Forestry in proximity to water

Where roads and water meets

Flowing water transports insects, plants and seeds downstream. It provides a constant addition of nutrients for many species. Species also use waterways to populate new areas. Dams and incorrectly placed culverts are obstacles for fish and insects and enables them to move along watercourses or between watercourses and lakes to spawn or find food.

In the county of Jämtland every third culvert are placed incorrectly and constitute obstacles for trout to swim upstream to their spawning areas.

There are thousands of culverts that influences large areas of our waters and this what it looks like all over the country. The Swedish Transport administration, forest companies, fishing management areas and road associations resore road culverts every year.

Bridges

Bridges as a means of crossing does not influence the watercourse natural beds or the way the water flows. Most species the live in or around a watercourse can swim up and down without hindrance. However, bridges are an expensive investment.

> **Future problems with erosion can occur if undersized culverts are used and it may have to be changed sooner then expected.**

Arched culverts

In smaller rivers an arched culvert can be used with the same good result as a bridge. A well-proportioned arched culvert makes the water not run too quickly through it. The sides inside the arched culverts are often used by otters and other smaller animals who move along the watercourse.

Pipe culverts

If a pipe-shaped culvert I to be used one can oversize it and place it deep enough so that a natural bed can be maintained through it.
Pipe culverts often increase the speed of the water which can cause problems for insects living in the water bed and fish pass. Future problems with erosion can also occur if the dimension of the culvert is too small. The culvert might have to be replaced earlier than necessary.

Arched culvert
Illustration: Bo Persson

Trout
Illustration: Lotta Strom

Migrating species in water

During dry periods with lower pH in the water fish and insects often escape downstream. An incorrectly placed culvert can become an obstacle for the migration back. As time goes by life in the water course is depleted upstream. When the fish cannot migrate to their spawning areas and both the fish and the populations grow smaller

Trout

The trout's name in Swedish (Öring) derives from its preference to riverbeds with coarse gravel, called 'ör' in Swedish. Trout that live in lakes spend their first period of life in the watercourse where it was hatched.
It lives off insects. Later it swims out into a lake where it begins living off small fish. When it is mature enough to spawn it swims back to the river or stream where it was hatched to spawn. Large trout can become up to a meter in length. The brown trout chooses to spend its whole life in flowing water and does not migrate at all. It only becomes about 30 cm's long.
To have healthy trout populations over time their migrations routes must be free of obstacles. They cannot be allowed to be hindered by dams or culverts. They also need clean bed substrate and patches with gravel and small stones free from silt where they lay their roe.

> **The otter makes long migrations along watercourses and it is therefore important with underpasses that will let the otter pass.**

Otter

The otter belongs to the weasel family and is well adapted to a life in water. The otter is mostly active at night. Tracks by the water's edge give away that there are otters in the area. Sometimes one can see 'slides' in the snow where the otter has rushed down banks. The otter is an accomplished swimmer and a powerful predator that catches its prey in shallow waters. It eats fish predominantly but can vary locally depending on species of prey.

The otter was almost extinct in Sweden. Hunting and the effect of pollution are probably the greatest causes but also hydro power, damage from fishing equipment and traffic accidents has also influenced the population. The otter makes long migrations along watercourses and it is therefore important to that underpasses allows the otter to pass. Measures to help the otter has given positive results and today the population is increasing. It is distributed over a large area of the country but is still rare and exempt from hunting.

Otter
Illustration: Lotta Ström

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