Mountainous forest watershed management Governance in Greece

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Ministry of Environment, Energy and Climate Change

Alcala de Henares, 28-29 January 2014

Central Forest Service

- ✓ Ministry of Environment, Energy & Climate Change
- ✓ Special Secretariat for Forests
- ✓ General Directorate of Development & Forest Protection & Natural Environment
- ✓ Directorate of Reforestation & Mountainous Watershed Management

Responsible for:

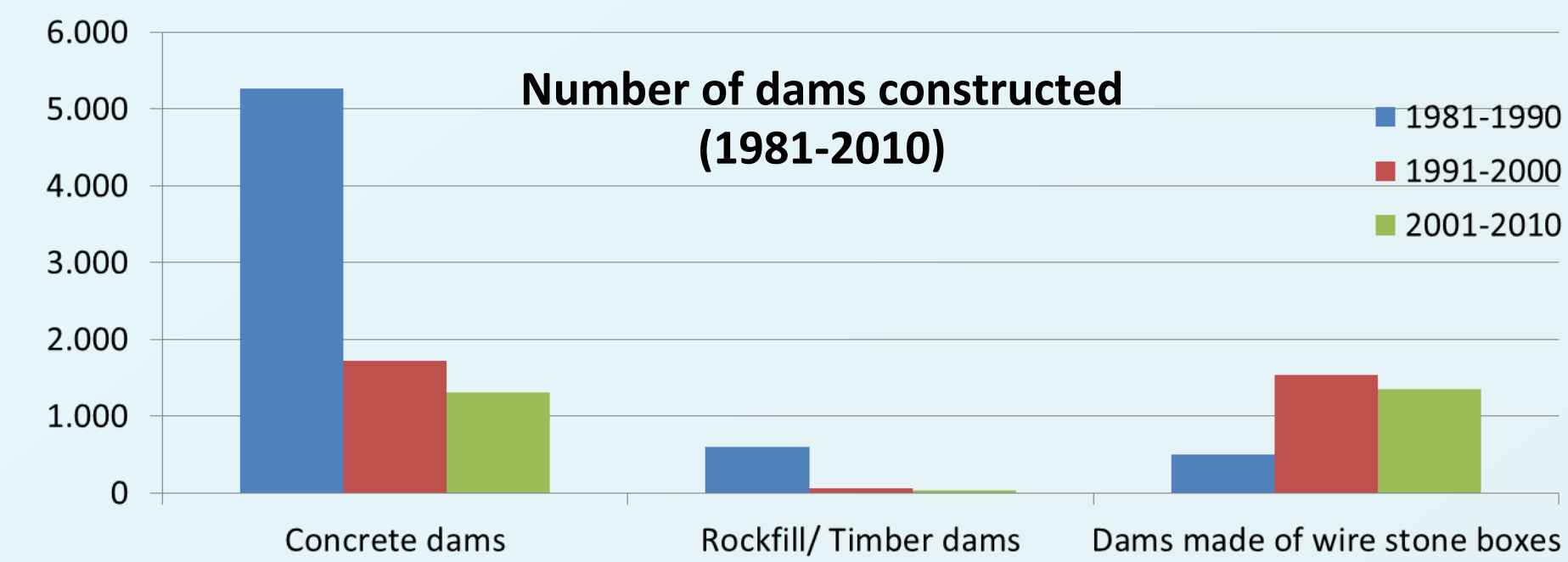
- ✓ The development and implementation of all Laws, Directivas and Programs (protection, coordination)
- ✓ Planning watershed management
- ✓ EU programs, regulations

