

Activity report 11-24-2014 to 08-31-2015

Montreux Clean Beach Project



Under our feet at the waters edge

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Who are we ?

Hydrology and Geology

Shannon "Shay" Erismann is a hydrologist and geologist. A graduate of the University of Hawaii at Manoa, Shannon has 10 years of experience in water management and pisciculture.

Currently a volunteer lifeguard (license SISL) and proud member of the Montreux lifesaver club, Shannon is responsible for the inventories and investigations for the plagespropres.ch project.



Administration and Analysis

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Currently a volunteer lifeguard (license SISL) and proud member of the Montreux lifesaver club. Roger is responsible for database administration, analysis and communication for the plagespropres.ch project.

Cover photo: objects found on the beach

Summary

Lac Lemman and its shores support a rich and diverse ecosystem, provide an important fresh water supply and are increasingly frequented by tourists and locals alike. Visible shore pollution undermines the attractiveness of our region, devaluing the lakeshore economically and negatively impacting the environment

Lake communities struggle to maintain green spaces, despite investing much time and money, the amount of trash that arrives on the lake shores, often by fluvial origins has only increased. Plagespropres.ch offers a simple strategy to eliminate pollution while effectively monitoring the macro-pollutants to better manage the lake quality in the future. Plagespropres.ch is a project based on two pillars:

- Regular and systematic disposal of shore line pollutants
- Documentation of quantity and composition of pollutants

Regular shoreline trash collection reduces the amount of pollution directly and immediately, benefiting local communities and wildlife. Systematic identification and documentation provides crucial information. When compared over time, the data demonstrates the changes in the composition and quantity of material found on the lake shores and may be used to track effectiveness of cleanup efforts, as well as information on the pollution source.

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The

Method

The shore line is the line of contact between water and land, the strand-line is a line usually marked by washed up or stranded aquatic vegetation and other debris, marking a previous high water level along a shore. The width of the strandline depends on the geography of the shore, quantity of material, wave heights and lake levels (image 1).

In the strand line the trash that is deposited by the lake is characterized by varying states of decomposition, broken up in small pieces and ambiguous in origin. The trash is often mixed in with branches, leaves and other natural material (image2). In these areas the most efficient way to eliminate the trash is by hand, making this a tedious and physical job.

Collected by hand for one hour and placed in a bag, the trash is then spread out for identification, estimation of volume and imaging (image 3). The data collected depends on the length of the strand line and the quantity of trash present. Depending on the volume on site one of two surveys is completed: **an inventory** or a **frequency survey**.

The surveys are completed at the time and place of collection using the KoboToolbox for androidOS. The frequency, time of day and day of the operations were selected at random. For the 40 weeks of the project there are 81 cleanup operations on six sites:

The trash is disposed of in the nearest public trash can. The images and results of all operations are available on the project website:

www.plagespropres.ch

The images and results presented in this document reflect the trash visible and collected on the day and at the location indicated.



Image 1 : strand line plage du Pierrier 11-08-15



Image 2 : strand line trash rive Montreux

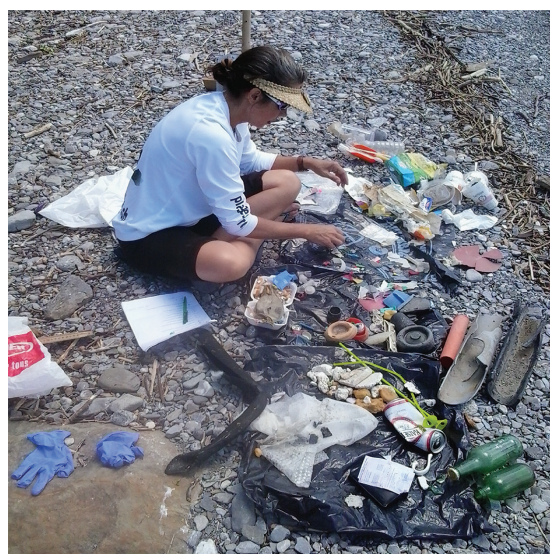


Image 3 : sorting of trash Montreux

During an inventory the trash is sorted by category and counted. The result of an inventory is therefore a table of objects found with the date at the column head and the category at the row head; completed with the number of pieces found of each category. (fig 1)

Date	8/11/2015
Quantity in liters	12
Cotton swab	17
Plastic shotgun wadding	3
Round media filter	2
Square media filter	1
Cigarette butt	389
Straws/coffee stick	13
Food wrapper	1
Chips /candy wrapper	13
Metal bottle top	3
Plastic bottle top	11
Aluminum pull tabs	0
Glass bottle	0
PET bottles	0
Aluminum can	0

fig 1 : sample of completed inventory

The frequency survey is composed of 18 « yes or no » questions and is intended to indicate the presence of an object in the strand line on the day of the operation. The result of a frequency survey is therefore a table with the date at the column head and the object in question at the row head.

By dividing the number of times an object was found (yes) by the number of surveys completed on the site (yes + no) we get the historical average of finding that object at the site. (fig 2)

The frequency survey is used when the volume of trash and time available does not allow for a complete inventory.

Fig 1 and image 4 : an inventory completed at the plage du Pierrier 11.08.2015.



Image 4 : sorting and counting

Date	31-07	26-07	24-07	18-07	08-07	"yes"	%
Round media filter	yes	yes	no	yes	no	3	0,6
Square media filter	yes	yes	no	yes	yes	4	0,8
Shotgun wadding	yes	yes	no	yes	yes	4	0,8
Cotton swab	yes	yes	yes	yes	yes	4	0,8
Cigarette butt	yes	yes	yes	yes	yes	4	0,8
PET Bottle	no	yes	no	no	no	1	0,2
Aluminum can	no	no	no	no	no	0	0
Plastic bottle top	yes	yes	yes	yes	yes	5	1
Plastic forks/knives	no	no	yes	no	no	1	0,2

fig 2 : of the five operations completed a PET bottle was found once: $1/5=0.2$ or 20%

The surveys allow us to gather data concerning the frequency and amplitude of the occurrence of trash on a particular site.

