# INTEGRATING SUSTAINABILITY INTO HIGHER EDUCATION THROUGH ACTIVE LEARNING

## *A CASE STUDY FROM UNIVERSIDAD REY JUAN CARLOS*

URJC Escuela Superior de Ciencias Experimentales y Tecnología

***Berta López Mir***, *Cristina Crespo Martín, Francisco Javier Lillo Ramos, Alba Martínez Coronado, Raquel Herrera Espada, José Luis Guerrero Márquez, Sandra González Muñoz, Marta Rincón Ramos, María Najarro de La Parra*

# 1. INTRODUCCTION

## *Ley Orgánica 2/2023 del Sistema Universitario (*LOSU)

- Strengthen funding
- Boost research and knowledge transfer
- Promote stabilization processes for university faculty
- Encourage equity and equality
- **Promote sustainability, combat climate change, and uphold the values of the Sustainable development Goals (SDGs)**
- **Actively promote teaching innovation**

# URJC2030 Project

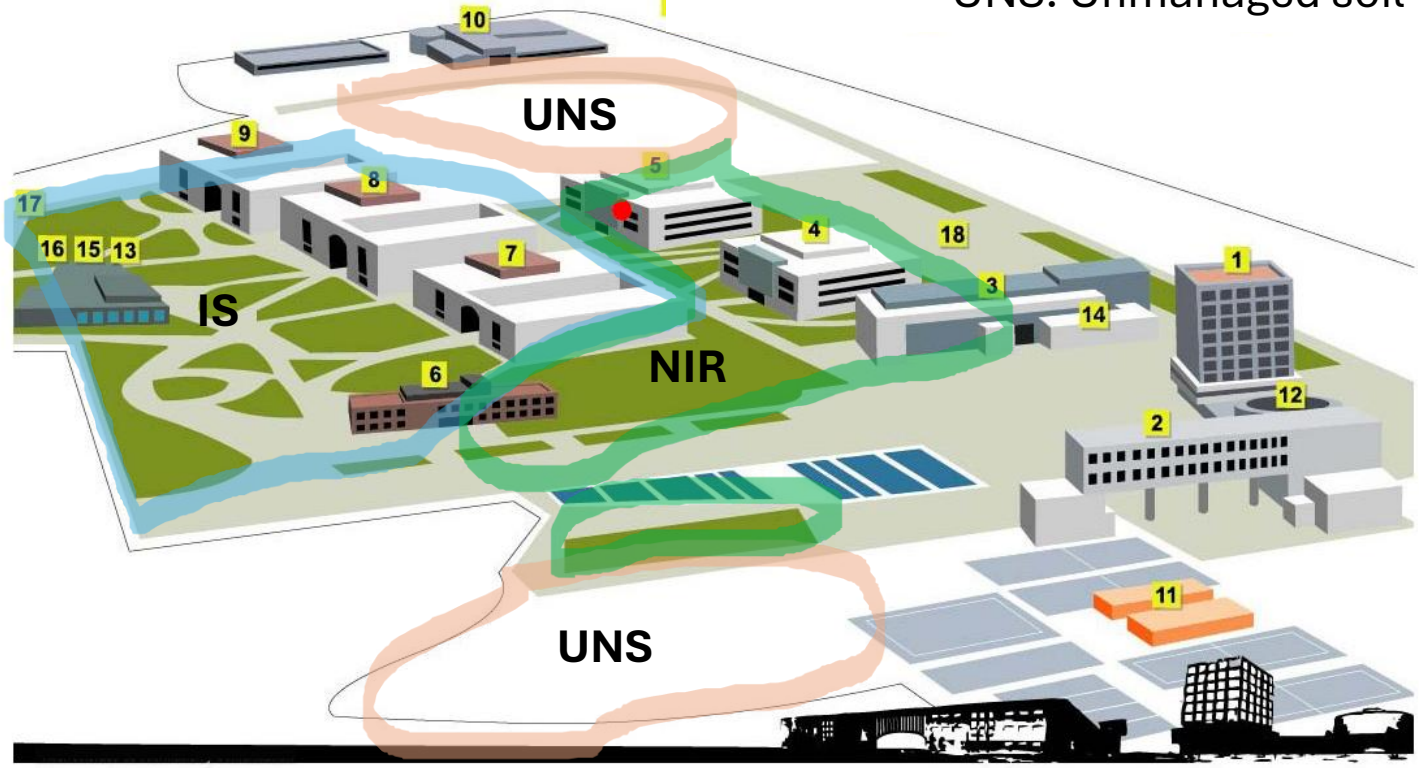
*Vice-Rectorate for Quality and Strategy*

## Project Goals

- Contribution to achieving the SDGs
- Teaching quality
- Research and knowledge transfer
- People and resources
- Institutional development, management, and good governance
- Green Office (created in 2010)


