

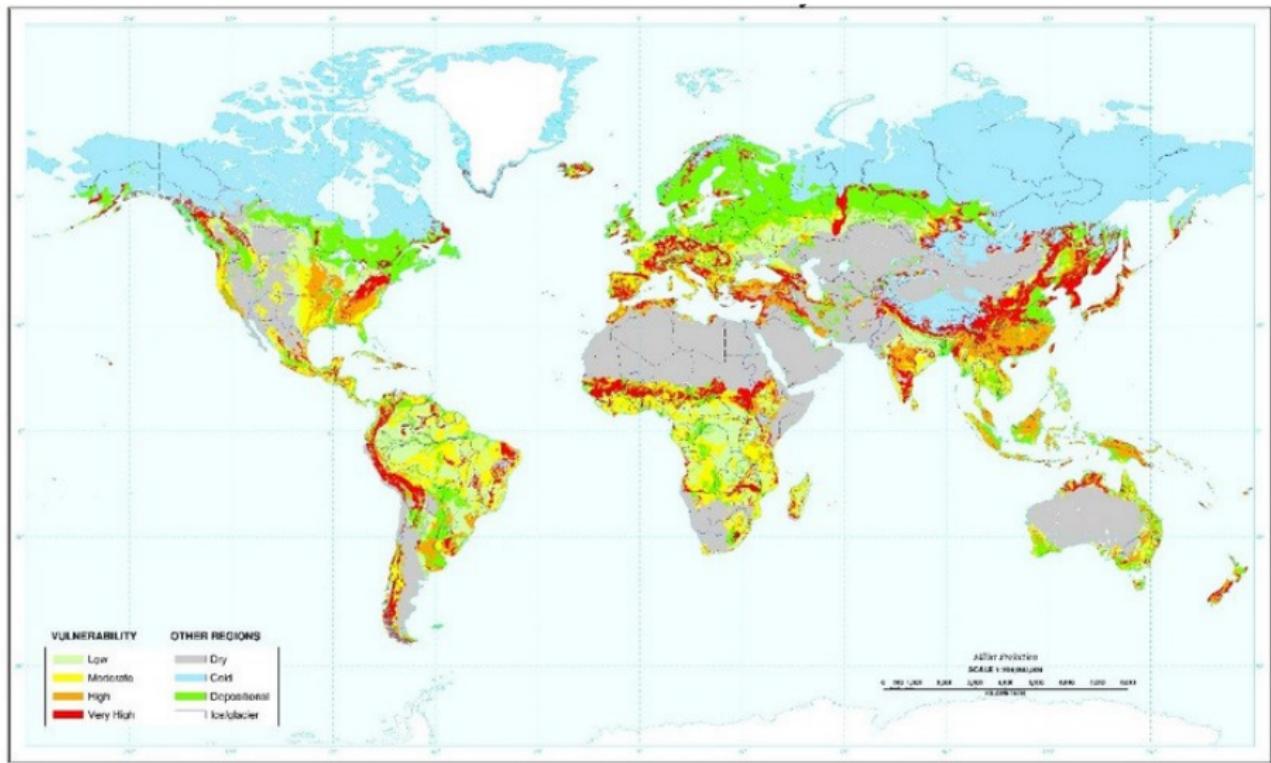
# GEOMORFOLOGÍA

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Versión: June 30, 2020





# Erosión

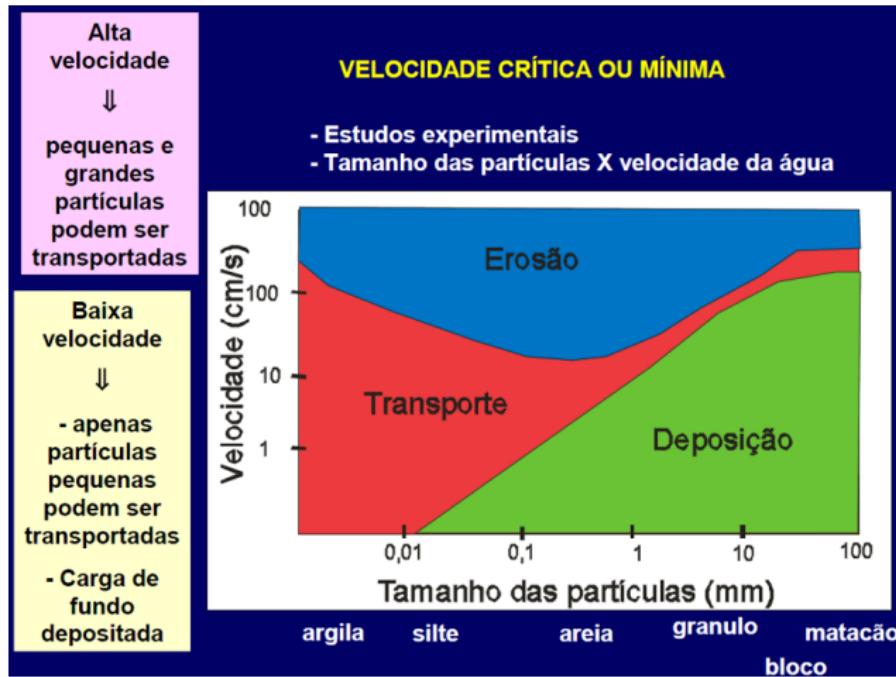
**Erosión** proviene del Latin *erodere*, que significa *to gnaw*. Es un proceso natural que reduce todas las montañas (denudación), pero al mismo tiempo enriquece en nutrientes los suelos de los valles.

**Erosión tolerable:** balance de pérdida de suelo y la formación de suelo por procesos de meteorización considerando la productividad de suelos. Por lo tanto la tolerancia fue definida como la erosión que no permite ninguna reducción apreciable en la productividad del suelo. Sin embargo no hay suficiente información para determinar la productividad de los suelos.

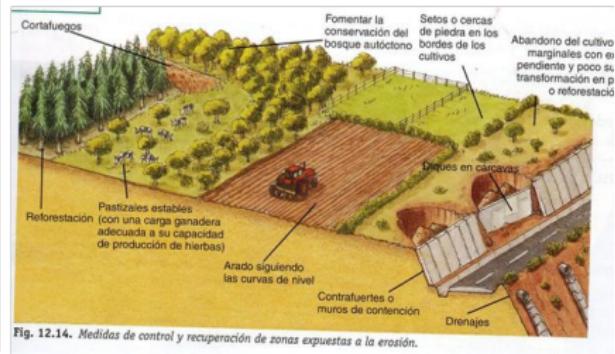
**Erosión normal o geológica:** Estabilidad cuando la pedogenesis (velocidad de la meteorización de la roca) y la erosión están en balance.

Proceso natural de arranque y movimiento de las partículas del suelo por medio de la acción de un agente erosivo (agua, viento, etc)..... y asociado a la erosión, se produce transporte y depositación de los materiales.