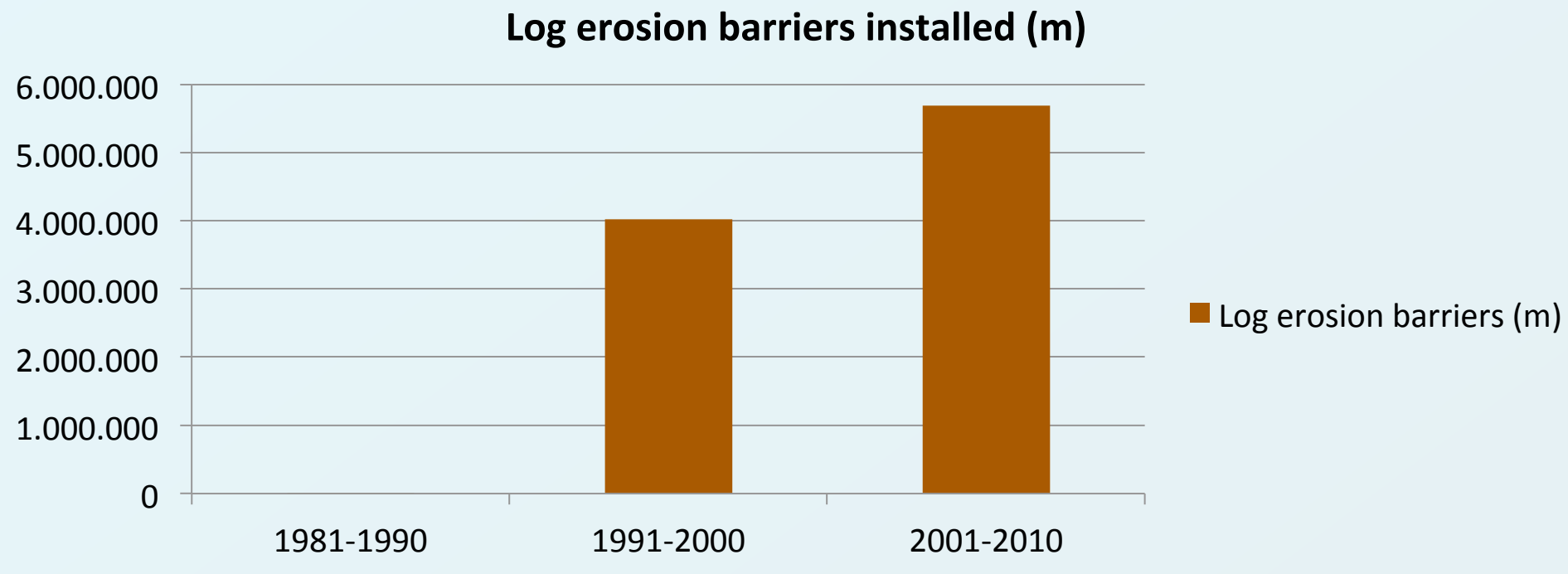
Regional Forest Service

- ✓ Ministry of Interior
- ✓ Regional administration
- ✓ General Secretary for Forests and Agriculture
- ✓ Forest Service-Section of Forests implementation projects

Responsible for:

- ✓ Checking dams, parallel walls etc.
- ✓ Plantings on high risk areas (steep slopes, unstable soils, values at risk)
- ✓ Reforestation


Number of dams constructed
(1981-2010)
6.000
5.000
4.000
3.000
2.000
1.000
0
1981-1990
1991-2000
2001-2010
Concrete dams
Rockfill/ Timber dams
Dams made of wire stone boxes


Log erosion barriers installed (m)
6.000.000
5.000.000
4.000.000
3.000.000
2.000.000
1.000.000
0
1981-1990
1991-2000
2001-2010
Log erosion barriers (m)

Thank you

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1st NWRM Mediterranean Workshop

Alcala de Henares, Madrid, Spain,

2014 January 28-29

Post - fire water retention management: The case study of Ancient Olympia, Greece

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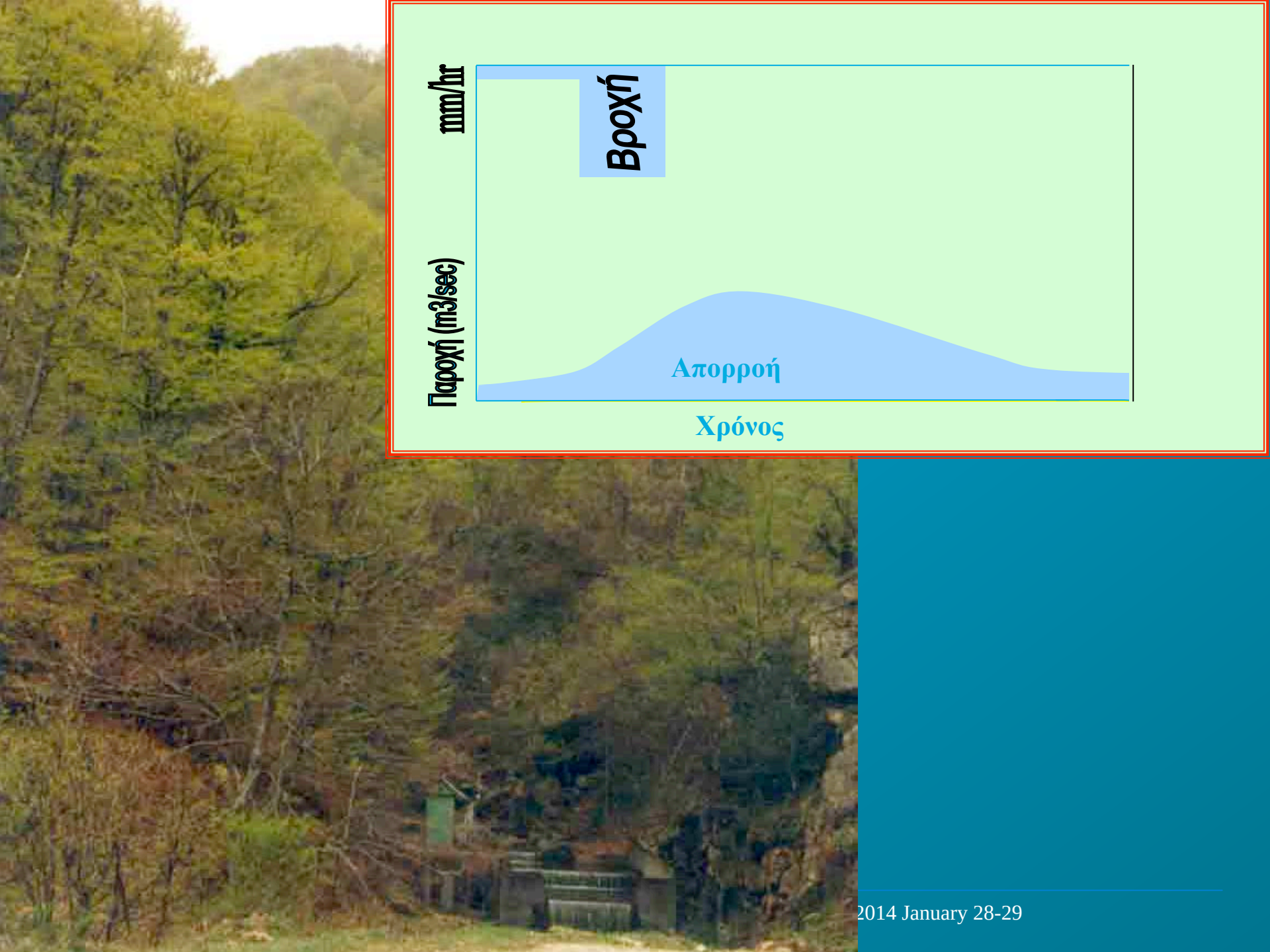
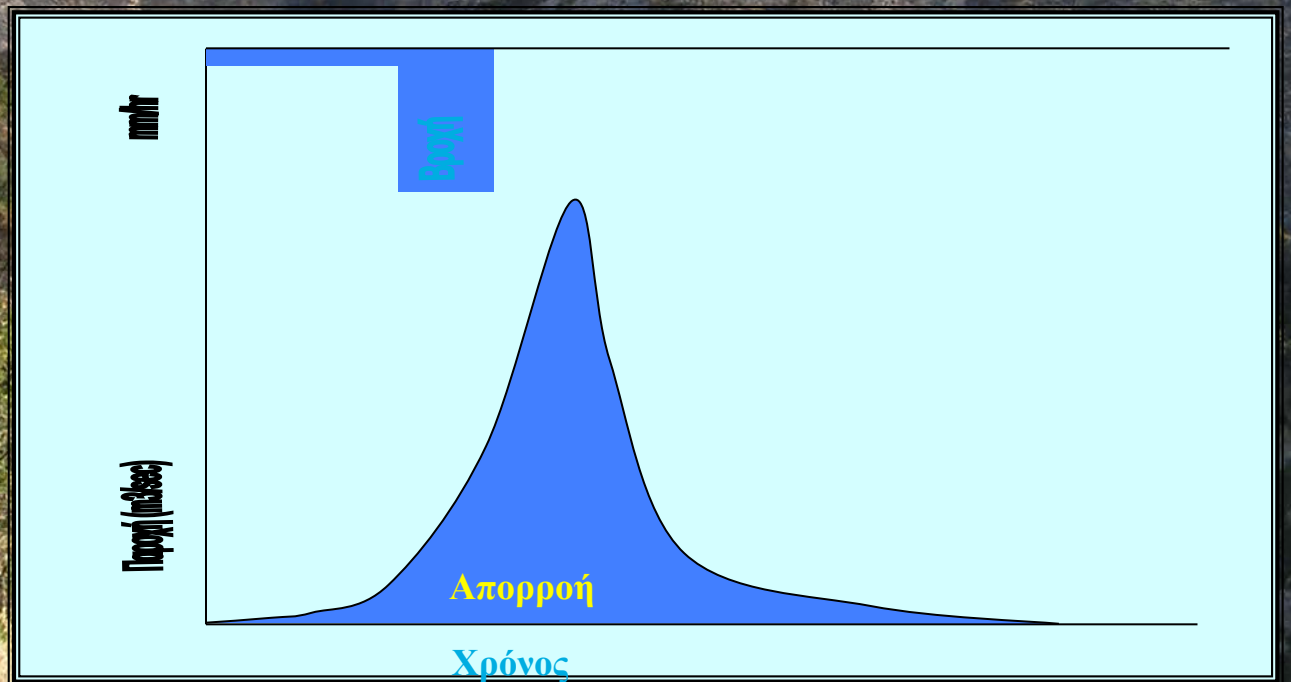