# Green Office: Actions to Save Irrigation Water Móstoles Campus URJC

IS: Irrigated soil
NIS: Not Irrigated soil
UNS: Unmanaged soil



# Green Office: Actions to Save Irrigation Water Consequences

IS: Irrigated soil
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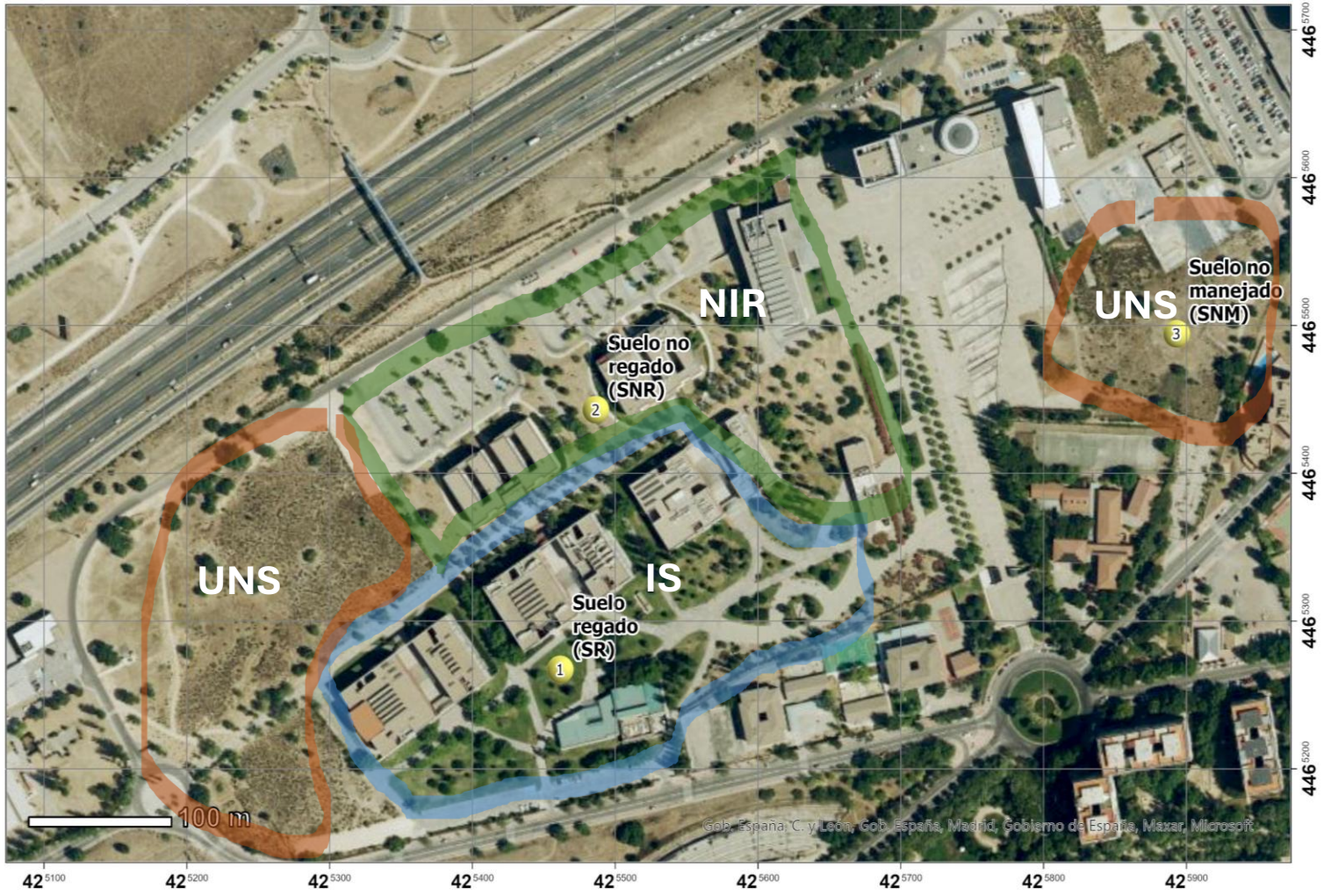
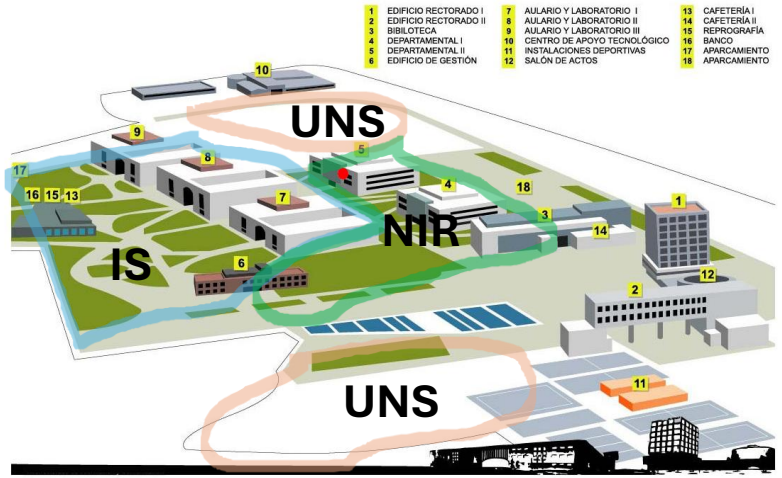
# Green Office: Actions to Save Irrigation Water Consequences

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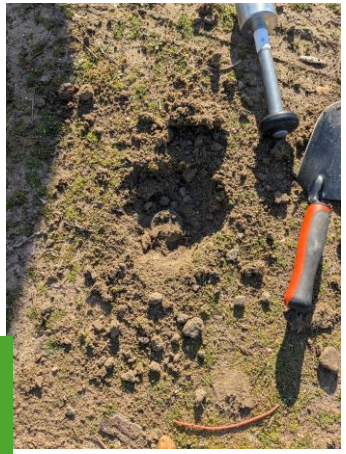
URJC Escuela Superior de Ciencias Experimentales y Tecnología

# Green Office: Actions to Save Irrigation Water Consequences





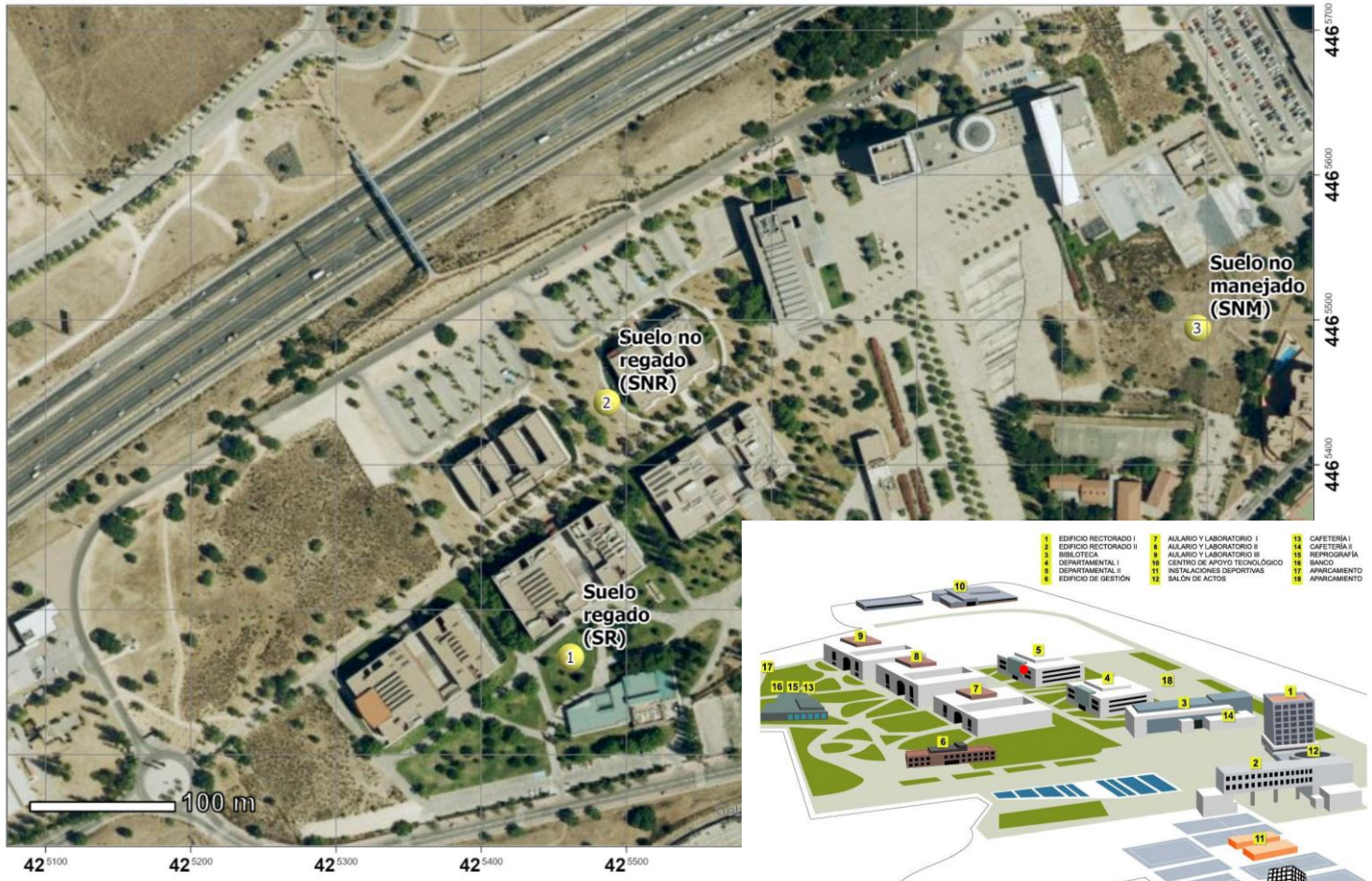
**Natural Laboratory to Study Soil Reaction to Drought**




