FRESHWATER SYSTEMS · INVASIVE MACROPHYTES

Distribution, Impact and Management of Water Hyacinth

Ground-truthing satellite estimates of water hyacinth and invasive weeds across eight Winam Gulf hotspots, with biological-control performance and an integrated management plan.

REFERENCE	ISSUED	REGION
C82_15(iv)	**June 2026**	**Homa Bay · Kendu Bay · Nyakach**

FRESHWATER SYSTEMS

97 to 100%
of floating cover is water hyacinth

2.97 M m²
largest infested area, at Koginga

8
hotspot sites ground-truthed

Neochetina
weevils give partial biological control

Background

Macrophytes support fish habitat, shoreline stabilization and nutrient cycling when present at balanced levels, but invasive floating species, above all water hyacinth (*Pontederia crassipes*), form dense surface mats in sheltered, nutrient-enriched bays. These mats restrict water movement and access, alter water quality, suppress native vegetation and disrupt fisheries and other lake-based activities. KMFRI conducts bi-annual mapping using freely available Landsat 8 and Sentinel-2 satellite data, complemented by periodic field ground-truthing across critical hotspots in the Winam (Nyanza) Gulf, an area of roughly 1,920 km² extending about 60 km in length with widths of 6 to 30 km.

Objective: to validate satellite-based extent estimates and to assess infestation severity, biological-control agent populations, plant traits and the water environment across eight hotspot sites in Homa Bay, Kendu Bay and Nyakach.

Key Findings

Severe, near-total infestation at the worst hotspots

Floating vegetation was dominated by water hyacinth at every site, with coverage consistently between 97 and 100%, consistent with rapid colonization of sheltered, nutrient-rich shoreline environments. The largest affected areas were Koginga (about 2.97 million m²) and Sango Rota (about 2.0 million m²), both rated Extreme, and Nyaroya (about 0.49 million m²), rated High. Dense mats in these locations alter local water chemistry, reduce oxygen availability and limit light penetration, conditions that suppress submerged vegetation and degrade fish habitat.

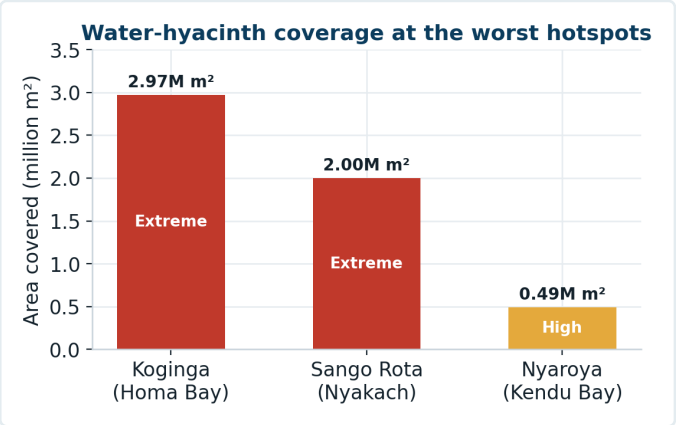


Figure 1. Infested area at the three worst hotspots, with severity ratings: Koginga and Sango Rota are at Extreme levels.

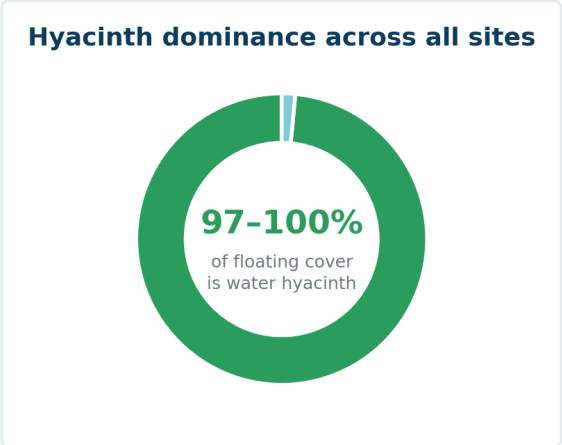


Figure 2. Water hyacinth dominated floating vegetation at every surveyed site (97 to 100% of cover).