mm/hr
Βροχή
Παροχή (m3/sec)
Απορροή
Χρόνος


22 August, 2007

A wildfire has many negative effects:

- Environmental,
- Ecological,
- Economic,
- Social,
- Cultural,
- Aesthetic etc.


mm/hr
Βροχή
Παροχή (m3/sec)
Απορροή
Χρόνος

What really happens?

- ✓ Overland flow (surface runoff) increases
- ✓ The soil is eroding severely
- ✓ Decrease of the soil infiltration capacity (more rain reaches the surface of the ground due to lack of vegetation, hydrophobic layer is usually developed in the soil, the porosity of the soil usually decreases, organic material is burnt completely etc.)
- ✓ Occurrence of soil erosion and overland flow contribute to severe flooding problems.

Olympia's rebirth

✓Greece's ancient Olympia is one of the best-known archaeological sites in the world. Given this historic and cultural relevance, the disaster caused by a raging wildfire in Olympia on Aug. 26th, 2007, created a sensation not only in Greece but around the world.

✓*The main and primary objective was to restore the archaeological site* and to ensure that Olympia recovers its natural beauty known as "Olympic landscape"

✓More precisely, the aim of Olympia's landscape restoration characterized as *"national goal"* - because of the strict timetable imposed by the very specific date (March, 24th, 2008) for the ceremony of the Olympic Flame for the Beijing Olympic Games of 2008 - was the embellishment of the place with immediate measures and interventions for the protection of the soil and its restoration of the vegetation through plant establishment.

The measures for the post-fire restoration (60 ha)

- ✓Soil erosion and flood mitigation measures
- ✓Gully and small stream channel check dams
- ✓Control of the post-fire natural regeneration
- ✓Re-vegetation establishment by hydro-seeding
- ✓Plant establishment of specific species to achieve the ancient plant composition
- ✓Special plantations in the areas outside the archaeological museum and in the Pierre's de Coubertin monument

The water retention undertaken measures

(indirect relation)

- ✓ Log erosion barriers (115 km)
- ✓ Gully and small stream channel check dams (26)
- ✓ Hydroseeding technique was applied (21 ha)
- ✓ Where the slopes were particularly steep, a kind of geotextile, the jute, was used in order to cover the soil before the application of hydroseeding (4 ha)

The aims were:

- ✓To shorten the length of the slopes
- ✓To increase the surface roughness
- ✓To increase the infiltration rates of the soil
- ✓To trap surface runoff and sediment
- ✓To improve the growing conditions for the retaining seeds (behind the log barriers)
- ✓To increase the surface and soil humidity
- ✓To provide favourable micro-environment for the seeds because of humidity retention and shading
- ✓To improve the hydraulic properties of the soil
- ✓To achieve direct aesthetic result

Log erosion barriers

✓The log erosion barriers were constructed from the cutting trunks of burned Aleppo pine (*Pinus halepensis*) and cypress (*Cupressus sempervirens*) trees.