# 2. TEACHING METHODOLOGY

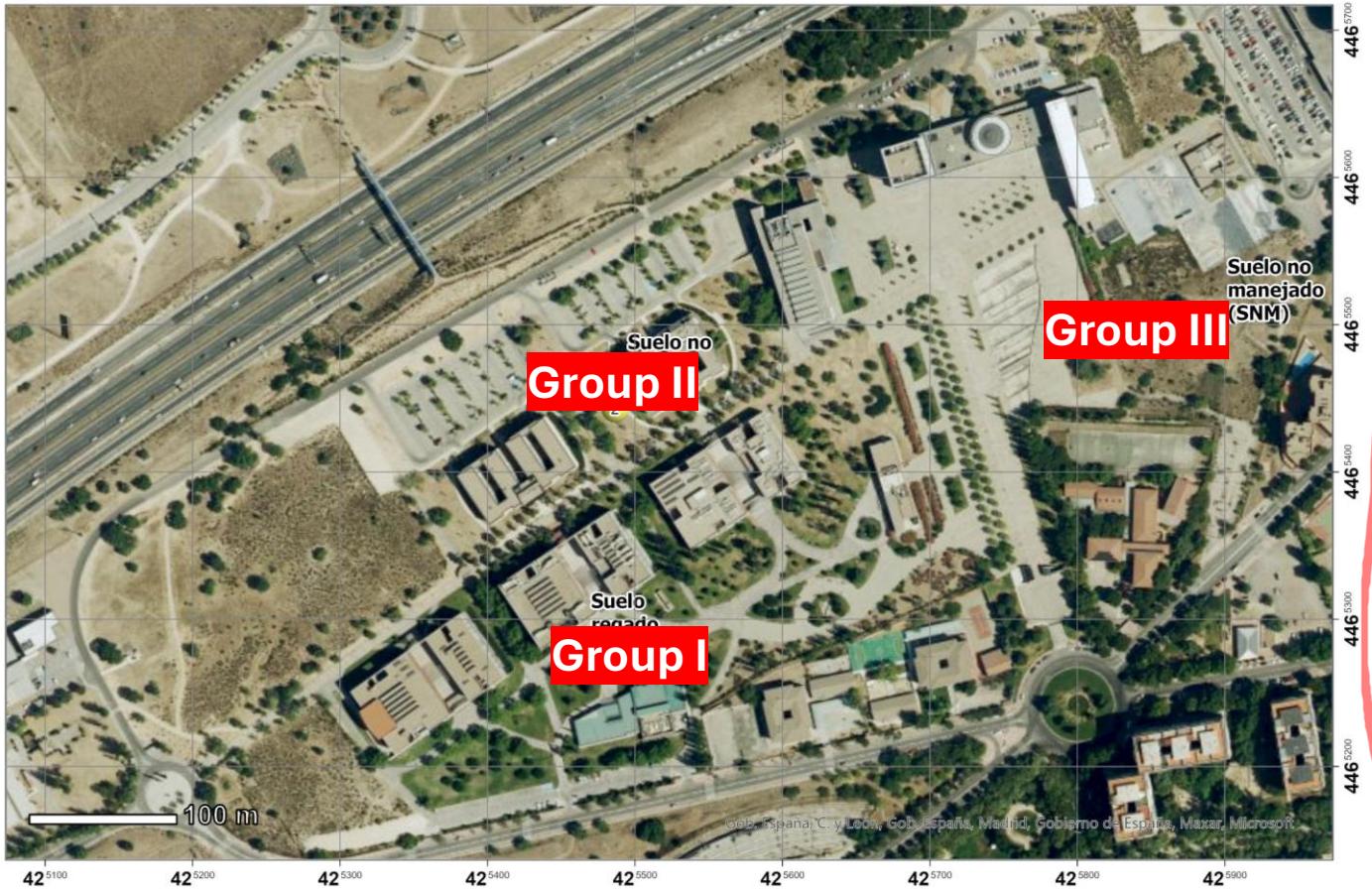
## **PRACTICAL WORK.** Green Campus Project

- Learning experience
  - Field practical classes and laboratory classes
  - Seminar for sharing results
- Active methodologies
  - Case-Based Learning
  - Cooperative Learning



