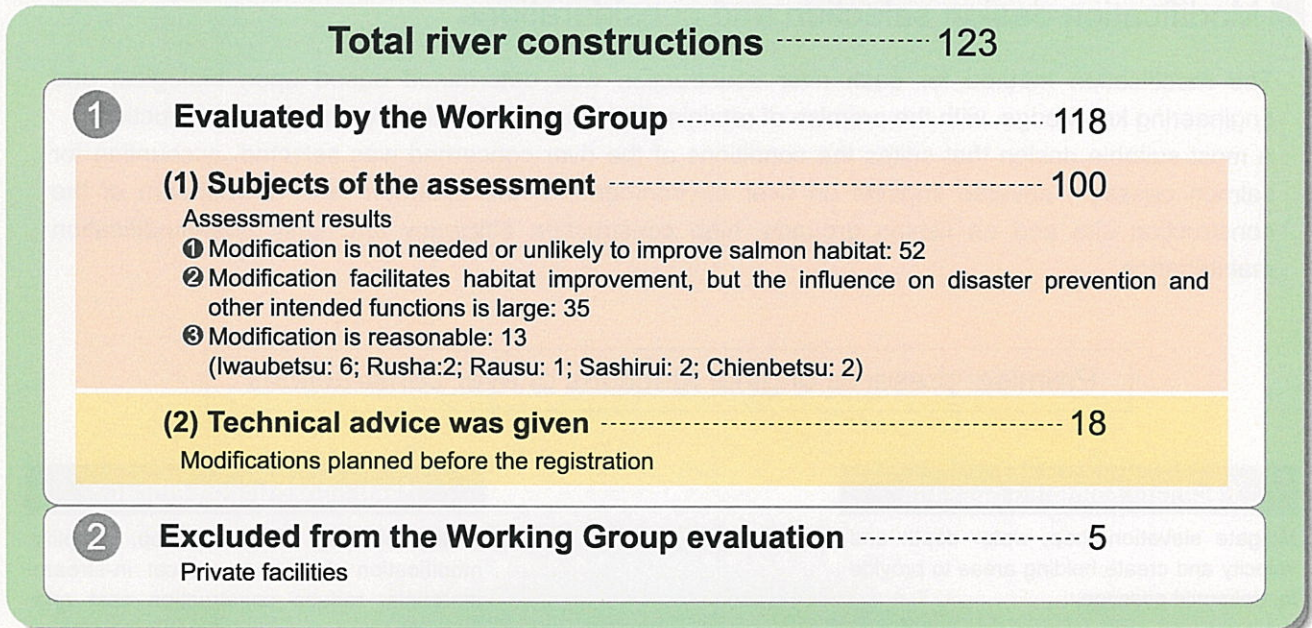


## Assessment results

After the assessment, the Working Group concluded that it was reasonable to modify 13 river constructions located in 5 rivers.

### Breakdown of the river constructions based on the assessment results

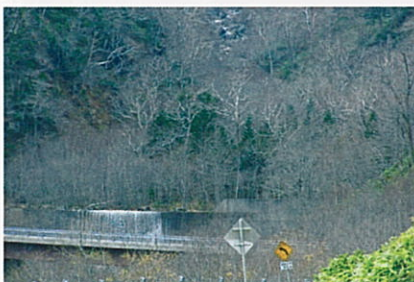


### Classification of the rivers based on the assessment results

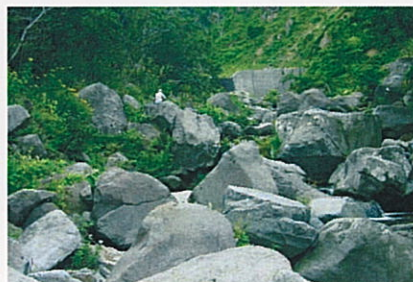
River Name	Assessment results
Horobetsu, Ponputa, Chitorai	Maintain the present form of all river constructions because there is no need for modification or no likelihood of habitat improvement.
Aidomari, Oshorokko, Mosekarubetsu, Okkabake, Shouji, Kennebetsu	Maintain the present form of all river constructions for disaster control and other reasons.
Iwaubetsu, Rausu	Modify the river constructions that were concluded that the influence of modification, in terms of disaster control and other viewpoints, would be minor.
Rusha, Sashirui, Chienbetsu	Modify all river constructions, except those identified unnecessary to be modified.