# Erosión vs Depositación



# Erosividad vs Erosionabilidad

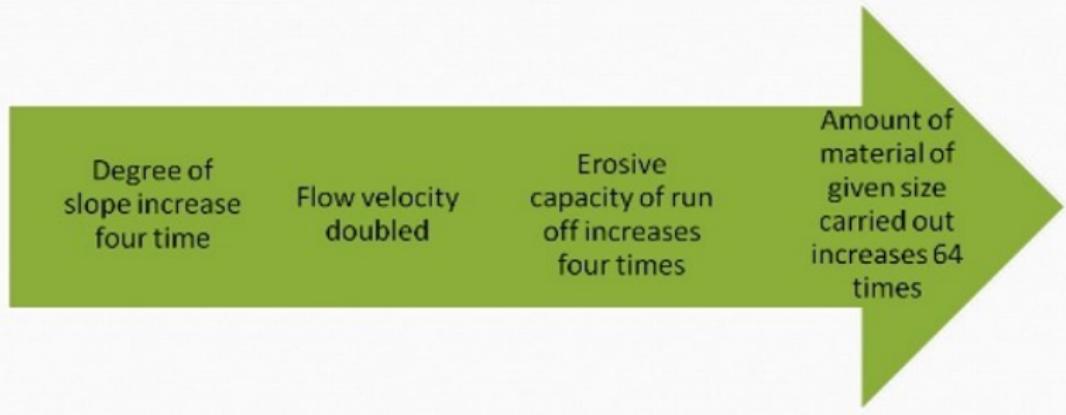


*Erosividad*

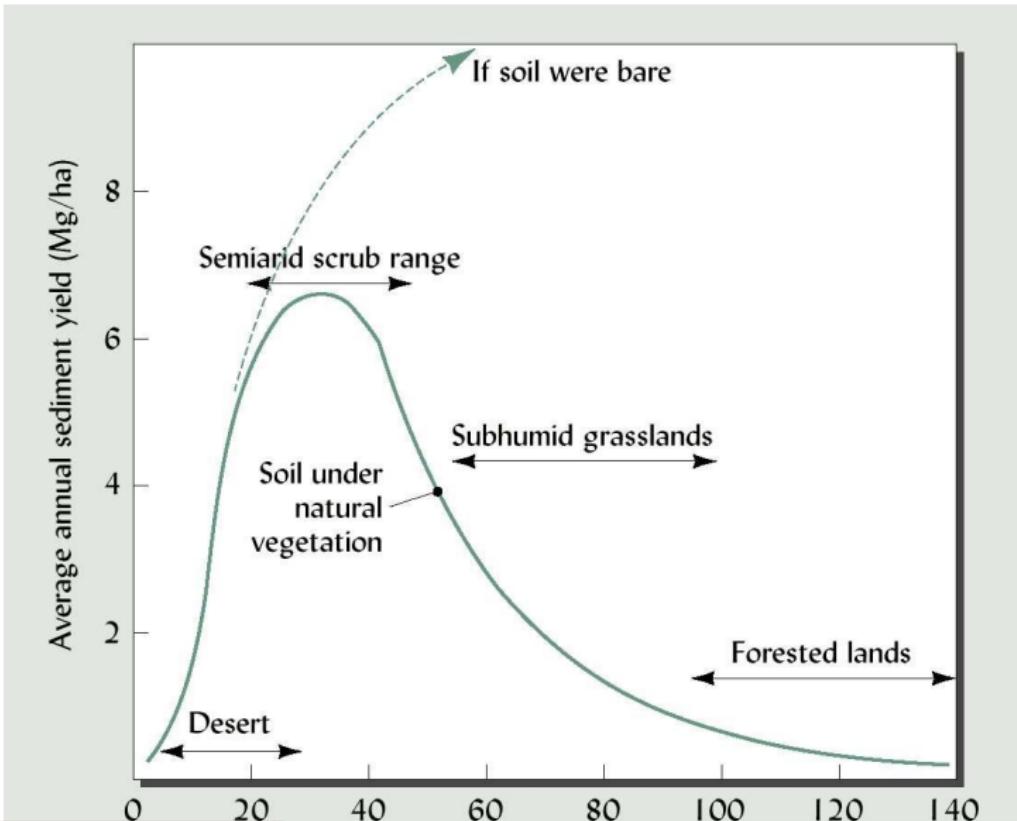
*Erosionabilidad*

# Factores

Climate	Topography	Soil Type	vegetation
<ul style="list-style-type: none"><li>• Rainfall</li><li>• Temperature</li><li>• Wind</li></ul>	<ul style="list-style-type: none"><li>• Degree</li><li>• Length of Slope</li></ul>	<ul style="list-style-type: none"><li>• Infiltration</li><li>• Permeability</li><li>• Soil Depth</li><li>• Particle size</li></ul>	<ul style="list-style-type: none"><li>• Land use</li><li>• Root system</li></ul>

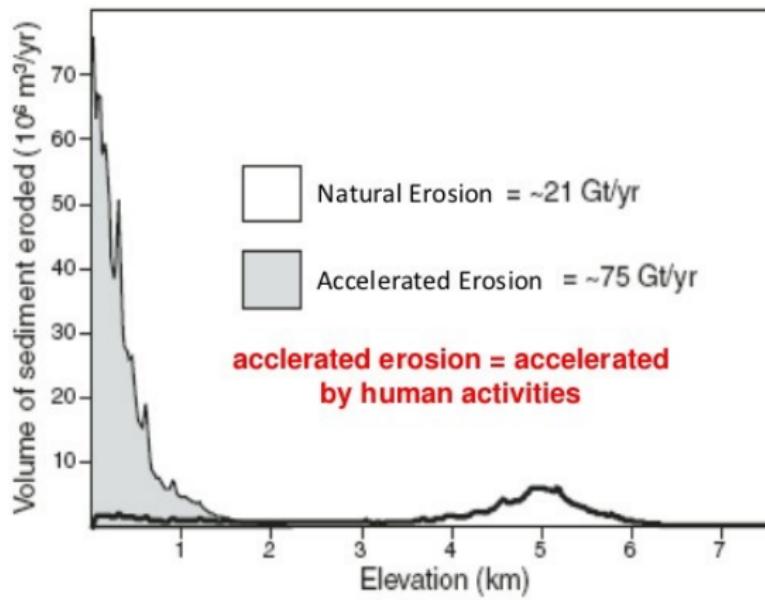


# Erosión y Vegetación



# Intervención antrópica

## Natural vs. accelerated erosion globally



# RUSLE

## Revised Universal Soil Loss Equation

$$A = R * K * L * S * C * P$$

A = perdida anual de suelo por hectárea

R = precipitación

L = longitud de las laderas

C = cobertura vegetal

K = erodabilidad del suelo

S = pendiente

P = practicas de control de erosión

# Erosión Hídrica

## **Splash erosion**

The force of falling irrigation or rainwater displaces soil particles

## **Sheet erosion**

Impermeable surfaces, compacted soil, or bare soil lets water run across it, washing away disturbed surface particles

## **Rill erosion**

Sheet erosion wears down soil to establish a definite path, forming rivulets in the soil referred to as rills. Rill erosion is much more visible to humans than splash or sheet erosion.

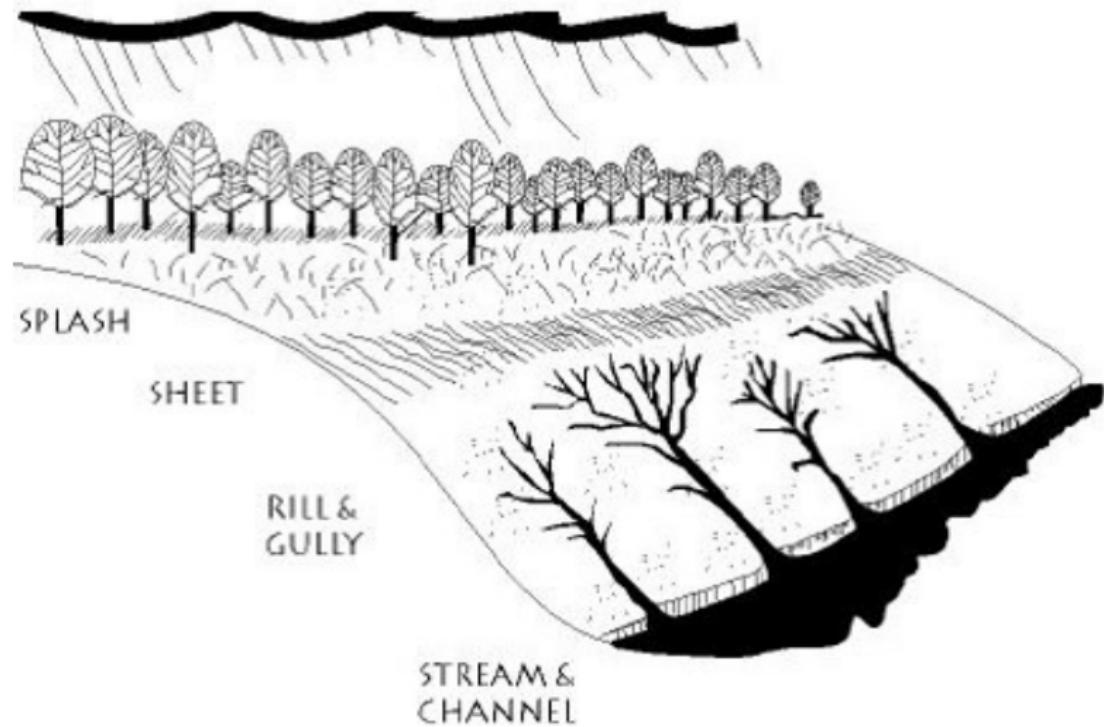
## **Gully erosion**

Over time, rills widen and deepen into a gully, accelerating the effects of erosion by creating more and more surface area susceptible to disturbance.

## **Bank erosion**

Fast water flows (often caused by influx of stormwater from impermeable surfaces) wear away stream sides at an accelerated pace, often causing bank failure.

