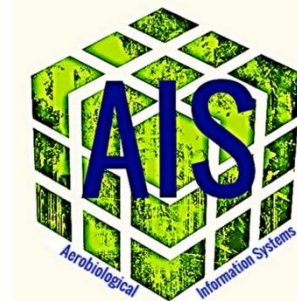




AIS LIFE LIFE13 ENV/IT/001107



Case Study France: Analysis of plants in public green spaces

Michel Thibaudon, Samuel Monnier

Réseau National de Surveillance Aérobiologique
Congress MedPalyno September 2017

MedPalyno 2017



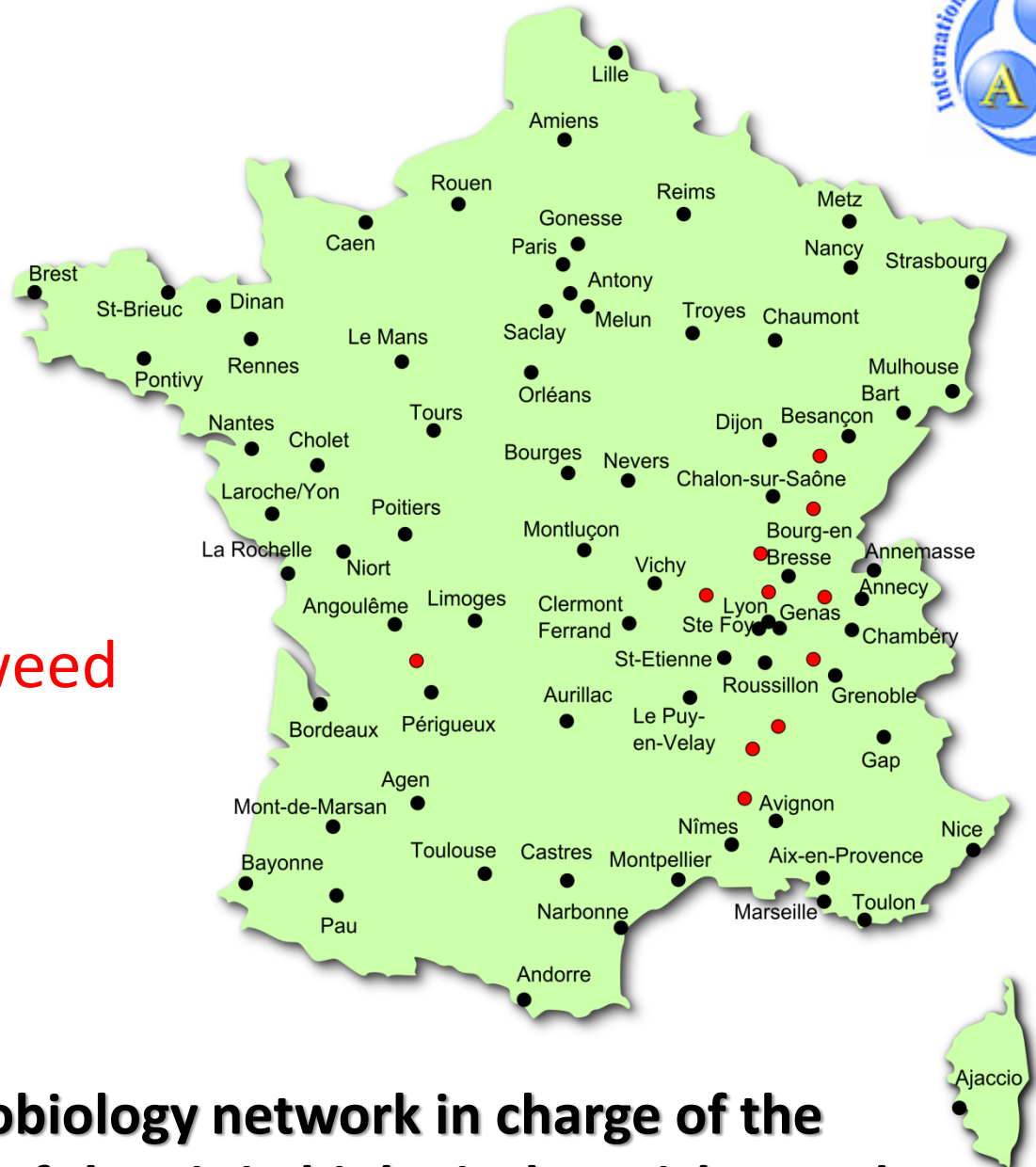


Pollen stations in France in 2017

70 stations

+

11 during ragweed
pollination

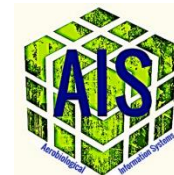


RNSA is the French aerobiology network in charge of the analysis of the content of the air in biological particles, and to give some information about their health impact.

AIS LIFE_Map



Aerobiological Information Systems and allergic respiratory disease management



AIS LIFE

(AIS LIFE LIFE13 ENV/IT/001107)

1. University of Florence - Department of Agrifood Production and Environmental Sciences, Florence - Italy (UNIFI)
2. CNR Institute of Clinical Physiology, Pisa - Italy (IFC-CNR)
3. Medizinische Universitaet Wien, Vienna - Austria (MUW)
4. Reseau National de Surveillance Aerobiologique, Brussieu - France (RNSA)
5. University of Pisa - Department of Biology, Pisa - Italy (UNIFI)
6. Institut national de la santé et de la recherche médicale, Paris - France (INSERM)



