https://doi.org/10.33472/AFJBS.6.2.2024.74-85

AfricanJournalofBiologicalS ciences

Research Paper Open Access

Pond degradation and wildlife preservation: a geographical analysis

Dr. Sunita Satapathy[1]*, Dr.Sanju Purohit[2], Ms.Renuka JyothiS[3], Dr. Vinod Mansiram Kapse[4], Sumanta Bhattacharya[5], Hala Baher[6]

*[1] Assistant Professor, Department of Zoology, Centurion University of Technology and Management, Bhubaneswar, India, Email:sunita.mishra@cutm.ac.in

[2]Researcher, Department of Geography, Rajasthan, India, Email- sanjanapurohit@yahoo.in

[3]Assistant Professor, Department of Biotechnology and Genetics, JAIN (Deemed to be University), Bangalore, Karnataka, India, Email: j.renuka@jainuniversity.ac.in,Orchid Id-0000-0003-3248-337X

[4]Director, Department of Electronics and Communication Engineering, Noida Institute of Engineering & Technology, Greater Noida, Uttar Pradesh, India, Email: director@niet.co.in,Orchid Id- 0000-0001-9123-9823

[5]Research scholar,Textile technology,Maulana Abul Kalam Azad University of Technology, West Bengal, India. Email: sumanta.21394@gmail.com

[6]Department of Radiology and Ultrasonography Techniques, College of Medical Techniques, Al-Farahidi University, Baghdad, Iraq. Email Id: hala.baher@uoalfarahidi.edu.iq

Corresponding author (*):sunita.mishra@cutm.ac.in

Article History
Volume 6,Issue 2, Feb 2024
Received:17 Dec 2023
Accepted : 08 Jan 2024
Published : 07 Feb 2024
doi: 10.33472/AFJBS.6.2.2024.74-85

Abstract

Ponds are vital elements of ecosystems around the world, sustaining biodiversity and preserving ecological equilibrium. However, the deterioration of these essential water sources due to rising human activity and environmental changes has set the varied species that depends on them in danger. This research aims to evaluate the geophysical properties, determine farmers' disposition toward promoting wildlife activity across 60 dairy farm ponds in Ahmadabad, Gujarat, and explore the relationship between habitat and landscape elements impacting bird populations. The observation included a five-meter-wide area along the riverbed, and the meadows, hayfields, and fallows that surrounded these tiny, circular ponds with either stony or muddy edges. The research found relationships between landscape characteristics and bird abundance by recording 1,962 birds from 45 distinct species. Notably, the distance between farm buildings and the breadth of riparian strips were out to be important determinants influencing the abundance of different species. The results underscore the significance of protecting undeveloped field borders and widening riverbanks, advocating deliberate actions to increase animal habitats near agricultural ponds. Additionally, more than eighty percent of pond landowners said that they would be ready to support greater animal activity with sufficient financial and logistical assistance, indicating a possible direction for cooperative conservation efforts.

Keywords: wildlife, farm, pond, rural landscapes, riverbank, and birds.

