

CASE STUDY 2: RIFLE RANGE Wetland

INTRODUCTION:

Rifle range is a neighbourhood in Kotagiri that is not too far from the town area. It is a wetland that is surrounded by a number of residences and it is on the verge of being taken over by more houses in spite of the extreme dampness of the locality. Over the last twenty years the number of houses in the catchment of this wetland has been exponentially increasing due to the housing demand within the town.



Figure 1: Map showing Rifle Range's location in the district

The wetland at rifle range was home to a distillery plant established by United Breweries Ltd. nearly a century ago. The building still stands at the site, but is unoccupied and unattended due to its extreme dampness. Eucalyptus trees were introduced in this area to absorb moisture in the wetland and to make the land suitable for construction. The majority residential neighbourhood is served entirely by the wetland for its drinking and domestic use.

LOCATION, PROXIMITY & SCALE

Rifle range is at a distance of less than a kilometre from Kotagiri town centre. The wetland at Rifle range is linear and it extends from the spring in the west towards the tight residential area to the east for a distance of 275m and a width varying from 15m to 50m. The wetland is connected by a motorable road that ends where the wetland ends.

The wetland is located at one of the prime residential areas within Kotagiri and it has a varied land use around it. Apart from the dense residences on the immediate catchment, there is also a Veterinary hospital, Fungiculture unit (edible mushrooms) and an abandoned distillery. There are six wells that were dug by the panchayat but only three of them are in use at the time of the study. The wetland at rifle range is one of the biggest among all the wetlands that are being studied in detail.



Figure 2: Context map of Rifle range

The 7 acre wetland has a stream that starts from the spring to the west that cuts across the wetland and goes downstream to Donnington through the dense neighbourhood and runs further down. The water at the head wetland is cleaner in comparison to the downstream due to the sewage being let out in the downstream. The water from rifle range is used by the immediate neighbourhood and also by the panchayat for supply to Alports area just above the wetland for an hour every alternate day.



Figure 3: Wetland at Rifle range

SIGNIFICANCE:

In order to serve the British soldiers who had encamped in the area, United Breweries Ltd started its first distillery in this area during the early 20th century. The abandoned building still stands in the ground. Since the area was marshy when they set foot, the area was planted with Eucalyptus trees that are best known for absorbing water from the ground. This was done as an attempt to make the land suitable for construction. Though the building was built by drying the land up, it wasn't quite enough to sustain. Very soon, the foundation got weaker and the building started sinking in with cracks appearing on the building. This made them abandon the building and move elsewhere. Though there is a legend saying that the wetland was once a lake, interaction with the residents helped us understand that it has always been a marshy land with a stream cutting through, only larger and with more water than what we see now.

SURVEY METHODOLOGY

The survey of the wetland at Rifle range was carried out by the team from Keystone Foundation during August 2017. The team was involved in observing and analysing various parameters such as the general profile and dimensions/extent, hydrogeology and biodiversity of the wetland to understand the overall wetland ecosystem.

LANDUSE AND LANDSCAPE CHARACTER:

The team at Keystone visited the site and analysed the landuse of its watershed area and traced the same out using Google Earth. The proportions of the various types were also calculated to get an idea of the extent of various uses in the watershed area contributing to the wetland.

Total area of catchment	108 acres
Total perimeter of the catchment	2595 m
Total area of wetland	6.99 acres
Total perimeter of the wetland	1192 m

Table 1: Area of the wetland and the catchment

Name	Area (acres)
Built-up	28.93
Tea	55.28
Tree cover	8.59
Wetland	6.99
Miscellaneous	8.21
Total	108

