

# Presentation of subject syllabuses in the field of soil erosion and torrential flood prevention on study programmes at the Department of Agriculture

**Prof. Paolo Porto**

**University Mediterranea of Reggio Calabria – Dipartimento di AGRARIA**



Reference Number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

"This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein"

Co-funded by the  
Erasmus+ Programme  
of the European Union



## The basic structure of a degree in Forest Sciences (3 + 2 system) at the University Mediterranea of Reggio Calabria (1 CFU = 1 ECTS)

The programme follows the 3 + 2 scheme of the national University System and allows participation to a PhD Course (3 more years) in different research themes.

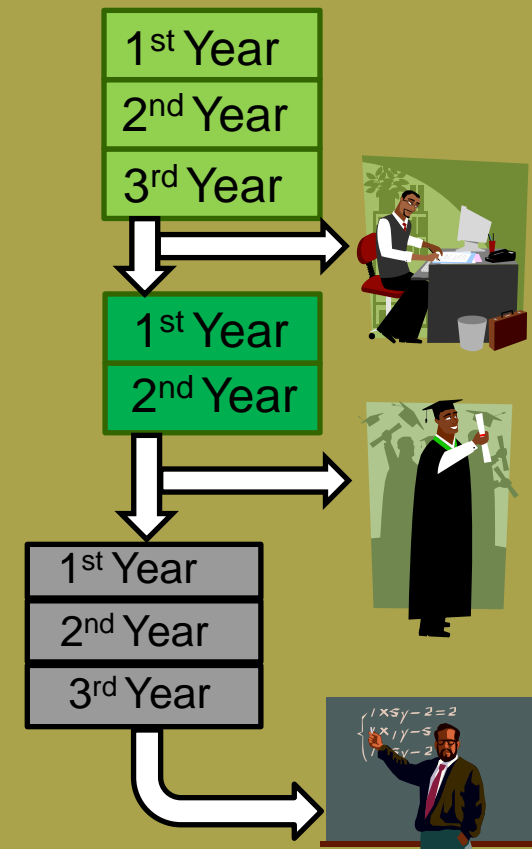
Each Degree programme provides a curriculum in which the courses are grouped into three categories:

- compulsory;
- non-compulsory within a group indicated by the Faculty;
- chosen by the student.

**Bachelor Degree**  
3 Years - 180 CFU

**Master Degree**  
2 Years - 120 CFU

**PHD**  
3 Years



# Environmental and Forest Sciences – BACHELOR DEGREE

## First year

COURSE	ECTS	SSD	SEMESTER
ELEMENTS OF MATHEMATICS	6	MAT/05	First semester
CHEMISTRY	8	CHIM/03	First semester
ENGLISH			First semester
- ENGLISH	3		First semester
- ENGLISH	3		First semester
GENETICA	6	AGR/07	Second semester
PLANT BIOLOGY	8	BIO/03	Second semester
ELEMENTI DI FISICA	6	FIS/01	Second semester
Forest Botany	6	BIO/03	Second semester

The two modules require basic knowledges on Mathematics (6 ECTS) and Physics (6 ECTS), both mandatory, given during the first year

## Second year

COURSE	ECTS	SSD	SEMESTER
FOREST ENTOMOLOGY	6	AGR/11	First semester
Mountain Agronomy and Zootechnics			First semester
- MOUNTAIN AGRONOMY	6	AGR/02	First semester
- PRINCIPI DI NUTRIZIONE ED ALIMENTAZIONE ANIMALE IN AMBIENTE MONTANO	6	AGR/18	First semester
FORESTAL ECONOMICS AND POLICY			First semester
- ELEMENTS OF FORESTAL ECONOMICS	6	AGR/01	First semester
Forest Chemistry			Second semester
- PLANT MOLECULAR PHYSIOLOGY	6	AGR/13	Second semester
- Chemistry of the Forest Floor	6	AGR/13	Second semester
Forest Plant Pathology	6	AGR/12	Second semester
FORESTAL ECONOMICS AND POLICY			Second semester
- FORESTAL ECONOMICS AND POLICY	6	AGR/01	Second semester
- FORESTAL AND ENVIROMENTAL LAW	6	IUS/03	Second semester

## Third year

COURSE	ECTS	SSD	SEMESTER
General Microbiology	6	AGR/16	First semester
Dendrometry and Principles of Forest Arrangement	6	AGR/05	First semester
FOREST ECOLOGY, SILVICULTURE AND MANAGEMENT OF PROTECTED AREAS			First semester
- FOREST ECOLOGY AND GENERAL SILVICULTURE	6	AGR/05	First semester
- MANAGEMENT OF PROTECTED AREAS	3	AGR/05	First semester
Forest Appraisal	6	AGR/01	First semester
Logging Mechanization	6	AGR/09	First semester
CAD LABORATORY	3		First semester
MATERIE A SCELTA	12		First semester
APPRENTICESHIP TRAINING AND GUIDANCE	2		First semester
STAGE AND ESTERNAL TRAINING	2		First semester
FINAL TEST	4		First semester
FORESTRY BUILDINGS AND LANDSCAPE			Second semester
- COSTRUZIONI FORESTALI E PAESAGGIO	6	AGR/10	Second semester
- LAND SURVEYING AND REPRESENTATION	6	AGR/10	Second semester
IDRAULICA, IDROLOGIA E SISTEMAZIONI IDRAULICO FORESTALI			Second semester
- IDRAULICA E IDROLOGIA FORESTALE	6	AGR/08	Second semester
- SISTEMAZIONI IDRAULICO FORESTALI	6	AGR/08	Second semester

The Teaching Modules that offer a specific programme in Torrent Control are given during the third year

# Subject syllabuses in the field of soil erosion and torrential flood prevention

These 2 modules (Hydraulics, Hydrology and Torrent Control) cover a total of 12 ECTS and aim at providing students with the acquisition of knowledge on:

- basic tools as well as theoretical and practical methods for analysis of hydrological processes;
- design of river control works and solution of the most relevant problems concerning control and mitigation of hydrogeological risks in agro-forestry areas.