The sites are difficult to compare because of variance in strand line, usage and size.

The

Sites

- 1) La Tour-de-Peilz, Bain des Dames
- 2) Clarens, Baye de Clarens
- 3) Clarens, plage du Pierrier
- 4) Baye de Montreux, rive droite
- 5) Baye de Montreux, rive gauche
- 6) Plage Villa Barton, Genève



Image 6 : Baye de Clarens



Image 8 : Baye de Montreux rive droite



Image 10 : Villa Barton

Site selection :

The sites at Clarens and Montreux are located at the river mouth of the two principal rivers of the community.

For practical reasons the sites all have public acces and are located in proximity to public transport.



Image 5 : La Tour de Peilz

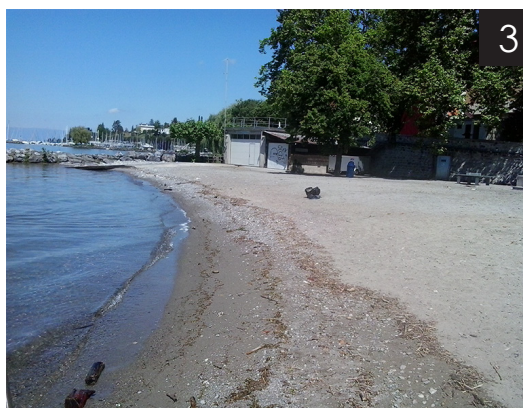


Image 7 : Plage du Pierrier

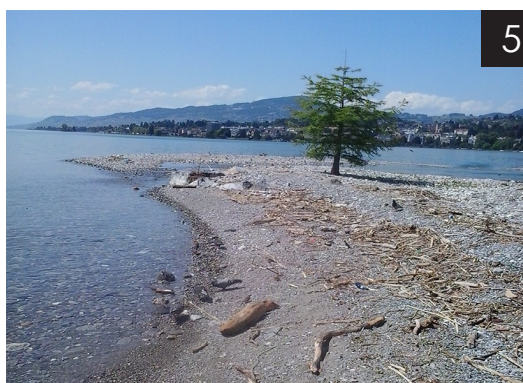
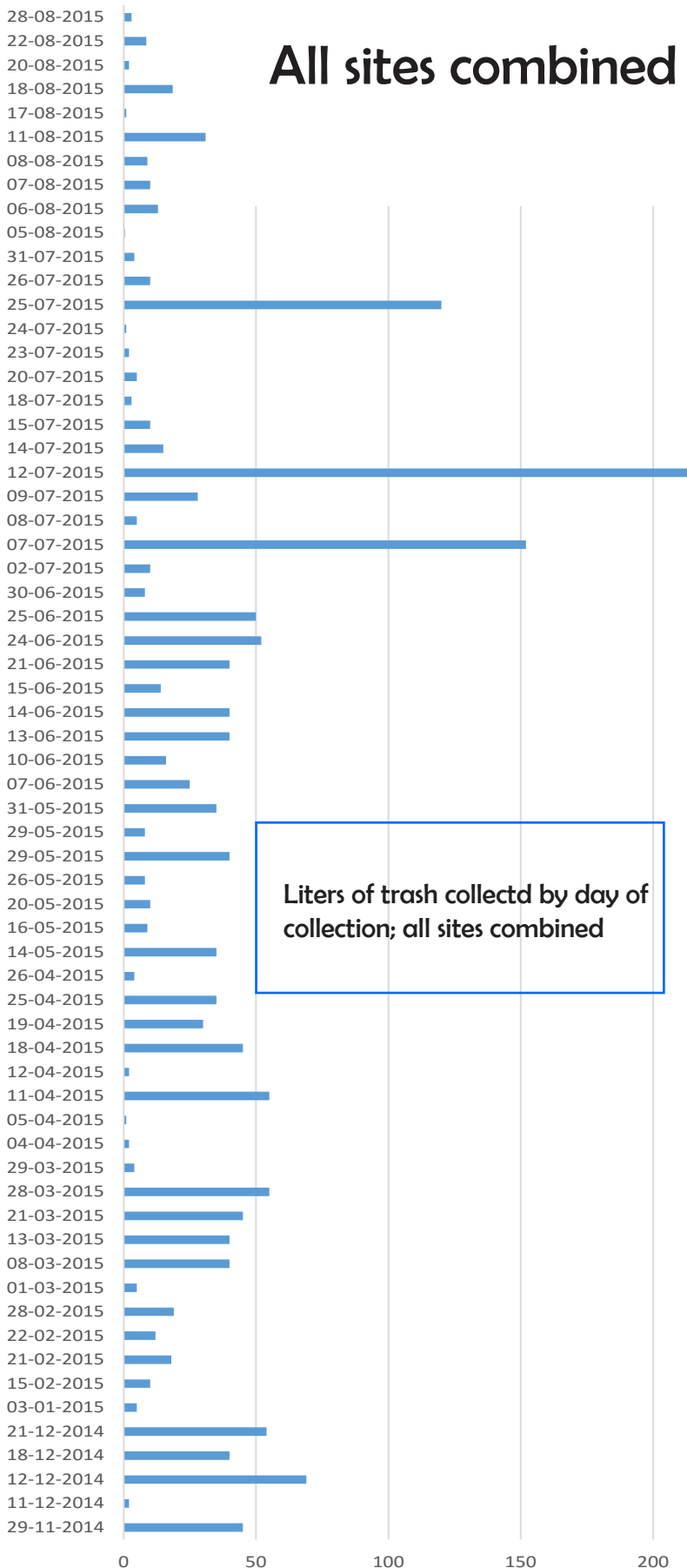


Image 9 : Baye de Montreux rive gauche

The Results:

All sites combined



From 11-24-2014 to 08-28-2015 81 clean-up operations were completed on six sites for a total of 1,765L of trash collected. A total of 61 surveys and 21 inventories were concluded

The average of all operations combined is 27.24L of trash collected per operation. Currently the average is declining after reaching its peak of 32.8L on 07-12-2015.

