



GRASSLANDS AND BIRDS IN CAMBODIA



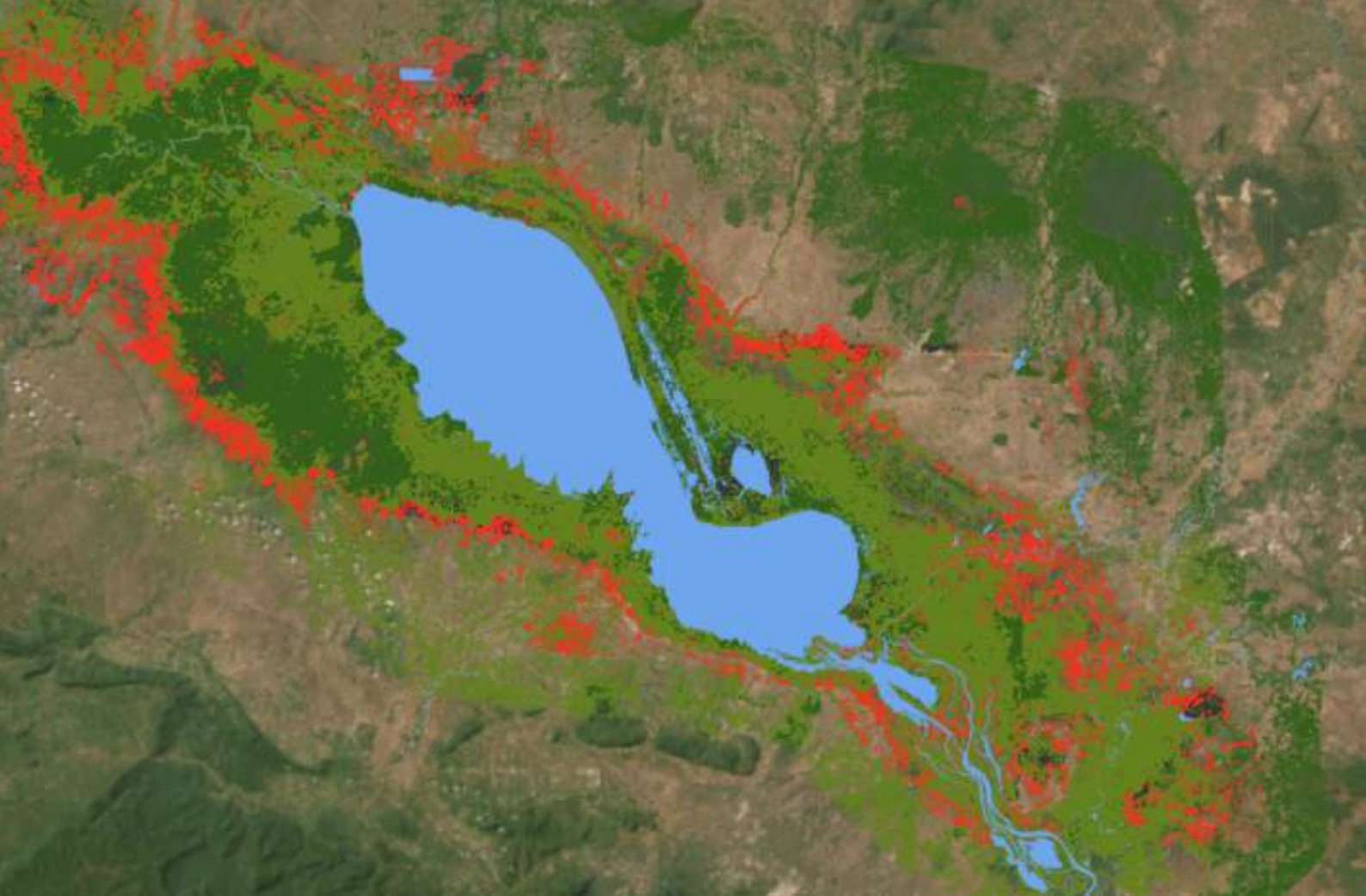
GRASSLAND IMPORTANCE

Grasslands are important habitats for a wide range of reasons. Both natural and semi-natural grassland areas provide an array of ecosystem services, including:

- Effective water catchment roles
- Provision of forage for cattle and wildlife
- Protection of watersheds, and stream and river channels
- Mitigation of drought and floods,
- Provision of breeding grounds and habitat for wildlife.