# Tipos de Erosión Hídrica



# Tipos de Erosión Hídrica



Splash Erosion



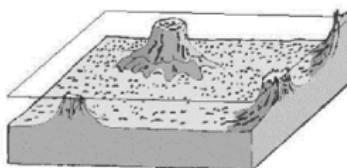
Sheet Erosion



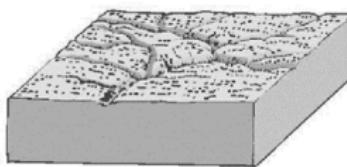
Rill Erosion



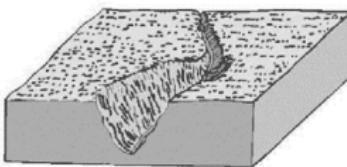
# Erosión Pluvial



(a) Sheet erosion



(b) Rill erosion

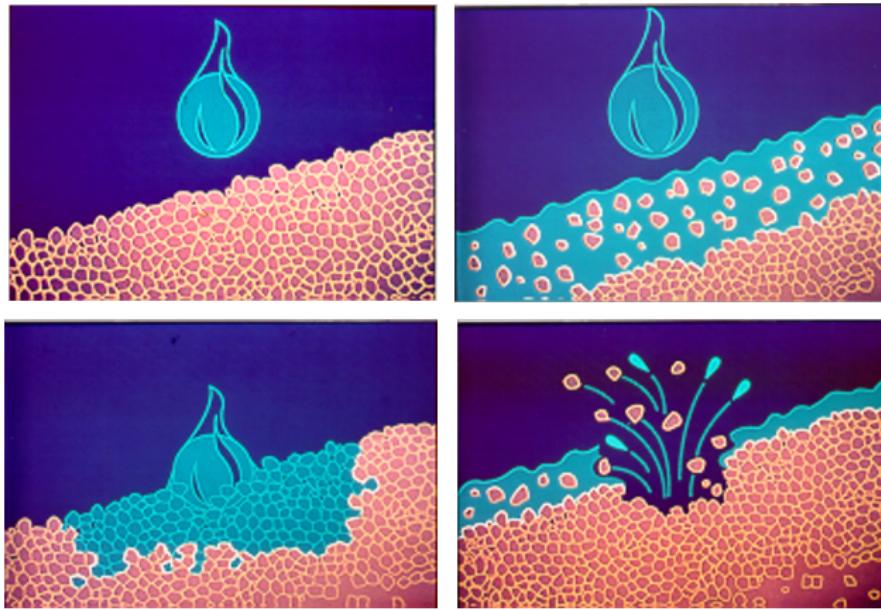


(c) Gully erosion



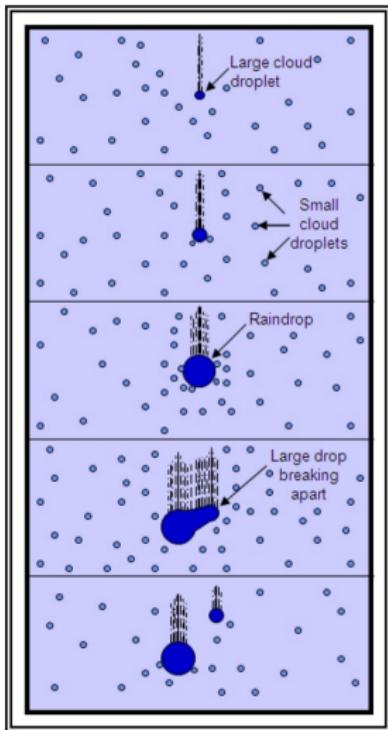
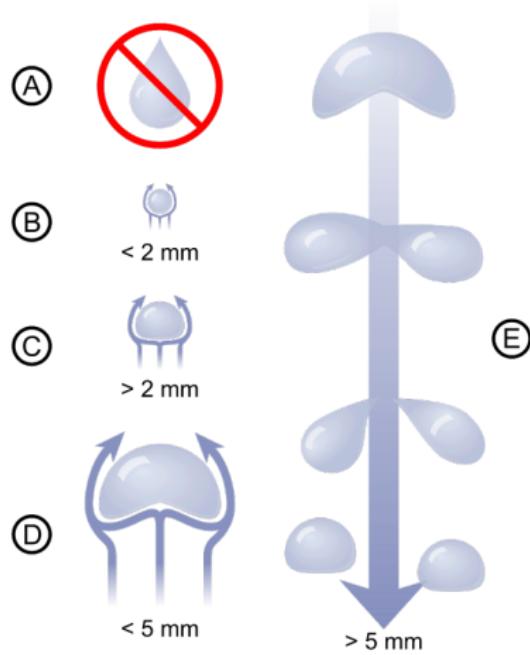
# Erosión Pluvial

*Splash*



# Erosión Pluvial

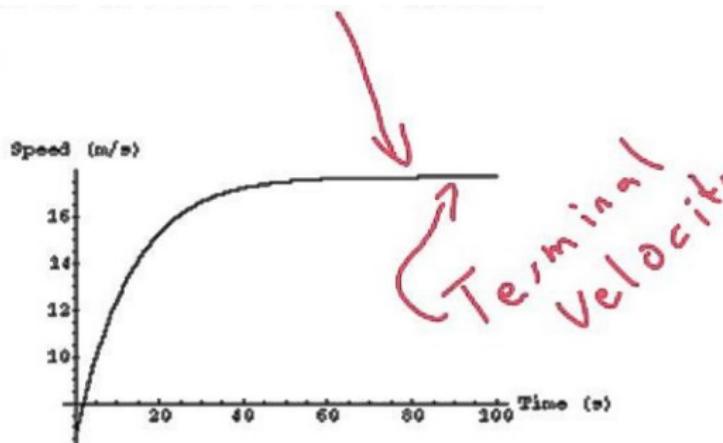
## Splash



# Erosión Pluvial

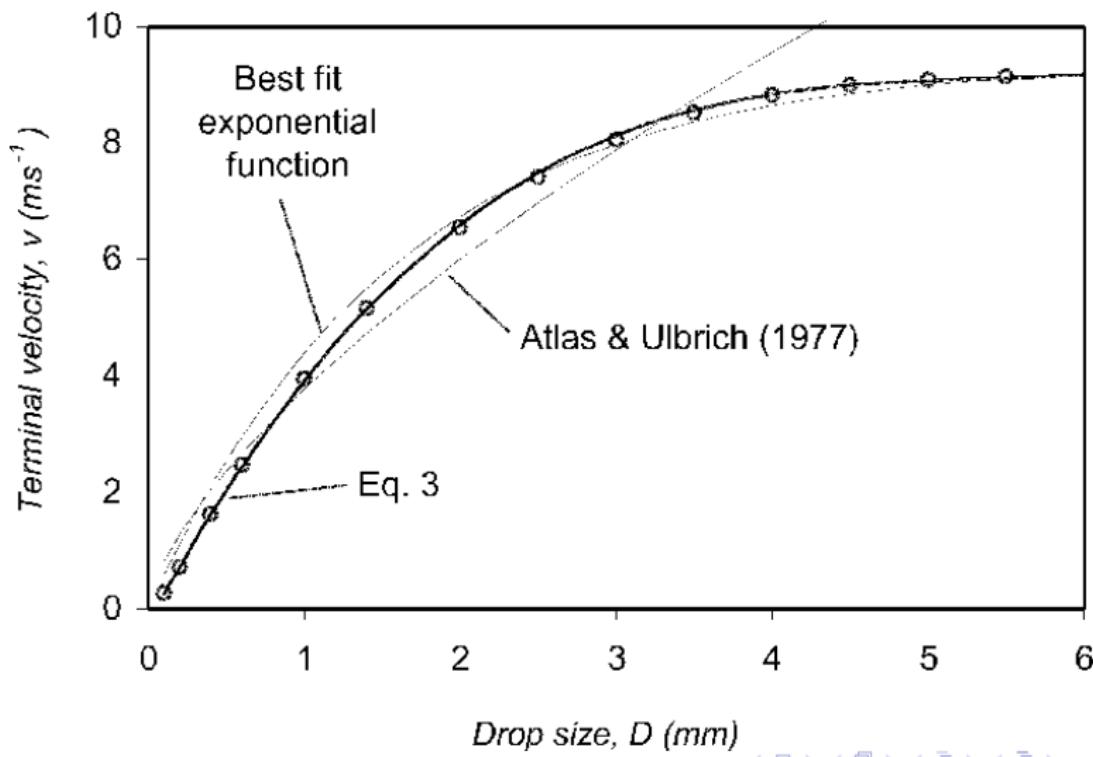
Splash

Air Resistance



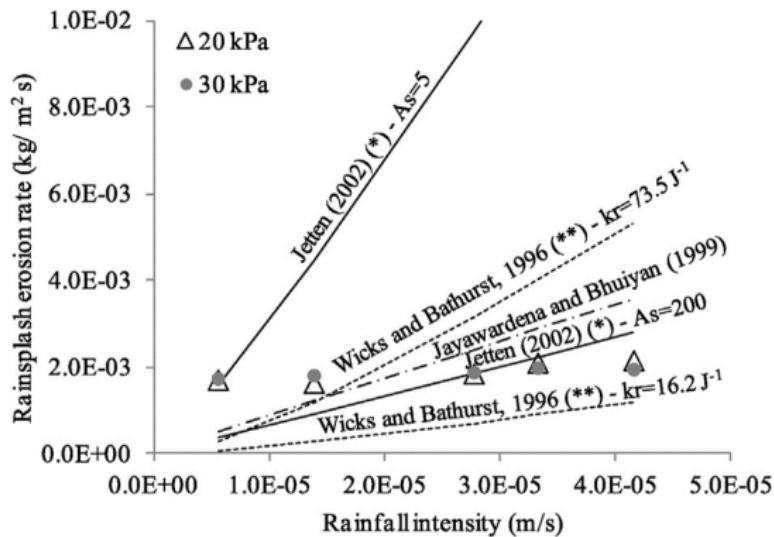
# Erosión Pluvial

Splash



# Erosión Pluvial

## Splash



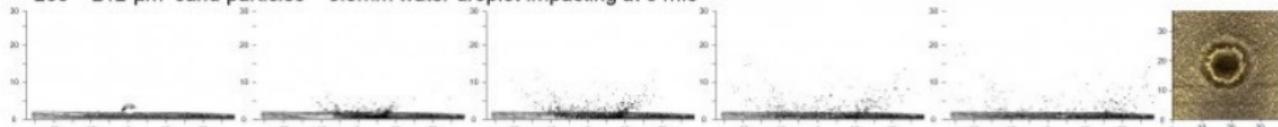
(\*) soil aggregate stability As in the range 0.00001-200 (Jetten, 2002)

