POLICY BRIEF

Savannah Grassland Conservation in Maharashtra

For People, Climate, & Biodiversity

KEY RECOMMENDATIONS

- Grasslands are not wastelands. It is important to amplify scientific evidence that show ecological value of grasslands and *address the identity crisis* that is preventing effective interventions.

- Management of grasslands fall under different government departments. An *inter-ministerial agency* can enable more effective governance

- Grasslands support pastoralist livelihoods, which is a carbon-efficient form of agriculture. It is important to recognise pastoralism as a separate management system and key *to mitigating climate change*.

- There is also a need to devise a *national policy on grassland management* and grazing, that outlines principles of managing grasslands in their own right.

- The socio-ecological complexity of grasslands require *standardised indicators* that facilitate effective decision-making on conservation, restoration and sustainable use of grasslands.

- Initiate long-term *ecological monitoring* programmes to monitor species population, distribution and changing ecological processes in savannah grasslands.

This policy brief focuses on the need for grassland conservation in Maharashtra. Tropical grasslands and savannahs are important for millions of people whose *pastoralist livelihoods* depend on this natural ecosystem. It is home to diverse forms of *wildlife* including the blackbuck and the Great Indian Bustard. Savannah grasslands are also key to addressing *climate change* because they sequester huge amounts of carbon.

Despite these vital benefits and the contribution of grasslands to India's economic and ecological security, *these habitats are declining rapidly*. In fact, they are considered 'wastelands'.

We mapped existing legal frameworks, conducted a detailed stakeholder analysis and *identified high-priority areas* in the state for immediate interventions. We have also compiled a range of implementable and viable recommendations for grassland conservation to become a reality in Maharashtra and in India.

Read the policy brief:

Acknowledgement

Suggested citation:

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Background

1.1. What are savannah grasslands and why are they important for India?

UNESCO defines savannah grasslands as 'land covered with herbaceous plants with 10 - 40% tree and shrub cover' (White, 1983). Globally, they cover about 46% of the land surface and contribute to the livelihood of over 800 million people through supporting pastoralism, dairy sector and the agricultural economy (Murray et al., 2000, Sala et al., 2017). Tropical savannah grasslands support the highest diversity of wild herbivores and carnivores globally (Shankaran & Ratnam, 2013).

These ecosystems (like the ones in India) are also essential carbon sinks, as they sequester significant amounts of carbon below ground (Parr et al., 2014). Grasslands are unique because their below-ground carbon remains stable even after disturbances such as fire and herbivory. Unlike trees, grasses are adapted to sequester carbon in a more water-efficient manner (Parr et al., 2014).

In India, savannah grassland ecosystems cover various biomes (high-elevation *Sholas* in the Western Ghats, low-lying peninsulas, Himalayan plateaus, etc.) and occupy 17% of the geographical area of the country (White et al., 2000). In Maharashtra, these ecosystems (patches of >10 sq.km.) take up over 8% of geographical area, including permanent pastures, grazing lands, and fallow land, according to a recent Open Natural Ecosystem (ONE) mapping study (Madhusudan & Vanak, 2021).
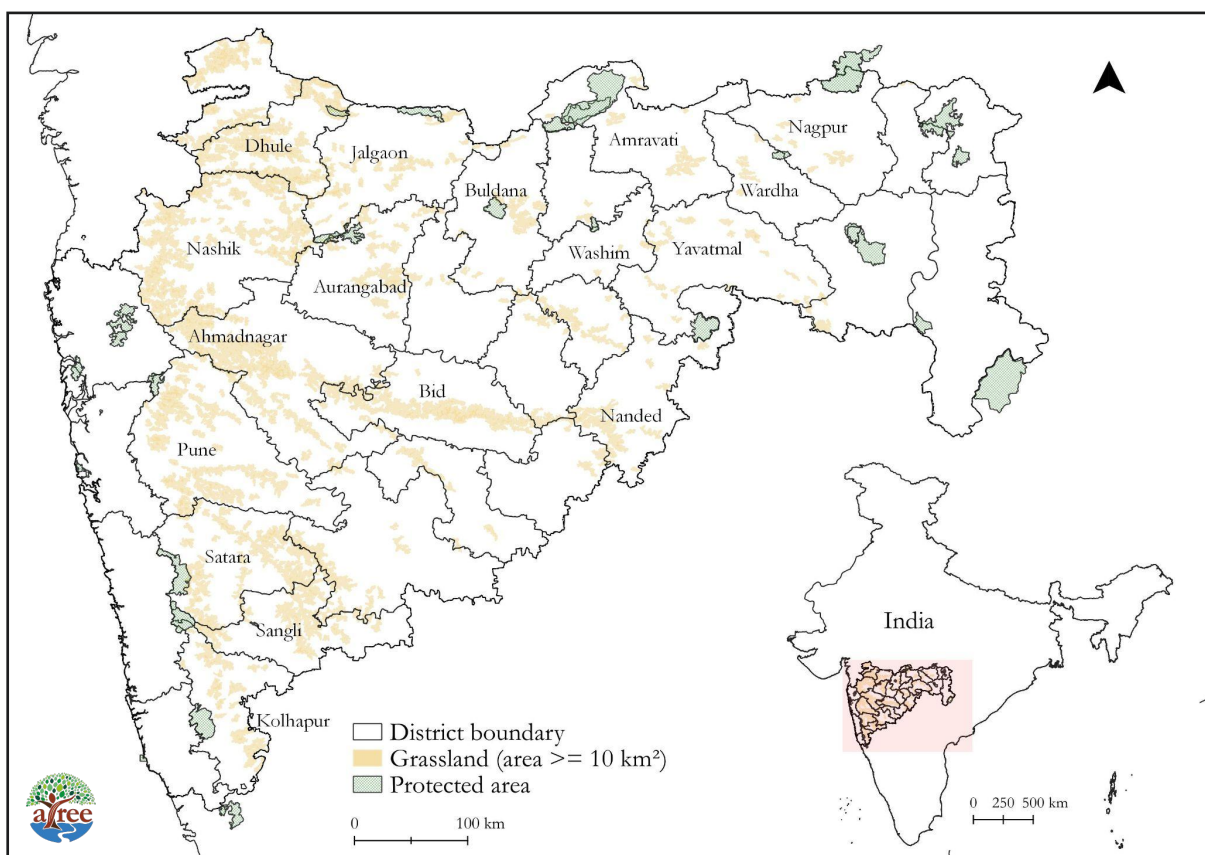

Figure 1: Areas with continuous savannah grasslands patches that are >10 sq.km. occur on 8% of Maharashtra's total area (~24,617 sq. km.)

Indian grasslands come under five categories based on grass species composition and climate (Dabadghao & Shankarnarayan, 1973); these are *Sehima - Dichanthium* grasslands (Peninsular India and the Aravali range); *Dichanthium - Cenchrus - Lasiurus* grasslands (Sub-tropical arid and semiarid region); *Phragmites - Saccharum - Imperata* grasslands (Gangetic plains, Brahmaputra valley, and Punjab); *Themeda - Arundinella* grasslands (Himalayan foothills); and temperate/alpine grasslands (high altitude Himalaya).

Savannah grasslands in India support at least 46 different nomadic and settled pastoralist communities and greatly subsidise agricultural livelihoods (Kishore & Köhler-Rollefson, 2020). Pastoralism-based economies are the backbone of Indian agriculture, contributing 3% to the national GDP and providing employment and livelihood for 70% of the population in rural areas (Kishore & Köhler-Rollefson, 2020). The number of practising pastoralists is estimated to be close to 13 million in India (Kishore & Köhler-Rollefson, 2020), out of which at least 1-2 million are in Maharashtra. The latter includes communities like Hatkar Dhangar,

Shegar Dhangar, Ahir Dhangars, Gavli Dhangar along with Nandgavli, Bharwad, Raika, Kurumar and others.