Table 2: Land use in the catchment and their area

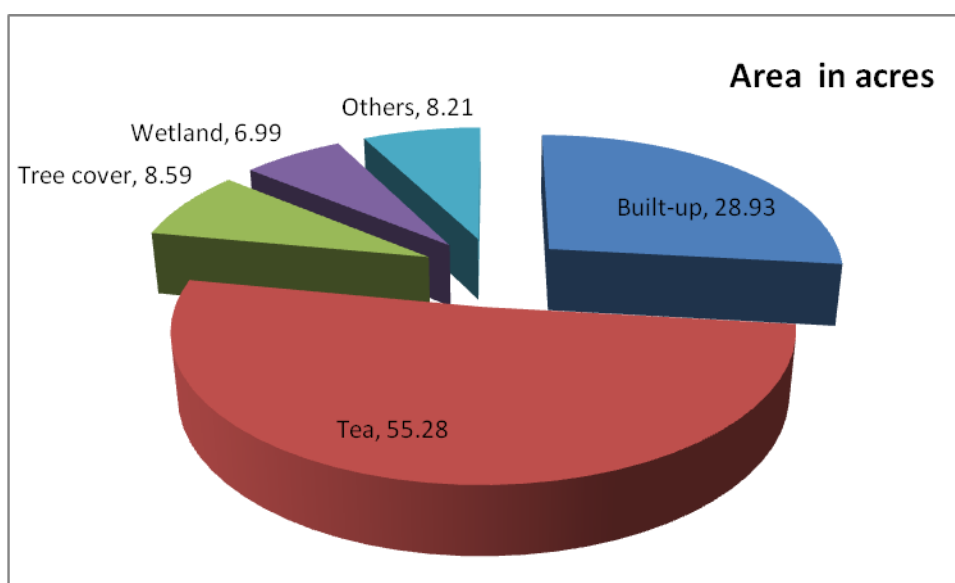


Figure 4: Proportion of the different land uses



Figure 5: Head wetland at Rifle range

Almost half of the watershed area is occupied by tea plantations (51% of the watershed) that reach down till the wetland itself in the head wetland. Since tea requires a dry landscape to grow in, most of the growth here has failed due to the swampy nature of the wetland. The tea plantations are however found till the ridge of the watershed area.



Figure 6: Land cover map of Rifle Range overlaid on Google Earth Image

Though tea occupies most of the watershed, the density of residences in this area is significantly high (27% of the watershed) as compared to the other wetlands that are studied (Elada, Upputhotti and Thalikulandah). This is probably due to the close proximity of the wetland to the town centre. While a handful of the current neighbourhood started inhabiting the place around 50 years back, most of the houses were built in the last decade due to the housing demand within the town area irrespective of the dampness due to the wetland. With this came the digging of private wells due to the abundance of water in the locality. Apart from this, the residences also let their domestic waste water into the wetland through pipelines set up by the individual families themselves.

There are 6 Panchayat dug wells of which 3 are used for supplying water to the nearby areas, especially Alports, a neighbourhood just above the wetland which faces severe water scarcity. Over the years, this led to the drying up of most part of the wetland leaving only a tiny stream that runs from East to West and further down to Donnington carrying sewage. The planting of Eucalyptus trees to dry the land up for construction also plays a major role in this scenario. On talking to the older residents there, it was understood that the wetland used to hold a substantial amount of water through most seasons of the year which was high enough to reach a person's knee with a stream that was as wide as three meters.

Apart from this, there is very minimal tree cover left in the area due to dense built up in the locality. The wetland hardly covers 6% of the overall watershed due to the encroachment of houses and other buildings in the area. However, most part of the wetland is dry due to over extraction in the recent past.

GEOLOGY:

The catchment has a very gradual slope which allows for infiltration of water all along the catchment. The depression has clayey soil as a result of silt deposited over time. The entire watershed area has deep top soil with a layer of weathered charnockite, a soft, thoroughly decomposed and porous rock, often rich in clay that is more than 20' deep. Below the deep weathered charnockite layer is the bedrock. The depth of the top soil gradually increases from the ridge of the catchment to the depression. Most of the rocks here are weathered leaving weathered soil and other weathered materials with no rock outcrops in the area.

The catchment area for Rifle range wetland had no rock exposures. The weathered layer exposures along the roadsides and other exposed areas were studied. The rock trends were not clear as there were less rock outcrops. The stream from the wetland flows in a NW – SE direction and meets the Longwood shola stream and flows into Donnington town and downstream.



Figure 7: Exposure in Polytechnic ground showing semi weathered layer in the middle surrounded by Regolith

The ground in Shakthi malai next to the polytechnic was the starting point. The regolith or weathered layer goes more than 7 metres deep, the semi weathered rock is seen (refer picture above) in one part of the exposure. There are vertical fractures seen in the semi weathered rock. The process of spheroidal weathering was also seen in the exposure.