(\*\*) without water depth and vegetation on ground surface ( $F_w=1; C_G=0$ ;  $C_c=0; M_D=0$ ); for  $I=20\text{mm/h}$ :  $\alpha=3.75 \times 10^{-8}$  and  $\beta=1.5545$ ; for  $I=50\text{mm/h}$ :  $\alpha=6.12 \times 10^{-8}$  and  $\beta=1.4242$ ; for  $I=100, 120, 150 \text{ mm/h}$ :  $\alpha=11.75 \times 10^{-8}$  and  $\beta=1.52821$ ;  $\text{kr}$  in the range for different soil texture (values from Wicks and Bathurst, 1996)

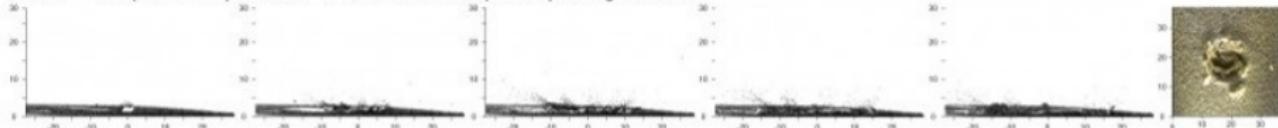
# Erosión Pluvial

## Splash

200 – 212  $\mu\text{m}$  sand particles – 3.5mm water droplet impacting at 6  $\text{m.s}^{-1}$



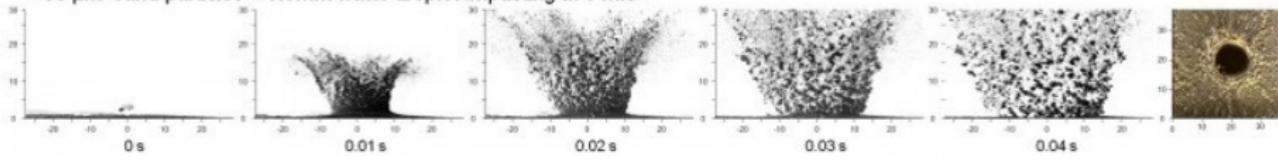
150 – 160  $\mu\text{m}$  sand particles – 3.5mm water droplet impacting at 6  $\text{m.s}^{-1}$



80 – 90  $\mu\text{m}$  sand particles – 3.5mm water droplet impacting at 6  $\text{m.s}^{-1}$

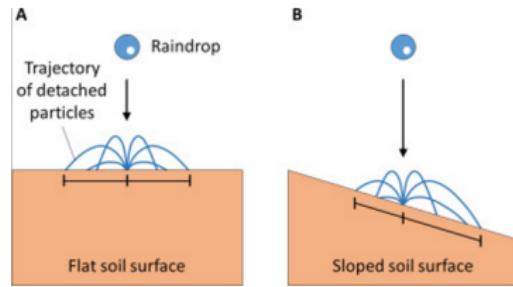
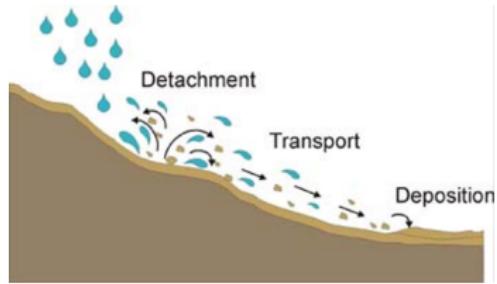


<80  $\mu\text{m}$  sand particles – 3.5mm water droplet impacting at 6  $\text{m.s}^{-1}$