With respect to agriculture, grasslands are globally recognized for **multiple ecosystem services** including fodder production, pollination of plants, crops and natural vegetation, disbursement of seeds, and cycling and movement of nutrients. On a broader level, grasslands help manage water supply and flow regulation, carbon storage, erosion control.





THREATENED ECOSYSTEMS AND SPECIES



Grassland conversion: Globally, grasslands have declined rapidly in the last century. According to data from NASA, grasslands used to occupy more than 25% of the Earth's surface. However, over 50% of temperate and 16% of tropical grasslands have been lost through conversion. This decline is mostly attributed to its conversion to arable land for agriculture, animal feed production, or industrial uses.

In the Tonle Sap Stronghold, recent research* shows that over 200,000 hectares of grassland were lost, predominantly (~90%) to croplands, between 2004 and 2023. This represents a decline from ~300,000 hectares in 2004. The map above illustrates this loss (**red**), clipped to the WCS Stronghold area.

Key threatened bird species include **Bengal Florican, Yellow-breasted Bunting, White-shouldered Ibis, Greater Adjutant, Sarus Crane, Milky Stork, Woolly-necked storks, Lesser Adjutant, Painted Stork, Asian Openbill, Black-headed Ibis, Oriental Darter and Chinese Grassbird.**

*Chea, M.; Fraser, B.T.; Nay, S.; Sok, L.; Strasser, H.; Tizard, R. A Survey of Changes in Grasslands within the Tonle Sap Lake Landscape from 2004 to 2023. *Diversity* 2024, 16, 448.

WCS ACTIVITIES

WCS has been working in the Tonle Sap Stronghold for over 25 years. Our conservation activities include:

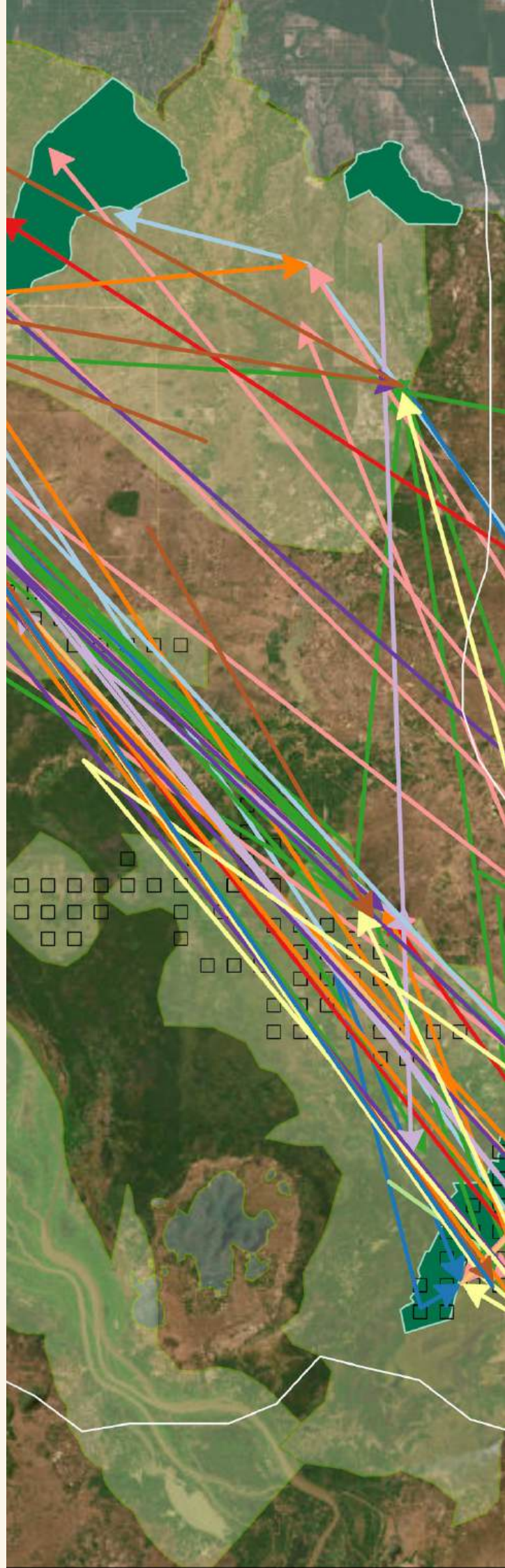
Habitat Monitoring: WCS regularly monitors key habitats within the landscape to assess ecological health, identify threats, and inform conservation actions. This includes tracking vegetation cover, livestock grazing, wildfires, and habitat degradation.