Indian savannah grasslands are also important for a range of uniquely adapted and threatened biodiversity such as the Indian grey wolf *Canis lupus pallipes*, Great Indian bustard *Aredeotis nigriceps*, Lesser florican *Sypheotides indicus*, Blackbuck *Antilope cervicapra*, Indian fox *Vulpes bengalensis,* Pallid harrier *Circus macrourus,* etc. These species are specifically adapted to open grassland conditions that have existed in India for millions of years.

Despite the contribution of savannah grasslands to the nation's economic and ecological security, these habitats are declining rapidly. The total area under grasslands has reduced from 18 million hectares (mha) in 2005 to 12.3 mha in 2015, as per data the Union Government presented to the United Nations Convention to Combat Desertification (UNCCD) during the 14th Conference of Parties (COP) (Pandey, 2019). Rajasthan, Maharashtra, Karnataka, Gujarat and Uttar Pradesh have undergone severe degradation and loss of grassland ecosystems.

1.2. Why are grasslands declining?

The foremost cause of declining savannah grasslands lies in the practice of recognising an ecosystem's worth based on its tree cover, a misunderstanding that can be traced back to colonial times. Grasslands, though naturally herb and/or grass dominated with fewer trees, are assumed to be barren, owing to their open, sometimes rocky nature. Hence, they have been categorised as 'wastelands' in India (DoLR, 2019). The wasteland category, once applied to

a region, promotes its diversion to agriculture, industry, or plantations.

It is also important to note that a large proportion of savannah grassland habitats in India fall outside the jurisdiction of the forest department and are in the form of private uncultivated or revenue lands. In fact, less than 5% of grassland habitats come under the Protected Area Network in India (Madhusudhan & Vanak, 2022).

Historically, a lot of grassland-like regions were managed under Common Property Resource (CPR) regimes, i.e. community-owned under village *panchayats*, which managed them for livestock or NTFP-based livelihoods. However, these areas come under the jurisdiction of state revenue departments. Due to considerable weakening of CPR legislation and institutions in recent decades, these lands have often been the first to be diverted to infrastructure and agriculture. Ironically, climate change mitigation projects in the form of tree plantations and renewable energy projects like solar and wind farms have also been responsible for the loss of grasslands. A recent assessment shows that over 60% (23,245 sq. km.) of Maharashtra's ONEs are targeted for afforestation through tree plantation projects (Madhusudan & Vanak, 2021).

Given this background, the need of the hour in savannah grassland conservation is a comprehensive policy which recognises these habitats as functional and important ecosystems that leads to better outcomes for biodiversity conservation and local livelihoods.

This policy brief focuses on the need for grassland conservation in Maharashtra. The brief maps international, national, and Maharashtra-specific legal frameworks and strategies that are both favourable and unfavourable for grassland conservation. With detailed stakeholder analysis, the brief further identifies high-priority areas in the state for immediate policy-level interventions and a range of implementable and viable recommendations stated for grassland conservation to become a reality in Maharashtra and in India.

Maharashtra's Savannah Grasslands

2.1. Pastoralists and indigenous livestock

Just like other arid and semi-arid areas of the world and India, parts of Maharashtra have an impressive diversity of pastoralist communities who rear indigenous sheep, goats, cows and buffalos through 'extensive pastoralism' (Please refer to Box 1). Extensive pastoralism depends on movement in open expanses of pastures that support people, livestock and wildlife together, and where human densities are generally low (fewer than 20 people per sq.km. (Galvin et al., 2008)). Maharashtra's extensive pastoralism is dependent on people being able to seasonally migrate between different biogeographic zones of the state, the most important zone being semi-arid savannah grasslands. These grasslands, be it government lands or private fallows, provide naturally growing fodder and water for pastoralist livestock and support their economy. As mentioned before, 13 million practising pastoralists are thought to be present in India. Given Maharashtra's geographic expanse and population, it is safe to say that Maharashtra's grasslands support at least 1-2 million of them.

Box 1: Presence of pastoralist communities in India
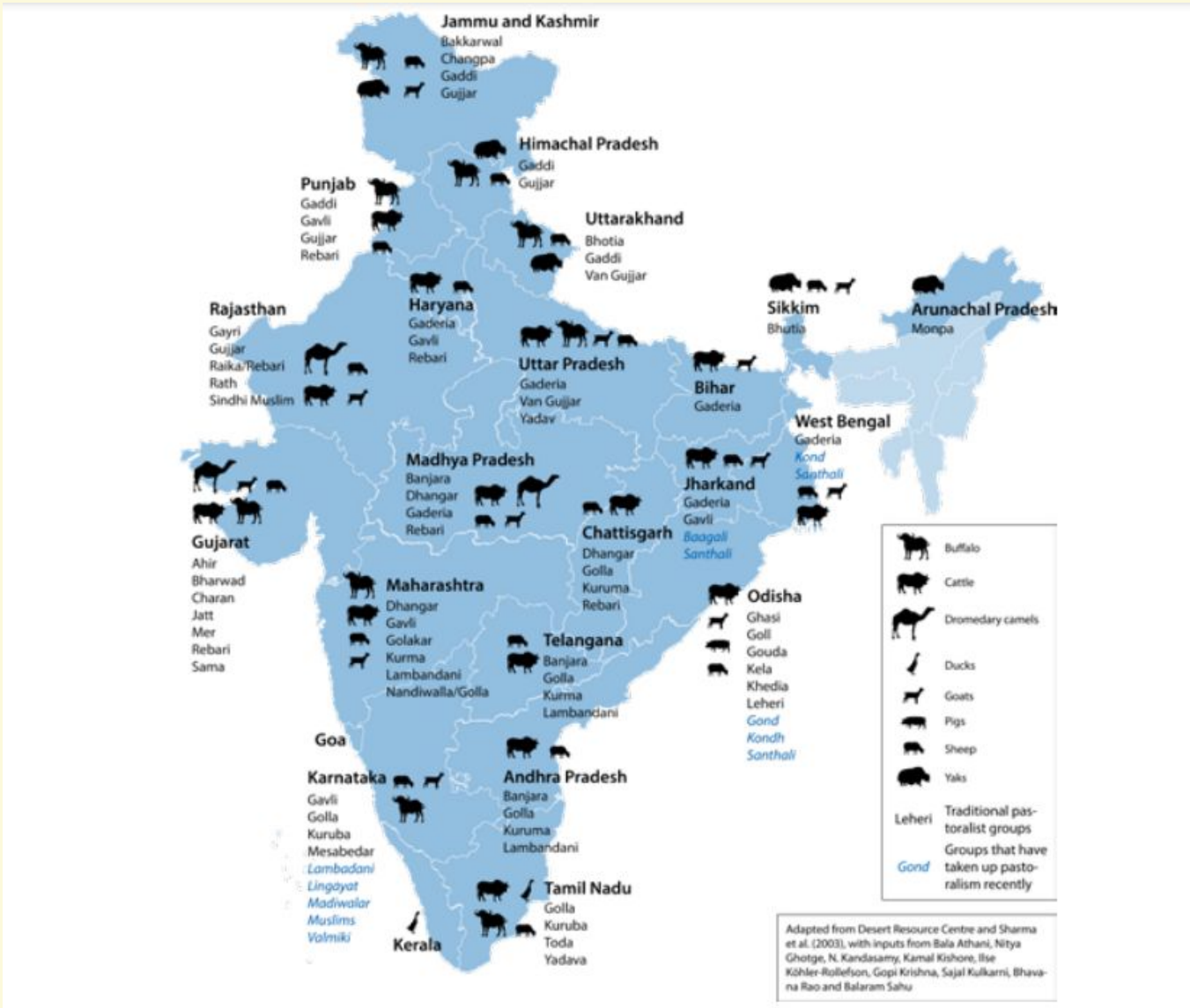
According to LIFE Network et al. 2016, 77% of India's livestock is herded in extensive systems. Livestock production is the backbone of Indian agriculture, contributing 4% to the national GDP and providing employment and livelihood for 70% of the population in rural areas.

