

Urban  
Waters  
Research  
Study

The Charles River and  
Lake Geneva

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*This study began with the idea of comparing the Charles River in Boston, USA to Lake Geneva in Switzerland. We believed that Lake Geneva, today a center of urban swimming and recreation, could be used as a prototype for implementing popular swimming in the Charles River. The two cities are very similar in terms of population size, climate, and urban history.*

*Today, prospects of swimming in the Charles River face three primary obstacles: pollution, funding, and public perception. Lake Geneva itself has also dealt with these issues, and overcome them successfully. Examining the progress the city of Geneva undertook can provide a model for understanding how to bring urban swimming to the Charles.*

## **Historical Comparison**

### ***Historical Development of the Charles River***

In the early 1900's, swimming in the Charles River in Boston was a popular summertime activity. During the hottest days of the year, the locals would flock to the many beaches lining the river, from Gerry's Landing to Magazine Beach and the Esplanade. Millions visited the beaches each year for swimming, fun, exercise and relaxation, and it even became necessary to install lights along the water to accommodate swimming that continued on into the nighttime (Charles River Conservancy 2009).

Despite the river's popularity as a swimming destination, untreated sewage was in fact being drained into the river in large amounts at the very same time that people were swimming in its waters. This practice had gone on for hundreds of years, since urbanization first reached the area in the 1600's. A steadily growing population size only increased this pollution. However, public awareness of the related health risks of these practice were at the time neither well known nor well understood.

Recognizing the growing strain on the water, state legislators approved a drainage system for the city of Boston to be built, completed in 1884. Sewage from Boston and the surrounding area was all diverted to Moon Island, a sewage discharge facility. Although advanced for its time, Moon Island did not treat the waste in any way. The facility would dump all of the untreated sewage into the outgoing tide, although 20% of this returned back into Boston Harbor, leaving the harbor infamously and severely polluted (Save the Harbor 2009). Furthermore, throughout the 19<sup>th</sup> century, 43 mills had been built along a 9.5 mile stretch of the river, from Watertown Dam to Boston Harbor. The Charles River had become "so polluted from industrial and domestic waste... that a government report recommended abandoning cleanup efforts on this area of the river" (Charles River Watershed Association 2009).

The Quabbin to Boston water supply system, built in the 30's, enabled the population size to increase tremendously and this density impacted upon already poor water quality, as did toxic discharges from nearby industrial facilities (Charles River Watershed Association 2009).

By the 1950's, pollution had significantly worsened, seriously increasing the risks to human health. Around the same time, a growing body of research became available, alerting people to the potential dangers of swimming in contaminated waters. Approximately 2 billion gallons of raw sewage were being dumped each year, and the MDC closed the Charles River for swimming in 1955 in response (Lecture 2009).

Treatment plants were constructed at Moon Island as well as Nut and Deer Islands in the 1950's and 60's, but this was not enough to halt further pollution. Facilities were often overloaded, and in any case, only conducted primary treatment processes on the wastewater. (Save the Harbor 2009). Water quality continued to deteriorate, and by the 1960's was near disastrous.

Little was done immediately to remedy the many problems facing the health of the river. It was not until the late 1960's and 70's that the situation slowly began to turn around, following greater public awareness and increased concern for the environment. The CRWA (Charles River Watershed Association) was formed in 1965 by a group of concerned citizens, who began advocating for greater emphasis on environmental health (Charles River Watershed Association 2009).

Cleanup efforts intensified in 1983, when Conservation Law Foundation sued federal and state officials to force the cleanup of Boston Harbor. A Quincy city solicitor, while jogging on a Boston beach, stepped on a pile of raw sewage. He sued the city for violation of the 1972 Federal Clean Water Act and was successful. The judge ordered the city to begin construction of a new secondary treatment plant, and a subsequent court case established a strict cleanup schedule. Control of the water and sewage systems was transferred to the newly created MWRA (Massachusetts Water Resources Authority). Since that time, water in the harbor has become progressively cleaner (Save the Harbor 2009).

Other organizations have gotten involved in the cleanup efforts as well. The EPA joined in 1995, in what is known as the Clean Charles River Initiative, established with the goal of "making the lower Charles River, from Watertown to Boston harbor, fishable and swimmable." At this time of their initial involvement, the river met regulations for swimmable conditions only 19% of the time (EPA 2009). Today, that percentage is in the 60's.

Despite the incredible progress in slowing the pollution of the river, problems do remain. CSOs have stubbornly remained one of Boston's biggest challenges in achieving clean water. In 1988, the lower Charles had 19 CSOs discharging 1.7 billion gallons per year, 150 million gallons of which was untreated sewage (EPA 2009). Today this number has declined to 6 CSOs discharging in times of exceptionally wet weather.

It was not until the mid-1990's, when Deer Island initiated secondary treatment for the wastewater entering the plant, that Boston's treatment facilities complied with the regulations of the Federal Clean Water Act, passed more than 20 years earlier. The goal of the act is to achieve a level of water quality that is both swimmable and fishable and it works by employing a variety of tools to regulate the discharge of pollutants from their point sources. This is done using both technology based standards and water quality based standards. The act also finances municipal wastewater treatment facilities and manages polluted runoff (EPA 2009, Lecture 2009).