Geospatial Analysis: WCS utilizes advanced geospatial techniques to map and analyze land use and land cover changes within the landscape. This includes tracking animal movements, mapping biodiversity, using habitat suitability models, assessing the impact of climate change, and employing satellite imagery, drones, and GIS. This helps identify critical habitats, assess habitat fragmentation, and inform spatial conservation planning.

Species Census: WCS conducts regular censuses of key species, including annual counts of Bengal Florican, White-shouldered Ibis, Sarus Crane, and Yellow-breasted Buntings and other 12 globally threatened waterbird species at Prek Toal Waterbird Colony. WCS also assists with the national censuses every five years for Bengal Florican across several including all protected and unprotected habitats within the Stronghold. WCS protects and monitors the population of key waterbird species at the Prek Toal Ramsar Site, known as the largest waterbird colony in Southeast Asia, and uses drone-based AI technology to monitor water bird colonies at Ang Trapeang Thmor Protected Landscape, Boeung Snae Multiple Use Area, Toul Promp, and Avian Rohalkes. Additionally, WCS conducts fish catch monitoring and mammal surveys by using camera traps to monitor population trends and inform fisheries conservation strategies.

Species Reintroduction Program: WCS works with the Ministry of Environment (MoE), Forest Administration (FA), WCS, and Angkor Center for Conservation of Biodiversity (ACCB) to set up the world's first captive breeding program for Bengal Florican at ACCB's center in the Kulen Mountain National Park. Since 2019, 15 eggs have hatched successfully, and 11 of the hatched Floricans continue to thrive. From 2019 to 2024, 30 eggs were collected, and 9 Bengal Floricans were rescued. Four of them are still thriving. CCTV has been installed in the Bengal Florican Breeding Facility to observe and record the bird's behavior.

The photo to the right shows the flight paths of the Bengal Florican using telemetry data from 2010 to 2014.



WCS ACTIVITIES

SMART Patrolling: WCS implements the Spatial Monitoring and Reporting Tool (SMART) system to enhance patrol effectiveness and reduce illegal activities within Protected Areas. The WCS team provides technical assistance, training, and support to government rangers and Community Based Organization (CBO) members to conduct regular patrols and collect data. WCS supports seven government patrol teams and 19 CBO patrol teams over five protected areas across the landscape, covering approximately 441,000 km of patrol distances over 6,300 patrol days annually.

Governance: WCS empowers local communities to sustainably manage natural resources. WCS provides assistance to strengthen 19 Community-Based Organizations (CBOs), including Community Fisheries, Community Protected Areas, and a Community Forest, through capacity building and financial support. These CBOs, in partnership with rangers, conduct regular patrols to safeguard local ecosystems. To enhance community-led conservation, WCS established a mini-trust fund scheme in collaboration with FiA, allocating \$10,000 to each of the five Community Fisheries in Prek Toal. With technical support from WCS, 11 CBO at Prek Toal and Bakan Protected Landscape successfully awarded their first small grant proposals with around \$12.5k each from the USAID Conserve, and one CFI at Metuek commune received \$10k and \$100 for one year for patrol activity from commune investment plan (CIP) budget. In collaboration with government agencies, WCS supports ranger patrols, law enforcement, and management efforts across multiple sites within the Tonle Sap Landscape.

