPP and TCMAP (through PAGMP).										
13) Strengthening of ranger force to prevent illegal activities.										
14) Control of invasive plants and habitat restoration.										
15) Consultation throughout of IPS and respect for their traditional ways of life.										
MIBNP – Migration Corridor (connects to Expansion Area)										
16) Agreement with IPs on a plan to expand the distribution of Tamaraw following the zonation of the Park.										
17) Following consultation with residing communities, validation of the proposed expansion area and delineation on the ground, with IPs.										
18) Definition of the modality of the management of the Migration Corridor.										
19) Habitat restoration.										
Ranchland Area (connects to Expansion Area)										
20) Phasing out of ranching (ensuring appropriate support for affected IP families).										
21) Rehabilitation of the Ranchland Area.										
22) Planning and implementation of Tamaraw translocation.										
Upper Amnay Watershed Region										
23) Avoidance or mitigation of negative impacts of road development (interprovincial cross-road).										
24) Comprehensive assessment of the Tamaraw population and habitat in Upper Amnay municipalities of: Sablayan, Victoria and Baco.										
25) Establishment of area protection measures (Declaration as Amnay-IP Tamaraw Habitat – ICCA, LCA, or OECM).										
26) Increased number of skilled and well-equipped rangers and volunteers, to address anthropogenic threats such as poaching, logging, and habitat encroachment.										

Activity	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Aruyan-Malati Tamaraw Reservation										
27) Reinforcement of traditional farming education with integrated farming, to regulate kaingin areas.										
28) Declaration of the Aruyan-Malati as Critical Habitat for the Tamaraw.										
29) Effective management of the Critical Habitat is established to secure Tamaraw habitats.										
30) The number of skilled and well-equipped rangers and volunteers is increased, to address anthropogenic threats such as poaching, logging, and habitat encroachment.										
31) Restoration and expansion of natural forest within the Tamaraw habitat, to reduce the presence of invasive species.										
32) Supplementation of Tamaraw population growth towards viable numbers, from sources identified through a feasibility study of available options, and with full agreement among stakeholders.										
Mount Calavite Wildlife Sanctuary										
33) Establishment through surveys, of presence/abundance and distribution of Tamaraw, core zones and areas of suitable habitat, and location of land used for farming.										
34) In consultation with affected IPs, zoning within the PA is updated to include areas suitable as Tamaraw habitat within the Strict Protection Zone.										
35) Agreement and implementation of community-based resource management and conservation plans for: protection against illegal logging and poaching; and for sustainable livelihoods compatible with traditional ways of life.										
36) Translocation of Tamaraw from suitable sources based on a feasibility study of available options.										

STATUS REVIEW

INTRODUCTION

The Tamaraw (*Bubalus mindorensis*) is a dwarf buffalo species, endemic to the island of Mindoro in the Philippines. Historically, Tamaraw are thought to have been present across the entire island, from sea level up to around 2,000 m above sea level (asl) in a range of habitats including secondary forest and grassland (Custodio, et.al. 1996). By 1969, however, Tamaraw were reduced to an estimated 100 individuals (Harrisson 1969). Recent surveys undertaken by the DENR through its TCP indicates the presence of about 600 individuals of Tamaraw in four areas (Table 2).

Table 2: Summary of Tamaraw population estimates from 1987, 1996 to 2018. Modified from Long *et al.* 2018)

Site	Year of population estimate		
	1987[1]	1996[2]	2018[3]
Mounts Iglit-Baco Natural Park	145	175	400-500
Upper Amnay Watershed Region (Eagle Pass)	65	65	5-70+
Aruyan-Malati Tamaraw Reservation	41	14-30	3-15
Mount Calavite Wildlife Sanctuary	45	>1	0-5
Santa Cruz – Pinagturilan	20	0	0
Oriental Mindoro (Municipalities of Victoria, Bansud, Bongabong and Mansalay)	40	0	0

[1]Petocz (1989); [2]de Leon (1996); [3]Long *et al.* (2018)

ECOLOGY AND BEHAVIOUR

Tamaraw inhabits secondary forest and open grasslands, both of which are seasonally burned by the indigenous Mangyan people who practice slash-and-burn farming. Tamaraw have been observed feeding more frequently in the early mornings and evenings and are typically observed in small family groups or lone bulls (Cebrian *et al.* 2014).

The exact age of sexual maturity in both bull and cow Tamaraw is unknown (Cebrian *et al.* 2014). Tamaraw cows have a gestation period of 317 days with a calving interval of 712 days (Sarabia *et al.* 1998), and typically give birth to one calf (Custodio, et. al. 1996). Tamaraws breed during the dry season, from December to May and births occur during Mindoro's wet season from June to November when vegetation is lush. Cows give birth to a single calf every two years (Custodio, et.al. 1996).

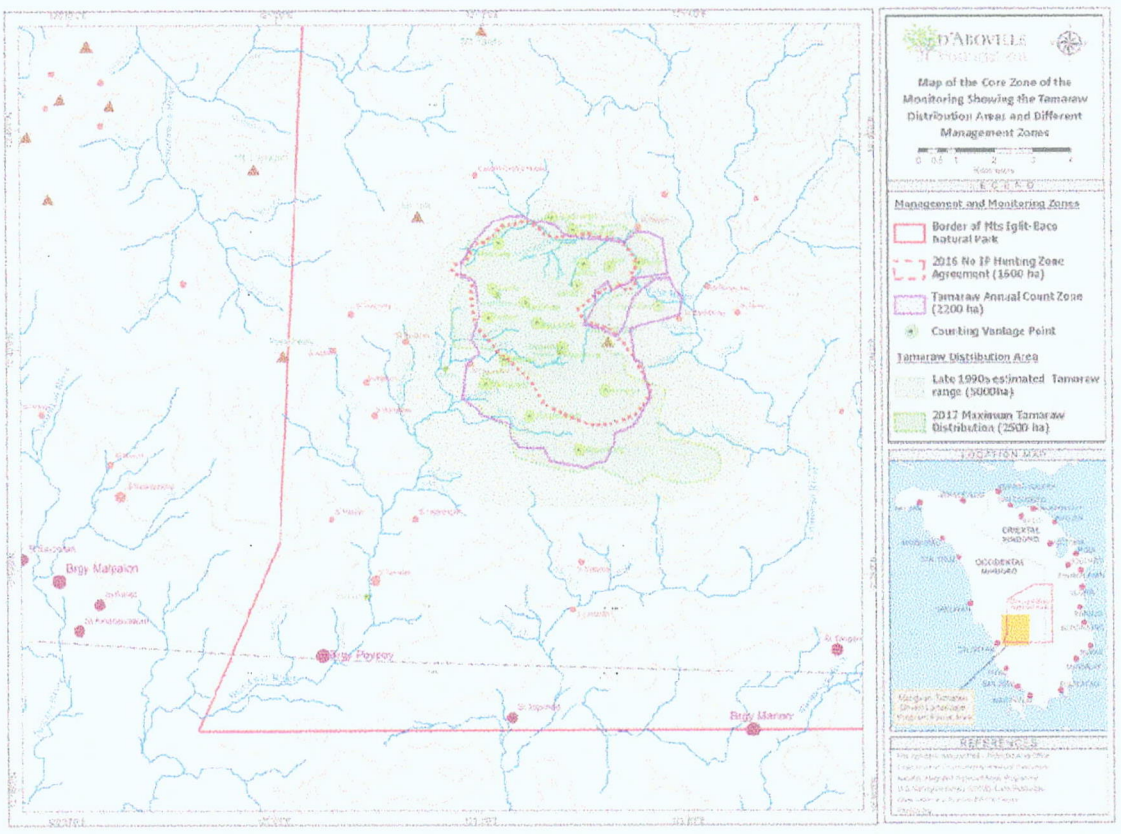
Tamaraw were often described as solitary (Talbot & Talbot, 1966; Kuehn, 1976; Suchomel, 2005). However, recent study in MIBNP revealed that bulls were often solitary and cows formed small family groups of 2-12 individuals of different ages, with or without bulls. These results demonstrate that the population remained relatively stable, maintaining a constant age structure and reproductive rate (Ishihara, et. al. 2014).

With fewer than 600 Tamaraw remaining and an estimated area of occupancy of less than 10,000 ha (Long *et al.* 2018), Tamaraw are listed as Critically Endangered on the IUCN 'Red List' (Boyles *et al.* 2016) and on the Updated National List of Threatened Philippine Fauna and their Categories (DAO 2019-09).

In addition to the populations at Mounts Iglit-Baco Natural Park (MIBNP), Upper Amnay Watershed and Aruyan-Malati Tamaraw Reservation, a 2019 survey has confirmed presence of up to six individuals in the Mount Calavite Wildlife Sanctuary. Details of the estimated sizes of Tamaraw populations as 2018, are presented in Table 2. Around 80% of individuals are presumed to be in only one subpopulation, in a restricted area of less than 3,000 ha within MIBNP (Long *et al.* 2018; see below).

MOUNTS IGLIT-BACO NATURAL PARK

While the Tamaraw population in Mounts Iglit-Baco Natural Park (MIBNP) has increased over the last two decades (Table 1), the area of occupancy has contracted (Long *et al.* 2018). In 2000, the area of presence was estimated to be around 5,000 ha, but this had reduced to 2,500 ha in the dry season of 2017 (Figure 1). The causes of the observed increase in population but contraction of area of occupancy are unclear (Long *et al.* 2018).



UPPER AMNAY WATERSHED REGION

Figure 7: The distribution of Tamaraw within the Core Zone of Monitoring in Mounts Iglit-Baco Natural Park, Mindoro, between the late 1990s and 2017, and showing different management zones (from Long *et al.* 2018)

Surveys in 2017 and 2018 confirmed the presence of a Tamaraw population in the Upper Amnay Watershed region (Figure 8). With an estimated population size of up to 70 individuals, and an area of occupancy greater than 6,000 ha, this population is larger than the Aruyan-Malati population (Long *et al.* 2018). Here, Tamaraw are confined to mountain habitats (mossy forest, montane tropical forest and dwarf vegetation) above 500 m asl, adopting browsing behaviour and a more fibre-rich diet than the grassland populations (Long *et al.* 2018; Schütz 2019).

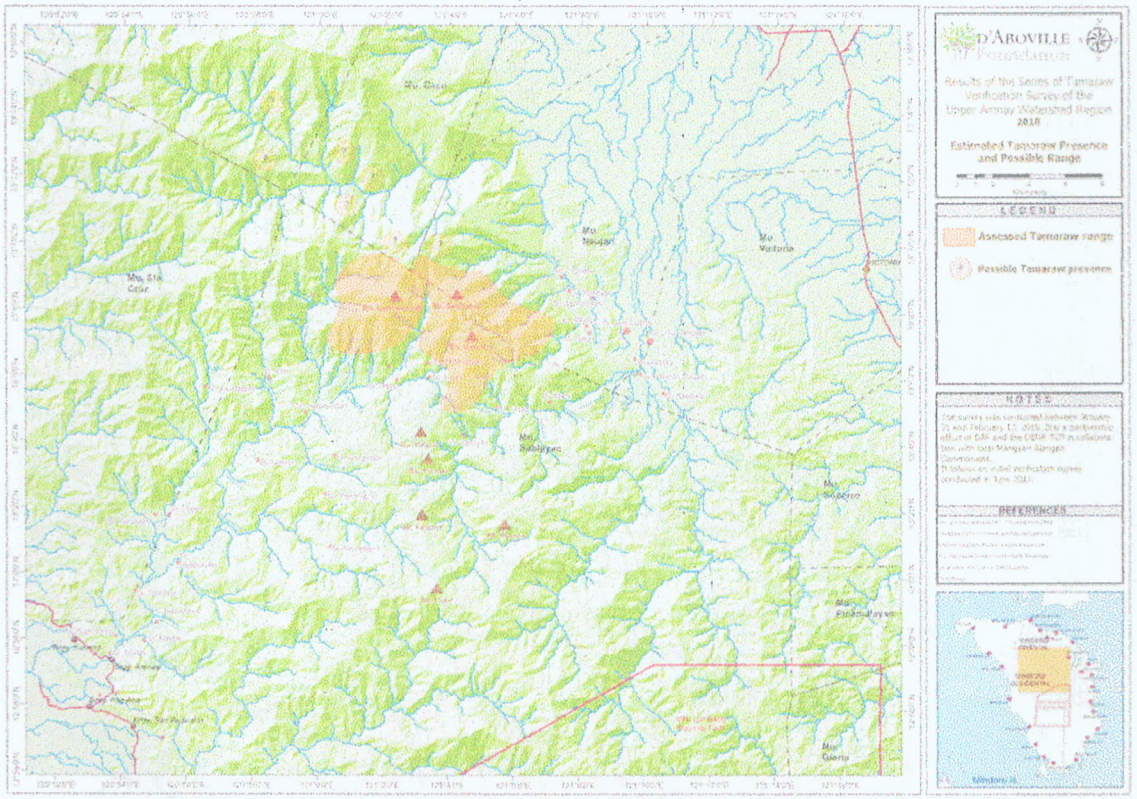


Figure 8: Location and possible range of the Tamaraw population of the Upper Amnay Watershed Region, Mindoro (from Long *et al.* 2018).

ARUYAN-MALATI TAMARAW RESERVATION

The Aruyan-Malati Tamaraw Reservation is located in Occidental Mindoro, to the west of MIBNP (Figure 3). The Reservation is characterized by a hilly landscape dominated by secondary forest, along with areas of open grassland from slash and burn agriculture (Long *et al.* 2018). Estimates of Tamaraw numbers here vary, with surveys suggesting 15-20 individuals in 2007, 10-12 individuals in 2015 and the most recent ranger patrols reporting two or three family groups along with a few solitary males (Long *et al.* 2018).

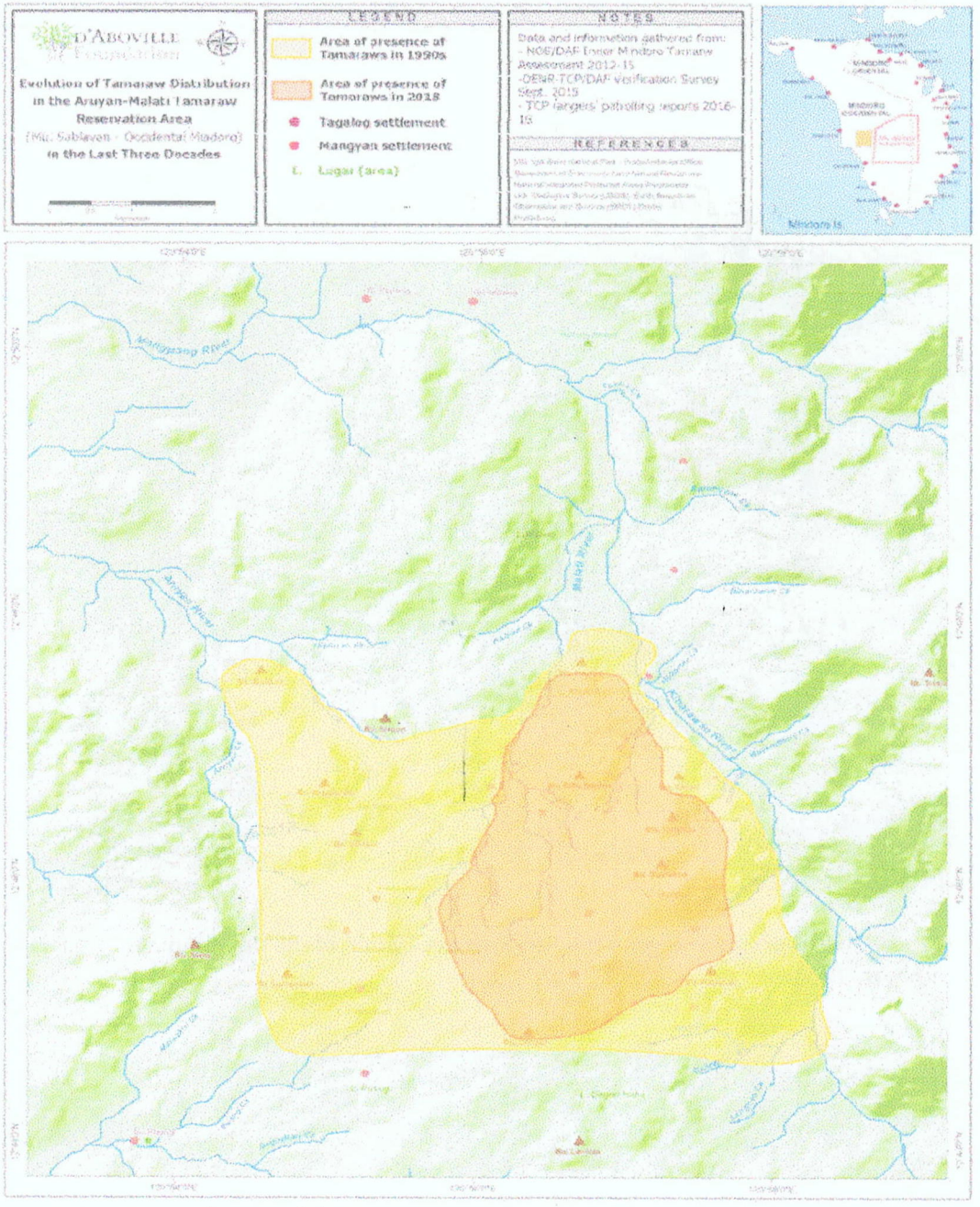


Figure 9: Location and range of the Tamaraw population in the Aruyan-Malati Tamaraw Reservation Area, Occidental Mindoro (from Long *et al.* 2018).

CURRENT AND HISTORIC THREATS

HABITAT LOSS AND DEGRADATION

Conversion of natural habitats into agricultural lands was likely the primary cause of decline in the Tamaraw's range throughout the 20th Century. Mindoro was once entirely forested, however by 1988 around 70% of forest cover had been lost to commercial logging and subsequent conversion to agriculture (Gonzalez *et al.* 2000), and a further 30,000 ha of forest cover was lost between 1988 and 2015 (Long *et al.* 2018). A total logging ban was implemented in 2011 and the Department of Environment and Natural Resources (DENR) has initiated a large-scale reforestation program (National Greening Program), including several sites in Mindoro. Despite this however, forests remain threatened (Israel & Lintag 2013).

Deforestation allowed grasslands dominated by cogon grass (*Imperata cylindrica*) to develop and persist, which were used for cattle ranching, forcing Tamaraw out and restricting them to more mountainous terrain (Long *et al.* 2018). Grasslands are frequently burnt by Mangyan communities as well as by the local authorities to assist with Tamaraw counts. This is likely facilitating the expansion of several invasive plant species, such as *Chromolaena odorata*, therefore reducing the quality of habitat for Tamaraw (Long *et al.* 2018).

HUNTING AND POACHING

Along with habitat loss, illegal hunting is one of the primary factors affecting the distribution of Tamaraw (Cebrian *et al.* 2014). Following World War II, the availability of high-powered rifles and automatic weapons, alongside traditional hunting using spears and pit-traps, contributed to the rapid decline in Tamaraw populations (Talbot & Talbot 1966; Cebrian *et al.* 2014). It is reported that hunting intensified in the late 1960s, and trophy hunting was occurring until the 1980s (Long *et al.* 2018).

There are reports that insurgent groups in the mountainous regions hunt Tamaraw for food, and the inhabitants of lowland areas occasionally kill Tamaraw when poaching pigs or deer. Mangyan indigenous communities use traditional hunting practices, such as spear or snare trapping, for deer or pigs, and Tamaraw are also occasionally killed (Long *et al.* 2018). Even low off-take levels are likely to have a major impact on the survival of remnant Tamaraw subpopulations (de Leon *et al.* 1996).

The improvement of infrastructure on Mindoro is facilitating access to the currently remote Tamaraw range areas, putting these populations at risk from poaching. For example, the cross-Mindoro road, currently under construction, will enable access to the Upper Amnay Watershed Region, threatening the survival of this newly confirmed population (Long *et al.* 2018).

DISEASE RISK

An outbreak of rinderpest, a highly contagious viral disease of domestic cattle, is a possible cause of the sharp decline in the Tamaraw population from 1900 to 1949 (Harper 1945; Buchholtz 1990; Cebrian *et al.* 2014). It is believed that the risk of disease is now lower as domestic cattle is no longer present in the same areas where Tamaraw populations are found. However, there is a risk of crossover in MIBNP, where cattle grazing continues close to the Core Zone of Monitoring (Long *et al.* 2018).

SMALL POPULATION EFFECTS

Declining population size and increased fragmentation leads to reduced gene diversity (through genetic drift) and increased inbreeding. This may reduce the fitness of a population and its ability to adapt to environmental change (Frankham *et al.* 2010). Further, small and restricted populations show

increased vulnerability to the influence of chance and may fluctuate dangerously in response to otherwise normal variation in environmental conditions. Therefore, the small size and fragmentation of the Tamaraw population may pose a serious threat to the long-term survival of the species (Long *et al.* 2018).

CONSERVATION INITIATIVES

LEGAL PROTECTION

The Tamaraw was first legally protected when the Commonwealth Act No. 73 was signed into law in 1936. This prohibited the killing, wounding or removing of Tamaraw from their habitat, however in 1939, Forestry Administrative Order No. 17 declared that special licenses were available to permit the killing and selling of dead or live Tamaraw. In 2001, the Republic Act No. 9147 brought in strict penalties for hunting, killing or trading Tamaraw, including the destruction of their habitat (Cebrian *et al.* 2014). The Tamaraw is listed in Appendix I of the Convention on International Trade of Endangered Species (Boyles *et al.* 2016).