1. Introduction

The human-dominated agricultural and residential environments, farm ponds represent some of the last lentic wetland ecosystems. For the sake of preserving the regionally diminishing biodiversity, farmers' desire to preserve them and their wildlife worth are underreported. The delicate balance between biodiversity and ecosystems is under jeopardy as a result of the increased industrialization, urbanization and unsustainable practices mankind is facing. Ponds are among the ecosystems severely impacted by these changes because they provide vital homes for a wide variety of animals. Pond degradation is a serious danger to the complex web of life,that these ecosystems sustain (Hill *et al.,* 2021). The human activity is causing these ecosystems to deteriorate more and more. Water quality degradation and pond ecosystem changes are caused by urban growth, pollution, agricultural runoff and climate change. Aquatic life is directly threatened by the buildup of pollutants including pesticides, fertilizers, and industrial waste, which upsets the delicate balance in these environments (Klimaszyk and Gołdyn 2020). Another major problem that is causing ponds to degrade is siltation. Sedimentation lowers water clarity, restricts light penetration, and hinders the development of aquatic vegetation. It is a result of deforestation changes in land use. The ecosystem as a whole suffers as a consequence, which has an impact on the resources available to species on land and in water (Pujiwinarko *et al.,* 2023). In numerous ponds around the globe, invasive species have become a major issue. Pond ecosystems suffer additional difficulties as a consequence of the invasion of alien species, which results in the loss of vital habitats for native flora and animals (Dai *et al.,* 2021). Degradation of ponds affects aquatic life but also the wider environment and the fauna that rely on ponds for existence. For example, amphibians are very vulnerable to changes in water quality and the deterioration of their environment. Ponds are essential in breeding grounds for many amphibian species, and any damage to these environments can result in population decreases and in extreme situations (Caballero-Díaz *et al.,* 2019). Another species of animals that is closely related to pond habitats are birds. Ponds are essential for feeding, breeding, and rearing young, especially for waterfowl. These bird species of number diminish as a result in the loss of ponds, which robs them of vital supplies. Furthermore, since ecosystems are interrelated, a single species' decrease can have a cascading impact on others, upsetting the delicate balance of predator-prey interactions (Rannap *et al.,* 2020). Wildlife on land is impacted even when ponds are not directly nearby. Ponds are a source of water for many species, and when these habitats are destroyed, animals are forced to go further in search of water, which exposes them to additional dangers like predators and car accidents. Because of this, the disappearance of ponds has a domino effect that affects biodiversity throughout whole ecosystems (Magnus and Rannap 2019). Ponds are essential to preserving biodiversity, and initiatives to protect and restore these habitats have gained momentum in recent years. The main goals of conservation efforts are to mitigate the effects of pollution, adopt sustainable land-use practices, and address the underlying causes of pond degradation. Restoring native vegetation around ponds promotes the general health of the ecosystem by reducing runoff and sedimentation (Bhande *et al.,* 2019). As pond deterioration increases, creative ways to deal with the difficult problems involved in maintaining these ecosystems are starting to emerge. The restoration of deteriorated ponds is possible with the application of eco-friendly technology and natural remediation methods, which are examples of sustainable pond management practices (Birniwa *et al.,* 2023). Constructed wetlands, for example, simulate natural filtering processes and can remove contaminants from water. By placing these artificial wetlands in appropriate locations, pollutants can be kept from entering ponds by intercepting runoff from urban and agricultural environments. Additionally, the development of eco-friendly agricultural methods, including as organic farming and agro forestry, can considerably lessen the effect of agricultural operations on pond ecosystems (Jia et al., 2019). Pond conservation is crucial for the health of aquatic life as well as for the network of terrestrial and avian species that depend on these environments for existence. It is an appeal to priorities pond conservation because of their inherent importance to maintain the diverse range of species on earth.

The research (Chen *et al.,* 2019) highlighted the value of ponds, which are vital freshwater ecosystems but are often underappreciated. Although freshwater ecosystems are important to society and ecology, bigger bodies have traditionally received priority in freshwater study, creating gaps in knowledge of pond ecosystems. Pond researchers came together for a workshop in 2019 to discuss topics related to ecology, conservation, and management. This event brought attention to the importance of giving these biodiesel habitats more attention. The research (Wang *et al.,* 2020) examined pollution, the effects of climate change, invasive species, and social and political constraints. The study emphasizes teamwork and strategies that combine bottom-up involvement, top-down regulation, and sustainable management. The research promoted nature-based approaches for descriptions of pond landscapes and conservation evaluations in developing nation settings by using smart sensors, citizen science, and modeling. The research (Schepers et al., 2020) evaluated the processes for regeneration and deterioration of coastal wetlands in the context of increasing sea levels. The results show that rising pond size was linked to lower elevations, tidal channel width corresponds with pond depth, suggesting a feedback process. This research (Stehle *et al.,* 2022) explored the need of comprehending feedback loops and alternate elevation states in relation to the permanent loss of marshes caused by pond development. This research highlighted the significance of diverse ecosystem services provided by healthy pond ecosystems in accomplishing the Sustainable Development Goals (SDGs).The article (Sauer *et al.,* 2022) evaluated effects of land-use demands and environmental changes frequently leave ponds underappreciated in comparison to bigger water bodies. The study (Bhagde *et al.,* 2020) introduced practical use-focused conservation strategies in place are inadequate. The study looks at anthropogenic influences and legal issues that contribute to the deterioration of Indian ponds. The research (Krivtsov *et al.,* 2022) provided pond ecosystem contributions to global environmental objectives being administratively recognized. The research examines global restoration approaches and framework that combines incentives, laws, and technology like as life cycle assessment and environmental DNA. The study (Yadav *et al.,* 2022) used Nature-based solutions are emphasized for cost-effective pond restoration, emphasizing their relationship to the circular economy and biodiversity protection, highlighting the need for legislative changes and comprehensive efforts. The research (Newton *et al.,* 2019) examines oral vaccination barriers prevent raccoon variant rabies virus (RRV). As a result, mild enzootic-period immunization actually increases mortality. Conversely, the results indicate that vaccination barriers are most effective during the epizootic phase. An important point of emphasis in wildlife disease management systems is the need to identify and contain outbreaks prior to the emergence of enzootics.

