



Transilvania University of Brasov  
Faculty of Silviculture and Forest Engineering

## *Experience in torrents management in Romania*

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### Torrential watershed management as Forest Engineering Activity

Torrential watershed management activity is a  
subject of interest in practice

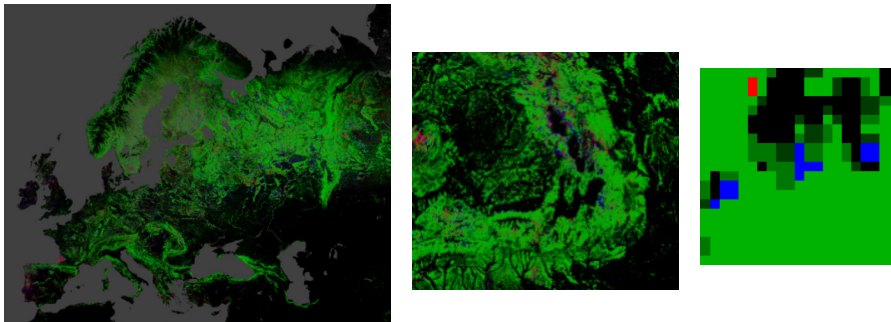
- by **immediate influence** which it has to the  
interaction between society  
and water due to
- natural hazards**, and
- by **long lasting  
protection** of riparian  
area.



Varna, Bulgaria – 21<sup>st</sup> of June 2014

## Torrential watershed management as Forest Engineering Activity

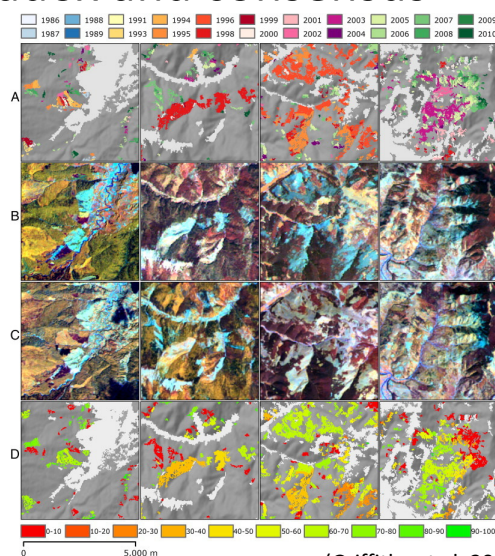
Dealing with small, predominantly forested,  
watersheds (headwaters)



## Protection of nature and society between paradox and consensus

### 1. Improper land use

In developing countries, rapidly-increasing populations usually migrate upland to occupy forests or rangeland. Most migrants cut trees, burn litter and grasses, and cultivate hillsides without using conservation measures. After a few years, the productivity of the soil is lost because of sheet, rill and gully erosion, and the land is abandoned. This kind of cultivation, (slash and burn or shifting cultivation) is repeated by farmers on other hillsides until the land loses its productivity there as well. Thus, the whole of an area may be completely destroyed by gully erosion as the gully heads advance to the upper ends of the watershed.

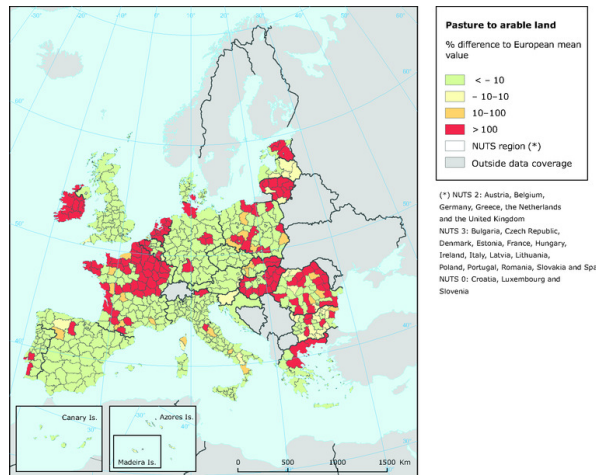


(Griffiths et al, 2012)

## Protection of nature and society between paradox and consensus

### 2. Overgrazing or transforming pastures to arable land

Overgrazing removes too much of the soil's protective vegetal cover and trampling compacts the soil; thus the infiltration capacity of the land is reduced. The increased run-off, caused by the insufficient water holding capacity of the soil, produces new gullies or enlarges old ones.