UNIVERSITÀ
DEGLI STUDI
FIRENZE

DISPAA
DIPARTIMENTO DI SCIENZE DELLE
PRODUZIONE AGROALIMENTARI
E DELL'AMBIENTE



DIPARTIMENTO DI BIOLOGIA
UNIVERSITÀ DI PISA



ISTITUTO DI FISILOGIA CLINICA
CONSIGLIO NAZIONALE DELLE RICERCHE



MEDICAL
UNIVERSITY
OF VIENNA



RESEAU NATIONAL DE SURVEILLANCE AEROBIOLOGIQUE



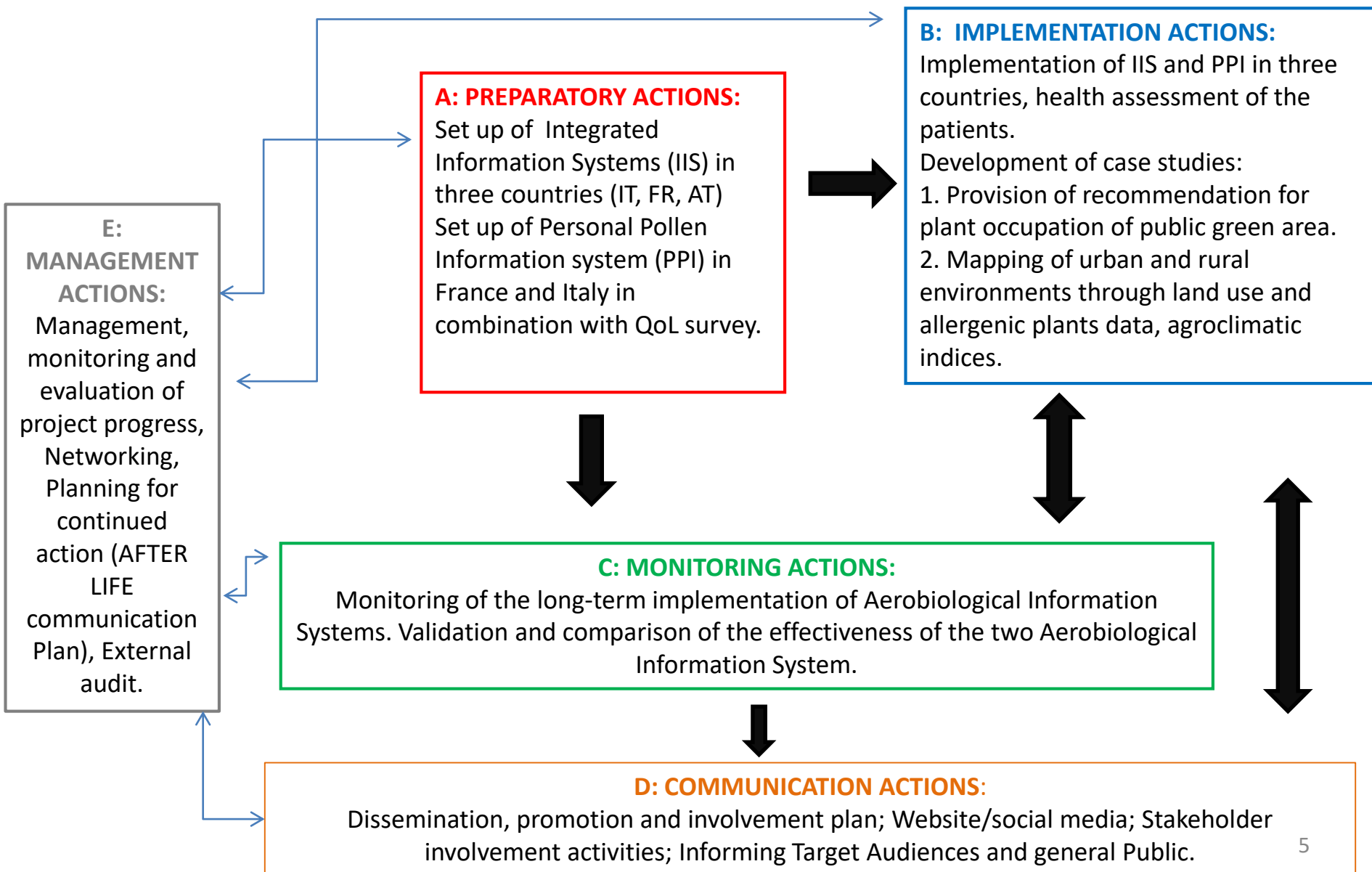
Inserm

Institut national
de la santé et de la recherche médicale



LIFE AIS project

Main objective: to develop the information base for policy on environment and health, in term of improved management of pollen-related allergic respiratory diseases





RNSA actions B4: Objectives

“Aerobiological Information Systems and allergic respiratory disease management”

Case Study France: analysis of plant occupation of public green spaces

- General: to provide recommendations for plant occupation of public green areas.
- Specific:
 - 1) assess pollen counts (and allergen content) in public gardens
 - 2) on basis of the obtained results to formulate recommendations in order to protect allergic patients.



RNSA actions B4. Summary

- **WHAT:** Pollen count and allergens
- **HOW:** Pollen traps for analysis of local pollen dispersion:
 - Sigma 2 passive pollen trap (change slide daily)
 - Hirst pollen trap at proximity (change drum once a week)
 - Slides are analysing by the RNSA (in partnership with LHVP).
- **WHERE:** Public gardens in Paris and Lyon
- **WHEN:** 2 campaigns 16 weeks = 32 weeks
 - Campaign 1: March 2015 to mid-June 2015
 - Campaign 2: March 2016 to mid-June 2016
- **LEADER:** INSERM, RNSA will be coordinators of the field survey in their Centers (Paris and Lyon), UPMC will support the activities of the action.
- **Expected results:** field assessment of pollen count during pollen season. Study of distribution of pollen in public green spaces according to season. Recommendations on plant occupation of public green spaces.



RNSA actions B4:

Pictures of the Hirst pollen traps in Paris



Paris Pasteur

The pollen trap is located on the roof of the Pasteur Institute in the 15th district.

Long. 2°20 – Lat. 48°52 – Alt. 60 m – pollen trap brand : Lanzoni– number of people concerned : 2 500 000



Paris LHVP

The pollen trap is located on the roof of the LHVP (Laboratory of Hygiene of the city of Paris) in the 13th district.

Long. 2°21 – Lat. 48°49 – Alt. 60 m – pollen trap brand : Lanzoni– number of people concerned : 2 500 000



RNSA actions B4:

Pictures of the Hirst pollen traps in Lyon



Lyon HEH

The pollen trap is located on the roof of the Hospital Edouard Herriot (HEH) in the 3th district in Lyon.

Long. 4°53 – Lat. 45°44 – Alt. 52 m • pollen trap brand: Lanzoni • number of people concerned: 1 000 000

Pollen trap Lyon



Lyon Gerland

The pollen trap is located on the roof of the Biomnis and Inserm Institut in the 7th district (Gerland).

Long. 0°38 – Lat. 44°12 – Alt. 48 m • pollen trap brand : Lanzoni • number of people concerned : 1 000 000



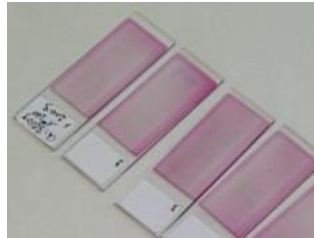
RNSA actions B4.

Material and Methods



- *Sigma2-like traps (SLT): passive pollen trap*
- SLT is composed on one hand of a transfer zone of air flow (high part) and on the other hand of a reception zone of particles by sedimentation (low part). Air flow goes through the trap in central zone, particles sediment and come on a coated slide disposed in the lower part of the trap
- The slides are changed every day
- Then the slides are send to the RNSA and analyzed with an optical microscope to obtain pollen counts (number of pollen grains by unit of time).