# Erosión Pluvial

## Splash



# Erosión Pluvial

## Microestoraques



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# Erosión Pluvial

## Estoraques



# Erosión Pluvial

## Laminar



# Erosión Pluvial

## Laminar & Surcos



# Erosión Pluvial

## Surcos



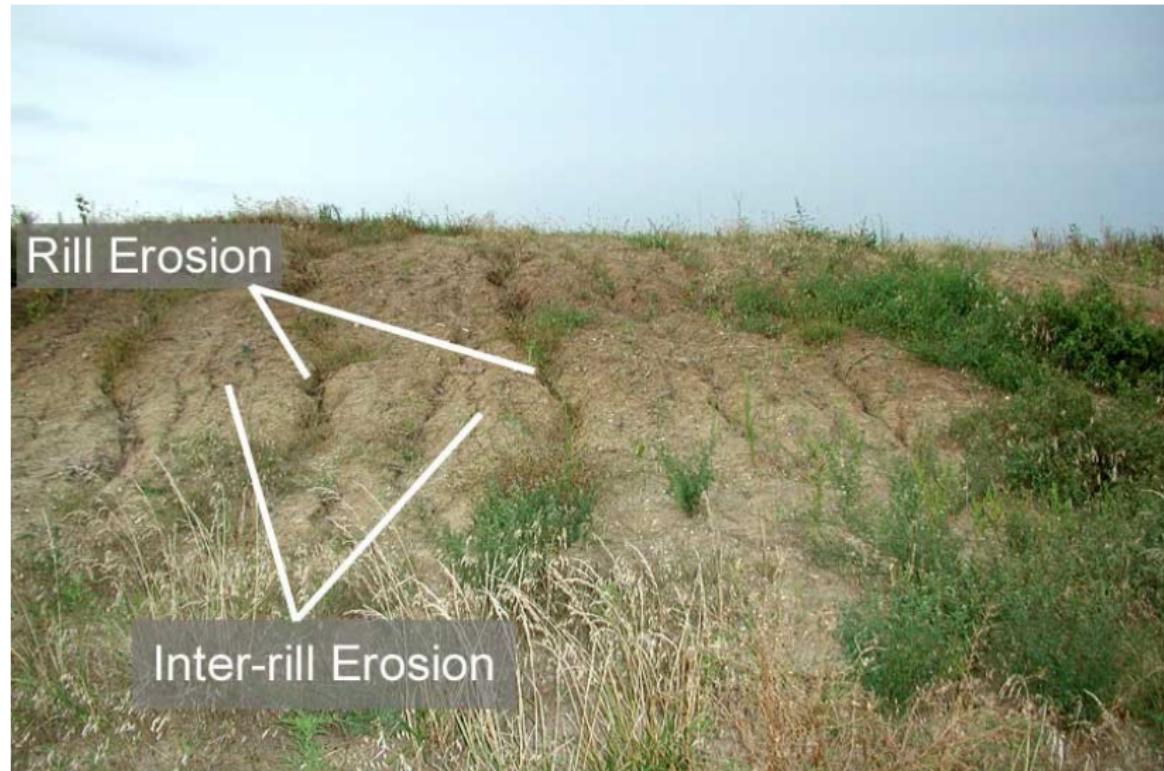
# Erosión Pluvial

## Surcos



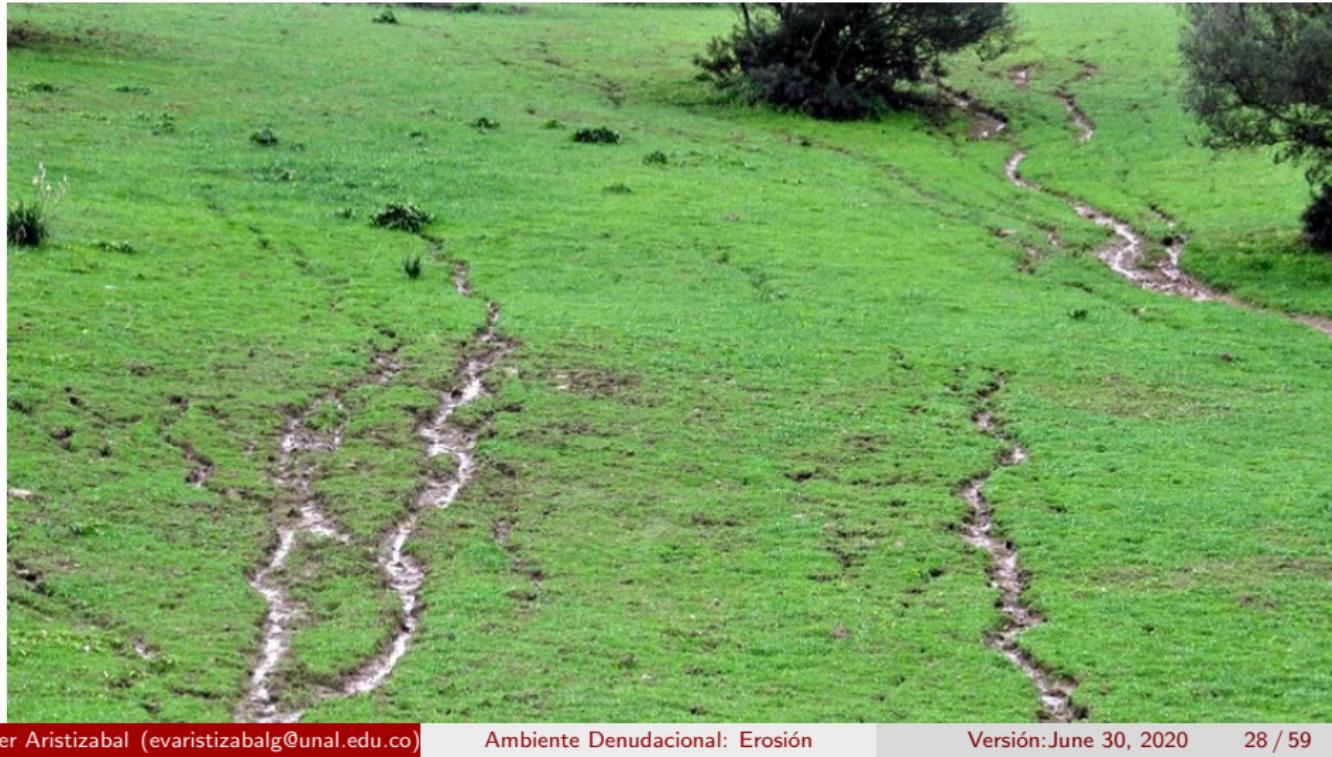
# Erosión Pluvial

## Surcos



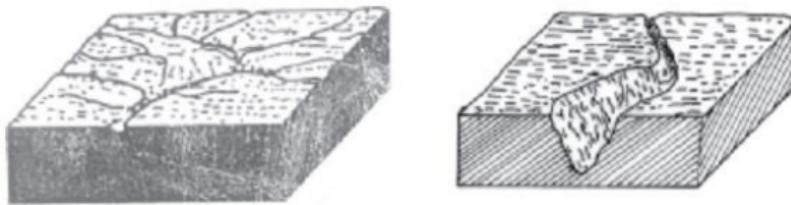
# Erosión Pluvial

## Surcos



# Erosión Pluvial

## Surcos & Cárcavas



*Fig. 17.5: (a) Rill erosion, (b) Gully erosion*

# Erosión Pluvial

## Cárcavas



# Erosión Pluvial

## Cárcavas



# Erosión Pluvial

## Cárcavas



# Erosión Pluvial

## Cárcavas



# Erosión Pluvial

## Cárcavas



# Erosión Pluvial

## Cárcavas



# Erosión Pluvial

Erosión laminar