### ***The Charles River Today***

The Charles River is approximately 2,000 feet wide, or .4 miles, in the area near Magazine Beach. The river is muddy brown in color due to the slow current, a side effect of the dammed river basin. In 1910, construction was completed on a dam at the mouth of the river near the Museum of Science. This stabilized the water level, eliminated existing mud flats, and enabled embankments to be created along the shoreline, such as the Esplanade Park. The river is bordered on either side by areas of green park space, benches, and pavement paths. The area (particularly on the Boston side) is well used in good weather by runners, walkers, bicyclists and roller bladers, as well as those simply relaxing on the grass. Sailboats are seen on the river year round, and there is a very active community boat house, which makes lessons available to those in the area, including low income children. Other recreational opportunities include concerts, picnicking, rowing, ice skating and so forth. Swimming would be a very welcome addition to the list of activities for the city dwellers.

Despite the large body of knowledge available today, the Charles River continues to be actively polluted by CSOs, illicit connections, storm water discharges from municipal storm drains, urbanization, and other point sources (Lecture 2009), although at much lower levels than in the past. 6 CSO (combined sewer overflow) discharges (raw sewage) still make their way into the river in times of heavy rain, and this is one of the main problems that continues to plague the river today. They are expected to be removed by 2013 (Lecture 2009). A settlement agreement between the EPA and the MWRA stated that the MWRA would initiate an effort to be completed by 2013, to reduce CSO discharges by 99.5%, down to 8 million gallons of CSO discharge per year (EPA 2009). This is a vast improvement from the 1.7 billion gallons discharged in 1988.

Today the Charles River is swimmable more than 60% of the time, with much credit given to the EPA who helped Boston raise this number from the low of 19% that it was only 14 years ago.

In sum, the main issues preventing swimming in the Charles River are as follows: the toxic bottom, the bacteria counts, and clarity (4 ft needed, as measured with a secchi disk) (Lecture 2009).

Progress is active on achieving a swimmable Charles River, in part due to efforts put forth by the EPA. They run a number of monitoring programs, including "hot spot monitoring" run by Roger Frymire. Otherwise known as the "mad kayaker," he traverses the river in search of illicit discharge

connections draining into the Charles. He reports the connections to the EPA, who in turn organize lawsuits against the parties involved (Lecture 2009).

### ***Legalities and Regulations in Boston***

Massachusetts has its own regulations and criteria for water quality. The Charles River is classified as a Class B, cold water body. This means that it can be used as a habitat for aquatic life, irrigation, primary and secondary contact recreation, etc. The regulations mandate certain levels of dissolved oxygen, pH, temperature, and bacteria. For bacteria, e. coli is tested, and the single sample maximum allowable density is 235 CFU/ 100 mL, 126 CFU for the mean. These regulations are adopted from EPA guidelines.

Testing in Boston is conducted by the EPA as a part of the core monitoring program, in use since 1998. It is in use during the summer months of high recreational activity, and there are 12 stations, which monitor both wet and dry weather conditions. These stations measure fecal coliforms, clarity, nutrients and chlorophyll and metals (Lecture 2009).

### ***Historical Development of Lake Geneva***

Geneva and Boston share very similar histories and even today are similar in size and population, both roughly half a million metropolitan inhabitants. Today Geneva is very proud of what the city considers the success story of their Lake, from the 1970's to today (Geneva Office for Water Renaturation Alex 2009).

The story begins in the late 1950's, when a horrible smell exuding from the river prompted a group of scientists to investigate further. They found that the smell was caused by decaying algae, and in doing so, also realized how dirty the water had become. This group of doctors, chemists and biologists became concerned by the increased pollution of Lake Geneva, and in 1957 they introduced systematic monitoring of water quality (Geneva Office for Water Renaturation Charles Stalder 2009). This smell just might have begun the turnaround of Lake Geneva.

The first sanitation program began in 1958, and by its end 17 years later, 99% of the population was connected to the sewer system. 120 km of pipes had been laid, and 15 wastewater treatment plants 27 pumping stations had been built. These projects totaled 250 million Swiss francs.

Throughout the years and great changes in water quality and public awareness, the swimming habits of locals were not particularly affected. Today they express gratitude today for the clean water they are able to enjoy, but many comment that they swam in the river in past years, regardless of its cleanliness (or lack thereof). Locals said that at the time, they knew the water was dirty, but swam anyway. This seemed to be the general consensus for action during this period.

***Lake Geneva Today***

Lake Geneva is a crescent-shaped lake located on the Swiss-French border; approximately 60% of the Lake is on Swiss territory. The lake is 224 square miles and has a maximum depth of 1,017 feet, and has a deep blue, remarkably clear color. The lake is the second largest freshwater lake in central Europe. It lies on the course of the Rhone River and has its source at the Rhone Glacier, although many other tributaries enter the lake along its course, many of them from foreign countries (The Columbia Encyclopedia 2008).