Awareness Training: WCS raises awareness about endangered species, protected area laws, climate change, climate resilience, hygiene, waste management, sustainable agriculture practices, Integrated Pest Management (IPM), biodiversity conservation, SMART Patrol, report writing, bookkeeping, eco-tourism, bird identification, local field guides, and resource management. WCS works with local schools and communities to promote environmental stewardship and responsible resource use.



WCS ACTIVITIES

Bird Protection: WCS prioritizes the conservation of threatened bird species. This includes protecting the **Bengal Florican**, a species residing in the Bengal Florican Conservation Areas (BFCAs) and Bakan Protected Landscape, as well as other globally threatened bird species such as the **White-shouldered Ibis** and others across the Stronghold.

Annual population surveys and monitoring are essential for informing rapid conservation action. These methods, in conjunction with habitat protection, sustainable livelihood improvement, community patrols, law enforcement support, and targeted conservation actions are essential for biodiversity protection.

Farming Engagements: WCS facilitates large-scale adoption of sustainable rice farming practices near Bengal Florican Conservation Areas (BFCA), supporting over 1,000 farmers with the Sustainable Rice Platform (SRP) Standard and access to better seed and markets.

Ecotourism: To generate sustainable income for local communities and support conservation efforts, WCS established and strengthened five Community-Based Ecotourism (CBET) initiatives. These CBETs offer birdwatching services to international tourists, providing economic opportunities, infrastructure development for local communities.



LOSS OF GRASSLAND

WCS monitors the change in habitats across the pockets of protected areas in the Tonle Sap Landscape.

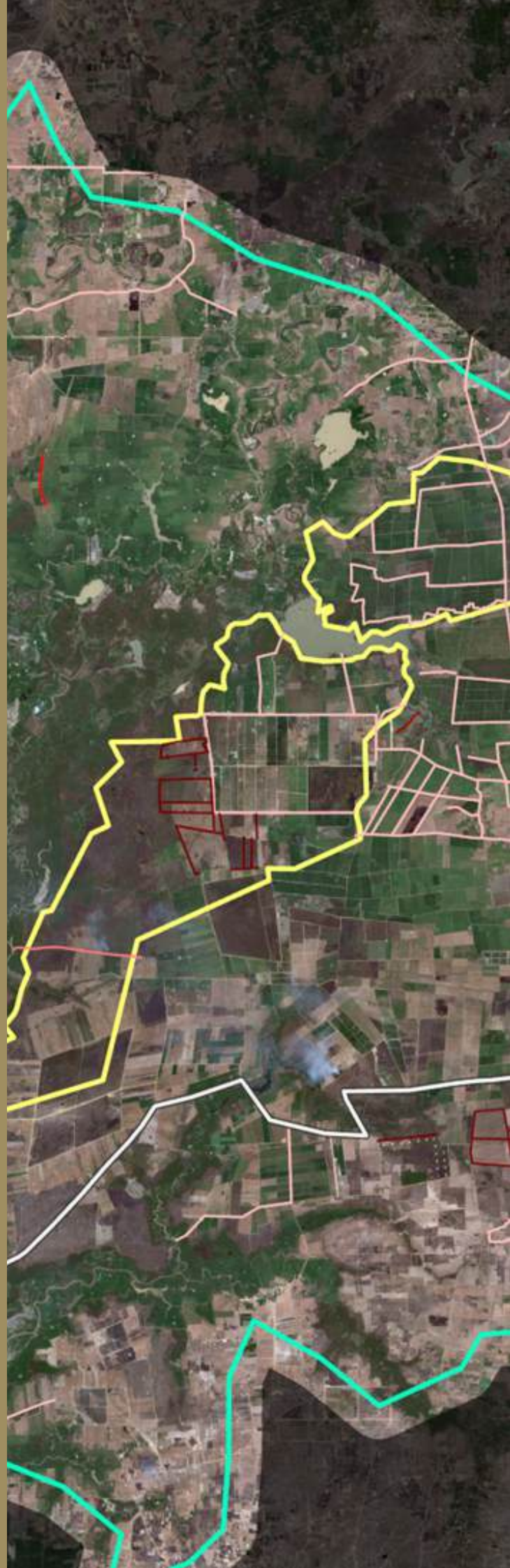
One focal area is an **Important Bird and Biodiversity Area (IBBA)** near Baray (green outline to the right). This is an internationally designated area for Florican breeding habitat, and within this IBBA, are two BFCAs: Baray BFCa and Choung Dong BFCa (yellow outline to the right).

