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Insect fauna of Kaylana Lake and surroundings, Jodhpur, Rajasthan, India

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Abstract
Kaylana Lake, located in the semi-arid region of Jodhpur, Rajasthan, represents an important freshwater wetland within the arid landscape of the Thar Desert. The present study documents the insect faunal diversity of Kaylana Lake and its surrounding habitats, including open water zones, lake margins, rocky outcrops, scrub vegetation and human-modified areas. A total of 85 insect species belonging to 8 orders, 25 families and 68 genera were recorded. *Coleoptera* was the most dominant order, followed by Hymenoptera and Lepidoptera. The diversity and distribution of insects reflected habitat heterogeneity and the availability of aquatic and terrestrial microhabitats in the semi-arid environment. Although the area faces increasing anthropogenic pressures, the persistence of diverse faunal assemblages indicates the resilience of this wetland ecosystem. This study provides the first information on insect diversity from this region and will support future biodiversity monitoring and conservation planning in arid-zone wetlands.

Keywords: Insect fauna, diversity, semi-arid ecosystem, Kaylana Lake, Jodhpur, Rajasthan

Introduction

Insects constitute the most diverse group of organisms on Earth and play a fundamental role in maintaining ecosystem structure and function through processes such as pollination, decomposition, nutrient cycling and regulation of trophic interactions (Wilson, 1987; Gullan & Cranston, 2014) [18, 9]. Documenting insect diversity is therefore essential for understanding ecosystem health, particularly in semi-arid and arid landscapes, where biodiversity patterns are strongly influenced by climatic variability and habitat heterogeneity (Parmesan *et al*., 2000) [13].

Freshwater ecosystems and their adjoining terrestrial habitats serve as important biodiversity reservoirs in dry regions. Lakes, reservoirs and associated wetlands create localized microhabitats that support a wide range of insect taxa, including both aquatic and terrestrial species (Subramanian & Sivaramakrishnan, 2007; Dijkstra *et al*., 2013) [17, 8] and play an important role in maintaining local microclimatic conditions (Charan & Sharma, 2021) [2]. In arid regions, such freshwater bodies function as habitat patches for biodiversity; however, comprehensive information on insect faunal diversity associated with these systems remains limited.

Kaylana Lake, located on the western outskirts of Jodhpur city in Rajasthan, is an important freshwater reservoir that plays a vital ecological, socio-economic and cultural role in the region. Constructed in 1872 by Pratap Singh, the lake serves as a major source of drinking water for Jodhpur and acts as a crucial habitat supporting a variety of flora and fauna in the semi-arid landscape of the Thar Desert. The surrounding terrain comprises rocky hillocks, scrub vegetation and human-modified habitats, creating a mosaic of microhabitats favourable for various insect groups. The lake and its surrounding areas form an important ecological interface between aquatic and terrestrial habitats.

Despite its ecological significance, the insect diversity of Kaylana Lake and its adjoining habitats has remained poorly documented. Previous entomological studies in Rajasthan have largely focused on agricultural landscapes, protected forest areas, or selected taxonomic groups, leaving freshwater-associated semi-arid ecosystems comparatively underexplored. Zooplankton diversity of Kaylana Lake has been investigated by Chouhan & Prakash (2024, 2025a, 2025b, 2026) [3, 4, 5, 6]; however, information on insect assemblages is still lacking. In recent years, rapid urban expansion, increasing tourism pressure, pollution and habitat fragmentation have posed serious threats to the ecological integrity of the area. Therefore, documenting insect species composition, distribution and habitat associations in such freshwater ecosystems is crucial for assessing wetland health and for developing effective conservation strategies in arid and semi-arid regions.

The present study aims to provide a comprehensive account of the insect fauna of Kaylana Lake and its surrounding habitats. By documenting species occurrences and ecological associations, this work contributes valuable baseline data for future monitoring and conservation planning in this ecologically sensitive wetland landscape.

Materials & Methods

Study area

Kaylana Lake is situated on the western periphery of Jodhpur city, Rajasthan, India (approximately 26.28°N, 72.98°E). The lake is an important freshwater reservoir in the semi-arid region of the Thar Desert, covering an estimated area of 0.5-1.0 km², and serves as a major source of potable water for Jodhpur city. The surrounding landscape is characterized by undulating rocky terrain, sparse xerophytic vegetation and varying degrees of anthropogenic land use.

