RIVER REHAB

Living Wandle
Landscape Partnership

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LIVING WANDLE LANDSCAPE

Living Wandle
Landscape Partnership

£2m

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RIVER REHAB

TODAY'S WORKSHOP

- ECOLOGY AND CONSERVATION
- FRESHWATER CONSERVATION
- THE RIVER
- HOW A RIVER WORKS
- RIVER HABITATS ← LUNCH?
- HUMAN MODIFICATIONS
- THE WANDLE
- RESTORATION ← YOU?

BIODIVERSITY

Biodiversity

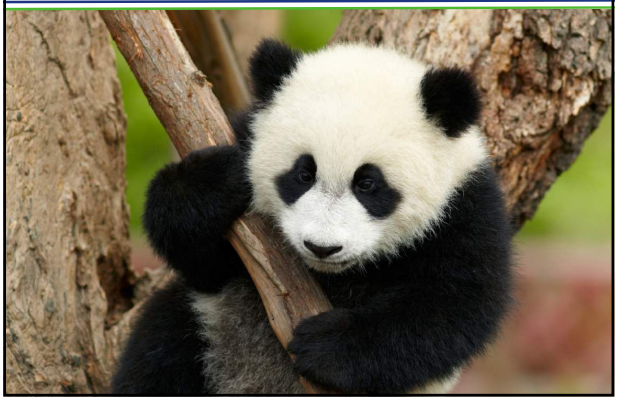
The variety within and between all species of plants, animals and micro-organisms and the ecosystems within which they live and interact

ECOSYSTEM

A community of living organisms in conjunction with the non-living components of their environment interacting as a system.

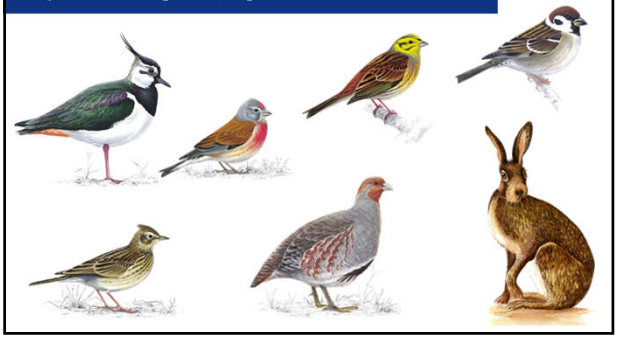
WHY CONSERVE BIODIVERSITY?

CONSERVATION CONCEPTS



CONSERVATION CONCEPTS

1. DIVERSITY IS KEY



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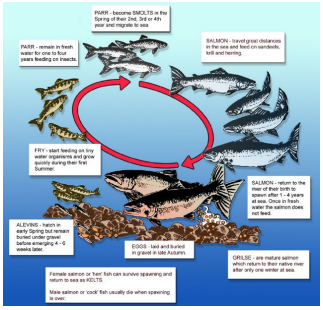