### Examples of river constructions decided not to be modified

River constructions were decided not to be modified if they met one of the following conditions: the river construction has been installed in a river with a high frequency of mountain-slope disaster (left photograph); it is located in the upstream of piled boulders impeding salmon migration (center); and it currently allows salmon migration (right).



An upper reach in the Rausu River



An upper reach in the Ponputa River



A lower reach in the Iwaubetsu River

# Modification of river constructions

## Principles for modification

### Modification design selection and considerations

The modification method for each river construction was determined based upon biological and engineering knowledge, with the premise of retaining the intended functions of the river construction. A most suitable design that suits the conditions of the river concerned was selected, accounting for salmon passage, adverse impacts on river environments in the upstream and downstream of the construction site and on fishing grounds, high construction efficiency and easy post-modification maintenance.

Premise: preserve original functions of river constructions

#### Facilitate salmonid passage

Mitigate elevation drop, water depth and velocity and create holding areas to provide for salmonid passage.

#### Keep construction efficacy

While reducing elevation drop, simplify modification design, use local in-stream materials, reduce construction cost and time, etc.

#### Avoid impacts on the upstream and downstream environments

Avoid bed degradation and changes in substrate composition and bed morphology in the upstream and downstream of the construction.

### Considerations of design selection

#### Simplify post-construction maintenance

Reduce maintenance time and cost.

#### Avoid impacts of construction on fishing grounds

Avoid disturbing fishing grounds during construction work.

#### Avoid influences of the work on surrounding ecosystems

Avoid adverse impacts of the work on habitat for rare species and other issues.



Modification of a dam in the Akai River

## River constructions with easy fish passage

To facilitate fish passage, fishway design needs to satisfy the following requirements: elevation drop between steps is small; water depth is constant at a certain level; there are both slow and fast currents, providing holding areas; and fish can easily find the passage route.

Even if fish appears to run past the river construction successfully immediately after modification, its long-term success will be difficult particularly if the modification design is inadequate. For example, the modified river construction may cause bed scouring in its upstream and downstream sides and produce excessive sediment flow; debris and trash easily snag the passage route; and the fishway has a complex configuration. These can constrain the maintenance of the dam and fishway in time and cost. Therefore, for determining a design that ensures sustainable fish passage, it is required to evaluate construction efficacy and post-modification maintenance as well as river morphology and geomorphologic settings comprehensively.