Inventory results (by number of pieces found)

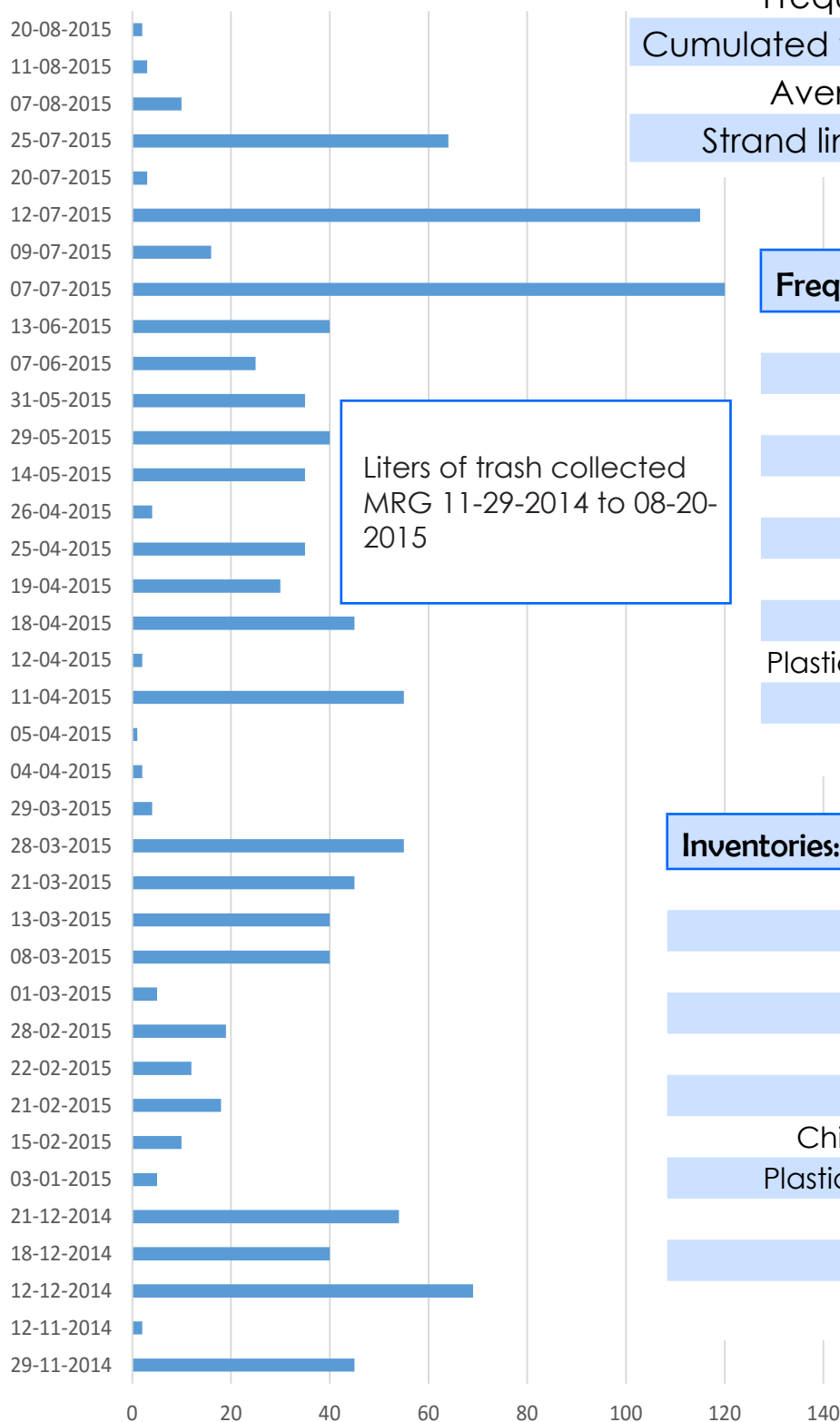
- 1) 2'527 Cigarette butts
- 2) 720 Plastic (plastic bags)
- 3) 697 Plastic (hard)
- 4) 670 Styrofoam
- 5) 278 Cotton swabs
- 6) 149 Plastic bottle tops
- 7) 125 Chips/candy wrappers
- 8) 83 Bits of glass
- 9) 80 Shotgun wadding
- 10) 62 Straws/stir sticks
- 11) 48 Metal tops

Frequency test results (order of frequency):

- 1) 0.98 Cigarette butts
- 2) 0.89 Plastic bottle tops
- 3) 0.77 Straws/stir sticks
- 4) 0.71 Food wrapper
- 5) 0.68 Cotton swabs
- 6) 0.56 Shotgun wadding
- 7) 0.41 Round media filter
- 8) 0.41 PET Bottle
- 9) 0.4 Plastic service
- 10) 0.33 Square media filter
- 11) 0.31 Aluminum can

The Results:

Montreux Rive Gauche (MRG)



Summary of activity:

First clean up 29-11-2014

Last clean up 20-08-2015

Clean ups 38

Inventories 4

Frequency tests 32

Cumulated total (liters) 1167

Average (litres) 30,71

Strand line (metres) 58

Frequency:

Cigarette butt 0,969

Plastic bottle top 0,781

Straw/stir stick 0,719

Food wrapper 0,688

PET bottle 0,531

Aluminum can 0,5

Cotton Swab 0,5

Plastic service 0,375

Plastic shotgun wadding 0,25

Round media filter 0,188

Square media filter 0,063

Inventories:

Cigarette butts 595

Plastic(bags) 165

Styrofoam 144

Plastic (hard) 69

Cotton swab 53

Plastic bottle top 25

Chips/candy wrapper 24

Plastic shotgun wadding 13

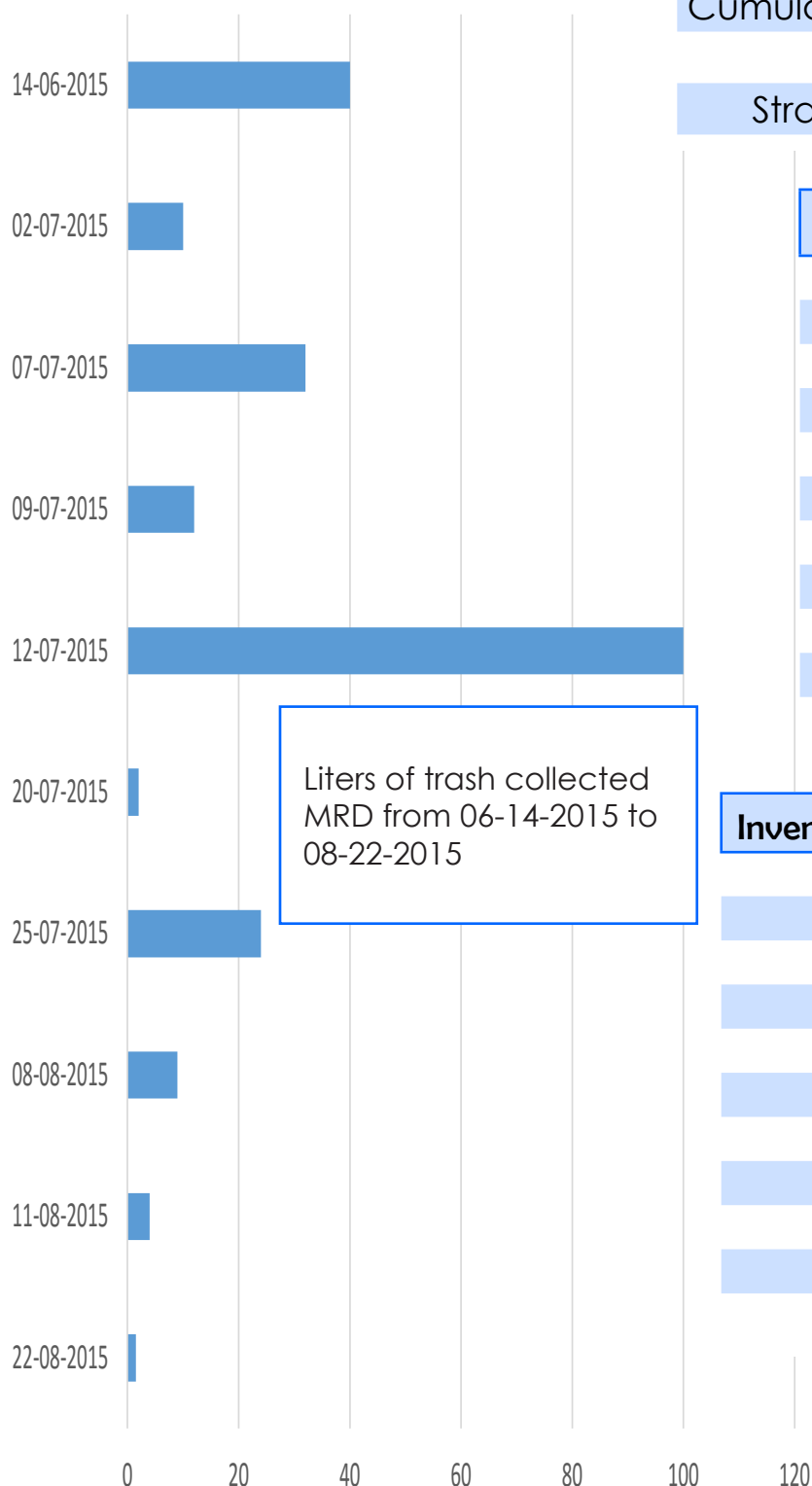
Food wrapper 13

Straw/stir stick 10

Broken glass 10

The Results:

Montreux Rive Droite (MRD)



Summary of activity:

First clean up	6/14/2015
Last clean up	8/22/2015
Nbr of clean ups	10
Inventories	4
Frequency tests	10
Cumulated total (liters)	234,5
Average	23,45
Strand line (meters)	64

Frequency:

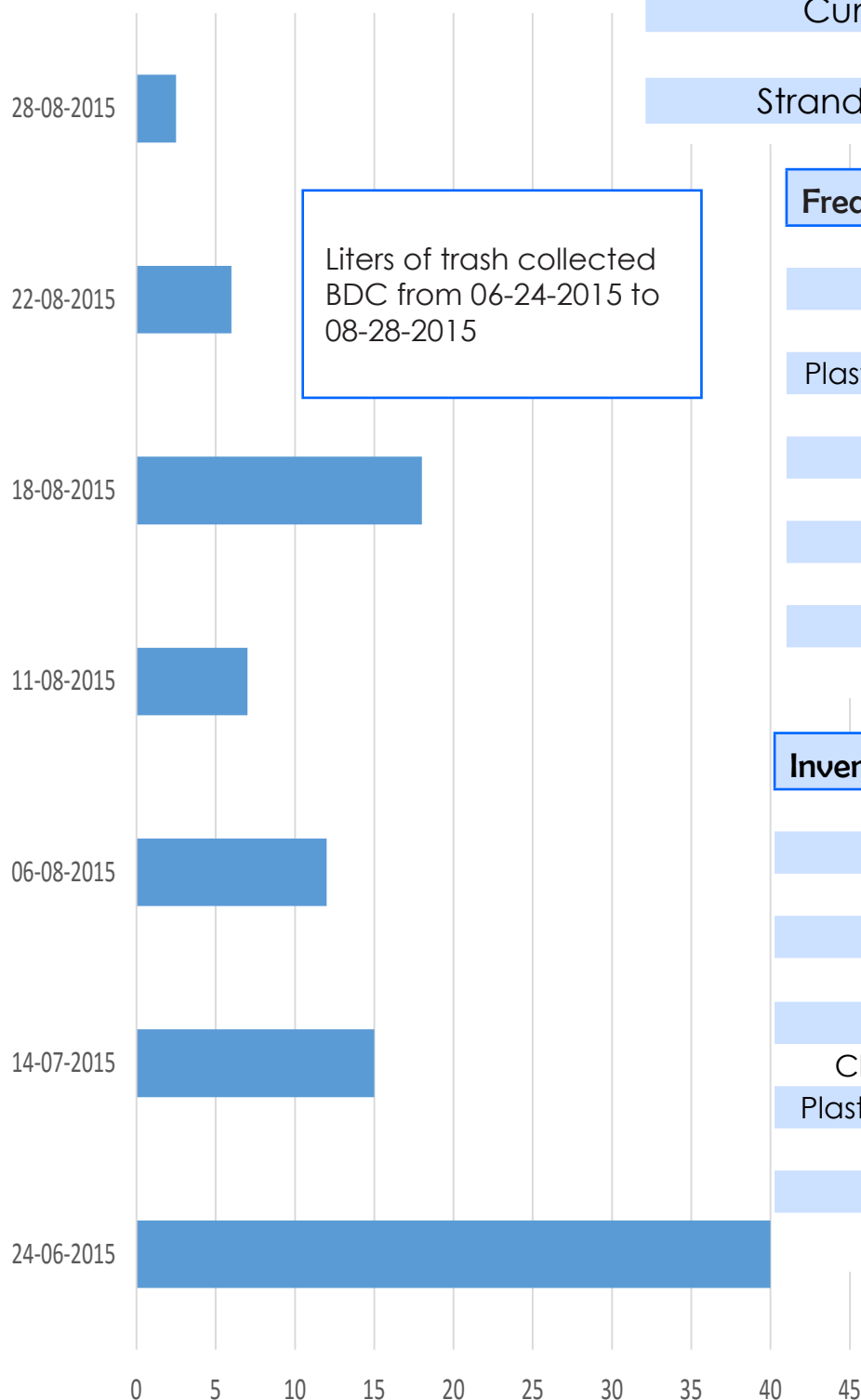
Plastic shotgun wadding	1,00
Cotton swab	1,00
Cigarette butt	1,00
Plastic bottle top	1,00
Straw/stir stick	1,00
Round media filter	0,78
Square media filter	0,67
Plastic service	0,67
Food wrapper	0,56
Medical bandage	0,44
PET bottle	0,33

Inventories:

Cigarette butt	853
Plastic (hard)	271
Plastic (bags)	249
Styrofoam	109
Cotton swab	106
Plastic bottle top	50
Chips/candy wrapper	35
Plastic shotgun wadding	33
Medical bottle/tube	28
Metal bottle top	21
Food wrapper	14

The Results:

Baye de Clarens (BDC)



Summary of activity:

First clean up	6/24/2015
Last clean up	8/28/2015
Nbr of clean ups	7
Inventories	4
Frequency tests	5
Cumulated total	100,5
Average	14,36
Strand line (meters)	78

Frequency:

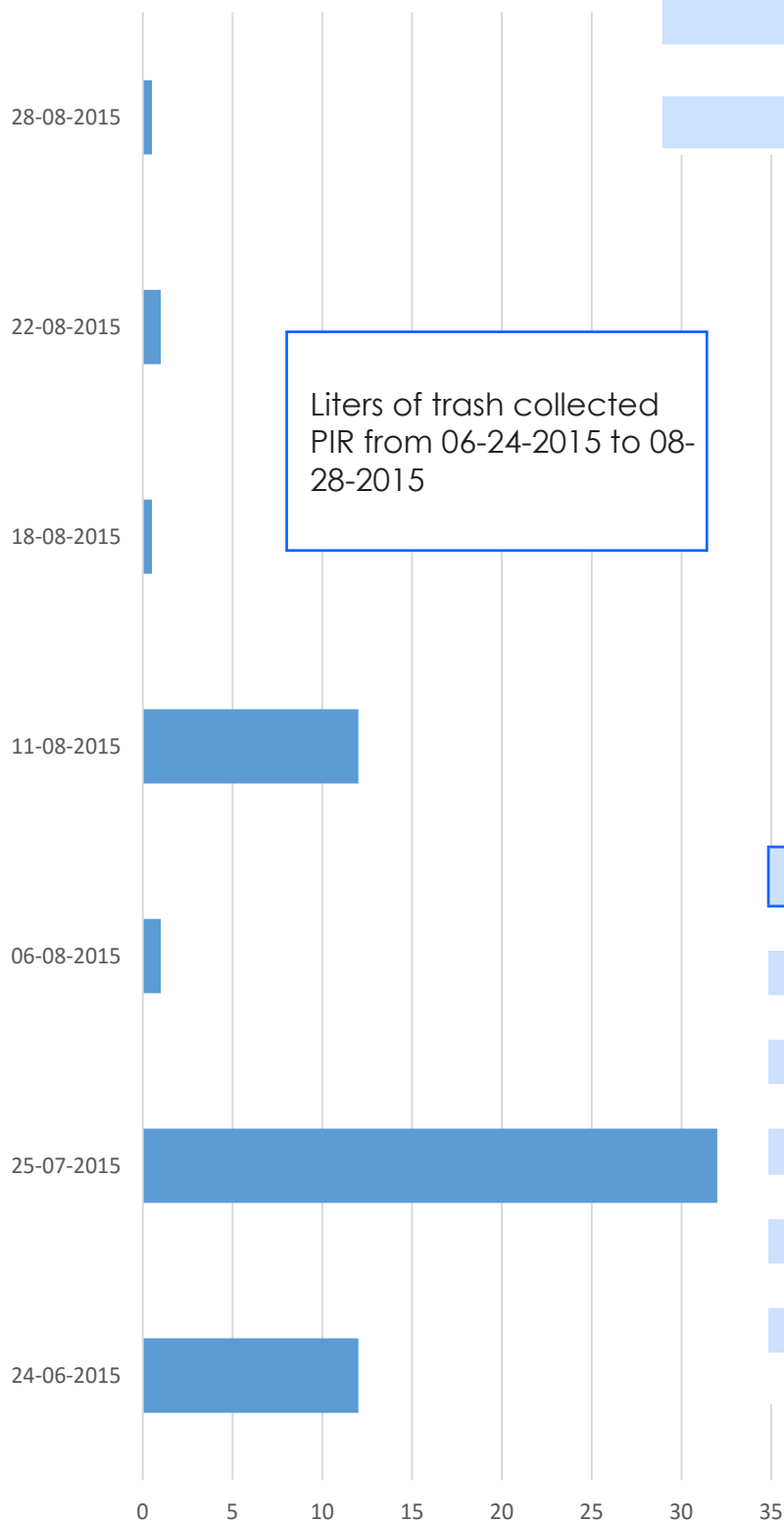
Cigarette butt	1
Food wrapper	1
Plastic bottle top	1
Plastic shotgun wadding	0,8
Cotton swab	0,8
Straw/stir stick	0,8
Square media filter	0,6
Medical band-aids	0,6
Round media filter	0,4
PET bottle	0,4
Tampax/condom	0,4