✓They were fixed parallel to the contours of the slopes of the hills.

✓They were secured on wooden stakes without any metal supports.

✓Their distances were determined according to log characteristics and also to topographic and hydro-meteorological conditions of each site they secured.

✓The log barriers formed continuous or empty-space lines for better fulfillment of aesthetic requirements of the area.

✓They also placed in a “mosaic design” consisting from single or double in height logs (one over the other) according to the gradient of the slopes.

Continuous lines

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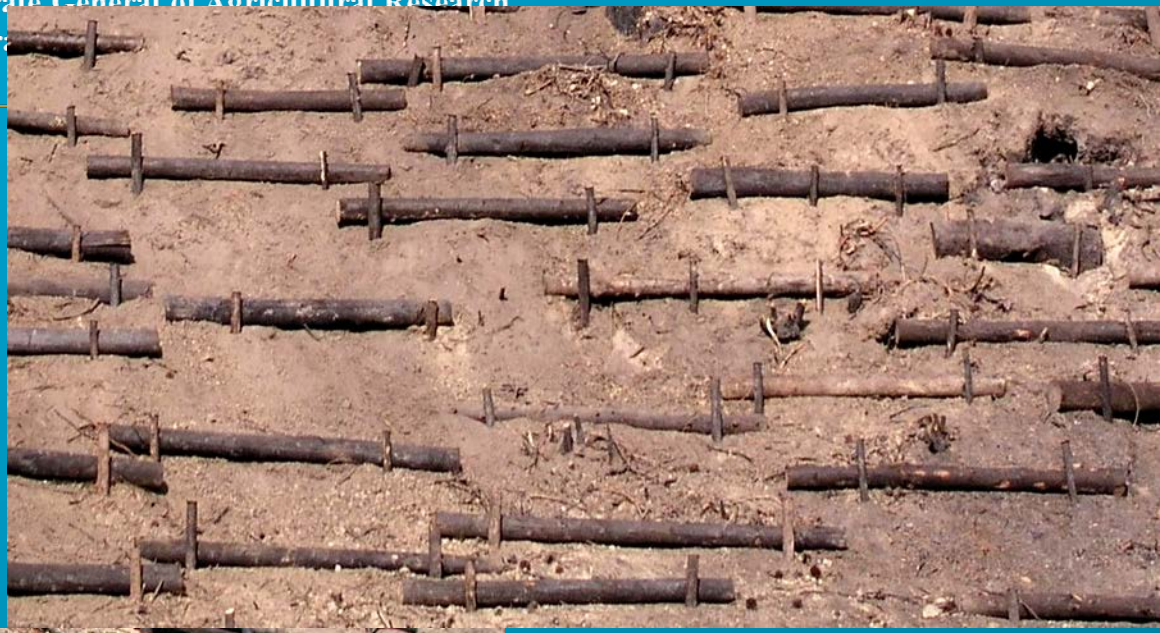
Empty-space lines

"Mosaic design"



Gully and small stream channel check dams

- ✓ Wood-made check dams were selected for the same reasons concerning the log barriers.
- ✓ They were built perpendicularly to the main channel of the stream or the gully.
- ✓ The construction cross-sections of these works were selected according to their morphological and hydro-geological characteristics.
- ✓ Twenty-six check-dams were constructed, mainly on the south slope of Kronios hill facing the ancient Stadium, where there had been a landslide after a fire in the year 1932. The check dams prevent any new massive soil movement that would cover the Stadium.

Hydro-seeding technique

Hydro-seeding technique was not applied to the total burned area but only to 21 ha and mostly on the steep slopes with the following mixture:

Water	20 m^3/Ha
Fertiliser N:P:K 6:48:6	400 Kg/Ha
Glue	10-170 Kg/Ha
Fibre wood	1800 Kg/Ha
Organic soil improver	400 kg/Ha
Seeds	200 Kg/Ha

The mixture of the used plant taxa seeds was:

Lolium rigidum 15%

Phacelia tanacetifolia 15%

Sanguisorba minor 20%

Onobrychis sativa 18%

Medicago lupulina 18%

Plantago lanceolata 7%

Achillea millefolium 7%

Annual and perennial seeds of selected herbaceous plants

Hydro-seeding with the particular technology of the machinery used and with the help of hosepipe reached the 120 meters in length and at 90 meters elevation difference.

Application of the jute geotextile (very steep slopes)

- ✓ The jute was used in order to cover the soil before the application of hydro-seeding.
- ✓ In some cases the jute was applied even between log erosion barriers.
- ✓ The jute that was used is manufactured 100% from plant materials and it was biodegradable in 4 years time.
- ✓ Its role is double: it retains and protects the surface of the soil and provides favorable micro-environment for the plants because of humidity retention and shading.
- ✓ Jute was fixed with small metal forks for better contact with the soil.

