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“Field and classroom-lab activities  
on Fresh Water Ecosystems,  
a case of a suburban-urban water stream”

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WELCOME TO

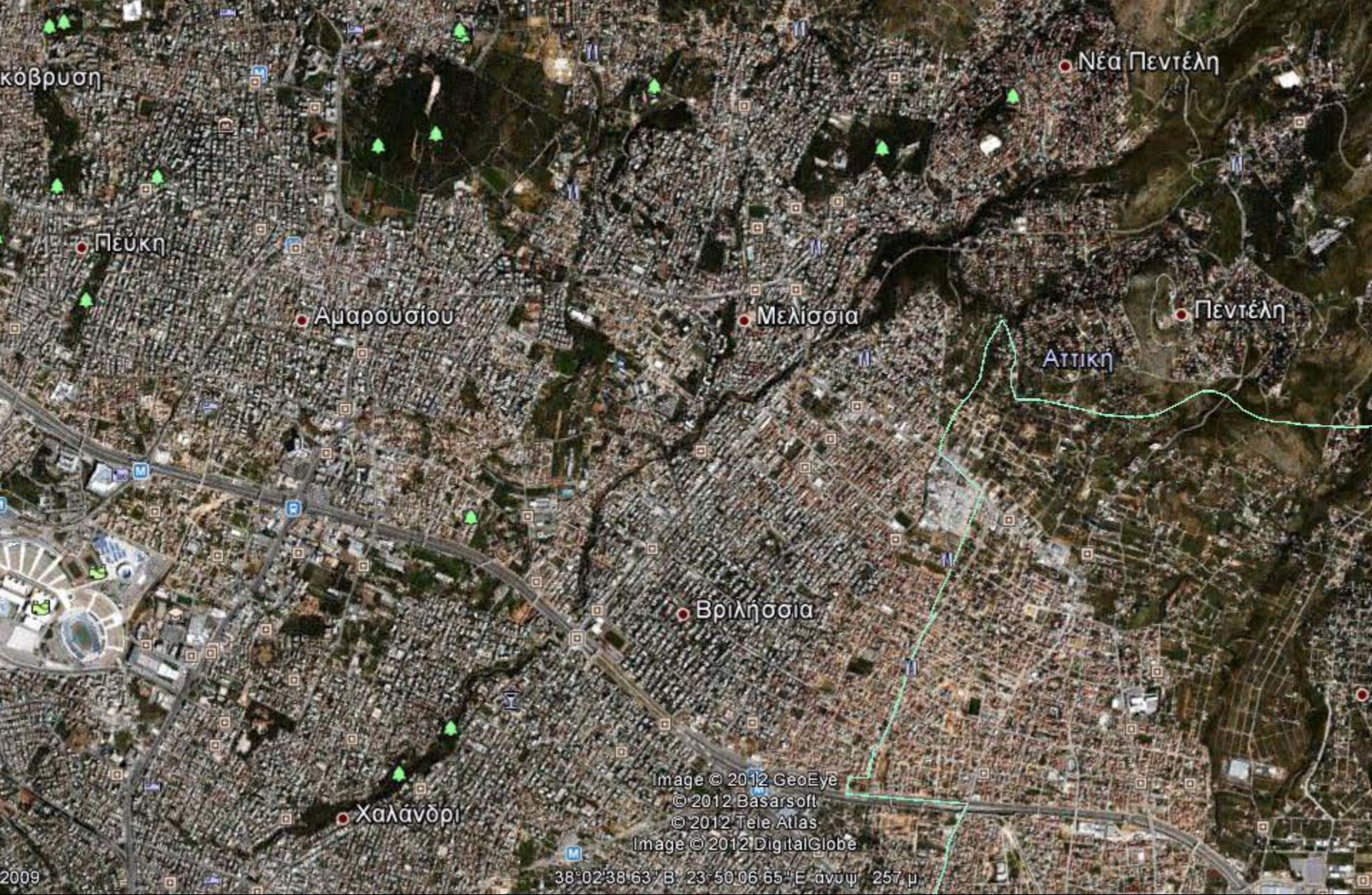
WWW

WONDERFUL

WATER