SALMON

Lay eggs in freshwater rivers

Fry live in freshwater rivers

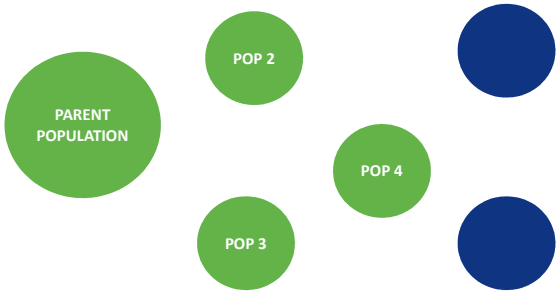
Adults migrate downstream

Some into the Atlantic Ocean

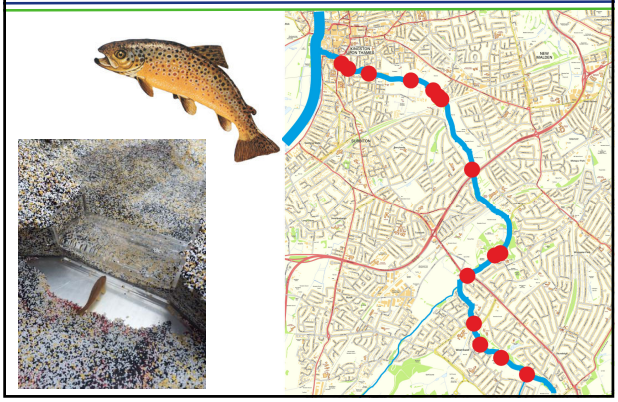
Return to freshwater rivers to breed

CONSERVATION CONCEPTS

2. CONNECTIVITY IS CRUCIAL



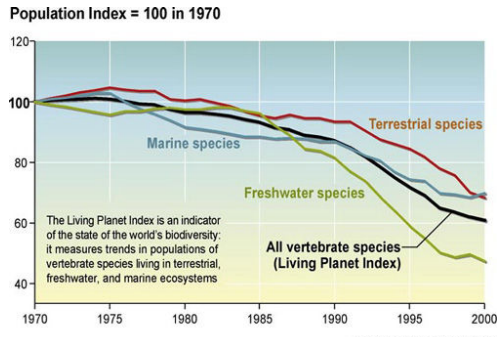
CONSERVATION CONCEPTS



CONSERVATION CONCEPTS

FRESHWATER ECOSYSTEM

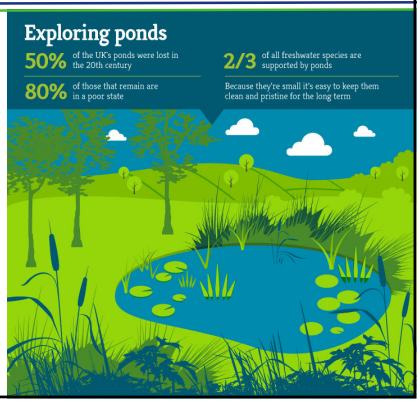
FRESHWATER ECOSYSTEM



FRESHWATER ECOSYSTEM

FRESHWATER SPECIES SINCE

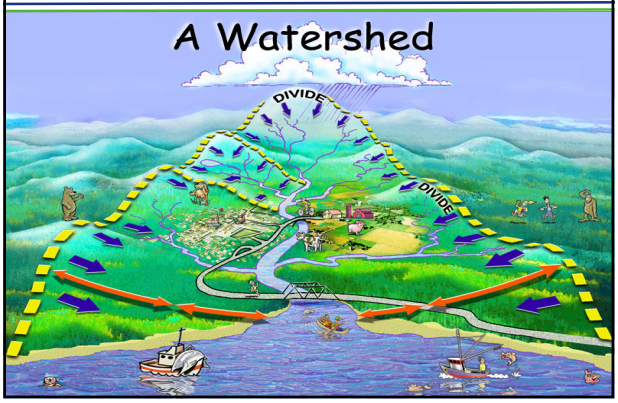
1970



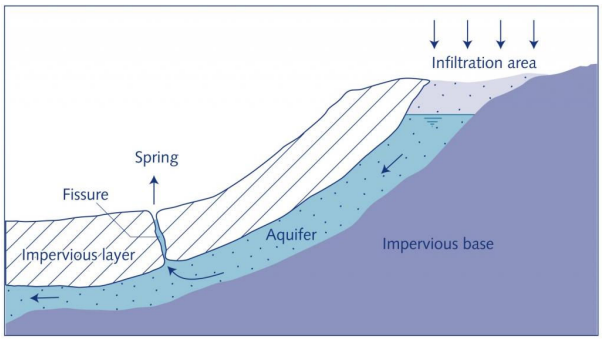
THE RIVER

THE RIVER

THE WATERSHED



RIVER SOURCES



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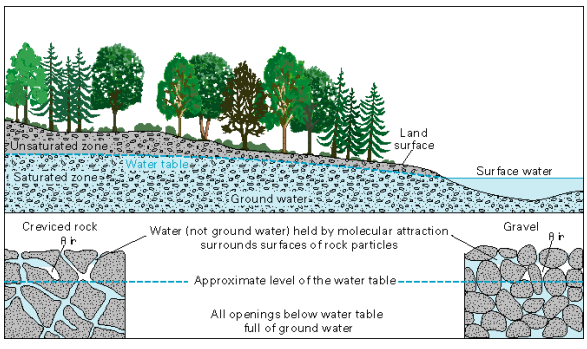