**Analyzes
in a lab**



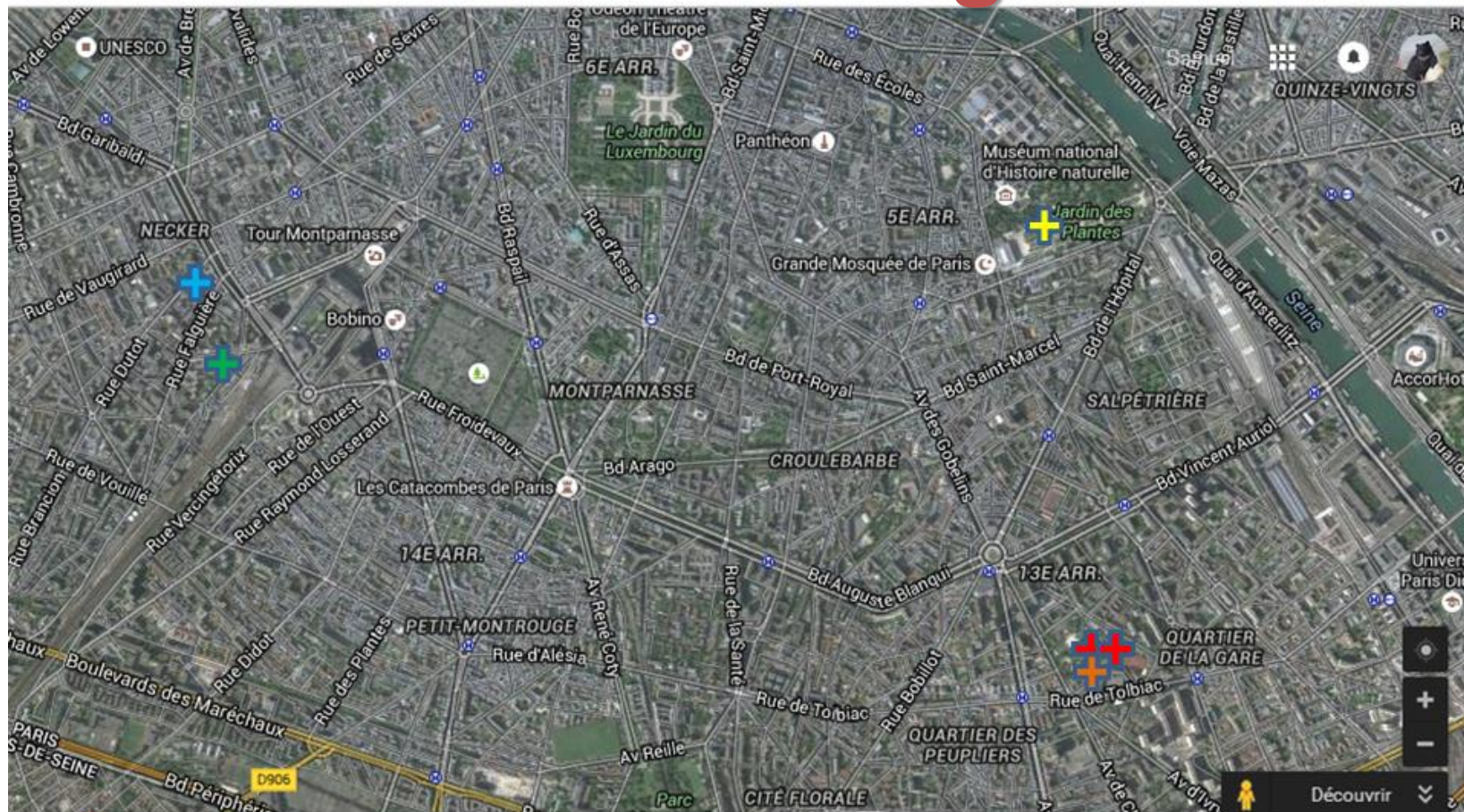
**1 slide
by day**



**counting pollen
through a speech
recognition system
with an optical
microscope**

RNSA actions B4.

Presentation of the gardens



- + SLT Choisy 1 et Choisy 2
- + SLT Jardin des plantes
- + SLT Dalpayrat
- + Hirst Paris Pasteur
- + Hirst Paris LHVP

Paris



RNSA actions B4.

Presentation of the gardens

- **Park de Choisy** : It's a public garden of 43 000m² which was created in 1937.

Address : Avenue de Choisy 75013 Paris France.



2 SLT pollen traps have been installed and the slides are changed every day by trained staff from LHVP (Laboratoire d'Hygiène de la Ville de Paris) who work next to the park.¹²



RNSA actions B4.

Presentation of the gardens

- **Park Pierre Adrien Dalpayrat** : It's a public garden of 9898 m² which was created in 1985.
Address : 2 Rue André Gide, 75015 Paris France.



1 SLT pollen trap has been installed and the slides are changed every day by trained staff from city hall of Paris (“service exploitation des jardins”) who work in the park.



RNSA actions B4.

Presentation of the gardens

- **Park Jardin des Plantes du Museum d'Histoire Naturelle:** It's a big public garden of 24 hectares open to the public for over 400 years with a wide variety of species.

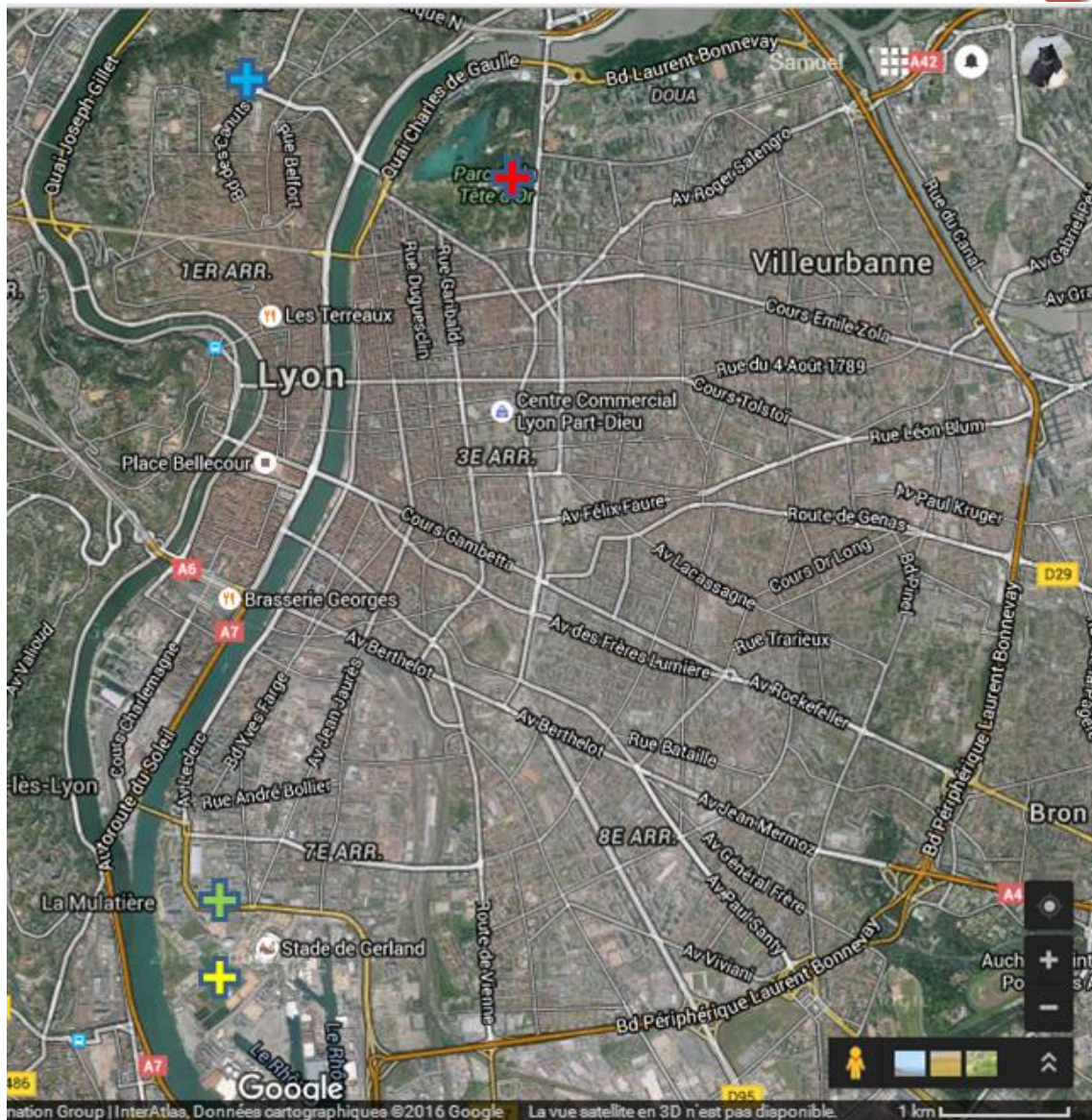
Address : 57 Rue Cuvier, 75005 Paris France



1 SLT pollen trap has been installed and the slides are changed every day by trained staff from the natural history museum (MNHN) who works in the garden.