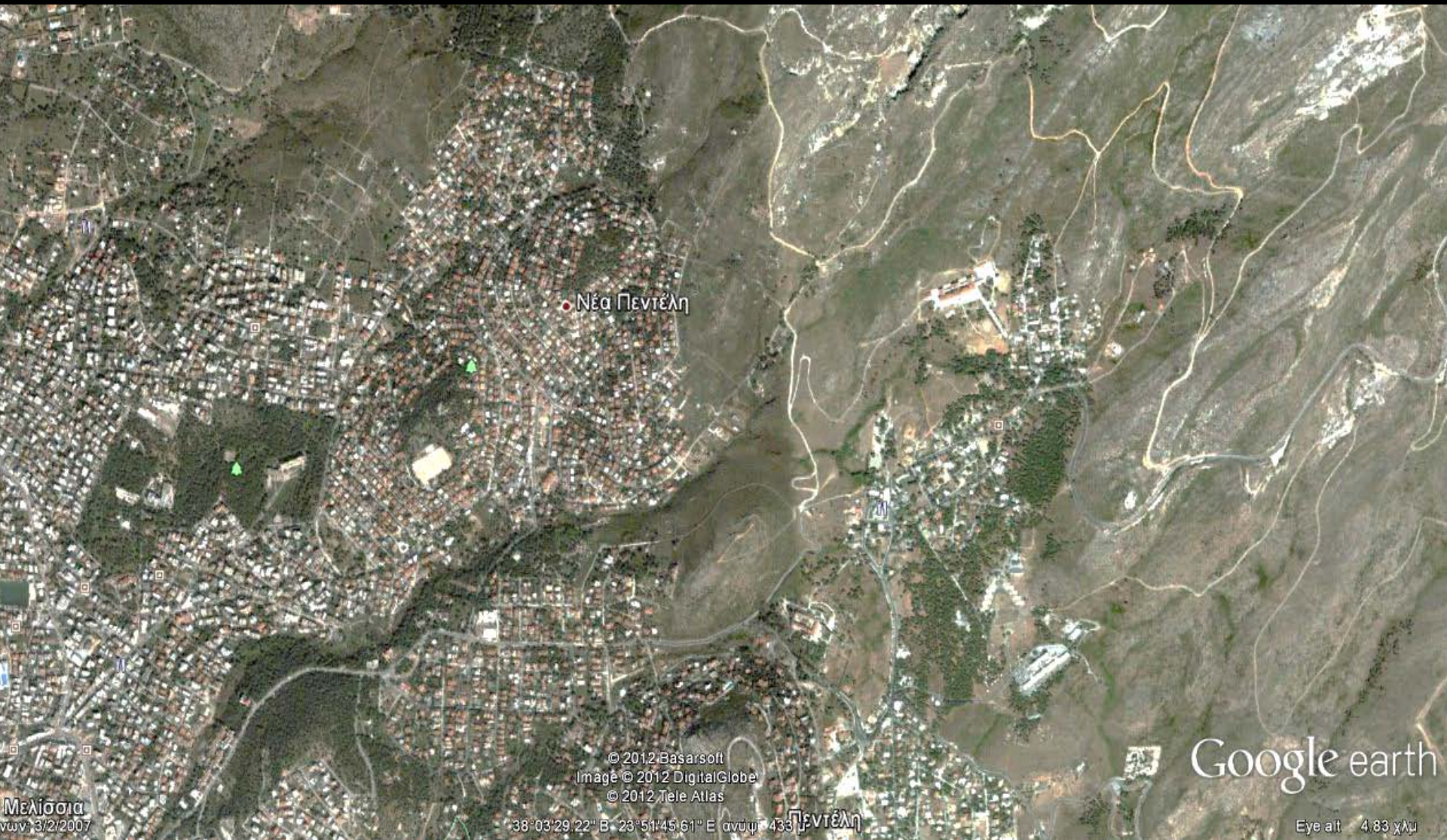
WORLD





**GENERAL VIEW OF THE AREA**  
scale: 1Km ♦ ♦





**SUBURBAN AREA (upstream)**

**Scale : 500m ♦ ♦**













**SUBURBAN SITE**

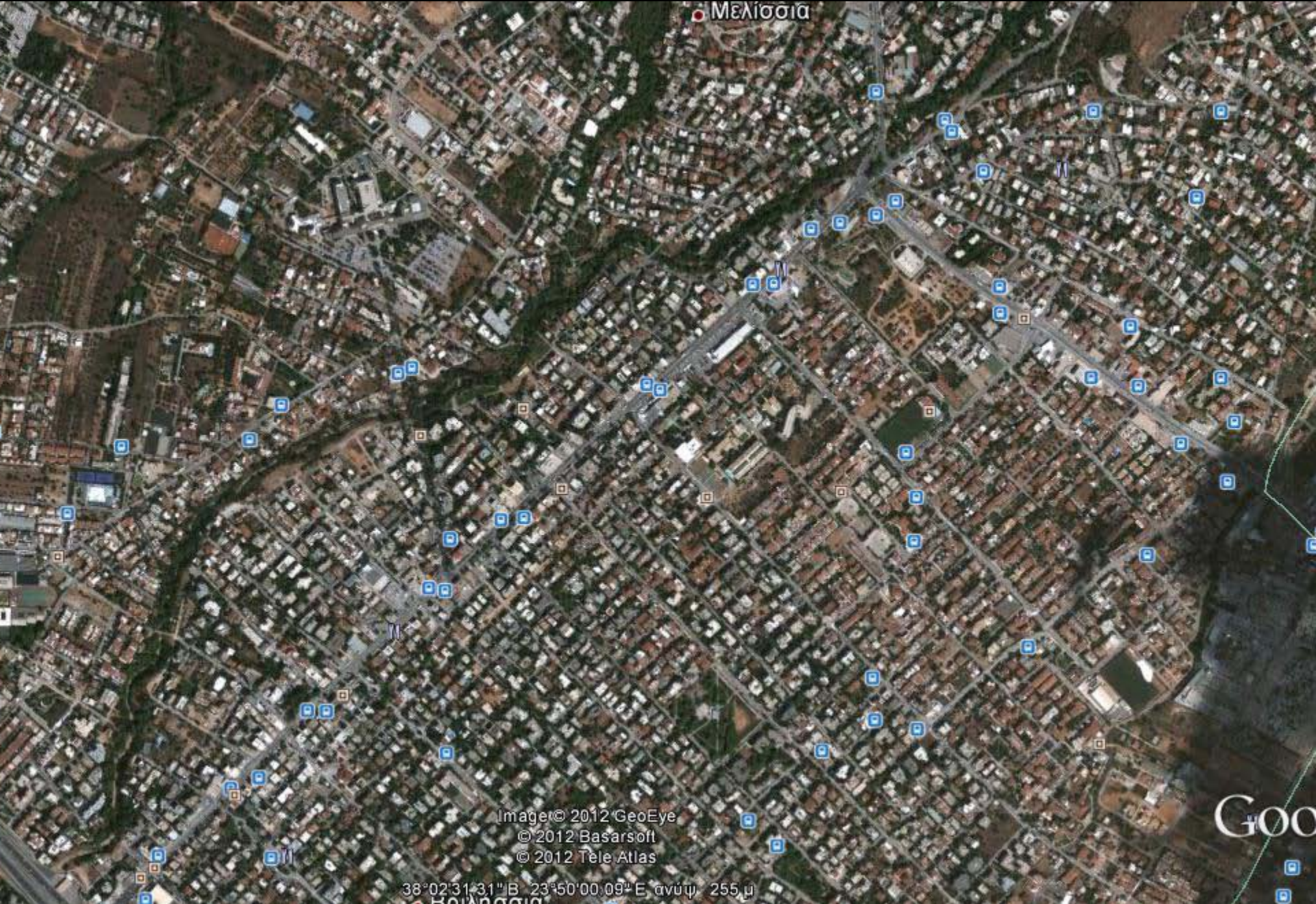












**URBAN AREA (MIDDLE STREAM)**

**scale: 500m**