It is also estimated that 53% of India's milk and 77% of India's meat production comes from extensive pastoralism.

Image source: Kishore and Kohler-Rollefson, 2020

Maharashtra's pastoralism supports 13 million cattle, 5.6 million buffaloes, 2.7 million sheep and 10.6 million goats (Livestock Census, 2019). Maharashtra's pastoralists rear an impressive number of known indigenous breeds (Table 1) that are adapted to regional climate and contribute greatly to the pool of animal genetic resources, an important component of biological diversity . Open habitats like savannah grasslands enable pastoralists to rear such breeds seasonally.

Table 1: Maharashtra's pastoralists rear an impressive number of known indigenous breeds

Type	Breeds
Cattle	Dangi, Deoni, Deolao, Gir, Khillari, Red Khandari
Buffalo	Jaffrabadi, Marathwada, Murrah, Nagpuri, Pandharpuri, Surti
Sheep	Dakkhani, Madgyal
Goats	Osmanabadi, Sangamneri, Konkan Kanyal, Berari

2.2. Maharashtra's savannah grassland biodiversity

The grasslands of the Indian peninsular region of Maharashtra host a variety of wildlife which includes a number of habitat-specific flora and fauna, the latter belonging to taxa such as arachnids, amphibians, insects, reptiles, mammals, and the avifaunal diversity (Carricondo-Sanchez et al., 2019; Nerlekar et al. 2022). This existing diversity includes a number of species flagged as Threatened, Endangered, or Critically Endangered under the current IUCN Red List. A few of these species are included under the top two schedules of the Wildlife Protection Act, 1972. viz. Indian gazelle, Blackbuck, Golden jackal, Bengal fox, Indian grey wolf, Lesser florican, Great Indian bustard, etc.

Additionally, a total of 436 plants belonging to 259 genera and 67 families have been reported from Maharashtra's grasslands, including 22 endemic taxa and around 67 different species of grasses (Janakiraman & Jalal, 2015). Research on grassland-specific biodiversity has provided evidence that their populations are increasingly affected as grassland habitats are being diverted (Ishtiaq et al., 2011; Katna et al., 2021; Jhala et al., 2022)).

We have identified and listed the following species of conservation concern, based on their status in India's Wildlife Protection Act,1972, or the IUCN Red List of Threatened Species, or the State of India's Birds Report 2021. This includes 9 bird species, five mammals, and a group of savannah grassland specialist fan-throated lizards, *Sitana spp (Sitana laticeps, Sitana ponticeriana, and Sitana spinaecephalus)*.

The Great Indian bustard, a flagship species of India's savannah grasslands, is categorised as Critically Endangered by the IUCN and is under Schedule-I in India's Wildlife Protection Act, 1972, thus given the highest conservation priority. Till recently, the semi-arid savannahs of Maharashtra was a stronghold of this species.

The Indian grey wolf is the flagship mammalian carnivore of Indian savannah grasslands. This large carnivore has been found to have a unique genetic lineage compared to grey wolves across the rest of the world (Sharma et al., 2004; Hennelly et al., 2021). Categorised as Schedule-I species in the Wildlife Protection Act, 1972, the Indian wolf has been provided with equal legal protection as the tiger.

However, its population is believed to be less than that of the tigers in India — a rough estimate suggests that there are currently around 3,000 Indian grey wolves in India (Jhala et al., 2022), and breeding populations have been documented in Maharashtra. Open scrub and savannahs of Maharashtra are among the last remaining habitats known to support a sizeable population of this species. The blackbuck and chinkara are the major wild prey of Indian wolves here, although wolves subsist mainly on small livestock.

Lesser-known carnivores such as the carnivores such as the striped hyena and Indian fox are also important fauna of these savannah landscapes. Apart from birds and mammals, the open savannahs of Maharashtra are important habitats of a unique and brightly coloured group of reptiles known as fan-throated lizards of genus Sitana .

Steppe eagle Aquila nipalensis, and tawny eagle Aquila rapax have been declared as Endangered and Vulnerable as per the IUCN Red List. These eagle species are specialists to open savannah grasslands and are widely distributed in ONEs of Maharashtra. The recent State of India's Birds' report shows a strong decline in the population of tawny eagles across the country.

Pallid and Montagu's harrier species are both important grassland birds of prey which migrate from North Asia to India each year. The pallid harrier is a near-threatened species. They play an important role in the ecosystem by efficiently controlling the population of small mammals and orthopterans thereby providing agricultural ecosystem services. Scattered grassland patches of Maharashtra are important roosting ground of these winter migratory species.

Rain quail	**Chestnut bellied sandgrouse**	**Striolated bunting**	**Blackbuck**
Ashy Crowned Finch Lark	**White Bellied Minivet**	**Fan Throated Lizard**	**Lesser Florican**

Illustrations by Sarayu Neelakantan

The rufous-fronted prinia was once a common passerine bird found in the dry scrub and savannah of India. The State of India's Birds report recently pointed out a strong decline in its population across its range.

Chestnut-bellied sandgrouse, lesser florican, painted sandgrouse, and Indian courser are some of the other important birds adapted to grassland conditions.

2.3. History of Maharashtra's grasslands

Maharashtra's pastoralism has adapted to make use of lands that cannot be easily cultivated due to their topography and water availability. In that sense, it has always been a low-intensity livelihood which relies on migration between geographies to make use of available rainfall. However, historical information on different management systems that grasslands were subject to is very fragmented and sparse. For instance, in parts of western Maharashtra, the conservation of grasslands was mainly by powerful families, whose reserved lands were termed *kuran*. There are records of employment of meadow guard (kurnya) in the later Peshwa period (Ogawa, 2015). Apart from supplying fuel and fodder, they were also useful as hunting reserves or parks (*ramna*) (Ogawa, 2015). *Kurans* were also important for cavalry during the rule of Shivaji and the Peshwas in western Maharashtra. Guha (2002) mentions that Peshwa Bajirao II had issued an order that an area in Pune district be maintained as a *kuran* for their horses.

Oral and written records exist of the agreements and conflicts between mobile pastoralists (sheep herding Dhangars) and the villagers and also orders by the rulers (Peshwas) regarding use of the grazing lands (Guha, 2002). Guha (2002) has described how pastures and the fodder that emanated from

them were often a source of conflict between communities and also between local people and the army of the rulers. Even before British rule, local rulers often declared reserve pastures for fodder collection and hunting or gave grants of such land to favoured individuals.

Later, the colonial forest department used savannah grasslands in two ways. Wherever cultivable soil was available, these areas were gradually converted to plantations for timber extraction. However, some grasslands were also categorised as 'pastures'. In an 1894 circular concerning management of areas, the colonial administration allowed the use of these pastures for limited local benefit (Joshi et al., 2011). Prior to the 1840s and before the imposition of cotton cultivation in the Berar region of Vidarbha by the British, there existed pastoralism which reared the indigenous Berar cattle on prime pastures (Satya, 2004).