## Protection of nature and society between paradox and consensus

### 3. Mining

Underground (block cave) mining is another factor that can cause gullying. Initially, cracks in the ground and soil creep (a kind of gravity erosion) are observed in the mining areas. Then, during rainy seasons, gullies are formed. Gullying in open-pit mining areas is also a big problem in many countries.

### 4. Road construction

If road cuts and fill slopes are not revegetated during or immediately following road construction, gullies may form on both sides of the road. Inadequate drainage systems for roads (small number of culverts, insufficient capacity of road ditches, etc.) are a major cause of gullying. Widening operations along roadsides do not often follow road construction but, where widening is practiced, the operation usually causes landslide erosion and then gullying during the first rainy season.

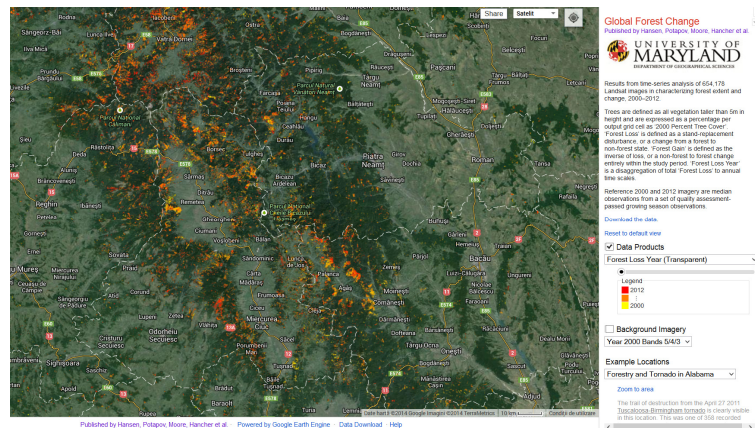
### 5. Livestock and vehicle trails

Gullies are also formed on livestock and vehicle trails that run along hillsides. This is because the traffic on them compacts the soil and reduces the water holding capacity.

# Protection of nature and society between paradox and consensus

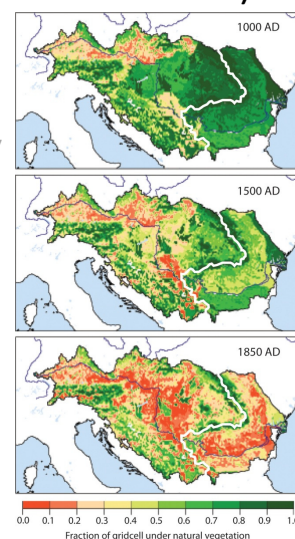
## 6. Destructive logging

In forest regions, logging with tractors down slopes can lead to gully erosion, because the run-off becomes concentrated along the skid trails. Highland logging with slack cables also causes gully erosion on forest land.



## Early Anthropogenic Transformation of the Danube-Black Sea System – (Giosan et al 2012)

*“Over the last century humans have altered the export of fluvial materials leading to significant changes in morphology, chemistry, and biology of the coastal ocean. Here we present sedimentary, paleoenvironmental and paleogenetic evidence to show that the Black Sea, a nearly enclosed marine basin, was affected by land use long before the changes of the Industrial Era. Although watershed hydroclimate was spatially and temporally variable over the last ~3000 years, surface salinity dropped systematically in the Black Sea. Sediment loads delivered by Danube River, the main tributary of the Black Sea, significantly increased as land use intensified in the last two millennia, which led to a rapid expansion of its delta. Lastly, proliferation of diatoms and dinoflagellates over the last five to six centuries, when intensive deforestation occurred in Eastern Europe, points to an anthropogenic pulse of river-borne nutrients that radically transformed the food web structure in the Black Sea.”*