On the Geneva side, the Lake is bordered by walking and biking paths and is well urbanized. These areas have high levels of pedestrian usage on a daily basis at most times of the day, particularly in nice weather. Boaters, fishermen, and swimmers can be seen in the water year round.

The Bains des Paquis in Geneva, the most popular and well used swimming location, is an organization run by an association of users. There are a number of different swimming areas, including a volleyball court and a water polo pit. There are pebble beaches lined with wooden platforms for sunning, a long concrete jetty for more crowds, and at least 2 more walled in swimming sections directly in the lake. There are sitting areas, a café for lunch, more secluded sunning areas, a complete spa, changing rooms, shaded areas, and table games. Cost is only 2 francs per day for adults, and a membership pass is available. 25% of funding comes from the city, with the remaining 75% generated by users of the site.

The Bains des Paquis are an important structure to the Genevese people. They can be seen as representative of the democratic power of the people and a mainstay of the working class. The story of the “rescue” of the site is local legend. Years ago, the Paquis area of the city was on the outskirts and perceived as a bit dangerous. Over time it became a more fashionable district, and being located along the lake front, it had the potential for some very profitable real estate space. The Bains des Paquis weathered all of these changes, until expensive hotels and restaurants began moving in, and the sparse Bains des Paquis began to look a little out of place to the city officials. In the 30's, the government completed a proposal to tear down the structure, but the people staged a huge movement and were able to keep control of the space by vetoing the motion. This history certainly contributes to the pride the members take in the swimming space today, and the same antagonism towards the “posh” private Geneve Plage beaches.

Programs to support the continued and growing health of the water always make the budget. Funding for the Office for Water Renaturation, who are responsible for maintaining and cleaning up the various natural water bodies in the region, comes from the state, and they are given a yearly budget within which there is almost complete autonomy to work with. On average, 4.5 million per year is spent on renaturation projects in the region, including building new beaches, creating new parklands along the river area to encourage recreation, and renovating shoreline

areas. The primary long term goals for the lake at this point are cited as being mostly quality oriented, and to create a good habitat for local animals and wildlife (Geneva Office for Water Renaturation Alex 2009).

One of the office's biggest pet projects is the creation of a new beach, to be built between the existing Geneve Plage and Baby Plage. The design calls for stone stairs leading into the water, and the project is estimated to cost up to 9 million dollars. It is still in the design phase, and thus far little information has been released to the public regarding this development.

Another project underway is the building of a major beach in the neighboring town of Versoix. An existing stone jetty is to be removed, which will prevent sediment building up along the mouth of the river. It will also allow for the transformation of natural coast into a designed beach/swimming area. This project is both functional (preventative maintenance) and aesthetic (to improve the desirability of the swimming site).

Communication with the public is an important part of the swimming programs the government runs, and for the past 15 years, the state has placed an emphasis on this aspect. Each year pamphlets are sent out in the mail along with utility bills, and also distributed in public places like libraries and schools. Pamphlets are aimed at both children and adults and address issues such as how to keep the water clean and what makes it dirty (education on chemical use, understanding how the water system works), updates on projects the city is undertaking, swimming locations, and different forms of life in the water. The basic aim of these is often to remind people that all of the water they use eventually winds up back in the river (Geneva Office of Water Renaturation Christine 2009). Internet results of the most updated water testing results are always available online.

The lake remains protected today from CSO discharge with very large pipes, and in heavy rains, the overflow is discharged into the Rhone. 95% of all waste that reaches the water from Geneva is treated, and 99.6% of the population is connected to sewage systems and wastewater treatment plants.

It would be naïve to say that Geneva has figured everything out. Runoff containing pesticides enter the river, primarily from the vineyards and grape orchards. Runoff containing the chemicals is generated from cleaning the machines and flows down to the riverside. The city has initiated a program to limit this occurrence, with Federal money allotted for incentivizing these plantations to reduce chemical entry into the water. Other industries facing the same problem are included in this initiative as well. Furthermore, for those who are found to have contaminated the water, there is a fine of 60,000 francs and a mandate to return the water to its original quality. These laws cover intentional contamination as well as accidents, like oil spills (Geneva Office for Water Renaturation Charles Stalder 2009). These laws exist, but locals and officials agree that the greatest deterrent to polluters is the devastation that would follow to a company's public image; such behavior is neither condoned nor tolerated by the people in any measure.

Phosphorous in the Lake is another problem the city is actively working to deal with. The goal for 2010 is to reach levels at 20 micrograms/liter. A ban is under consideration for products (such as dishwashing liquids) that contain the substance.

PPCPs have emerged as a growing problem in the past 5 years as well, under the scrutiny of Geneva officials, with 2 regional firms producing herbicides that have been detected in Lake Geneva. Medications, ibuprofen in particular, are reaching new awareness in the public and regulations are currently being developed. Projects like the Micropol research are investigating ways to remove such contaminants, and there are currently 2 studies underway to understand how ozonation might be used in this effort. These studies are being conducted at wastewater treatment plants that accept only domestic waste. The plants are modifying their process to also treat phosphorous and PPCPs (Geneva Office for Water Renaturation Charles Stalder 2009).