RIVER SOURCES

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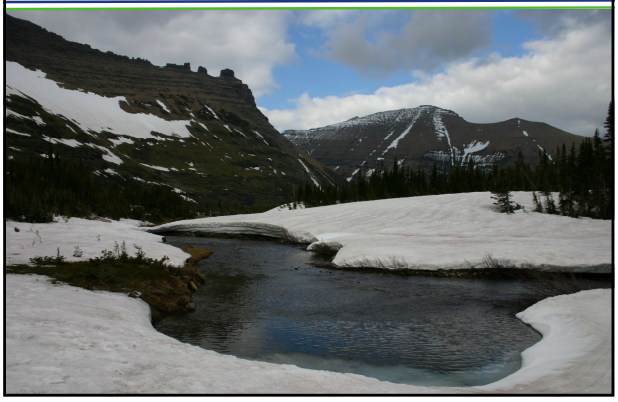


RIVER MOUTHS

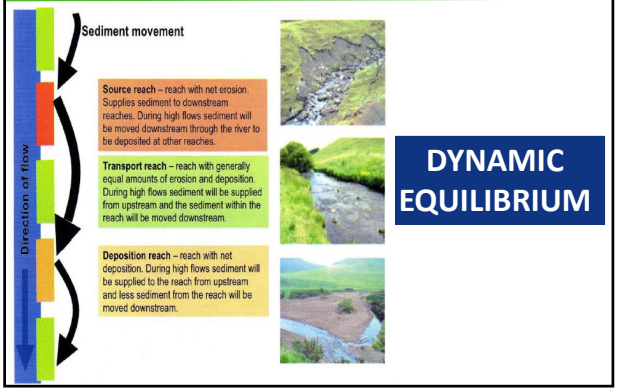
MOUTHS

RIVER MOUTHS

FRESHWATER SYSTEM

RIVER MECHANICS

RIVER MECHANICS



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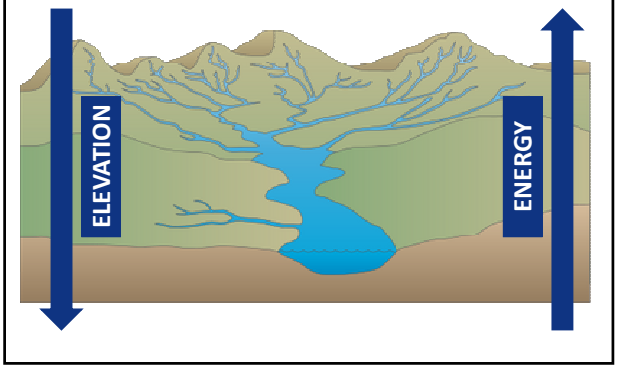

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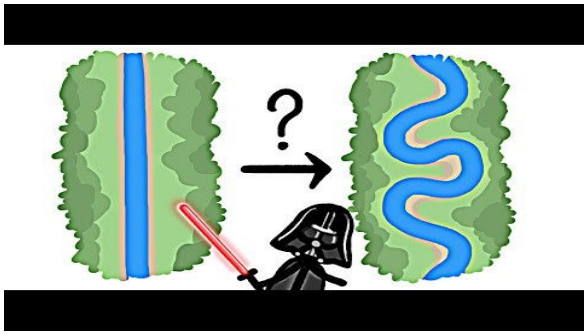