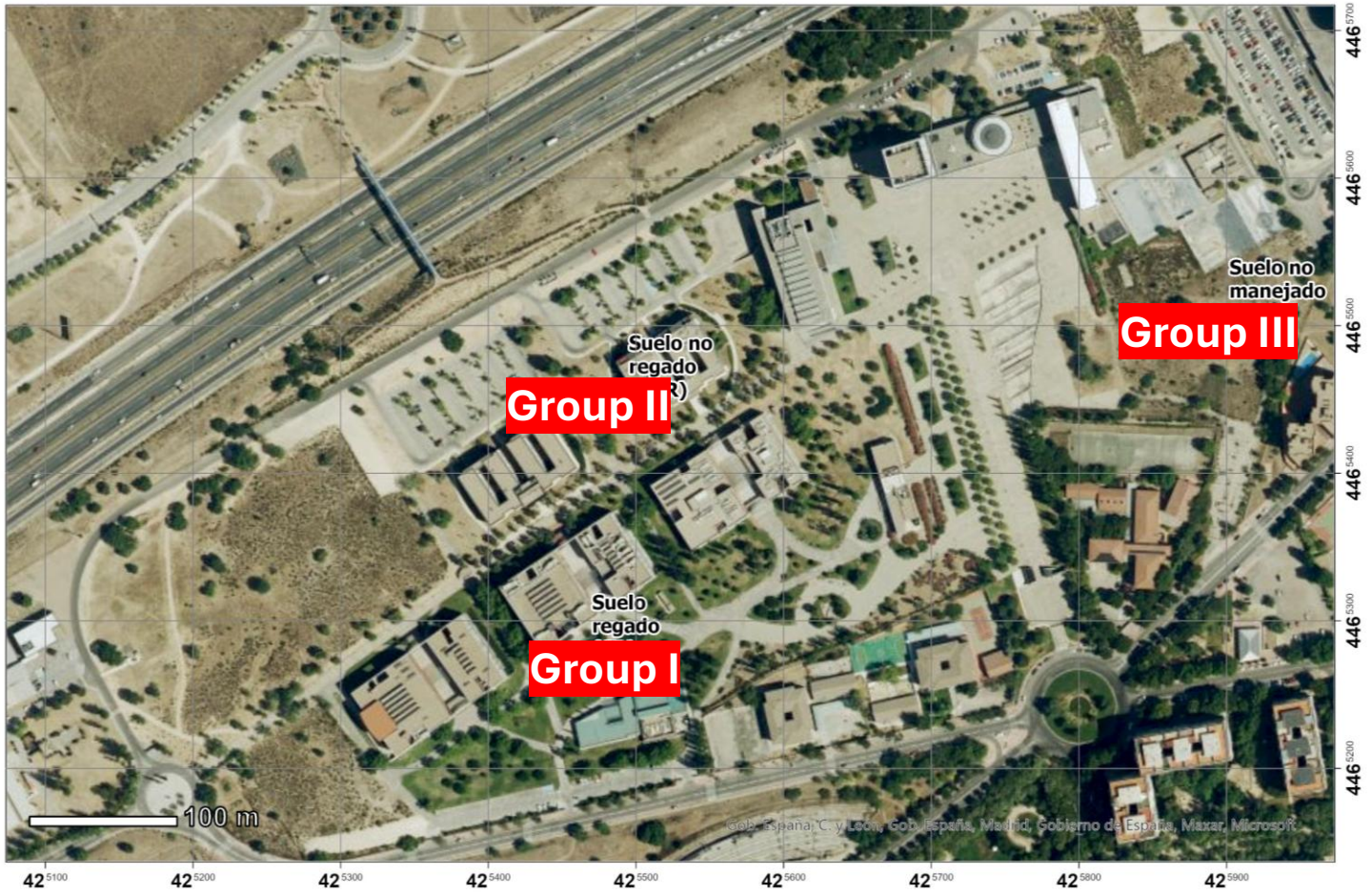
# PRACTICAL WORK

## Green Campus Project




| ANALYTICAL WORK | | SEMINAR FOR SHARING RESULTS | |
|---|---|---|---|
| **Group I (Irrigated Soil)** | 11 students | **Group A** | 5 students<br>*1 from Group I, 2 from Group II y 2 from Group III* |
| | | **Group B** | 5 students<br>*2 from Group I, 1 from Group II y 2 from Group III* |
| **Group II (Not Irrigated Soil)** | 11 students | **Group C** | 5 students<br>*2 from Group I, 2 from Group II y 1 from Group III* |
| | | **Group D** | 6 students<br>*2 from Group I, 2 from Group II y 2 from Group III* |
| **Group III (Unmanaged Soil)** | 11 students | **Group E** | 6 students<br>*2 from Group I, 2 from Group II y 2 from Group III* |
| | | **Group F** | 6 students<br>*2 from Group I, 2 from Group II y 2 from Group III* |

# PRACTICAL WORK
## Green Campus Project






# **PRACTICAL WORK.** Green Campus Project
## Cooperative Learning

| ANALYTICAL WORK | | SEMINAR FOR SHARING RESULTS | |
|---|---|---|---|
| **Group I (Irrigated Soil)** | 11 students | **Group A** | 5 students *1 from Group I, 2 from Group II y 2 from Group III* |
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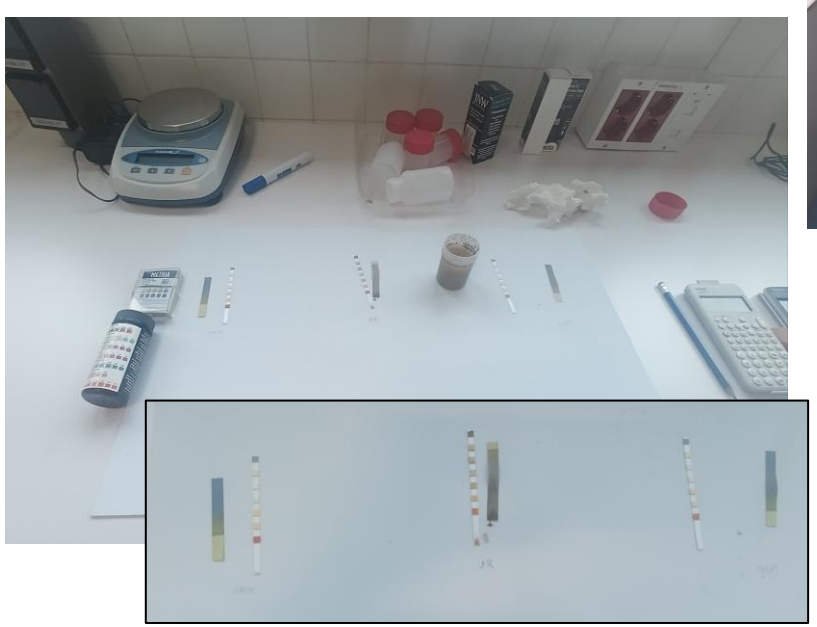
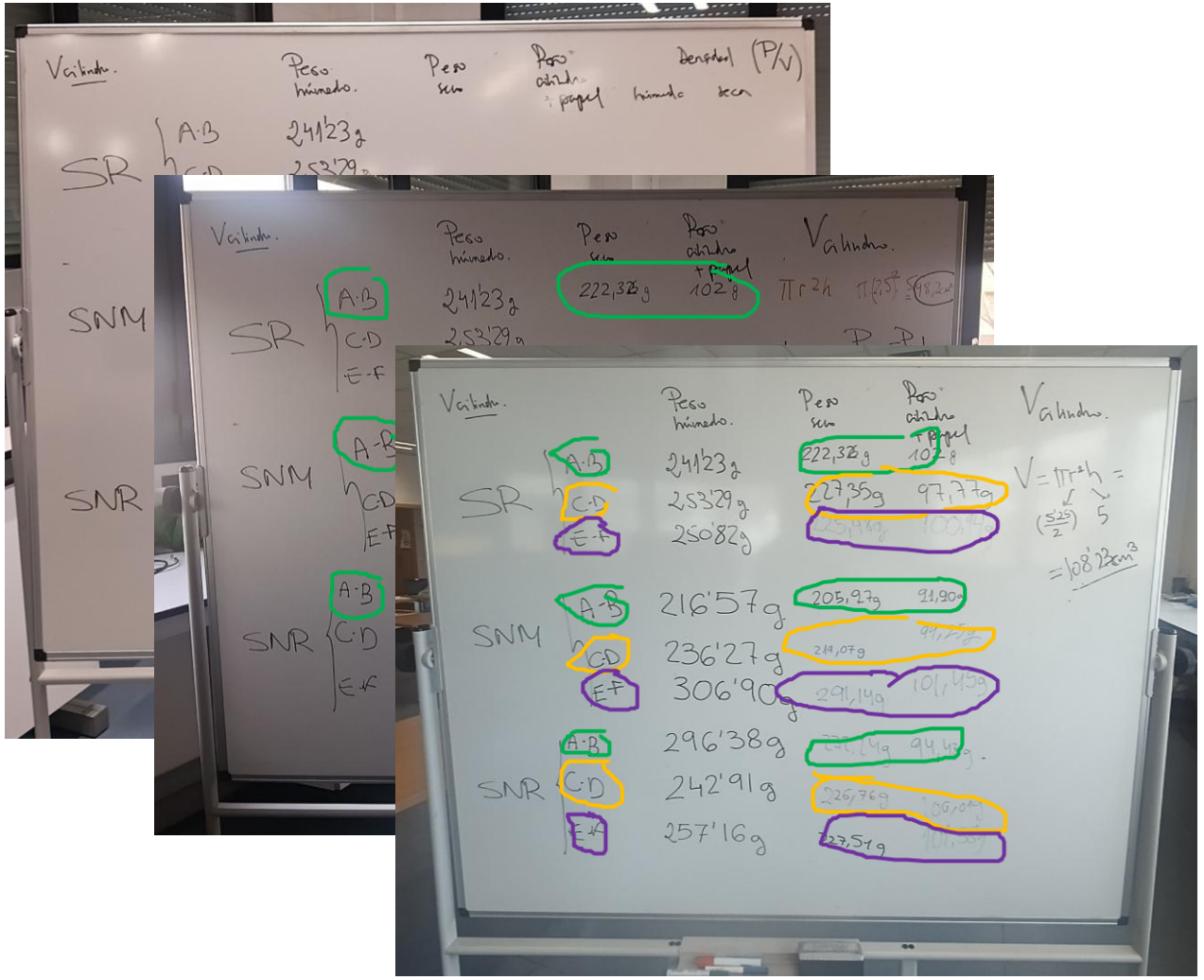


