Imperata cylindrica (L.) Raeusch

Saccharum spontaneum L.

FINDINGS

A total of 44 plant species have initially recorded from these five PAs as exotic species. Among them, 13 species from HNP, 13 species from KNP, 13 species from MNP, 10 species from RKWS, and 07 species from SEWS are considered as IAS and analyzed for EICAT criteria for identifying their environmental impacts on the native flora and fauna. However, the following seven species were found commonly to have Major (MR) environmental impacts on these five PAs (Table).

TABLE: SEVEN PLANT SPECIES DEMONSTRATE IAS CHARACTERISTICS AS MAJOR (MR) EICAT CATEGORY

SN	Scientific name	Family	Local Name	English Name	Distribution in PAs
1	*Chromolaena odorata* (L.) R.M.King and H.Rob.	Asteraceae	Assamgach, Assamlata, Barashialmuti	Devil weed, Triffidweed, Siam Weed	HNP[2], MNP[2], SEWS[2], RKWS[2], KNP[2]
2	*Mikania scandens* (L.) Willd.	Asteraceae	Assamlota, Germany lota, Tofani lota	Hempweed	HNP[2], SEWS[4], KNP[2], MNP[2], RKWS[2]
3	*Mimosa pudica* L.	Fabaceae	Lajjabati, Sorminda gach, Sensitive plant	Shame plant, Sensitive plant	HNP[4], MNP[4], RKWS[2], KNP[2]
4	*Imperata cylindrica* (L.) Raeusch.	Poaceae	Sungrass, Chhan	Cogon grass	HNP[2], RKWS[2], KNP[2], SEWS[4]
5	*Saccharum spontaneum* L.	Poaceae	Kansh	Wild sugarcane, Fodder cane, Kans grass	HNP[3], KNP[2], SEWS[4]
6	*Eichhornia crassipes* (Mart.) Solms in A. DC.	Pontederiaceae	Kachuripana, Water hyacinth	Common water hyacinth	HNP[5], SEWS[2], KNP[2], MNP[2]
7	*Lantana camara* L.	Verbenaceae	Mogkanta, Nakphul, Lantana	Lantana	HNP[2], MNP[3], RKWS[2], KNP[2]

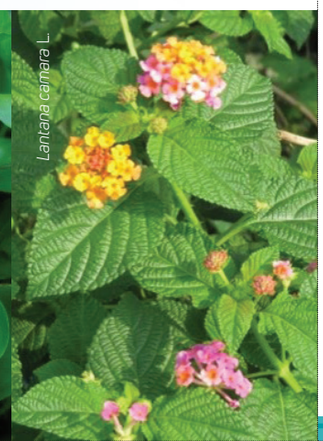
EICAT categories of IAS of plants based on the impacts on local forest biodiversity:
2 = Major (MR), 3 = Moderate (MO), 4 = Minor (MN) and 5 = Minimal Concern (MC)

Moderate (MO): *Ageratum conyzoides* L. at HNP, MNP and RKWS, *Hyptis suaveolens* (L.) Poit. at KNP, and *Ipomoea carnea* subsp. *fistulosa* (Mart. & Choisy) D.F. Austin at KNP and MNP are found to have Moderate (MO) impact.

Minor (MN): *Hyptis suaveolens* (L.) Poit. at HNP and RKWS, *Senna occidentalis* Roxb. at KNP and MNP, *Senna tora* (L.) Roxb. at KNP, MNP and RKWS, *Synedrella nodiflora* (L.) Gaertn. at MNP, *Wedelia trilobata* (L.) A.S. Hitchc at MNP, and *Salvinia molesta* D.S. Mitchell at SEWS are found to have Minor (MN) impact.

Minimal Concern (MC): *Ageratum conyzoides* L. at SEWS, *Ipomoea carnea* subsp. *fistulosa* (Mart. & Choisy) D.F. Austin at HNP and RKWS, *Croton bonplandianus* Baill. HNP, KNP and MNP, *Senna tora* (L.) Roxb. at HNP, and *Acacia auriculiformis* at RKWS and MNP seem to have Minimal Concern (MC).

Eichhornia crassipes (Mart.) Solms in A. DC.



Lantana camara L.