## Module: IDRAULICA E IDROLOGIA FORESTALE

Professor	<u>SANTO MARCELLO ZIMBONE</u>
Objectives	Within the professional education in Environmental and Forest Sciences, the course provides a basic and specific knowledge on: - hydrostatics, hydraulics of pressured pipelines and open channels, outflow and supply from groundwater; - rainfall measurements and data processing, measure and estimation of fundamental hydrological processes, analysis of rainfall-runoff modeling and peak discharge estimation.  Acquisition of knowledge on: - basic tools as well as theoretical and practical methods for analysis of hydrological processes and design of river control works - solution of the most relevant problems concerning control and mitigation of hydrogeological risks in agro-forest areas.

## Module: SISTEMAZIONI IDRAULICO FORESTALI

Professor	<u>PAOLO PORTO</u>
Objectives	Within the professional education in Environmental and Forest Sciences, the course provides a basic and specific knowledge on: - methods for watershed and hydrographic network characterization, estimation and measurement of sediment transport, analysis of criteria for bedslope stabilization and torrent control works design (with particular reference to the equilibrium bedslope evaluation in mountain torrents); - study of grade-control structures (types of check-dams and sills) and criteria for their hydraulic and structural sizing.  Acquisition of knowledge on: - basic tools as well as theoretical and practical methods for analysis of hydrological processes and design of river control works - solution of the most relevant problems concerning control and mitigation of hydrogeological risks in agro-forest areas.



# Subject syllabuses in the field of soil erosion and torrential flood prevention

## Module: IDRAULICA E IDROLOGIA FORESTALE

Professor SANTO MARCELLO ZIMBONE

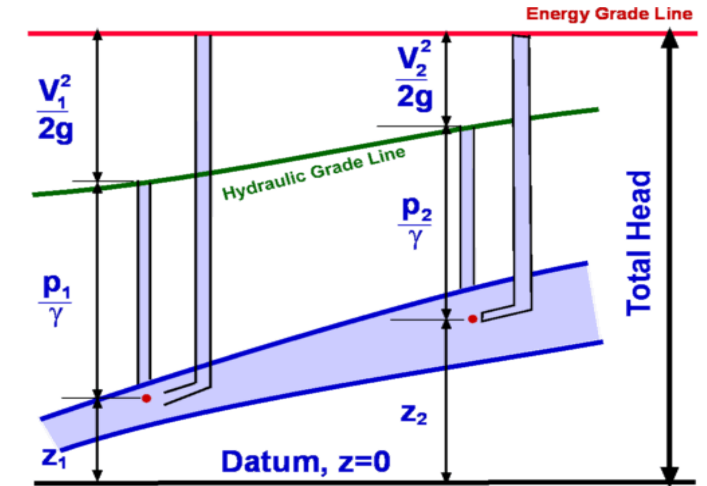
Objectives Within the professional education in Environmental and Forest Sciences, the course provides a basic and specific knowledge on:

- hydrostatics, hydraulics of pressured pipelines and open channels, outflow and supply from groundwater;
- rainfall measurements and data processing, measure and estimation of fundamental hydrological processes, analysis of rainfall-runoff modeling and peak discharge estimation.

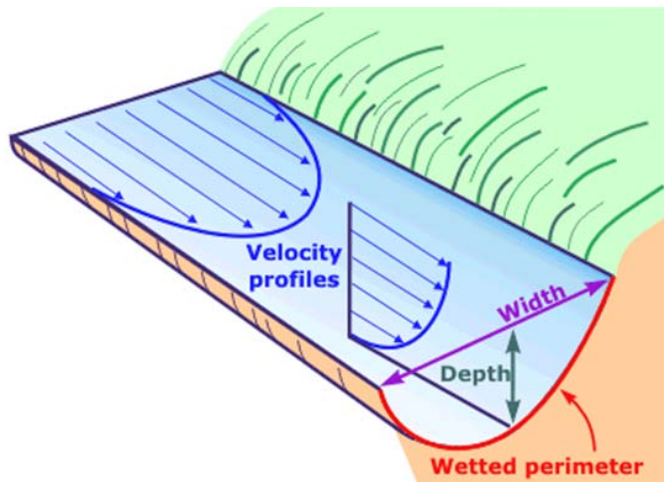
Acquisition of knowledge on:

- basic tools as well as theoretical and practical methods for analysis of hydrological processes and design of river control works
- solution of the most relevant problems concerning control and mitigation of hydrogeological risks in agro-forest areas.

