The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in word format and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Arzoo Malik
Project title	Community-based approach to conserve migratory bird habitat from pesticide contamination: A pioneer study in Gujarat state, India.
RSG reference	20828-1
Reporting period	December 2016- December 2017
Amount of grant	£4220
Your email address	arzoomalik8.am@gmail.com
Date of this report	4 January 2018

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
To survey the common farming practices and farmers' attitude towards the usage of pesticides and its possible impacts				Ten villages surrounding of Nal Sarovar were surveyed and 113 farmers were interviewed to know the common farming practice and it was revealed that majority of them are using pesticides.
To evaluate the contamination level by organochlorine and organophosphorus pesticides in surface waters, sediments and moulted feathers from birds in Nal Sarovar bird sanctuary.				Water, sediment samples and moulted feathers of birds were collected in different seasons. Water and sediment samples were analysed; however, the feather samples will be sent to our collaborators for further analysis.
To correlate the contamination level of pesticides in the wetland with the farming practices in the vicinity and organize awareness campaigns to educate local farmers about the sustainable practices to improve the habitat quality				Our results and the map depicts that the wetland has a potential risk of receiving contaminants through runoff from north-eastern catchment of the wetland. We organised the awareness workshop among the villagers of that area to highlight the risk of pesticide contamination on birds as well as on human health. During these workshops, informative brochures were distributed and tried to motivate them towards bio-pesticides and sustainable agricultural practices.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

The challenge we faced while implementing this project was short of financial assistance for pesticide analysis in sediments, surface water and moulted feather samples. It was expected to get the grant from Kushlan water bird grants which unfortunately didn't receive due to limited funds availability. I have tried to cover the expense from my personal savings which have caused the delay in analysis and completion of the second objective mentioned above. The other major challenge was technical issues in instruments again causing problems in getting the analysis done in time. Samples were sent to another lab with instruments in good working conditions.

3. Briefly describe the three most important outcomes of your project.

Three most important outcomes are:

- *A Watershed map depicting the drainage pattern and surrounding areas contributing runoffs into the wetland.*
  This map is a baseline data providing information on the specific areas contributing runoff that might carry pesticides and other contamination into the wetland. Also, this map can be utilized by the managers for developing future conservation strategies. (Appendix 1)

- *Baseline data on pesticide usage in the surrounding villages of the study area.*
  There was no preliminary data present before this project on pesticide application in farmlands in the vicinity of Nal Sarovar bird sanctuary. Based on the map created, total 10 villages were surveyed from which, 113 farmers were interviewed to collect information on the type of pesticides being used, and if they are experiencing any adverse health impacts during application of pesticides.

  It was revealed that most common problem is eye irritation and skin burning sensation and nausea which occurs while spraying the pesticides in fields. It is due to the fact that these farmers never use any precautions while working in fields. Also, we acquired information from them whether they have knowledge on the importance of migratory birds and alternatives to pesticides. It was noted that people are not aware of sustainable agriculture practices and the facilities to get such information.

- *Awareness of harmful impacts of pesticides on health and environment*
  There is lack of awareness among the farmers on adverse impacts of pesticides on their health as well as on the environment. This awareness workshop was found really helpful in highlighting the issue of pesticide contamination and their sustainable alternatives such as bio-pesticides. Also, this helped us in connecting these farmers with vendors of bio-pesticides and organisations providing help and information on sustainable agricultural

practices. They were also educated about the importance of bird conservation and impacts of pesticides on birds. Majority of farmers were inspired and convinced to incorporate changes in their conventional practices and use of bio-pesticides.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

The locals were involved in all project activities including field surveys conducted in Nal Sarovar Bird sanctuary as well as in surrounding villages. Local boatman was hired for collecting samples from the wetland. During the survey and interview with farmers, a villager always accompanied into different villages and assisted in interacting with farmers in a local language. Masters students were involved in field survey and sample collection. With the help of this project, we were able to provide information on the potential impacts of pesticide application on human health and on bird habitat. The project is beneficial in generating awareness among farmers, drawing the attention of wetland managers (forest department) towards the risk of pesticide contamination on this only Ramsar site of the state. This project was also proved helpful in enhancing the capacity of university students in scientific data collection and analysis as well as communication skills.