### River constructions modified in various ways



Ice-Harbor Type Fishway



Slit Dam

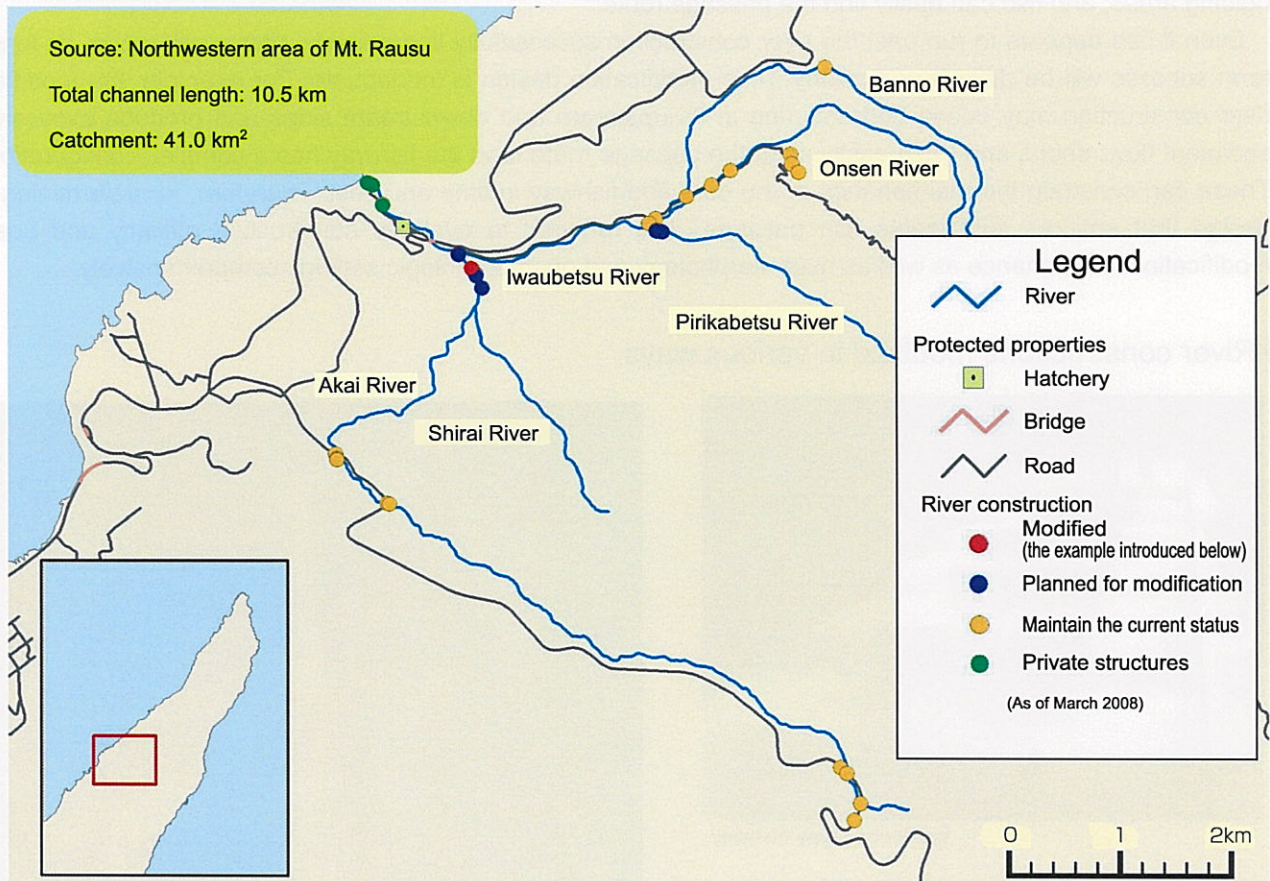


Turn and stair-type Fishway

## Iwubetsu River

### Overview of the river

Source: Northwestern area of Mt. Rausu  
 Total channel length: 10.5 km  
 Catchment: 41.0 km<sup>2</sup>



### Land use and properties

- A town road has been laid along the mainstream.
- Major road facilities are Prefectural Route 93 and a bridge on it. Others are a town road to Shiretoko-goko Lakes and a bridge in the lower reaches, Iwubetsu Hot Spring Resort in the middle and a trail to Mt. Rausu in the upper reaches.
- There is a salmon hatchery in the most downstream watersheds.

### Past disasters

- The 1979 and 1981 typhoons triggered debris flows and swept away part of the town road leading to the hot spring.

### Distribution of river constructions

- A total of 27 river constructions have been installed in the Iwubetsu River catchment (7 on the mainstream).

### Salmonid distribution

- Dolly varden have been observed in the upstream of the confluence with the Banno River (approximately, altitude 150 m).
- Hatch-and-release of salmon and trout has been practiced.

## Modification design

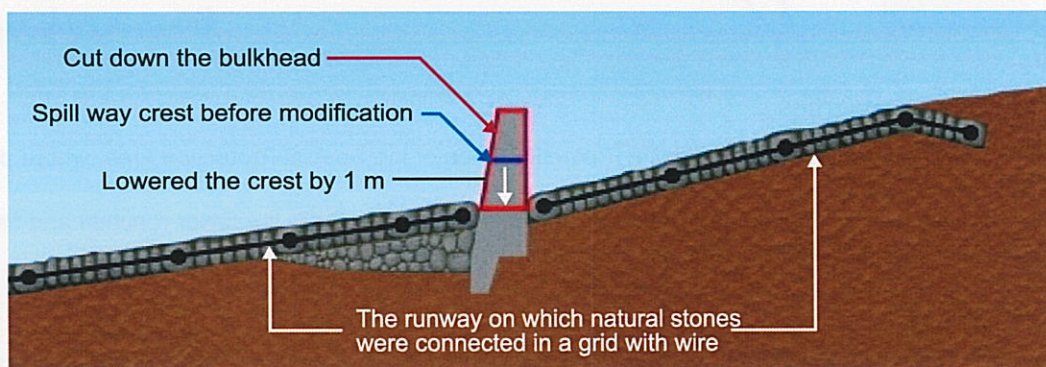
With regard to the check dam on the tributary Akai River (administrative agency: Hokkaido Regional Forest Office), the Working Group's assessment concluded that the influence of the modification on human properties (residences, roads, bridges, etc.) would be minor partly because the river is relatively stable.