THE WAY FORWARD

This is for the first time, a PA based IAS survey has been conducted in five PAs of Bangladesh under this project. Also, Bangladesh has become the pioneer of applying IUCN EICAT categories and criteria to identify the invasiveness of recorded IAS from these five PAs, where seven species were categorized as Majors. Therefore, some recommendations are made in the following to make such kind of study more effective in the future:

- Implementation of the developed strategic management plan for each PA to control the invasiveness of seven Major (MR) IAS species and prevent the native species from their harmful effects,
- A complete risk assessment to measure the impacts of invasiveness, and limiting the extent and occurrence of the IAS in natural forest areas,
- Inventory and identification of IAS in the other important PAs and developing the strategic management plans as well,
- Understanding mechanisms by which the invasive alien plant species survive, propagate, and spread,
- Development of standardized procedures for the introduction and periodic monitoring of invasive species,
- Establishment of clear quarantine regulations, and periodic assessments of their effectiveness,
- Developing control measures plan and implement effective mechanisms to remove exotic plants from important protected areas of the country for its sustainability,
- Political commitment through the promulgation and enactment of proper legal instruments,
- Prior clearance for species of economic and/or aesthetic importance (ornamental) before introduction, with proper documentation of country of origin, concerned organizations, and probable ecological impact on native species,
- Community awareness campaigns from the government as well as NGOs level to educate local people about the problems caused by IAS and involve them for managing, and to solve and prevent the spreading of IAS in country's different land-use/land cover,
- Developing appropriate policies and rules to facilitate IAS-free PAs in the country,
- Develop a promising approach to restore the landscape with native plants and encourage the concerned agencies and community to conduct their plantation programme with native species.

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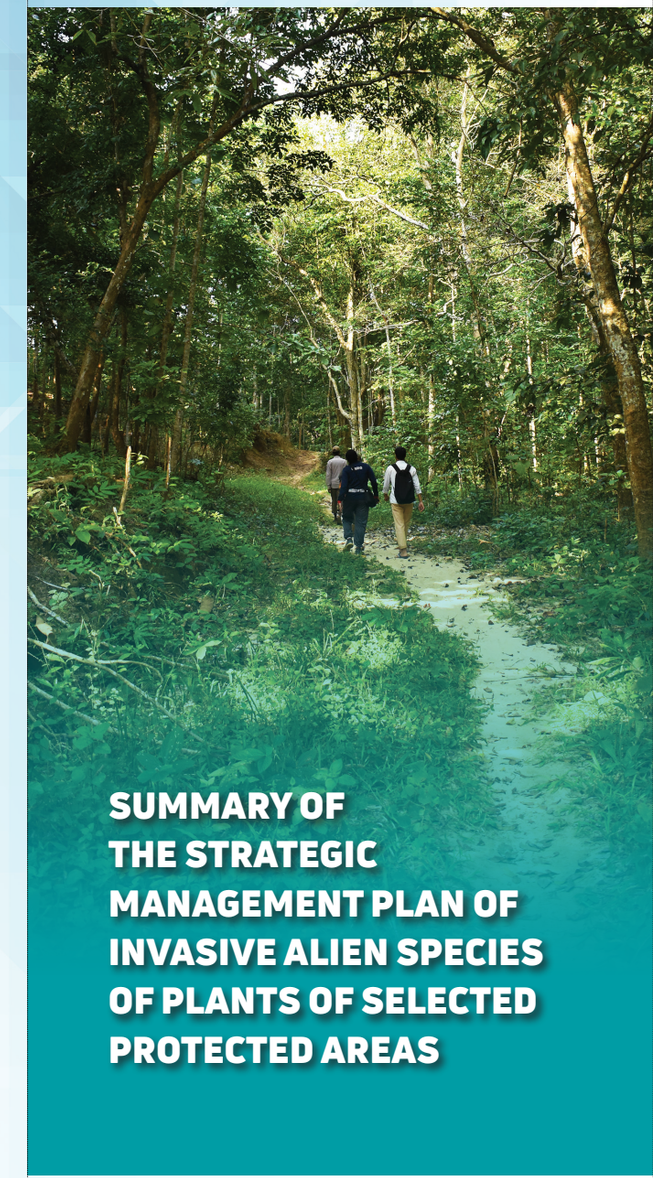

SUMMARY OF THE STRATEGIC MANAGEMENT PLAN OF INVASIVE ALIEN SPECIES OF PLANTS OF SELECTED PROTECTED AREAS

SUFAL

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INTRODUCTION

Invasive Alien Species (IAS) are plants, animals, pathogens, and other organisms that are non-native to an ecosystem, and which may cause economic or environmental harm or adversely affect human health. IAS are usually introduced from outside their natural range of distribution (i.e., other countries or other regions of the country) by either intentional or unintentional human activity, that has established self-reproducing populations in the wild and has caused obvious changes in local, artificial or natural ecosystems. This introduction of plants is a very old practice and all the introductions are not harmful but few of them are becoming invasive and causing tremendous losses to the local flora and fauna.