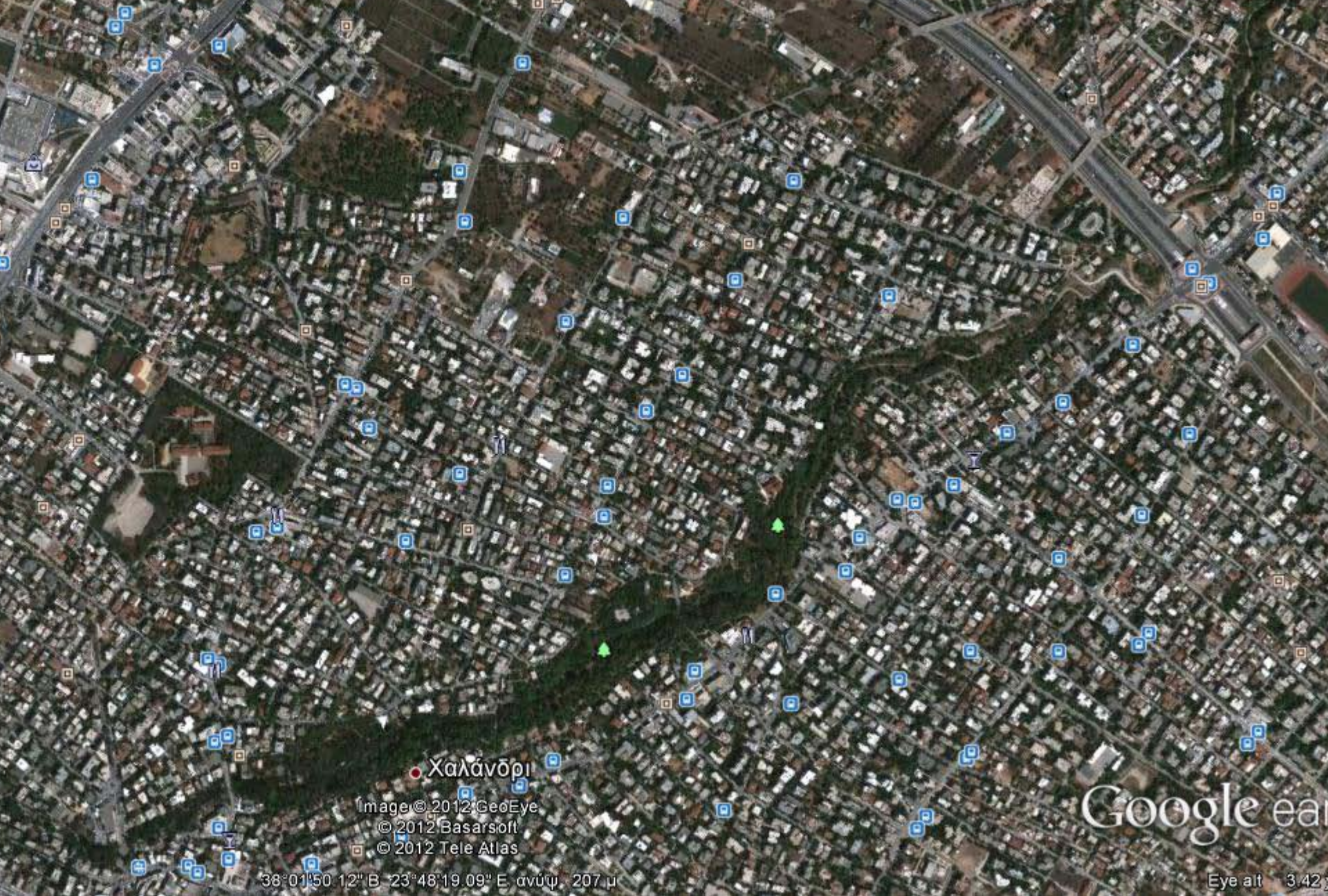












**URBAN AREA (MIDDLESTREAM) scale :500m** ◆ ◆















Why fresh water ?



- The interdisciplinary nature of water in the curriculum
- The challenge of the presence of fresh water in the vicinity
- The rise of environmental awareness in suburban - urban water streams
- The principle of sustainability



# Objectives



- Knowledgeable (Thematic)
- Emotional
- Motivational - Initiative
- Social - Behavioral
- Self Educational





















I HAVE BEEN WITH YOU FOR MANY YEARS  
WHAT ABOUT YOU ?