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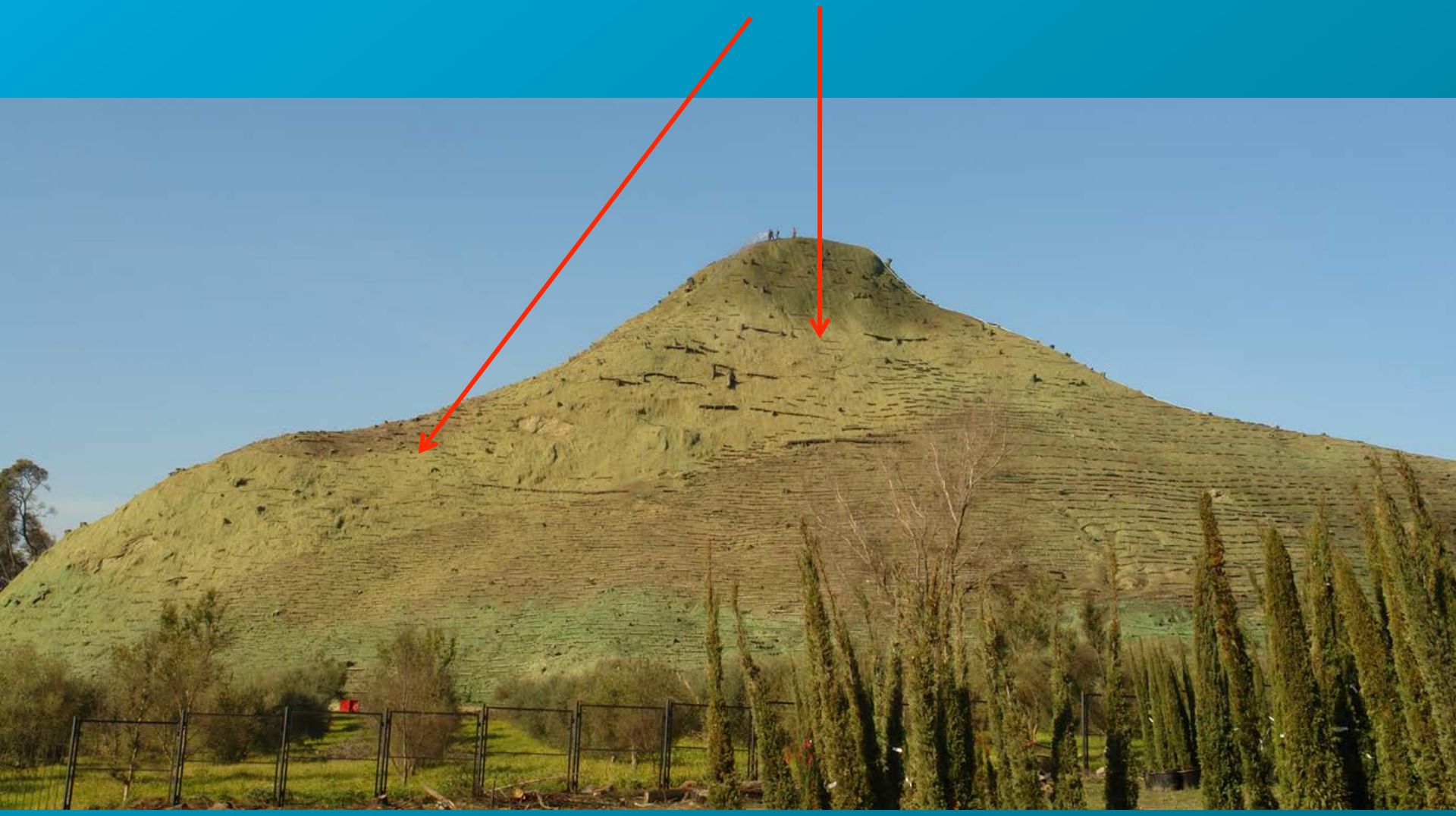
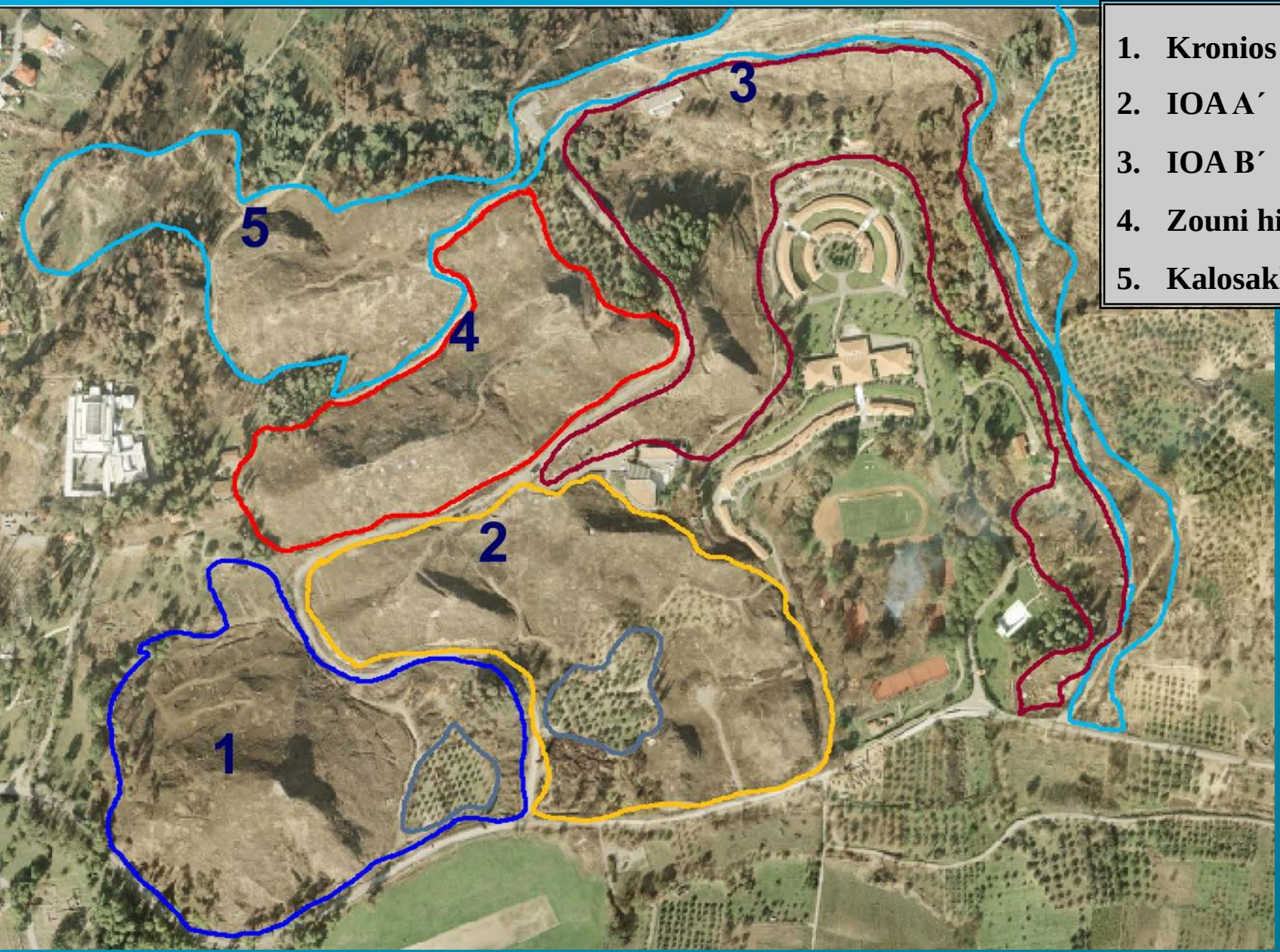
Application of the jute geotextile in Kronios hill