The check dam shown below was modified in fiscal year 2006.

### After Improvement



### Before Improvement



### Design Features

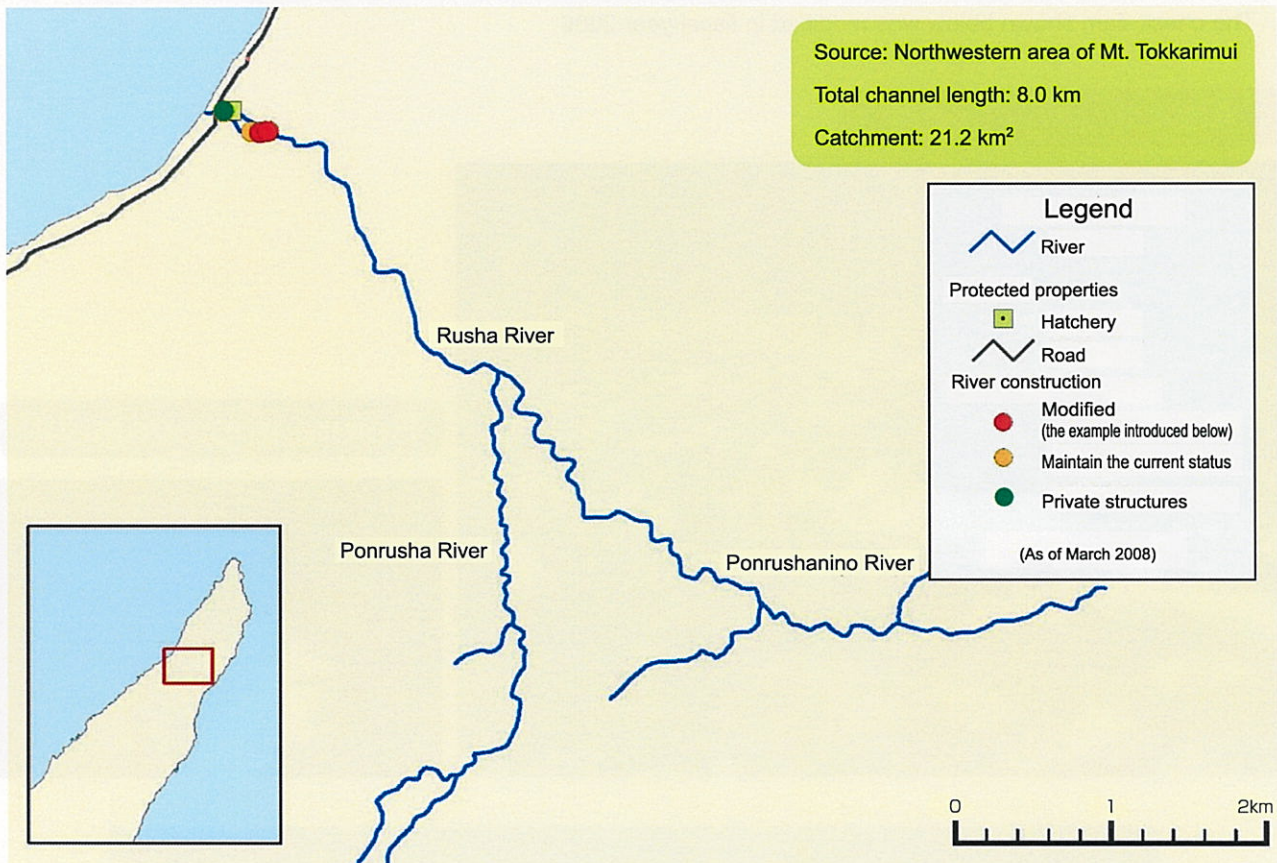
The runway was made experimentally using natural stones to meet the following three conditions: upstream migration is not impeded, the view worthy of world natural heritage status is restored and original erosion control functions are retained.