5. Are there any plans to continue this work?

Yes certainly, we have planned to extend this work in future. We would monitor the farming practices and pesticide usage in the studied area. We will continue conducting awareness programmes in other villages on alternatives of pesticides and sustainable agriculture. It is important to monitor the contamination level and quality of water for successive years of wetland and for that we are planning to write and submit the proposal to generate funds for the pesticide analysis in water and sediments.

Moreover, this work was recognised and appreciated by Forest Department and one of the chemical industry located close to our study area, have offered us to organise one such workshop in the end of January 2018.

6. How do you plan to share the results of your work with others?

The results will be shared both locally as well as globally. At the local level, the detailed final report will be submitted to the Forest Department. We will also publish articles in the local language. Whereas, scientific research article will be published in international journals to fill the gap of data deficiency on pesticide contamination in wetland from India.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The project was started in December 2016 after receiving the Ruffords small grants and the project activities were carried through December 2017.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used. 1 £ sterling = 83.74 INR as on 17 November 2016

Item	Budgeted Amount	Actual Amount	Difference	Comments
Student fellowship	2700	2700	0	
Field work (Sampling and collection)	200	250	-50	
Village survey	100	100	0	
Local travels (workshop)	445	405	40	
Chemicals	150	300	-150	
Awareness campaigns	170	160	10	
Printing of handouts/banners	100	60	40	
Workshops and Training (materials, meals and conducting charges)	280	260	20	
Consumables	75	75	0	
Total	**4220**	**4310**	**-90**	**Personal savings**

9. Looking ahead, what do you feel are the important next steps?

Pesticide contamination in wetland is a long term issue as they can persist for longer duration that should be monitored for 2-3 years to check the level. We are planning to continue this work further and analyse the sample to have sufficient data on pesticide contamination in water and sediment samples. Also, will try to identify the potential impacts on migratory birds inhabiting the area by analysing the moulted feathers and egg shells. To accomplish this we will continue writing the proposal and submit it again to generate funds and collaborating with local NGOs.