- PHYSICAL & CHEMICAL  
WATER QUALITY VARIABLES

Temperature

$\text{PO}_4^{3-}$  ,  $\text{NO}_2^-$  ,  $\text{NO}_3^-$  ,  $\text{NH}_4^+$

pH

$\text{O}_2$





- Are present in enormous amount in domestic and industrial water as well as in run - off from arable lands.
- They are responsible for the phenomenon of eutrophication ( ευτροφισμός) and as such for the decline of the macro fauna and flora.



# WHY PHOSPHATE ( $\text{PO}_4^{3-}$ )

- Various kinds of chemical linkage coming from households and industries are found as phosphorus inflows into the environment
- An increased phosphorus content can lead to eutrophication of water fresh bodies
- The consequence of this excessive plant growth is an oxygen deficiency in the water bodies
- Disastrous effects on most life forms in the fresh water body
- EU drinking water regulations :  
max 6.95 mg/l  
recommended value 0.56 mg/l



# WHY NITRITE ( $\text{NO}_2^-$ )

- The natural decomposition of organic nitrogen compounds produce nitrite as an intermediate stage in the nitrogen circle
- The decomposition of plants containing nitrate under exclusion of air, produces nitrite
- An increased nitrite concentration is an important indicator for a potential fecal pollution of water
- The nitrite analysis in drinking water is imperative and is one of the most important water test (dangerous to health - causing cyanosis the babies and might lead to death)
- Fish water max 0.03 mg/l
- EU drinking water max 0.1 mg/l



# WHY NITRATE ( $\text{NO}_3^-$ )

- A substance of the nitrogen - circle in nature
- Has a very positive influence on the growth of plants
- An excessively high nitrate concentration in fresh water leads to "eutrophication"
- The consequence of this the formation of reducing low oxygen with disastrous effects on most live forms in the water body
- Fish water max 20 mg/l



# WHY AMMONIUM , ( $\text{NH}_4^+$ )

- One of the most important indicators for the pollution of a water body
- Is produced by the decomposition of the nitrogen - containing organic substance through micro-organisms under low-oxygen conditions
- Fish water max 0.5 mg/l







**SAMPLING  
STATION**

**PO<sub>4</sub>**

**NO<sub>3</sub>**

**NO<sub>2</sub>**

**NH<sub>4</sub>**

**A**

**6 mg/l**

**50 mg/l**

**0,02- 0,1 mg/l**

**0,05 - 0,2 mg/l**

**B**

**4 - 5 mg/l**

**50 mg/l**

**0,02- 0,1 mg/l**

**0,05 - 0,2 mg/l**



## WHY OXYGEN (O<sub>2</sub>)

- The amount of dissolved oxygen in the water influences the structure and diversity of most life forms.

## WHY TEMPERATURE (T)

- An important parameter since it influences the speed and chemical reactions and the amount of dissolved oxygen



# WHY pH

- In acid waters (low pH) or alkaline waters (high pH) a lot of macroinvertebrates cannot develop
- In acid waters e.g. water snails will occur.





TABLES - WAX -  
24  
MORNING



SAMPLING  
STATION

O<sub>2</sub>

T

pH

A

10.8 mg/l

11° C

8

B

9.76 mg/l

12° C

7



# CALCULATION AND UTILISATION OF THE BIOTIC INDEX



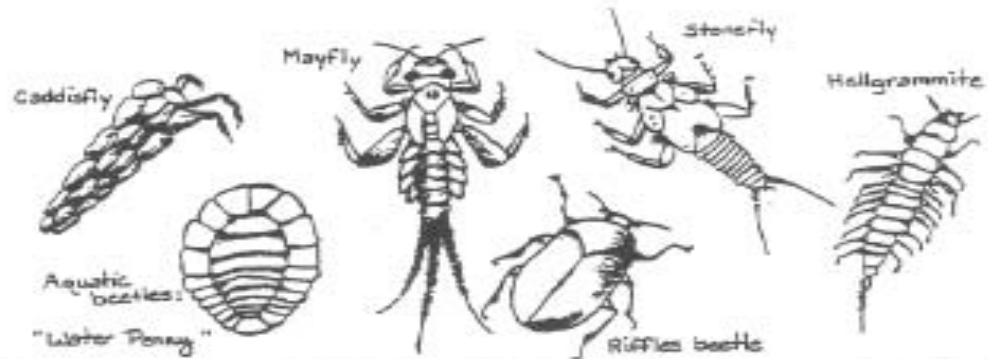
### BIOTIC INDEX STANDARD TABLE (BISEL)