The results of the effort (1)

- ✓ The effectiveness of the applied treatments was rated qualitatively during a site survey.
- ✓ The rating for the log erosion barriers was “excellent” or “good” in 70% of the measurements
- ✓ The rating for hydro-seeding was 60% “excellent”
- ✓ The jute matting technique, which had been applied on particularly steep slopes, the rating was 60% “good” or “fair.”
- ✓ According to the measurements, none of the treatments was considered “poor.”

The results of the effort (2)



1. **Kronios hill**
2. **IOA A΄**
3. **IOA B΄**
4. **Zouni hill**
5. **Kalosakka hill**

General view of the area a day after the fire occurred (August 2007)

General view of the area after the completion of the works (January 2008)

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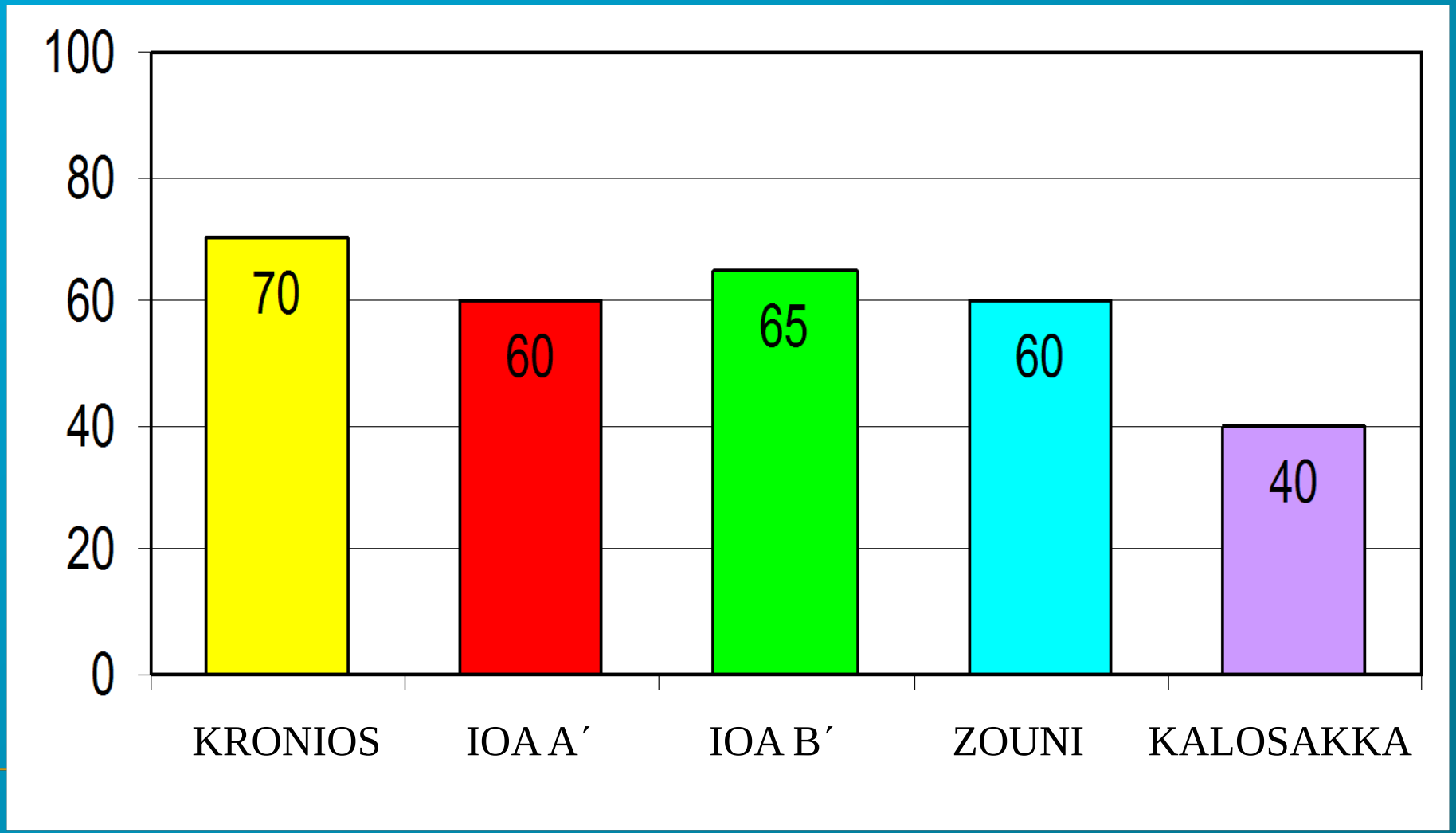
Percent (%) of the soil retained