# **PRACTICAL WORK.** Green Campus Project
## Cooperative Learning

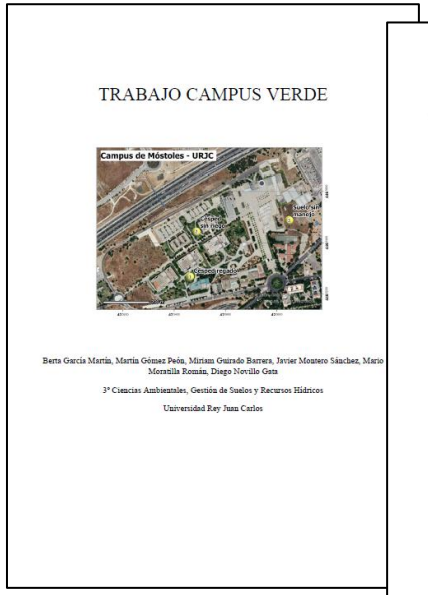
| FASE 1: TRABAJO ANALÍTICO | | FASE 2: SEMINARIO E INFORME FINAL | |
|---|---|---|---|
| **Group I (Suelo regado)** | 11 students | **Group A** | 5 students<br>*1 from Group I, 2 from Group II y 2 from Group III* |
| | | **Group B** | 5 students<br>*2 from Group I, 1 from Group II y 2 from Group III* |
| **Group II (Not Irrigated Soil)** | 11 students | **Group C** | 5 students<br>*2 from Group I, 2 from Group II y 1 from Group III* |
| | | **Group D** | 6 students<br>*2 from Group I, 2 from Group II y 2 from Group III* |
| **Group III (Unmanaged Soil)** | 11 students | **Group E** | 6 students<br>*2 from Group I, 2 from Group II y 2 from Group III* |
| | | **Group F** | 6 students<br>*2 from Group I, 2 from Group II y 2 from Group III* |



# **PRACTICAL WORK.** Green Campus Project **Evaluation.** Final Report



**Group A**


TRABAJO CAMPUS VERDE

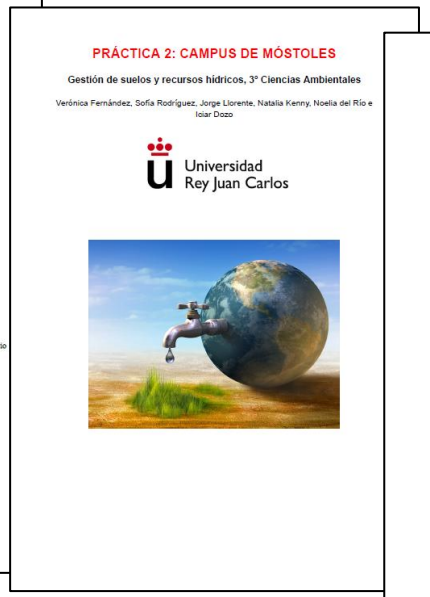
Campus de Móstoles - URJC

Berta García Martín, Martín Gómez Peón, Miriam Guirado Barrera, Javier Montero Sánchez, Mario Moratilla Román, Diego Novillo Gata

3º Ciencias Ambientales, Gestión de Suelos y Recursos Hídricos

Universidad Rey Juan Carlos

**Group B**

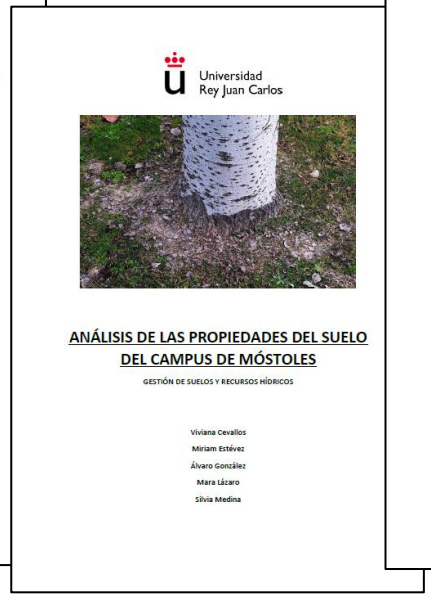

PRÁCTICA 2: CAMPUS DE MÓSTOLES

Gestión de suelos y recursos hídricos, 3º Ciencias Ambientales

Verónica Fernández, Sofía Rodríguez, Jorge Llorente, Natalia Kenny, Noelia del Río e Iolar Dozo