RNSA actions B4.

Presentation of the gardens



- + SLT Tête d'Or
- + SLT Croix Rousse
- + SLT Gerland
- + Hirst Lyon Gerland

Lyon



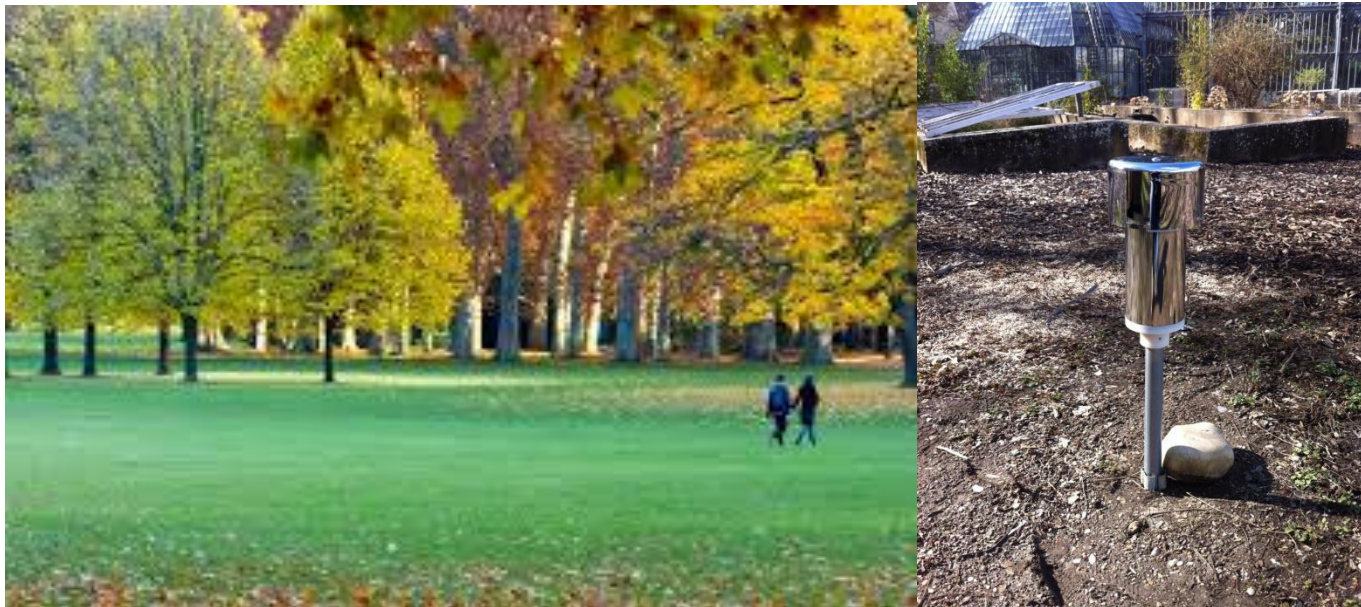
RNSA actions B4.

Presentation of the gardens

➤ **Park de la Tête d'Or :**

The “Park de la Tête d’Or” is one of the bigger public park in France.
It was designed on the model of the English garden and was created in 1857.

Address : Boulevard de Stalingrad 69006 Lyon France



1 SLT pollen trap has been installed and the slides are changed every day by trained student staff from Lyon.



RNSA actions B4.

Presentation of the gardens

- **Park de Gerland:** It's the second biggest park in Lyon; it occupies an area of 18 hectares and was created recently in 2000.

Address : Avenue Jean Jaures 69007 Lyon



1 SLT pollen trap has been installed and the slides are changed every day by trained staff from “jardin des fleurs” of the park de Gerland in Lyon.



RNSA actions B4.

Presentation of the gardens

- **Park de l'Hôpital de la Croix Rouse:** It's a park of 4.5 ha Located in the 4th arrondissement of Lyon next to the Croix-Rousse hospital. It was designed by René-Edouard André in 1913 and includes about 1200 trees.

Address : 103 Grande Rue de la Croix-Rousse 69004 Lyon France



1 SLT pollen trap has been installed and the slides are changed every day by trained student staff from Lyon.

Allergy potency

- Pollen allergy depends on several parameters such as the amount of pollen in the air, the sensitivity of people and the allergy potency of the pollen of each plant species
- **The pollen allergy potency of a plant species is the ability of its pollen to cause an allergy to a significant part of the population**
- **The pollen allergy potency can be:**
 - **Low or negligible:** No problem to plant them in urban garden
 - **Moderate:** Only a few species can be planted in the same garden
 - **High:** This species cannot be planted in urban places
- Species or genus with a strong AP **in red** should be labeled as "**Not to be planted in habitation or residence area**", those with moderate AP **in yellow** should be labeled as "**Not to be planted in big quantities in habitation or residence area**". Other species with low or negligible AP **in green** **may not be affected by public information.**

Results Paris : Number of pollen grains for each allergenic taxa : March-June 2015 and March-June 2016

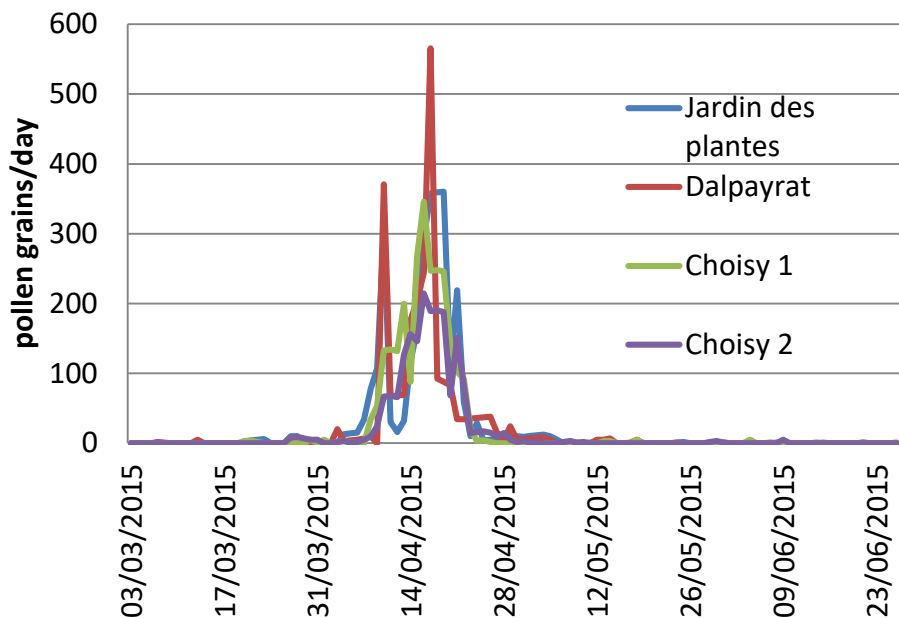
Capteurs Taxons	SLT CHOISY	SLT CHOISY	SLT CHOISY	SLT CHOISY	SLT Jardin des Plantes	SLT Jardin des Plantes	SLT Jardin Dalpayrat	SLT Jardin Dalpayrat
	1 2015	1 2016	2 2015	2 2016	2015	2016	2015	2016
Betula	2537	3575	1913	2709	2860	3236	2415	3724
Carpinus	310	2697	233	1938	237	1189	63	1667
Cupress	14371	8745	9700	3871	5453	6206	5660	2859
Quercus	1249	2202	1284	1891	9453	4802	2664	1750
Fraxinus	2312	760	1591	338	2536	527	1950	482
Populus	890	1271	508	532	728	225	202	535
Platanus	2864	1090	2679	842	8515	4229	2513	1091
Salix	350	294	218	182	244	186	409	348
Poaceae	2323	22015	7460	867	3065	21781	2370	2519
Urticaceae	994	631	1096	626	1560	1016	617	494
Total	29342	52050	27791	18355	35312	49690	19733	22442