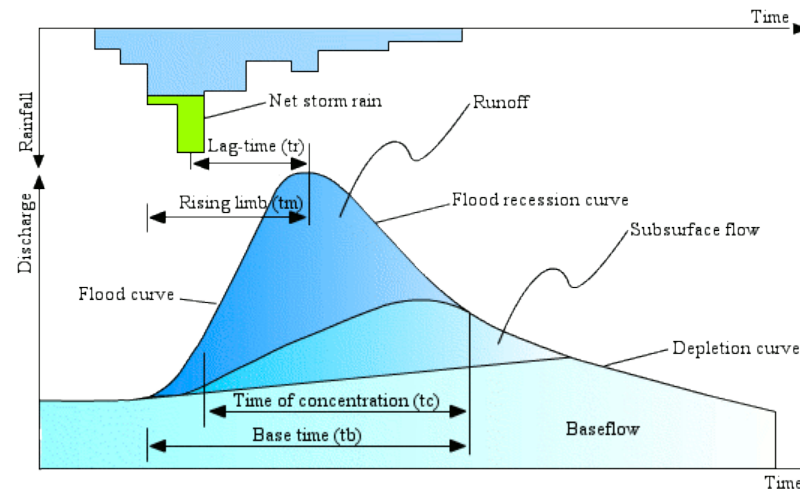
## Hydraulics of pressured pipelines



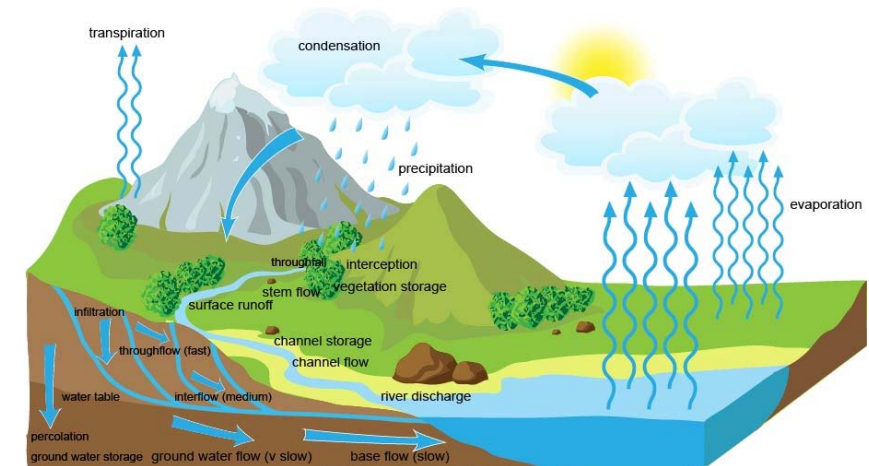
## Hydraulics of open channels



## Rainfall/Runoff modelling



## The hydrological cycle



# Subject syllabuses in the field of soil erosion and torrential flood prevention

## Module: SISTEMAZIONI IDRAULICO FORESTALI

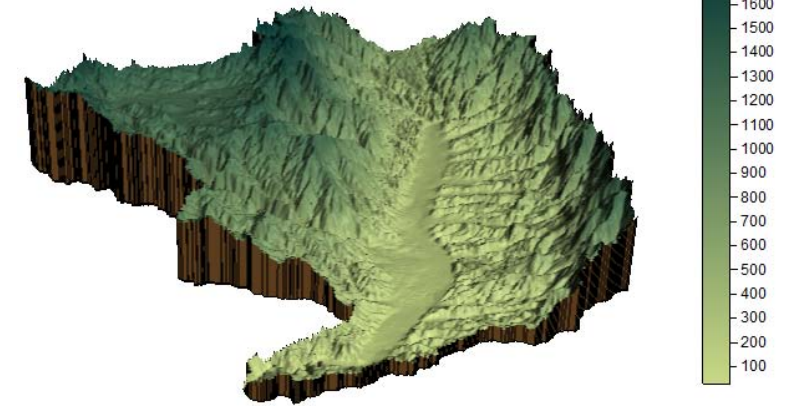
Professor PAOLO PORTO

Objectives Within the professional education in Environmental and Forest Sciences, the course provides a basic and specific knowledge on:

- methods for watershed and hydrographic network characterization, estimation and measurement of sediment transport, analysis of criteria for bedslope stabilization and torrent control works design (with particular reference to the equilibrium bedslope evaluation in mountain torrents);
- study of grade-control structures (types of check-dams and sills) and criteria for their hydraulic and structural sizing.

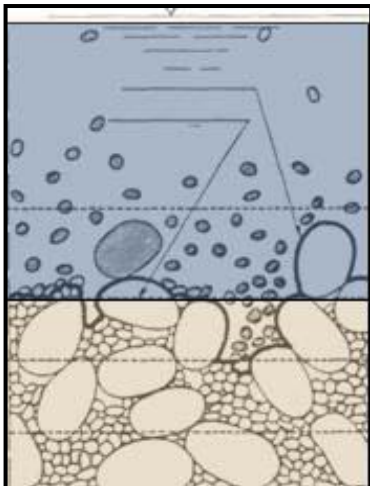
Acquisition of knowledge on:

- basic tools as well as theoretical and practical methods for analysis of hydrological processes and design of river control works
- solution of the most relevant problems concerning control and mitigation of hydrogeological risks in agro-forest areas.