Universidad Rey Juan Carlos

**Group C**


Universidad Rey Juan Carlos

ANÁLISIS DE LAS PROPIEDADES DEL SUELO DEL CAMPUS DE MÓSTOLES

GESTIÓN DE SUELOS Y RECURSOS HÍDRICOS

Viviana Cevallos

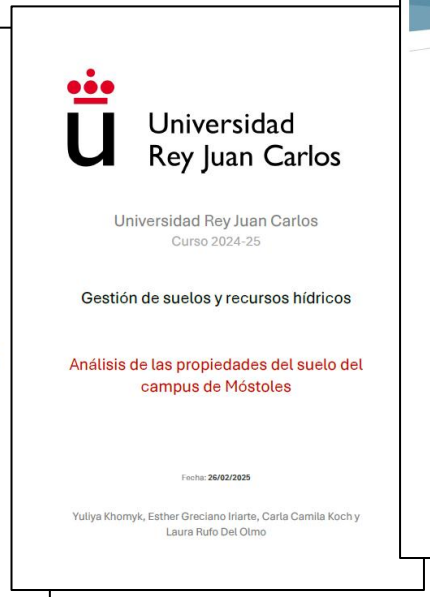
Miriam Estévez

Álvaro González

Mara Lázaro

Silvia Medina

**Group D**


Universidad Rey Juan Carlos

Universidad Rey Juan Carlos

Curso 2024-25

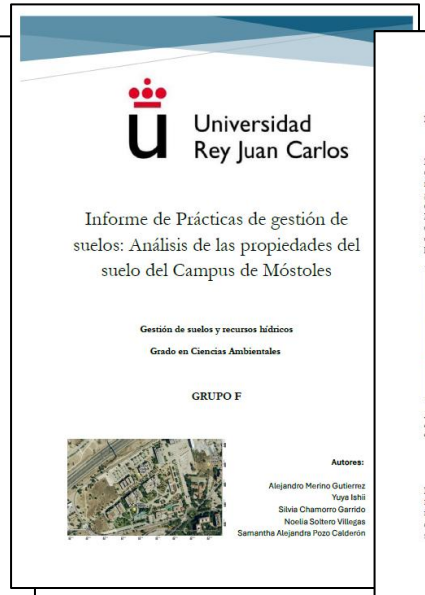
Gestión de suelos y recursos hídricos

Análisis de las propiedades del suelo del campus de Móstoles

Fecha: 26/02/2025

Yuliya Khomyk, Esther Greciano Iriarte, Carla Camila Koch y Laura Rufo Del Olmo

**Group E**


Universidad Rey Juan Carlos

Informe de Prácticas de gestión de suelos: Análisis de las propiedades del suelo del Campus de Móstoles

Gestión de suelos y recursos hídricos

Grado en Ciencias Ambientales

GRUPO F

Autores:

Alejandro Merino Gutierrez

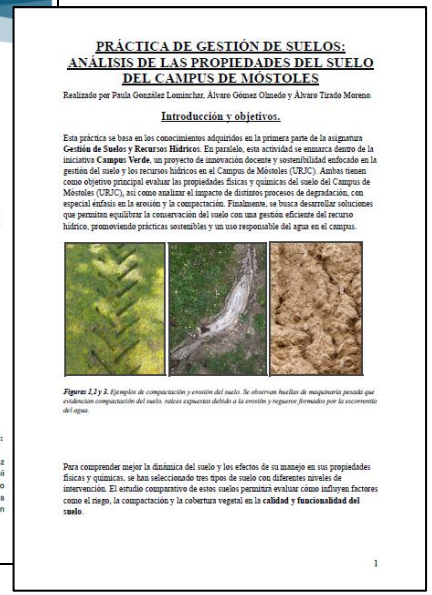
Yuya Ishii

Silvia Chamorro Garrido

Noelia Soltero Villegas

Samantha Alejandra Pozo Calderón

**Group F**


PRÁCTICA DE GESTIÓN DE SUELOS: ANÁLISIS DE LAS PROPIEDADES DEL SUELO DEL CAMPUS DE MÓSTOLES

Realizado por Paula González Lominchar, Álvaro Gómez Olmedo y Álvaro Tirado Moreno.

Introducción y objetivos.

Esta práctica se basa en los conocimientos adquiridos en la primera parte de la asignatura **Gestión de Suelos y Recursos Hídricos**. En paralelo, esta actividad se enmarca dentro de la iniciativa **Campus Verde**, un proyecto de innovación docente y sostenibilidad enfocado en la gestión del suelo y los recursos hídricos en el Campus de Móstoles (URJC). Ambas tienen como objetivo principal evaluar las propiedades físicas y químicas del suelo del Campus de Móstoles (URJC), así como analizar el impacto de distintos procesos de degradación, con especial énfasis en la erosión y la compactación. Finalmente, se busca desarrollar soluciones que permitan equilibrar la conservación del suelo con una gestión eficiente del recurso hídrico, promoviendo prácticas sostenibles y un uso responsable del agua en el campus.

*Figuras 1.2 y 2. Ejemplos de compactación y erosión del suelo. Se observan huellas de maquinaria pesada que evidencian compactación del suelo, raíces expuestas debido a la erosión y regueros formados por la escorrentía del agua.*

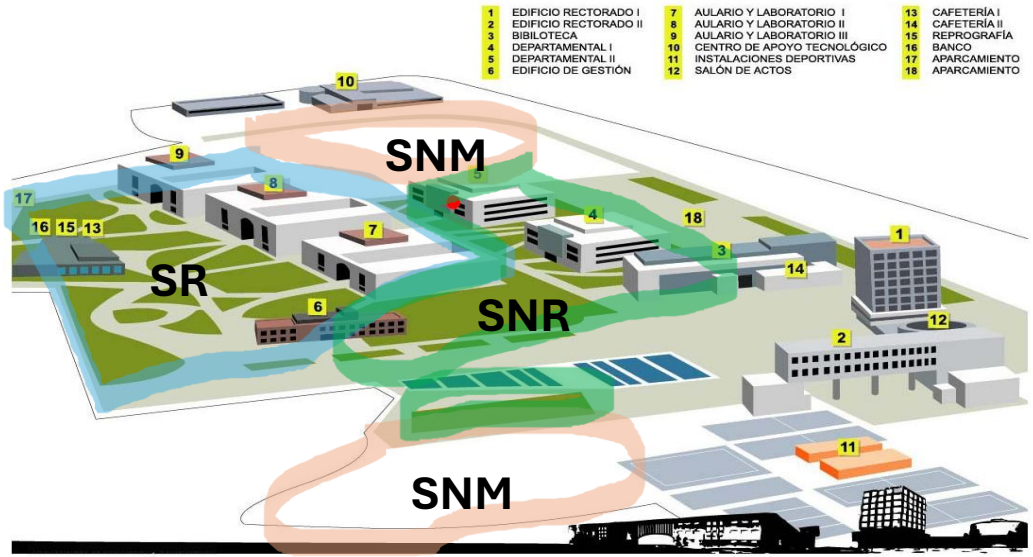
Para comprender mejor la dinámica del suelo y los efectos de su manejo en sus propiedades físicas y químicas, se han seleccionado tres tipos de suelo con diferentes niveles de intervención. El estudio comparativo de estos suelos permitirá evaluar cómo influyen factores como el riego, la compactación y la cobertura vegetal en la **calidad y funcionalidad del suelo**.