## The first dissertation in torrent control 1887 – “Revista Padurilor” Review

Identify the causes of floods in Prahova Upper Watershed

*Causele și remedii inunecurilor și depunerilor din Basinul Prahovei.*

titlul: *Cercetarea cauzelor și remediului inunecurilor și depunerilor din Basinul superior al Prahovei* (!), a apărut zilele trecute o importantă lucrare din pana unuia din silvicultorii noștri cei mai cunoscuți. Mi propun a face o dare de seamă, foarte succintă de conținutul acestui volum în octavo, de 245 pagini, cu charta Basinului Prahovei și 22 figuri în text.

To map the area where damage was done

Acosta a doua parte a volumului cuprinde două capitole intitulate: a). *Limitele unde se produc stricăciuni* și b). *Afluenții râului Prahova.*

P.S. Antonescu-Remuș, 1887

## The first dissertation in torrent control “Bogdan Valley” Example

Domnul Antonescu-Remuș studiază apoi cu minuțiozitate următoarele afluențe de pe coasta stângă a Prahovei: afluențele Azuga, valea Rea, valea Cănelui, valea Gagului, afluențele Bogdana, valea Mărului sau Vârtejului, valea Fruntea lui Vasile sau valea Șipote, afluențele Crățiele, afluențele Conciu, Năparul, valea Florinului, afluențele Cernica și în fine afluențele Bătrăioara.



Map of Romania 1864



Satellite image 2013

## Perception of foresters in 1900



It will be a wrong perspective just to construct dams without solving the real problem – bad management of lands, in this case deforestations

Alt fel procedînd, prin înființări de diguri avînd de scop rectificarea și strîmtoarea albiei acelor cursuri de apă, în cari continuă a se depune materiile tirite de pîraele torențiale, afluenți ai lor, — după cum s'a propus și la noi de cîțiva ingineri, — pericolul inundațiunilor devine și mai iminent și așa fiind, ar fi cea mai mare greșeală de a întreprinde atari lucrări hydrotehnice, pînă ce nu am isbutit să vindecăm răul încă de la origina lui.

Am arătat mai sus că, una din cauzele principale ale formațiunii torenților, la noi, este despăduririle practicate fără spirit de discernămint.

## Torrential watershed management

The Torrential Watershed Management consist in applying in the watershed area, a series of measures, **biological works**, agro-forestry measures and **hydrotechnical structures** with the primary purpose of **soil and water control**

Munteanu 1975



## Torrent control works

- **Biological works** (afforestation on banks and siltations, grassing etc.), Which has the capacity to be self-generated and give outdoor productions act as **living works** – they become permanent to the system
- **Biotechnical structures** (wood dams, masonry sills dried vegetative mat, etc.) who have a limited ability to enter the vegetation, but **blending vegetation in their structure**, they will become biotechnical structures
- **Hydrotechnical structures**, which are designed as monolithic or prefabricated construction that integrates the structure, materials with **a high resistance to shock, vibration and erosion**.

## Biological and biotechnical structures



a) Vegetative dams



b) – Wooden dams



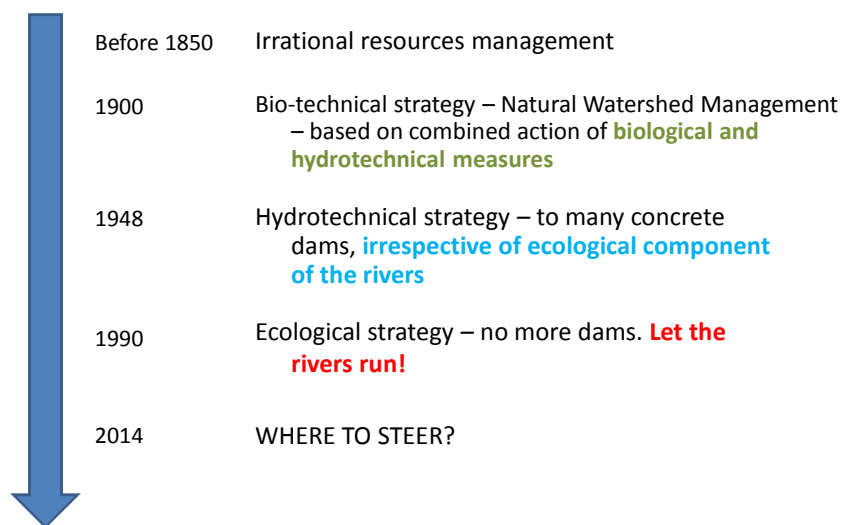
c) – afforestation on banks and siltations