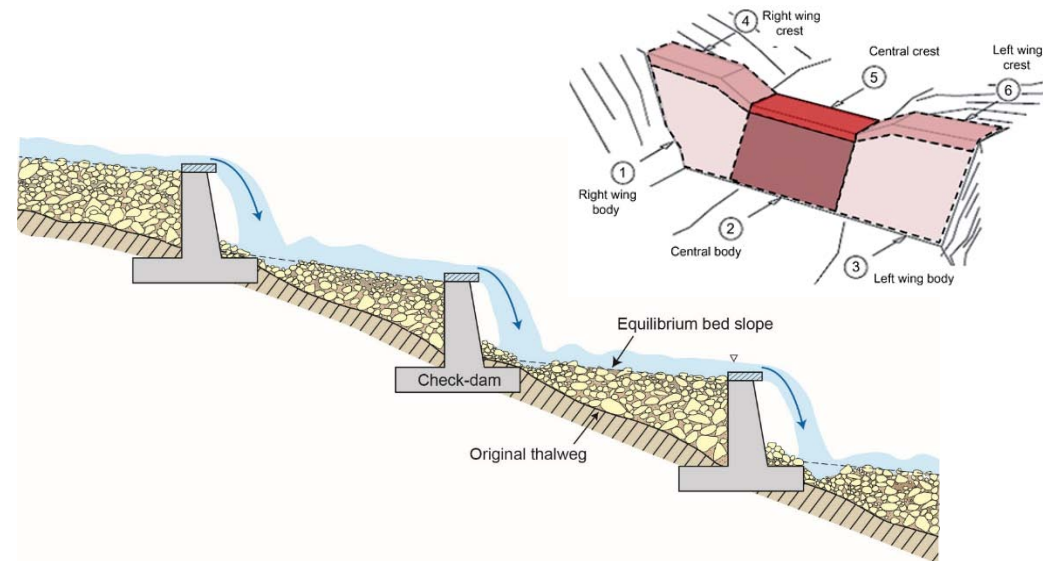


Watershed and hydrographic network characterization

## Sediment transport



## Bedslope stabilization and torrent control works design



## Check-dams design and sizing





The Teaching Modules that offer a specific programme in Soil erosion are given during the first year

### First year

COURSE	ECTS	SSD	SEMESTER
Environmental Chemistry of Urban and Forest Ecosystems	6	AGR/13	First semester
Soil Protection and Conservation and Watersheds Planning			First semester
- Watersheds Planning and Management	3	AGR/08	First semester
- Soil Protection and Conservation and Hydraulic Rehabilitation	6	AGR/08	First semester
Plant diseases and phytosanitary protection			First semester
- MALATTIE DEL VERDE E DELLE PIANTE ORNAMENTALI	6	AGR/12	First semester
FOREST GEOBOTANY	6	BIO/03	First semester
Laboratory of GIS	5		First semester
Plant diseases and phytosanitary protection			Second semester
- Integrate Protection of the Forest Systems	3	AGR/11	Second semester
SOIL ECOLOGY	6	AGR/13	Second semester
Natural and Cultivated Mountain Systems	6	AGR/02	Second semester
Management of Forest Systems and Safety in Forestry Operations			Second semester
- Silviculture and arboriculture for timber production	9	AGR/05	Second semester
- Wood Harvesting and Safety in Forestry Operations	3	AGR/09	Second semester

## Environmental and Forest Sciences – MASTER DEGREE

### Second year

COURSE	ECTS	SSD	SEMESTER
Forest Fire Protection	6	AGR/05	First semester
ECONOMICS AND ENVIRONMENT APPRAISAL	6	AGR/01	First semester
Ethology and wildlife management	6	AGR/19	First semester
Landscape planning and infrastructures in agro-forestry areas	6	AGR/10	First semester
MATERIE A SCELTA	12		First semester
APPRENTICESHIP TRAINING AND GUIDANCE	3		Second semester
STAGE AND ESTERNAL TRAINING	9		Second semester
Final project	13		Second semester

The two modules are also integrated by a GIS laboratory (5 CFU) that provides basic knowledge on storing, manipulating, analyzing, and presenting spatial or geographic data.

# Subject syllabuses in the field of soil erosion and torrential flood prevention

These 2 modules (Soil Protection and Conservation and Watershed Planning) cover a total of 9 ECTS and aim at providing students with the acquisition of knowledge on:

- basic methodologies and technologies to individuate the main agents responsible for soil erosion and to explore the effects on rural and urban areas;
- basic knowledge on different management practices with reference to law frameworks on catchment planning and river ecosystems.

## Soil Protection and Conservation and Hydraulic Rehabilitation

Professor PAOLO PORTO

Objectives Within the professional education in Environmental and Forest Sciences, the course provides a basic and specific knowledge on:  
- basic methodologies and technologies to individuate the main agents and atmospheric phenomena causing water erosion;  
- basic methodologies aimed at planning and managing watersheds using an integrated approach.

Acquisition of knowledge on:

- theoretical and practical methods for analysis of hydrological processes responsible for soil loss and hydrogeological disasters in mountain areas
- solution of the most relevant problems concerning control and mitigation of hydrogeological risks in mountain areas.

## Soil Protection and Conservation and Watersheds Planning

Professor GIUSEPPE BOMBINO

Objectives The course aims to provide the basic knowledge to analyze the different management planning practices of within a watershed area. It pays attention to the physiographic unit "watershed", to the cause-effect relationships that govern the physical phenomena taking place in it. The effects of the anthropic activities on water resources are discussed. The principles and aims of planning activity to be applied within the agri-forest area, for achieving a rational water resource management, are dealt. Therefore, in view of the law framework, the possible measures to be applied in the semi-arid Mediterranean context are also examined, in order to achieve effective river basin planning, including to the possible effects of hydraulic systems on the ecosystem .