MIBNP was established as Mts. Iglit-Baco Game Refuge and Bird Sanctuary in 1969 and upgraded to a National Park in 1970. The declaration of MIBNP as a "natural park" rather than national park in 2018 recognizes the Mangyan communities living within the boundaries of the protected area, as well as their rights to use and manage natural resources. A management plan for MIBNP is in publication, and this will help to guide conservation actions in the park (Long *et al.* 2018). Mt Calavite Wildlife Sanctuary was first established as Mt. Calavite Game Refuge and Bird Sanctuary in 1920. Currently, all other known Tamaraw populations are found outside protected areas (Long *et al.* 2018).

The Presidential Committee for the Conservation of the Tamaraw was formed in 1979, leading to the creation of the DENR-supervised Tamaraw Conservation Program (TCP). Since 2005, the TCP has been managed by the DENR MIMAROPA Regional Office.

CAPTIVE POPULATION MANAGEMENT

A 'Gene Pool Farm' was established in Manoot, Mindoro in 1980 as an *ex situ* breeding facility for Tamaraw. Between 1982 and 1984, 20 Tamaraw were captured from Aruyan-Malati (Custodio *et al.* 1996). Several animals died during either the capture process, transportation or soon after release into the facility, and 11 animals remained by 1990. Five calves were born between 1990 and 1999, however some of these were stillbirths due to infection by bluetongue virus and leptospirosis. One calf died during the birthing process, and another survived for a year before dying due to endoparasite infection. The fifth calf named "Kalibasib", a male born in 1999, is the only captive-bred Tamaraw that survived until adulthood. It succumbed on 10 October 2020 at 21 years of age (DENR-TCP field report, 2020).

The failure to establish a breeding programme at the Gene Pool Farm has been attributed to the difficulties of access, disease, husbandry techniques used and frequent changes in management responsibility (Cebrian *et al.* 2014; Long *et al.* 2018). However, animals were able to breed and live to old-age at the facility, indicating that with improved husbandry techniques and advanced disease control, a future conservation breeding programme could be successful (Long *et al.* 2018).

POPULATION MODELLING AND CONSERVATION PLANNING

A Population and Habitat Viability Assessment (PHVA) workshop for Tamaraw was held in 1996. This highlighted the vulnerability of the remaining Tamaraw populations due to their small size, even when facing relatively low levels of poaching (de Leon *et al.* 1996).

Where implemented, the recommendations of the 1996 PHVA have achieved success for the Tamaraw (Long *et al.* 2018); in MIBNP, for example, the numbers of Tamaraw have shown a positive trend (Table 1). However, in the areas where conservation action has not been taken, or has been insufficient, populations are now presumed extirpated (e.g. Santa Cruz, Baongabong), at high risk (e.g. Aruyan-Malati, Mt Calavite) or at risk of further decline (e.g. Upper Amnay Watershed Region) (Long *et al.* 2018).

TAMARAW POPULATION VIABILITY ANALYSIS

SUMMARY

- Tamaraw presence is confirmed at four wild sites: Mounts Iglit-Baco Natural Park (N=400-500), Upper Amnay Watershed Region (N=10-60), Aruyan-Malati Tamaraw Reservation (N=3-15) and Mount Calavite Wildlife Sanctuary (N=4-6).
- The viability and recovery potential of these populations was explored under a variety of conditions using *VORTEX* simulation models (Lacy& Pollack, 2017) and the results are summarised below. The timeframe considered was 100 years. An extinction probability of zero and an inbreeding coefficient below the international rule of thumb for captive populations (F≤0.125) were used to distinguish successful scenarios.

These results and inferences are based on population models built using the best information available at the time of the workshop. There remain many areas of parameter uncertainty. The thresholds and figures reported here should be used as a guide only and revised as new information becomes available.

- The baseline model growth rate of r=0.0452 (approximately 4-5% per year) was highly sensitive to changes in factors related to female breeding success (annual percentage of females breeding, adult female mortality, age at first breeding). Environmental threats or conservation measures that target these factors are likely to have a disproportionate effect on population viability. Over the range of values considered, varying male mortality rates had little impact.
- Populations beginning small but able to grow showed lower risks of extinction and accumulated less inbreeding than those that remained small. In the absence of poaching, disease outbreaks or extreme environmental effects, a stable population of at least 75 Tamaraw was required to achieve both zero extinction risk and the maintenance of inbreeding below the recommended threshold. Where constraints on growth were removed the same could be achieved with a population starting with 50 individuals.
- Populations showed poor tolerance to poaching. Populations of 100 individuals showed rapid declines and extinction risks of 44-100% where poaching levels reached or exceeded four adult Tamaraw per year.

- Models incorporating outbreaks of domestic cattle-borne diseases showed lower average population sizes, decreased growth and increased likelihood of extinction over the 100-year period. Results suggest that a *population of N=100 could withstand only occasional and mild disease outbreaks.*
- Under a scenario of "no conservation action", site-specific models predicted 100% risk of extinction over the next 100 years, of Tamaraw at Aruyan-Malati and at Mount Calavite; 48% extinction risk for Upper Amnay; and 1% extinction risk at Mounts Iglit-Baco Natural Park.
- The potential value of a captive population as a source of release animals was modelled. To produce more than two individuals per year for release, a breeding facility would need to hold at least 25 individuals, with sustained annual breeding in at least 60% of the females.
- In models without poaching, establishing a new Tamaraw population required an initial release cohort of at least 20 Tamaraw. Where poaching was present, likelihood of success was poor and much larger release *cohorts were needed. Release cohorts with a female-biased sex-ratio grew more quickly.* A ratio of 10:10 took approximately 45 years to reach 100 individuals whereas a ratio of 14:6 took 35 years. Too great a skew can elevate inbreeding rates and risk loss of all founder males before breeding.

INTRODUCTION

There are many gaps in our knowledge of Tamaraw biology and in our understanding of how the species might respond to changes in environment or management. Computer simulation models, though not expected to be an accurate depiction of living Tamaraw populations, can help us to assemble available information and expert opinion and use it to make informed assumptions about what needs to be done, how and when. Analyses of this type are generally referred to as Population Viability Analyses (PVA).

PVA Goals

1) To explore the strengths and weaknesses of Tamaraw life-history characteristics.
2) To estimate the relative impact on population viability, of known or potential threats.
3) To illustrate the group's best guess at the likely future for remaining Tamaraw populations under current conditions.
4) To compare the relative impact of alternative management interventions on Tamaraw population viability, both overall and at individual sites.
5) To identify key gaps in knowledge that would help improve these analyses.

For the Tamaraw PHVA, PVA models were built using the *VORTEX* simulation program (Version 10.3.6.0) (Lacy & Pollack, 2017). *VORTEX* models are particularly well-suited to exploring questions about populations numbering a few hundred individuals or less as they incorporate those aspects of demographic, environmental and genetic uncertainty that are known to pose risks to populations of this size.

The following pages present details about the models constructed, the rationale behind the scenarios explored and summaries of the major findings.

BASELINE MODEL

A baseline model was built to simulate a population of reasonable size, under good conditions, in absence of major threats and without extreme pressure from small population-related issues. In later sections, this model was adapted to reflect known or estimated site or population conditions, or proposed conservation management scenarios.

Data for the baseline Tamaraw model were drawn from:

- information from surveys at Mounts Iglit-Baco Natural Park;
- information from a previous population viability analysis (de Leon et al., 1996);
- information in the literature, for closely related species;
- estimates and opinions elicited from experts in the lead up to, during and following the 2018 PHVA workshop.
- Results of modelling work by Christophe Bonenfant.

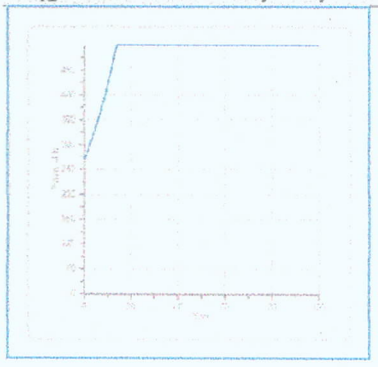
Further information on baseline model parameters is provided at the end of this section.

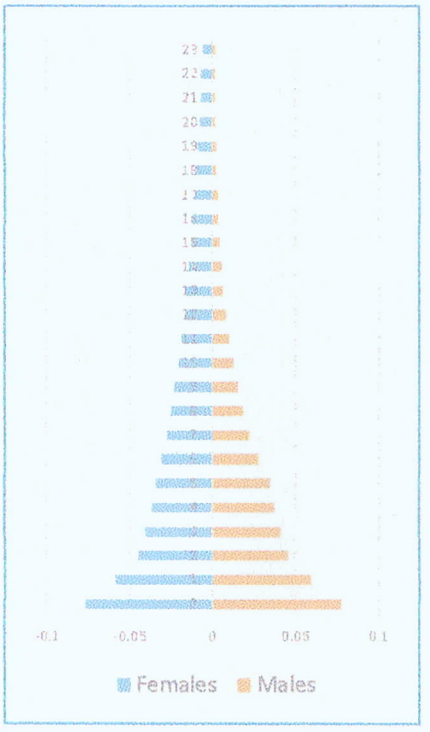
DETERMINISTIC CHARACTERISTICS

In the absence of probabilistic effects (stochastic fluctuations in demographic rates and environmental impacts; and inbreeding depression), the baseline model shows a mean annual growth rate of roughly 4-5% per year (Lambda (λ) = 1.0462). Generation time (average age at breeding) across both sexes is 10.6 years. See Table 1. for details. The ratio of adult males to adult females in the modelled population is 0.572 to 1.000 with only a small percentage of individuals of either sex surviving beyond 15 years (3.2% of males, 12.3% of females). In a wild population a lower percentage of older males can result from direct and indirect impacts of inter-male competition. This skew matches that observed at MIBNP but it was suggested there may be differences at other sites related to greater forest cover, which may favour more even adult sex-ratios.

Table 3. Deterministic characteristics of the baseline model.

Measure	Value
r (instantaneous growth rate)	0.0452
λ (lambda – annual growth rate)	1.0462
Ro (growth per generation)	1.7083
T (generation time in years)	10.60





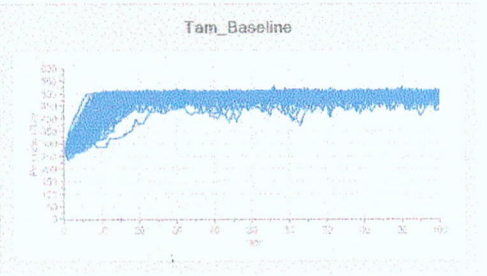
Figures 10 & 11. Graph of deterministic growth (left) and of population age-structure (right), showing skew towards adult females.

STOCHASTIC CHARACTERISTICS

The inclusion of probabilistic effects (stochastic fluctuations in demographic rates and environmental impacts; inbreeding depression) reduces the mean instantaneous rate of growth from 0.0452 to 0.0424.

Table 4. Impact of probabilistic factors on performance in the three baseline models, with illustration of 100 probabilistic projections (right).

Measure	Value
r (instantaneous growth rate)	0.0452
Standard Deviation in r	0.0595
Mean size of surviving populations @ 100 years	492.87
Probability Extinct @ 100 years	0.000



As illustrated, the inclusion of probabilistic effects has a slight negative impact on the growth rate of the baseline model but despite this it grows consistently over the 100-year period modelled with no significant declines and no risk of extinction.

SENSITIVITY TESTING

There remains much uncertainty around the values used in the models. Some model parameters are more influential than others in shaping population performance and understanding which of these can help determine priorities for future action, for research and for monitoring. *VORTEX* can help by providing a simple and quick way to test the sensitivity of the baseline models to uncertainty in each individual parameter.

One parameter at a time was selected in the baseline model (e.g. age at first breeding, inter-birth interval, sex-ratio etc.) and was varied across a plausible range of values, keeping all other parameters constant. The impact of this variation on population growth rate was recorded and compared to that recorded for other parameters. The results are illustrated in Figure 12 below.

Across the range of values considered, factors related to female breeding success had the greatest impact on population growth rate. Increasing the annual percentage of females breeding from the most pessimistic value to the most optimistic one increased the growth rate of the population from

3% to 7%. An adult sex-ratio biased towards females and reduced adult female mortality also increased growth rates considerably. Reducing the age at first breeding also showed an effect. Longevity (lifespan) and age at last breeding had no observable impact. This is counter-intuitive and results because in the models (and often in wild populations) most mortality occurs in young animals such that relatively few individuals of a cohort are left as the designated ages at last breeding and longevity approach. Loss of these individuals therefore has only a small impact on population growth rates. Male mortality rates had no observable impact.

THREATS

There is uncertainty about the sizes of remaining Tamaraw populations, the ages and sexes of remaining animals, whether or not the population is growing, the quality of habitat in each area, what threats may be operating at each site and at what level of severity. A series of generic models were built to explore the potential impacts of these factors on growth rates and extinction risk.

POPULATION SIZE

Tamaraw are known to be persisting at a minimum of four isolated sites in Mindoro. Population size estimates range from 4-6 individuals at Mount Calavite Wildlife Sanctuary to 400-500 at Mounts Iglit-Baco Natural Park. Models were built with a representative range of starting population sizes (N=5, 15, 25, 50, 75, 100, 200, and 400). Two types of scenario were used to explore the potential impact of population size on viability:

- **No growth scenarios:** in which populations are capped at the starting population size (e.g. due to poaching, disturbance, poor habitat quality or some other factor).
- **Growth scenarios:** in which the constraints on growth are removed and population growth is allowed up to a carrying capacity of 500 Tamaraw.

Extinction risks and inbreeding accumulation for each scenario are reported in Table 4. and illustrated in Figures 13 and 14.

Table 4. Impact of starting population size on 100-year extinction risk with and without the ability for population growth. Non-zero extinction risks and population mean inbreeding coefficients above the internationally accepted threshold for captive programs, are flagged in RED.

	P (Extinction at 100 years) (%)		Inbreeding accumulation at 100 years (Coefficient of inbreeding, F)	
Initial population size (No. Tamaraw)	With no further growth	With unconstrained growth	With no further growth	With unconstrained growth
5	100	91.0	N/A	0.3586
15	92.8	13.3	0.4222	0.1823
25	33.6	0.7	0.2827	0.1013
50	0.3	Zero	0.1448	0.0473
75	Zero	Zero	0.0975	0.0329
100	Zero	Zero	0.0764	0.0268
200	Zero	Zero	0.0389	0.0185
400	Zero	Zero	0.0195	0.0158

Zero growth was achieved by setting carrying capacity equal to initial population size.

POPULATIONS THAT ARE NOT GROWING

For "static" or non-growing populations, likelihood of extinction over the 100 year period ranged from 100% for N=5 to 0% for N≥75 individuals. Average (mean) time to extinction was relatively short for smaller populations (13.5 years for N=5) and longer for larger ones (87 years for N=50). Inbreeding accumulation after 100 years varied from F=0.4222 for N=5, to F=0.0195 for N=400. Populations of N≥75 remained below the internationally recommended maximum inbreeding threshold for captive programs (F=0.125, i.e. that expected to result from a half-sibling pairing).

GROWING POPULATIONS

Populations that begin small but can grow, show a lower risk of extinction than those whose growth is constrained. Likelihood of extinction for growing populations ranged from 91% for N=5 to 0% for N≥25 individuals. Mean time to extinction (MTE) was longer than for populations that were not growing (MTE for N=5 was 30 years compared to 13.5 years). Inbreeding depression remained below internationally accepted thresholds in all populations initiated with 25 or more individuals.

Note that none of these modelled scenarios include risks from other threats such as disease, poaching or environmental deterioration.

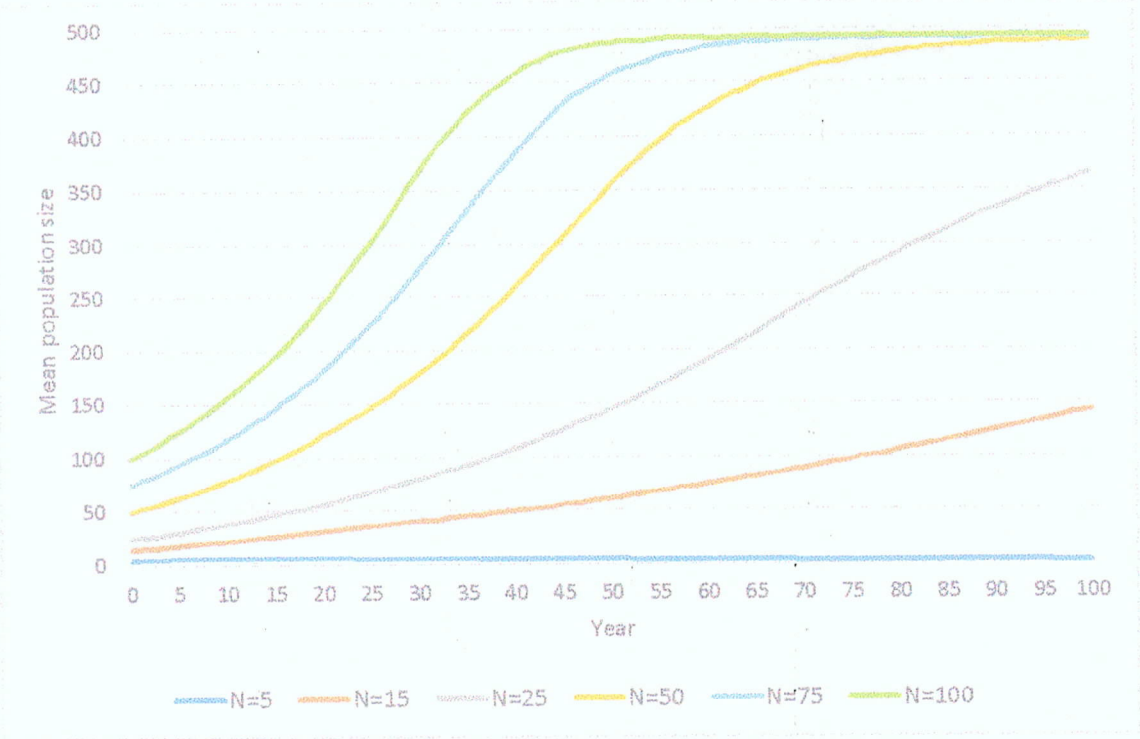


Figure 13. Mean population size over time for Tamaraw models initiated with between 5 and 100 individuals and unable to grow.

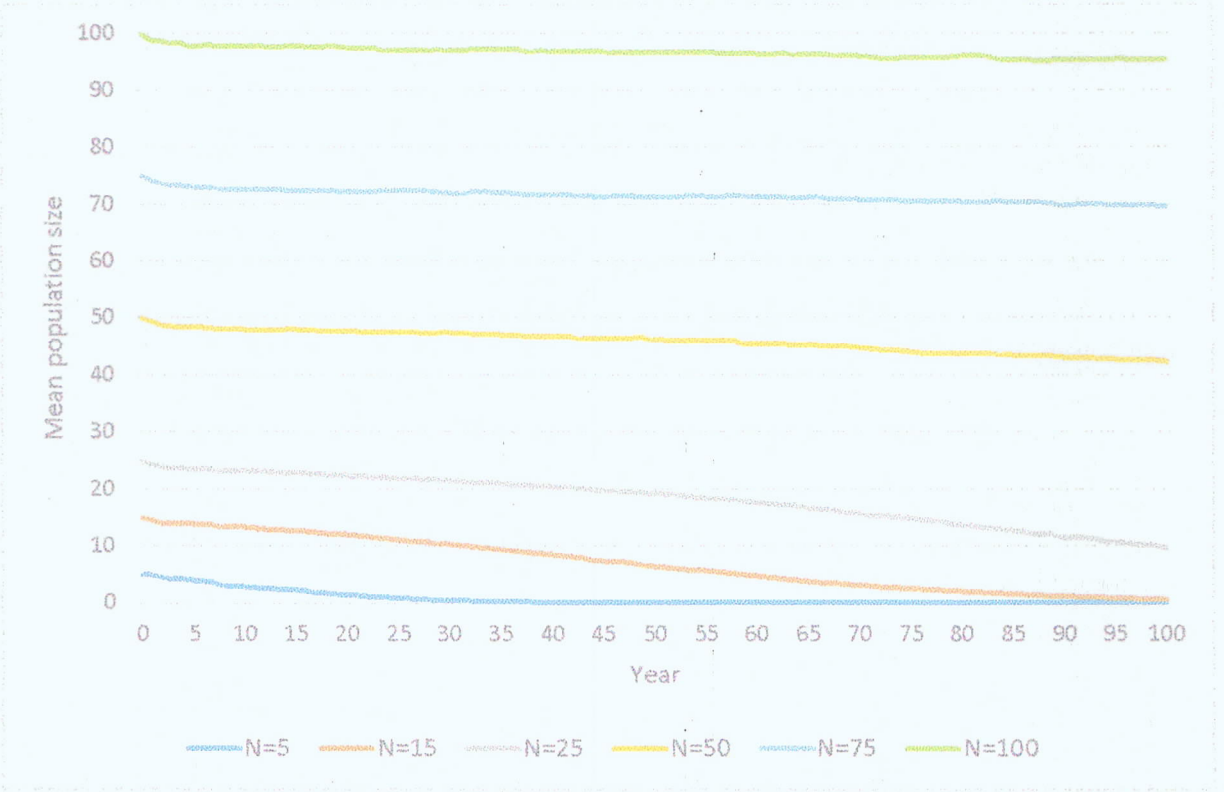


Figure 14. Mean population size over time for Tamaraw models initiated with between 5 and 100 individuals and able to grow.

POACHING

Poaching refers here to the illegal hunting of Tamaraw. It does not include traditional hunting by IPs, which is currently assumed to be included as one of several unspecified causes of annual mortality. Poaching is modelled separately, as the periodic removal of a specified number of individuals. Poaching is modelled here as an annual collection that varies from year to year around a prescribed mean value of 2, 4 or 8 animals. The population began with 100 Tamaraw in each case.