## Hydrotechnical structures

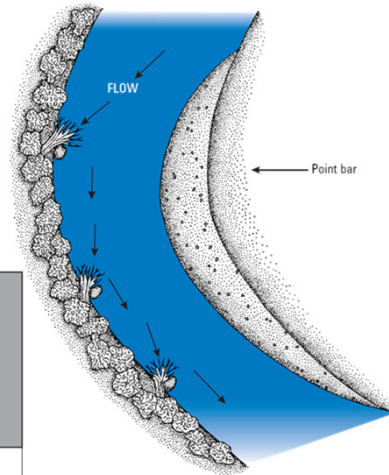
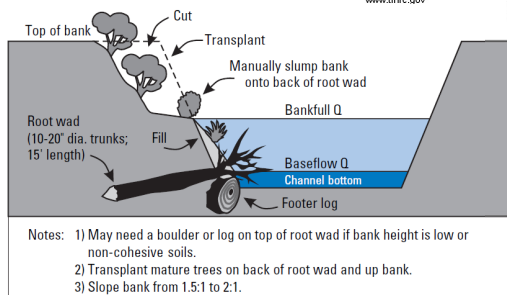


The most common dams in torrent control activity

## Concept evolutions

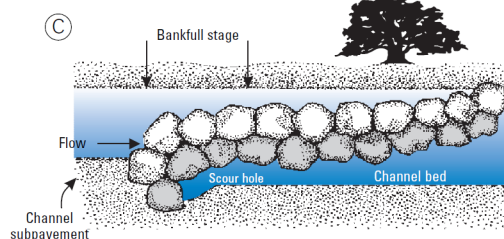
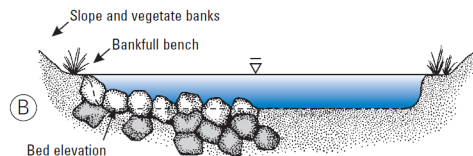
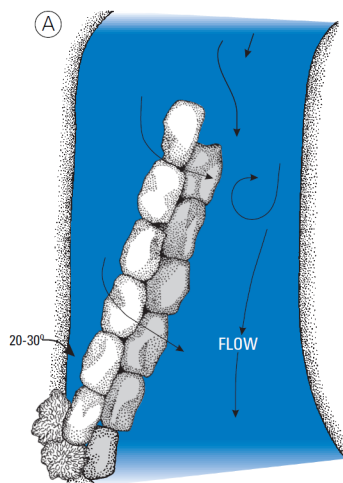


## Old and new concepts



## Old and new concepts

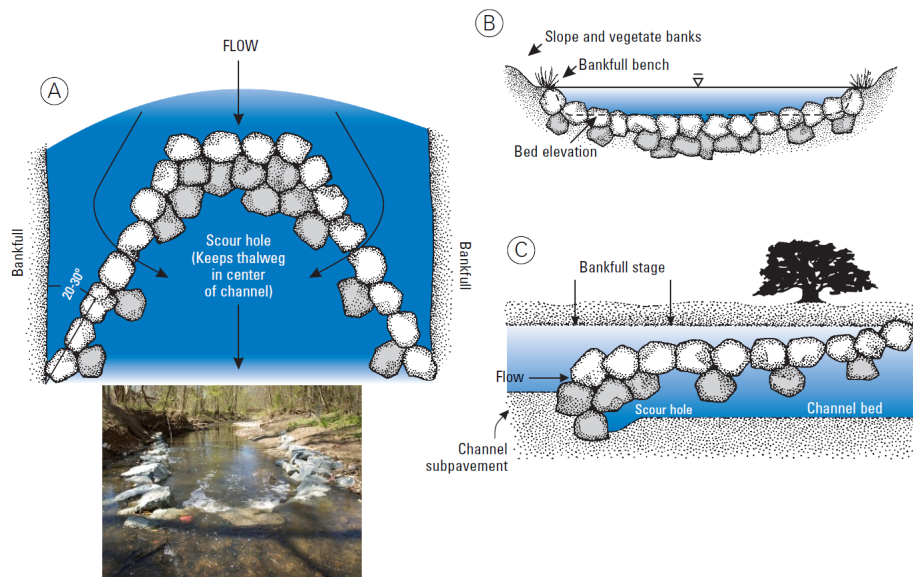
Structure spans 1/2 to 2/3 of stream width.