Erosión laminar – erosión concentrada



cárcava

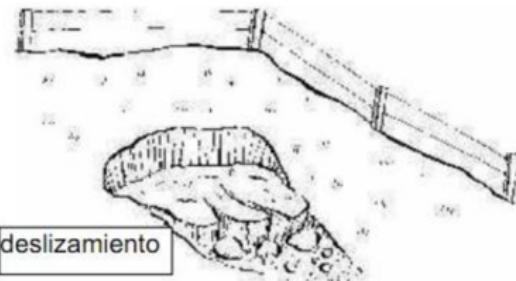


Surco - cárcava

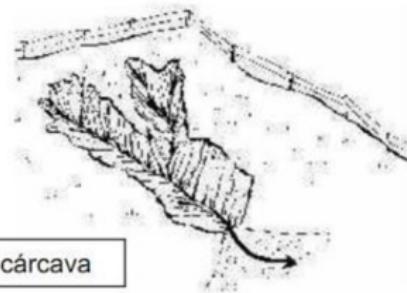


Surcos

# Movimientos en masa vs erosión concentrada



deslizamiento



cár lava



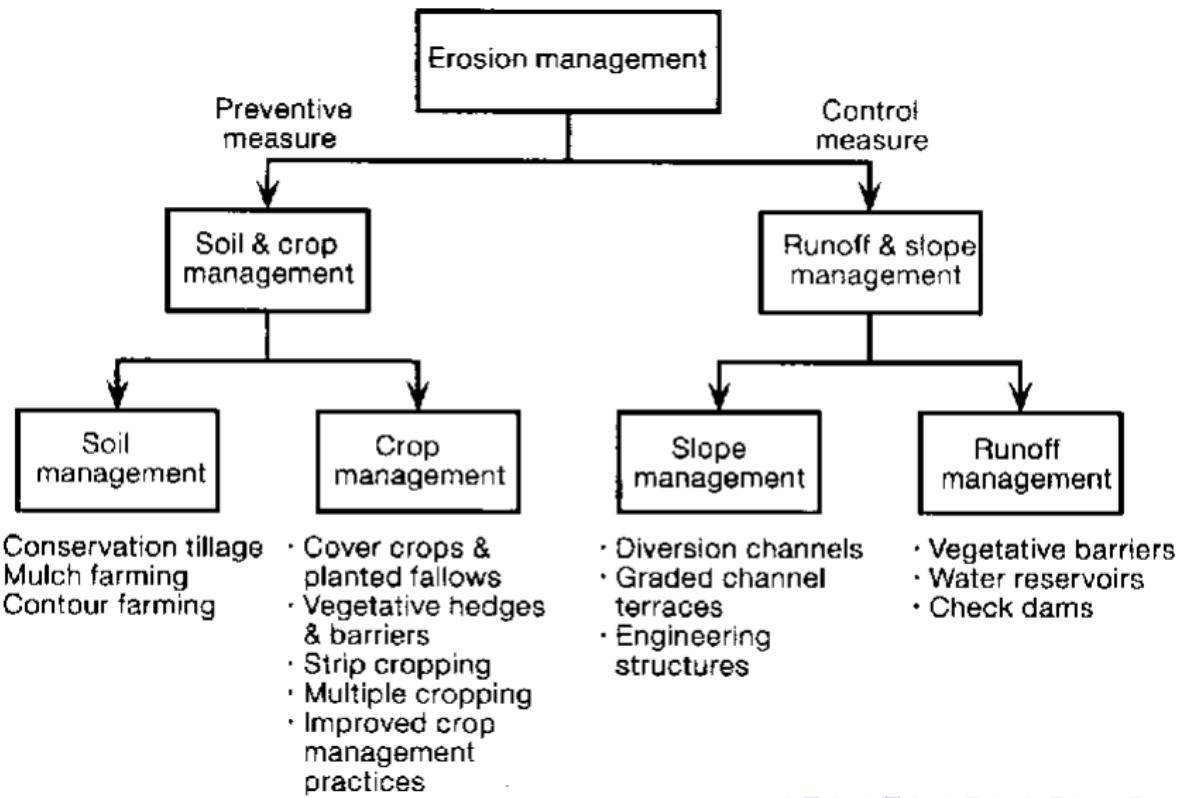
# Erosión de Banca



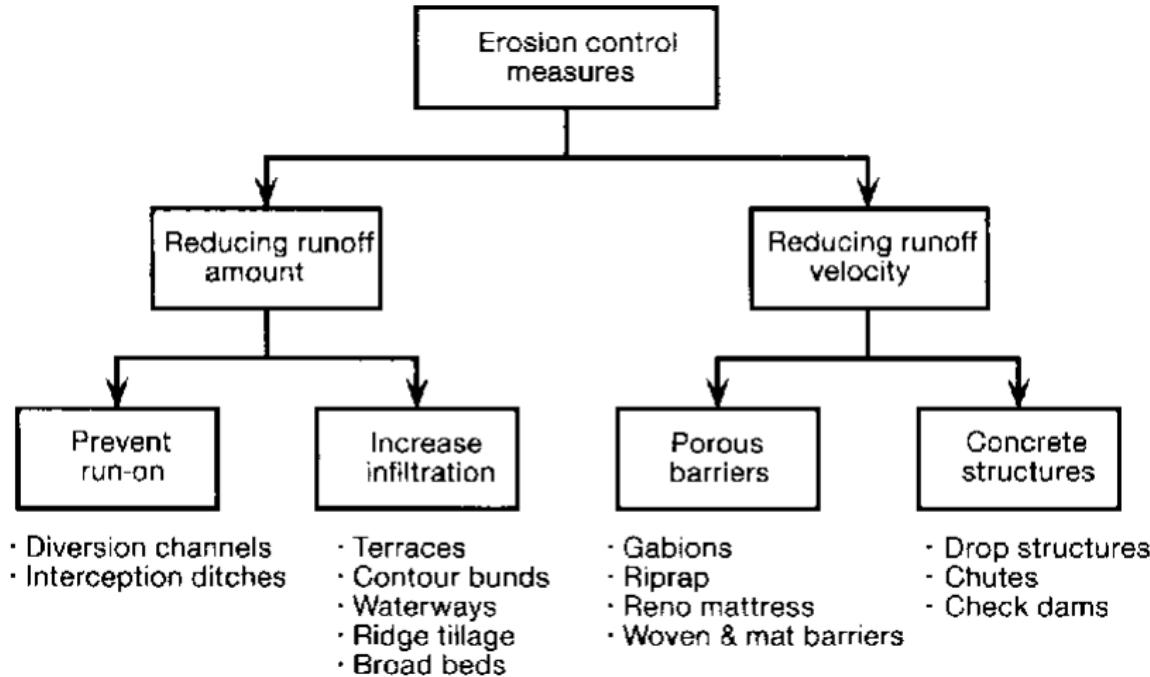
# Erosión de Banca



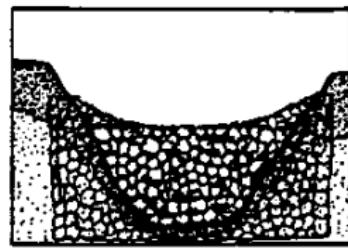
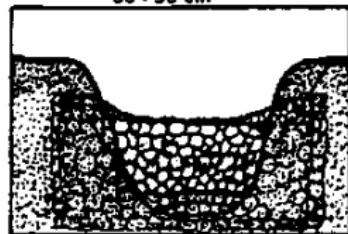
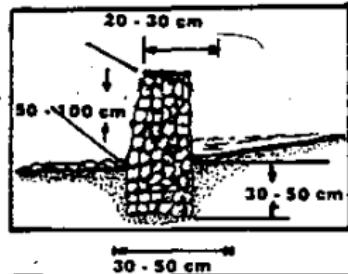
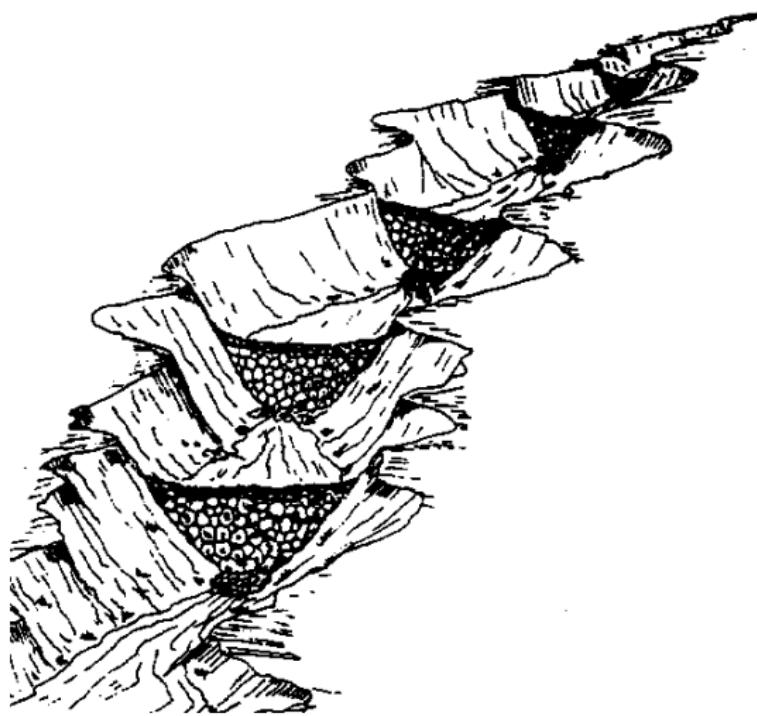
# Control de la erosión



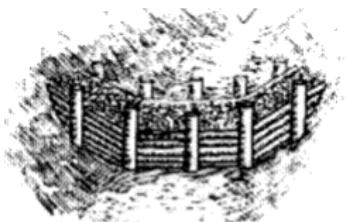
# Control de la erosión



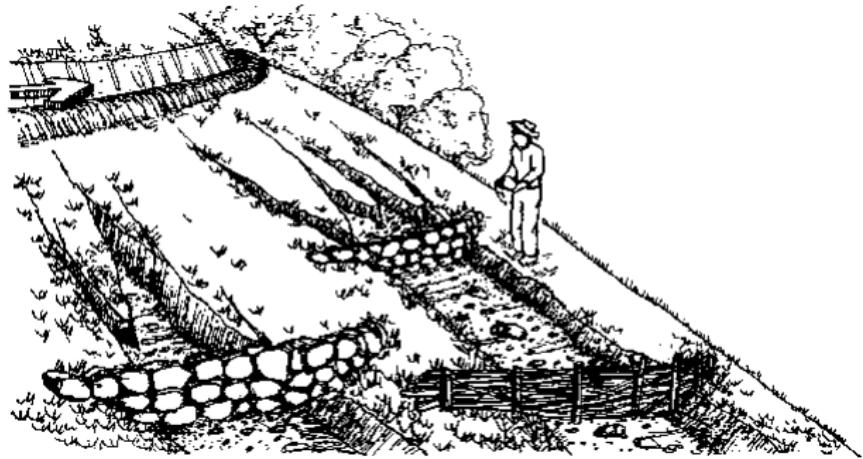
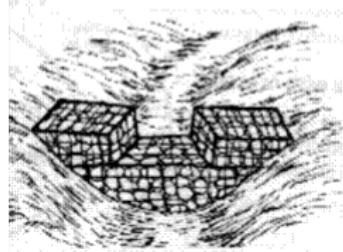
# Control de la erosión