Indicator group	Score	Class Frequency	Number of Taxa				
			0-1	2-5	6-10	11-15	>15
<b>Plecoptera</b>	<b>1</b>	>1	–	7	8	9	10
		1	5	6	7	8	9
<b>Tricoptera</b>	<b>2</b>	>1	–	6	7	8	9
		1	5	5	6	7	8
<b>Ephemeroptera</b>	<b>3</b>	>1	–	5	6	7	8
		1	3	4	5	6	7
<b>Gammaridae</b>	<b>4</b>	≥ 1	3	4	5	6	7
<b>Aselidae</b>	<b>5</b>	≥ 1	2	3	4	5	-
<b>Chironomidae(diptera)</b>	<b>6</b>	≥ 1	1	2	3	-	-
<b>Absence of all above Eristalis or other tolerants Diptera</b>	<b>7</b>	≥ 1	0	1	1	-	-

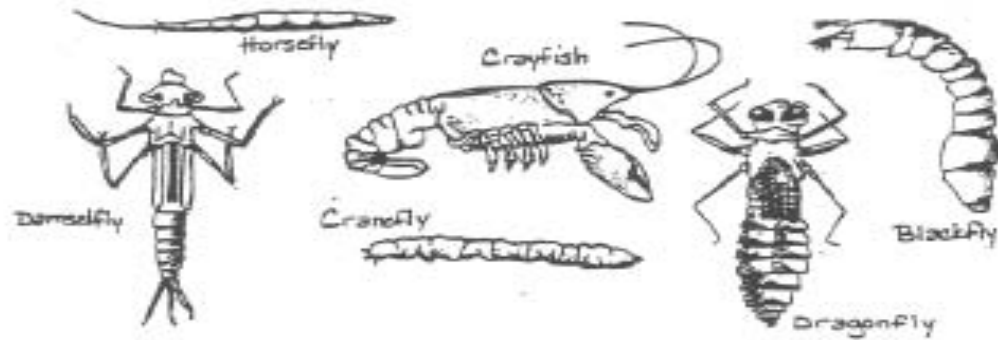
Biotic Index Value



Low pollution tolerance scores



Intermediate pollution tolerance scores



High pollution tolerance scores

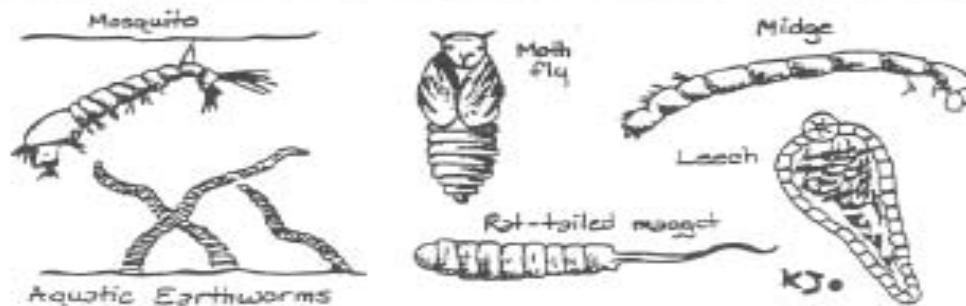


Figure 6.2. General pollution tolerance for common aquatic organisms.



Table 6.2. Water quality based on Family Biotic Index (adapted from Hilsenhoff, 1977).

Biotic Index	Water quality	Degree of organic pollution
0.00–3.50	Excellent	No apparent organic pollution
3.51–4.50	Very good	Possible slight organic pollution
4.51–5.50	Good	Some organic pollution
5.51–6.50	Fair	Fairly significant organic pollution
6.51–7.50	Fairly poor	Significant organic pollution
7.51–8.50	Poor	Very significant organic pollution
8.51–10.0	Very poor	Severe organic pollution



# DECOMPOSERS IN SOIL ORGANIC MATTER (HUMUS)

Organic substance consisting of partially or wholly decayed plant or animal matter