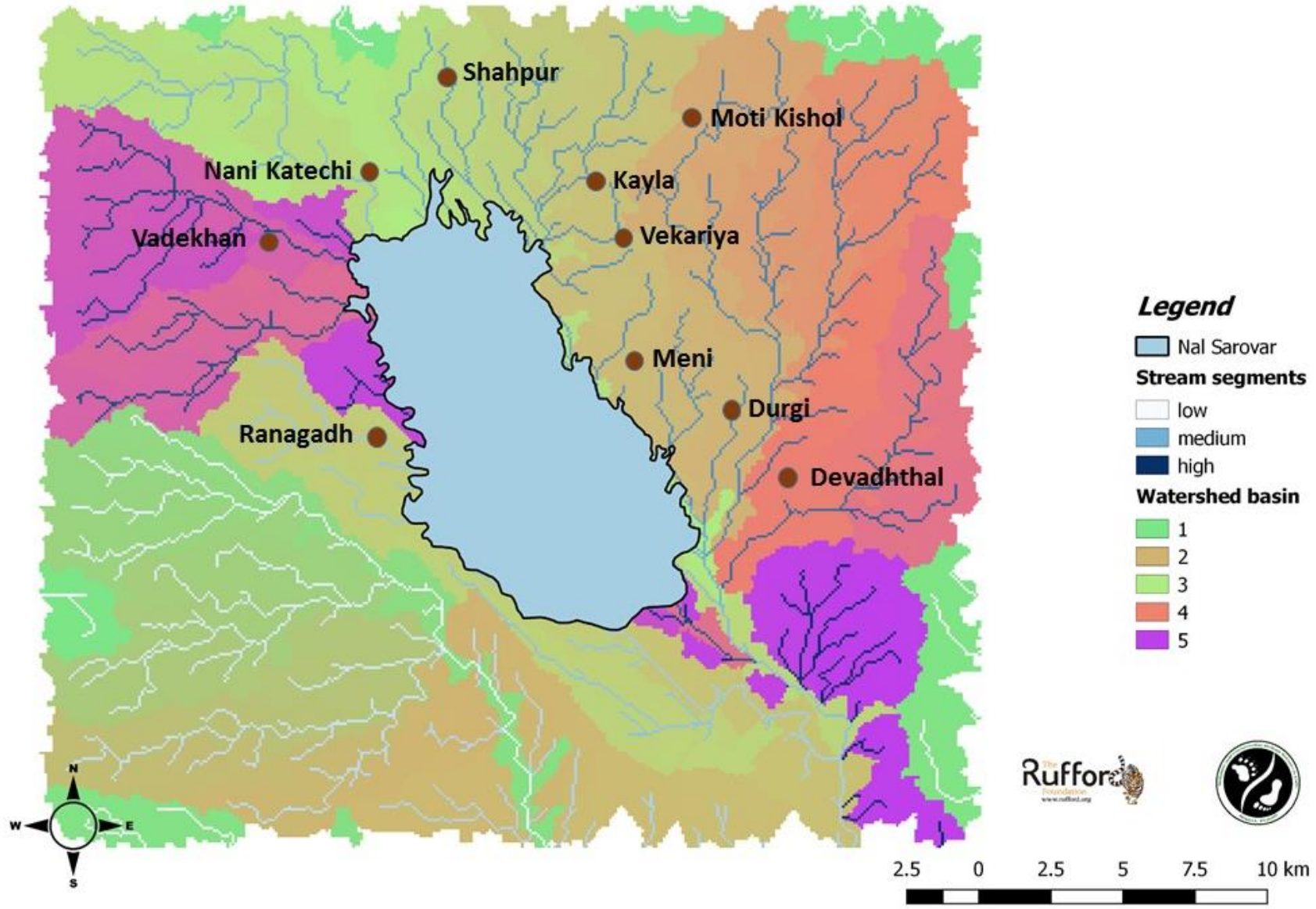
10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did the RSGF receive any publicity during the course of your work?

Yes, we have used The Rufford Foundation logo in all the project materials provided to the project team and during the workshop and it was mentioned that this work is supported by the Rufford foundation. We also printed the t-shirt using Rufford Foundation logo which was used during various project activities. Students involved in project activities were informed about The Rufford Foundation and how it is supporting various conservation oriented projects in different countries.

11. Any other comments?

I sincerely thank to RF for financial assistance to initiate this pioneer work on bird habitat conservation from pesticide contamination and creating awareness among farmers towards bio-pesticides. I would also thank to The Principal Chief Conservator of Forests, Gujarat state for permission and Earth Protectors (local NGO) for collaboration. Thanks are also due to my supervisors Dr Nishith Dharaiya (India) and Dr Silvia Espín (Spain) for their continuous guidance and support.

Appendix 1



Map showing drainage patterns and areas contributing runoff in to the wetland

Dark blue colour of stream segments shows highest intensity of runoff entering from North Eastern range of the wetland

Field and Village survey

Appendix 2

Interaction with Farmers

Appendix 2

Awareness Campaigns

Aims:

1. *Socio-economic background of farmers.*
2. *Details of Farms and cropping system.*
3. *Pesticide use and Management.*
4. *Farmers' perception towards the effects of pesticide usage on human health and environment.*

Place		Taluka/District	
Location(GPS)		Date	
Time Start		Time End	
Name		Proximity from Nal Sarovar	