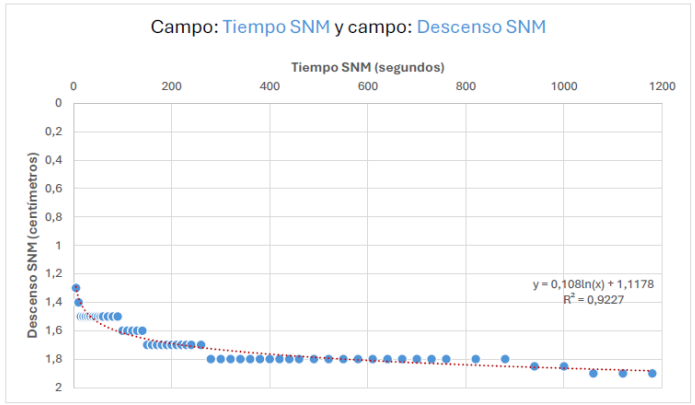
1

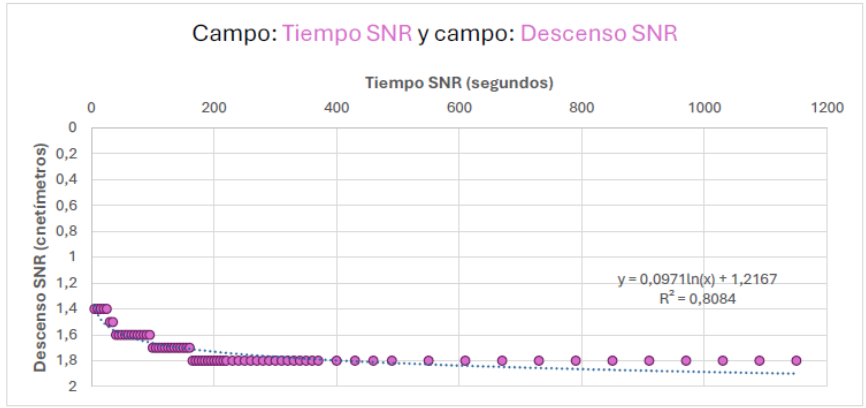
# **PRACTICAL WORK.** Green Campus Project
# **Evaluation.** Presentation of results

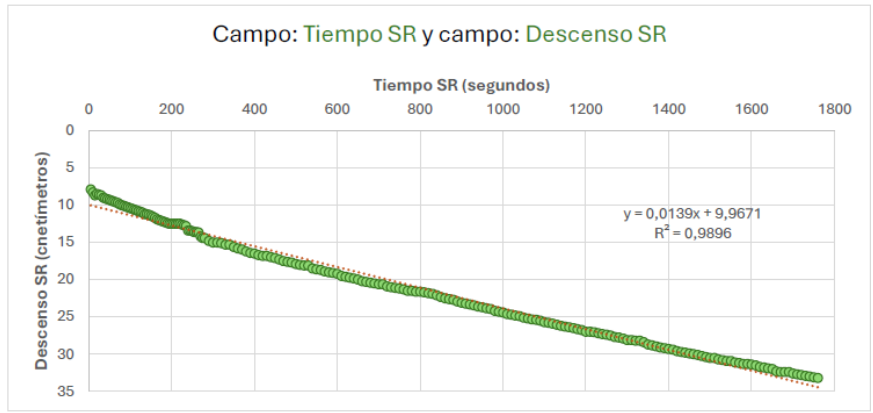
| N.º de Muestra | Densidad ap.seca (g/cm³) | Densidad ap.húmeda (g/cm³) | Agua (%) |
|---|---|---|---|
| SR1 | 1,22 | 1,40 | 14,03 |
| SR2 | 0,88 | 1,04 | 17,75 |
| SNR1 | 1,41 | 1,67 | 18,73 |
| SNR2 | 1,40 | 1,54 | 10,39 |
| SNM1 | 1,52 | 1,69 | 10,73 |
| SNM2 | 1,55 | 1,71 | 10,44 |

| N.º de Muestra | Conductividad campo (mS/cm) | Conductividad hidráulica (µS/cm) | pH hidráulico |
|---|---|---|---|
| SR1 | 0,15 | 75 | 7,72 |
| SR2 | 0,17 | 75 | 7,72 |
| SNR1 | 2,44 | 137 | 7,06 |
| SNR2 | 2,64 | 137 | 7,06 |
| SNM1 | 0,34 | 149 | 8,24 |
| SNM2 | 0,34 | 149 | 8,24 |