The dam was cut down by 1 m, and the upstream and downstream sides of the dam were sloped with natural stones. Using a traditional stone assembling technique, the stones were fixed with wire in an irregular arrangement to create a natural appearance.

A field test using pink salmon confirmed passage over the modified dam.

# Rusha River

## Overview of the River



### ● Land use and properties

- The river flows within a National Wildlife Protection Zone of the Special Protection Area, where public access is restricted.
- There are Shiretoko Logging Road, bridges and a salmon hatchery in the lower reaches and fishing grounds in the river mouth.

### ● Past disasters

- The 1972 and 1973 rainstorms carried down sediment and large woods, causing a collapse of the hatchery and damages to the fishing ground and other properties.

### ● Distribution of river constructions

- After the above disaster events, Shari Town and fishery parties requested countermeasures. Three check dams were then installed in the lower reaches. A hatchery weir has also been constructed in the most downstream reach.

### ● Salmonid distribution

- The Rusha River is a river where pink salmon and masu salmon naturally spawn. In fall, brown bears frequently appear to prey on the migrating fish.
- Hatch - and - release of salmon and trout yearlings has been practiced.

## Modification Design

Migrating chum salmon had been observed in the upstream of the check dams (administrative agency: Hokkaido Government) in the Rusha River. However, the previous flow conditions and elevation drop made passage difficult from November through winter when water temperature is low. The Working Group concluded that these two dams should be modified to facilitate salmonid passage. The check dam shown below was modified in fiscal year 2006.