Results Lyon : Number of pollen grains for each allergenic taxa : March-June 2015 and March-June 2016

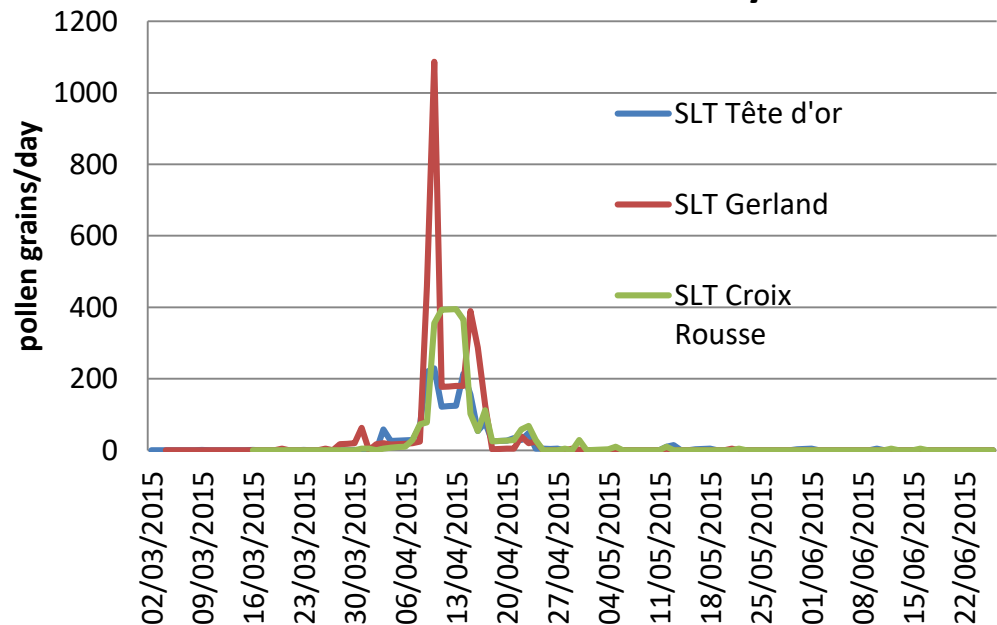
Capteurs Taxons	SLT Gerland 2015	SLT Gerland 2016	SLT Croix- Rousse 2015	SLT Croix- Rousse 2016	SLT Tête d'Or 2015	SLT Tête d'Or 2016
Betula	2731	5198	2544	2660	1829	1299
Carpinus	329	1905	302	2307	515	1410
Cupress	6239	2960	4296	3390	14748	2575
Quercus	4618	1989	6964	2307	6338	2033
Fraxinus	4352	1445	5344	1696	4749	1158
Populus	2050	2865	991	1543	1420	1394
Platanus	14383	10366	6607	13146	20090	23397
Salix	326	211	879	160	288	149
Poaceae	6224	3287	7401	3503	5037	3079
Urticaceae	865	441	678	492	678	95
Total	42117	37021	36006	40818	55692	42832