The region experiences an arid to semi-arid climate, with extremely hot summers (maximum temperatures often exceeding 45°C) and comparatively mild winters. Annual rainfall is low and erratic, averaging 300-350 mm, mostly concentrated during the monsoon months (July-August). The surrounding vegetation is dominated by xerophytic and thorny scrub species such as *Prosopis juliflora*, *Acacia senegal*, *A. nilotica*, *Ziziphus nummularia* and various grasses and herbs adapted to dry conditions (Reddy *et al*., 2011) [15].

The study area included habitats within a radius of approximately 1-3 km from the main water body of Kaylana Lake. These habitats encompassed open water and shoreline zones, rocky outcrops and hill slopes, scrub forests, thorny vegetation, human-modified areas, roadside vegetation and wastelands. All habitat types were systematically surveyed to document maximum possible insect diversity.

Fig 1: Kaylana Lake, Jodhpur, Rajasthan

Fig 2: Habitat around Kaylana Lake, Jodhpur, Rajasthan

Sampling and Identification

Insects were collected using hand-picking and sweep-net techniques. Hand-picking targeted visible, slow-moving, or substrate-associated arthropods on vegetation, leaf litter, trunks and rocks using fine forceps and soft brushes. Sweep-netting was carried out in grassy patches, scrub vegetation and along lake margins to sample flying and vegetation-dwelling insects. Collected specimens were preserved in 70% ethanol or killed in ethyl acetate jars, properly labelled with collection details. Specimens were sorted and identified up to the lowest possible taxonomic level using standard taxonomic keys and relevant literature.

Results

A total of 85 insect species belonging to 8 orders, 25 families and 68 genera were recorded from the Kaylana Lake area and its surrounding habitats. *Coleoptera* emerged as the most dominant order (26 species), followed by Hymenoptera (24 species), Lepidoptera (12 species) and Diptera (7 species). Odonata and Orthoptera were each represented by five species, while Hemiptera and Mantodea were represented by fewer species.

Aquatic insects such as dytiscid beetles were commonly encountered in shallow water zones, while odonates were observed along lake margins, indicating the availability of suitable breeding and foraging habitats. Terrestrial insects were abundant in scrublands, rocky outcrops and anthropogenic habitats surrounding the lake. The complete checklist of recorded species, along with their habitat associations, is provided in Table 1, and the order-wise composition of the insect fauna is summarized in Table 2.