Figure 8: Dyke/Hard rock intrusion seen in Polytechnic ground Figure 9: Spheroidal Weathering

There are roads dividing the catchment from the wetland into two halves. The road cuttings from Ramchand towards club road shows weathered layer depth between 2 metres to 7 meters. Hard rock was not seen anywhere in the catchment. The catchment is divided into two parts by the road, the top part being the main recharge area is cut from the catchment.

The important aquifer for the wetland is the weathered unconfined layer which stores and transmits water to the wetland. There are two major drainages feeding the wetland, one starting from the left flank (West) which brings water mixed with sewage from the dense habitations in Ramchand area, and the other drainage forming from the right flank (NNE) from below Windygap area in club road. The drainage from the right flank also has a depression spring close to the valley which feeds the wetland. The soil in the wetland is clayey type which helps in holding the water above ground level. The movement of ground water is much slower in the clayey sediment.

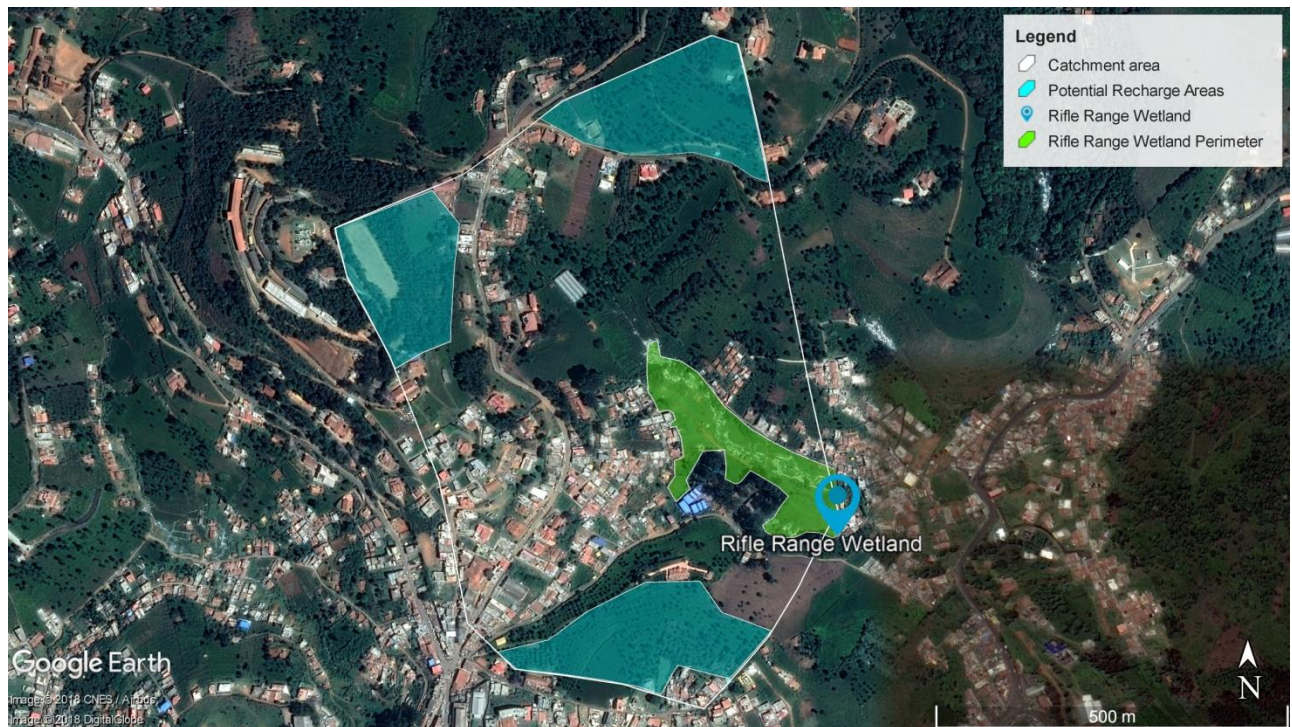


Figure 10: Potential recharge areas of Rifle Range wetland is shown in the map.