Betula (birch) in Paris and in Lyon in 2015

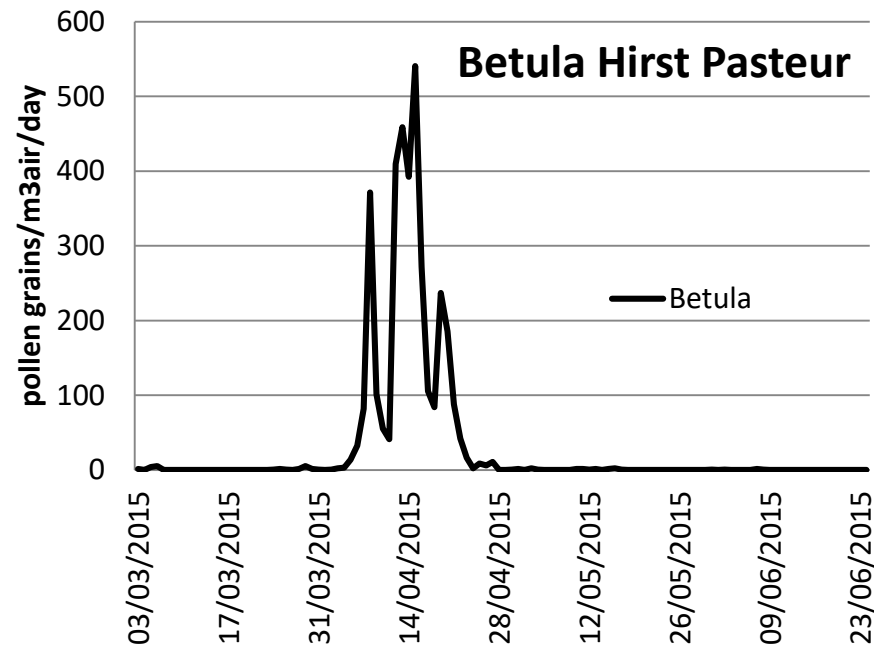
Betula SLT Paris



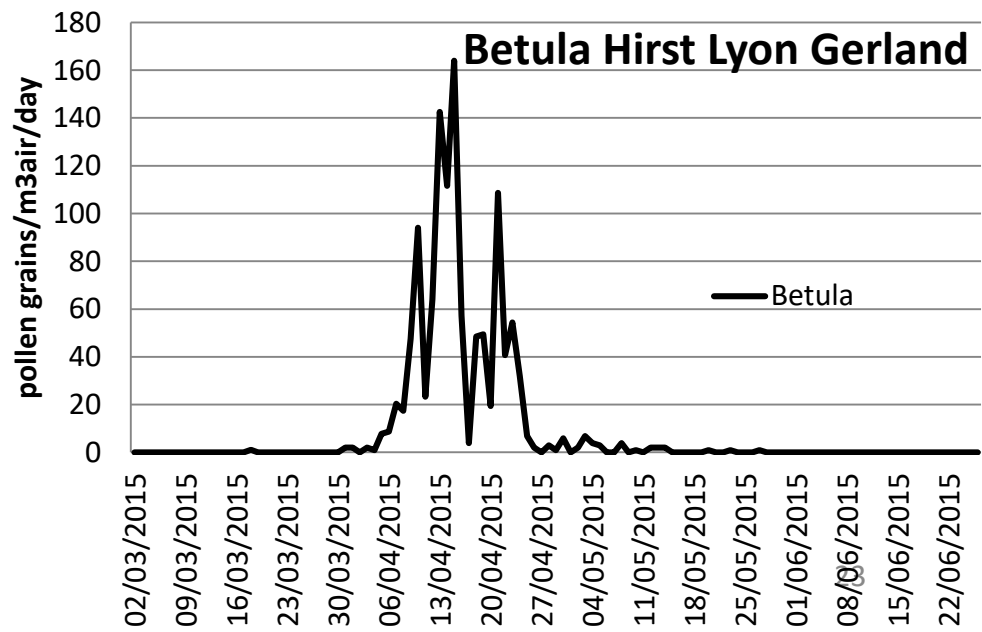
Betula SLT Lyon



Betula Hirst Pasteur

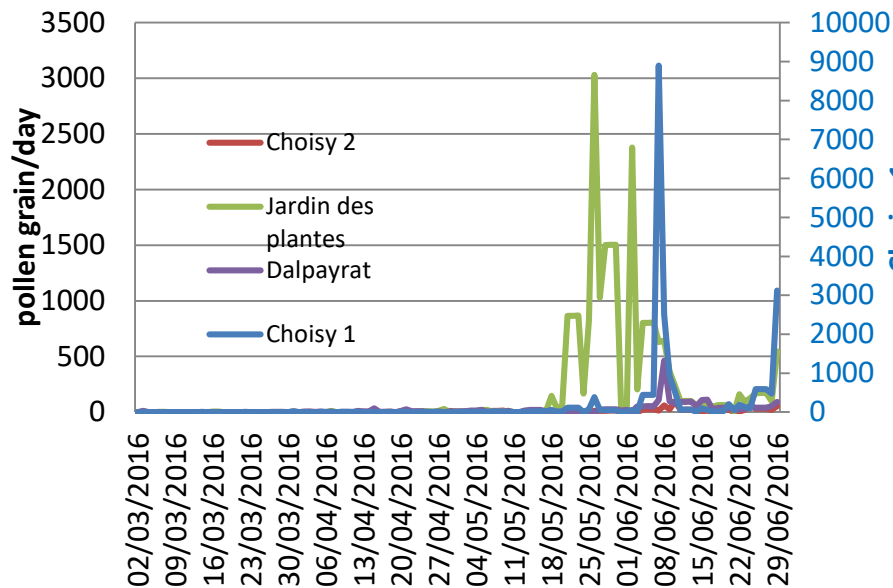


Betula Hirst Lyon Gerland

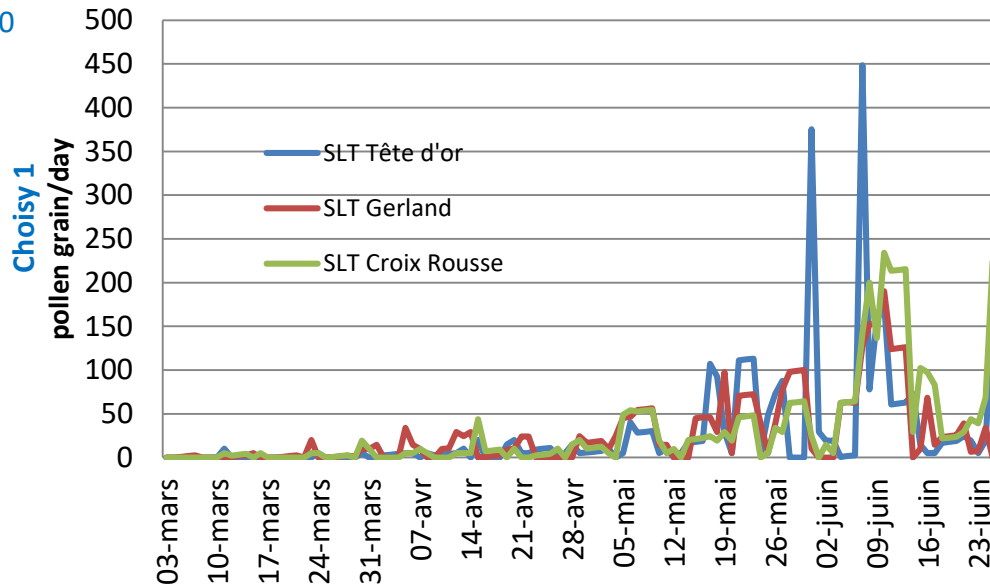


Poaceae (grasses) in Paris and in Lyon in 2016

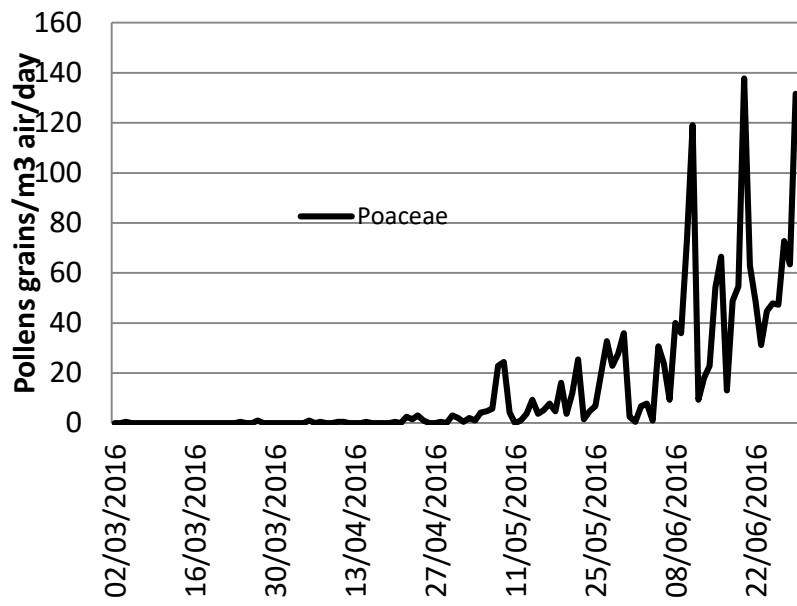
Poaceae SLT Paris



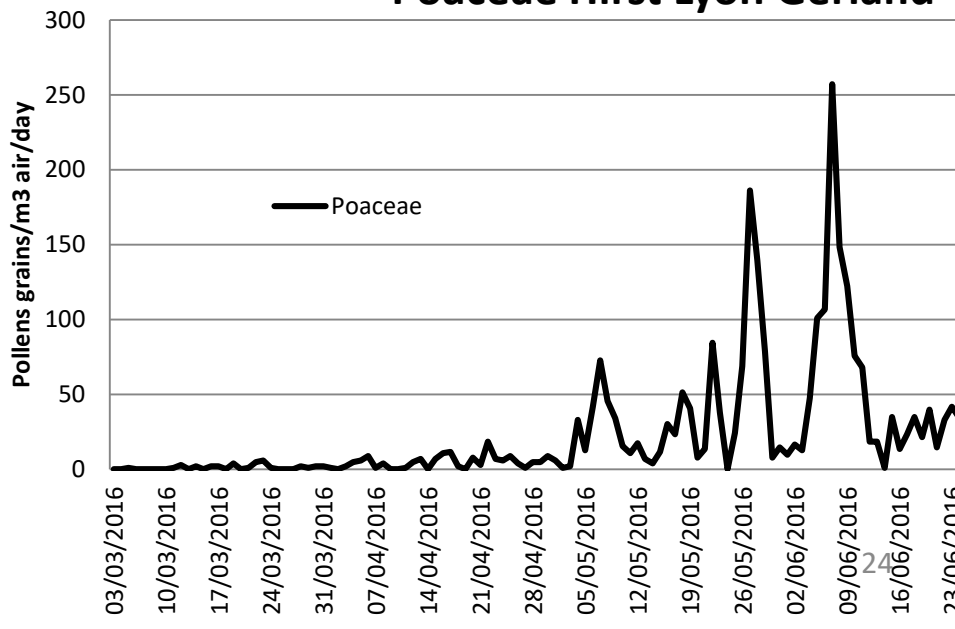
Poaceae SLT Lyon



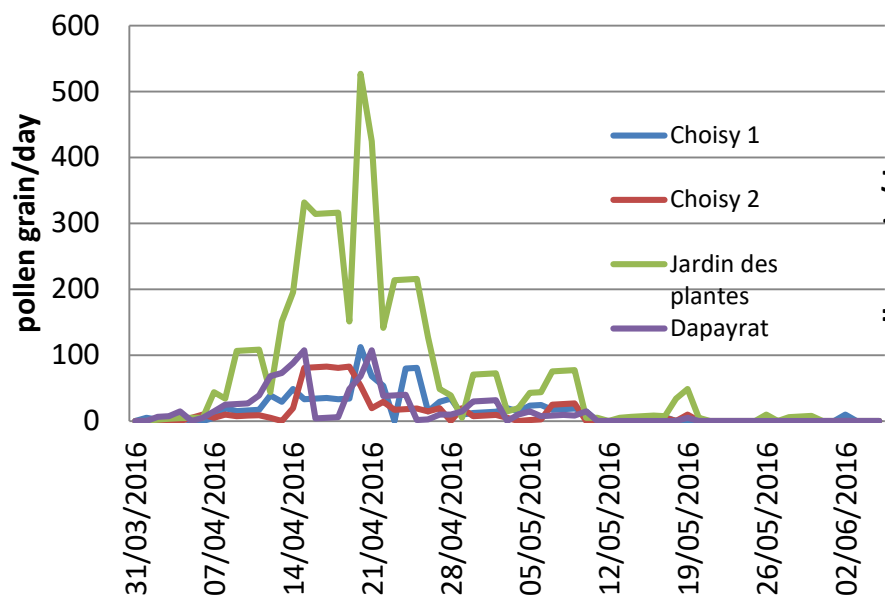
Poaceae Hirst Pasteur



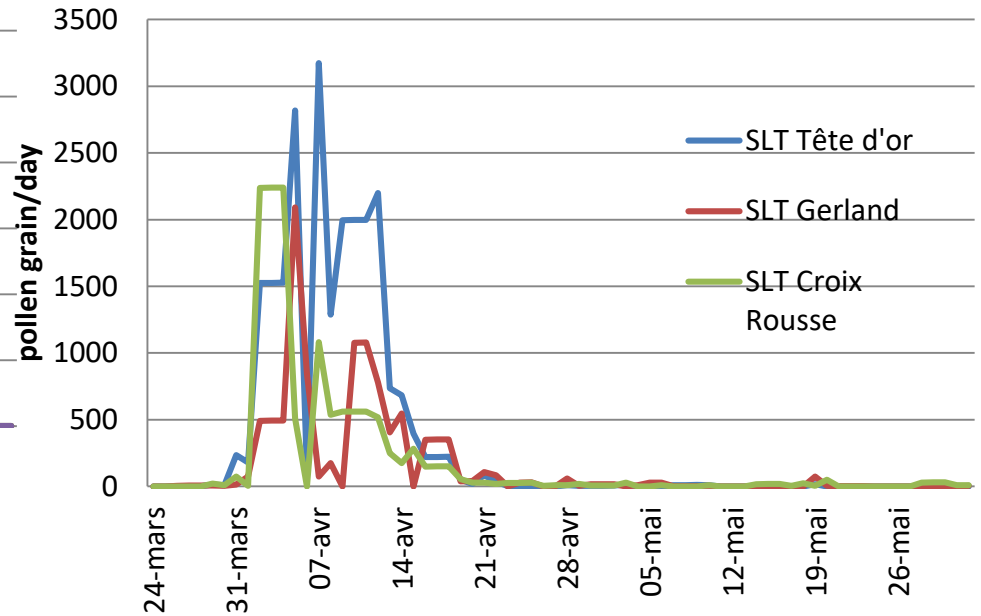
Poaceae Hirst Lyon Gerland



Platanus SLT Paris

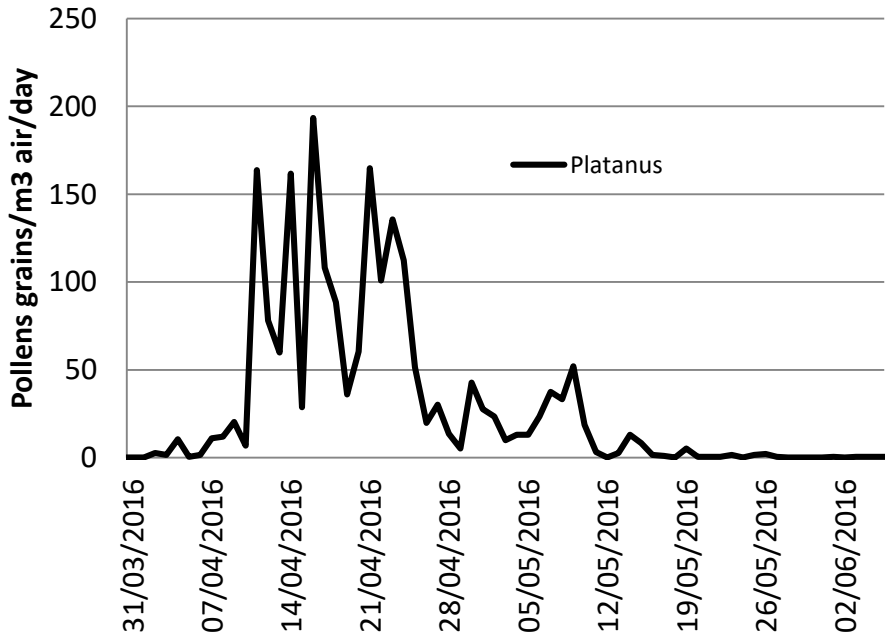


Platanus SLT Lyon

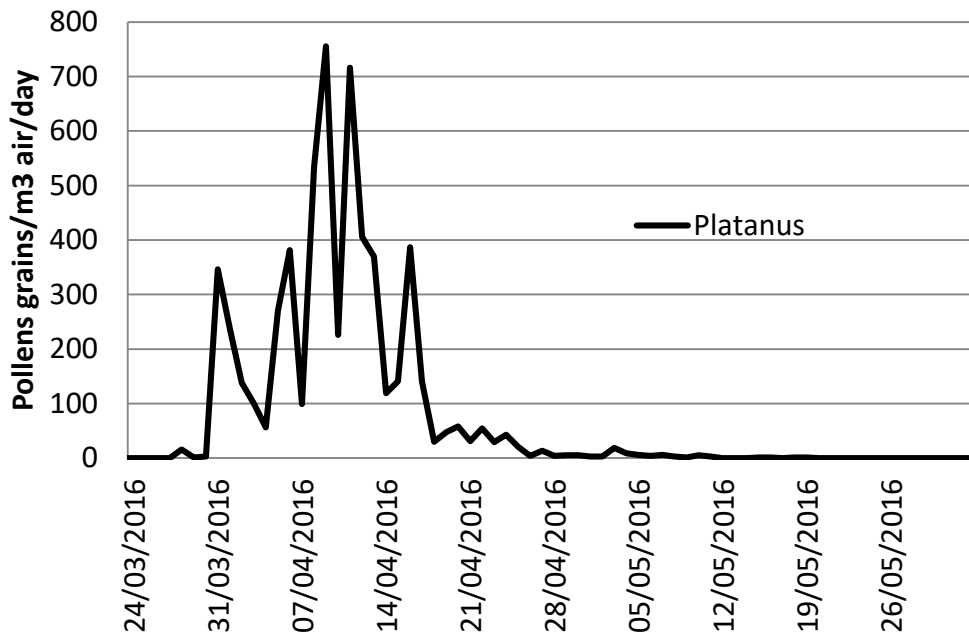


Platanus

2016



Platanus Hirst Lyon Gerland



Exemple Index for Lyon Gerland parc

Index of exposure :it takes into account the allergy potency of the species and the number of pollen grains.

$$\text{Index of exposure} = \frac{\text{Allergy potency} * \text{Number of pollen grains}}{1000}$$

Index of source :it takes into account the allergy potency and the number of species.

$$\text{Index of source} = \frac{\text{Allergy potency} * \text{Number of species}}{10}$$

Pollen trap Taxa	SLT Tête d'Or Index of source	SLT Tête d'Or Index of exposure	Recommandations
Betula (birch)	23	9	
Carpinus (hornebeam)	38	6	
Cupress (cypress)	6	52	
Quercus (oak)	65	17	n
Fraxinus (ash)	82	18	
Populus (poplar)	10	3	n
Platanus (plane tree)	83	87	r
Salix (willow)	5	1	n

Legend :
n = nothing to do
| = limit the species
r = remove the species

Exemple Index for Paris Choisy Parc - **Index of exposure** :it takes into account the allergy potency of the species and the number of pollen grains.

$$\text{Index of exposure} = \frac{\text{Allergy potency} * \text{Number of pollen grains}}{1000}$$