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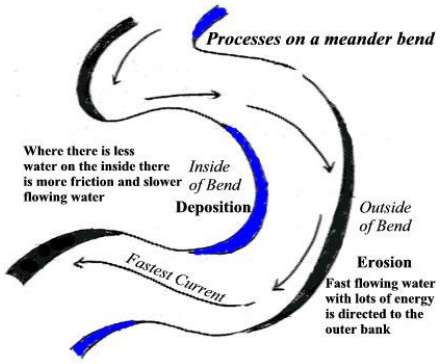
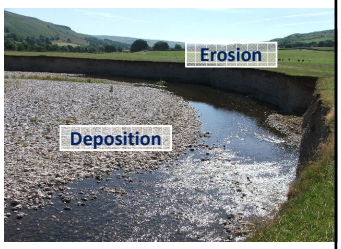


River Forms & River Habitats

- What is dynamic equilibrium?
- Water follows path of least resistance
- Erodes where sediment is soft
- Deposits when water is slowed down
- Equilibrium is dynamic – responds to environmental factors

Habitat Creation

- Erosion & Deposition = Habitat Formation
- Different processes form different habitat patches
- Lack of equilibrium results in reduced habitat
- Rehabilitation helps conserve freshwater biodiversity



Point Bars

- Occurs on inside bend
- Slowed water deposits sediment
- Point bar extends
- Good area of marginal habitat

Point Bars

- Become colonised
- Water cress & burr reeds
- Seeds transported in river and by birds
- Roots secure the point bar
- Flies climb up reeds
- Birds nest in the vegetation

Mid-channel Bars

- Form during low discharge
- Obstacle to flow - site of deposition
- Colonised by hardy grasses
- Trap sediment
- Home to rich variety insect life
- Good hunting ground for birds

Benefits of Plants

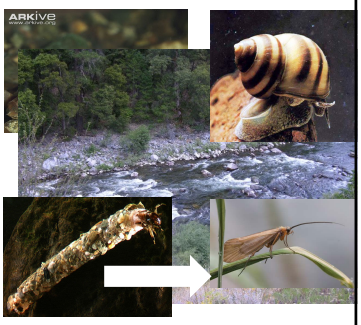
- What benefits do plants offer freshwater ecosystems?

Pools

- Form in areas of soft riverbed
- Outside bend of meanders + low incline straight sections
- Good fish habitat
- Hunting ground for predators
- Invasive species

Riffles

- Form in areas of hard riverbed
- Where incline is steep
- Wide range of invertebrates
- Small fishes - bullhead



Backwaters

- Areas of slack water off-channel
- Old river channels
- Pike spawning habitat
- Nursery ground for fish fry
- Many insect species

Diversity is key!

RIVER MODIFICATIONS

1. ABSTRACTION

Rivers are a source of freshwater which we need for drinking, washing, cooking and sewage treatment.

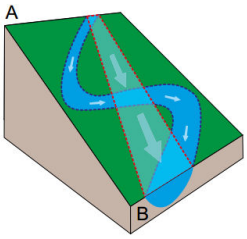
↑ ABSTRACTION ↓ WATER LEVEL

Whether from the river directly or groundwater aquifers, over abstraction can cause rivers to "dry up". This habitat loss has negative effects on freshwater wildlife.

RIVER MODIFICATIONS

2. STRAIGHENTING

Rivers have been straightened in the past to remove a perceived flood risk.



↑ STRAIGHT
↑ GRADIENT
↑ STREAM POWER
↑ CHANNEL INCISION

RIVER MODIFICATIONS

2. STRAIGHENTING

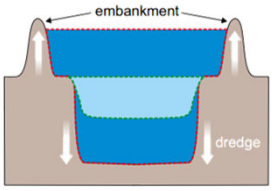
Rivers have to be channelized to confine them to an unnatural straight channel.

RIVER MODIFICATIONS

RIVER MODIFICATIONS

3. CHANNEL DEEPENING

Dredging has been used as a flood mitigation measure.