Key geo spatial findings include:

- recently, loss of grassland dramatically increased in the IBBA and the BFCAs within this designated area.
- (2021-2022): A significant loss of 3.8% (305.88 ha) of grassland to paddy fields was observed.
- (2022-2023): No significant loss of grassland, but a minor loss of 0.3% (~30 ha) of shrubland to paddy fields was noted.
- (2023-2024): A substantial loss of 8.2% (~875 ha) of grassland to paddy fields was recorded, primarily between November 2023 and March 2024. Additionally, there was an expansion of infrastructure (canals and roads) and the reactivation of previously abandoned paddy fields, posing a threat to endangered species.

The land cover classification involved three main steps: pre-processing, data analysis, and verification. Satellite imagery from March 2022 and 2023 was used to compare land cover changes during the dry season. The 2022 and 2023 methodologies were similar, with the exception of cloud and shadow removal in 2023 for more accurate interpretation. Additionally, more extensive ground truth verification, including interviews, was conducted in 2023 to enhance accuracy.

The primary data source was Sentinel-2 imagery, with additional support from Sentinel-1, Landsat 8, Planet high-resolution mosaics, Google Earth, and Mailbox base maps. These data sources were used for image segmentation and interpretation, ensuring accurate mapping of vegetation cover.



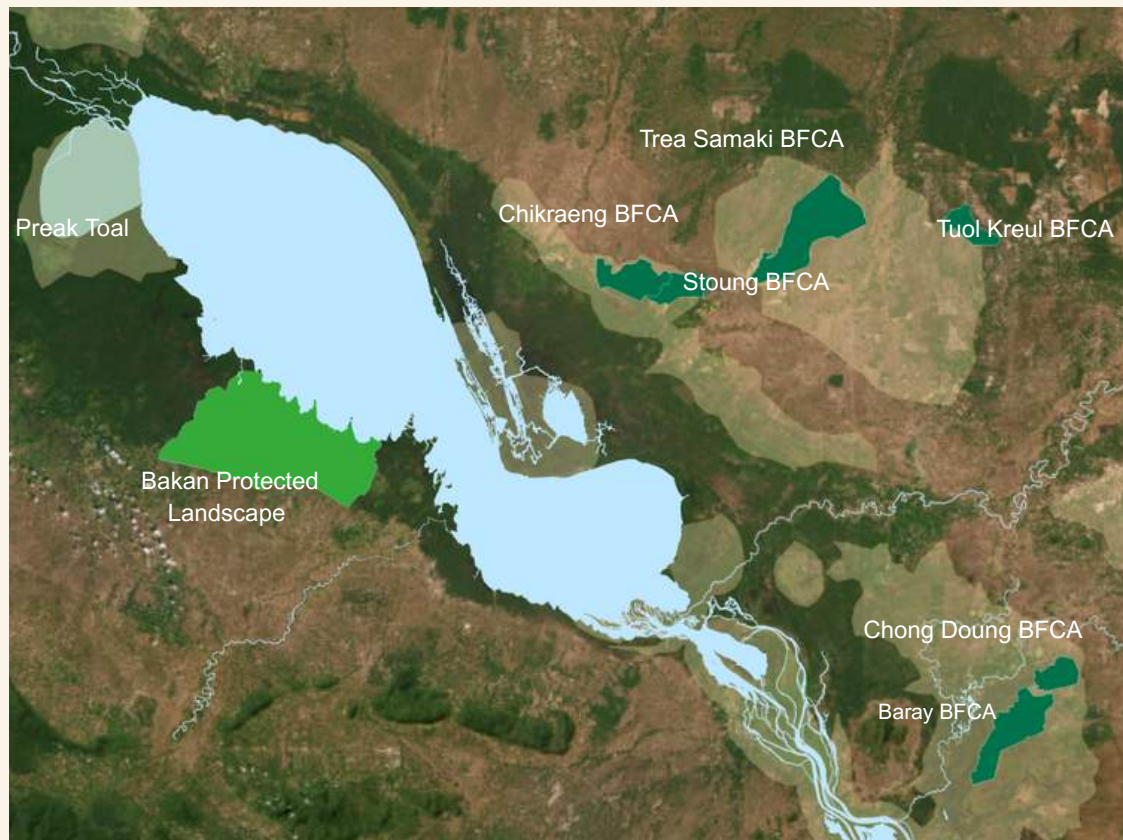
BENGAL FLORICAN CONSERVATION AREAS (BFCA)