# Subject syllabuses in the field of soil erosion and torrential flood prevention

## Soil Protection and Conservation and Hydraulic Rehabilitation

Professor PAOLO PORTO

- Objectives Within the professional education in Environmental and Forest Sciences, the course provides a basic and specific knowledge on:
- basic methodologies and technologies to individuate the main agents and atmospheric phenomena causing water erosion;
  - basic methodologies aimed at planning and managing watersheds using an integrated approach.
- Acquisition of knowledge on:
- theoretical and practical methods for analysis of hydrological processes responsible for soil loss and hydrogeological disasters in mountain areas
  - solution of the most relevant problems concerning control and mitigation of hydrogeological risks in mountain areas.



Measurements of soil erosion in plots

## Monitoring soil erosion at catchment scale

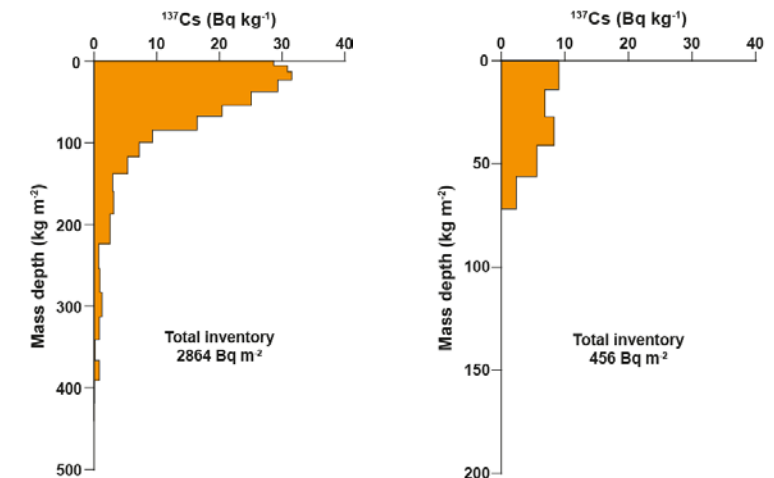


## The use of tracers to investigate soil erosion

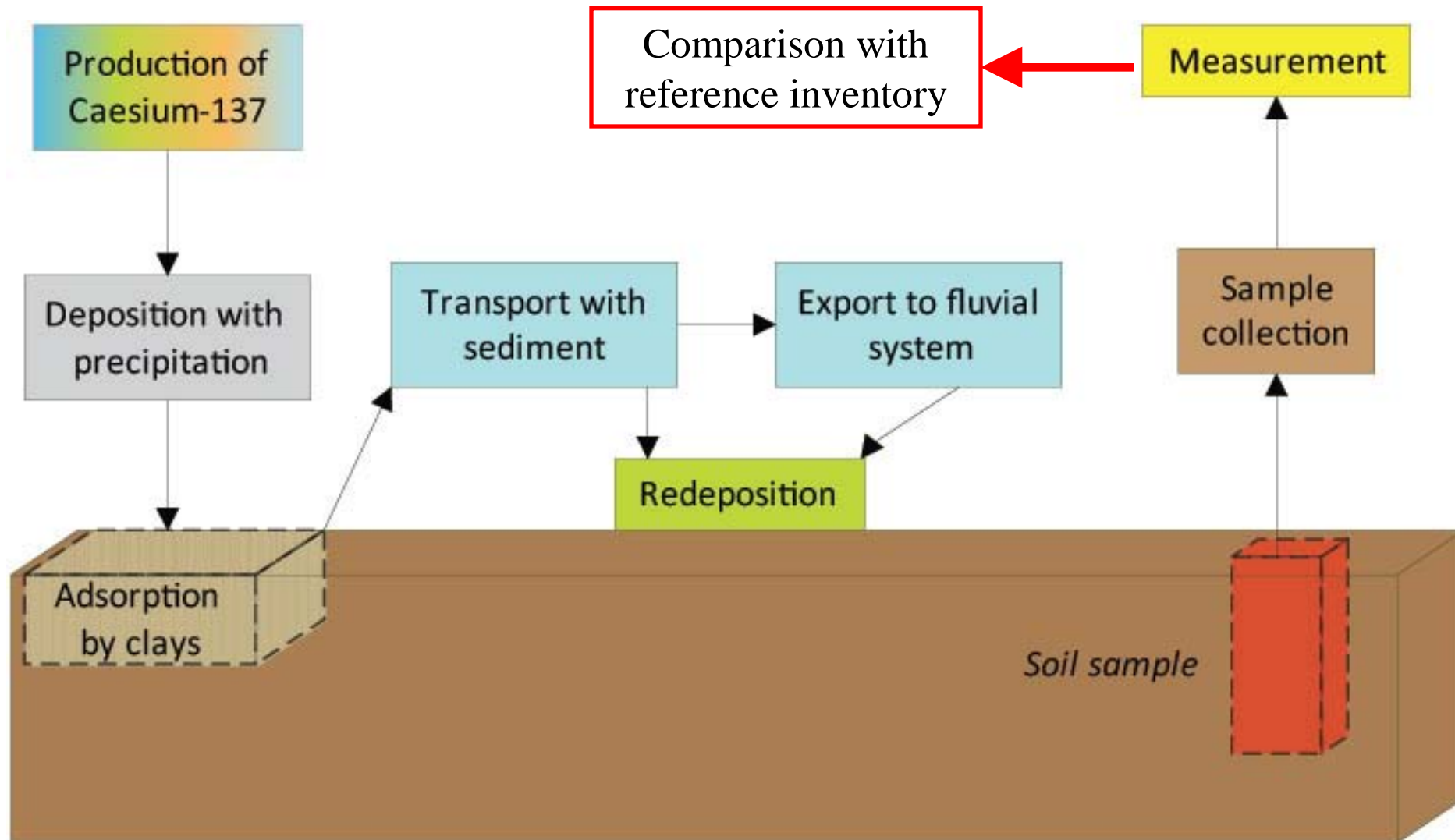