Despite the presence of these other, more dangerous contaminants, duck fleas are commonly viewed as the single inconvenient side effect of swimming in the river today. They are small larvae that burrow underneath human skin, as an "accidental" or "intermediary" host on their way to the ducks. An itchy rash results from this infestation, tending to last approximately one week before subsidizing, without treatment (Geneva Office for Water Renaturation Christine 2009). In conversations with the locals it seemed this was perhaps the most common complaint when it comes to Lake Geneva swimming. Unfortunately there seems to be no cure, the only solution to this minor problem being avoidance of the water itself, and particularly in areas of concentrated duck populations and activity.

### ***Legalities and Regulations in Geneva***

The city tests for e. coli from April through October at 29 locations, twice each month. If results are poor, testing is also done for salmonella contamination. Tests are processed using the method of membrane filtration. Results are analyzed using a statistical approach, in which you look at 10 different results for each location. A rating of "very good" is given for tests less than 100 CFU, "Acceptable" for those between 100 and 1000 CFU, "warning signal" for those greater than 1000 CFU, and bathing is forbidden if more than 3 test results are greater than 1000 CFU. Water quality is rated "very good" almost always, and is sometimes "Acceptable". The office can forbid bathing for 3 days if the results are poor, although this has been done on only 2 occasions in the last ten years. The city of Geneva uses stricter regulations than mandated by the federal government.

Nearly all of the fish in Lake Geneva come within the safety range for PCB contamination (limit is 8 picograms per kilo). Fish contamination is mainly a problem only in the Rhone, where the river is used for travel and so the PCB sediments, which will not decay, are often stirred, contaminating the water.

Due to its size and international reach, regulating Lake Geneva can be a tangle of red tape. Many of the tributaries entering the river flow across borders from other countries, such as the

mountains in France. This brings up the issue of pollution and inflows from foreign countries with different regulations. Much progress has been made on working on agreements with France regarding water treatment and inflows into Lake Geneva.

Such complications are not issues for the Charles River in Boston, which is entirely contained within Massachusetts. The Charles River is fed by more than 50 brooks and streams, through 22 cities and towns in eastern Massachusetts before emptying into Boston Harbor. Boston has a much less complex project in terms of dealing with pollution inflows to the Charles, as the only unknown sources for pollution originate from CSO's.

### **Public Perception, Local Behavior: Boston vs. Geneva**

Surveys results illustrate the disparities between these two cities. 11% of Boston locals surveyed have ever swum in the river, compared to the 89.1% of Geneva locals who say that they have.

Geneva locals who do not swim report the reason being that "I do not enjoy swimming" (50%), "water is too cold" (25%), or that they plan to swim in the future (25%). In contrast, Boston locals who do not swim report many more reasons, centered more on serious safety concerns rather than personal swimming preference. 59.1% say that the water is too dirty, 20.4 % that they use other swimming facilities, 22.4% that there is not a safe place to swim, 14.3% that swimming is not allowed, and only 10.2% say that they do not enjoy swimming. This data indicates that were there a clean and safe swimming area designated on the Charles, locals would be interested in visiting.

This conclusion is further supported by examining the group of people who would support putting government funds towards increasing the quality of swimming water in the Charles. Of locals who said that they do not swim in the Charles because it is either "too dirty" or "not safe," 90.2% support putting government funds towards the purpose of revitalizing the river, compared to 79.5% of all those surveyed in Boston. This supports the idea that those who would be most likely to swim in the river, were it to be clean, would also be the ones willing to be money forth for the effort and benefit. Those who are less likely to swim in the river, even if it were clean, are less likely to want to put money towards this effort. It thus appears that there are two primary groups in Boston: "swimmers" who are interested in swimming in a *clean* river, and "non swimmers," who are less interested in swimming in the river, regardless of its water quality. As a benchmark figure, overall 89.1% of those surveyed in Geneva support increased funding towards this cause.

Furthermore, 93.8% of those in Geneva believe that the water in their city is safe for swimming, compared to 35.2% of those in Boston, despite comparable e. coli levels, both of which fall within regulations for swimmable water quality. 68.1% of those in Geneva feel that their city

encourages recreational swimming in the lake, and 54.3% that the government maintains active communication with the public about recreational swimming areas, compared to 9.5% and 14.4% of Bostonians, respectively. The city of Boston has a lot of work to do towards improving their public image and perceptions of their environmental work, and this survey indicates that Boston residents would be in support of increasing the funding towards achieving the shared objective of a cleaner river.

Understandably, there is no comparison whatsoever between the swimming habits of Bostonians and the Genevese. Of swimmers in Boston, the majority (57.1%) report swimming in the Charles at a frequency of only less than once per swimming season. This could – and often does – indicate a one-time dip into the water. 42.8% swim between 1 and 5 times per season. Remember that only 8.1% of those surveyed in the Boston area have ever swum in the river at all, compared to 71.4% of Genevese. The majority of swimmers in Geneva (57.1%) report swimming more than 5 times every bathing season. Anecdotal evidence indicates that it is also quite common for residents to swim multiple times per week, the entire year round – including December! A figure much larger than 5 times per bathing season. An additional 31.4% report swimming between 1 and 5 times per season, and 11.4% less than once per bathing season.