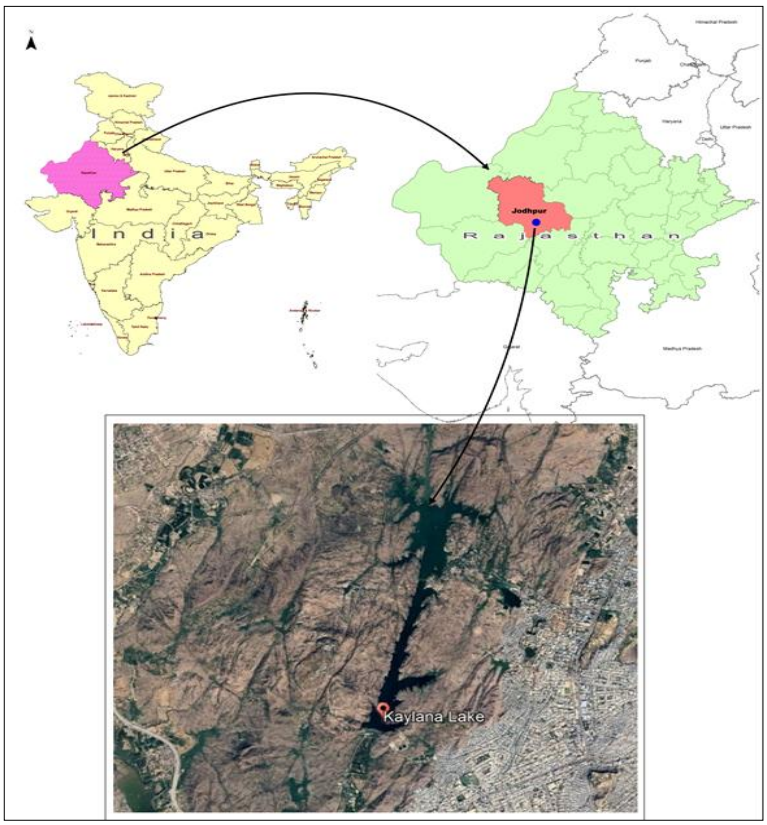

Fig 3: Map of study area

Table 1. Checklist of insect faunal diversity recorded at Kaylana Lake area

Order	Family	Subfamily	Sl. No.	Name of the species	Habitat
Coleoptera	Coccinellidae	Coccinellinae	1	*Cheilomenes sexmaculata* Fabricius, 1781	Flowery and grassy vegetation
	Dytiscidae	Cybistrinae	2	*Cybister tripunctatus* (Olivier, 1795)	Open water zone
		Dytiscinae	3	*Eretes sticticus* (Linnaeus, 1767)	Shallow waters
			4	*Hydaticus luczonicus* Aubé, 1838	Shallow waters
			5	*Rhantaticus congestus* (Klug, 1833)	Water bodies with vegetation
			6	*Sandracottus dejeani* (Aubé, 1838)	Shallow water with muddy substrate
		Hydroporinae	7	*Hydroglyphus flammulatus* (Sharp, 1882)	Shallow waters
			8	*Hygrotus kempi* (Gschwendtner, 1936)	Stagnant water
		Laccophilinae	9	*Laccophilus flexuosus* Aubé, 1838	Vegetated lake margins
			10	*Laccophilus sharpi* Régimbart, 1889	Shallow water near lake vegetation
	Noteridae	Noterinae	11	*Canthydrus laetabilis* (Walker, 1858)	Stagnant water along lake margins
	Scarabaeidae	Scarabaeinae	12	*Caccobius indicus* Harold, 1867	Cattle dung pats
			13	*Caccobius pantherinus* Arrow, 1931	Dung pats
			14	*Caccobius torticornis* Arrow, 1931	Dung-rich sandy soil
			15	*Copris furciceps* Felsche, 1910	Dung-buried tunnels in loose soil
			16	*Copris numa* Lansberge, 1886	Scrubland soil
			17	*Digitonthophagus bonasus (*Fabricius, 1775)	Dung pats
			18	*Gymnopleurus cyaneus* (Fabricius, 1798)	Dung pats
			19	*Heliocopris tyrannus* (Thomson, 1859)	Large dung pats
			20	*Onthophagus catta* (Fabricius, 1787)	Dung pats
			21	*Onthophagus ensifer* Boucomont, 1914	Dung-rich soil
			22	*Onthophagus kuluensis* Bates, 1891	Dung pats
			23	*Onthophagus seniculus* (Fabricius, 1781)	Dung pats in open habitats
			24	*Onthophagus variegatus* (Fabricius, 1798)	Dung pats in grass-covered areas
			25	*Phalops divisus* (Wiedemann, 1823)	Dung pats in open dry habitats
			26	*Scarabaeus andrewesi* Felsche, 1907	Dung balls on sandy ground
Diptera	Culicidae	Anophelinae	27	*Anopheles subpictus* (Grassi, 1899)	Stagnant water, vegetated edges
		Culicinae	28	*Aedes aegypti* (Linnaeus in Hasselquist, 1762)	Urban containers, stagnant water
			29	*Armigeres subalbatus* (Coquillett, 1898)	Urban containers, stagnant water
			30	*Culex quinquefasciatus* Say, 1823	Stagnant water edges
	Muscidae	Muscinae	31	*Musca domestica* Linnaeus, 1758	Urban and rural habitats, attracted to decaying organics and water sources
	Asilidae	Asilinae	32	*Cophinopoda chinensis* Fabricius, 1794	Shrubs
	Tephritidae	Dacinae	33	*Bactrocera dorsalis* Hendel, 1912	Host plants
Hemiptera	Dinidoridae	Dinidorinae	34	*Coridius janus* (Fabricius, 1775)	Ground surface
	Lygaeidae	Lygaeinae	35	*Graptostethus servus* (Fabricius, 1787)	Vegetation
			36	*Spilostethus pandurus* (Scopoli, 1763)	Dry open ground
	Pentatomidae	Pentatominae	37	*Nezara viridula* (Linnaeus, 1758)	On trees
Hymenoptera	Apidae	Apinae	38	*Amegilla cingulata* (Fabricius, 1775)	Open scrub, wildflowers
			39	*Apis cerana indica* (Fabricius, 1798)	Gardens, trees, cavities
			40	*Apis dorsata* Fabricius, 1793	Flowering trees
			41	*Apis florea* Fabricius, 1787	Shrubs
		Xylocopinae	42	*Xylocopa latipes* (Smith, 1852)	Nests in stems/wood, abundant on flowering plants
			43	*Xylocopa pubescens* (Klug, 1817)	On flowers
	Vespidae	Vespinae	44	*Vespa orientalis* Linnaeus, 1771	Vegetation near lake
		Polistinae	45	*Polistes olivaceus* DeGeer, 1773	Vegetation near lake
	Sphecidae	Ammophilinae	46	*Ammophila clavus* (Fabricius, 1775)	Scrublands
			47	*Ampulex novarae* Saussure, 1868	Open grounds
		Sceliphrinae	48	*Sceliphron madraspatanum* (Fabricius, 1798)	Builds mud nests on walls, sheds, open dry areas.
			49	*Chalybion bengalense* Dahlbom, 1845	Rock cavities
		Sphecinae	50	*Prionyx viduatus* (Christ, 1791)	Open grounds
			51	*Prionyx crudelis* (Smith, 1856)	Sandy soil
			52	*Sphex pruinosus* Germar, 1817	Burrows in sandy soil
	Formicidae	Formicinae	53	*Camponotus angusticollis* (Jerdon, 1851)	Soil
			54	*Camponotus compreesus* (Fabricius, 1787)	Near bases of trees
			55	*Camponotus irritans* (Smith, F., 1857)	Sandy soil, open ground
		Dolichoderinae	56	*Tapinoma melanocephalum* (Fabricius, 1793)	Under stones
		Dorylinae	57	*Dorylus labiatus* Shuckard, 1840	Soil tunnels
		Myrmicinae	58	*Crematogaster contemta* Mayr, 1879	On trees, arboreal nests