### The radiometric equipment



### <sup>137</sup>Cs Profiles in undisturbed and eroded soil



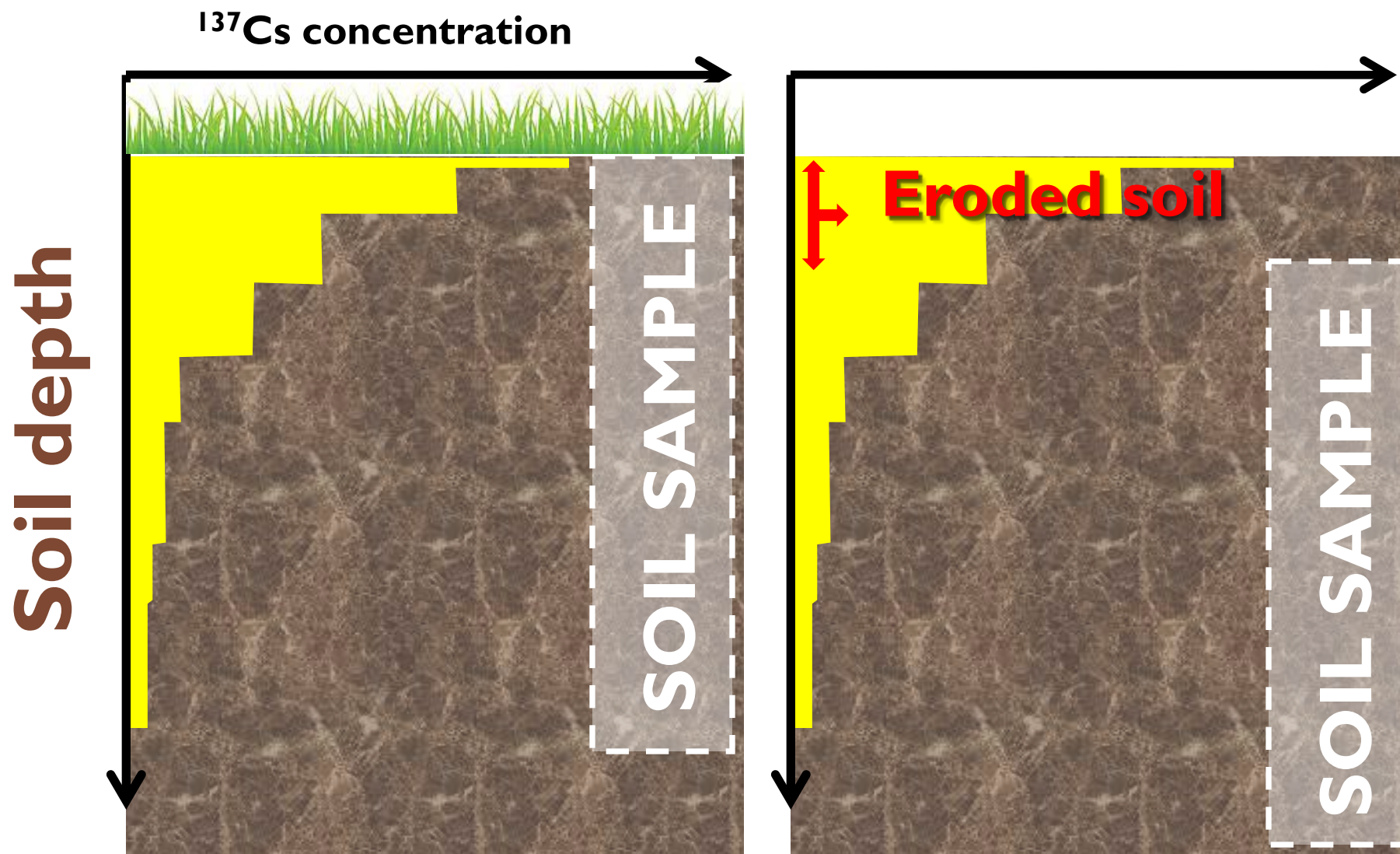
# THE CESIUM-137 TECHNIQUE



# The $^{137}\text{Cs}$ technique

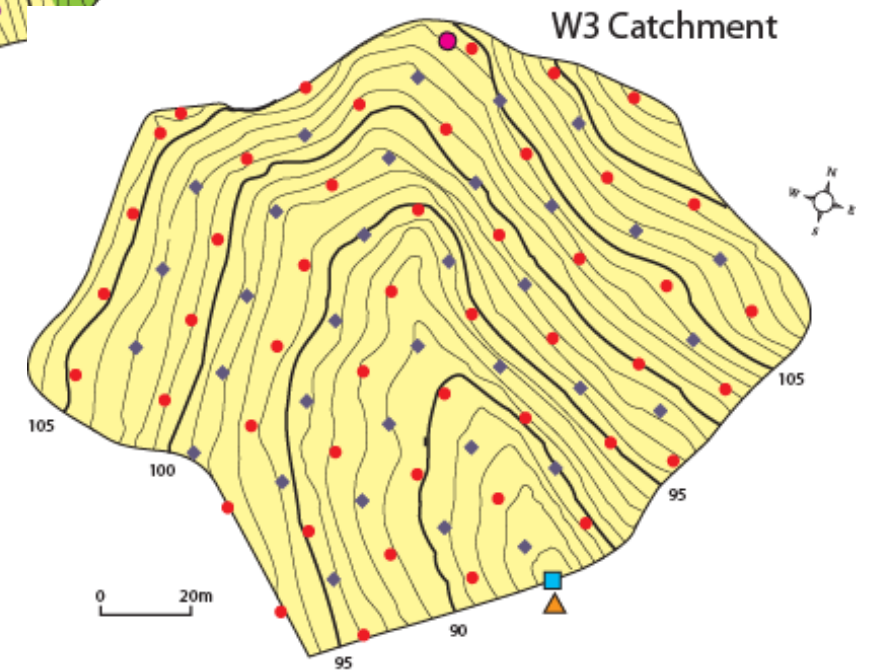
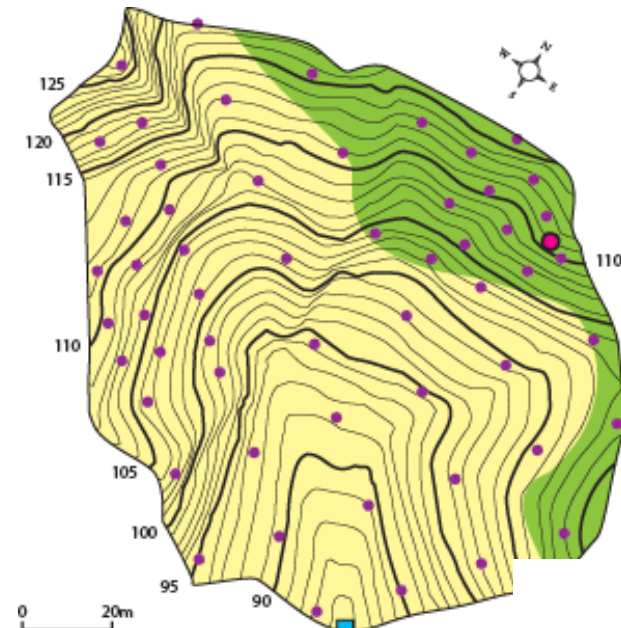
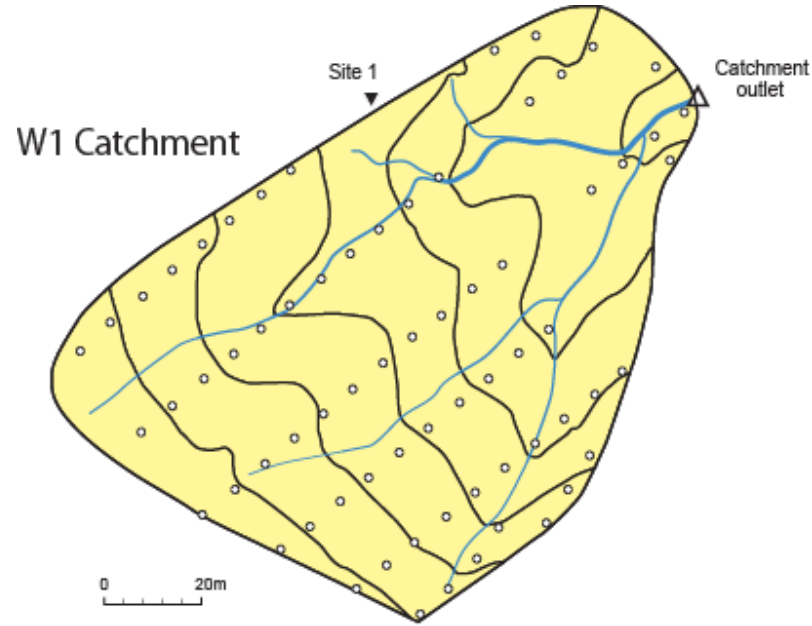
Undisturbed site

Eroded site





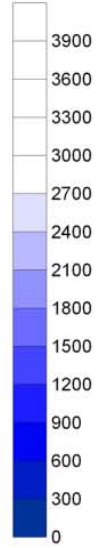
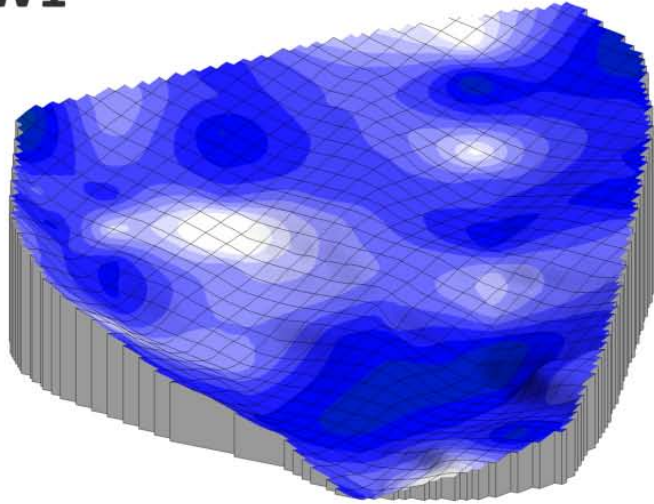
# The sampling campaigns