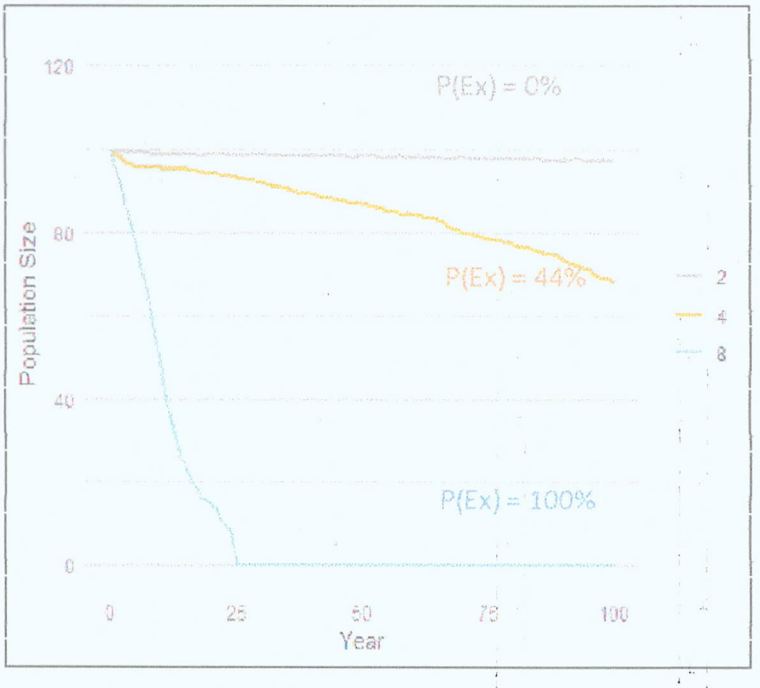


Figure 15. Impact of mean poaching rates of 2, 4 and 8 individuals per year, on a population of 100 Tamaraw, over 100 years. Mean population sizes over time and 100-year extinction risk are shown.

For a population of 100 individuals a mean poaching rate of four or more individuals per year caused rapid population declines and extinction risks of 44-100%. Note that in these models, poaching was of both adult males and females. If for any reason

poaching favoured females the impact would be more severe.

DISEASE

Disease is included indirectly in the baseline model as it would be expected to be a component of annual mortality, disease outbreaks can cause a spike in mortality that would fall outside the normal year-to-year variation in rates. Several diseases carried by livestock are transmissible to Tamaraw and could cause an outbreak, including haemorrhagic septicaemia, surra and bovine tuberculosis. No data were available to inform estimates of the potential frequency or severity of such events but models were built to test the relative vulnerability of populations to a range of values and results are shown in Figures 16 and 17.

A disease outbreak was introduced to a population of 50 individuals, occurring with an average frequency of either once every 10 years (10%), once every 7.5 years (15%), or once every 5 years (20%). The impact of the disease was to increase mortality by 50% in the year of occurrence. Results are illustrated in Figure 16. In a further set of models the frequency was held constant at once every 7.5 years (15%) and the severity was varied, increasing mortality by 25%, 50% and 75%. Results are shown in Figure 17.

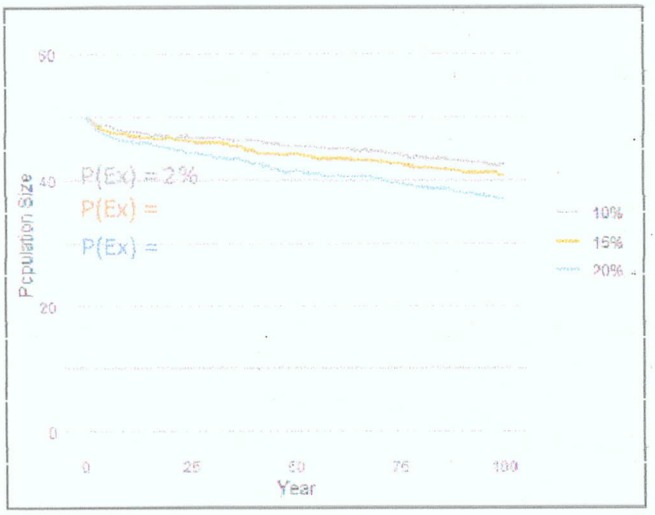


Figure 16. Impact of frequency on the impact of a hypothetical disease which, when it occurs, increases mortality by 50%.

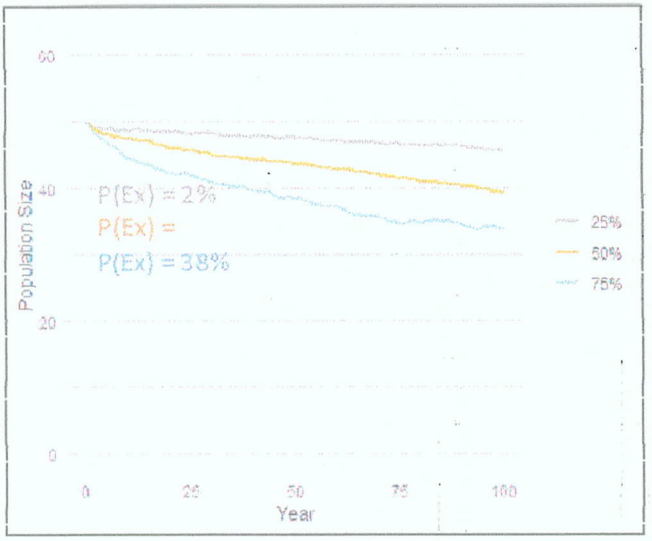


Figure 17. Impact of disease severity on mean population size and extinction risk, for a population of 50 individuals, and a hypothetical disease with a 15% likelihood of occurrence.

The introduction of disease to the models reduces average population size, decreases growth and increases the likelihood of extinction over the period considered. At the range of frequencies modelled, population extinction risk varied from 2-10%. At the severities modelled, extinction risk varied from 2-38%. Results suggest that a population of this size could withstand only occasional and mild disease outbreaks.

SITE-BASED SCENARIOS

The following section describes models built for each Tamaraw population. These models were built using what is known or assumed about the characteristics and circumstances of each. As so little is known, three models were built for each population: a pessimistic model, a best-guess model and an optimistic model. Demographic information from Mounts Iglit-Baco, the best studied population, was used as the basis for all models.

MOUNTS IGLIT-BACO

[Note that since these models were run the estimate of current population size at MIBNP has been reduced to 400-500]

The main threats to this population were poaching and habitat destruction. A best-guess model assumed a current population size of 530 individuals (though numbers are likely to be lower) and a carrying capacity of 650. Poaching rate was set to a mean of 8 individuals every year. In the pessimistic model, starting size was 450 individuals and carrying capacity 600, with poaching increased to 10 individuals per year. Finally, in the optimistic model, starting size was set to 600 individuals, carrying capacity to 800 individuals, and poaching to 6 individuals per year.

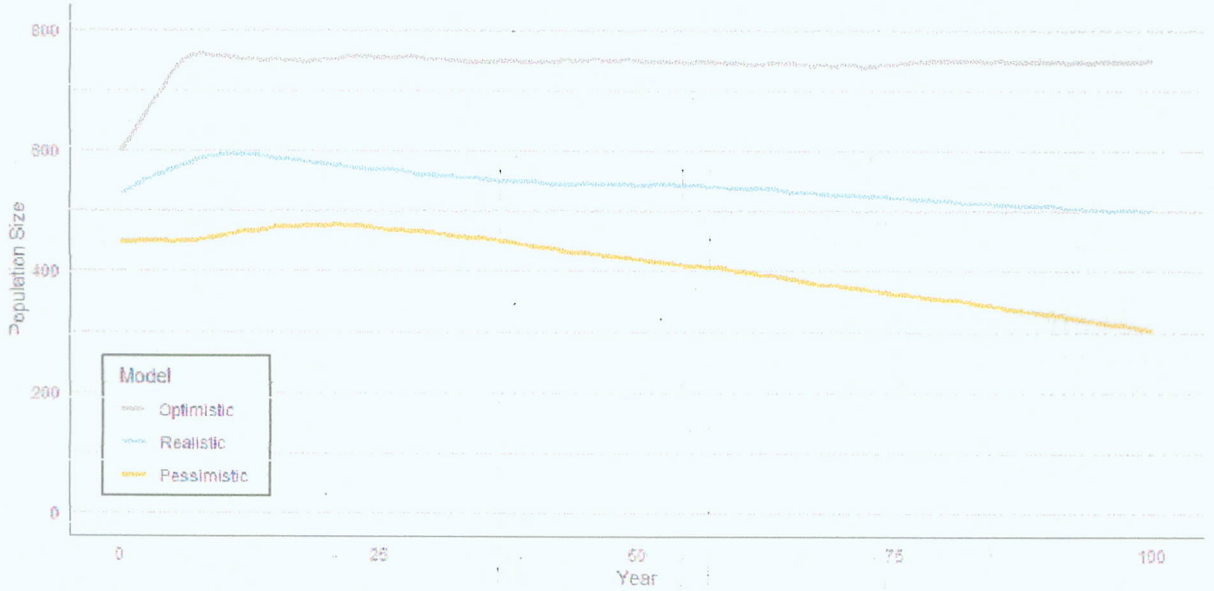


Figure 18. Pessimistic, best-guess and optimistic models for the Tamaraw population at Mounts Iglit-Baco Natural Park in the presence of poaching.

With no further change in environmental conditions, and assuming low levels of poaching, the Mts. Iglit-Baco population would be expected to persist. However, the equilibrium is fragile. The best-guess model shows an ongoing decline (though only a 1% chance of extinction over the period modelled) and the pessimistic model shows a 12% risk of extinction. It is important to note that these scenarios do not consider either the effect of weed encroachment, which would be expected to reduce the

carrying capacity of the site and therefore the number of Tamaraw supported, or the effect of translocating Tamaraw to other sites for conservation purposes, which would be expected to reduce Tamaraw numbers temporarily. Both scenarios would exacerbate the impact of poaching and are explored in subsequent sections.

UPPER AMNAY WATERSHED REGION

Poaching is considered the main threat to the Tamaraw population in the Upper Amnay Watershed Region. In the best guess model, starting population size and carrying capacity were both set to 70 individuals. In the optimistic model both were set to 100 individuals and in the pessimistic model both were set to 20 individuals. Note that in all models, between 1 and 4 individuals were poached each year with the exact number randomly selected by the program.

The future of Upper Amnay population will depend on current population size and on how quickly the poaching threat can be mitigated at that site. At the lower end of current population size estimates, poaching will lead to extinction in this area in the next 25 years. If the population is larger, poaching will cause a decline but time to extinction will be longer.

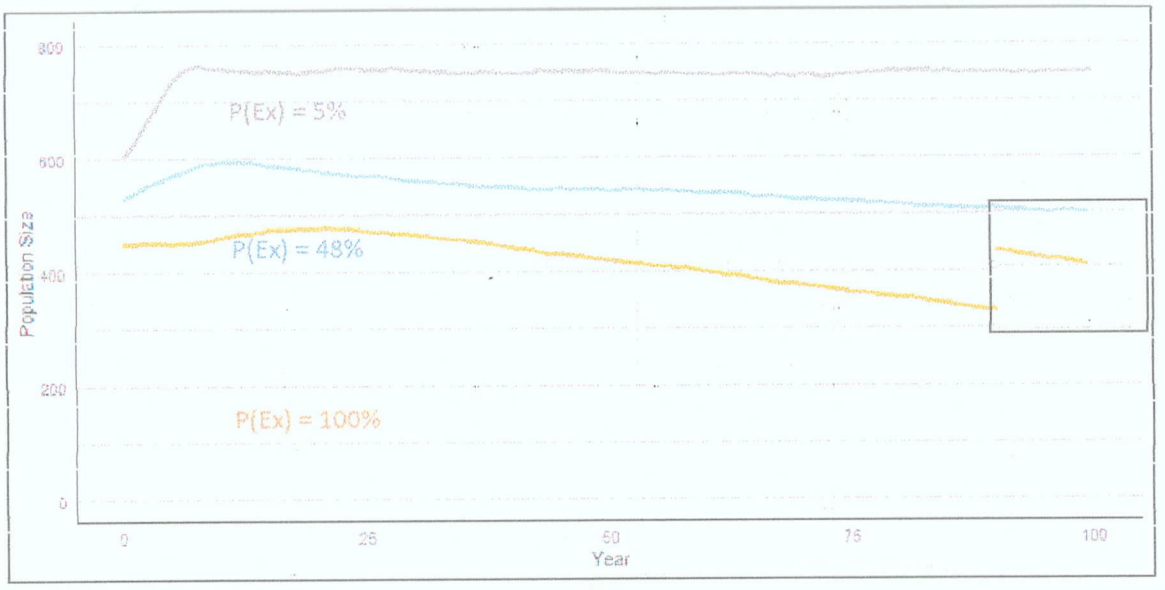


Figure 19. Pessimistic, best-guess and optimistic models for the Tamaraw population at Upper Amnay Watershed Region, in the presence of poaching.

ARUYAN MALATI

The Aruyan Malati population is particularly small and this poses a major threat to population persistence. Poaching is also considered an issue at this site. In the best guess model, starting size and carrying capacity are both set to 10 individuals. In the optimistic model both are set to 15, and in the pessimistic model they are set to 5 individuals. Either one or two individuals were poached each year with the exact number randomly assigned by the program. The results are illustrated in Figure 20.

Even without poaching, the Aruyan-Malati population is at high risk of extinction unless it can be supported to grow larger. With continued poaching extinction is expected sometime in the next 15-30 years.

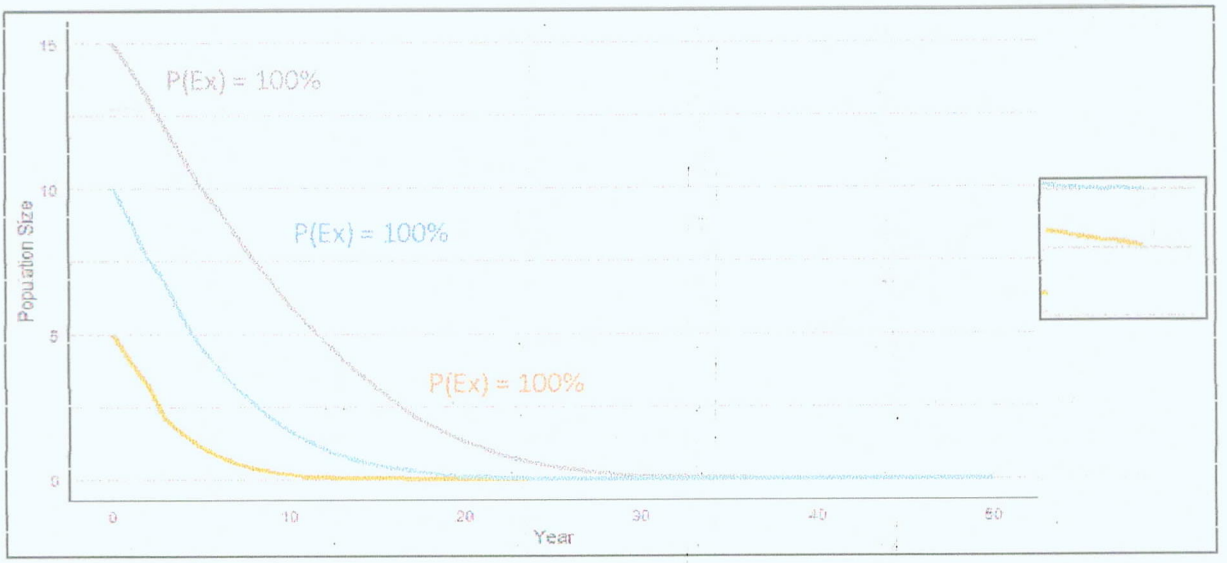


Figure 20. Pessimistic, best-guess and optimistic models for the Tamaraw population at Aruyan-Malati in the presence of poaching.

MOUNT CALAVITE

[Note that these models pre-date the recent MCWS survey confirming estimates for 4-6 individuals].

Tamaraw numbers at Mount Calavite Wildlife Sanctuary could be as low as 1 to 5 individuals. However, due to its location, the population is considered relatively safe from poaching. In the realistic model, starting size was set to 2 individuals and carrying capacity to 10, in the optimistic model starting size was set to 5 Tamaraw and carrying capacity to 15 individuals, and in the pessimistic model, starting size was set to 2 individuals and carrying capacity to 5. No poaching was included. See Figure 21 for results.

Without supplementation, the Mount Calavite Wildlife Sanctuary population is extremely vulnerable to small population effects and is expected to decline to extinction within 7-33 years.

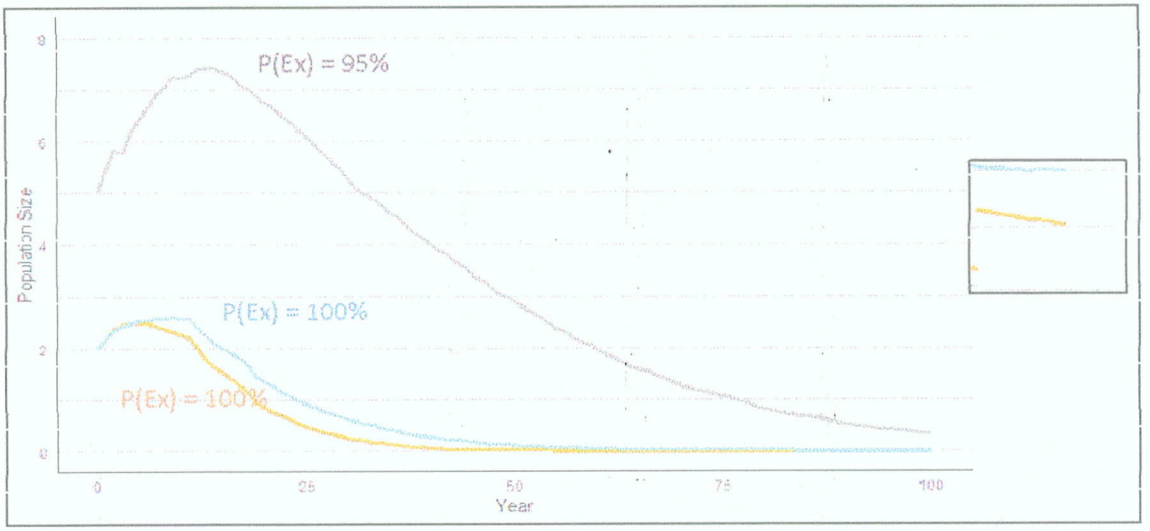


Figure 21. Pessimistic, best-guess and optimistic models for the Tamaraw population at Mount Calavite Wildlife Sanctuary. No poaching is included.

CAPTIVE BREEDING

Models were constructed to investigate the potential for using a closely managed captive population as a net producer of animals for release to wild sites. Scenarios were constructed which explored the size of annual harvest possible from captive populations of different sizes. Baseline annual percentage of females breeding is set to 50% but additional values were also modelled, representing low reproductive success (40%) which sometimes occurs in captive populations, especially during the early phases of a program, and the higher than usual success rates that can result from more intensive husbandry (60%). Breeding through artificial insemination was also included using success rates drawn from experience with Carabao (25%). Calf mortality is the same across all scenarios.

As illustrated, the larger the facility, the more Tamaraw available for release. To produce more than two surplus individuals per year for release, a breeding facility would need to hold at least 25 individuals, with sustained annual breeding in at least 60% of the females. At the facility sizes modelled (up to 100 Tamaraw) the maximum number of animals available for release each year would be around 8-9.

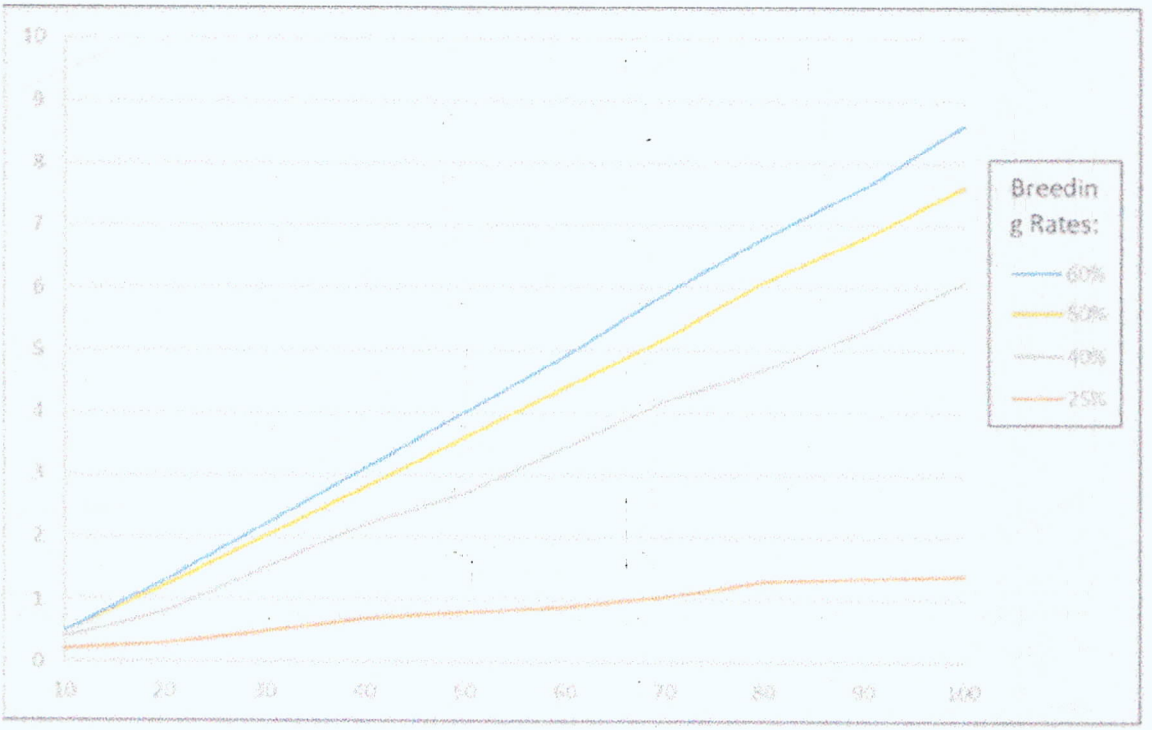


Figure 22. Expected harvesting potential of a hypothetical Tamaraw captive program under varied reproductive success.