2. Materials and methods

Data acquisition

Our study took place in the Kankaria Lake (23.006◦ N, 72.6011◦ E), which corresponds to the southeastern part of the city, in the Maninagar area. Kankaria Lake is the second-largest lake in Ahmadabad, Gujarat. The 205 km^2 region has developed diverse and scattered rural landscapes. Because of the continued expansion of farming and a tendency toward city in all land types establish there, there is barely a limited quantity of remaining agricultural land cover. Consequently, it is the most threatened Maninagar areas in terms of biodiversity. The 250 species of bird found in this region, 70 have been designated as precedence species in Kankaria Lake in

Southeastern Maninagar owing to their rarity or representativeness in this biological zone. Species of bird in open and farming settings are thought to be facing the greatest decreases in number and chance of observation.

Nature Measurements and Biological Characteristics

The field measured the size of ponds and riverbank strips a term for the area where land meets water along agricultural fields in the early spring of 2021 using a 30-meter adhesive measurement. The percentage cover of the bare soil, perennial, plant and forested layers in these strips it was estimated visually. Submerged vegetation, indications of riverside vegetation management (chopping) and the possibility of livestock access to the ponds were among the other field outcomes. Employing clinometers, bank slopes were measured in four directions at each pond. The mean values of these measurements were used for further analysis. The precise location of each pond was obtained in the field using the Global Positioning System (GPS). We identified the land-use categories within a 1000 m, 500 m, and one-kilometer increasing radius of every pond using four LANDSAT Thematic Mapped satellite images, with a pixel size of thirty meters. Initially, it had been categorized into fields of training based on a variety of reference materials about wetlands, forest ecosystems, and crops. The images were used to identify all of 28 land-use types, which were combined into the five main classifications shown in **Table 1**.

Table 1: Types of Land Use (Source: Author)

No	Various land types	Fields
1.	Dairy farming	Old fields, hayfields, fallow non-cropped, and land pastureland.
2.	Cash crops	cereals, cornfields, plowed fields, and specialized crops)
3.	Anthropogenic	Roads, Urban development and housing
4.	Forest	Alder stands, coniferous and mixed forests, deciduous, and areas of tree under renewal.
5.	Others	Unclassified pixels and clouds

Wealth and Abundance of Birds

Mid-July to the end of August in 1997 and 1998 was the time frame for breeding bird observations. When the weather was suitable, ponds were inspected using a combination of techniques:

- A ten-minute observing time, and
- An active search that included wandering around the pond and scraping the grass.

While we were actively searching to find embedded, the inactive examination time allowed collecting data on propagation birds. We recorded all birds heard or observed, except those flew above. At each pond, eight trips were made in total between dawn and 9:00 a.m., where the most diurnal bird activity occurs. We took into account four signs of bird use:

- The overall quantity of birds,
- The average species richness of birds
- The whole quantity of decreasing bird.

The History and Farming Usage of Ponds

Between June and October of 2021-2022, a property owner's assessment was conducted during in-person meetings with farmers to gather information on the history and current use of ponds. During the visits, questions were aimed at gathering the following kinds of information: the study examined the historical context of the pond, including its creation or modification, past utilization, and its connection to farming practices. It explored attitudes toward wildlife conservation, the impact on crops, and the level of preparedness for managing ponds to balance wildlife conservation and agronomic objectives.