Aim 1: Socio-economic background of farmer					
1	Gender		A: Male		B: Female
2	Age				
3	Education		Literate		Illiterate
4	Annual income				
	Less than 1 lakh	1-2 lakhs	2-5 lakhs		More than 5 lakhs
5	How long have you been working in farms?				
	Less than 10 years	10-20 years			More than 20 years
6	Are you satisfied with your profession?				
	A. Not satisfied	B. Hardly satisfied	C. Adequately satisfied	D. Considerably satisfied	E. Exceptionally satisfied

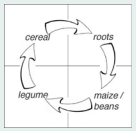
AIM 2: Details of farms and cropping system			
7	Do you have your own land?	A. Yes	B. No
8	If yes, what is the area of your farm land?		
9	What type of crops do you grow?		
10	Season specific crops		
	Summer	Monsoon	Winter
11	What is the soil type of your farmland?		
12	What type of cropping system do you use?		
13	What type of irrigation system do you use?		
14	What is the source of water for irrigation in farmland?		

AIM 3: Pesticide use and management					
15	Do you apply pesticide in agricultural field?	A. Yes	B. No		
16	If yes, what products do you use?				
17	How do you select the product?				
18	How often do you apply pesticide in your field?				
19	Do you apply the amount mentioned on the product label?	A. Yes	B. No		
20	What technique do you use for pesticide application in your field?				
21	Do you cocktail different kinds of pesticides?	A. Yes	B. No		
	If yes, Specify:				
22	From where you get the information about the usage of pesticides?				
	A. Retailers	B. Govt./Forest authorities	C. Local media	D. NGO	E. Fellow farmers
23	Do you take any personal protective precautions while using pesticides?	A. Yes	B. No		
	If yes, specify				
24	Do you use mask or scarf during pesticide spraying?	A. Yes	B. No		
25	Do you use gloves while handling the pesticides?	A. Yes	B. No		
26	How do you dispose pesticide containers?				

AIM 4: Farmer's perception towards the effects of pesticides on human health and environment				
27	Do you think pesticides are harmful?	A. Yes	B. No	
28	If yes, pesticides are harmful to what?			
	A. Soil	B. Water bodies	C. Human health	D. Birds
	Explain:			
29	Did you observe any adverse health symptoms during pesticide application?	A. Yes	B. No	
30	If yes, Specify			
31	Are you aware of bio pesticides?	A. Yes	B. No	
32	If yes, What is the source of knowledge?			
33	Are you aware of organic farming?	A. Yes	B. No	
34	If yes, Do you support it?	A. Yes	B. No	
	If yes, Why?			
	If No, why?			
35	Do birds visit your farms?	A. Yes	B. No	
36	Are these birds harmful to your crops?	A. Yes	B. No	
	If yes, how?			
37	Birds should be conserved?	A. Yes	B. No	
38	Do you agree to change the farming practices for bird conservation?	A. Agree	B. Disagree	

Alternatives

Crop rotation - A typical 4 year rotation would include a cycle with maize and beans, a cereal and a root crop with either of the following.

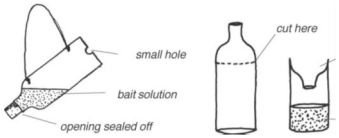


Companion planting
Growing certain plants to protect other plants from pests or diseases. For example onions planted either side of a row of carrots help to deter carrot flies.

Barriers
Barriers are physical structures put in place to prevent a pest from reaching a plant

Crawling insects
Cut the top off a transparent plastic bottle and place it firmly into the ground, over a young plant. This stops
pests such as slugs from reaching the plant.