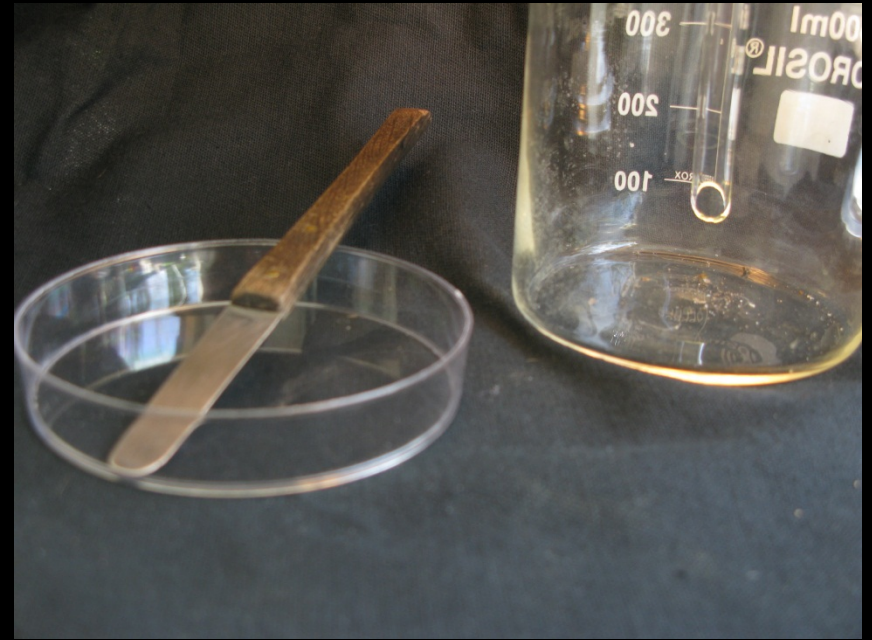


# Collecting humus



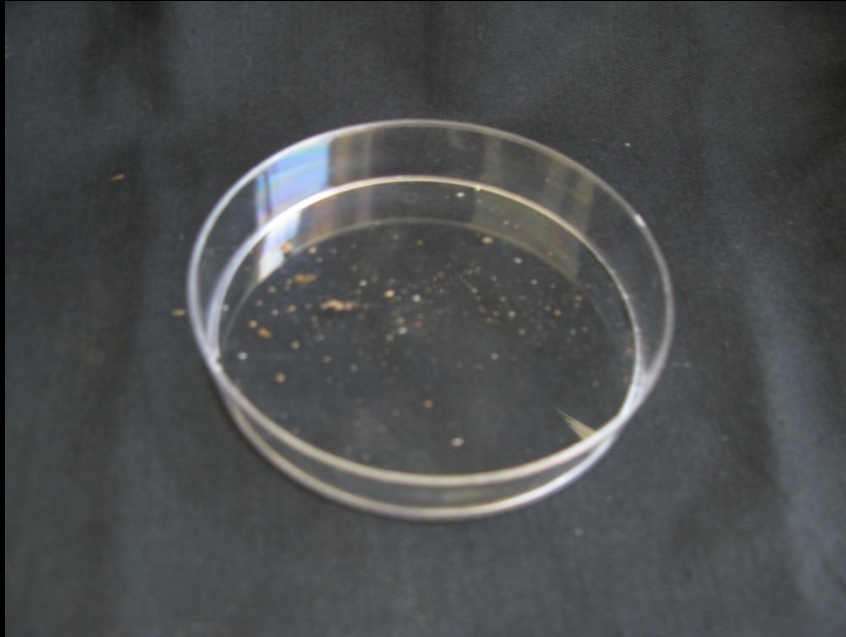


# Trapping of decomposers





# Observing decomposers













... and keep walking !!!













# REFERENCES

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- European Biotic Index Manual for Secondary Schools, Comenius 3.1 European In-service Training Project, Socrates educational programme , 1995-1999
- Kalaitzidis D. and Psalidas V., "The river : Handbook of Pedagogical Activities of Environmental Education , for Secondary Education" , Kritiki editions, Athens , 1999
- Zimmerman M. "The Use of the Biotic Index as an Indication of Water Quality", Dept. of Biology Lycoming College Williamsport PA, USA, 1993