Multiple records such as the ones above indicate that Maharashtra has a history of grassland management for people's livelihoods, cavalry and game animals.

2.4. Current management and governance

Land and forest management in India comes under the Concurrent List; thus both the state and central governments hold the power and responsibility for managing land resources. Management authorities are divided into four major categories based on dedicated authorities: the gram panchayat, state government, central government, and non-government entities such as civil society organisations. Together, these authorities share the responsibility of managing different forms of grassland for their respective targeted activities such as biodiversity conservation, industrialisation, or other forms of revenue generation. The course of the activity depends on the concern and objective of three major land ownership regimes; forest department land, revenue department land, and privately-owned land.

Forest department land

The Territorial and Wildlife wings of the Forest Department are in charge of managing grasslands which come under their jurisdiction. Most grasslands are under the Territorial wing (Reserve Forests). Protected Areas that are dedicated to biodiversity conservation, cover hardly 5% of Maharashtra's grasslands. Reserve Forests of Maharashtra have over the decades been used for afforestation activities where CAMPA (Compensatory Afforestation Fund Management and Planning Authority) funds, supplemented by MGNREGA funds, are invested to increase forest cover. Eight percent of Maharashtra's reserve forest lands that were under pasture till 1994 (kuran development circles) were meant for the benefit of village communities village communities (Gogate & Mohan, 1994). Over time, these have also been diverted for afforestation making all reserve forests set aside for plantation activity funds. Moreover, Reserve forests are supposed to create local beneficiaries through Joint Forest Management Committees (JFMCs). But when savannah grasslands are afforested, their benefit to people may may reduce if the lands become inaccessible for pastoralism. JFMCs may also become dysfunctional in such a scenario (Lele, 2014).

Revenue department land

Savannah grasslands under revenue lands mostly fall in the category of village common lands, locally locally called gairaan. In some regions of Maharashtra, village common lands still have intact grasslands, thanks to their maintenance as fodder areas under legal provisions like Maharashtra Land Revenue Code, 1966 and Maharashtra Grazing Policy, 1968. However, in in parallel, the Wastelands Atlas's category of 'culturable wasteland' (Saigal, 2011) includes the same village commons. Hence, the diversion of such lands to industry and infrastructure projects is legitimised through an ecologically and socially flawed discourse around 'poor quality' of land. During the land reform movement, which aimed at equitable distribution of cultivable land, only limited agricultural land was

available for giving away to the poor. The above revenue lands were then distributed to farmers/landless marginalised groups for agriculture by handing over 'pattas' or

cultivation rights. This led to gradual but long-term diversion of grasslands for agriculture.

Private land

A large proportion of grasslands in Maharashtra are in the form of private fallow lands which cannot be cultivated because of factors like hilly terrain, lack of water availability, inability of landowner to invest in agriculture, etc. Such areas remain vulnerable to diversion to other uses, especially if they are categorised as 'wasteland' in the Wasteland Atlas. For eg. in western Maharashtra, uncultivated savannahs are often chosen for setting up Special Economic Zones and for large-scale renewable energy projects such as solar parks through rapid acquisition.

In western and central Maharashtra, where grasslands have been gradually cultivated through irrigated water, water-intensive cropping under sugarcane is often incentivised. The Commission for Agricultural Costs and Prices report of 2013 states that Maharashtra's sugarcane crop in semi-arid regions is inefficient in water usage given the input to output ratio. This has been corroborated by studies that suggest Maharashtra should reduce

area under sugarcane cultivation in dry regions owing to high water consumption (Gulati and Mohan, 2018). This has been corroborated by studies that suggest Maharashtra should reduce area under sugarcane cultivation in dry regions owing to high water consumption (Gulati and Mohan, 2018). Such diversion of grasslands to intensive land uses, especially when under private ownership has also caused a rapid decline in Maharashtra's grasslands.

As a result of the multifaceted uses of savannah grasslands — industrial sector expansion on wastelands, increasing forest cover, and protecting endemic biodiversity — an overlap in management is inevitable. However, the concern of pastoral communities is not represented adequately in the represented adequately in the management even even though these are the people who directly depended on grasslands for their livelihoods. A mechanism is needed for coordination between different stakeholders.

Policies and Institutions Involved in Grassland Conservation

Existing international commitments and obligations, national level policies and legislations, as well as state-level schemes, policies and programmes provide an enabling framework within which to expand capacity for institutions and processes for grassland

conservation in India. While some of these may not address conservation of grasslands directly, they provide the supporting policy infrastructure and direction to guide and support grassland conservation.

3.1. International commitments and agencies as drivers

International agencies such as the UN and its subsidiaries often have an impact on national policies through their resolutions or mandates. International agencies such as the UN and its subsidiaries often have an impact on national policies through their resolutions or mandates. The declaration of the International Year of Rangelands and Pastoralists (2026) (2026) by the United Nations, while not a binding international commitment, highlights the ecological as well as socio-economic importance of the ecosystem and the people dependent on it for their livelihood, culture, and identity. The Strategic Plan for Biodiversity under the Convention of Biological Diversity (CBD) under the Convention of Biological Diversity (CBD) additionally sheds light on conserving different ecosystems that contribute to the conservation of biodiversity.

The UN Decade on Ecosystem Restoration (2021-2030) offers multiple opportunities for the same at the national level. India's commitment to the Paris Agreement 2015 of increasing carbon sequestration by creation of a carbon sink of 2.5 to 3 billion tonnes through additional forest and tree cover by 2030.

creation of a carbon sink of 2.5 to 3 billion tonnes through additional forest and tree cover by 2030, and to UNCCD to restore 26 million hectares of degraded land by 2030, and to Sustainable Development Goal 15, which focuses on biodiversity conservation by 2030, provide enabling conditions enabling conditions for conservation and restoration of its grasslands. To ensure that the state respects the treaties and oversees internal implementations, the Constitution directs the legislature to shoulder the responsibility of admittance of international law into the Indian legal system in Article 51 and Article 253; the constitution defines the power of the legislature to make laws accordingly. As explained in the previous sections, conserving and restoring grasslands to enhance livelihoods, sequester carbon, and conserve biodiversity will be a strong enabler for India to meet these international commitments. As explained in the previous sections, conserving and restoring grasslands to enhance livelihoods, sequester carbon, and conserve biodiversity will be a strong enabler for India to meet these international commitments.

3.2. National acts, policies and action plans

At the national level, there exist laws, policies and schemes that lay down the legal framework for the governance of forest lands, biodiversity and wildlife. These also determine the use and access to the resources on such lands. In Article 48A, the Indian Constitution obligates the State to conserve, enhance, and preserve the country's forests and wildlife through Directive Principles of State Policy. Complementing the state's obligation is elucidated in the

Fundamental Duties for citizens to protect and enhance the biodiversity of forests, streams, rivers, and wildlife in Article 51A. The Indian Forest Act, 1927, the Wildlife Protection Act, 1972 and the Forest Conservation Act, 1980 provide the legal framework for the governance of forests through categories and definitions that may encompass grassland ecosystems on ground. This has implications for grasslands in terms of the kinds of programmes that are

carried out on classified lands. The Environmental Protection Act, 1986 and CAMPA are examples of legislations that impact land-use and determine the diversion of resources for various other uses. While diversion of forest land is acceptable for certain uses such as 'green energy' and renewable energy projects and are exempted from Environmental Impact Assessments, such projects may negatively impact grasslands and the biodiversity present within them. ONEs, often seen as unproductive lands, are converted to renewable energy parks such as solar parks. This however has adverse effects on the ecology of grasslands as well as local communities (Madhusudhan and Vanak, 2022).