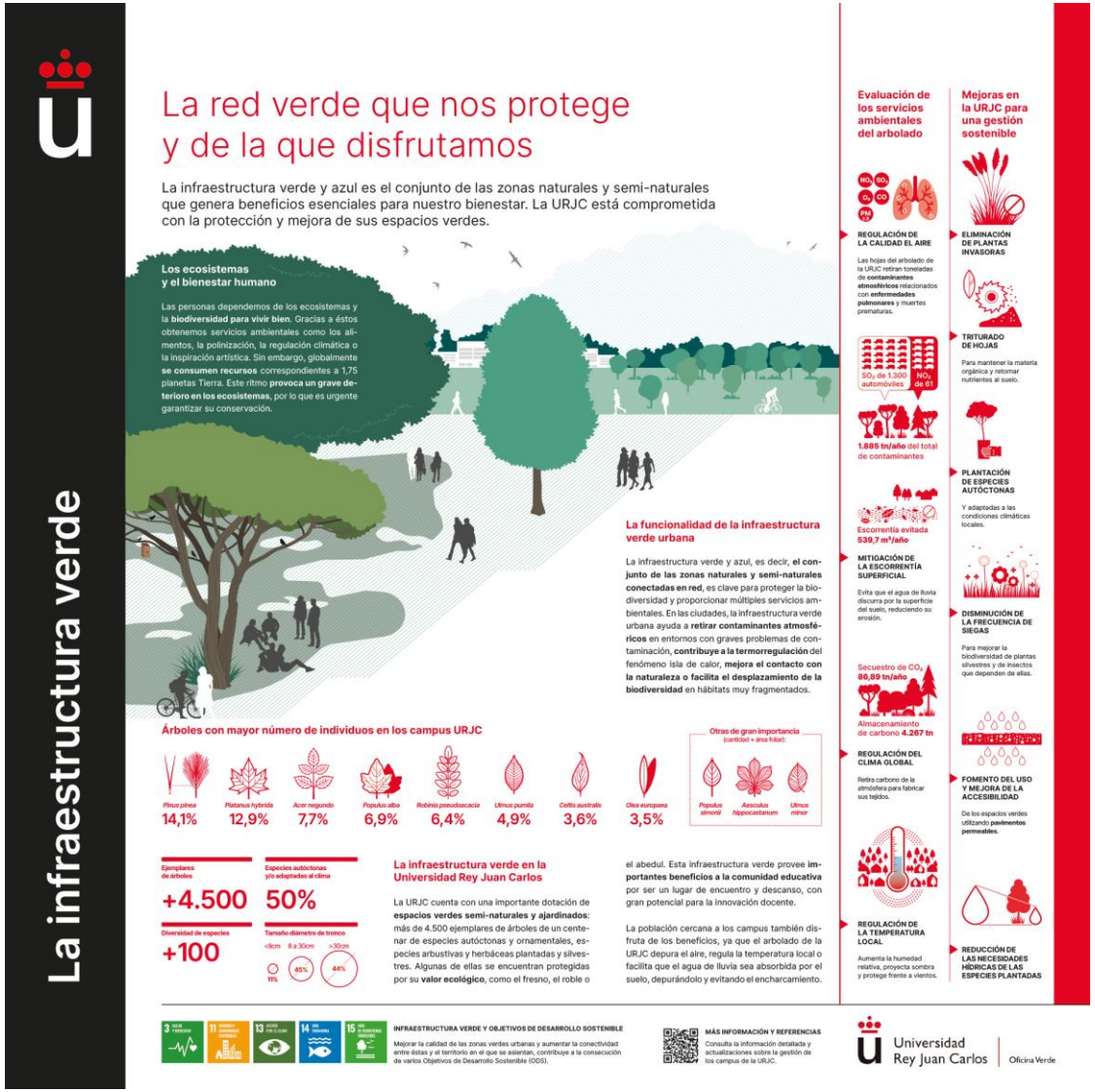


# **PRACTICAL WORK.** Green Campus Project
# **Evaluation.** Campus Sustainability

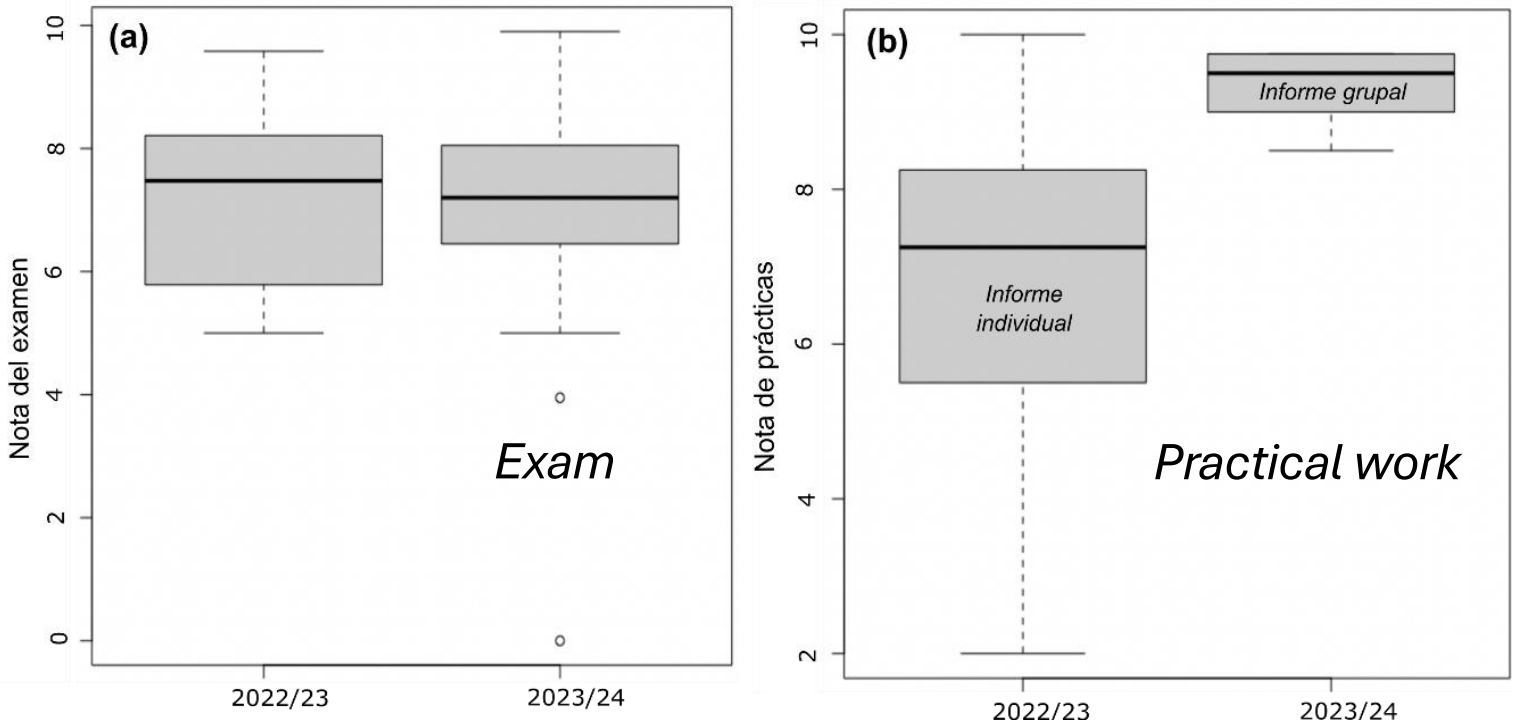



# 3. RESULTS

## Student feedback

| Evaluation of the Group Dynamics | |
|---|---|
| **1. Which group do you belong to?** | A, B, C, D, E, F |
| **2. Has there been any incident? Do you consider that any member from the group has not participated sufficiently?** | 0 answers |
| **3. If you answered yes to the previous question, indicate the percentage of collaboration for each person.** | 0 answers |
| **Evaluation of the Activity** | |
| **4. Rate your level of satisfaction with the activity from 1 to 5.** | 4.6 / 5 |
| **5. ¿Would you repeat the activity next year?** | Yes in all answers |
| **6. Do you have any other suggestions?**<br>Improve the organization in laboratory analytics.<br>Interest in including more activities of this type. | |

# Comparison with previous year scores




## Descriptive statistics for the practical work

| Academic year | Mean | Median | Standard Deviation | Interquaratile Range (IQR) | Q1 (25%) | Q2 (50%) | Q3 (75%) | Q4 (100%) | Number of data |
|---|---|---|---|---|---|---|---|---|---|
| **2022/23** | 7,25 | 6,7 | 2,3 | 2,4 | 5,75 | 7,25 | 8,12 | 10 | 24 |
| **2023/24** | 9,5 | 9,3 | 0,45 | 0,75 | 9 | 9,5 | 9,75 | 9,75 | 33 |

# 4. CONCLUSIONS

- Active methodologies such as Case-Based Learning and Cooperative Learning has enhanced student autonomy and participation, gradually replacing traditional expository methods with inquiry-based approaches.

- This learning experience has encouraged the application of theoretical knowledge to real-world sustainability challenges within the students' own environment, helping to better understand the applicability of what was learned.

- The methodology has successfully integrated sustainability into university teaching, aligning with the LOSU and the 2030 Agenda, and offers a model that could be applied to other courses for similar integration.

# Future initiatives

- Implementation into an URJC teaching innovation project (granted in the 2024/25 call), to extend the activity to other degrees and give it a more multidisciplinary approach
  - Soil Science (3rd year Biology Degree)
  - Hydrogeology (4th year Experimental Sciences Degree), Hydrogeology (2nd year Water Resources Degree)
  - Soil and Water Resource Management (3rd year Environmental Sciences Degree)
  - Biodiversity and Ecosystems (3rd year Environmental Engineering)
- Frame the results within other initiatives of the Green Office
  - Maximize the contribution of students to achieving the SDGs in their campus.
  - Assess the potential of proposing the activity as a Service-Learning Project.

*Funded by the URJC 2024/2025 Educational Innovation Projects call, project code PIE24_075*

# Acknowledgements


- This project was funded by the Universidad Rey Juan Carlos 2024/2025 Educational Innovation Projects call, project code PIE24_075