Statistical Analysis

They used SAS (version 8.0) and STATIST1X (version 2.2) to conduct statistical analysis. A significant probability criterion of ≤0.05 was established. Initially, the Shapiro-Wilk test was used to verify that all biophysical and bird-related data were normal. The dependent and independent variables underwent logarithmic or square transforms. The correlation matrix allowed to test for multicollinearity between continuous variables. A correlation was eliminated if it was present (r > 0.75) for one of two highly linked variables. The (chi-square test) was employed to evaluate the predicted proportions with the variance of responses across different groups for every question addressed to landowners. The method of multiple linear regressions was utilized to examine the impact of continuous variables such as habitat and landscape on the entire wealth and species richness of birds found near ponds and the overall profusion of species that harm crops are in decline. The number of ponds analyzed for some statistical analyses was less than sixty-one because:

- Some variables had insufficient values,
- Some ponds were not able to be examined eight times because of bad weather,
- The ponds' irregular surface areas made it difficult to calculate the number of ponds using the distance end to end and breadth measurements,
- Some property-owners refused to react an individual question.

3. Result

Origin, Use in Farming, and Features of Pond Habitat

A majority (86.4%) got water from local brooks or isolated streams, driven by surface runoff and elevated water **Table 2**. 5 Ponds were created between 2020 and 2023, with soil excavation accounting for 50% of the total. These ponds, which had an average size of 0.16 ha, were rectangular in form 68%, with average widths of 35.0 ± 19.0 m and lengths of 39.0 ± 22.5 m.

Table 2: The study of sixty agricultural ponds in Kankria Lake, Maninagar, Ahmadabad, Gujarat The sample size for the estimated region (n = 51) varies. (Source: Author)

Variable	MEAN (±SD)	Minimum	Maximum
Area (m^2)	1665.4 ± 1384.6	19	7599
Width (m)	35.0 ± 1.90	2	99
Slope (degrees)	20.0°	3.2°	32.3°
Riparian strip width (m)	6.1± 12.7	1	98

Length (m)	39.0 ± 22.5	4	107
Distance to the Closet (m)			
Stream	564.6 ±374.1	1	1000
Pond	285.3± 215.4	24	1000
Farm house	372.5± 386.8	8	1499
Cultivated field	28.3±128.0	1	999
Farm Building	321.0 ±363.2	1	1499
Vegetal cover %			
Herbaceous	77.5	0.0	39.0
Trees	12.3	0.0	99.0
Shreebs	2.8	0.0	99.0
No. of adjacent ponds /radius			
500 m	2.1 ± 1.6	0	5
1000 m	5.7 ± 3.0	0	10

The average width of the riparian strips around ponds was 7.1 ± 13.7 m, including the cases where the ponds were next to woodlots. The mean strip width decreased to almost 3 m when these circumstances were excluded, matching typical circumstances. Nearly 79% of these areas were covered by the herbaceous layer, with less land covered by the shrub and forest layers.A range of low herbaceous plants, including brambles, smartweeds, sensitive fern and reed canary grass, encircled the ponds. There was aquatic emergent/submerged vegetation, such as cattail, common duckweed and water milfoil, in 55% of the ponds. The bank slopes were rather steep, at 20 ± 4.2°. Water plants that were emergent or submerged were not controlled by 91% of owners, while 47% of owners used mechanical means to manage terrestrial vegetation. 77% of farmers limited their cattle access to ponds, while only 52% of farmers kept cattle in **Table 3**.

Table 3: Study of 60 agricultural ponds in Kankria Lake, Ahmadabad, and Gujarat. Sample sizes that are variable are cattle access (n = 31) and pond origin (n = 53). (Source: Author)

Variable/Type	X^2	%	F	dp
Origin				
Removed		49.0		
Current depression	16.4	40.5	≤0.001	1
Other 1		9.3		
Water source				
Origin 2	34.2	87.4	≤0.001	0
Other 3		12.4		
Pond water supply				
Below ground	0.96	56.2	>0.05	0
Eliminate		43.6		
Shape				

Square-shaped		68.7		
Rectangular	19.0	14.0	≤0.001	2
Square		7.7		
Round (or oval)		9.2		
Shoreline				
Typical	32.8	85.8	≤0.001	1
Non-standard		12.4		
Not sure		1.5		
Bank slope/soil				
muddy or soft	19.1	37.4	≤0.001	1
abrupt or stony		21.8		
Others 4		40.8		
vegetation enclosing the terrestrial surface				
minimal gramineous		23.3		
Forbs	4.8	20.2	≤0.05	1
Others 5		56.2		
aquatic flora				
Not at all (bare dirt)	2.0	43.7	≤0.05	1
Current (green)		56.1		
Management of riparian strip				
cutting-related mechanical	67.5	54.6	≤0.001	2
None		29.6		
Chemical or grazing practices for cattle		15.5		
Aquatic vegetation management	43.5	92.1	≤0.001	1
None		7.6		
Mechanical				
Access to cattle				