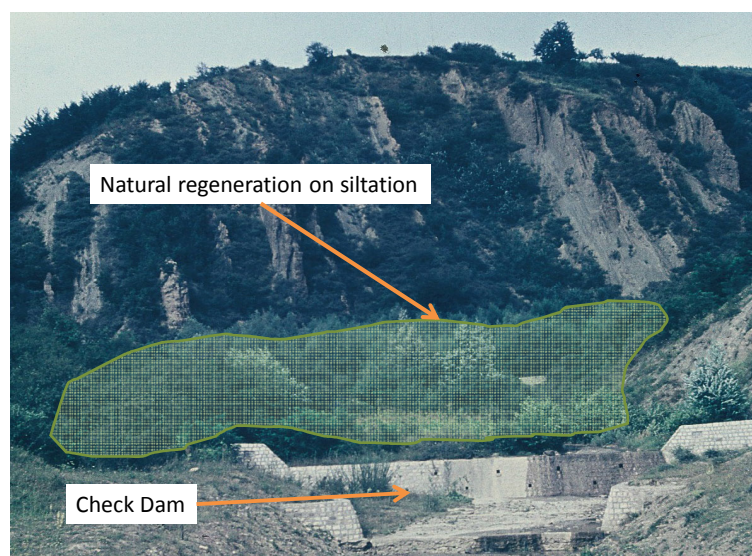
Notes: Rocks in vane are not spaced.  
Can use to divert flow to center of channel.



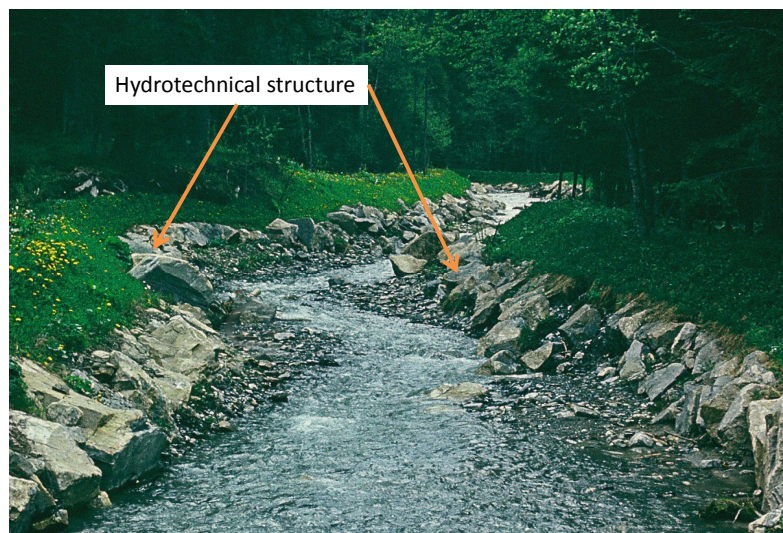
## Old and new concepts



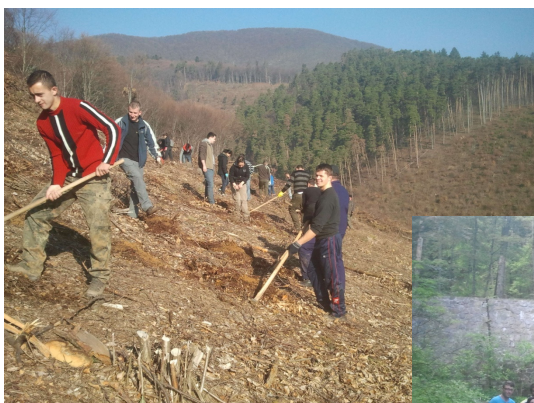
## What has been done until now?