The Task Force report on Grasslands and Deserts (2006) submitted to the Planning Commission was a well-meaning report that acknowledged 'Grasslands and deserts are the most neglected ecosystems by the Ministry of Environment and Forests, which looks after biodiversity conservation in India'. The Task Force recommended a National Grazing Policy, along with other policies and programmes aimed at research and conservation of grasslands in India.

In April 2021, the Supreme Court recognised the criticality of protecting Great Indian Bustards of grasslands of Gujarat and Rajasthan, where overhead power lines laid down for renewable energy projects led to many being electrocuted, and ordered the relevant authorities to lay power lines underground in the future. In the same year, the National Green Tribunal ordered all encroachments to be removed from Gujarat's Banni grasslands within six months, clearing

the way for the community's long-going fight to claim the rights of grasslands under the community Forest Rights Act (FRA). Thus, legally, there are accounts of the courts recognising the biodiversity, communities, and ecological values of the grasslands.

The FRA provides Scheduled Tribes and other forest dwelling communities the right to own, access and use forest resources, while PESA extends the scope and functioning of Gram Sabhas in Scheduled Areas which were not previously covered by the Panchayati Raj Act, 1993. This relates to decentralisation of forest governance and ensuring that local communities are able to govern natural resources they depend on for their lives and livelihoods.

The state level programmes in Maharashtra also influence or alter the existence of grasslands in Maharashtra. Certain state-level schemes for plantations, afforestation, and protection of grassland patches have been traced as well since these alter grassland ecosystems and its function as a habitat for a variety of species. This also relates to how access to grassland patches by communities dependent on them is curtailed though such programmes.

The policy maps below (Figures 2 and 3) provide a picture of the enabling policy and legal environment for the protection of grasslands in India. These include international commitments and obligations, national level policies and legislations, as well as state-level schemes, policies and programmes that align with or can be leveraged to facilitate grassland conservation, along with those that may prove to be challenging for grassland conservation.
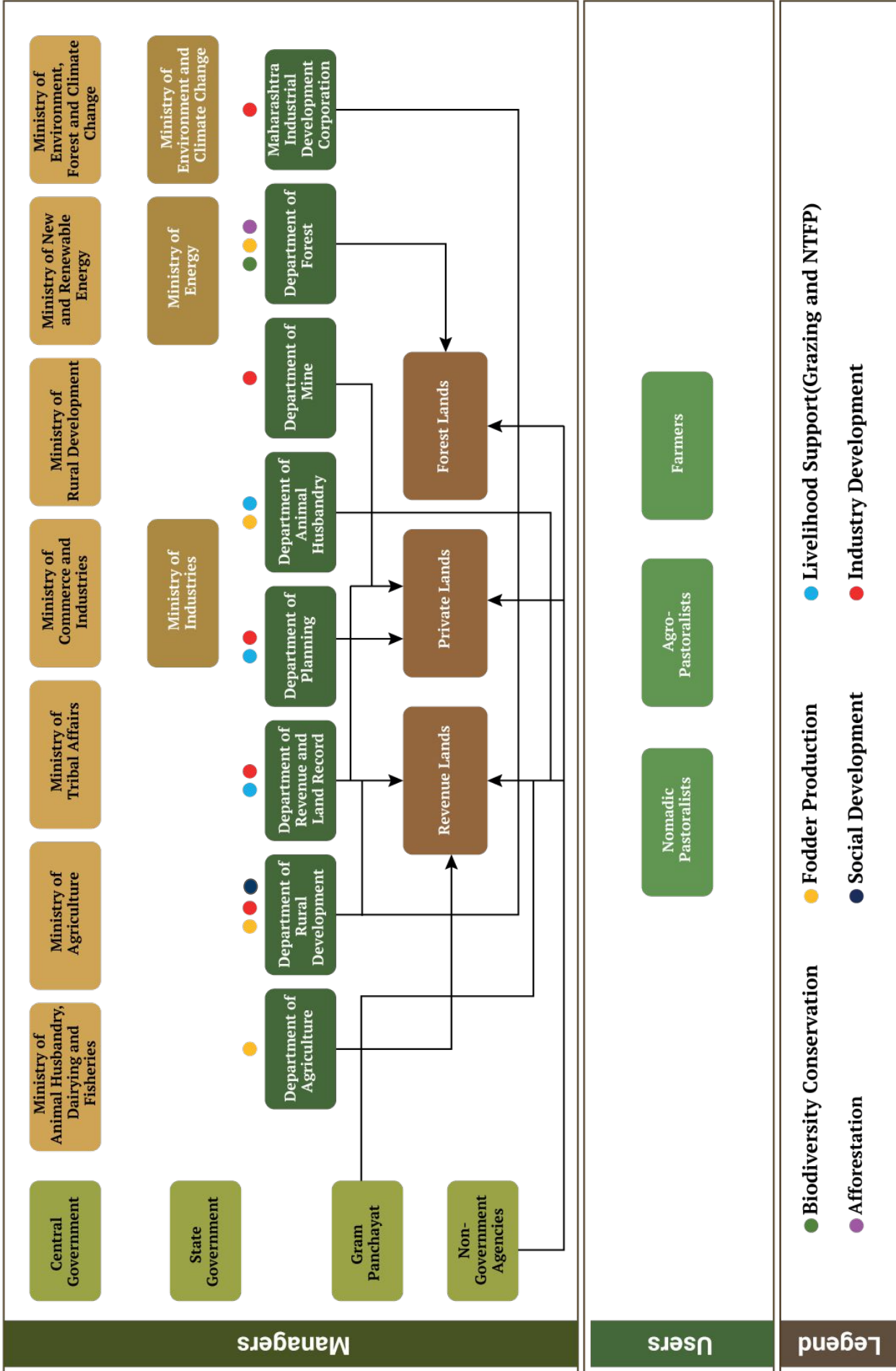
Figure 2: *Stakeholder map showing i) Managers: different government and non-governmental agencies arranged (top to bottom) based on the hierarchy of decision-making; and ii) Users: Direct end-users of the landscapes. The connecting arrows show the type of interventions (shown in the legend) made by each stakeholder in different land types.*

National Policies

- National Forest Policy 1952
- National Forest Policy 1988
- The Integrated Wasteland Development Programme, 1989-90
- National Conservation Strategy and Policy Statement on Environment and Development, 1992
- National Policy and Macro-level Action Strategy on Biodiversity, 1999
- National Land Use Policy, 1988
- National Environment Policy (2006)
- National Wind-Solar Hybrid Policy, 2018

National Action Plans & Programmes

- The Desert Development Programme, 1977-78
- National Afforestation Programme, 2000
- National Wildlife Action Plan (2002-2016)
- National Bamboo Mission, 2006-2007
- Integrated Development of Wildlife Habitats, (2007-2012) - Recovery of Endangered Species
- National Action Plan on Climate change, 2008
- Species Recovery Programme, 2008-00
- National Environmental Action Plan, 2008
- Integrated Watershed Management Programme, 2009
- National Biodiversity Action Plan (2009)
- National Livestock Mission, 2014-15
- Green India Mission, 2015
- National Solar Mission, 2015

Maharashtra-specific Legislations

- Maharashtra Industrial Development Act, 1961
- Maharashtra Private Forest (Acquisition) Act, 1975
- Maharashtra Biological Diversity Rules, 2008

