# **SCIENCE REPORT**

# **RIVER COUPLES**

We and prof. Papini have seen six couples of rivers: A semi natural river and an artificial one in each couple.

The most particular ones are listed here:



# A1

The water is full of kelps, but there is a lot of healthy vegetation.

## A2

Here we can note a concreted river. In this way plants will never be able to grow. When it rains the risk is that these rivers may flood.



### B1

Here we can see a perfect mountain river.

**B2** 

In this picture we can observe a river closed in a pipe: this means that it is forced through a concrete pipe. If it flooded it might cause the impending road to collapse.

Talking about the pictures with our teacher we realized that human beings should behave differently with nature and in particular with rivers. We decided to investigate the aspect of riparian vegetation which in most of the city's rivers is completely cut off.

### **FIRST TRIP**

On the 21st September we went on a trip with Mrs. Papini, Mr. Capecchi and Mrs Francesca. We went to Gello River Park and from there we walked along Ombrone on the right river bank. Then we went back home walking by the river.

Along this river part we made 5 stops to analyze the plants.



Our stops consisted in selecting an area and seeing which and how many plants there are in this area, together with the percentage of surface they occupy. The part of the area is divided in layers. The plants along the river bank are similar to natural markers. Indeed, if there are many invasive plants as in Ombrone this means that the river isn't in good conditions. Instead, if there are few invasive plants and many plants that should dominate the river bank, this means that the river is in good conditions. Besides this, along the river bank we came across the Saponaria officinalis which is unusual for that time of the year. Indeed it blossoms in March. Along the river we saw some weirs: they are buildings that reduce the slope and consequently the erosion and the sediment. Some parts of the river were dry because of the nursery parks. We also saw an isolated mudded water puddle and some fish destined to die. Indeed the puddle was too small for the fish to survive. At the end of the trip we measured the diameter and the ground grain size with two suitable devices Mrs. Papini gave us.

Our first trip is over.

### SECOND TRIP

On 26thSeptember we had the second trip along the river Vincio with Mrs Papini, Capecchi and Francesca. The river Vincio is by the zoo.





Along the river we did three stops but we couldn't go along the whole river because it was invaded by Poligono del Giappone. Along the river we saw three weirs. The first near the zoo, the second near a nursery park, the third under a rusted bridge where we stopped to analyze the conditions of the river, depending on the kind of plants that grow there. We walked as far as Pontelungo. From there we went along the river Ombrone and we saw the last weir, that was situated on the spot where Vincio flows into Ombrone. We lay the meter down along the whole width of the channel of the river(17 m), while we were one meter distant one from the other. Everyone got the nearest stone to the meter marker repeating this procedure three times. We measured the size of the sediments and the diameter of the stones. And we found out that they were rather big ... Then we walked back along Ombrone. Here are the photos of the plants we came across more frequently.



In this order: Artemisia verlotorum, Helianthus tuberosus, Conyza Canadensis, Arundo donax, Populus nigra, Reynoutria bohemica, Salix alba, Echinochloa crus galli







Then we listed the species found along the bank at any stop in an electronic chart and classified them according to their ecology The groups point out the ecological conditions of the river which are not so bad, but the worst situation is downstream near the confluence with Vincio.

We worked hard both at school and at home on the ecosystem services in particular the ones offered by rivers. For example: supply of aquifer, water shading, reduction of temperatures and more oxygen for fish, habitat for plants, bird, mammals, insects and crustaceous, supply of wood, fish, therapeutic grass and more cultural services. When rivers are badly treated and modified, we have to give up a big part of them, spending a lot of money to have them back again. Is it worthwhile?

On the 26thOctober we did an experiment to learn how to calculate the discharge. The experiment consisted in pressing the piston of a syringe at a constant speed and calculating how long it took the water to get out of the syringe. In the first line we can read how many times we did the experiment, in

the second line the volume, in the third the time. The results are in the last line.

1	2	3	4	5
50cc	30cc	50cc	50cc	30cc
53,5s	28,7s	16,5s	169s	183s
0,93	1,05	3,03	0,3	0,16

In the experiment 5 we have added a needle. We saw that the flow had increased because the needle hole is smaller than the syringe one so the water flowed fasterWe have learnt how to calculate the discharge: by doing volume/time and the discharge keeps constant. If the water is forced in a narrower channel, it increases its speed. After redoing the experiment to understand better, Mrs Papini made us write the formula of discharge in a different way. That is Q(discharge)=Volume/time Surface base x height (of the channel, in our case the length of the syringe/time. This means that if the discharge is constant, the base surface and the speed are inversely proportional. If one decreases, the other increases. That's why the water in the needle increases its speed. In fact the reason why the riparian vegetation is often removed from the banks is that the roughness of the channel's bottom increases while the speed decreases, increasing the risk of flooding. So what's the right thing to do? A brain teaser.

Benefits and costs must be evaluated. Maybe if we left the rivers in their natural place, everything would be solved and all the ecosystem services the riparian vegetation offers us, might be safe and there wouldn't be risks for anyone.