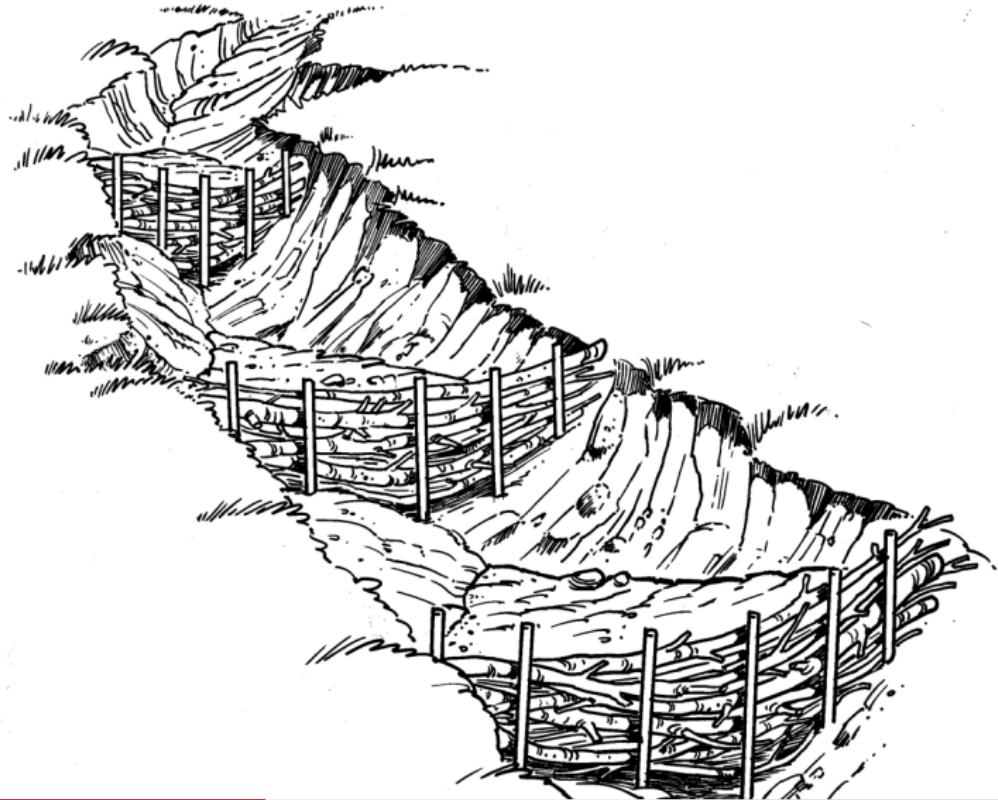
# Control de la erosión



Brush Wood Check Dam



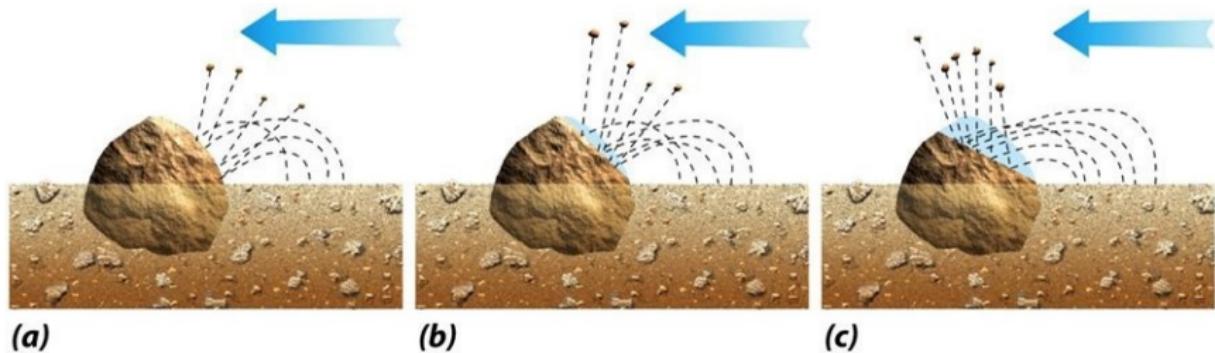
# Control de la erosión



# Control de la erosión



# Abrasión del viento



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# Abrasión del viento



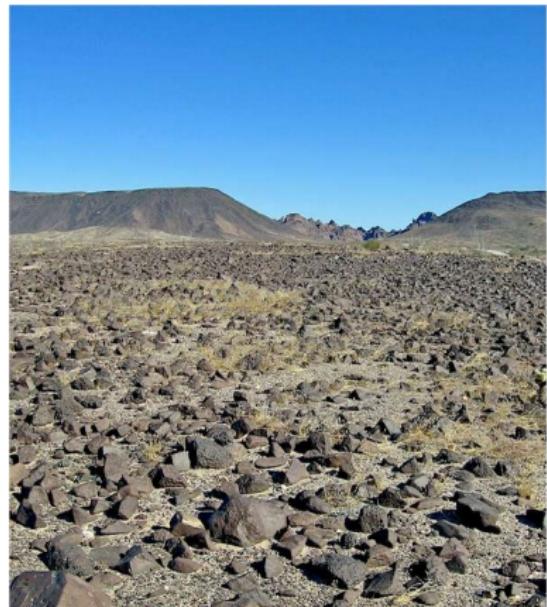
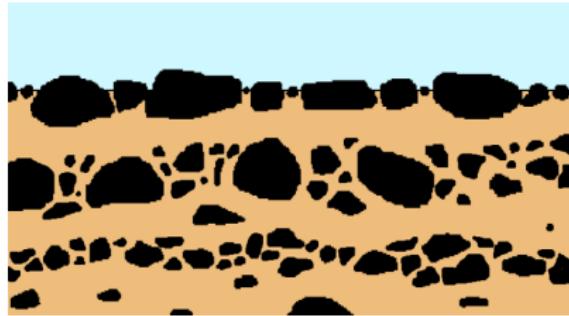
# Abrasión del viento



# Abrasión del viento

## Pavimentos Desérticos

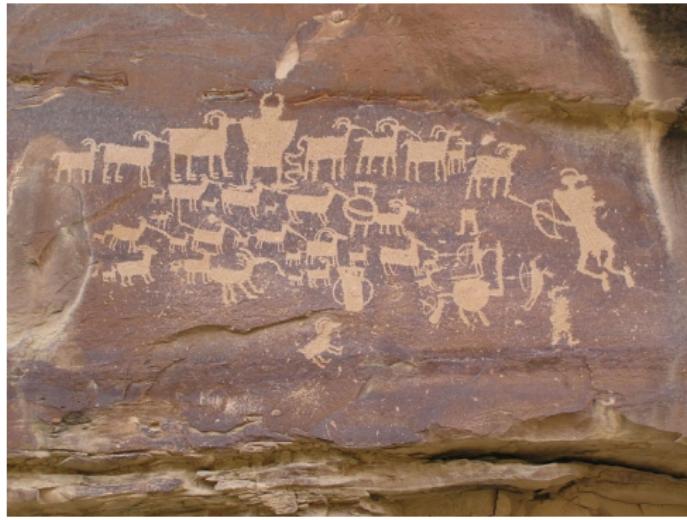
El continuo transporte de materiales finos por erosión del viento sin el reemplazo de sedimentos (deflación) puede generar una cobertura de grava denominada desert pavement



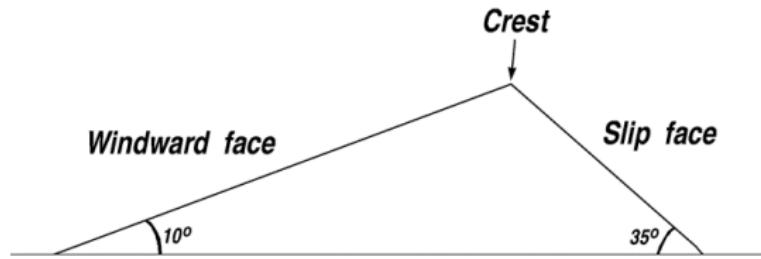
# Abrasión del viento

## Barniz Desérticos

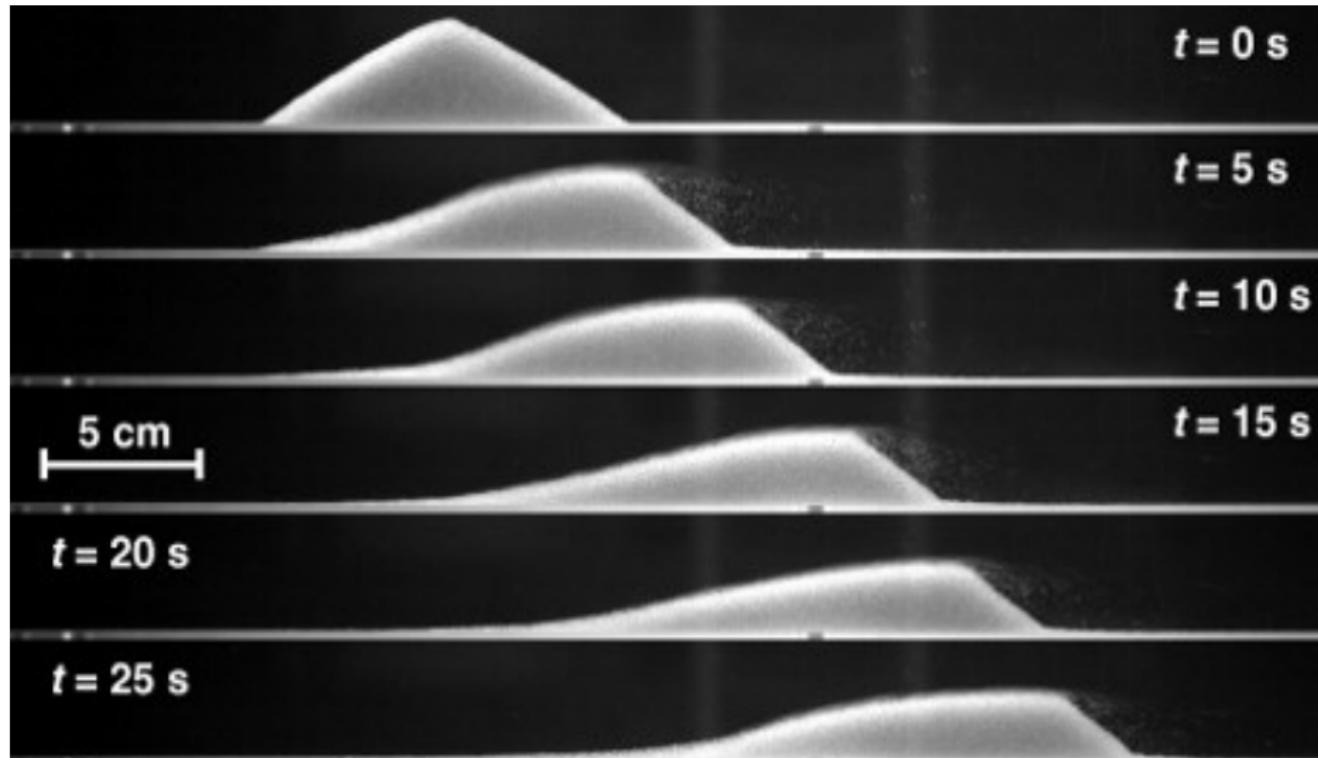
Costra brillante oscura enriquecida en Mn – Fe. > 10.000 años