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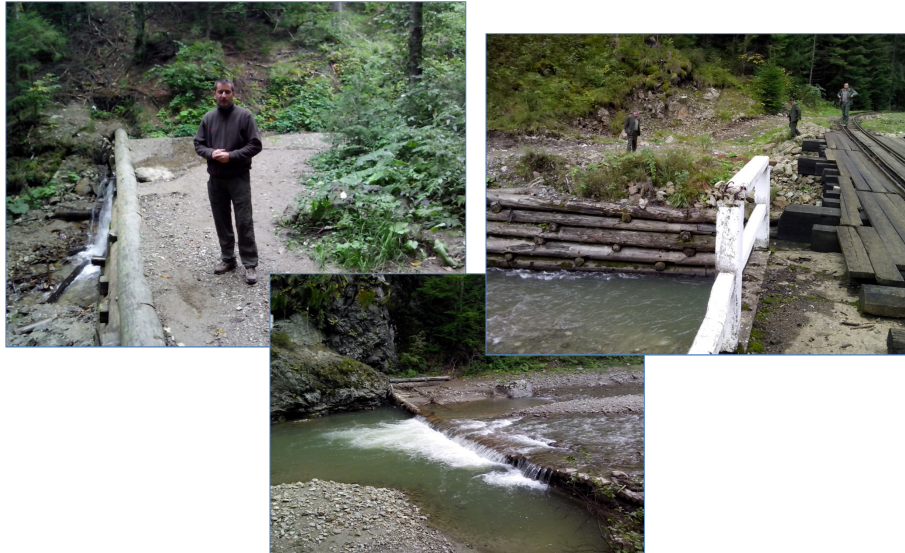


What has been done until now?



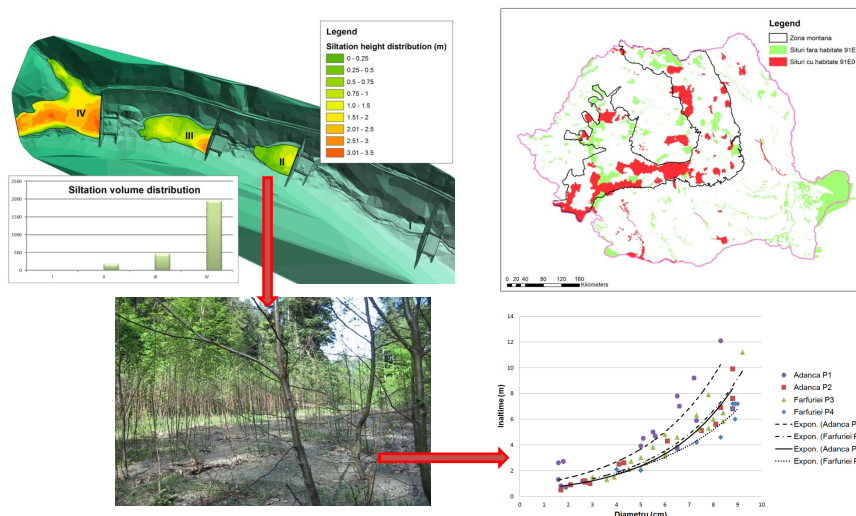


## What has been done until now?



## Which is the impact of Torrent control Dams to Biodiversity?

- In torrential valleys with no permanent water flow



## Discussion...

- What have we learnt from the past?
- Did we forget the destructive power of torrents?
- Are we acting in name of society taking into consideration the environmental costs?
- Do we treat the cause or the effect?
- Are we evaluating correctly the treats?
- Do we have to think globally and act locally?