- **Index of source** :it takes into account the allergy potency and the number of species.

$$\text{Index of source} = \frac{\text{Allergy potency} * \text{Number of species}}{10}$$

Pollen trap Taxa	SLT Choisy 1 Index of source	SLT Choisy 1 Index of exposure	SLT Choisy 2 Index of source	SLT Choisy 2 Index of exposure	Recommandations
Betula (birch)	0,3	18	0,3	14	l
Carpinus (hornebeam)	/	9	/	7	n
Cupress (cypress)	/	69	/	41	n
Quercus (oak)	0,4	7	0,4	6	n
Fraxinus (ash)	4,8	9	4,8	6	l
Populus (poplar)	1,3	2	1,3	1	n
Platanus (plane tree)	1,6	8	1,6	7	l
Salix (willow)	/	1	/	1	n

Legend :
n = nothing to do
l = limit the species
r = remove the species

Conclusion 1/2

- The different results show that according to their locations, SLT pollen trap provide substantially similar results. The pollen seasons are the same on the Hirst and SLT pollens traps.
- Some taxa highlighted on the proximity pollens traps seem to be related to the surrounding vegetation (ex : Cupressaceae, Plantaginaceae, Platanus, Poaceae ...)
- With this results, it is possible to inform the gardeners about the species which must be absolutely removed and the species which must not be planted in the future.

Conclusion 2/2

① www.vegetation-en-ville.org/que-faire/le-potentiel-allergisant/

- There are many allergenic species in the parks of the cities of Lyon and Paris like birch, cypress, plane tree We need to take into account the health impact in the choice of vegetal species to implant in green areas and avoid to plant allergenic species.

- With these results, a guide has been updated with recommendations for species to avoid and species to plant in the green areas and parks in France available on the website: <http://www.vegetation-en-ville.org/que-faire/le-potentiel-allergisant/>

Cryptomeria du Japon	Taxodiaceae	Fort