INITIATING NEW POPULATIONS

The analysis considered the possibility creating new populations of Tamaraw at suitable sites in the future. Models were constructed to explore the minimum number of Tamaraw needed to establish a new population under a range of poaching intensities (0, 2, and 5 adult Tamaraw per year). In addition, models were used to explore the impact on growth and viability, of releasing a skewed sex-ratio of animals. The results are illustrated in Figure 23 and Figure 24 below.

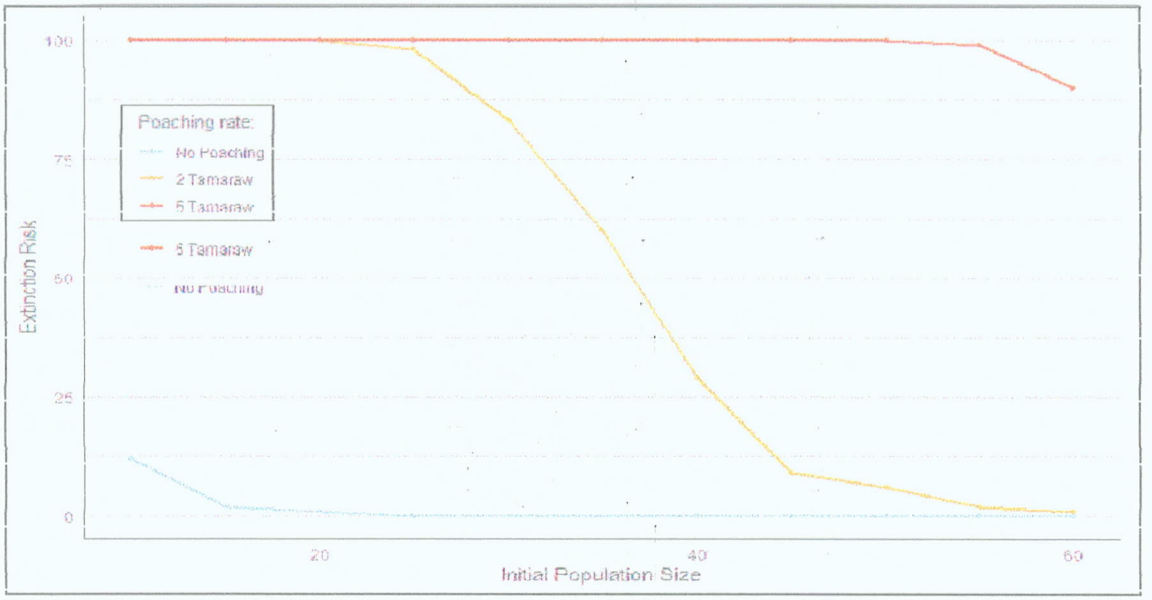


Figure 23. Impact of release site poaching intensity on minimum number of animals needed to establish a new population of Tamaraw.

As illustrated, poaching tolerance is low. Even where only two individuals are poached each year, an initial release cohort of at least 60 individuals is required to achieve an extinction risk of zero. In situations where five individuals are poached each year, 60 is not sufficient and extinction risk remains close to 100%. Where there is no poaching, a population can be established with as few as 20 individuals (provided there is space for growth). Note that populations established with 20 individuals may require supplementation downstream to mitigate inbreeding depression.

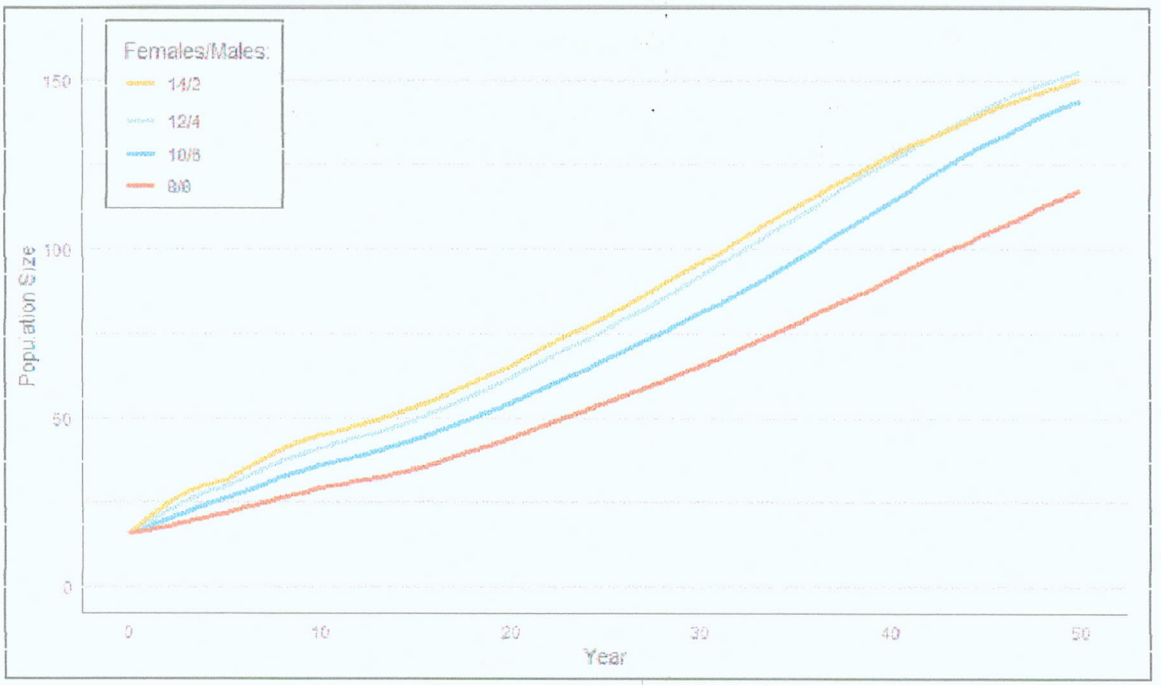


Figure 24. Impact of founding sex-ratio skew on the subsequent growth of a release cohort of 16 Tamaraw.

Release cohorts with a sex-ratio bias towards females can be expected to grow more quickly than those with an even sex-ratio, allowing larger and therefore less vulnerable population sizes to be achieved faster. For example, a population initiated with 10 males and 10 females might take around 45 years to reach 100 individuals, where it might only take around 35 years for a population initiated with 10 females and 6 males, or 30 years for a population initiated with 14 females and 2 males. In reality, the disparity in growth may be even greater due to the impact of increased inter-male competition where sex-ratios are more even. It should be noted that too extreme, a skew towards females risks loss of the very small number of males in the early stages of the program. Such an extreme skew will also increase the rate of inbreeding accumulation in the population as all first-generation offspring will be descended from just a few males, increasing the likelihood of mating between close relatives.

Much more work is needed on site-specific models before they can be used to identify optimal strategies for supplementing existing sites or establishing new ones. Currently there is not enough information on site characteristics or on the likely behaviour of release cohorts comprised of different age-classes or sex-ratios, to be able to construct "best-guess scenarios". These elements need further discussion among experts and the recommended feasibility studies relating to translocation will also provide valuable information for this.

COMPARISON BETWEEN 1996 AND 2018 BASELINES MODEL PARAMETERS

Parameter	1996 PHVA	2017 Baseline	Explanation, rationale & notes
Time period considered	100 years	100 years	
Inbreeding depression (# Lethal Equivalents (LEs) per diploid individual.	3.14 LEs with 50% assigned as lethal recessives	6.29 LEs with 50% assigned as lethal recessives	How severe do we expect inbreeding depression to be? New *VORTEX* default for wild populations (based on O'Grady *et al.* 2006). In 1996 the default was 3.14 LEs, based on analyses of captive populations (Ralls et al. 1988).
EV correlation between breeding and survival.	1.0	0.5	Is a good year for breeding a good year for survival? New Vortex default – values can range from 0-1. Precautionary value = 1.0
Median age at first breeding	5 years	5 years	In general, what age are Tamaraw when they have their first offspring?
Maximum lifespan	23 years	23 years	What is the oldest age Tamaraw live to?
Age at last breeding	23 years	23 years	What is the oldest age they breed at?
Maximum broods per year	1	1	How many times to they breed in a typical year?
Maximum offspring per brood	1	1	In a single breeding event, what's the most offspring they might have?
Sex-ratio at birth	50:50	50:50	At birth, what is the ratio of males to females?
Annual % females breeding	50% (S.D. 5%	50% (S.D. 5%)	1996 PHVA report notes that 2-year inter-birth intervals are typical for water buffalo, therefore 50% is likely to be the upper end of range. Rationale for more pessimistic models is as follows: Ishihara *et al* 2015 report mean annual % females breeding of 29.1 (range 20.5 to 37.3) based on 5 years of surveys 2006-2011, at Mounts Iglit-Baco National Park. This value of 29.1% is based on wild survey data of females with calves and so is assumed to miss early calf mortality. The 1996 PHVA accounted for this and the same method is applied here as follows: Survival through age 1 in this model is 0.8, therefore: % females calving annually =(29.1/80)*100 = 36% Repeating for the surveyed range of values gives: 26 – 47%. With rounding = 40%, which is applied to pessimistic models.
Density dependence	None included	None included	Though assumed to exist there is no information on the size or shape of effect. Excluded from the baseline but included in some scenarios
Mortality Rates (%) (F/M) 0-1 yr 1-2 yrs 2-3 yrs	 20/20 20/20 5/5	 20/20 20/20 5/5	Age-specific mortality rates were manipulated to account for the observed sex-ratio bias in adults towards females (1:1.86) reported at MNP in Ishihara *et al.* 2015 and the ratios of calves to juveniles to adults reported in the same paper (21.3:21.0:57.8). EV of 30% used as per 1996 PHVA. The following life-stages were assumed for Tamaraw: Calf: 0-12 months; Juvenile: 1-3 yrs-old; Sub-adult: 4-5 yrs-old; Adult: 5 yrs and over. It was agreed that traditional hunting by IPs at current rates (though these are not known) would be considered

Parameter	1996 PHVA	2017 Baseline	Explanation, rationale & notes
3-4 yrs	5/5	5/5	a component of natural mortality. Other forms of hunting or extraction are modelled using the Harvest function.
4-5 yrs	5/5	5/5	
5+ yrs	5/5	5/15	
Catastrophes	None included	None included	None in the baseline though based on analyses of 88 taxa, Reed *et al* suggest a background likelihood of catastrophic decline in vertebrate populations (i.e. loss of at least 50% head of population) of 14% per generation. There are also reported risks to water buffalo from domestic cattle-borne diseases: rinderpest, which takes the highest toll when it occurs but is not as common as foot-and-mouth, and anthrax, which is rare. These are considered in some scenarios.
Male monopolisation	None	None	It is assumed that 100% of males are in the breeding pool. Note that because of the adult sex-ratio imposed by the mortality rates, there will be fewer adult males breeding than females.
Starting population size	175	270	Initial population size set to 270 (1996 estimate of K for MIBNP) – large enough for initial dynamics not be distorted by small population effects, small enough to allow observable growth with K set to 500.
Carrying capacity	270	500	1996 PHVA: estimated K=270 for MIBNP. Based on maximum population size reported during 5 years of observations, Ishihara *et al.* (2015) estimated K=413 for MIBNP. At the 2018 PHVA carrying capacity estimates for MIBNP (under additional management intervention) exceeded 1500 individuals and for the entire island of Mindoro exceeded 2200 individuals. K set to 500 here as a conservative estimate of current space.
Harvest	None included	None included	Excluded from baselines.
Supplementation	None included	None included	Excluded from baselines.
Genetic Management	None included	None included	Excluded from baselines.

CONSERVATION MANAGEMENT AND ACTION PLAN 2021 - 2030

INTRODUCTION

In summary, the 2021-2030 Tamaraw Conservation Management and Action Plan includes:

- A long-term VISION for the future of Tamaraw in Mindoro, described in aspirational terms;
- A description of what it means to realise the VISION, in operational terms;
- A summary of current barriers to achieving the VISION;
- GOALS aimed at overcoming these barriers;
- ACTION STEPS to be taken in pursuit of these GOALS, including recommendations on where and how action should be taken and who would ideally be placed to take it.

Successful conservation of Tamaraw will require sustained and interdisciplinary collaboration and communication among a diverse coalition of partners. A Tamaraw Conservation Coordinating Council (TC3) will be established to achieve a streamlined and effective response to the challenge. The TC3 will provide a forum for the implementing partners, will hold review meetings every six months and will complete a full review of the plan in 2024.

This action plan document is intended for use by:

- workshop participants, as a record of the actions, initiatives and collaborations discussed;
- government agencies, to inform the development of other action plans and initiatives;
- non-governmental conservation organisations and community groups, to guide and inform their priorities and work plans;
- the TC3, to help in tracking and supporting progress with the directions and priorities agreed;
- donor organisations, to guide priorities for funding support.

2050 VISION FOR TAMARAW

"By 2050, Tamaraw are a source of national pride and a flagship for Mindoro's natural and cultural heritage. They thrive in well-managed habitats, in populations that co-exist with Indigenous Peoples, and are valued by local communities across Mindoro."

"Sa taong 2050, ang Tamaraw na pinagmumulan ng pambansang karangalan at sumisimbolo sa natural na ganda at pamanang kultura, ay napararami at napangangalagaan sa isla na malayang naninirahan kasama ang mga Mangyan at napahahalagahan ng mga pamayanan sa Mindoro."

IN PURSUIT OF THIS VISION, BY 2050 WE CAN ENVISAGE:

- 1200 – 2200 Tamaraw spread across multiple sites in Mindoro (at least 5 totalling 40,000ha or more), the largest of which supports at least 600 animals and at least two others supporting 300 or more;
- Unregulated activities have ceased where Tamaraw occur, and protected viable ecosystem and food security is achieved for both Tamaraw and Indigenous Peoples; and

- The benefits of Tamaraw conservation, whether financial, cultural or ecological, are shared with other species, with Indigenous Peoples and with all Mindoreños.

WE WILL KNOW IF WE ARE MOVING TOWARDS THIS FUTURE WHERE:

- Systematic and scientifically robust population monitoring of Tamaraw provides evidence of sustained population increase across multiple sites;
- The Tamaraw Conservation Coordinating Council (TC3) is operationalized as the national government and citizens organization that:
  - ensures harmonization and synchronization of TCMAP objectives and activities with each partner organization's annual work and financial plans, and with the plans or frameworks of other agencies;
  - ensures government commitment to resource implementation of the TCMAP through both finance and manpower, including allocation of responsibility for actions, six-monthly monitoring and review of actions, and acting as the decision-making and problem-solving agency for TCMAP implementation.
- The TCP is institutionalized and secures increased funding through DENR's annual budget allocation, to allow it to operate as the TC3 Secretariat and to conduct those activities not done by other partners.
- Traditional and national laws are enforced, and unregulated hunting, encroachment and other forms of natural resource exploitation are demonstrated to have been reduced through successful prosecutions and reduced evidence of such activities during opportunistic patrols and annual census work.
- Reduced coverage of invasive plants is achieved within Tamaraw habitat through active control work.
- Periodic socio-economic surveys of Indigenous Communities and qualified tenured migrants within Tamaraw habitat provide evidence of improved food security and health.
- Management actions to improve habitat quality and population viability for Tamaraw and other species provide improved livelihood opportunities for Indigenous People, and other relevant communities, in both financial and cultural terms.
- Existing surveys of related threatened species sharing the habitat of the Tamaraw provide evidence of improved status following Tamaraw conservation management interventions.

Opportunistic surveys of the general public and increased linkage with national and international organizations provide evidence of their growing awareness of and positive attitudes towards Tamaraw, and biodiversity in general; Tamaraw habitats across Mindoro and along established biodiversity corridors are afforded adequate protection under existing laws, i.e. NIPAS or other effective conservation measures, and are integrated in the land use plans of concerned local government units and that of the ancestral domains.

OBSTACLES TO RECOVERY AND CONSERVATION

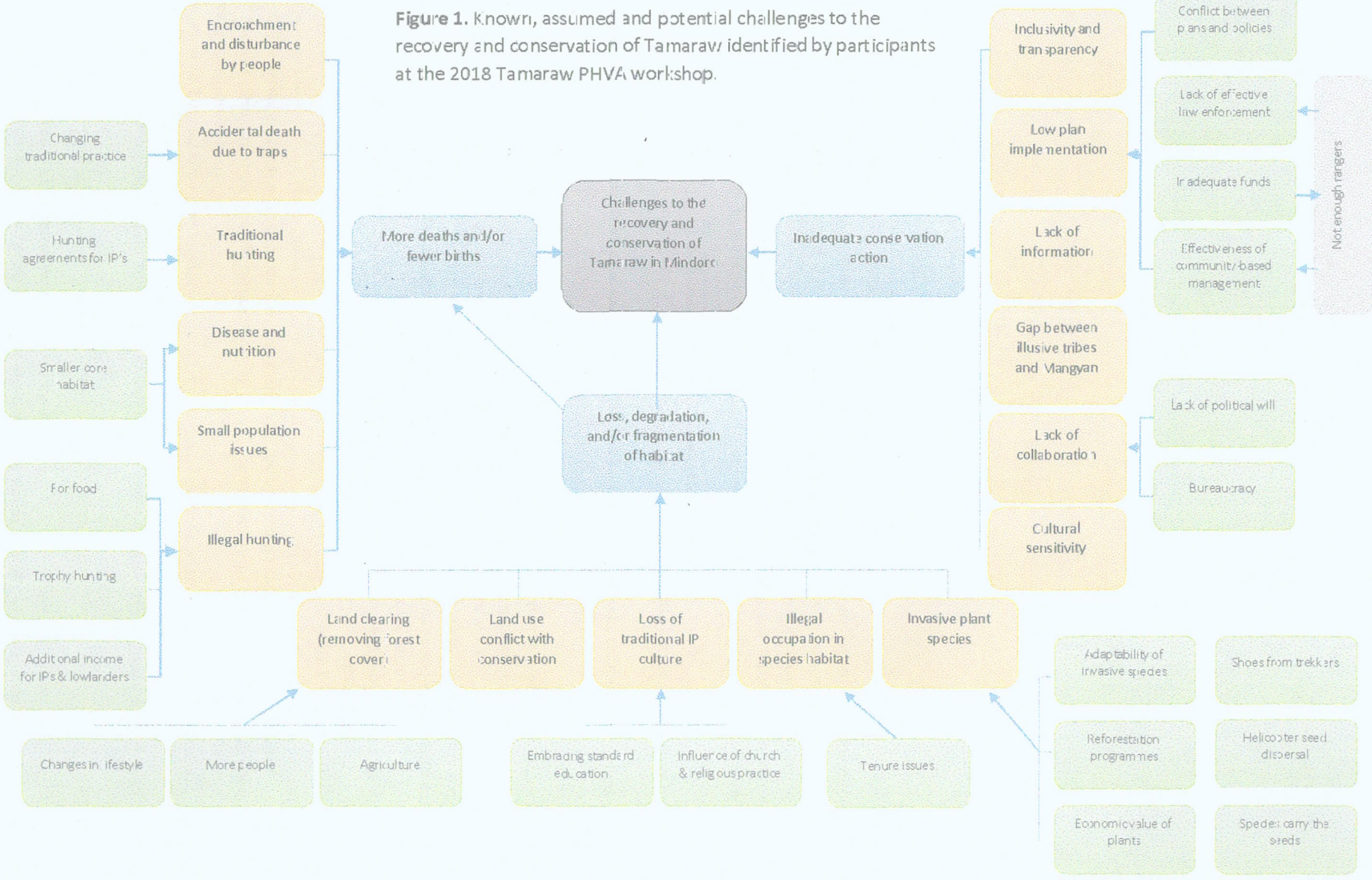


Figure 1. Known, assumed and potential challenges to the recovery and conservation of Tamaraw identified by participants at the 2018 Tamaraw PHVA workshop.

INTRODUCTION

The subsequent sections of this Plan provide recommendation for the protection and management of Tamaraw at individual wild sites (Mts. Iglit-Baco Natural Park, Upper Amnay Watershed Region, Aruyan Malati Tamaraw Reservation and Mount Calavite Wildlife Sanctuary). These sites are isolated from each other and the populations that they support are small enough to be vulnerable to one or more of the following risks (from Schaffer, 1987): environmental catastrophes (rare events causing an extreme depression in births or survival); year-to-year environmentally-driven variation in birth and death rates; chance-driven variation in sex-ratio or birth and death rates; depressed fitness due to chance loss of gene diversity (drift or founder effect), or inbreeding. In combination, these risks can lead to extinction even in the absence of human-mediated threats. Risks can be reduced by managing all populations as a single meta-population, using the heightened capacity for growth and gene diversity retention in larger populations to support persistence, genetic health and growth of smaller ones. Over the longer-term, and provided that populations are large enough, fragmentation can offer genetic advantages over a single, contiguous population of equivalent size, and can help contain the impacts of disease outbreaks and other catastrophes. This section of the document focuses on meta population-wide species management issues to support a holistic and integrated approach to Tamaraw recovery and conservation across Mindoro.