Action Plans

Mapping Acts, Policies and Stakeholders

Maharashtra

- Maharashtra Wildlife Action plan (2021-30)
- Maharashtra Forest Policy 2008
- Maharashtra Biological Diversity Rules, 2008
- Van Mahotsav Scheme - NAP
- Vasantrao Naik Scheme - Plantation Scheme
- Social forestry Nurseries, Tree Credit Scheme - Increase Green Cover in Non-Forest Region
- Tree plantation and conservation under sustainable development goals (Goal -15 - Life on land) State Scheme
- Forest Meadow and Fodder Area Development Program
- Maharashtra Industrial Policy, 2019
- Maharashtra Forest Policy 2008
- Maharashtra Forest Rules, 2014

Policy Map

International Commitments and Obligations

- The Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972
- The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) 1973
- UNEP 1976
- Man and Biosphere Programme (MAB) 1986
- Intergovernmental Panel on Climate Change (IPCC) 1988
- The Convention on Biological Diversity (CBD) 1992
- The Cartagena Protocol on Bio-safety 2000
- The Nagoya Protocol 2010
- Strategic Plan for Biodiversity 2011-2020 and Aichi Biodiversity Targets
- The United Nations (UN) has declared 2026 the International Year of Rangelands and Pastoralists

National Legislations

- Waste Lands (Claims) Act 1863
- Indian Forest Act 1927
- Wildlife (Protection) Act, 1972
- Forest (Conservation) Act 1980
- Environmental Protection Act 1986 - Ecological Sensitive Zones
- Protection of Plant Varieties and Farmers' Rights Act 2001
- National Biological Diversity Act (2002) and Rules (2004)
- Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act 2006
- Provisions of Panchayats (Extension to the Scheduled Areas) Act, 1996.
- The Compensatory Afforestation Fund Management and Planning Authority (CAMPA) Act
- National Green Tribunal Act 2010
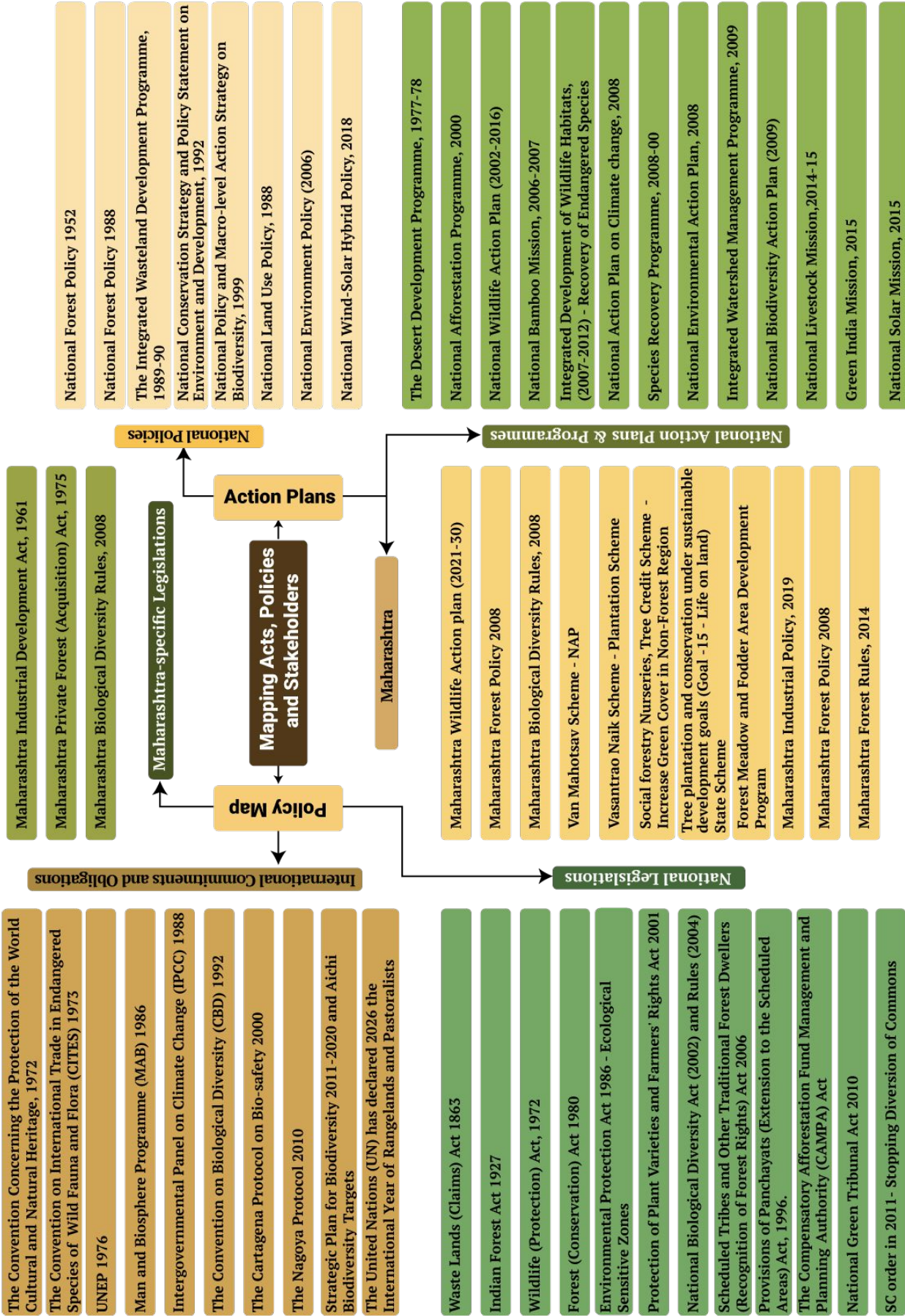- SC order in 2011 - Stopping Diversion of Commons

Figure 3: Policy map depicting policy framework influencing grassland conservation in India. It provides the enabling policy and legal environment for the protection of grasslands in India, including international, national and state level commitments.

Prioritisation Exercise to Identify Conservation Areas
(for biodiversity and pastoralists)

In order to identify grassland areas that should be prioritised to achieve the goal of biodiversity conservation and agro-pastoralists' welfare as well as those that must not be diverted for other purposes, we have carried out a prioritisation exercise using *Ecological Niche Modelling using MaxEnt* (methodology in Annexure). We developed a high-resolution map (Figure 4) that depicts important biodiversity hotspots and critical grazing grounds of pastoral communities to sustain their livelihood in Maharashtra's ONEs.