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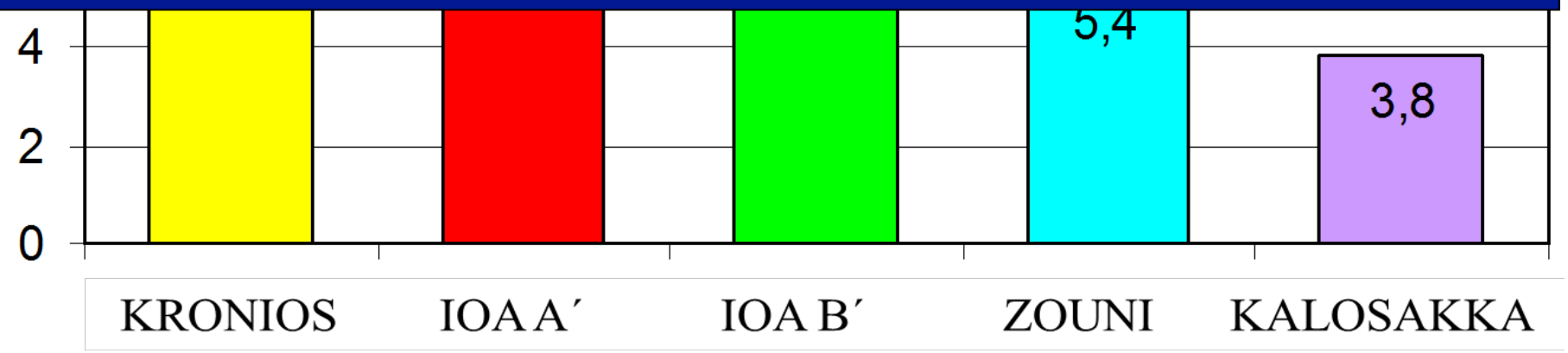
Retention of soil material in mm

The total estimated soil material was

2.500 m³ / 30 ha

or retention of a total 7.5 mm of fertile soil



Post-fire natural regeneration

After the onset of the first postfire rainy season (November 2007), the Aleppo pine postfire regeneration was very satisfactory and the mean pine seedling density reached up to 11.55 ± 0.77 seedlings / m^2

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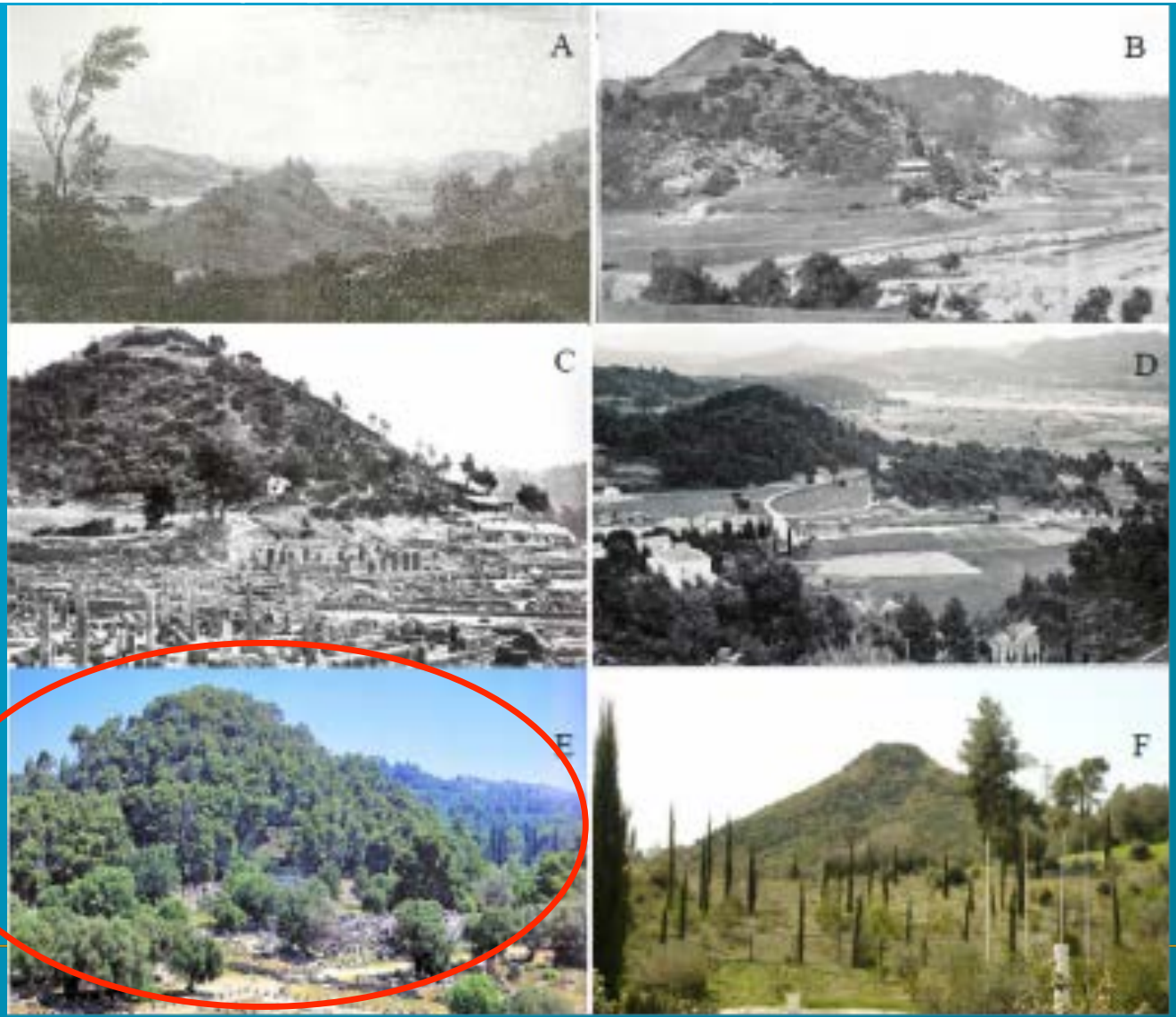
The evolution of Olympic landscape through the last two hundred years