Inventories:

Styrofoam	220
Plastic (hard)	88
Cigarette butt	87
Plastic (bags)	76
Cotton swab	46
Plastic bottle top	33
Chips/candy wrapper	24
Plastic shotgun wadding	13
Food wrapper	13
Metal top	11
PET bottle	7

The results:

le Pierrier (PIR)



Summary of activity:

First clean up	06-24-2015
Last clean up	08-28-2015
Nbr of clean ups	7
Inventories	4
Frequency tests	6
Cumulated total	59
Average (litres)	8,43
Strand line (metres)	56

Frequency:

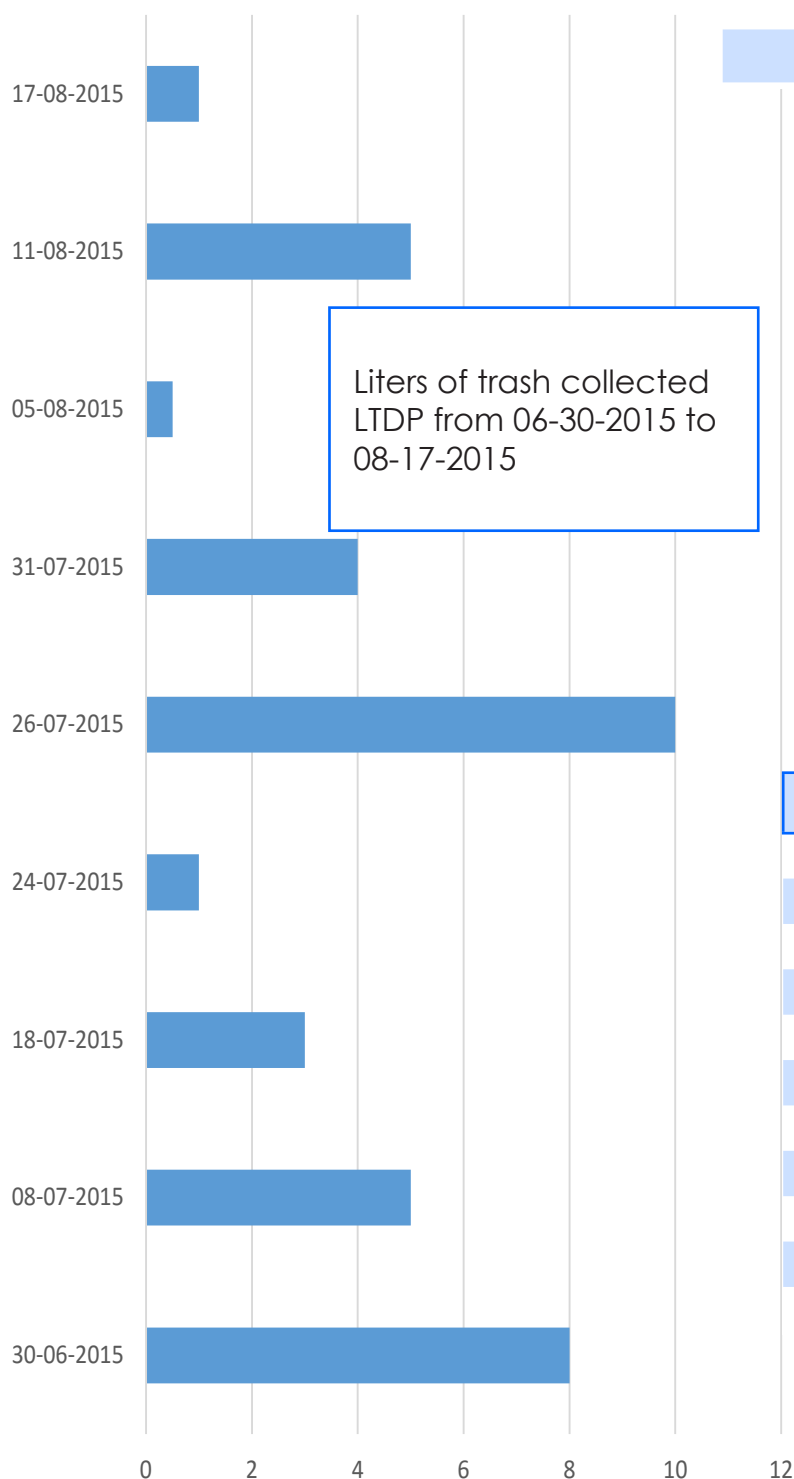
Cotton swab	1,00
Cigarette butt	1,00
Round media filter	0,83
Plastic shotgun wadding	0,83
Plastic bottle	0,83
Straw/stir stick	0,67
Square media filter	0,50
Plastic service	0,50
Medical bandage	0,50
Food wrapper	0,33
PET bottle	0,17