			59	*Monomorium indicum* Forel, 1902	Under stones, soil surface
			60	*Trichomyrmex destructor* (Jerdon, 1851)	Leaf litter
		Pseudomyrmecinae	61	*Tetraponera rufonigra* (Jerdon, 1851)	Tree trunks
Lepidoptera	Nymphalidae	Danainae	62	*Danaus chrysippus* (Linnaeus, 1758)	Grassy open field/flowering plant
		Nymphalinae	63	*Hypolimnas misippus* (Linnaeus, 1764)	Grassy open field/flowering plant
			64	*Junonia lemonias* (Linnaeus, 1758)	Grassy open field/flowering plant
			65	*Junonia orithya* (Linnaeus, 1758)	Grassy open field/flowering plant
	Papilionidae	Papilioninae	66	*Pachliopta aristolochiae* (Fabricius, 1775)	Grassy open field/flowering plant
			67	*Papilio demoleus* Linnaeus, 1758	Grassy open field/flowering plant
	Pieridae	Coliadinae	68	*Catopsilia pomona* (Fabricius, 1775)	Grassy open field/flowering plant
			69	*Catopsilia pyranthe* (Linnaeus, 1758)	Grassy open field/flowering plant
			70	*Eurema hecabe* (Linnaeus, 1758)	Grassy open field/flowering plant
			71	*Eurema laeta* (Boisduval, 1836)	Grassy open field/flowering plant
		Pierinae	72	*Belenois aurota* (Fabricius, 1793)	Grassy open field/flowering plant
			73	*Colotis amata* (Fabricius, 1775)	Grassy open field/flowering plant
Mantodea	Eremiaphilidae	Iridinae	74	*Schizocephala bicornis* (Linnaeus, 1758)	On Green Vegetation
	Rivetinidae	Deiphobinae	75	*Deiphobe incisa* Werner, 1933	On Green Vegetation
Odonata	Coenagrionidae	Ischnurinae	76	*Ischnura aurora* (Brauer, 1865)	Near water bodies
	Libellulidae	Brachydiplacinae	77	*Brachythemis contaminata* (Fabricius, 1793)	Near water bodies
		Libellulinae	78	*Orthetrum sabina* (Drury, 1773)	Near water bodies
		Pantalinae	79	*Pantala flavescens* (Fabricius, 1798)	Water bodies
		Trithemistinae	80	*Trithemis pallidinervis* (Kirby, 1889)	Near water bodies
Orthoptera	Gryllidae	Gryllinae	81	*Acheta domesticus* (Linnaeus, 1758)	Leaf litter
			82	*Gryllodes sigillatus* (Walker, 1869)	Within soil cracks
	Acrididae	Oedipodinae	83	*Acrotylus humbertianus* Saussure, 1884	Scrubland
	Pyrgomorphidae	Pyrgomorphinae	84	*Poekilocerus pictus* (Fabricius, 1775)	Aak Plants
			85	*Atractomorpha crenulata* (Fabricius, 1793)	Plants