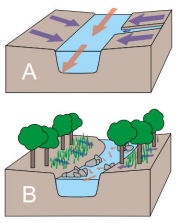


- WATER MASS
- VELOCITY
- STREAM POWER
- BANK EROSION

RIVER MODIFICATIONS

4. SMOOTHING THE BED

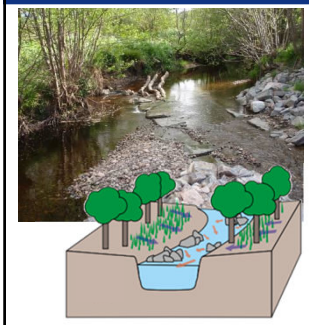
Channel bed features such as Large Woody Material and plunge pools are removed due to perceived flood risk and for Health & Safety.



- SMOOTHNESS
- FRICTION
- STREAM POWER
- EROSION

RIVER MODIFICATIONS

4. SMOOTHING THE BED



RIVER MODIFICATIONS

RIVER MODIFICATIONS

5. CULVERTING

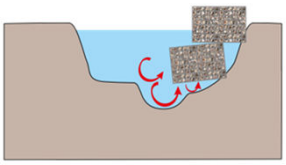
Many urban rivers were forced underground to remove flood risk and make room for development.

- ↑ FLOOD RISK
- ↓ LIGHT
- ↓ HABITAT QUALITY
- ↓ CONNECTIVITY

RIVER MODIFICATIONS

6. REINFORCEMENT

The use of hard engineering to prevent bank erosion and reduce flood risk.

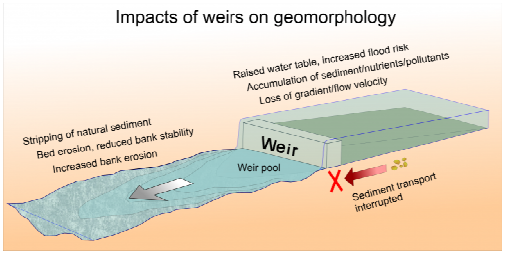


- ↑ SMOOTHNESS
- ↓ FRICTION
- ↑ STREAM POWER
- ↑ EROSION

RIVER MODIFICATIONS

7. WEIRS

Weirs were introduced along rivers to control the flow of water for milling.



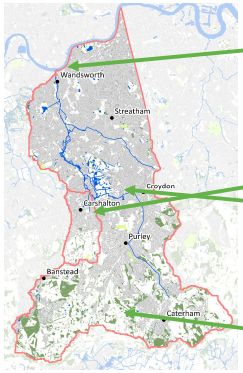
RIVER MODIFICATIONS

7. WEIRS

Weirs were introduced along rivers to control the flow of water for milling.

- ↓ HABITAT CONNECTIVITY
- ↑ FRAGMENTATION
- ↓ SPECIES DISPERSAL

THE RIVER WANDLE



- Joins the Thames
- Rises at Carshalton Ponds/Grotto
- Rises in Wandle Park
- North Downs

A CHALK STREAM

Only 200 left worldwide 90% of which are found in England


BROWN TROUT


MAYFLY

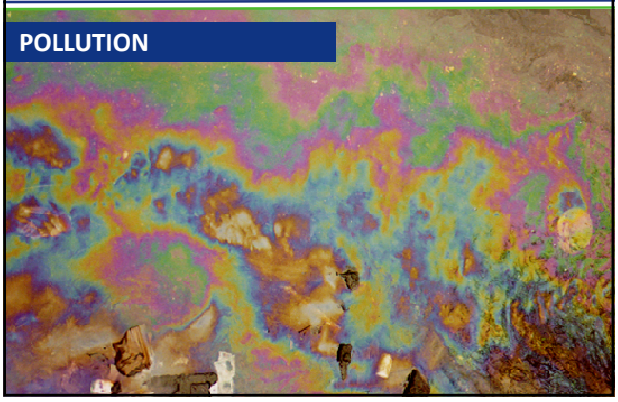

WATER CROWFOOT

CHALLENGES

FISH PASSAGE

CHALLENGES

POLLUTION



CHALLENGES

LACK OF HABITATS

RIVER RESTORATION

WHAT ARE WE AIMING FOR?