Tilleuls*	Tilliacées	Modéré
Ormes*	Ulmacées	Faible/Négligeable

*plusieurs espèces
** le pollen de platane est faiblement allergisant. Par contre, les micro-aiguilles contenus dans les bourres provenant de la dégradation des capitules femelles de l'année précédente sont très irritantes.

Herbacées spontanées		
Espèces	Familles	Potentiel allergisant
Chénopodes*	Chénopodiacées	Modéré
Soude brûlée (Salsola kali)		Modéré
Ambrosies*	Composées	Fort
Armoises*		Fort
Marguerites*		Faible/Négligeable
Pissenlits*		Faible/Négligeable
Mercuriales*	Euphorbiacées	Modéré
Plantains*	Plantaginacées	Modéré
Graminées	Poacées	Fort
Oseilles* (Rumex)	Polygonacées	Modéré
Orties*	Urticacées	Faible/Négligeable
Pariétaires		Fort

*plusieurs espèces

Graminées Ornementales		
Espèces	Familles	Potentiel allergisant
Baldingère	Poacées	Fort
Calamagrostis		Modéré
Canche sespeuse		Fort
Elyme des sables		Modéré
Fétuques*		Fort
Fromental élevé		Fort
Queue de lièvre		Modéré
Stipe géante		Modéré

*nombreuses espèces



Acknowledgments

- Jean Claude Bertrand and the staff of the green spaces in Paris
- Eric Joly, Philippe Barré, Xavier Riffer, Sylvie Rebuffat and the staff of the MNHN in Paris
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- Valérie Bex, Vincent Doucet, Sophie Barral...and the staff of the LHVP in Paris
- Franck Grangette and the staff of the « maison des fleurs » de Gerland
- Jean-Claude Teoli the director of the Croix-Rousse hospital in Lyon
- Sophie Pamies Directrice de l'Ecologie Urbaine à Lyon
- Dominique Deruaz, Daniel Boulens, Fabienne Chevalier, Frédérique Pautz, Dominique Peyrard...of the city hall of Lyon
- Audrey Tissot for changing the slides every day of the SLT Parc Tête d'Or and Croix Rouse.
- The staff of the RNSA for reading the slides of each SLT



Thank you for your
attention !

The End