Table 2: Order-wise composition of insect fauna recorded from Kaylana Lake area

	Order	No. of Families	No. of subfamilies	No. of Genera	No. of Species	Percentage (%)
1	*Coleoptera*	4	8	18	26	31
2	Diptera	4	5	7	7	8
3	Hemiptera	3	3	4	4	5
4	Hymenoptera	4	12	18	24	28
5	Lepidoptera	3	5	9	12	14
6	Mantodea	2	2	2	2	2
7	Odonata	2	5	5	5	6
8	Orthoptera	3	3	5	5	6
		25	43	68	85	100

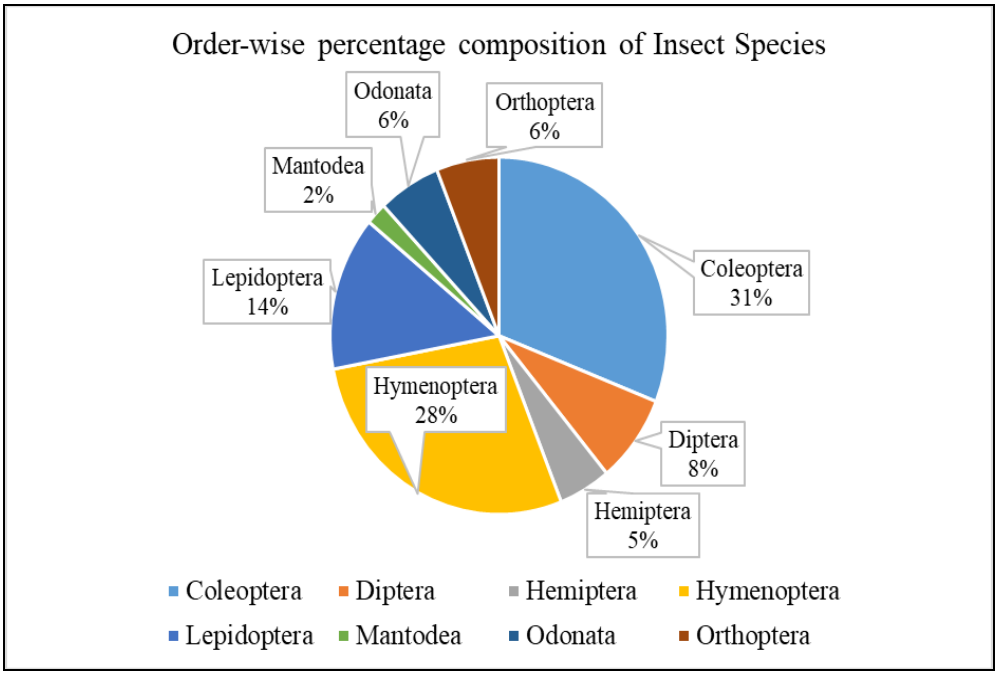

Fig 3: Percentage composition of insect species across different insect orders recorded from the Kaylana Lake area, Jodhpur, Rajasthan