PROCESSES

Restoring natural river processes is the ideal for River Restoration. These allow a river to "recover" and over time, create river forms which provide habitats.

FORMS

In urban settings, we cannot leave rivers to take their natural course. Restoring forms which mimic some minor processes and create habitats is then the best compromise.

RESTORATION REALITY

BEFORE

RESTORATION REALITY

PROCESS

RESTORATION REALITY

FORM

RESTORATION REALITY

FORM

RESTORATION REALITY

AFTER

RIVER REHAB TECHNIQUES

CHANNEL NARROWING

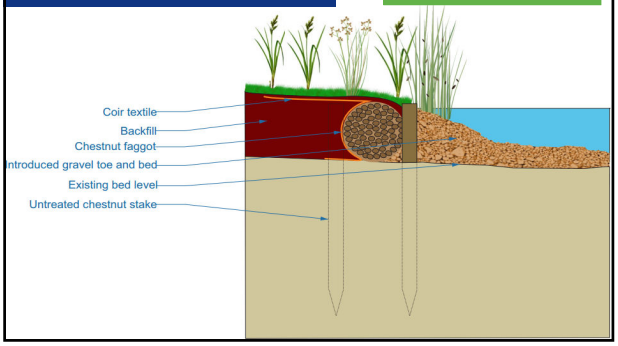
An over-wide channel has a lower stream power, causing sediment to drop out and accumulate, smothering gravel habitats.

- ↓ CHANNEL WIDTH
- ↑ FLOW SPEED
- ↑ STREAM POWER

RIVER REHAB TECHNIQUES

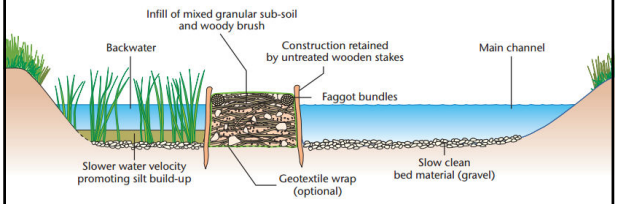
CHANNEL NARROWING

FAGGOTS



RIVER REHAB TECHNIQUES

CHANNEL NARROWING | **CAUSEWAY**



RIVER REHAB TECHNIQUES

CHANNEL NARROWING | **MID-CHANNEL**

RIVER REHAB TECHNIQUES

CHANNEL NARROWING | **LWM**

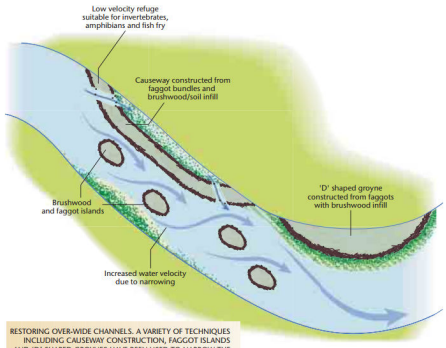
Use a series of Large Woody Deflectors to force the main flow of the channel into a narrower space, increasing speed

RIVER REHAB TECHNIQUES

CHANNEL NARROWING

GRAVELS

RIVER REHAB TECHNIQUES



RESTORING OVER-WIDE CHANNELS. A VARIETY OF TECHNIQUES INCLUDING CAUSEWAY CONSTRUCTION, FAGGOT ISLANDS AND 'D' SHAPED GROYNES HAVE BEEN USED TO NARROW THE CHANNEL AND INCREASE WATER VELOCITY.