### After Improvement



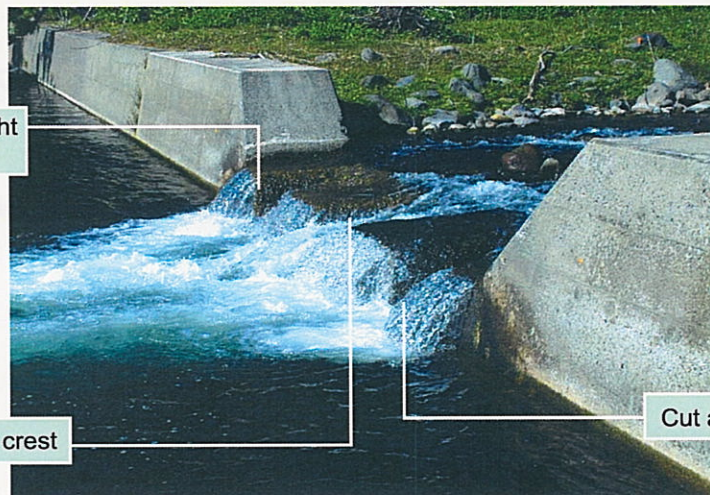
### Before Improvement



Cut a notch on the right side of the crest

Cut down the central crest

Cut a notch on the left side

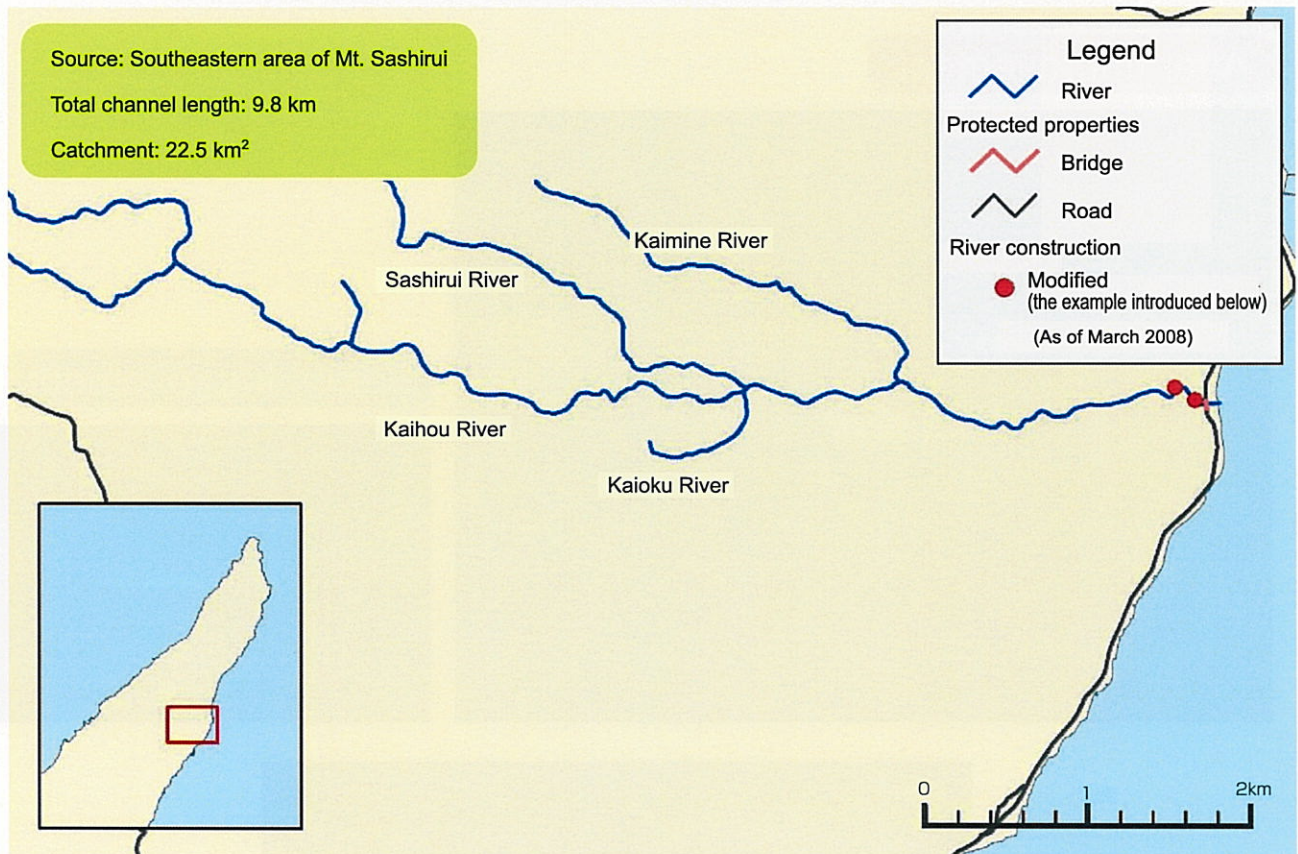


### Design Features

To remove the obstacles posed by currents and the drop, the center of the crest was cut down to create a rectangular opening, a 'slit', and a 'notch' was carved on both right and left sides of the downstream edge of the lowered crest. Field survey after modification found that the number of chum salmon redds increased.

# Sashirui River

## Overview of the River



### ● Land use and properties

- The major roads are Prefectural Route 87 (Shiretoko Park to Rausu Line) and Sashirui Bridge. Other properties include Sashirui Forest Park and residences.

### ● Past disasters

- The 1996 heavy rainfall carried sediment and woods down the river.

### ● Distribution of river constructions

- Two check dams have been installed, both with a fishway facility.