It seems that the trend of swimming is not fading among the younger generation, either, a good sign for Boston. In fact, the younger adults in Geneva (aged 15 to 24) are those most likely to report having swum in the lake – 84.6% have done so, compared to 66.6% of those aged 25 to 44, and 50% of those aged 45 to 65. Furthermore, those aged 15 to 24 report swimming most frequently – 77.7% report swimming more than 5 times each bathing season. The next most frequent swimmers are aged 35 -44, and 29.4% report swimming more than 5 times each bathing season.

Not surprisingly, the most frequent swimmers by age are also those most likely to support funding – or perhaps this is due to varying financial status. The youngest, aged 15 to 24, all support funding, as do 94.1% of those 35-44, and 100% of those 45-54. There is a slight drop in support among those aged 25-34, with 57.1% supporting funding.

Support for increased funding is high all around in Geneva, but it is highest among those who swim most frequently, at 94.7%. Still, however, 75% of those who swim less than once per season support funding.

Support for funding among Boston residents varies little by age: 77.7% of those aged 15-24 support funding, as do 71.4% of those 25-34, 91.6% of those 35-44, and 75% of those 45-54. This indicates that a plan for a swimmable Charles is economically sustainable, at least in terms of continued public support.

14.7% of swimmers in Geneva have ever gotten sick from swimming in the waters, but only 1 of these 5 people concede that it has affected their swimming habits. Anecdotal evidence

suggests that the most common ailment from swimming is a skin itch as a result of duck fleas, a rash most consider very mild and hardly an illness. It heals itself in a short period of time. 100% of non swimmers say that they know at least one person who has gotten sick after swimming in the water. The severity of any of these "illnesses" is unknown.

Due to the low frequency of swimmers in Boston, it is inappropriate to evaluate their illness rates alone. Of the 20 non swimmers in Boston who know others who have swum in the Charles, 2 know of an illness that followed. Of the 6 people in Boston who have swum in the river, 1 reported an illness after swimming.

Regardless, it seems clear that rivers are important to those who live in the city. 86.7% of local Bostonians say that the river is an important part of their life in Boston, as do 89.1% of Geneva locals (Northeastern University 2009).

## Examining Solutions

It is apparent that for a time, the Charles River and Lake Geneva followed parallel states of development. At some point, however, the two cities took different paths that proved to be fateful. Understanding how and why these places developed in such different ways, and what enabled the continued success of swimming in Lake Geneva, can help Boston to develop an actionable plan for a swimmable Charles River.

Before moving forward with implementing swimming sites along the Charles, there are several obstacles that must first be overcome.

The first of these is the actual water quality itself, both its physical and biological qualities. We must ensure that every swimming site has a minimum visibility depth of 4 feet. This is a function of safety so that swimmers can easily be found and identified in the water. Interventions to adjust the amount of visibility do exist, but may prove expensive or difficult to implement, so thorough research is needed to identify the most cost-effective solution. The biological properties of the water must also improve. This is necessary in order to comply with Massachusetts state law. Today the water quality complies with regulations for swimming more than 60% of the time. Research conducted by Northeastern University in May 2009 indicated that e. coli levels along the Charles River varied between 20 CFU (Magazine Beach) to 200 CFU (near a discharge pipe). These results all came within the range of safety for single-testing of swimming waters. These numbers should continue to improve with time, as remaining CSOs are closed according to plan. The plan today estimates this to be done by 2013. Continuing work by Roger Frymire and the EPA to halt illegal sewage connections will also limit contamination events and lower e. coli levels. Modeling, or predictive software, is currently under development. This successful development and use of such a

tool might present the ability to predict “safe” swimming times in advance, maximizing usability of beaches that are swimmable only part of the time.

Algae blooms, which can occur seasonally, and residual industrial waste (PCBs) also act as deterrents to swimming implementation. PCBs are carcinogenic and highly toxic. They remain in the sediments at the bottom of the river. However, if they are not disturbed and the sediment stirred up, swimming can be a safe activity. Workarounds to avoid disruption of the sediments include solutions such as a floating net floor above the river bottom (facilitating access directly from the beach) or floating docks placed in the deeper waters.

Once safe swimming has been established, there still remains the problem of an unchanging public perception of the health of the river. Despite the phenomenal improvements in recent years, only 31.4% of locals think that the water is safe for swimming. The Charles has certainly developed a reputation. Compared to 54.3% of people in Geneva feel that the city does a good job at maintaining communication with the public about water quality, only 13.2% of Boston locals say the same. Newsletters, media campaigns, and direct outreach can all play a part in educating the public about the Charles River of today. It is also essential to mobilize and integrate the active “swimmer” group of the Boston population into advocacy efforts. They will prove to be necessary components to such a large scale project.