No	10.11	78.0	≤0.001	1
Yes		21.8		

The majority of ponds were situated in landscape settings that were more than 500 meters from the closest stream and more than 300 meters from the closest homes or structures. The nearest agricultural field was around 35 meters away on average. The average distance between ponds was 285 meters, with a range of 20 meters to 1 kilometer. Around ponds, hayfields pastures and fallows dominated the landscape of dairy farms, regardless of the radius taken into theaccount **Figure 1.**

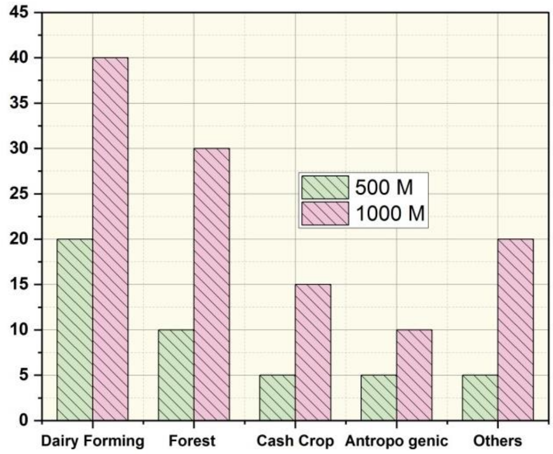

Figure 1*: In Kankria Lake, Ahmadabad, examine the various land uses around the sixty ponds*
(Source: Author)

The study includes a range of ecosystems: (1) forests (deciduous, mixed, and coniferous), as well as areas of alder stands and shrub or tree regeneration; (2) anthropogenic landscapes (urban areas, housing, and roads); (3) wetlands, which includes the habitats in deep water; (4) dairy farming zones, which include hayfields, pastures.

Use of Ponds by Birds

Fifty-five bird species produced a total of 1962 individuals. Eighteen percent of the birds were Red-winged Blackbirds (Agelaius phoeniceus), followed by Song Sparrows (Melospiza melodia) at ten percent, Killdeer (Charadrius vociferous) at nine percent, Common Grackles (Quiscalus quiscula) at nine percent, and Bobolink (Dolichonyxoryzivours) at three percent. Of all bird observations, 52% were top five species. The birds were found in between 38% and 83% of the ponds that were investigated, based on the kind **Table 4**. Remarkably, decreasing species recorded 75% of bird sightings, but 43% of observations in Quebec were associated with agricultural damage.

Table 4: Bird species distribution and abundance in sixty agricultural ponds in Gujarat for decreasing species (Quebec), use the acronym Qc. (Source: Author)

creatures		Features of Species			Relative Pond Occurrence Abundance	
		Dependent on Wetland	The crop Disease	Reduced QC		
Red - Winged Block bird	Agelaius Phoenixes		×	×	18.1	70.4
Song	MelospizaMeladia	×		×	10.0	83.2

Sparrow						
Common Grackle	Quiscalusquiscula		×	×	9.0	48.0
Killdeer	Charadrius vociferous			×	3.1	48.0
Bobolink	Dolichonyxoryzivours			×	2.8	42.0
Moarning Dove	Setophgapensylvanica	×			0.1	2.014.8
Other Unidentified Brids					1.4	15.8

In different landscape radii (500 m and 1000 m), the amount of nearby fallow land was positively correlated with bird numbers overall for decreasing and crop-damaging species. Bird abundance indices were adversely affected by the mixed-wood forest and grains that surrounded the pond. The breadth of riparian strips favorably influenced decreasing species abundance, except in the 500 m radius model.

Pond Landowners' Views

Farm owners' support for wildlife promotion initiatives (82%) and admiration of the wildlife on their property (80%) beyond expectations. A smaller number of landowners (18%) were impacted by crop damage concerns than would be predicted by chance alone. Consistent with predictions, 54% of respondents did not depredation to the existence of a pond, and 79% of respondents thought the damage level was acceptable **Table 5**.