Site	Area covered (m²)	Severity
Homa Bay (Koginga)	2,970,000	Extreme
Nyakach Bay (Sango Rota)	2,000,000	Extreme
Kendu Bay (Nyaroya)	490,000	High

Biological control helps, but cannot do it alone

The weevils *Neochetina eichorniae* and *N. bruchi* were present and associated with plant damage through feeding and oviposition. Higher weevil densities at Kendu Bay and the Homa Bay sewage site coincided with more feeding scars and reduced plant vigour. Plant traits measured included fresh weight, root length, petiole number and length, and laminar area; heavily infested sites such as Koginga and Sango Rota generally carried larger plants, and short roots common in floating mats may increase fragmentation and dispersal. However, heavily infested, nutrient-rich bays sustained dense, healthy mats despite weevil presence, so biological control is insufficient as a stand-alone measure. At Bala Beach, skin irritation on contact with the water suggested possible toxic cyanobacteria under stagnant conditions.

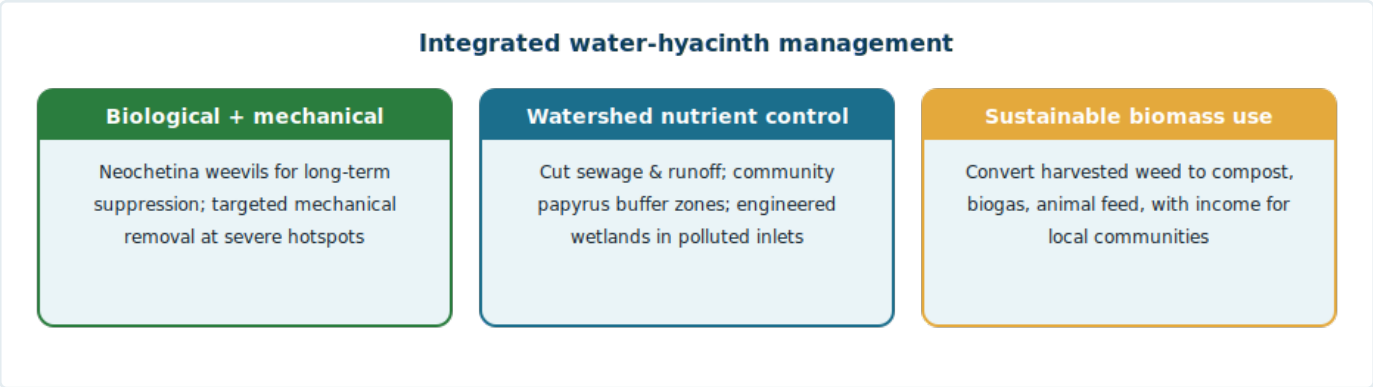


Figure 3. Integrated water-hyacinth management combines biological and mechanical control, watershed nutrient control, and sustainable use of harvested biomass.

Conclusions

- Infestation is severe across all eight hotspots, with coverage of 97 to 100% and Extreme severity at Koginga and Sango Rota.
- *Neochetina* weevils reduce plant vigour but cannot control mats alone under optimal growth conditions.
- Combined ecological and socio-economic risks, including hypoxia, habitat disruption and suspected cyanobacterial irritation, make coordinated, integrated management urgent.

Recommendations

1. Immediate (0 to 3 months): clear navigation channels, prioritise mechanical removal at the most severe hotspots, and target isolated mats to prevent spread.
2. Medium-term (4 to 12 months): reinforce and monitor *Neochetina* weevils where they are effective, and establish community-managed papyrus buffer zones.
3. Long-term (12 months and beyond): control sewage inflows and fertilizer runoff, reduce catchment soil erosion, and construct engineered wetlands in polluted inlets.
4. Convert harvested biomass into compost, biogas, animal feed or briquettes to offset costs and support livelihoods.
5. Sustain bi-annual satellite mapping and field ground-truthing to track infestation and guide response.

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Suggested citation: Ongore, C. et al. (2026). Distribution, Impact and Management of Water Hyacinth and Invasive Weeds in Lake Victoria. KMFRI Factsheet C82_15(iv).