Inventories:

Cigarette butt	434
Plastic (bags)	67
Styrofoam	65
Plastic (hard)	33
Cotton swab	28
Chips/candy wrapper	20
Straw/stir stick	17
Plastic bottle top	14
Plastic shotgun wadding	9
Food wrapper	7
Broken glass	6

The results:

La Tour-de-Peilz (LTDP)



Summary of activity:

First clean up	6/30/2015
Last clean up	8/17/2015
Nbr of clean ups	9
Inventories	5
Frequency tests	8
Cumulated total (liters)	37,5
Average (liters)	5,4
Strand line (meters)	34

Frequency:

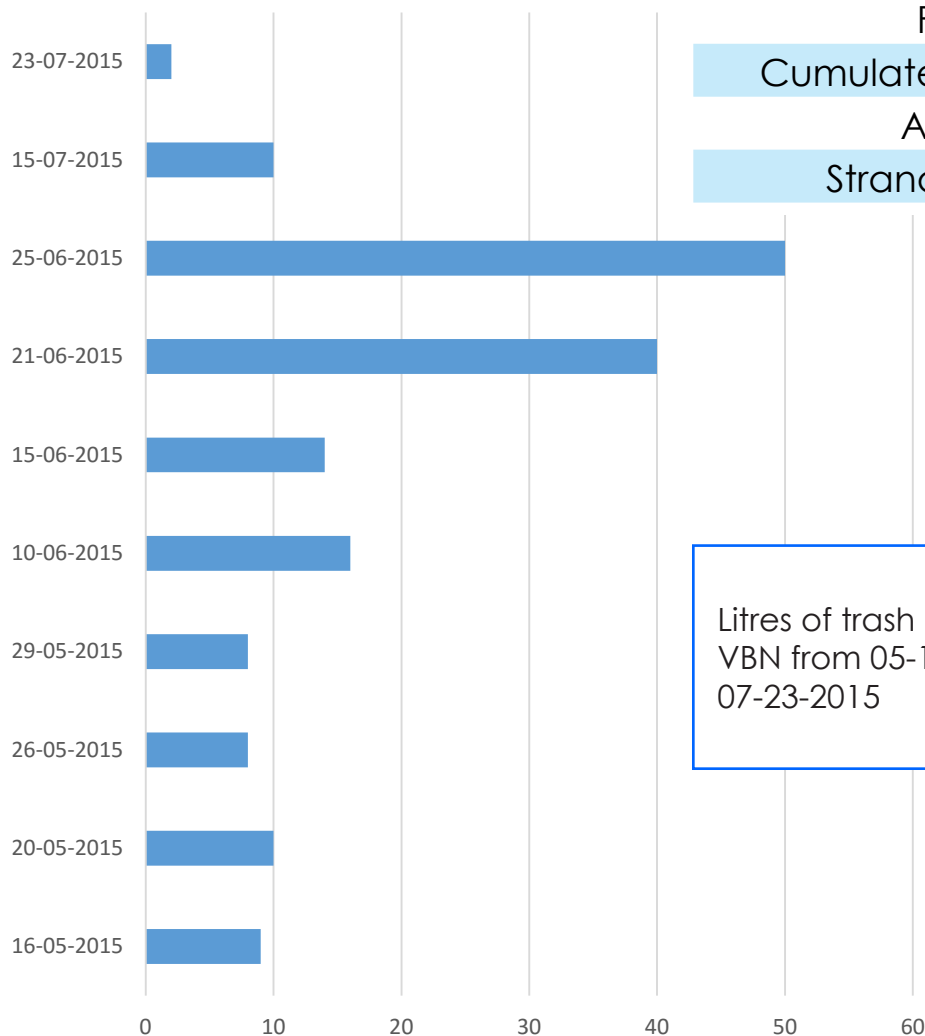
Food wrapper	1
Plastic bottle top	1
Cigarette butt	0,88
Square media filter	0,75
Plastic shotgun wadding	0,75
Cotton swab	0,75
Straw/stir stick	0,75
Medical bandage	0,75
Round media filter	0,63
Denner	0,13
PET bottle	0,13

Inventories:

Cigarette butt	558
Plastic (hard)	236
Plastic (bags)	163
Styrofoam	132
Broken glass	62
Cotton swab	26
Plastic bottle top	27
Piece of metal	35
Chips/candy wrapper	22
Straw/stir stick	19
Sqaure media filter	14

The results:

Villa Barton, GE (VBN)



Summary of activity:

First clean up 16/05/2015

Last clean up 23/07/2015

Nbr of clean ups 10

Inventories 0

Frequency tests 0

Cumulated total (liters) 167

Average (liters) 16.7

Strand line (meters) 64

Litres of trash collected
VBN from 05-16-2015 to
07-23-2015

Discussion

The mean volume of waste collected from all sites combined is 27,94L per visit. Volume spikes during weekends and large events are evident. Aproximately 20L of the 27. 94L can be attributed to fast food material and bottles which have a greater volume. These items are often left behind by beachgoers rather than deposited by the lake. The larger material is generally removed by the city services or finds its way in to the lake.