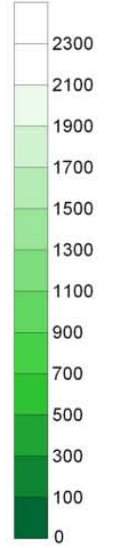
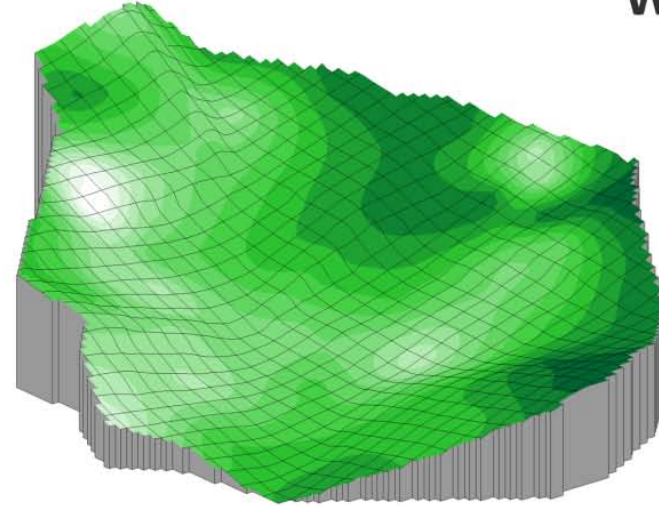
- Sampling point
- Area with discontinuous forest cover
- Rain gauge
- Stream gauge
- ▲ Coshocton wheel sampler
- 90 Contour (m)

# The inventory values for the three catchments

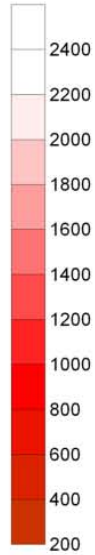
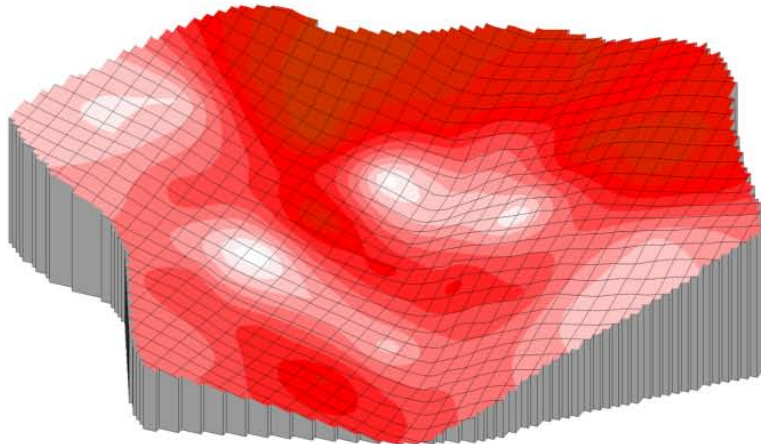
W1



W2



W3



## Environmental and Forest Sciences – BACHELOR DEGREE

### Third year

COURSE	ECTS	SSD	SEMESTER
General Microbiology	6	AGR/16	First semester
Dendrometry and Principles of Forest Arrangement	6	AGR/05	First semester
FOREST ECOLOGY, SILVICULTURE AND MANAGEMENT OF PROTECTED AREAS			First semester
- FOREST ECOLOGY AND GENERAL SILVICULTURE	6	AGR/05	First semester
- MANAGEMENT OF PROTECTED AREAS	3	AGR/05	First semester
Forest Appraisal	6	AGR/01	First semester
Logging Mechanization	6	AGR/09	First semester
CAD LABORATORY	3		First semester
MATERIE A SCELTA	12		First semester
APPRENTICESHIP TRAINING AND GUIDANCE	2		First semester
STAGE AND ESTERNAL TRAINING	2		First semester
FINAL TEST	4		First semester
FORESTRY BUILDINGS AND LANDSCAPE			Second semester
- COSTRUZIONI FORESTALI E PAESAGGIO	6	AGR/10	Second semester
- LAND SURVEYING AND REPRESENTATION	6	AGR/10	Second semester
IDRAULICA, IDROLOGIA E SISTEMAZIONI IDRAULICO FORESTALI			Second semester
- IDRAULICA E IDROLOGIA FORESTALE	6	AGR/08	Second semester
- SISTEMAZIONI IDRAULICO FORESTALI	6	AGR/08	Second semester

## Environmental and Forest Sciences – MASTER DEGREE

### Second year

COURSE	ECTS	SSD	SEMESTER
Forest Fire Protection	6	AGR/05	First semester
ECONOMICS AND ENVIRONMENT APPRAISAL	6	AGR/01	First semester
Ethology and wildlife management	6	AGR/19	First semester
Landscape planning and infrastructures in agro-forestry areas	6	AGR/10	First semester
MATERIE A SCELTA	12		First semester
APPRENTICESHIP TRAINING AND GUIDANCE	3		Second semester
STAGE AND ESTERNAL TRAINING	9		Second semester
Final project	13		Second semester

**STAGE AND EXTERNAL TRAINING**



## Stage and external training

Further information on Soil Erosion and Torrent Control is provided within the Modules of Stage and External Training as well as Apprenticeship Training and Guidance. Both these Modules are offered during the Bachelor and the Master Degrees and cover a number of ECTS ranging from 4 (Bachelor) to 12 (Master).

This is an important issue that needs to be considered if the aim is to develop a Master Curriculum in Soil Erosion and Torrent Control.

The aim of these modules is to provide students with internships and placements in companies, public or private bodies, and/or professional associations, and **further training activities in the field.**





## Training activities in the field



Reference Number: 598403-EPP-1-2018-1-RS-EPPKA2-CBHE-JP

"This project has been funded with support from the European Commission. This publication reflects the views only of the author, and the Commission cannot be held responsible for any use which may be made of the information contained therein"

Co-funded by the  
Erasmus+ Programme  
of the European Union