EXPANDING AND CONNECTING THE META-POPULATION

Over the next 10-years, supporting and accelerating growth in known populations will be key to success. Beyond 10 years, maintaining gene-flow across the meta-population will also become important (Ralls *et al.*, 2018; Frankham *et al.*, 2017). The ability to translocate Tamaraw between populations is a requirement of both strategies. The best available information indicates that currently only the Mts. Iglit-Baco population is sufficiently large and robust as source of Tamaraw for translocation to other sites. Supporting this population to maximize its growth rate is therefore critically important. An *ex situ* conservation breeding program in Mindoro could provide an additional or alternative source of animals for translocation, as well as other conservation benefits. An evaluation of the feasibility, risks and potential advantages of these different translocation sources and strategies, would help decision-makers to weigh the alternatives.

In addition to growing and connecting known populations, adding new ones would improve overall species viability as well as moving the program closer to the vision of "secure populations across Mindoro". There may be some areas that still support small groups of Tamaraw[4], as well as some currently unconsidered areas that could be managed to support Tamaraw in future. A systematic review of potential Tamaraw sites, island-wide, using mapping software, would be a valuable first step in planning future expansion of the meta-population.

MONITORING THE META-POPULATION

An annual Tamaraw count has been in place at Mts. Iglit-Baco for many years and this has provided valuable information on population size and status over time. Setting in place systems for regular, comparable estimates of Tamaraw numbers in other populations would help monitor overall meta-population status and identify problems early. The current fire-based count methodology at MIBNP is

[4] for example, during the PHVA workshop, an IP elder reported observation of Tamaraw tracks in the Blue Mountain area, at the border between forest and grassland.

not ideal and a review of this is needed. Site-appropriate monitoring methods will also need to be developed for each of the other Tamaraw sites.

IMPLEMENTATION

A unifying governance structure for the TCMAP, with processes in place for gathering key information, evaluating options and making decisions, will help keep all stakeholders informed and moving forward towards shared goals. A Tamaraw Conservation Coordinating Council (TC3) will be established for this purpose. The TC3 will provide a forum for the implementing partners, will hold review meetings every six months and will complete a full review of the plan in 2024.

WORKING ADAPTIVELY

Due to the complexity of the work outlined in the TCMAP and the changing environment in which this work will be conducted, frequent progress reviews will be needed to ensure that activities and resources continue to be directed to the highest priority work and locations. In addition to biological needs, decisions about meta-population expansion and management will need to take account of social, political and economic factors. Learning from the results of work carried out and sharing this information program-wide, will help accelerate progress. Policy makers and managers will need ongoing support from stakeholders and access to the most current information, to weigh the risks and potential benefits of different management actions on an ongoing basis, including the risks of delaying or of taking no action. These aspects of adaptive management will be key to the successful implementation of the TCMAP.

META-POPULATION MANAGEMENT RECOMMENDATIONS

The following recommendations are provided to guide meta-population management decisions over the next 10 years. These are based on a combination of conservation genetics rules of thumb and on Tamaraw PVA models which were built using the best information and estimates available at time of writing.

Figure 2. emphasizes current distribution and potential range expansion. It will be refined over time as further information becomes available on some sites and following discussion and agreement with stakeholders.

THERE ARE MANY GAPS IN OUR KNOWLEDGE OF THE POPULATION DYNAMICS OF TAMARAW. AS THE PROJECT MOVES FORWARD AND NEW INFORMATION BECOMES AVAILABLE, PVA MODELS AND ANY RECOMMENDATIONS BASED ON THEM, SHOULD BE REVIEWED AND ADJUSTED.

RECOMMENDED META-POPULATION SIZE

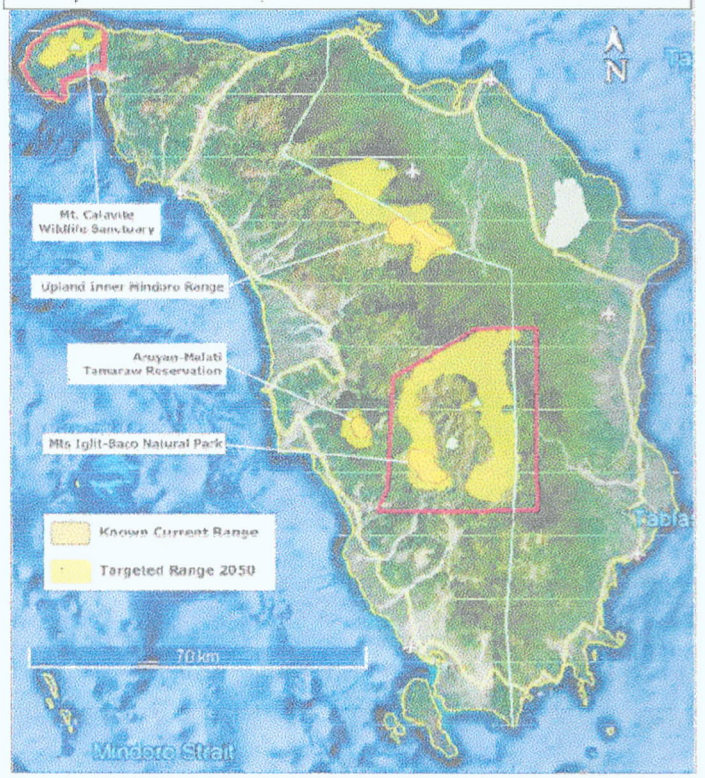
Targets for meta-population size should accommodate both biological viability of the species and, beyond that, aspirations for the broader ecology of the Island. The minimum target below, of 2200 living Tamaraw in Mindoro, accounts only for the biological viability component. It represents the critical threshold for long-term, ongoing genetic health[5] and is expected to confer a 100-year extinction risk of zero, assuming a well-protected environment.

Recommended minimum meta-population size for Tamaraw

= >2200 individuals

PVA models indicate that implementing the actions recommended in this plan could see this number reached or exceeded by 2050. Over the 10-year life of this plan it should be possible to increase numbers to more than 700 Tamaraw (estimated range 670 – 770).

Figure 2. Mindoro Island - current Tamaraw distribution and targeted species range in year 2050.



RECOMMENDED MINIMUM POPULATION SIZE

Given the same conditions, larger populations will be more robust than smaller ones and all attempts should be made to maximise the carrying capacity (and therefore the Tamaraw population size) at each site. However, at some designated sites, expansion to larger numbers may not be possible. As a guide, models indicate that **with zero poaching**, a population of 75 Tamaraw carries a low risk of extinction over a 100-year period, with inbreeding accumulation likely to remain below internationally accepted thresholds for captive programs. At sites where numbers sit below this, or where poaching remains present, more frequent and more resource-intensive management intervention is likely to be needed.

Recommended minimum target for populations = > 75 individuals

RECOMMENDED MINIMUM NUMBER OF FOUNDERS FOR NEW POPULATIONS

PVA models indicate that under zero poaching, release cohorts of at least 20 individuals have a strong chance of establishment and growth. To provide for genetic health, rules of thumb recommend initiating populations with 20-30 effective founders, collected from across the species' range. Note that releases can be phased. **Recommended Target[6] = 20-30**

[5] Targets a genetically effective size of 1000 (from Frankham et al., 2014), assuming an Ne/N ratio of 0.45, estimated from the mean of nine ungulate studies (Frankham, 1995).

[6] Note: Establishment of ex situ populations may require fewer individuals due to ability to manage some risks more closely.

Skewing the sex-ratio of release cohorts towards females provides faster population growth but also faster accumulation of inbreeding. Decisions about the composition (age and gender) of release cohorts should be taken with advice from experts in behaviour and management.

Table 1. Estimate of meta-population status, giving population size estimates, estimates for 2050 without further conservation action, estimates for 2028 and 2050 with recommended action, and the major challenges to achieving these results.

	Current size	Future: no further action	Future: with recommended action		Major challenges (confirmed at the 2018 workshop)
Site	2018	2050	2028	2050	
Mts Iglit-Baco NP (all areas)	400 - 500	< 400	> 650[7]	> 1500	Space for further growth is now limited and may decline in future due to impact of fires and invasive plants and uncontrolled hunting from residing IP communities.
Upper Amnay	10 - 60	Uncertain	20 - 120[8]	Preliminary estimates suggest > 700 in total across these sites	Road development and resumption of mining could prevent population recovery. Current uncertainty about numbers, distribution and hunting intensity may hinder action.
Aruyan Malati	3-15	Poor			Too few animals. Little to no chance of recovery without supplementation.
Mount Calavite	4 - 6	Poor			Too few animals, if any. No chance of recovery without supplementation.
Total estimates	417-581		>700	>2200	

GOALS FOR META-POPULATION MANAGEMENT

Goal 1. Mobilise for Tamaraw all natural areas of Mindoro that are suitable.

Sub-goal 1a: Maximize capacity of known sites
Sub-goal 1b: Identify the location of all remaining Tamaraw
Sub-goal 1c: Mobilize additional, previously unconsidered sites for Tamaraw in Mindoro

Goal 2. Actively manage all Tamaraw as a meta-population.

Sub-goal 2a: Ensure regular meta-population-wide reporting on key parameters and use this to support effective management
Sub-goal 2b: Determine whether an *ex situ* conservation breeding program for Tamaraw should be established in Mindoro
Sub-goal 2c: Develop a Tamaraw translocation program to facilitate recovery of the species

Goal 3. Secure resources and political will for the Tamaraw meta-population.

[7] Based on an ongoing but conservative growth rate (4% p.a.) from the mean of current estimates (N=450).
[8] Based on ongoing but conservative growth rate (4% p.a.) from the range of current estimates (N= 17 – 81)

GOALS, SUB-GOALS AND RECOMMENDED ACTIONS: META-POPULATION MANAGEMENT

GOAL 1. Mobilize for Tamaraw all natural areas of Mindoro that are suitable

Sub-goal 1A. Maximise capacity of known sites

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
1A.1	Identify additional areas of potentially suitable contiguous habitat, to extend existing sites.	Areas are identified and mapped.	X	X									100	100									TCP, NGOs, with partners. (FASPO funded Meta-Population Research)
1A.2	Harness existing initiatives within Mindoro to identify and develop potential habitat corridors to connect current or potential populations.	Existing initiatives are identified, collaboration is established.			X	X									60	80							TCP, with partners.

Sub-goal 1b. Identify the location of all remaining Tamaraw

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
1B.1	Collect reports from communities on Tamaraw sightings outside known Tamaraw sites.	Collated reports are shared with TC3.	X	X									240	150									TCP, with partners. (FASPO funded Meta-Population Research)
1B.2	Follow-up with surveys where information looks promising.	Reports from follow-up surveys are shared with TC3.	X	X	X								600	700	200								TCP, NGOs, Academe, site stakeholders. (FASPO funded Meta-Population Research)

Sub-goal 1c. Mobilize additional, previously unconsidered sites for Tamaraw in Mindoro

No.	Action	Indicator of achievement	Y1	Y2	Y3	Y4	Y5	Y6	Y7	Y8	Y9	Y1	Budgetary Requirement (P'000)	Leads, Collaborators

													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
1C.1	Carry out Island-wide habitat suitability mapping to identify likely candidates and follow-up with socio-economic & environmental assessments.	Reports with maps are shared.		X	X									180	330								**TCP**, with partners. (FASPO funded Meta-Population Research)
1C.2	Assess political acceptability.	Reports.			X	X									50	50							**TCP**, with partners.
1C.3	Initiate the site planning process.	Planning is in progress.				X	X								100	100							**TCP**, with partners.

GOAL 2. Actively manage all Tamaraw as a meta-population

Sub-goal 2A. Ensure regular meta-population wide reporting on key parameters and use this to support effective management

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										**Leads**, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
2A.1	Implement site appropriate count methods and population monitoring meta-population wide.	Appropriate monitoring methods are in place at all sites and generating useful information.			X	X									300	300							**TCP**, proposed monitoring group within TC3 (NGOs)
2A.2	Monitor densities of Tamaraw over time, in different habitat types, to support evaluation of both existing and potential new sites (info to be used in conjunction with PVA-derived MVP estimates).	Guidelines for calculating site carrying capacities for Tamaraw and minimum size of area needed to support a viable population (accounting for different habitat types).			X	X	X	X	X	X	X	X			100	100	100	100	100	100	100	100	**TCP**, with partners.
2A.3	Compile an annual report on meta-population status for the TC3.	Annual report is shared.		X	X	X	X	X	X	X	X	X		10	10	10	10	10	10	10	10	10	**TCP**, with partners.

Sub-goal 2B. Determine whether an *ex situ* breeding program should be established in Mindoro																								
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										**Leads**, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
2B.1	Carry out a study to explore the need for an *ex situ* program and the feasibility of delivering this, using the IUCN SSC *Ex situ* Guidelines as a framework. Include a cost-benefit assessment of *in situ* versus *ex situ* sources of animals for translocation.	Recommendations on the role and requirements of an ex situ breeding program in Mindoro. Agreement on the relative costs and benefits of using captive versus wild-sourced Tamaraw as source for translocation.	X	X	X								100	200	200								**TCP**, NGOs, AWCSG, ZSL, WRS, CCTU.
2B.2	Conduct consultation with stakeholders on options proposed through the Feasibility Study prior to any decision being taken.	Consultation completed. Document demonstrating sufficient agreement across parties on priorities.		X	X									200	200								**TCP**, with partners.
2B.3	Use the results of the Feasibility Study and other relevant factors, to decide on whether to establish an *ex situ* program.	Decision on whether to pursue an *ex situ* program in Mindoro.			X	X																	**DENR Secretary**
2B.4	Implement the decision as required.	To be determined.					X	X	X	X	X	X											**TCP**, with partners.

Sub-goal 2c. Develop a Tamaraw translocation program to facilitate recovery of the species																								
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										**Leads**, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
2C.1	Conduct a feasibility study on Tamaraw translocation, to find new populations or reinforce existing ones, including evaluation of alternative sources (see also 2B.1).	Completion of feasibility study and final report delivered to DENR.	X	X	X								100	200	200								**TCP**, NGOs, AWCSG, ZSL, WRS, CCTU.
2C.2	Conduct consultation with stakeholders on options proposed through the Feasibility Study prior to any decision being taken.	Consultation completed. Document demonstrating sufficient agreement across parties on priorities.		X	X									200	200								**TCP**, with partners.

2C.3	Complete habitat assessments for potential translocation sites to ensure habitat suitability and appropriate threat levels.	Documented habitat assessments.	X	X	X								150	150	150								TCP, with partners.
2C.4	With stakeholders, prioritise sites for reintroduction/reinforcement and develop a translocation plan for each.	Translocation plan for each prioritised site, including all necessary permissions, timeframes, recommended sources of animals and methods.			X	X									100	100							TCP, with partner, IUCN SSC AWCSG, ZSL, CCTU.
2C.5	Implement translocation plans and update translocation program recommendations as new information becomes available.	Animals are translocated as recommended. Translocation program recommendations are up-to-date					X	X	X	X	X	X					2,000	2,000	2,000	2,000	2,000	2,000	TCP, with partners inc. IUCN SSC AWCSG, ZSL, CCTU.

GOAL 3. Secure resources and political will for the Tamaraw meta-population																							
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
3.1	Integrate Tamaraw and TCMAP into long-term island-wide development and management plans of both provinces.	Evident consideration of Tamaraw and TCMAP in provincial mgt. plans.		X	X	X								100	100	150							TCP, RED, DENR-BMB and partners.
3.2	Identify potential agencies/organizations other than DENR to fund TCMAP activities to integrate into their own local government and departmental plans.	Potential organizations identified through the TC3.		X	X	X								50	100	100							TCP, RED, DENR-BMB and partners.
3.3	Capital Outlay for Construction/Rehabilitation of TCP Office in San Jose, Occidental Mindoro				X										10,000								DPWH, DENR

3.4	Capital Outlay for construction and Establishment of Tamaraw Research Center				X							15,000						DOST, DENR, LGU

MOUNTS IGLIT-BACO NATURAL PARK

Scope: Covers areas within Mts. Iglit-Baco Natural Park that either currently support Tamaraw or could in future – a "Core Zone of Monitoring" (CZM), a "Migration Corridor", a large "Expansion Area" and an area currently used for cattle ranching – the "Cattle Ranchland Area" (see Figure 3).

INTRODUCTION

Mts. Iglit-Baco Natural Park is the current strong-hold of the Tamaraw. Focused conservation attention in the past three decades has led to consistent growth of this population, to its current size of approximately 400-500 individuals. However, over the past 30 years the area occupied by the population appears to have contracted to an area within the "Core Zone of Monitoring", where most of the patrolling effort occurs. Meanwhile, a population previously found on the east side of the Park seems to have vanished. Within the CZM, the regular practice of controlled burning (both by IPs and by DENR to assist the annual count), encroachment by invasive alien species of plants taking advantage of the fire regime, and ongoing hunting pressure (both by IPs and by lowlanders) threaten the future of this species in the Park. In addition, increasing pressure from other land uses prevents dispersal of Tamaraw, limiting population growth and keeping numbers constrained within the carrying capacity of the area secured today.

With concerted management efforts there is potential to re-expand the Tamaraw population into its most recent range within and beyond the "Core Zone of Monitoring". Restoring habitat in this area will benefit the Park's biodiversity as well as residing IP communities who rely on the abundance of natural resources for their well-being. Further to this, building a safe "Migration Corridor" of land previously occupied by Tamaraw would support dispersal outside the CZM towards the North, into a large "Expansion Area" of remote and potentially suitable habitat. Finally, an area of the Park currently used for cattle ranching by non-tenure migrants could, through habitat restoration and translocation, support a new population of Tamaraw. Once established, this population could also grow outwards into the "Expansion Area" (see Figure 3). Realising this potential will involve close consultation and collaboration with resident IP communities and investment in rangers and other law enforcement mechanisms. Population models indicate that this action could increase Tamaraw numbers at Mt. Iglit-Baco to over 1500 individuals by 2050, which under continued favourable conditions could be expected to show long-term viability.

It should be noted that a shift away from regular burning, coupled with active forest restoration, may reduce the carrying capacity of the CZM for Tamaraw by reducing the availability of preferred food. However, provided that the other elements of the plan proceed successfully, there will be overall benefits to the Park in biodiversity and ecosystem resilience, and overall benefits to Tamaraw as the population is supported to grow outwards into other areas.

The Tamaraw population in MiBNP is of critical importance to the success of recovery efforts. For the foreseeable future, this population will house most individuals of the species. As such it will be an important source of founders both for new populations and to supplement struggling population fragments elsewhere in Mindoro.

Other relevant plans: Protected Area General Management Plan of MIBNP, 2019-2024; Final Draft, ADSDPP of Tau Buid; ADSDPP of Buhid/Bangon; 3 ICCAs (Buhid).

Goal 4. Secure the current Tamaraw population and expand its distribution within and beyond the Core Zone of Monitoring.

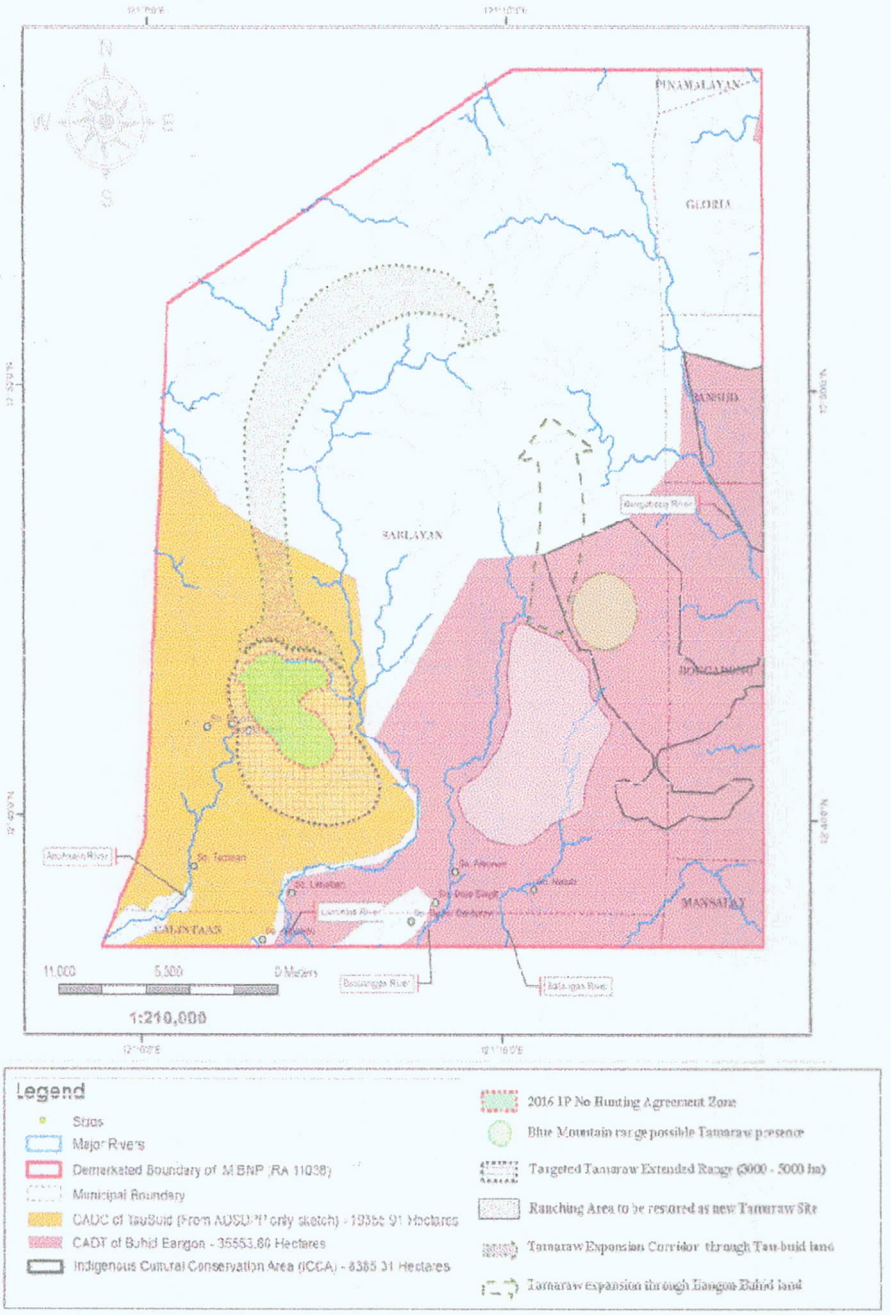
Goal 5. Restore the Cattle Ranchland Area to create a new site for Tamaraw.