In the economic times we are currently faced with, funding for projects to create swimmable recreation areas may not be a realistically likely goal. However, the public support for such projects does exist; in fact, 73.5% of local Bostonians would support funding towards projects to increase the health and quality of the Charles River. Again, a large group of interested individuals, mobilized to the cause, can greatly increase the likelihood of approval for related projects.

It cannot be emphasized enough that public involvement is needed to spur the government into action. Like those who saved the Bains des Paquis from destruction, dedicated supporters and a public action campaign are needed to bring attention to this important issue. Calling upon local pride and a shared history, the people can be motivated to care.

However, it is also time the government took effective leadership action on their own and dedicated a task force and appropriate budget to this project. Following the example of Geneva, who began a program for water and sewage treatment sanitation when a problem was identified, so too is Boston obliged to provide for the mental and physical health of the people in providing safe, natural swimmable areas.

## **A Vision for Implementation**

It is likely that one future bathing site would be located along Magazine Beach, which was also one of the popular swimming destinations in the early and mid 1900's. This area is easily accessible, somewhat sheltered, and has good potential for cleaner water. Bathing structures here might incorporate a bathhouse with dock extending into the deeper water, where contaminated sediments are less likely to be disturbed.

From examining popular bathing sites across Europe, the research team has identified a number of factors that contribute towards a more successful bathing location. Bathing sites should be located in areas that are in well-traveled areas and are easy for a majority of locals to access. Admission fees should be nominal, with additional fees charged for services such as use of the spa or massage rooms. This enables all residents of the Boston area to be able to attend.

A cafeteria or restaurant on site, along with picnicking areas nearby, encourage families to spend the day, as do adjacent games and sports areas (such as table hockey, ping pong, and volleyball).

Year-round attendance is key in maintaining revenue. Night time activities for adults, such as dancing on the dock, live music, and a café can be incorporated, as can fitness classes (yoga or pilates) and spa services. Again, location near a central area, such as downtown Boston, enables easy access throughout the day.

Developing a homegrown appetite for urban swimming along with a robust set of traditions in Boston will ensure the protection of natural waterways and a cultural strength for future generations to enjoy.

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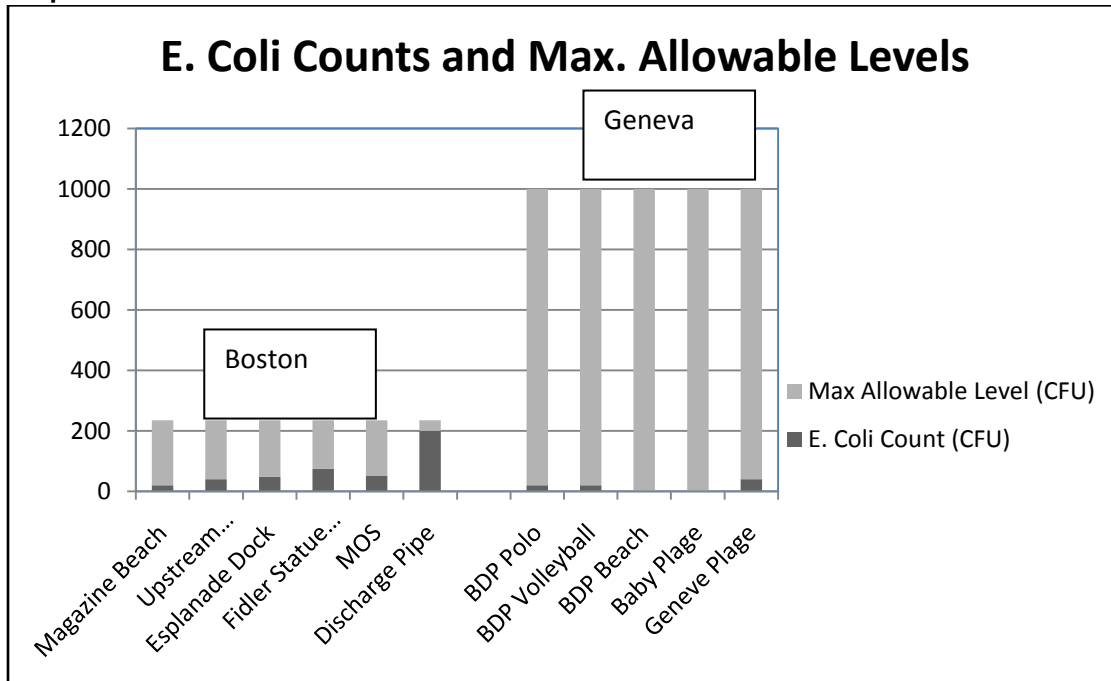
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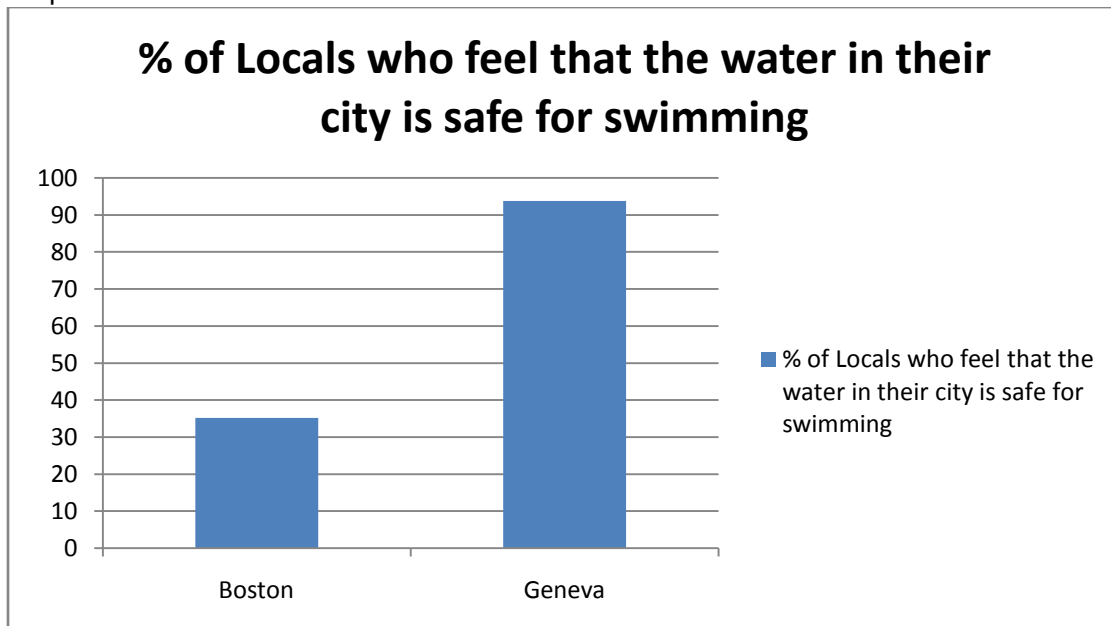
**Appendix**