Upon observation the objects found appear to represent the commercial activity in the area. The frequency test confirms the observations for all categories of trash related to food consumption. Located adjacent to a supermarket, many restaurants and a busy pedestrian walkway; MRG and MRD take either first or second position in all of these categories. (fig 4)

location	MRG	MRG
Date	8/11/2015	6/13/2015
Quantity	3	40
Cotton swab	13	17
Plastic shotgun wadding	3	5
Cigarette butt	113	155
Straw/stir stick	0	6
Food wrapper	0	10
Chips/candy wrapper	0	16
Plastic bottle top	7	9
Glass bottle	0	2
PET bottle	0	1
Aluminum can	0	1
Styrofoam	34	26
Plastic (hard)	19	41
Plastic (bags)	37	67

fig 5: inventory of MRG 08/2015 and 06/2015

	MRG	MRD	PIR	LTDP	BDC
Mcdonalds	0,20	0,11	0,00	0,00	0,20
Movenpick	0,00	0,11	0,17	0,00	0,00
Other_takeout	0,60	0,56	0,33	1,00	1,00
Denner	0,10	0,00	0,00	0,13	0,00
PET_Bottle	0,30	0,33	0,17	0,13	0,40
Aluminum_Can	0,30	0,11	0,00	0,00	0,20
Plastic_top	0,80	1,00	0,83	1,00	1,00
Fork_spoon_knife_plastic	0,50	0,67	0,50	0,13	0,20
Straw	0,80	1,00	0,67	0,75	0,80
Misc_Fast_food	0,30	0,22	0,00	0,00	0,20

fig 4: results of frequency tests for food related trash red = the most frequent

However, 40 of the 81 operations report a volume of 10L or less (49%). At low volumes the trash is composed of different objects.

The results of two inventories of MRG illustrate this difference. On the inventory of June 13th, with a volume of 40L, PET bottles, aluminum cans, straws and food wrappers are all present. On the other hand, for the inventory of August 11th, with a volume of 3L, none of those objects were found. (fig 5) (image 12 and 13)

This important drop in volume, -92.5%, between the two inventories is not reflected in the amount of pieces of trash found. On June 13 374 pieces of trash were picked up versus 226 pieces on August 11th; a difference of only -39%. Food wrappers and bottles are more voluminous than the other objects collected.

This observation suggests that volume (or mass) does not sufficiently explain the quantity of trash found on the beach. The volume does not indicate the composition, the number of pieces collected nor does it give any indication of the source or the frequency of the pollution.

Plastics are the most abundant material found at all sites combined and all sites individually. Plastics take many forms and it is often difficult to identify what the original plastic pieces were or their function.

Of the thousands of pieces of plastic found and/or counted on the five sites we were able to identify a few objects that appear regularly and are not normally associated with activities on the beach: cotton swabs, media filters and plastic shotgun wadding. (image 14)

Media filters come from water treatment plants and industries that use a lot of water (fish farms and food processing). Cotton swabs are flushed down toilets and end up on our beach. Before arriving on our lakeshore, the plastic shotgun wadding was inside a shotgun shell. The plastic skirt separates the shot from the powder and is ejected from the shotgun at the same time as the shot.

More information:

<http://www.hammeranddirt.blogspot.ch/2015/07/shotgun-shells-biofilters-cotton-swabs.html>

The exact geographic origin of these items is unknown, but the frequency tests and inventories confirm the observations. These three items are found in either the top 10 of inventories, the top 10 of frequency or both. On any beach in this study you have a 100% chance of finding plastic, 68% chance of finding a cotton swab, 63% chance of finding a media filter* and 56% chance of finding plastic shotgun wadding.



image 12: MRG trash found 06-13-2015



image 13 : MRG trash found 08-11-2015

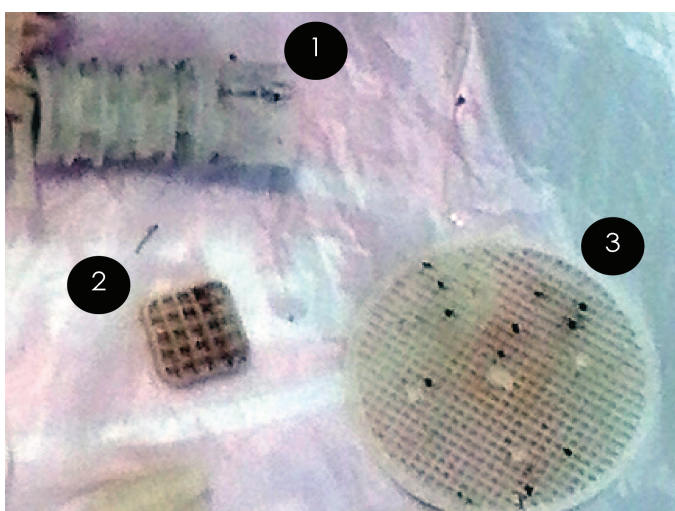


image 14 : 1= shotgun wadding; 2/3= media filter

* all types of media filters

Conclusion

The city services are very effective at reducing the volume of trash present on the beach, but this only to a certain size. Nevertheless, the volume of trash that is left is a concentration of bits of plastic, styrofoam, cotton swabs, cigarette butts and other unknown objects that put in doubt our image of a clean lake.

The concentration and placement of this trash in the strand line is concerning. Whether it is a child playing on the beach or a swan digging for bread crumbs; there can be no doubt that that they will come into contact with these items and other unknown items that come to rest on our lake shore.

Removal of these pollutants is mandatory if we are to assure a safe environment and reinforce our image of a "clean" country. The inventory and identification of this trash gives us clues about where it comes from and the data collected can be used to determine the density and frequency of the pollution.

Recommendation

The plagespropres.ch project should continue and be expanded to include all the rivers in the communities of Vevey, La Tour-de-Peilz and Montreux. The emphasis should remain on the elimination and identification of the trash collected. .

Possible evolutions

Regular water quality testing to include testing for e-coli.

Investigation on the origin of media filters and shotgun wadding

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