Goal 6. Initiate a shift in habitat management and promote restoration of natural vegetation in the Core Zone of Monitoring.

Goal 7. Harmonize Tamaraw conservation goals with the Residing Mangyan Tribes' Plans for their Ancestral Domain (ADSDPP), respecting their cultural identity and traditional practices in the area.

Goal 8. Strengthen law enforcement and wildlife crime prevention.

Figure 3. Illustrates the proposed expansion and managed movement of the MiBNP Tamaraw population.



Potential challenges: Lack of funding, insurgency, concerns of IPs about the proposed expansion of Tamaraw distribution range; the employment status of rangers; lack of commitment from LGUs and from other relevant government agencies.

Note: for more detailed maps of the distribution of Tamaraw in Mounts Iglit-Baco Natural Park see Appendix II

GOAL 4. Restore the Cattle Ranchland Area to create a new site for Tamaraw

Sub-goal 4A. Phase out ranching

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	PAMO will work with:
4A.1	Organise inter-agency meetings for the gradual phase out (ongoing).	Meetings conducted for as long as they are needed.	X	X	X	X	X						500	200	200	200	200						Ranchers, IPs Leaders, LGUs, NCIP, PENRO
4A.2	Secure agreement with IP communities for the conversion of the Ranchland Area to a Tamaraw site.	Signed Free Prior and Informed Consent (FPIC).	X										160										TCP, IP Leaders, NCIP, PENRO
4A.3	Finalise phase out agreement: • identify resettlement area for cattle; • finalise timeline of phase out agreement.	Resettlement area and timeline for phase out are agreed through a plan (relocation/phase out plan)	X	X									200	200									Ranchers, Provincial Government, PENRO and CENROs
4A.4	Implement phase out agreement.	No cattle remain.	X	X	X	X	X						150	150	150	150	150						

Sub-goal 4B. Rehabilitate Cattle Ranch Area

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	PAMO will work with:
4B.1	Conduct rapid ecological surveys and vegetation mapping of the entire ranching area, identifying most suitable places for a long-term rehabilitation plan and Tamaraw reintroduction.	Documented surveys. Zoning system of rehabilitation plan drafted, locating Tamaraw reintroduction sites.	X	X									450	400									Academe, appropriate local NGOs, ERDB.

4B.2	Conduct a socio-agro-ecological investigation through an agro-ecosystem analysis (AEA) defining bio-physical and socio-economic conditions of the targeted areas.	Technical report and recommendations.		X	X								450	600								NGOs, academe. experts (IAF Ph), NCIP, Buhid tribe.
4B.3	Formulate a comprehensive rehabilitation design including biosecurity assessment, habitat restoration plan and bio-cultural development scheme.	Rehabilitation plan is completed and approved by concerned parties.			X										400							ERDB, TCP, NGOs with specific expertise.
4B.4	Identify affected IP families and concerned Buhid communities. Integrate them into the full process through temporary compensation, active involvement in the restoration phase and long-term socio-economic participation in the new wildlife-oriented land-use plan.	List of families, settlements, geo-localization and mapping; new socio-economic activities identified and developed with affected IP families and communities.		X	X	X	X	X	X	X	X	X	160	160	160	160	160	160	160	160	160	ERDB, TCP, NCIP, relevant NGOs.
4B.5	Promote the concept of the rehabilitation plan in order to secure additional funding.	Commitments from national government agencies (DENR, DOST), LGUs, local NGO, donor agencies.		X	X	X	X	X	X	X	X	X		100	100	100	100	100	100	100	100	ERDB, TCP.
4B.6	Endorse and initiate the new IP land-use plan in accordance with Buhid ADSDPP and PAGMP.	Land-use plan reflected and implemented in the PA zoning				X	X	X	X	X	X	X				100	100	100	100	100	100	Buhid tribe, TCP, NCIP.
4B.7	Launch the habitat restoration phase on selected future Tamaraw sites.	Activities are implemented and monitored.				X	X	X	X	X	X	X				100	100	100	100	100	100	DENR, Buhid tribe, partner organizations.
Sub-goal 4C. Plan and implement Tamaraw translocation																						

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										PAMO will work with:
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
4C.1	Conduct a feasibility study on the pertinence, needs and acceptance to relevant stakeholders, of *ex situ* intervention, and of a translocation program.	Completion of feasibility study and final report delivered to DENR and PAMB.	X	X	X								100	200	200								**TCP**, NGOs, AWCSG, ZSL, WRS, CCTU.
4C.2	Develop a translocation plan for Tamaraw (including methodology and implementation mechanism).	Approved/adopted translocation plan & MOA among stakeholders.			X	X									120	300							As above.
4C.3	Secure all permits from IPs and government.	Permits on hand.					X	X									10	10	10	10	10	10	As above.
4C.4	Implement translocation program including acclimatization phase.	Monitoring and evaluation reports.						X										2,000					As above.

GOAL 5. Secure the current Tamaraw population and expand Tamaraw distribution within and beyond the Core Zone of Monitoring

Sub-goal 5A. Harmonize PAGMP for MIBNP zoning system with TCMAP and Tau-Buid Ancestral Domain status and plan

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										PAMO will work with:
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
5A.1	Harmonize objectives and zoning system of PAGMP with TCMAP targets and models.	Plans are aligned and Tamaraw expansion zone map approved by both Offices.	X																				TCP.
5A.2	Translate the sub-zones map of Mt. Iglit-Baco Natural Park into Filipino language and Mangyan dialect.	Translated Mts. Iglit- Baco Natural Park sub-zones map(s) are available.		X										200									TCP, NGOs.

5A.3	Review the current status of Tau Buid Ancestral Domain Claims and other initiatives of the tribe.	Supporting documents.	X	X								50	50								NCIP, relevant NGOs, LGU.
5A.4	Consult Tau Buid Leader(s) and reach agreement on the proposed harmonized rationale and objectives of TCMAP/ PAGMP.	Plan(s) and maps endorsed/ accepted by Tau Buid	X	X								276	276								TCP, NCIP, Tau Buid leaders.
Sub-goal 5B. Restore Tamaraw presence to its most recent range in the Core Zone of Monitoring (Tamaraw Extended Range 3,000 to 5,000 ha)																						
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)									PAMO will work with:
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
5B.1	Document the current living conditions, land-use system and hunting practices of the IP communities concerned with the CZM Tamaraw range (socio-agro-ecological investigation).	Technical reports, documents and data are available	X	X	X								200	250	250								Partner organizations and experts.
5B.2	Design and agree with IPs a strategy to expand the distribution of Tamaraw following the zonation of the Park.	Agreed plan for expansion of Tamaraw distribution.		X										160									TCP, NCIP, IPs.
5B.3	Define with concerned communities a traditional hunting management model allowing Tamaraw movement towards targeted areas (including use of traps and fire regime).	Agreed model and documented maps.		X	X	X								200	352	200							TCP, NCIP, IPs.
5B.4	Validate and delineate the proposed CZM expansion area / hunting management on the ground with concerned IP communities.	Endorsed technical maps along with landmarks.			X	X									250	200							TCP, IPs.
5B.5	Implement use and regulation of the agreed zones. - Including provision of Capital Outlay for construction of 2 rangers' stations in expanded habitat	Monitoring and evaluation reports.			X	X	X	X							4,000								TCP, IPs, NCIP.

5B.6	Conduct habitat restoration based on IP bio-cultural plans as defined in GOALs 6 and 7.	Monitoring and evaluation reports.			X	X	X	X	X					100	100	100	100	100			TCP, IPs, NCIP
Sub-goal 5C. Establish a Migration Corridor towards the north of the Core Zone of Monitoring, through the Tau Buid Ancestral Domain and Central Wilderness Zone																							
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										PAMO will work with:
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
5C.1	Document the current living conditions, land-use system and hunting practice of the upland IP communities (Hubads) concerned by the corridor plan (socio-agro-ecological investigation).	Technical reports, documents data.		X	X	X	X							350	350	350	350						Partner organizations and experts.
5C.2	Design and agree with concerned upland IPs establishment of dispersal corridor along with modalities on use, regulation and rights for DENR monitoring.	Agreement and documenting map.				X	X	X	X	X	X					100	100	100	100	100	100		TCP, NCIP, IPs.
5C.3	With IPs, validate and delineate the proposed corridor on site with landmarks and geo-mapping.	Endorsed technical maps along with landmarks.				X	X	X	X	X	X	X				50	50	50	50	50	50	50	TCP, NCIP, IPs.
5C.4	Implement use and regulation on the agreed zones.	Monitoring and evaluation reports.					X	X	X	X	X	X											TCP, NCIP, IPs.
5C.5	Conduct habitat restoration and IP bio-cultural plans as defined in GOALs 6 and 7.	Monitoring and evaluation reports.					X	X	X	X	X	X					100	100	100	100	100	100	TCP, IPs, NCIP.

GOAL 6. Initiate a shift in habitat management and promote restoration of natural vegetation in the Core Zone of Monitoring																										
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads and collaborators:
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
6.1	Initiate a grassland burning reduction plan for the DENR counting zone.	Reduction in grassland burning of more than 80% over the next 4 years.	X	X	X	X							100	200	200	200							TCP, PAMO with partner NGOs.
6.2	Develop and test an alternative counting methodology that does not require burning.	Vetted options for counting.	X	X									400	400									TCP, PAMO, partners.
6.3	Allow natural regeneration.	Semestral reports on habitat quality.	X	X	X	X	X	X	X	X	X	X	30	30	30	30	30	30	30	30	30	30	TCP, PAMO, LGUs.
6.4	Conduct botanical analysis and ecological monitoring (including alien invasive plant species) in areas where fire regime has ceased.	Technical report and monitoring report.		X	X	X	X	X						600	600	600	600	600					PAMO, TCP, DENR partners and academe.
6.5	Experiment with eradication/control methods to hamper regrowth of non-palatable, highly competitive plants (hagonoy)	Technical report and monitoring report.		X	X	X	X							450	450	450	450						TCP, PAMO.
6.6	Develop and generalize eradication/control operations for invasive alien species (IAS)	Regularly updated map of extent of IAS.			X	X	X	X	X	X	X	X			100	100	100	100	100	100	100	100	PAMO with partners.
6.7	With IPS, establish a list of trees and plants to be used for active reforestation intervention.	List of trees validated by IPs.		X	X								400	400									PAMO, TCP.
6.8	Establish a habitat restoration plan including replantation scheme, zoning schedule, starting inside the SPZ and out to residing IP areas (link to 6.2 and GOAL 7)	Two-phase Habitat Restoration Plan.			X	X	X						100	100	100								PAMO, TCP.
6.9	Actively restore forest including natural fire breaks.	Regularly updated map of restored forest.				X	X	X	X	X	X	X			100	100	100	100	100	100	100	100	PAMO, TCP, IPs.

GOAL 7. Harmonize Tamaraw conservation goals with the Residing Mangyan Tribes' Plans for their Ancestral Domain (ADSDPP), respecting their cultural identity and traditional practices in the area

Sub-goal 7A. Integrate Tau Buid cultural practices and the Tribe's claims and rights into the Tamaraw conservation strategy

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads and collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
7A.1	Inform IPs of the TCMAP and ensure a translated version of the document.	Report on meetings with IPs. Translated TCMAP is available.	X	X									100	100									IPs.
7A.2	Gather information on the Indigenous Political System of the Tau Buid, including: • information on customary law and the way in which internal contraventions are managed, thus to harmonize it with the law enforcement of the Park; • use of natural resources and share of the living space among the members (land allocation).	Report on indigenous political system of Tau Buid.	X	X	X								200	400	400								NCIP and other partners.
7A.3	Assist Tau Buid tribe in securing their CADT.	CADT awarded to Tau Buid Tribe.	X	X	X								150	150	150								PAMO, NCIP, NGO(s)
7A.4	Assist the Tau Buid tribe in the formulation/updating of their ADSDPP (with draft exists for 2013-2018) & ensure that there are clear policies in favour of Tamaraw conservation in the overlap area between the Ancestral Domain claim by Tau Buid and the Tamaraw habitat Expansion Area stated in the ADSDPP.	ADSDPP with clear plan on Tamaraw conservation and management. ADSDPP formulated/updated.	X	X	X								420	420	420								PAMO, TCP, NCIP, NGO(s)
7A.5	Harmonize PA law enforcement plan with local IP customary law and agree on modality of implementation between the tribe and law enforcers.	Reports on meetings/ agreements with IPs		X	X	X								200	200	200							PAMO, TCP, NCIP, Tribal Leaders.

7A.6	Policies in the Tamaraw habitat expansion area agreed by Tau Buid leaders and members.	No reported violation of agreed policies in the Tamaraw expansion area. Signed FPIC by all IP leaders.				X	X	X	X	X	X	X												PAMO, TCP, NCIP, IP Tribal Leaders.
7A.7	Support IPs to adjust their farming systems to ensure food security, to re-introduce complexity to the landscape and diversity in farming systems (e.g. agroforestry techniques, permaculture, and appropriate technology).	Environmentally sensitive farming techniques adopted by IPs (modernized Tau Buid and Hubads addressed with specific strategies and means).		X	X	X	X	X	X	X	X	X	X	400	200	200	200	200	100	100	100	100	100	NCIP, DA, DOT, OMSC, TESDA, MBCFI.
Sub-goal 7B. Support and enhance the Buhid-Bangon ADSDPP in the context of the ranching rehabilitation plan																									
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)											Leads and collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
7B.1	Obtain copies of the Buhid-Bangon ADSDPP, CADT and ICCA plans and maps.	Documents are available.	X	X																				Buhid-Bangon Tribe, NCIP, PAMO.
7B.2	Inform the Buhid-Bangon tribe of the TCMAP and ensure availability of translated versions of the document.	Report of meetings with IPs. Translated TCMAP is available.	X	X									100	100										Buhid-Bangon Tribe, NCIP, PAMO.
7B.3	Gather information on the indigenous political system of Buhid-Bangon tribe, including: • information on customary law and the way in which internal contraventions are managed, thus to harmonize it with the law enforcement of the Park; • use of natural resources and share of the living space among the members (land allocation).	Report on indigenous political system of Buhid-Bangon.		X	X									520	520									PAMO, NCIP and other partners.

7B.4	Align actions 4B.1 and 4B.4 according to the documents pertained in 7B.1 and information about the stage of development of plans.	Harmonized TCMAP-specific sub-goals with Buhid-Bangon plans and implementation stage.			X	X									150	150							PAMO, Buhid-Bangon tribe
7B.5	Harmonize PA law enforcement plan with local IP customary law and agree on modality of implementation between the tribe and law enforcers.	Plans and methods harmonized.				X										50							TCP, PAMO, IPs.
7B.6	Initiate bio-cultural landscape development within and beyond the rehabilitation area (linked with 4B.5)	Agreed plans and actions are initiated.				X	X	X	X	X	X	X											PAMO

GOAL 8. Strengthen law enforcement and wildlife crime prevention

Sub-goal 8A. Improve capacities of officers to conduct their duties in the field

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads and collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
8A.1	Develop adaptive management planning by implementing SMART (Spatial Monitoring and Reporting Tool) for the monitoring of illegal and unwanted activities. 8A.1a Capital Outlay for the procurement of gadgets for SMART	SMART is used by the PAMO and TCP to collect and analyse field data, regular reports are used for further strategic planning; regular reports on efforts presented to the PAMB.	X										500										TCP, PAMO, DAF, PAMB, GWC.
8A.2	Conduct advanced wildlife crime prevention training for Tamaraw rangers, park rangers and management staff.	Wildlife crime prevention and law enforcement efforts are complemented by advanced tactics in which field staff show competency.	X	X									750	750									TCP, PAMO, DAF, GWC.

8A.3	Improve area coverage and ranger effectiveness to decrease illegal and unwanted hunting activity. 8A.3a Capital Outlay for the procurement of vehicles and equipment for Quick Response Team (QRT) 4,000 (Capital Outlay for procurement of vehicles and gadgets for QRT)	Increase the number and competency of rangers and staff with law enforcement authority Decrease in recorded illegal and unwanted hunting activity.	X	X	X	X	X	X	X	X	X	X	10,500	6,500	6,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	TCP, PAMO.
8A.4	Improve employment and working conditions for rangers (contracts, salaries, equipment, facilities).	Index of incentive – permanent contracts for TCP staff; improved equipment, living conditions, incentives and benefits for field staff; improved ranger performance/morale.	X	X	X	X	X	X	X	X	X	X	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	TCP, DENR.
8A.5	Establish effective communication system between field officers and their offices.	Field and long-distance communication tools are operational	X	X									80	80									TCP, PAMOs, LGUs.
8A.6	Clarify mandates and duties of Tamaraw rangers and PAMO park rangers.	Duty and scope of actions are clearly defined.	X																				DENR.
8A.7	Deputize all enforcement staff for arrest of perpetrators of illegal activity.	Deputation papers to all field officers.		X	X									100	100								DENR.
8A.8	Introduce new technologies and techniques to prevent illegal activities (camera traps, wildlife crime science). 8A.8a Capital Outlay for Procurement of device amounting to 440,000.00	New technologies and techniques are tested and/or assessed and implemented effectively	X	X	X								200	200 & 440 CO	200								PAMO, TCP with partners.

8A.9	Develop specific cultural sensitivity training to siganon (non-IP) rangers about IP culture and rights.	Training conducted, siganon rangers demonstrate competence; reduction in number of observed and reported conflicts with IPs.	X	X	X	X	X	X	X	X	X	X	150	150	150	150	150	150	150	150	150	150	TCP, IP leaders.
Sub-goal 8B. Improve law enforcement mechanisms at the office level																							
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads and collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
8B.1	Reactivate and strengthen the Barangay Tamaraw Conservation Council.	Report on regular meetings.	X	X	X	X	X	X	X	X	X	X	50	50	50	50	50	50	50	50	50	50	TCP, LGUs, partners.
8B.2	Establish and strengthen multi-agency enforcement teams and operations.	Available logbook documenting patrol reports including apprehensions; SMART reports; commitments of support from team members; number of capacity building activities.	X	X	X	X	X	X	X	X	X	X	50	50	50	50	50	50	50	50	50	50	TCP, PNP, DENR, other concerned agencies.
8B.3	Complete multi-stakeholder Law Enforcement Forum & modules initiated in 2016.	All modules completed.	X	X	X								250	250	250								PAMO, TCP, DENR.
8B.4	Implement ordinance and recommendations of Law Enforcement Forum outputs	Ordinance in force.			X	X	X	X	X	X	X	X			20	20	20	20	20	20	20	20	TBC.
8B.5	Strengthen public awareness and coordination with Barangay officials and LGUs on laws implemented inside the PA according to the ENIPAS Act.	Campaigns implemented.	X	X	X	X	X	X	X	X	X	X	250	250	250	250	250	250	250	250	250	250	LGUs, TCP, PAMOs.

8A.1 Capital Outlay for Purchase of handheld devices, database hardware and software and ICT equipment – 500,000

8A.3 Additional budget for Capital Outlay for Quick Response Team= 4,000,000

- Elf truck drop side

- Motorcycles
- Communication devices
- Firearms, ammunitions, and other para military gadgets and equipment

8A.8 Capital Outlay for gadgets and devices = 440,000

- Camera traps, Body cameras, drones

UPPER AMNAY WATERSHED REGION

Scope: Upper Amnay Watershed Region at the border between Oriental and Occidental Mindoro.

INTRODUCTION

A population of Tamaraw was confirmed in the Upper Amnay Watershed Region in 2018. The overall size and exact extent of this population remain uncertain. Estimates range from 10 to 70+ which, though a small number, makes this potentially the second largest remaining Tamaraw population in Mindoro. The variety of habitats where Tamaraw were assessed in this region (mountain, mossy forest and tropical highland biotopes) are very different to the grassland habitat of MIBNP, suggesting that Tamaraw are more ecologically flexible than previously assumed. Further assessment in Upper Amnay (Lamlamayan, Gimparay, & Batuoy-Liyao) as well as additional surveys in adjacent areas are required to improve knowledge of the status of Tamaraw in this region and the quality and distribution of suitable habitats.

Even though this population is protected by its remoteness, there is a need to engage in further collaboration with local Alangan communities and concerned authorities to limit and prevent illegal activities and habitat encroachment in this region. Building a mixed monitoring and protection team with sufficient resources and equipment would be the first step towards securing the continuing growth of this population towards robust numbers. Executive Order 23 (s2017) imposed a country-wide ban on logging in natural and residual forests. In the case of Upper Amnay, where the majority overlaps with an ancestral domain, section 2.2 states, "Tree cutting associated with cultural practices pursuant to IPRA may be allowed only subject to strict compliance with existing guidelines of the DENR." Ranger and volunteer intervention can ensure that tree-cutting is kept to non-commercial volumes by IP communities, while awareness raising and community empowerment can ensure that these IP communities are not used (or abused) as fronts by commercial logging entities.