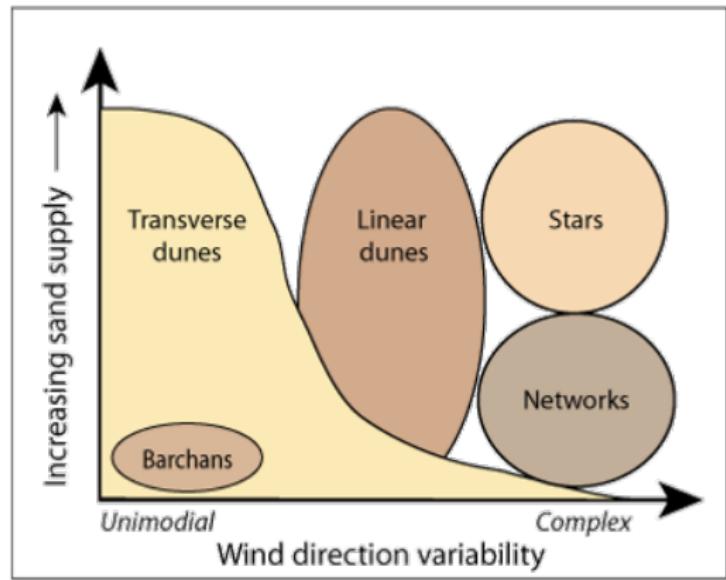
# Dunas



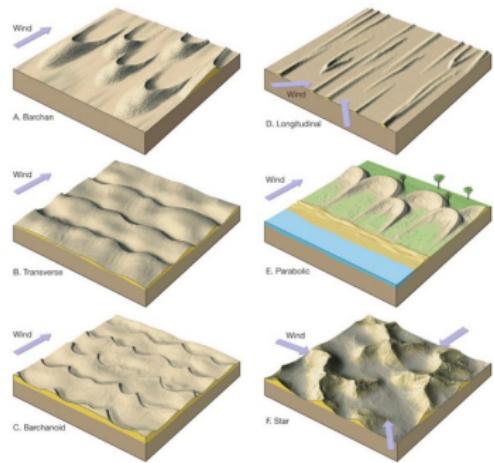
# Dunas



# Dunas



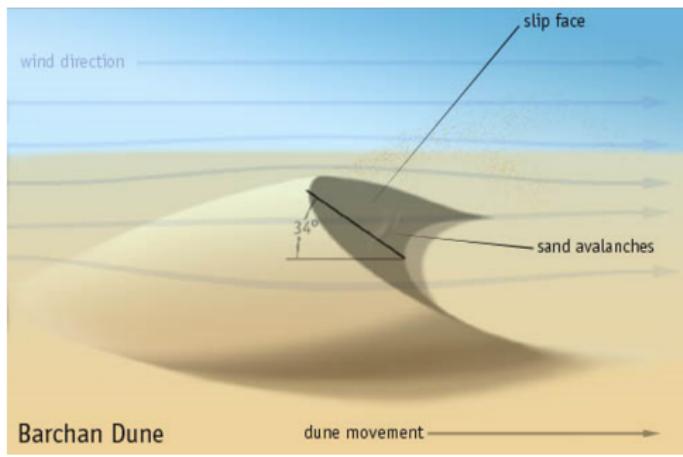
Adapted from Livingstone and Warren (1996, 80)



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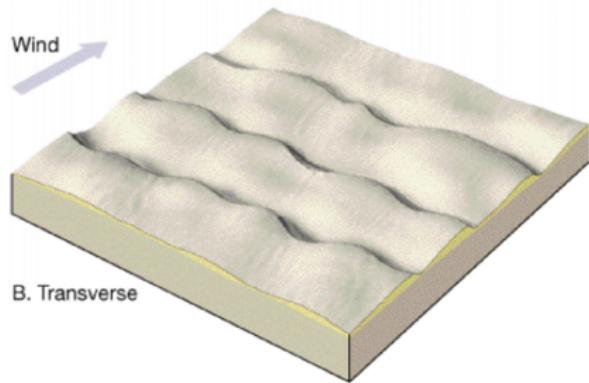
# Dunas

## Barchan



# Dunas

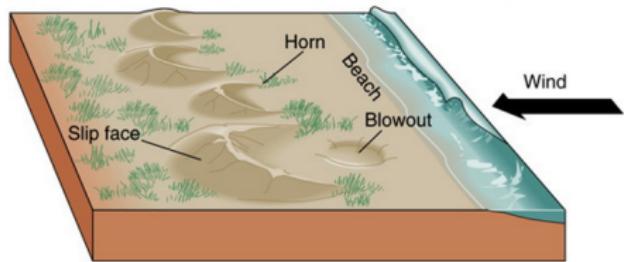
## Transversales



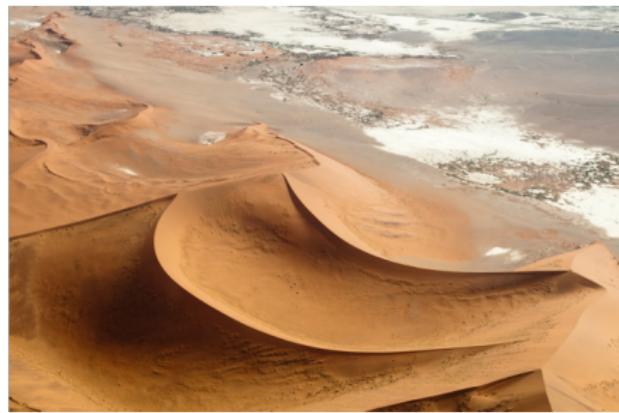
B. Transverse



# Dunas Parabólicas



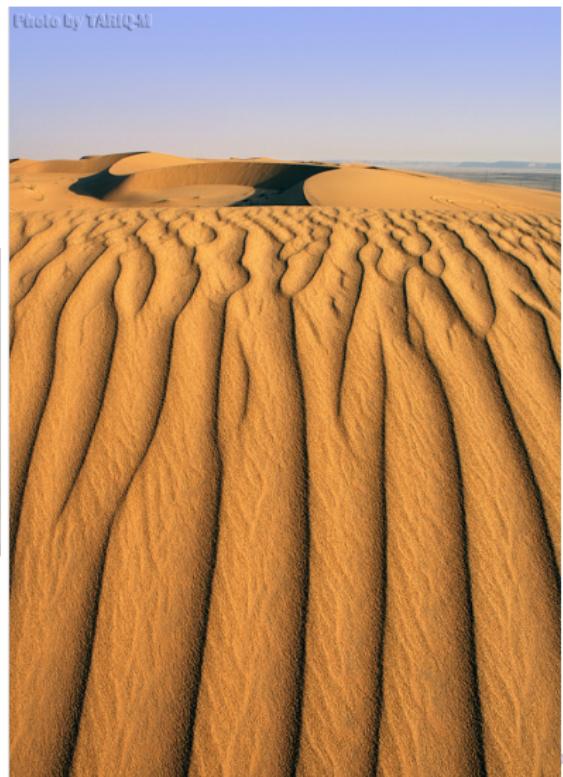
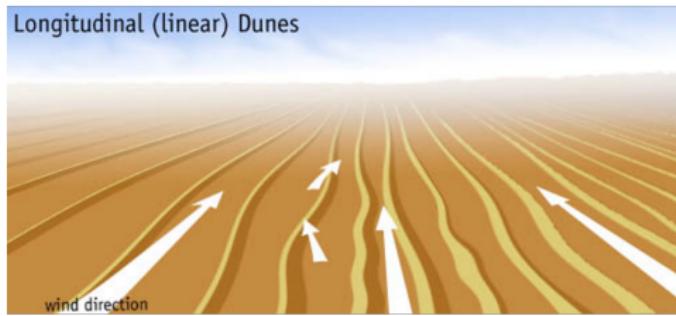
C Parabolic dunes



# Dunas

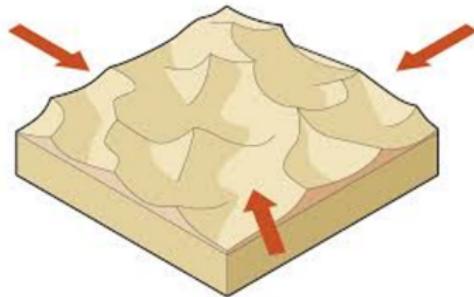
## Longitudinales

Longitudinal (linear) Dunes



# Dunas

## Estrellas



# Loess

depósitos de limo originados por la deposición de partículas con tamaños que van desde los 10 a los 50 micrómetros y que son transportados por las tormentas de polvo a lo largo de miles de años. Es de color amarillento y carece de estratificación. Está formado principalmente por silicatos (cuarzo, feldespato, etc.), carbonato de calcio (procedente de roca caliza, dolomía, etc.), finísimos detritos orgánicos y minerales del grupo de las arcillas.