**Graph 1.1**



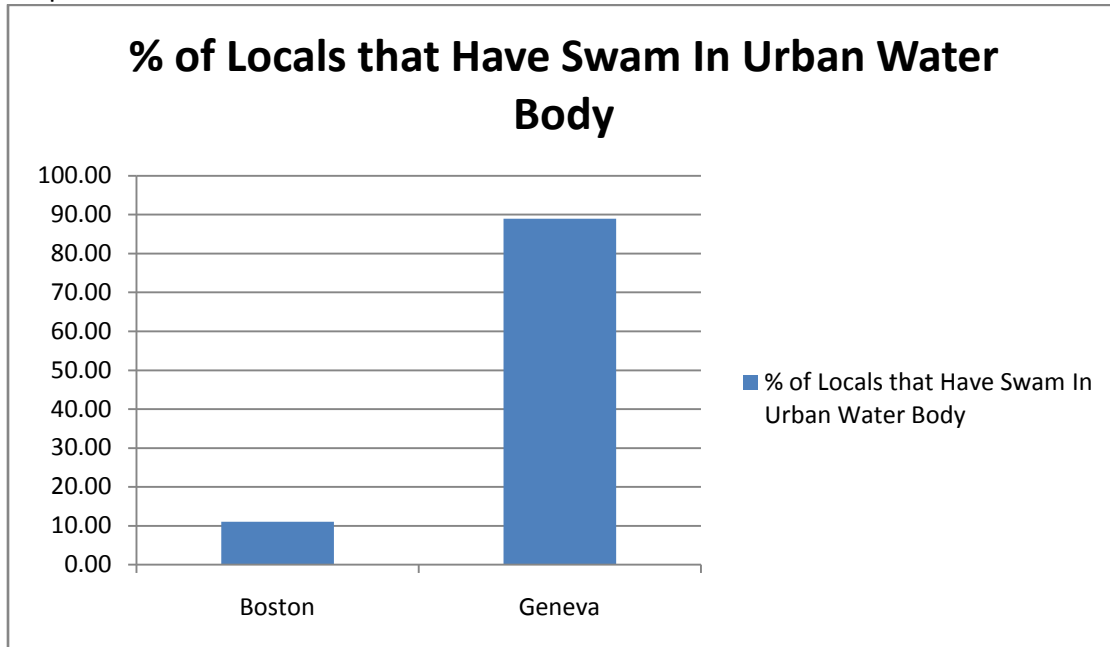
Urban Water Swimming Study, Northeastern University, 2009