Table 5: Landowners opinions and commitment to promoting wildlife usage in Kankria Lake, Ahmadabad,and Gujarat. (Source: Author)

Utilization Indicator for Birds	RADIUS (M)	R2	Factors Incorporated into the Model	Estimating Parameters	p	F
Total abundance of all bird species	500	0.12	portion of uncultivated land	0.002	7.55	≤0.01
	1000	0.08	Fallow land area	0.0004	3.83	≤0.04
			Fallow land area	0.001	29.11	≤0.001
Total number of species that harm crops	500	0.14	Fallow land area	0.0001	8.71	≤0.01
	1000	0.10	Fallow land area	0.00004	5.40	≤0.04
			Fallow land area	0.001	31.60	≤0.001
Total number of	500	0.21	The riparian strip's width	0.26	5.02	≤0.04

decreasing creatures			portion of uncultivated land	0.00004	5.46	≤0.04
	1000	0.19	Length of the riparian zone	0.28	5.89	≤0.04
Overall species richness	500,and 1000	0.33	Length of the riparian zone	0.04	4.20	≤0.04

Particularly, more than 89% of landowners said they would want to keep the existing environmental conditions of their ponds. This 60% tendency is significant, above expected values, when it comes to protecting riparian vegetation. When maintaining their riparian strips, almost half of the landowners use mechanical techniques. Out of those who own cattle, 52% said that they would be ready to restrict access in the future, which is more than they expected but less than the percentage of access limitations that exist. The preparedness to adopt field methods for wildlife promotion (21%) matches with chance predictions, but this number would have been substantially higher (47%) with prospective financial incentives and external organizational accountability for maintenance operations.

4. Conclusion

This study emphasizes the complex interactions that shape the dynamics of biodiversity around agricultural ponds between geophysical characteristics, farmer viewpoints, and landscape elements. The results underscore the critical function of fallow land in augmenting bird populations, but with a warning about the deleterious effects of specific topographical features, such as mixed-wood forests and cereals. The importance of maintaining these characteristics in agricultural landscapes is highlighted by the discovery that the width of riparian strips is a crucial factor influencing the number of decreasing species. Most importantly, pond landowners'openness to wildlife-friendly projects is a possible pathway for collaborative conservation efforts. The majority of farmers seem to have a positive outlook by their willingness to support efforts for wildlife control and maintain the current state of ponds. Notably, farmer involvement in wildlife conservation might be further increased by means of monetary incentives and external organizational responsibility. The research offers significant perspectives on the fine quilibrium that must be struck between ecological sustainability and agricultural practices. It is becoming more and more important to identify and promote these synergies as human activity causes the global landscape to shift quickly. Establishing specific conservation methods is made possible by the correlations between bird populations and landscape features that have been observed. Prospective and sustainable biodiversity conservation in agricultural landscapes can be achieved by supporting the maintenance of riparian strips, fallow fields, as well as current pond conditions by matching conservation objectives with farmer interests.

References

Bhagde, R. V., Pingle, S. A., Bhoye, M. R., Pansambal, S. S., &Deshmukh, D. R. (2020). A Comparative Study of Physico-Chemical Parameters of the Freshwater Ponds from SangamnerTaluka of Ahmednagar, Maharashtra, India. *International Journal of Biological Innovations*, **2(2)**, 137-142.https://doi.org/10.46505/IJBI.2020.2209

Bhande, R., Noori, M. T., &Ghangrekar, M. M. (2019). Performance improvement of sediment microbial fuel cell by enriching the sediment with cellulose: *Kinetics of cellulose degradation. Environmental Technology & Innovation*, **13**, 189-196.https://doi.org/10.1016/j.eti.2018.11.003

Birniwa, A. H., Ali, U., Kutty, S. R. M., Jagaba, A. H., & Noor, A. (2023). Innovative and eco-friendly technologies for the upgradation of pharmaceutical wastewater treatment processes. In The Treatment of Pharmaceutical Wastewater (pp. 367-398). Elsevier.https://doi.org/10.1016/B978-0-323-99160-5.00006-0

Caballero-Díaz, C., Sánchez-Montes, G., Butler, H. M., Vredenburg, V. T., &Martínez-Solano, Í. (2020). The role of artificial breeding sites in amphibian conservation: a case study in rural areas in central Spain.http://hdl.handle.net/10261/240044

Chen, W., He, B., Nover, D., Lu, H., Liu, J., Sun, W., & Chen, W. (2019). Farm ponds in southern China: Challenges and solutions for conserving a neglected wetland ecosystem. Science of the Total Environment,**659**, 1322-1334.https://doi.org/10.1016/j.scitotenv.2018.12.394