RIVER REHAB TECHNIQUES

CHANNEL NARROWING

RIVER REHAB TECHNIQUES

BANK REPROFILING

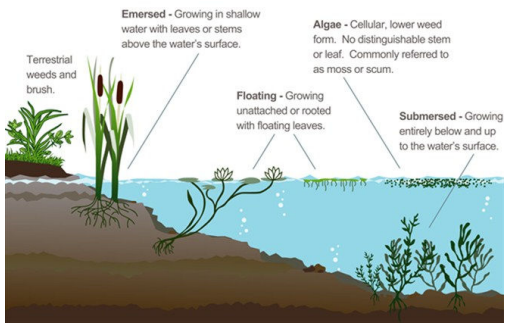
RIVER REHAB TECHNIQUES

BANK REPROFILING

RIVER REHAB TECHNIQUES

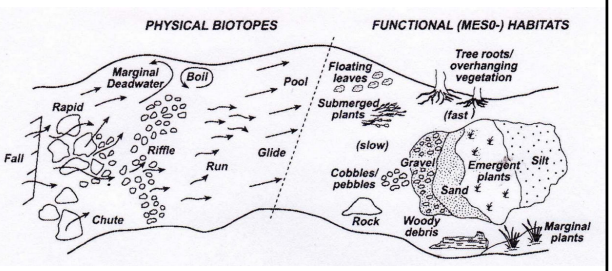
BANK REPROFILING

MARGINAL PLANTS



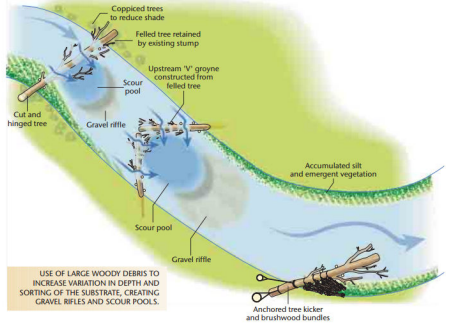
RIVER REHAB TECHNIQUES

IN CHANNEL DIVERSITY | **BED STRUCTURE**



RIVER REHAB TECHNIQUES

IN CHANNEL DIVERSITY | **LWM**



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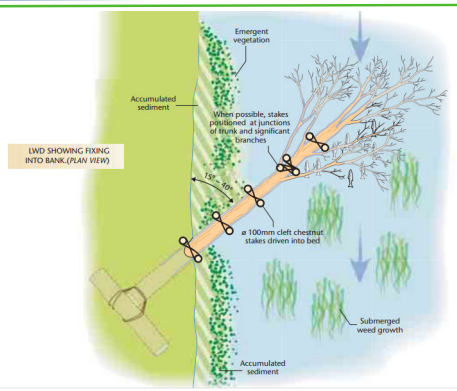

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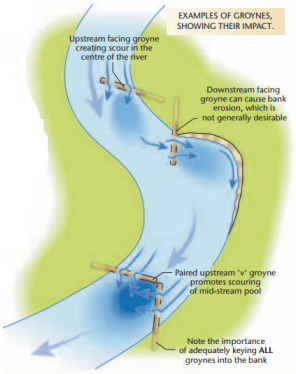

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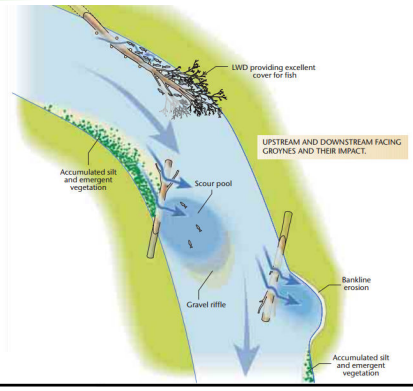

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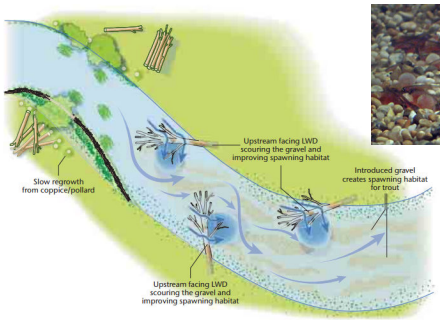
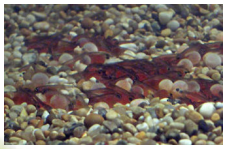
IN CHANNEL DIVERSITY



GRAVELS



RIVER REHAB TECHNIQUES

IN CHANNEL DIVERSITY

PLANTS