Biodiversity hotspots were identified by stacking the distribution maps of different conservation priority species generated using Ecological Niche Modelling tools (See Annexure). Based on the number of species occupying a particular zone, we identified areas of high priority for conservation. The map was later overlayed with a layer of important migratory routes and sites of significance for different pastoral communities.
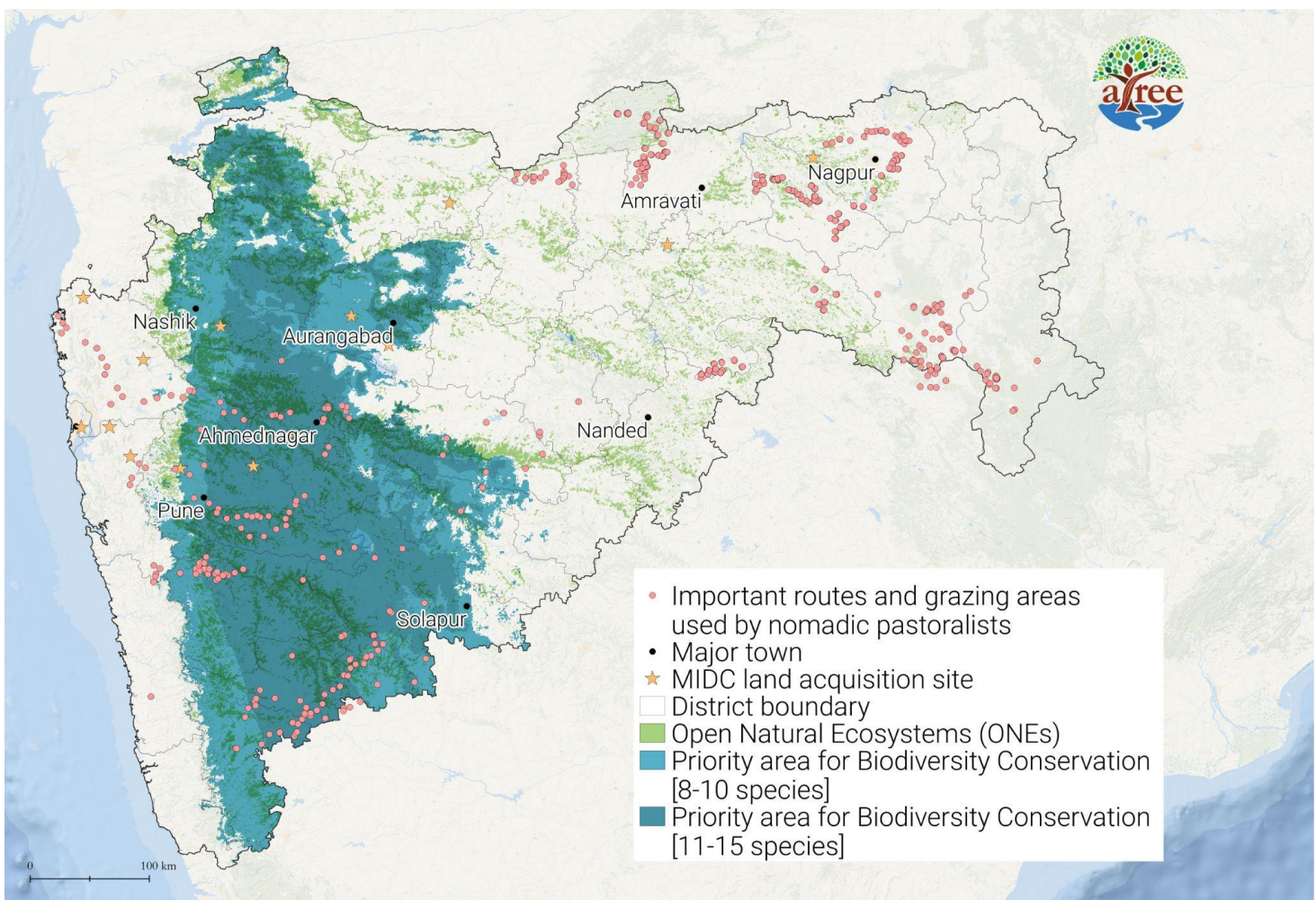

Figure 4: Map of priority areas for conservation of grassland specialist species in Maharashtra. The color gradient from light blue to dark blue shows areas of high (for 8-10 species) to extremely high (for 11-15 species) conservation priority.

This map was prepared by the ATREE-Ecoinformatics Lab on September 28, 2022. Pastoralist routes and grazing data is sourced from the Centre for Pastoralism (CFP) and the ONE layer is from Madhusudan and Vanak (2022). The base layer is Esri Terrain.

A total of 108,375 sq. kms. have been identified as high priority areas based on the number of conservation-important grassland species that are present. Of these priority zones, 38,415 sq. kms. falls under ONEs that need to be targeted in action plans for biodiversity conservation and livelihood of pastorals.

Ahmednagar, Pune, Solapur, Nashik, and Satara are the districts holding more than 10,000 sq. kms. of high conservation priority areas. ONEs of these areas must not be diverted to any land cover change as these are the areas important for more than eight species of conservation concern described in the Annexure A.

Similarly, Thane, Pune, Ahmednagar, Beed, Satara, Solapur, Kolhapur, Sangli, Buldana, Amravati, Nagpur, Wardha, Yavatmal, Nanded, and Chandrapur holds important grazing grounds for the pastoral community. Acquisition sites identified by the Maharashtra Industrial Development Corporation (MIDC) falling under priority areas need reconsideration.

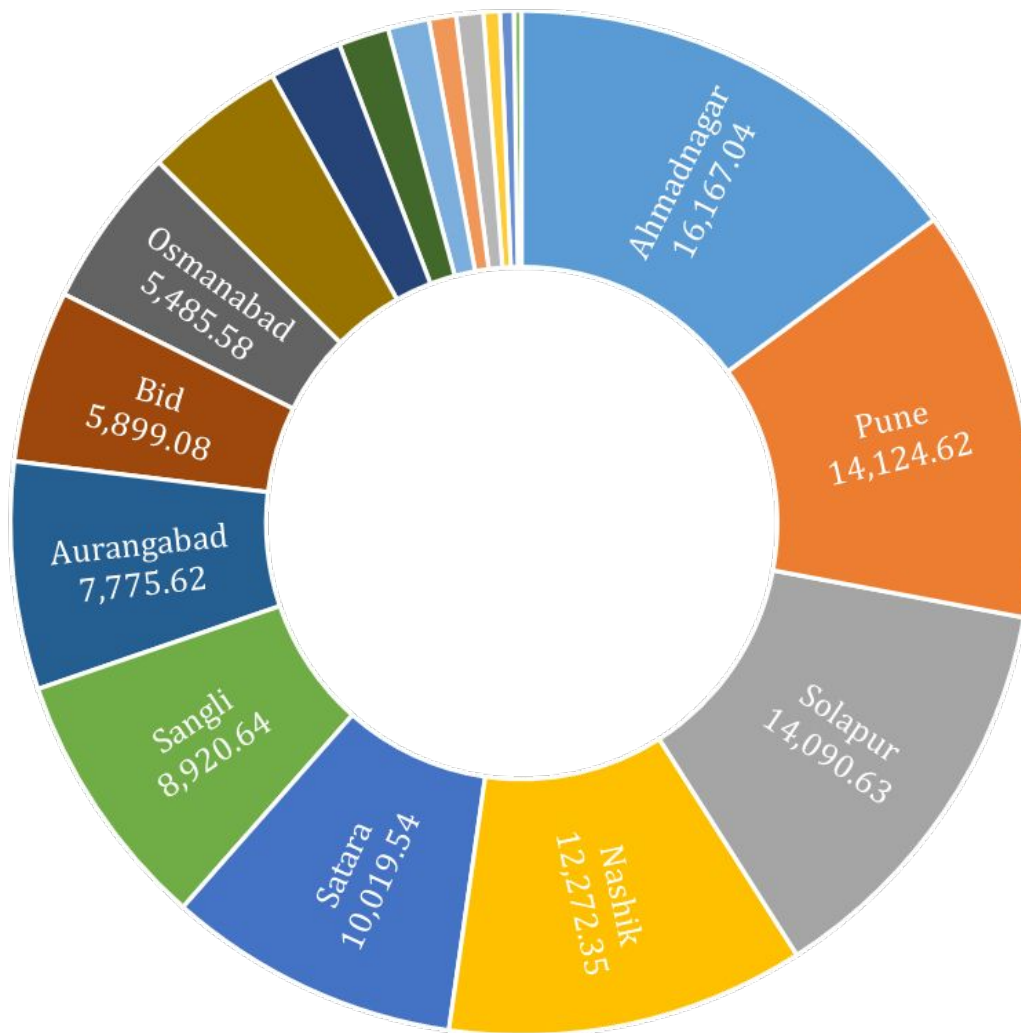Table 2 contains details of the district-wise priority areas identified.