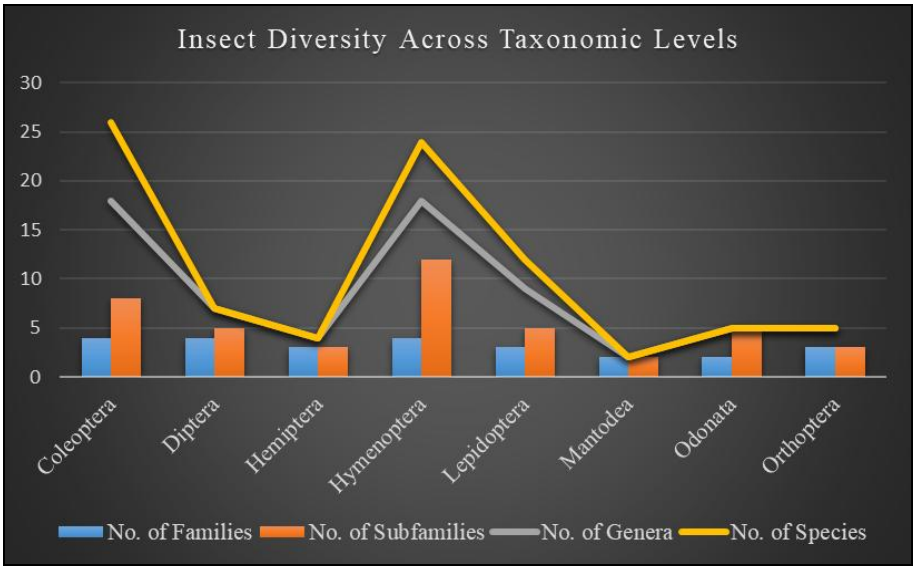

Fig 4: Graphical representation of insect diversity of Kaylana Lake area, Jodhpur, Rajasthan

Discussion

The present study constitutes the first consolidated account of insect faunal diversity from Kaylana Lake and its surrounding habitats in Jodhpur, Rajasthan. The occurrence of 85 species belonging to eight insect orders highlights the ecological importance of this freshwater wetland within the semi-arid landscape of western Rajasthan. The diversity and distribution of insect taxa recorded in the study area are closely associated with the availability of heterogeneous aquatic and terrestrial microhabitats.

Coleoptera emerged as the most dominant order, primarily due to the high representation of *Scarabaeidae* and Dytiscidae. Scarabaeid dung beetles such as species of *Onthophagus*, *Copris*, *Caccobius* and *Gymnopleurus* indicate the presence of organic resources and grazing activity in the surrounding landscape and play a significant role in nutrient recycling and soil aeration (Bang *et al.*, 2005; Hajji *et al.*, 2024) [1, 10]. Aquatic beetles recorded from shallow waters and vegetated margins indicate suitable freshwater conditions that support predatory insect assemblages (Pintar & Resetarits, 2017) [14] and are widely regarded as bio-indicators of ecosystem balance (Das *et al*., 2025) [7].

Hymenoptera was represented by a diverse assemblage of bees, wasps and ants. The presence of multiple pollinator species, including *Apis*, *Amegilla* and *Xylocopa* (Sowmiya *et al*., 2018; Latha *et al.*, 2018) [16, 12], suggests the availability of flowering vegetation in scrub and open habitats around the lake. Ant species belonging to *Camponotus*, *Monomorium*, *Crematogaster* and *Tetraponera* were widely distributed across soil, leaf litter and arboreal habitats, reflecting their ecological adaptability and functional role in soil turnover and ecosystem processes.

Lepidopteran species were mainly observed in open grassy fields and flowering vegetation, indicating suitable larval host plants and nectar resources in the surrounding terrestrial habitats. Dipteran taxa, particularly mosquitoes and muscid flies, were associated with stagnant water bodies, vegetated margins and human-modified environments, reflecting the influence of aquatic conditions and anthropogenic activities on species composition.

Odonates were observed along lake margins and, as excellent indicators of freshwater ecosystem health (Kumar *et al*., 2015) [11], their presence suggests the availability of suitable habitats for breeding and development. Orthopterans and mantids were mainly recorded from scrublands and vegetated areas, highlighting the habitat heterogeneity of the region.

Conclusion

This study documents the first insect faunal diversity of Kaylana Lake and its surrounding habitats and highlights the ecological importance of this freshwater ecosystem in the semi-arid region of western Rajasthan. Despite harsh climatic conditions and increasing anthropogenic pressures, the lake supports a diverse assemblage of insect taxa adapted to both aquatic and surrounding terrestrial habitats. The baseline data generated through this study will be useful for future biodiversity assessments, long-term monitoring and conservation planning in arid-zone wetlands.

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