Bait traps
Sticky solution can be prepared and used to attack flies and cut-worms



Light trap

Pheromone trap

Yellow sticky traps

Ms. Arzoo Malik
Wildlife & Conservation Biology Lab
Department of Life Sciences
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Patan

Keeping Nal Sarovar Pesticide Free

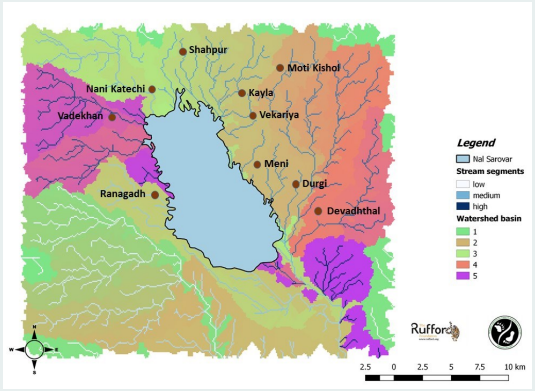
Farmer Awareness Programme

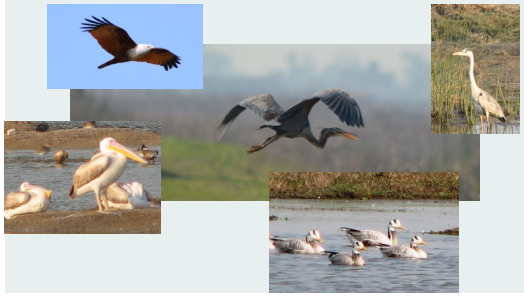
Organized by
Wildlife and Biology Conservation Lab

Supported by
Ruffords Small Grants Foundation

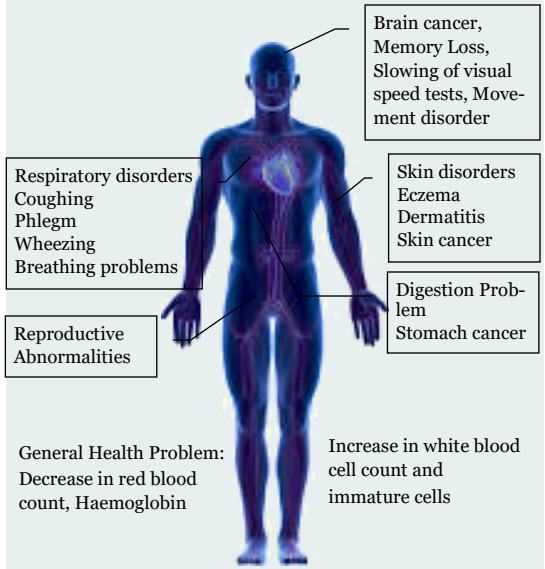
Nal Sarovar
A Ramsar site

Nal Sarovar, the only Ramsar site in Gujarat state, is an important wetland for migratory birds. The Nal Sarovar bird sanctuary is a depression formed by joining of two gulfs on both sides, receiving runoffs from its surroundings. The Bird sanctuary fall on an important migratory route of many migrant waterfowls mostly coming from Northern and Central Asia, Siberia and Europe and Himalayas. Among the diverse species of birds some are globally threatened such as the Oriental darter (*Anhinga melanogaster*), Painted stork (*Mycteria leucocephala*), Imperial eagle (*Aquila heliaca*), and White eyed pochard (*Aythya nyroca*).





Pesticide and its Effects

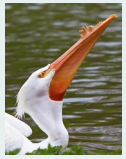


General Health Problem:
Decrease in red blood count, Haemoglobin

Increase in white blood cell count and immature cells

Effect on behaviour:
Change in feeding & mating behaviour
Less attentiveness to young ones

Malformed beaks and skeleton in chicks
Fluid retention in heart
Defects in feather growth



Reduced hormone level results in decreased egg production

Anaemia & decreased haemoglobins
Damage to calls and organs
Decreased immune function

Bio-pesticides

Bio pesticides are made from naturally occurring substances that controls pests by non-toxic mechanisms and in eco-friendly manner. They may be derived from animals such as nematodes, plants (*Chrysanthemum, Azadirachta*) and microorganisms like *Bacillus thuringiensis*, Trichoderma, Nucleopolyhedrosis virus, and include living organisms (natural enemies), their products (phytochemicals, microbial products) or by-products (semi chemicals). Hence pose less threat to the environment and human health. They are generally less toxic than chemical pesticides, often target-specific, have little or no residual effects and have acceptability for use in organic farming.