WATER QUALITY:

The water sample was taken from two points in the wetland along the stream (marked on the map above); where the stream is intersected by the bridge where a community well is used to draw water for washing clothes and at the end of the wetland. Though the quality of water at both these points is almost the same, there were few differences in terms of the iron content, hardness and coliform in water.



Figure 11: Map showing the location of water sample collection for quality test

The sample from **point 01** was at a very important junction in the wetland where the flow of water in the stream is interrupted by a crossover bridge that leads to the residences built on the catchment area. The water here was clear and odourless and has a higher pH possibly due to the mix of detergents that have high alkalinity. The salt content in this water is within the permissible level for drinking water and so are the electrical conductivity and the total dissolved solids.



Figure 12: Residents washing clothes near a panchayat well

There was presence of iron in the water that was evident from the rust orange base and an oily film on top. The iron level in this water is 1mg/l whereas the permissible level is 0.3mg/l. Apart from being an aesthetic problem, the colour does not affect the quality of the water for consumption. Due to lack of open defecation and sewage release into the stream water, there is no Coliform or ammonia present in the water.

Water quality			
	BIS standards	Point 01 on stream	Point 02 on stream
COORDINATES			
pH	6.5-8.5	7.86	6.55
TDS	<500 ppm	210	112.4
Electrical Conductivity	0 - 1500	151	79.8
Salinity	<200 mg/l	104	57.7
Temperature		26.9	25.4
Water quality tests with Jal Tara Kit			
Residual Chlorine	<0.2	NIL	NIL
Turbidity	5-10	5-10	5-10
Chloride	<250-1000 mg/l	NIL	NIL
Dissolved Oxygen	5	6	4
Flouride 1.0mg/l	<1.0	0.6	0.6
Phosphorus		0.1	0.1
Iron	0.3	1	3
Hardness	<200	120	80
Ammonia	0.5	<1	<1
Coliform	Nil	Absent	Present
Nitrate	<45	NIL	NIL

Table 3: Water quality test results

Whereas in **sample 02**, at the end of the wetland, the pH level was within the permissible limit but on the lower side indicating that the water is acidic. Similarly, the electrical conductivity, TDS and Salinity were also within the limits. Iron content in this sample is higher than sample 02 and as high as 3mg/l which gives it a strong odour and a subtle orange colour. The presence of faecal Coliform indicates that the sewer from the nearby houses could be let out here.

There is no intense farming around the area. Therefore, in both cases, there was no Chloride or Residual Chlorine. The very low level of phosphorous in the wetland limits the growth of aquatic plants in the entire wetland.

Though the quality of water is within the permissible levels for drinking at the wetland, as the stream travels further down, the water is fully contaminated as the stream collects all the domestic waste from the households and turns into a drainage duct rather than a freshwater stream.



Figure 13: Sewage being drained into the stream

HABITAT AND SPECIES



Figure 14: Dense aquatic plants lining the stream in the wetland

The wetland at Rifle range houses a number of indigenous wetland species of flora and fauna, whereas exotics are mostly found on the catchment. Amidst the dense residential development, the animals, birds and insects along with the plants help maintain the wetland ecosystem at Rifle range wetland. The terrestrial animals found along the wetland include wild boars, goats, buffalos, monkeys and Cows. The wetland is used as a grazing ground for the nearby household who own cattle as observed. Due to the practice of dumping waste in the wetland by the households, there were a number of boars that eat through the piles of waste.

The bird species include Long tailed Shrike, Pied Bushchat, Red whiskered Bulbul, Wagtail, Common Sparrow, Crow, Common Myna, Swift, and Pond heron. Bee varieties such as *Apis Dorsata* and *Apis Cerana* were also found foraging on the flowers of *Lindernia*. Apart from this dragonflies and ladybugs were also found.