Currently, the greatest risk to this population is the development of an inter-provincial road which could bring greater accessibility and disturbance into remaining Tamaraw habitats. All efforts should be made to reconcile the road project's economic objectives with social and environmental safeguards. Without formal area protection measures, the area is also potentially at risk to mining operations when the 25-year provincial moratoriums of both Oriental and Occidental Mindoro provinces expire in 2027 and 2034 respectively.

The assessed Tamaraw population is located within the Titled Ancestral Domain of the Mangyan Alangan Tribe. Therefore, any conservation action must involve the Tribe and be in line with its Land Development Plan.

Other relevant plans: ADSDPP, Forest Land Use Plan and Comprehensive Land Use Plan of LGU Santa Cruz.

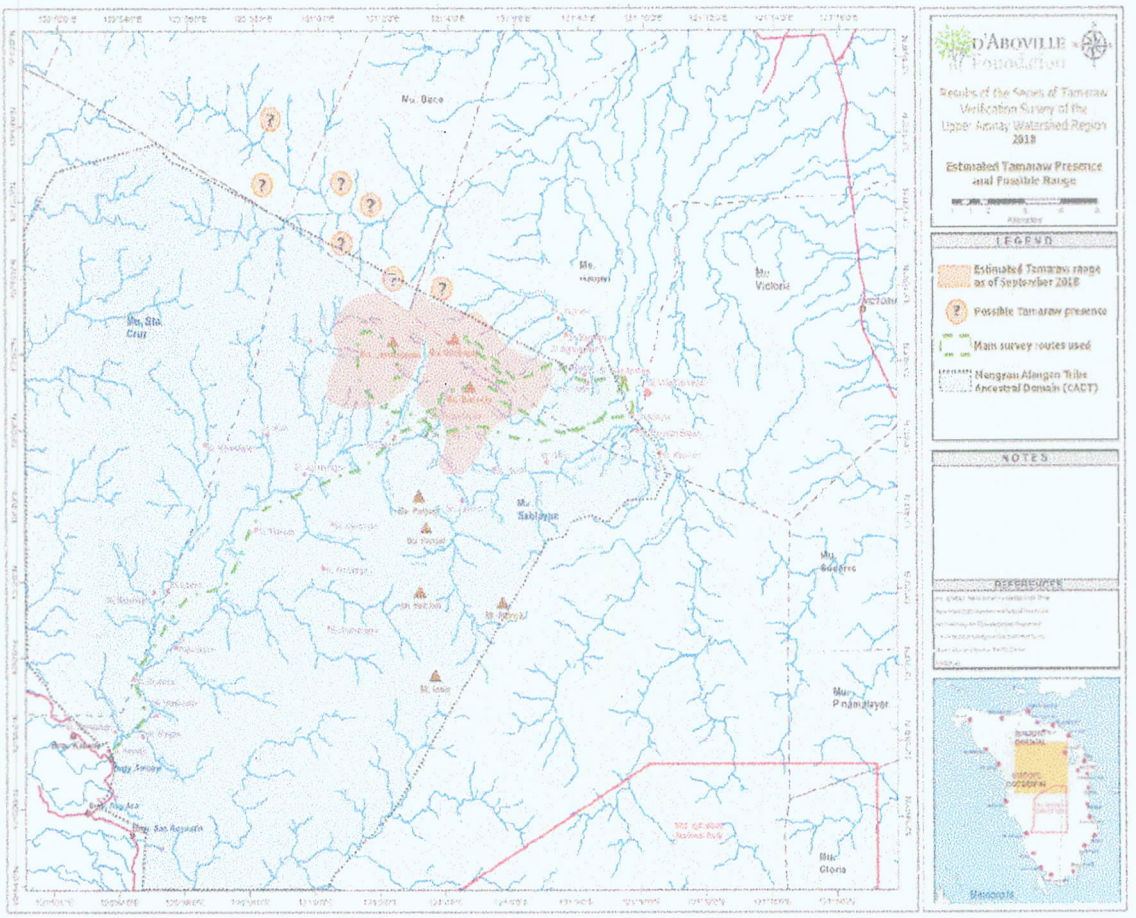
Goal 9. Initiate regular monitoring and patrolling efforts to address threats such as poaching, logging, and habitat encroachment

Goal 10. Conduct a comprehensive socio-environmental assessment of the region to assist integration of conservation objectives with the ongoing socio-economic dynamic of the Alangan Tribe.

Goal 11. Create an "Alangan – Tamaraw Protected Landscape" under an ICCA, LCA or OECM category, to underpin area protection measures

Goal 12. Avoid or mitigate negative impacts of road development (interprovincial cross road).

Figure 4. Upper Amnay Watershed Region showing estimated Tamaraw range as of September 2018 (courtesy of D'Aboville Foundation)



GOAL 9. Initiate regular monitoring and patrolling efforts to address threats such as poaching, logging and habitat encroachment

Note that this refer to monitoring and patrolling by local DENR rangers under supervision of Tamaraw rangers and involving local Alangan tribe as volunteer or contractors.

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads & collaborators
9.1	Identify Alangan chieftains, elders and community members whose area of authority or attributed land parcels encompass Tamaraw range (as stated in the Tribe Ancestral Domain and Land-Use Plan).	Complete list of Alangans and settlements directly affected by Tamaraw presence.		X	X									120	120								TCP, Alangan tribe, NCIP.
9.2	Identify committed Alangan members to create a monitoring/warden team (initially volunteers, eventually contracted) representing the diversity of the Tribe (Katutubong Bantay Tamaraw).	Ready to go team(s) of at least 4 members from both Provinces		X	X	X							300	300	300								TCP, Tribal Leaders, Bgry. LGUs, Municipal LGUs
9.3	Secure formal consent of above members (9.1) to allow DENR rangers and Alangan members to patrol and monitor the Ancestral Domain.	Kasunduan (agreement between DENR and Tribal leaders).		X	X									100	100								TCP, Tribal Leaders.
9.4	Define and establish mandate, monitoring agenda, coordination mechanism and capacities of the mixed monitoring teams (i.e. patrol routes, regularity, field equipment, field data collection, reporting and communication tools).	Duty and monitoring agenda validated by the Tribe and coordinating organization(s).		X	X									100	100								TCP, Tribe, IP monitoring team.
9.5	Lobby for allocation of funds from concerned LGUs and/or DENR offices for Katutubong Bantay Tamaraw (P400K by 2025, P 600K by 2030).	Amounts allocated.		X	X	X	X	X	X	X	X	X		400	400	400	400	600	600	600	600	600	NGOs, IPMR, IP Leaders.

9.6	Deploy the SMART platform as a monitoring and law enforcement tool along with SOP for patrolling strategy.	Effective SMART system in use with supervising coordinating entity.		X	X	X	X	X	X	X	X	X											TCP, Alangan Tribal Leaders.
		At least 4 volunteers (2 from Occidental Mindoro & 2 from Oriental Mindoro) by 2025		X	X	X	X																TCP, Alangan Tribal Leaders.
		At least 12 volunteers (6 from Occidental Mindoro & 6 from Oriental Mindoro) by 2030						X	X	X	X	X											TCP, Alangan Tribal Leaders.
9.7	Build capacity (skills & equipment) – 4 sets of training by 2023, 6 sets of training 2025, for volunteers to be deputised as Wildlife Enforcement Officers (WEO) by the DENR.	Training courses conducted (e.g. WEO, Jungle survival, SAR, Wildlife Identification); # rangers trained; basic equipment provided.	X	X	X	X	X						1,050	1,050	1,050	1,050	1,050						TCP, NGOs.
9.8	Capital outlay for construction of rangers' station					X										2,000							DENR, TCP

GOAL 10. Conduct a comprehensive socio-environmental assessment of the region to assist integration of conservation objectives with the ongoing socio-economic dynamic of the Alangan Tribe

Note that the area to be assessed includes Lamlamayan, Gimparay, & Batu Oy-Liyao

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Collaborators
10.1	Conduct additional verification surveys in adjacent areas in Municipalities of Naujan, Baco, San Teodoro, & Sablayan.	Number of surveys conducted	X	X									150	150									TCP, MBCFI, DAF, LGU, Katutubong Bantay Tamaraw Team.

10.2	Conduct ethnobiological & socio-economic assessment of residing communities.	Percentages of sites covered.		X	X	X											200	200	200								TCP, MBCFI, DAF, LGU, Katutubong Bantay Tamaraw Team, NCIP and expert in social sciences.
10.3	Conduct a threat assessment and risk assessment on Tamaraw and natural resources/ecosystems of the region.	Technical report.	X	X	X	X									150	150	150	150									As above.
10.4	Conduct habitat assessment and Tamaraw ecology studies.	Technical reports		X	X	X									150	150	150										IPs, DENR, NGOs and partners, academe.
10.5	Evaluate potential maximum future Tamaraw distribution according to biophysical parameters, estimated viable population sizes and area carrying capacity estimates.	Prospective map of Tamaraw range in 2050 and population models.			X											200											TCP, Partner NGOs, IUCN - SSC.

Goal 11: Create an "Alangan – Tamaraw Protected Landscape" under an ICCA, LCA or OECM category, to underpin area protection measures.

This would involve assessing feasibility then establishing a bio-cultural landscape conservation area under adequate regulation, to preserve the upland forest habitat, upper watershed and the Tamaraw living there.

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Collaborators
11.1	Consult with stakeholders.	Meetings held; resolution/endorsement from IP group; MOA/agreement; # of participants & institutions.		X	X	X	X							150	150	150	150						TCP, IPs, NCIP, LGU.

11.2	Lobby for Municipal LGU policy support (Mun. Sablayan, Naujan, Baco, San Teodoro, Santa Cruz).	Sangunlang Bayan (SB) resolution drafted and approved.		X	X	X	X									50	50	50	50						IP representatives, TCP, MENRO, NCIP, IPAO.
11.3	Develop a comprehensive management plan through a participatory process ensuring harmonization with ADSDPP.	Management plan drafted, endorsed, and approved.					X	X											200	200					IPs, NCIP, TCP, LGUs, NGOs.
11.4	Develop proposals and generate funds.	# of proposals drafted, submitted, and approved; amount of funds released.						X	X	X	X	X								100	100	100	100	100	NGOs, TWG (IPs and major stakeholder).
11.5	Support designing the use, regulations and protective measure for the Alangan – Tamaraw Protected Landscape.	Appendix of ADSDPP or management plan.						X																	DENR, Tribe, NCIP.

GOAL 12. Avoid or mitigate negative impacts of road development (interprovincial cross road)

[Note: reconciling the road project's economic objectives with social and environmental safeguards will require either re-routing the itinerary or imposing restrictive regulation].

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads; collaborators
12.1	Initiate discussions between stakeholders.		X										100										TCP, DPWH, IPs, NCIP, NEDA, prov. & mun. LGU, DENR.
	12.1.1 Discussion among IP communities.	Agreement & resolution, documentation of meetings.	X																				

	12.1.2 Request the District representative and/or governor to call for meeting with major stakeholders (IP, DPWH regional, Prov. Eng'g Office).	Agreement & resolution, documentation of meetings.	X																	TCP, IP, NCIP, DPWH, Regional & Provincial Engineering Office
12.2	Feasibility study and biological-social impact assessment (field surveys and analysis).	Biological and Social Impact report (with initial recommendations/mitigation measures).		X	X										150	150				TCP, NCIP, NGOs, Academe.
12.3	Define and agree on alternative routes and/or mitigating structures with regulation of developments and settlements.	Endorsement by politicians and project implementing bodies.			X	X														DENR, DPWH, Tribe, Mindoro Prov. Govt.

ARUYAN-MALATI TAMARAW RESERVATION

Scope: Aruyan-Malati area in the Municipality of Sablayan.

INTRODUCTION

Aruyan-Malati region is a historical area for Tamaraw, hosting a substantial population until recently. However, latest assessments estimate the size of this population at 3-15 individuals. This makes it extremely vulnerable, with little chance of persistence without urgent action. Recovery of Tamaraw in Aruyan-Malati will require an increase in the number of trained, well-equipped rangers to prevent poaching, as well as a drastic change in the land-use system of the residing Tau Buid communities to allow sufficient and suitable undisturbed places to persist. Besides this, some habitat restoration work might be needed at some point. Due to the small size of this population and the limited carrying capacity of the area, these measures alone will not guarantee recovery and persistence. Translocation of Tamaraw into the site from other populations will be needed, both to initiate growth and in the longer-term to reduce the accumulation of inbreeding, which could otherwise depress population health.

Declaring the Aruyan-Malati area as critical habitat for Tamaraw is essential to the long-term future of the species in this area. However, it should be noted that the side of Aruyan is covered by Presidential Proclamation No. 72, series of 1954, declaring the area as "Sablayan Penal Colony and Farm". Its overall administration lies in the Department of Justice – Bureau of Corrections (previously the Bureau of Prison) and not in DENR. There has been a move to change the proposed declaration for critical habitat from Aruyan-Malati to Malati-Buayan and this will be one of the proposed activities of the DENR in 2020.

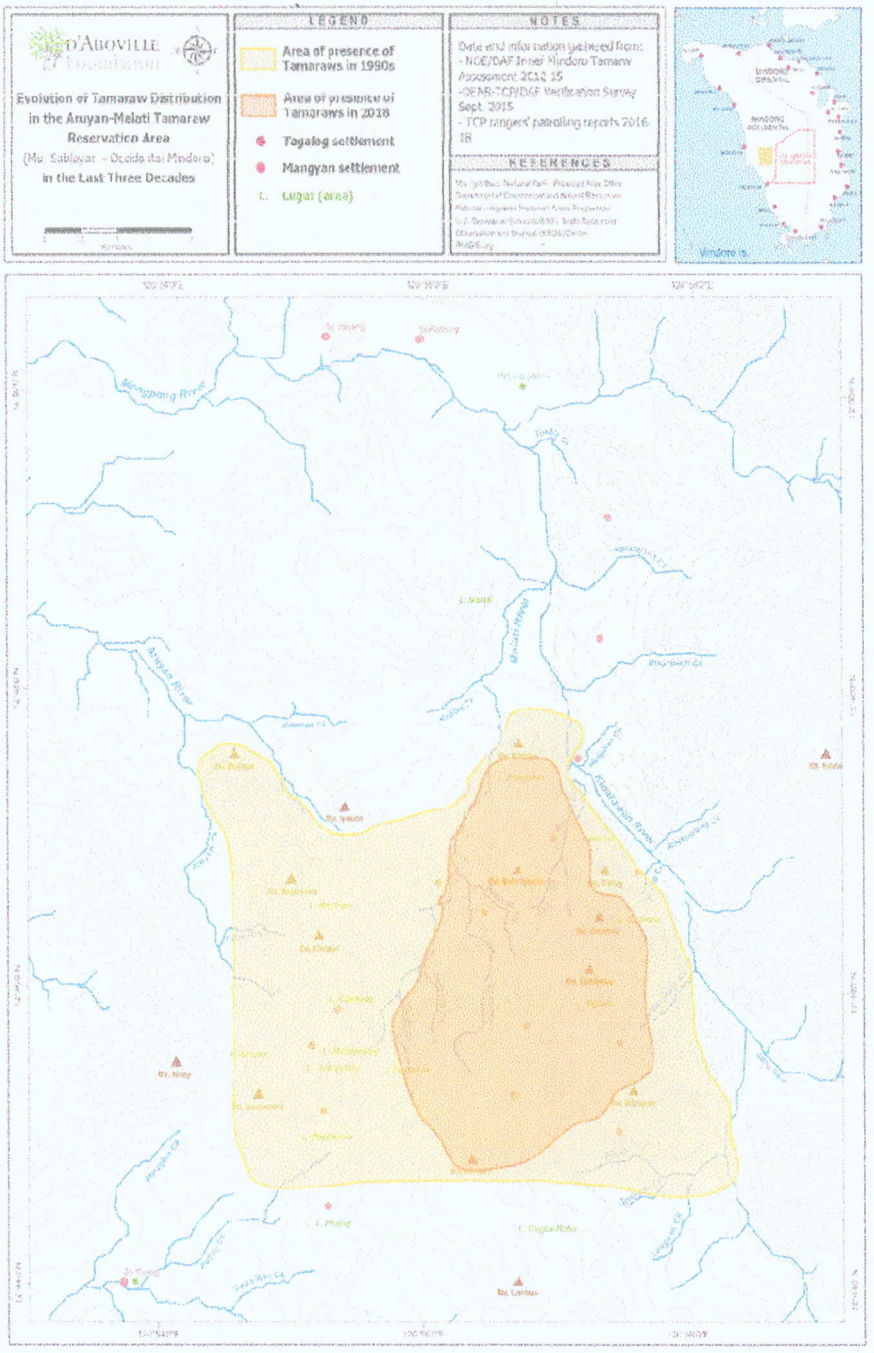
Relevant plans: ADSDPP Tau Buid, Forest Land Use Plan (2016 draft) and Comprehensive Land Use Plan of LGU Sablayan, plans being implemented by the Department of Justice (DOJ) – Bureau of Corrections in that area.

Goal 13. Establish effective management and protection of the Aruyan Malati landscape, to secure Tamaraw habitats.

Goal 14. Reinforce traditional farming education with integrated farming, to regulate kaingin areas.

Goal 15. Increase the numbers of rangers and volunteers with proper skills and equipment to address anthropogenic threats such as poaching and logging.

Goal 16. Enhance mechanisms for effective law enforcement, following Standard Operating Procedures on natural resources abuse and wildlife crime prevention, with consideration for traditional and cultural practices of the IPs.



Goal 17. Supplement population growth of Tamaraw to viable numbers, with full agreement from stakeholders.

Goal 18. Restore and expand natural forest within the Tamaraw habitat to reduce the presence of invasive species and promote a network of undisturbed areas for wildlife.

GOALS, SUB-GOALS AND RECOMMENDED ACTIONS: ARUYAN MALATI TAMARAW RESERVATION

GOAL 13: Establish effective management and protection of the Aruyan-Malati landscape, to secure Tamaraw habitats																							
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
13.1	Finalize declaration of the Aruyan-Malati as "Critical Habitat" for Tamaraw.	Submission of source documents such as draft DENR Administrative Order or Local Ordinance/Resolution.	X	X	X																		TCP, LGU Sablayan.
13.2	Reach management agreement within the Critical Habitat of Tamaraw.	Assessments of Tenurial Instruments (within CADT, and Tamaraw Habitats); No. of Tenurial Maps; No. of Certification Preconditions (FPIC applied).		X	X										50	50							TCP, LGU-Sablayan, SPPF, NCIP.
13.3	• Formulate Critical Habitat Management Plan by 2024. • Implement plan from 2025 onwards, • Integrate or continue initiatives from other relevant goals.	Critical Habitat Management Plan prepared (2024). Approval of Management Plan by Regional Executive Director (RED) pursuant to DENR Administrative Order No. 2016-07.			X	X	X	X	X	X	X	X			250	250	150	100	100	100	100	100	**TCP & LGU Sablayan,** Management Body, CSOs, Academe, Tau-Buid Tribe (Tagnaran Administrative Unit of Tau-Buid Tribe), NCIP.

GOAL 14. Reinforce traditional farming education with integrated farming, to regulate kaingin areas																								
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
14.1	Conduct study to define socio-agro-ecologic context of the area (biophysical and socio-economic conditions).	Technical report disseminated to concerned stakeholders and representatives.			X	X									200	200							DENR, Tribe, NCIP, academe, experts e.g. Institute of Agroforestry in the Philippines.
14.2	Initiate improvement of agroecosystem through farming techniques and agroforestry training in frame of future ADSDPP.	Activity plan endorsed by the tribe				X	X									200	200						DENR, Tribe, NCIP, academe, experts e.g. Institute of Agroforestry in the Philippines.
14.3	Implement land-use plan for agro-forest system at the scale of the Critical Habitat.	Endorsed global land-use plan of the concerned communities in accordance with the Management Plan of AMTR					X	X	X	X	X	X											All stakeholders & partners.
14.4	Training in agro-forestry or integrated farming methods.	No. of agro-forestry farming or integrated farming system adopters No. of agroforestry farms established.					X	X	X	X	X	X					500	500	500	500	500	500	NCIP, TCP, Department of Agriculture, Tau-Buid Tribe (Tagmaran - Administrative Unit of Tau-Buid Tribe), LGU Sablayan.

GOAL 15. Increase the numbers of rangers and volunteers with proper skills and equipment, to address anthropogenic threats such as poaching and logging

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
15.1	Identify the appropriate ranger-to-area ratio in Antyan-Malati	No. of rangers needed based on the available budget and total area is known.	X																				TCP, LGU Sablayan, Tau-Buid Tribe (Tagmaran - Administrative Unit of Tau-Buid Tribe).
15.2	Establish SMART system with SOP training for Wildlife Crime Prevention and Law Enforcement.	Effective use of cyber trackers and SMART platform generates reports to a coordinating entity.		X	X									200	200								TCP, DAF, MENRO.
15.3	Hire rangers.	Required rangers are hired with annual renewal (10% increase per year with endorsement from IP's).	X	X	X	X	X	X	X	X	X	X	840	924	1,020	1,122	1,234	3,272	3,272	3,272	3,272	3,272	TCP LGU Sablayan, Tau-Buid Tribe (Tagmaran - Administrative Unit of Tau-Buid Tribe).
15.4	Capacitate newly hired rangers.	No. of trained rangers No. of technical and paralegal trainings conducted	X	X	X	X	X	X					575	575	575	575	575	575					TCP, LGU Sablayan, Tau-Buid Tribe (Tagmaran - Administrative Unit of Tau-Buid Tribe), Armed Forces of PH, BLGU.
15.5	Deputize trained rangers.	DENR-WEO Certificate (Annual Renewal; No. of Deputized Rangers)	X	X	X	X	X	X	X	X	X	X	100	100	100	100	100	100	100	100	100	100	TCP (DENR, Tau-Buid Tribe (Tagmaran -Administrative Unit of Tau-Buid Tribe)).
15.6	Increase volunteers (Bantay Gubat)	Capacitation of volunteers; No. of technical and paralegal trainings conducted; deputation of volunteers (Bantay Gubat) by DENR; endorsement from IPs.	X	X	X	X	X	X	X	X	X	X	420	420	420	420	420	420	420	420	420	420	**LGU Sablayan,** TCP, Tau-Buid Tribe (Tagmaran - Administrative Unit of Tau-Buid Tribe).