Dai, X., Wang, L., Tao, M., Huang, C., Sun, J., & Wang, S. (2021). Assessing the ecological balance between supply and demand of blue-green infrastructure. *Journal of Environmental Management*, **288**, 112454.https://doi.org/10.1016/j.jenvman.2021.112454

Hill, M. J., Greaves, H. M., Sayer, C. D., Hassall, C., Milin, M., Milner, V. S., ...& Wood, P. J. (2021). Pond ecology and conservation: research priorities and knowledge gaps. Ecosphere, **12(12),** e03853.https://doi.org/10.1002/ecs2.3853

Jia, Z., Chen, C., Luo, W., Zou, J., Wu, W., Xu, M., & Tang, Y. (2019). Hydraulic conditions affect pollutant removal efficiency in distributed ditches and ponds in agricultural landscapes. *Science of the Total Environment*, **649**, 712-721.https://doi.org/10.1016/j.scitotenv.2018.08.340

Klimaszyk, P., &Gołdyn, R. (2020). Water quality of freshwater ecosystems in a temperate climate. Water, **12(9),** 2643.https://doi.org/10.3390/w12092643

Krivtsov, V., Forbes, H., Birkinshaw, S., Olive, V., Chamberlain, D., Buckman, J.,&Diekonigin, C. (2022). Ecosystem services provided by urban ponds and green spaces: a detailed study of a semi-natural site with global importance for research. Blue-Green Systems, **4(1)**, 1-23.https://doi.org/10.2166/bgs.2022.021

Magnus, R., &Rannap, R. (2019). Pond construction for threatened amphibians is an important conservation tool, even in landscapes with extant natural water bodies. Wetlands Ecology and Management,**27**, 323-341.10.1007/s11273-019-09662-7

Newton, E. J., Pond, B. A., Tinline, R. R., Middel, K., Bélanger, D., & Rees, E. E. (2019). Differential impacts of vaccination on wildlife disease spread during epizootic and enzootic phases. *Journal of Applied Ecology*, **56(3**), 526-536.https://doi.org/10.1111/1365-2664.13339

Pujiwinarko, A., Soeprobowati, T. R., &Kismartini, K. (2023). The Potential of Agroforestry to Overcome Agricultural Land Degradation in the Dieng Plateau, Central Java, Indonesia. In E3S Web of Conferences (Vol. **448**, p. 03034). EDP Sciences.https://doi.org/10.1051/e3sconf/202344803034

Rannap, R., Kaart, M. M., Kaart, T., Kill, K., Uuemaa, E., Mander, Ü.,&Kasak, K. (2020). Constructed wetlands as potential breeding sites for amphibians in agricultural landscapes: *a case study. Ecological Engineering*, **158**, 106077.https://doi.org/10.1016/j.ecoleng.2020.106077

Sauer, E. L., Cruz, J., Crone, E., Lewis, C., Plumier, E., Cwynar, B., ...& Preston, D. L. (2022). Multiscale drivers of amphibian community occupancy in urban ponds. Urban Ecosystems, **25(5),** 1469-1479.10.1007/s11252-022-01239-2

Schepers, L., Brennand, P., Kirwan, M. L., Guntenspergen, G. R., &Temmerman, S. (2020). Coastal marsh degradation into ponds induces irreversible elevation loss relative to sea level in a microtidal system. Geophysical Research Letters, **47(18),** e2020GL089121.https://doi.org/10.1029/2020GL089121

Stehle, S., Manfrin, A., Feckler, A., Graf, T., Joschko, T. J., Jupke, J., ...& Schulz, R. (2022). Structural and functional development of twelve newly established floodplain pond mesocosms. Ecology and Evolution, **12(3)**, e8674.https://doi.org/10.1002/ece3.8674

Wang, W., Fu, H., Lee, S. Y., Fan, H., & Wang, M. (2020). Can strict protection stop the decline of mangrove ecosystems in China? From rapid destruction to rampant degradation. Forests, **11(1)**,

55.https://doi.org/10.3390/f11010055
Yadav, S., &Goyal, V. C. (2022). Current Status of Ponds in India: A Framework for Restoration, Policies and Circular Economy. Wetlands, **42(8**), 107.10.1007/s13157-022-01624-9

Cite this article as: **Dr. Sunita Satapathy** Pond degradation and wildlife preservation: a geographical analysis, African Journal of Biological Sciences. 6(2), 74-85. doi: 10.33472/AFJBS.6.2.2024.74-85