The **Northern Tonle Sap Lowlands Protected Landscape** (NTSLPL) is a cluster of six small, protected areas. Each small protected area is a **Bengal Florican Conservation Area** (BFCA), and all are strategically located in areas critical to the survival of this species. These are illustrated in the below map in **dark green**. Key Biodiversity Areas (KBA) in the Stronghold are also illustrated below in **yellow**.

- **Baray**
- **Chong Doung**
- **Tuol Kreul**
- **Trea Samaki**
- **Stoung**
- **Chikraeng**

These six areas cover ~31,000 ha and are managed by the Ministry of Environment (MoE), with the goal to protect the Bengal Florican population. Other globally threatened species found in this habitat include the **White-shouldered Ibis**, **Yellow-breasted Bunting**, **Sarus Crane**, **Greater and Lesser Adjutants**, **Black-necked Stork**, and **Milky Stork**.

Other grassland protected areas now include the **Bakan Protected Landscape**, (in **green** below) added in July 2023. This ~38,000 hectare area of grassland habitat safeguards critical species such as the **Bengal Florican**, **Manchurian Reed-warbler**, and Cambodia's only known population of the elusive **Chinese Grassbird**. This work aligns with Cambodia's commitment to the global 30x30 initiative.





BENGAL FLORICAN MONITORING

Bengal Floricans are critically endangered grassland birds. Globally, it is estimated that there are ~500 Bengal Floricans remaining in the wild according to BirdLife International. The Floodplain maintains approximately 80% of this population.

There are several key methods for monitoring the status of this rare species:

- WCS led annual census
- National led 5 year census
- Community and ranger patrols every month

All long term monitoring occurs during the breeding season.

BENGAL FLORICAN BREEDING HABITS IN CAMBODIA

- **Habitat Requirements:** Open grasslands with varying vegetation heights
- **Breeding Season:** Mid-March to mid-May
- **Nesting:** April through July, depending on rainfall
- **Breeding Locations:** Farmland and grazing areas
- **Eggs per Clutch:** Usually only one
- **Nest Survival:** Relatively high (83%)

The annual Bengal Florican census is conducted from March to May/June to count displaying males within sample plots across select areas. Areas include breeding habitats, both inside and outside protected areas. A statistic model is used to estimate the population and assists in understanding long-term monitoring trends. The method was jointly developed by professors from the University of East Anglia.

The MoE and WCS teams conduct annual long-term population census monitoring at breeding sites by counting males in designated areas. From March to May/June, male Floricans display in select territories by ruffling their throat feathers, pumping their heads, and jumping into the sky. Females remain hidden on the ground.