15.7	Creation of Barangay Tamaraw Conservation Council (BTCC)	BTCC created within/nearest Brgy. LGUs of known Tamaraw habitat		X	X									216	216							Bgry. LGUs, TCP, Municipal LGUS

GOAL 16: Enhance mechanisms for effective law enforcement, following Standard Operating Procedures on natural resources abuse and wildlife crime prevention, with consideration for traditional and cultural practices of the IPs																						
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads (Collaborators)
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
16.1	Issuance and implementation of Local Ordinances on prohibiting the hunting of Tamaraw and other destructive practices (e.g. timber poaching, electrofishing, mining, and quarrying), targeting non-IPs: • Development plan: 2022-2023 • Local Issuance: 2024 • Implementation: from 2025	Local Ordinances No. of violators arrested; No. of cases filed in court; No. of cases resolved. Enforcement Plan No. of IPs involved in the enforcement activity; No. of monitoring teams created (barangay level).		X	X	X	X	X	X	X	X	X		250	250	100	100	100	100	100	100	BLGU and IPMR, LGU Sablayan, Tau-Buid Tribe (Tagmaran, Administrative Unit of Tau-Buid Tribe).
16.2	Reinforcement of "Awareness Raising on Environmental Conservation and Tamaraw Protection".	IEC Materials; Communication Plan; informal lectures (*Dalaw Turo* even outside Tamaraw Month); film showing.	X	X	X	X	X	X	X	X	X	X	250	250	250	250	250	250	250	250	250	250	TCP, Tau-Buid Tribe (Tagmaran, Administrative Unit of Tau-Buid Tribe).
16.3	Provision of Capital Outlay for the construction and/or repair of Ranger's stations				X										1,500								DENR

GOAL 17: Supplement population growth of Tamaraw to achieve viable numbers, with full agreement from stakeholders																								
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads (Collaborators)
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
17.1	Conduct feasibility study for the translocation of Tamaraw.	• Habitat range, viable area. • Suitable zones for acclimatization and release. • % survival rate, carrying capacity of the area, adult sex ratio, fecundity rate.	X	X	X								100	100	100								TCP & LGU Sablayan, Tau-Buid Tribe (Administrative Unit of Tagmaran), CSOs, external experts e.g. IUCN SSC AWCS.
17.2	Develop and implement a translocation plan.	T3D				X	X	X	X	X	X	X				250	250	250	250	250	250	250	TCP & LGU Sablayan, Tau-Buid Tribe (Administrative Unit of Tagmaran), CSOs, IUCN SSC AWCS, CCTU, CWC.

GOAL 18: Restore and expand natural forest within the Tamaraw habitat to reduce the presence of invasive species and promote a network of undisturbed areas for wildlife																								
No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000)										Leads, Collaborators
													2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
18.1	Conduct survey, mapping and planning (includes zoning of areas).	Survey, mapping and planning report (reforestation areas identified, GIS maps, species inventory).		X	X									150	150								TCP, CENRO/ PENRO, NGO(s), Sablayan LGU.
18.2	Conduct ethno-ecological study of the forest ecosystem and rationale for use of forest resources of the Aruyan-Malati region.	Technical report endorsed by the Tribe and DENR.		X	X	X								175	175	175							TCP, tribe, NGOs, academe, experts.

18.3	Design network of areas of ecological importance for low disturbance zones.	Agreed map delineated on site with agreed regulations.		X	X								150	150						TCP, tribe, NGOs, MENRO.

INTRODUCTION

The Mt. Calavite Wildlife Sanctuary (MWCS) is one of the six protected areas in the Mindoro Island. The MCWS has a total land area of 18,172.69 hectares per RA 11038 (ENIPAS Act of 2018), and lies in the Municipality of Palauan, which is located in the northern-west tip of the Province of Occidental Mindoro. Tamaraw used to occur in MWCS and their continued presence was re-confirmed after a decade of no data by a recent survey. However, current population estimates range from only 4-6 individuals.

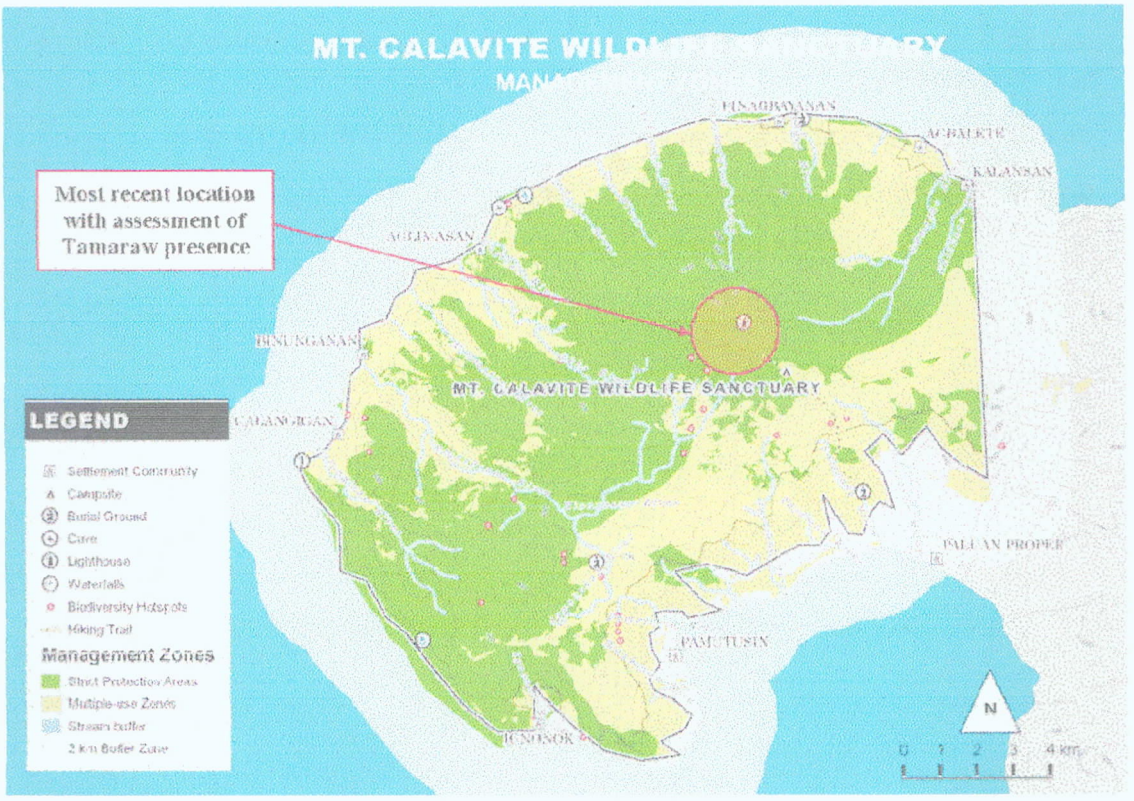


Figure 6. Mount Calavite Wildlife Sanctuary showing the area where Tamaraw presence was confirmed in 2019.

The "Mount Calavite Wildlife Sanctuary Protected Area Management Plan 2017 – 2021" provides an important opportunity for Tamaraw conservation. The planned zoning system includes a strict protection zone (SPZ) (9,552ha) composed of upland habitats above 1000m, forest, a DENR-National Greening Program (NGP) restoration zone and steep, rough terrain. A significant portion of this could be considered potential Tamaraw range. Though the current plan does not make specific recommendations for the recovery and conservation of Tamaraw, it includes provisions for the protection of biodiversity in general, including protection, patrolling, habitat restoration, land-use regulation and community engagement. This section does not aim to duplicate this plan, but instead to support it by recommending Tamaraw-specific measures for integration into the broader program of work operating at MCWS.

Addressing habitat management and protection issues alone will not guarantee recovery and persistence of Tamaraw at MCWS. Translocation of Tamaraw into the site from other populations will be needed, both to initiate growth and in the longer-term to reduce the accumulation of inbreeding, which could otherwise depress population health.

Other relevant plans: ADSDPP and the "Mount Calavite Wildlife Sanctuary Protected Area Management Plan 2017 – 2021" (due to be updated).

GOALS FOR MOUNT CALAVITE WILDLIFE SANCTUARY

Goal 19. Verify the presence and location(s) of Tamaraw in MCWS.

Goal 20. Assess suitable habitat for Tamaraw, delineate potential range, and include within MCWS Strict Protection Zone.

Goal 21. Strengthen protective measures within the range delineated for Tamaraw.

Goal 22. Re-establish a healthy population of Tamaraw at MCWS.

GOAL 19. Verify the presence and location(s) of Tamaraw in MCWS

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
19.1	Survey to verify presence and locations of Tamaraw in MCWS	Verification report confirming presence and locations of Tamaraw in MCWS	X										150										TCP, NGOs, academe and relevant site stakeholders.

GOAL 20. Assess suitable habitat for Tamaraw, delineate potential range and include within MCWS Strict Protection Zone

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
20.1	Conduct perimeter survey/ground truthing/delineation of upland farming areas already occupied by IPs within the SPZ, based on the results of the socio-economic assessment and monitoring system (SEAMS) results.	Reports shared.	X	X									100	100									TCP, PAMO, with partners.
20.2	Assess the current suitability for Tamaraw, of the habitats, conditions and activities within MCWS and determine what (if anything) needs to be done to restore these areas for Tamaraw.	Report on current suitability of MCWS for Tamaraw, and on restoration requirements for these areas (if any)		X	X									250	250								TCP, PAMO, with partners.
20.3	Assess feasibility of establishing a viable population of Tamaraw in MCWS.	Report on feasibility of establishing a viable population of Tamaraw in MCWS		X	X									100	100								TCP, PAMO, with partners.
20.4	Update zoning within the PA to include areas suitable as	PA zoning is updated to support Tamaraw conservation.	X	X										100	100								TCP, PAMO, with partners.

	Tamaraw habitat within the SPZ and implement associated activities such as consultations with affected IPs.																										
20.5	Establish a protection system for the updated SPZ that includes suitable habitats for Tamaraw.	Tamaraw are well- protected within the SPZ.		X	X	X	X	X	X	X	X	X															TCP, PAMO, with partners.
20.6	Consult with local communities to develop a socio-cultural and socio-economic perspective on how local communities will accept and benefit from, Tamaraw reintroduction.	Benefits of Tamaraw reintroduction are well-understood by and evident in local communities.		X	X	X									100	100	100										TCP, PAMO, with partners.
20.7	Conduct a community awareness program to address perceptions or concerns that livelihood activities within the park will be prohibited or negatively affected once a Tamaraw conservation program is implemented.	Within local communities, perceptions of the Tamaraw conservation program are mainly positive.	X	X	X	X	X	X	X	X	X	X	100	100	100	100	100	100	60	60	60	60					TCP, PAMO, with partners.

GOAL 21. Strengthen protective measures within the range delineated for Tamaraw

Sub-goal 21A. Prepare the site for Tamaraw

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
21A.1	Increase the number of well-trained and well-equipped rangers (see actions related to this in MIBNP section).	More rangers, better trained and equipped.		X	X	X	X	X	X	X	X	X		420	420	420	420	420	420	420	420	420	PAMO, TCP with partners.

21A.2	Creation of Barangay Tamaraw Conservation Council (BTCC)	BTCC created within/nearest Brgy. LGUs of known Tamaraw habitat			X	X									216	216							
Sub-goal 21B. Manage the area to support Tamaraw once present																							
21B.1	SMART patrolling and more patrolling (see MIBNP working group report).	Patrolling and enforcement are effective enough to support a population of Tamaraw.		X	X	X	X	X	X	X	X	X		30	30	30	30	30	30	30	30	30	PAMO, TCP with partners.

GOAL 22. Re-establish a healthy population of Tamaraw at MCWS

No.	Action	Indicator of achievement	Y1 2021	Y2 2022	Y3 2023	Y4 2024	Y5 2025	Y6 2026	Y7 2027	Y8 2028	Y9 2029	Y10 2030	Budgetary Requirement (P'000) 2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Leads, Collaborators
22.1	Align the TCMAP and the MCWS PAGMP.	TCMAP priorities are included in the post-2021 MCWS PAGMP.	X	X	X																		PAMO, TCP with partners.
22.2	Update and finalize the PA management plan using TCMAP as a reference, in line with the ENIPAS Act and its implementing rules and regulations	PA management plan is finalized with TCMAP as reference.		X	X										100	100							PAMO, TCP with partners.
22.3	Work with TC3 to include MCWS in the Tamaraw meta-population translocation program.	MCWS is included in the meta-population translocation program. Timelines and sources of Tamaraw are agreed.				X	X									250	250						PAMO, TCP with partners
22.4	Design and implement a translocation plan for MCWS	Approach is agreed and resources are secured. Tamaraw are released in MCWS.						X										4,000					PAMO, TCP, national & international partners

MONITORING AND UPDATING OF THE PLAN

The actions identified should be monitored and evaluated for its effectiveness, as well as regularly updated to address emerging issues and challenges. The BMB through the DENR MIMAROPA Region and TC3 shall monitor and evaluate the implementation of the activities in the TCMAP. The TCMAP shall be reviewed and updated every five (5) years or as necessary.

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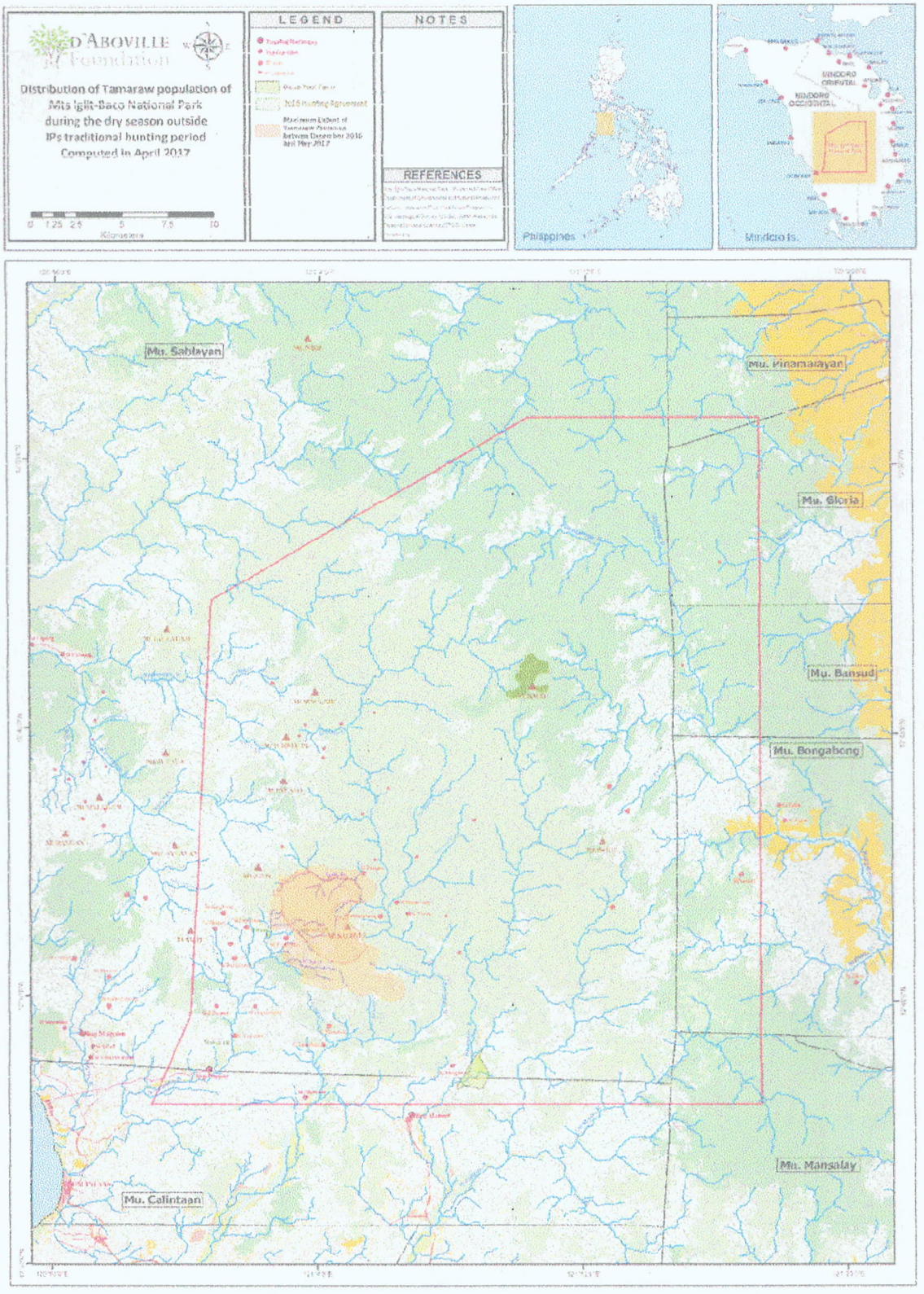
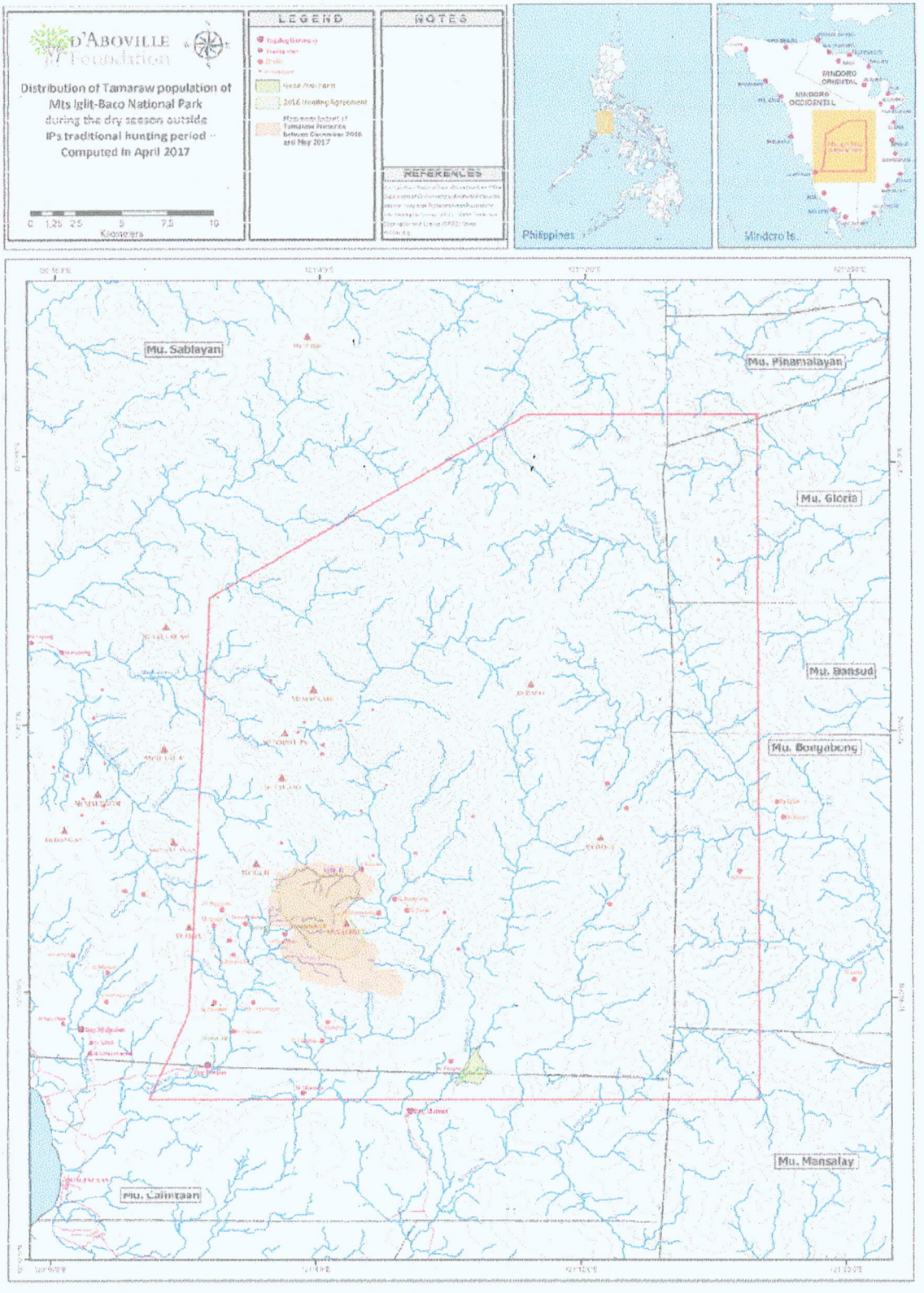
APPENDIX I. MAPS




D'ABOVILLE
Foundation
Distribution of Tamaraw population of
Mts Iglit-Baco National Park
during the dry season outside
IPs traditional hunting period
Computed in April 2017
0 1.25 2.5 5 7.5 10
Kilometers
LEGEND
Grace Park Farm
2016 Hunting Agreement
NOTES
REFERENCES
Philippines
MINDORO ORIENTAL
MINDORO OCCIDENTAL
Mindoro Is.
Mu. Sablayan
Mu. Pinamalayan
Mu. Gloria
Mu. Bansud
Mu. Bongabong
Mu. Mansalay
Mu. Calintaan