Figure 5: Top districts of Maharashtra based on the occurrence of high priority zones (area in sq. km.) in each district

Table 2: High-priority zones and areas under ONEs overlapped in each district of Maharashtra. Areas under ONE's need to be targeted for conservation.

District	High Priority Area (sq. km)	ONE	ONE Cover (%)
Ahmadnagar	16,167	3,599	21
Pune	14,125	3,472	22
Solapur	14,091	1,243	8
Nashik	12,272	4,459	29
Satara	10,020	2,686	26
Sangli	8,921	1,886	22
Aurangabad	7,776	1,365	13
Bid	5,899	2,010	19
Osmanabad	5,486	508	7
Kolhapur	4,829	1,537	20
Dhule	2,499	2,648	36
Buldana	1,725	933	10
Nandurbar	1,410	1,757	29
Jalna	930	388	5
Jalgaon	928	1,488	13
Latur	562	374	5
Amravati	469	910	7
Akola	130	266	5
Wardha	81	490	8
Raigarh	35	17	0
Hingoli	14	740	15
Thane	6	34	1
Yavatmal	2	1,893	14
Parbhani	1	395	6

District	High Priority Area (sq. km)	ONE	ONE Cover (%)
Ratnagiri	1	21	0
Bhandara	0	100	3
Chandrapur	0	345	3
Garhchiroli	0	3	0
Gondiya	0	1	0
Nagpur	0	815	8
Nanded	0	1,518	14
Sindhudurg	0	34	1
Washim	0	480	93

Picture credit: Kalyan Varma

Policy Recommendations

This policy brief offers the following recommendations for developing an effective management plan for grassland conservation in India, specifically for Maharashtra.

1. Address the identity crisis: Grasslands are not wastelands

The grasslands of India harbour immense ecological, social and cultural value and must be valued at par with other ecosystems such as forests. However, as of today (most) grasslands in the country are categorised as 'wastelands' and do not get desired protection. Amplifying the scientific evidence that shows grasslands' ecological value is key to replacing misplaced narratives. While quantifying the value of grasslands can be complex, it must be accounted for while forming conservation policy. To do so, policy makers must look beyond a 'productivity' discourse, and move towards an 'ecological discourse'.

2. Create an inter-ministerial agency for governance

As mentioned before, grasslands fall under three types of governance- under the Forest Department, Revenue Department (especially, Gairaan) and Private lands. There needs to be a multi-sectoral agency that coordinates and drives management of grasslands with necessary representation from key ministries such as Forest (including wildlife divisions), Animal Husbandry, Rural Development, Science and Technology, and Agriculture.

3. Recognise pastoralism as a separate management system and its importance to mitigate climate change

Pastoralism is not recognised as a separate management system in India (Kishore & Köhler-Rollefson, 2020). Pastoralism is being sustained more because of the non-feasibility of agriculture rather than a concerted effort to facilitate this livelihood. This needs to change. A recent circular by the Ministry of Fisheries, Animal Husbandry and Dairying (R-440485/23/2020-DADF Dept (E-18009) Dated 23 Aug 2022) states that assistance be given to pastoralists under various schemes and the Maharashtra state government is a recipient of this circular. The Food and Agriculture Organization (FAO) of the United Nations describes extensive pastoralism as a dryland protein production system which has learnt to overcome environmental variability which otherwise does not support large scale farming naturally (Report on Pastoralism and Variability in 2021). This is a low-input and carbon-efficient way in which these grasslands can be utilised for human benefit.

However, pastoralists are turning towards agriculture in the era of climate change and erratic weather patterns, increasing livelihood vulnerability. Extensive pastoralism should be given more assistance and support in the time of climate change along with social security measures like mobile education and mobile healthcare for livestock and people.

4. Devise a Grassland Management and Grazing Policy

India's 'Draft Grazing and Livestock Management Policy (1994)', and 'Draft National Policy for Common Property Resource Lands (CPRLs)'can be effective if implemented properly. However, there is also a need to devise a national policy on grassland management and grazing, that outlines principles of managing grasslands in their own right. This has also been recommended by the report of the Task Force on Grasslands and Deserts (Planning Commission, 2006). This policy needs to be specific for savannah grasslands under different governance structures i.e. for Forest, Revenue and Private.

5. Develop archetypes to describe degradation and restoration of savannah grasslands

The socio-ecological complexity of grasslands require standardised indicators that facilitate effective decision-making on conservation, restoration and sustainable use of grasslands. The indicators must consider the local environmental conditions, global and local drivers of change, and their social and ecological impacts, as well as broad management and restoration objectives and the cost-effectiveness of such strategies.

6. Initiate long-term ecological monitoring programmes to monitor species population, distribution, and changing ecological processes in savannah grasslands

The unique biodiversity of India's savannah grasslands has long been undervalued due to reasons described in this policy brief. Studies have shown that lack of research and scientific attention has resulted in missing out on a higher potential for endemism in these ecosystems. 43% of its endemic plant diversity has only been described in the last two decades (Nerlekar et al., 2021). There is a need to initiate long-term ecological monitoring programmes to document and understand the biodiversity and ecological changes in these threatened ecosystems, so that appropriate measures can be taken to protect and restore these ecosystems, so that appropriate measures can be taken to protect and restore these ecosystems.

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Annexure

Ecological Niche Modelling using MaxEnt

Maxent is the most commonly used program to predict the spatial distribution of a species based on presence-only records. It uses ecological niche modelling (ENM) to generate a probabilistic map of species distribution based on the relationship between species presence records and different climatic and geographic variables such as temperature, rainfall, slope, elevation, etc.

Presence records for each selected species were obtained either through direct field data collection on the ground or through different data repositories such as Ebird, GBIF, and India biodiversity portal. Thousands of locations were obtained for different species. To avoid spatial autocorrelation, we filtered the total number of locations to be used for modelling using the thinning tool in 'spThin' package in R. Distance vale between two locations for the thinning process were decided based on the home range of the target species.

Bioclimatic variables to predict species distribution were obtained from worldclim.org with a spatial resolution of 1km (30 Sec). We first generated the Correlation matrix of the occurrence location and climatic variable to filter autocorrelated variables. Climate variables correlating less than 0.7 was considered for further modelling.

We used 'ENMeval' package in R to build a series of candidate models to define a relationship between species occurrence and climatic variables. The model with the lowest AIC value was selected as the best fit model and used to tune features and regularised multiplier settings in Maxent. The output map of the high probability area of species presence was generated using the 10th percentile training presence logistic threshold value (table A.1).

Table A.1: List of identified priority species, number of locations for each species used for modelling distribution, thinning radius, and 10th percentile training presence logistic threshold value.

Species (Common name)	Category	Before Thinning	After Thinning	Home Range (radius in km)	Threshold
Chestnut-bellied sandgrouse	Bird	816	121	5	0.29
GIB	Bird	30	11	5	0.39
Indian Courser	Bird	1010	224	2	0.32
Montagu Harrier	Bird	1867	289	5	0.34
Painted sandgrouse	Bird	317	81	5	0.34
Pallid Harrier	Bird	1634	304	5	0.33
Rufous fronted Prinia	Bird	388	130	1	0.21
Steppe Eagle	Bird	1307	128	5	0.13
Tawny Eagle	Bird	401	109	5	0.16
Wolf	Mammal	218	20	5	0.14
Hyena	Mammal	84	16	5	0.22
Chinkara	Mammal	115	22	5	0.31
Indian Fox	Mammal	20	9	2	0.43
Blackbuck	Mammal	19	10	5	0.39
Fan throated lizard	Reptile	13	9	1	0.44

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