**Graph 1.2**



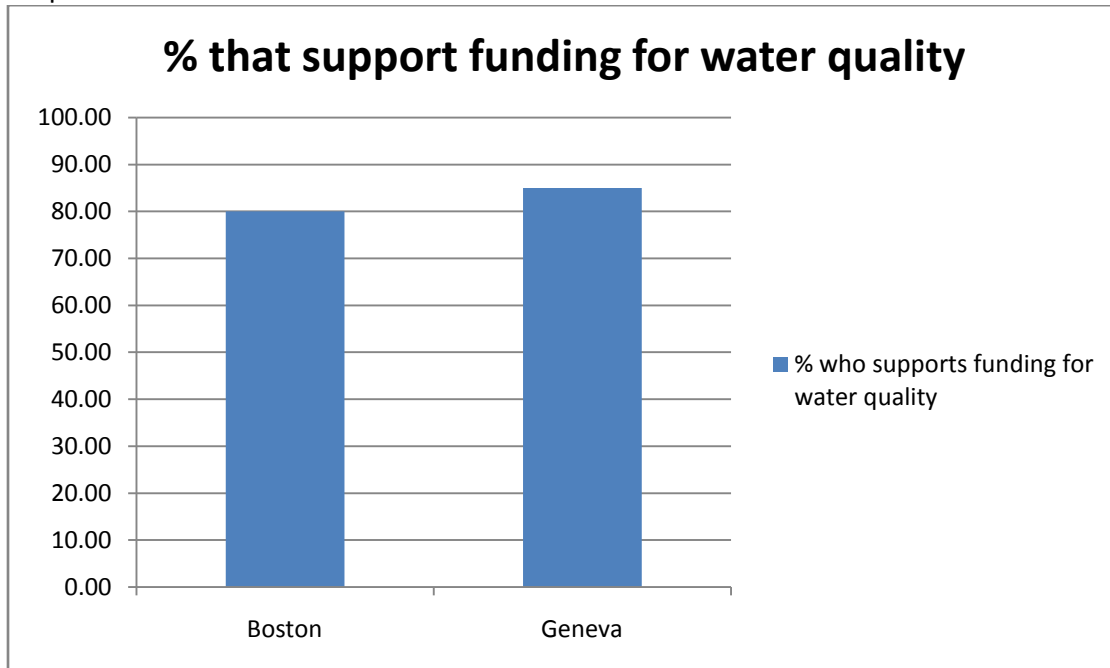
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Graph 1.3



Urban Water Swimming Study, Northeastern University, 2009

Graph 1.4



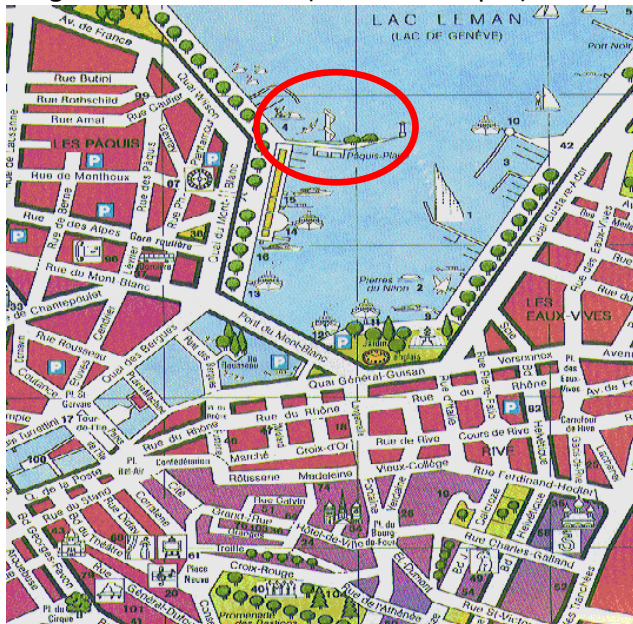
Urban Water Swimming Study, Northeastern University, 2009

Image 2.1: Duck Flea



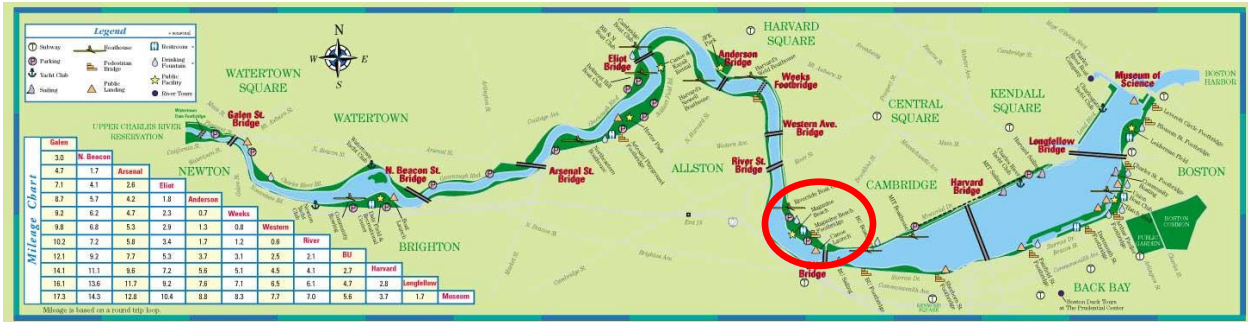
From Geneva Office for Water Renaturation

Image 2.2: Lake Geneva (Bains des Paquis)



<http://img372.imageshack.us/img372/9165/mapgenevaos9.gif>

Image 2.3: Charles River (Magazine Beach)



[http://esplanadeassociation.org/park/images/CRWABasinMap\\_000.jpg](http://esplanadeassociation.org/park/images/CRWABasinMap_000.jpg)

Image 2.4: Magazine Beach



[www.thecharlesriverconservancy.org](http://www.thecharlesriverconservancy.org)