In Bangladesh, information is scarce about the alien species and their impacts on the ecosystem and species. More than 300 exotic species are listed as either wildly growing or cultivated as an economic crop in Bangladesh. Considering the issues, IAS has been addressed under Article 8(h) of the Convention on Biological Diversity (CBD) and Sustainable Development Goal (SDG), Target 15.8 to meet the challenges. In order to achieve this target Forest Department and Bangladesh National Herbarium have been implementing a programme entitled 'Developing Bangladesh National Red List of Plants and Developing Management Strategy of Invasive Alien Species (IAS) of Plants in Selected Protected Areas (PAs)' as part of the World Bank funded SUFAL project. IUCN Bangladesh is providing key technical support to this programme.

As a sequel to this initiative, the present research-based survey on 'Developing Management Strategy of IAS of Plants in five PAs (Himchari National Park, Kaptai National Park, Madhupur National Park, Rema-Kalenga Wildlife Sanctuary, Sundarban East Wildlife Sanctuary)' have been conducted.

PROJECT SITES

Following five study sites were selected for the investigation of the Invasive Alien Species (IAS).

HIMCHARI NATIONAL PARK (HNP)

Himchari National Park (HNP), a Protected Area (PA) is located on the outskirts of Cox's Bazar city, Bangladesh. HNP was declared as a national park on 15 February 1980. The forest area measuring about 1,729 hectares.

KAPTAI NATIONAL PARK (KNP)

Kaptai National Park (KNP) is an important national park situated in Rangamati District, Bangladesh. KNP was declared as protected area in 1999 with an area of 5,464.78 hectares. It comprises two ranges namely Kaptai Range and Karnaphuli Range with eight beat offices. Its forest type is mixed evergreen two IAS seasonal field surveys have covered an approximately 1.07 hectares area.

MADHUPUR NATIONAL PARK (MNP)

Madhupur National Park (MNP) was officially declared as National Park in 1982. The Park is located at Madhupur upazila, Tangail district in the north region of the country. About 75% of the forest area is covered with Sal (Shorea robusta). MNP covers an area of 8,436 hectares.

REMA-KALENGA WILDLIFE SANCTUARY (RKWS)

Rema-Kalenga, formerly a part of the Tarap Hill Reserve Forest of Sylhet Forest Division was declared a wildlife sanctuary on 7 January 1982. Geographically, the sanctuary falls under Kalenga range of Habiganj district administration of greater Sylhet. This sanctuary, originally consisted an area of 1,095 hectares which was expanded later in 1996 to 1795.54 hectares.

SUNDARBANS EAST WILDLIFE SANCTUARY (SEWS)

Sundarbans East Wildlife Sanctuary (SEWS) was declared as protected area in 2017. It covers an area of 1,22,920.90 hectares and located in the south-eastern part of Sundarban Reserve Forest (SRF). SEWS situated in a low-lying area of flat islands interspersed by a complex network of rivers, canals and tidal creeks.

METHODOLOGY

The methodology of the IAS study has been selected for the five PAs through a number of expert consultation meetings, training programmes, workshops and FGDs with relevant stakeholders. The Two seasonal (i.e., Post-monsoon and Pre-monsoon) field surveys have been conducted to record the IAS from all five PAs following the approved methodology. The random quadrat method was applied for both taxonomic and ecological measurements. The quadrat size was 2 m x 2 m for climber, herb, and grasses, 5 m x 5 m for shrubs, lianas, and 10 m x 10 m for trees determined based on the species-area-curve method. A total of 734 quadrats or 7.34 hectares (sample plots) were surveyed across the five PAs covering all sites, habitats and altitude ranges. The invasiveness of recorded IAS of plants have been identified through the application of IUCN EICAT (Environmental Impact Classification for Alien Taxa) Categories and Criteria, fieldwork, and literatures survey. EICAT is the IUCN global standard for measuring the severity of environmental impacts caused by animals, fungi and plants living outside their natural range. EICAT has the following five impact categories:

Chromolaena odorata (L.) R.M.King and H.Rob.

Mikania scandens (L.) Willd.

Massive (MV): Causes local extinction at least one native taxon (i.e., taxa vanish from communities at sites where they occurred before the alien arrived); which is necessarily irreversible; even if the alien taxon no longer present the native taxon cannot recolonize the area.

Major (MR): Causes local or sub population extinction of at least one native taxon (i.e., taxa vanish from communities at sites where they occurred before the alien arrived); which is naturally reversible if the alien taxon is no longer present.

Mimosa pudica L.

Moderate (MO): Causes population decline in at least one native taxon, but no local population extinction.

Minor (MN): Causes reduction in individual performance (e.g., growth, reproduction, defence, immunocompetence), but no decline in local native population sizes.

Minimal concern (MC): Negligible level of impact; no reduction in performance (e.g., growth, reproduction, defence, immunocompetence) of individuals of native taxa.