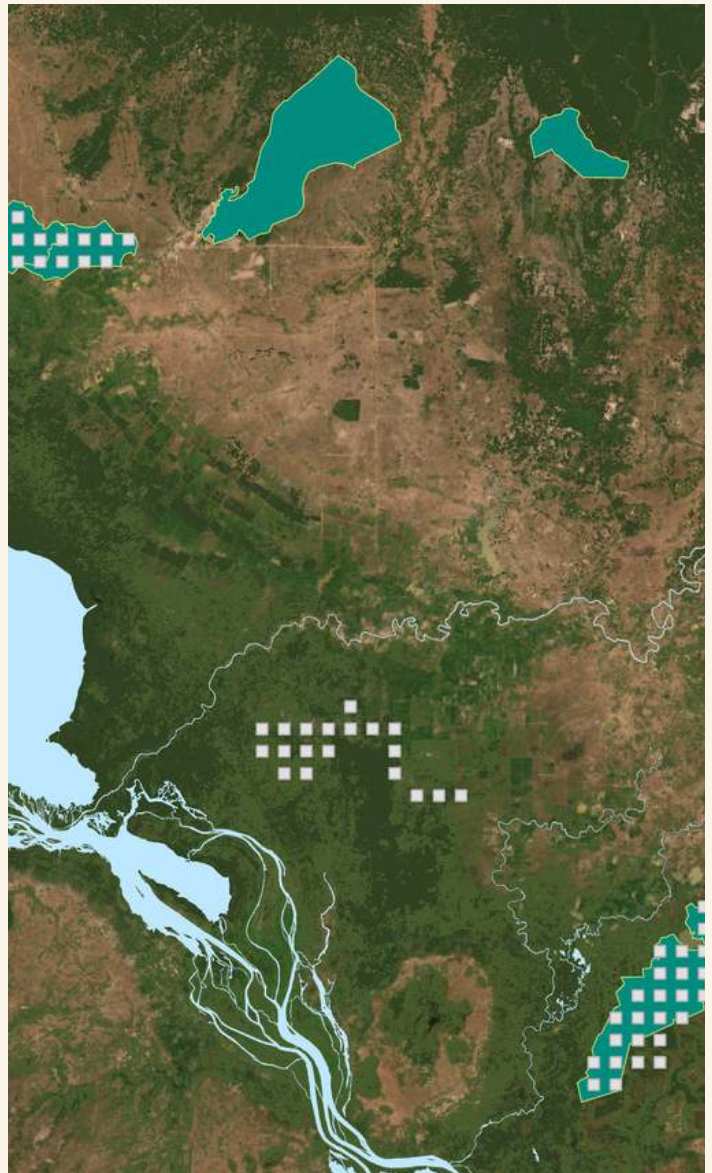
Community engagement is integral to this monitoring program, with local participants often assisting with the identification and protection of breeding sites. Patrol teams complement these efforts, helping to mitigate threats to the species by ensuring breeding habitats remain undisturbed and free from illegal activities. These combined efforts strengthen the protection of Bengal Florican populations in Cambodia.



MONITORING

BENGAL FLORICAN CENSUS METHODOLOGY

- **Survey Area:** 1-km² replicate squares, separated by 1 km (e.g. the 2022 survey had 132 squares - see the **grey boxes** to the right).
- **Survey Timing:** peak display activity.
- **Survey Method:**
 - Four surveyors per square (standing in the middle).
 - GPS used for navigation and data recording.
 - Each square visited two to three times by different observers.
 - One-hour observation sessions in the morning (06:00 - 08:30) and afternoon (16:00 - 18:30).
 - Surveyor records locations, number of displaying males and females, and other activity or habitat information.
- **Survey Goal:**
 - Monitoring for displaying male Bengal Floricans and other key species.
 - Sampling at least 20% of each site's area.
 - Minimum of eight survey squares per site.





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