Archaeological museum


September 2010

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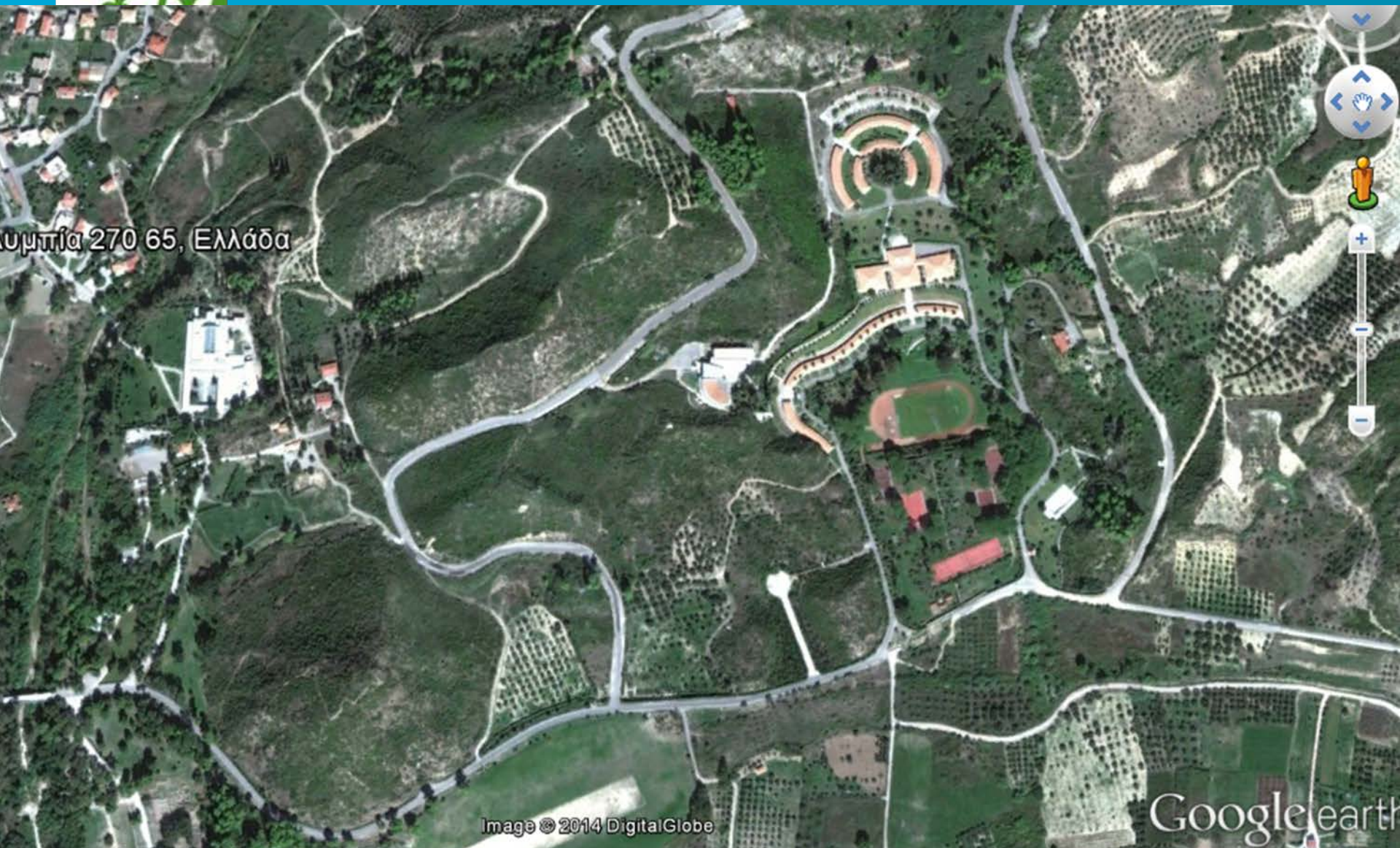

A notice for our work

We might have an “open” field for forest management future research after a wildfire. And that will be definitely connected with the water cycle or with the preventively taken water retention measures

Thank you very much for your attention