In the wetland at Rifle range, one can see *Isachne*, *Scripus*, *Centella Asiatica*, *Viola*, *Kyllinga*, *Eupotarium*, *Tea*, *Cyperus*, *Viola*, *Poa grass*, *Hydrocotyle*, *Commelina*, *Arum*, *Rorippa*, *Brachiara plantaginea*, *Axonopus compressus*, *E.Nigra* and *L. Misorensis*. The plant profile in this area is dominant with the native aquatic plants that help retain the wetland water at a desirable quality. Due to this, the water quality tests also showed a relative increase in the quality after passing through 100 metres long dense aquatic plants.

At the depression, where the stream runs, the landscape is dominated by *Arum*, *Isachne*, *Scripus* and *Ludwigia* which are native aquatic plants that play a major role in retaining water in the stream and in improving the quality of water as it runs downstream. Apart from that the dried up patches are taken over by a mix of both native and exotic grasses. Lining the wetland towards the south is *Eucalyptus* that was first introduced by United Breweries Ltd in early 20th century to make the marshy land suitable for construction.

ECOSYSTEM SERVICES

The wetland at Rifle range is fully surrounded by residences that fully depend on the wetland for their drinking water and water for other domestic uses. Therefore one of the important ecosystem services provided by the wetland is groundwater replenishment and water purification. The encroachment by built structures at Rifle range is minimal leaving the wetland to play its role in water replenishment successfully. In addition to this, the wetland aquatic plants play a major role in purifying the water at the wetland and helps serve the community with better quality drinking water. The wetland also helps in flood control during monsoons.

EXISTING ACCESS AND AWARENESS AMONG STAKEHOLDERS

Residents of the neighbourhood are the only stakeholders that can have a direct, yet far reaching effect in terms of conserving the wetland. While the older residents are aware of the wetland characteristics as they have been coexisting with the wetland for generations, the newer residents are unaware of the situation as it doesn't affect their livelihood directly. The town panchayat (local government body), the secondary stakeholder, is under pressure to supply the town with water, supplying from water surplus areas to water deficit areas within the town, leaving the wetland in disarray. There is competing pressure on the wetland from all the stakeholders, by constant digging of wells, encroachment of the wetland for parking and

ad hoc measures to control flooding and drought which leads to the ecological degradation of the wetland.



Figure 15: Wetland being used for parking by the nearby residents

OPPORTUNITIES AND CONSTRAINTS

The opportunities and constraints in conserving the wetland at Rifle range lies mainly with its residents. Educating the neighbourhood on the importance of the wetland will improve the sense of belonging among the residents to create a positive effect. Pressure on the wetland due to housing, parking and lack of household and community services are a few areas where the wetland can be improved.

WAY FORWARD

The analysis of the wetland at Rifle range suggests that the wetland is in a stage where minimal interventions can be carried out to conserve the wetland. Once well maintained, this would develop the health of the wetland. The following are the few recommendations towards wetland conservation at rifle range:

1. Mobilising the important stakeholders such as the residents of the wetland and its catchment, landowners and the Panchayat.

2. Creating awareness among the residents and keeping them well informed about the role of wetlands in producing drinking water and the effects of their everyday behaviour towards the wetland.
3. Efficient waste management system to be developed towards waste collection from low lying areas that avoids waste accumulation in the wetland.
4. This in turn also reduces the human wildlife conflict as there are plenty of wild boars in the area that feed into the waste.
5. Regulating the number of bore wells in the area to effectively extract water to supply to other areas in the town.
6. Deweeding the wetland and removing of exotic plants and trees is necessary to allow the native wetland species to grow.
7. With the help of the Forest department and the local stakeholders, native species have to be planted in the catchment where exotics have taken over.
8. Since the wetland is already rich in native aquatics, it is essential to protect them through fencing and also create new patches of native plants and allow them to spread across the wetland.
9. In the wetland, a **buffer on the either side of the stream** must be maintained in order to allow for the aquatic plants to thrive and further help in water retention and purification.
10. In order for these measures to sustain over a period of time, the wetland has to be fenced in certain critical areas and areas of intervention. Movement through the wetland should also be restricted and regulated to avoid damage due to human intervention.
11. Downstream, the condition of the stream has to be improved by desilting, trapping sewage outlets from the household and improving the edge conditions of the stream.

With the implementation of these strategies and efficient monitoring of the over the period of time, the health of the wetland ecosystem can be restored.