### ● Salmonid distribution

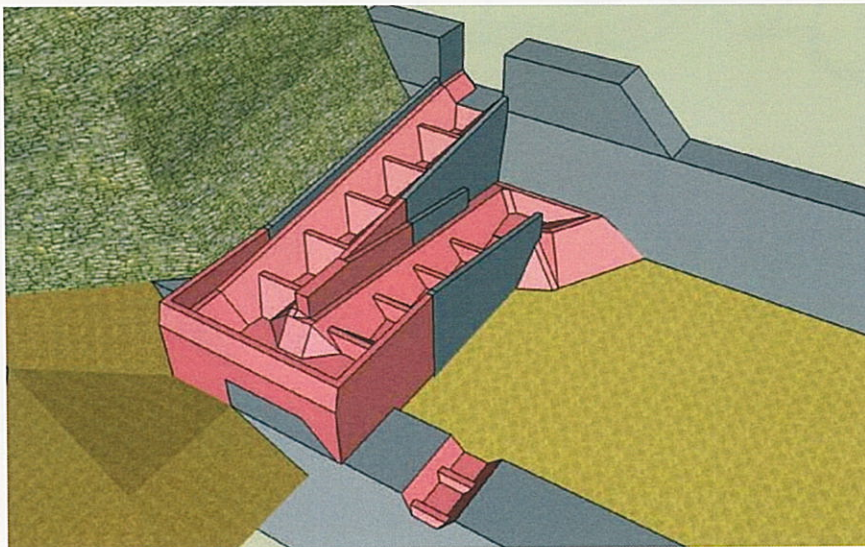
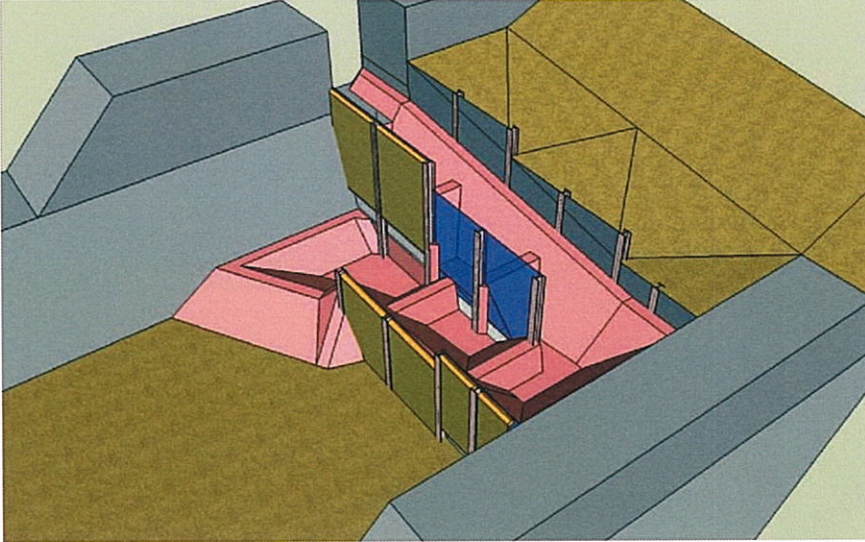
- Chum salmon, pink salmon, masu salmon and dolly varden have been confirmed.
- Hatch-and-release of salmon and trout has been practiced.



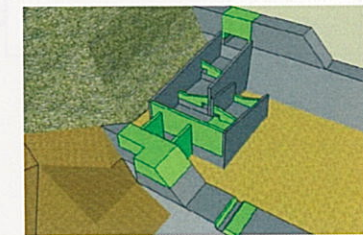
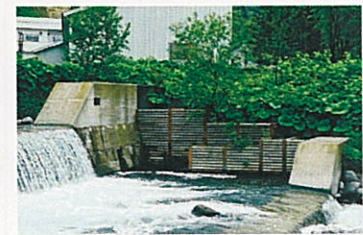
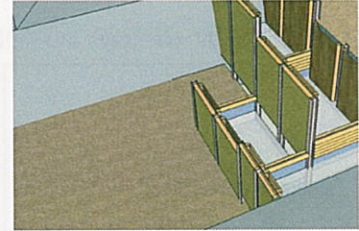
## Modification Design

With regard to two check dams in the Sashirui River (administrative agency: Hokkaido Government), the Working Group concluded that modifying the existing fishway systems (pool style) would likely improve salmon migration. The check dam shown below was modified in fiscal year 2007.

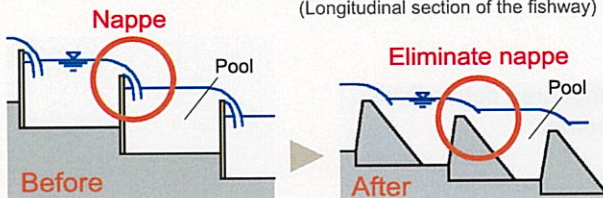
### After Improvement



### Before Improvement



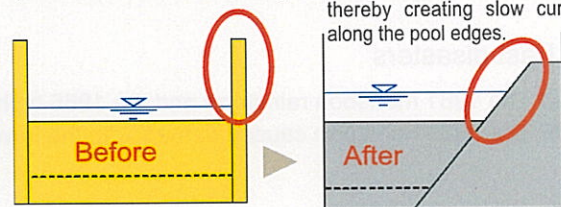
- 1 Reduced the fishway gradient, water velocity and other physical and hydraulic barriers.  
(Longitudinal section of the fishway)



- 2 Modified for simple maintenance.

(The cross section of the fishway)

The sidewalls were inclined, thereby creating slow currents along the pool edges.

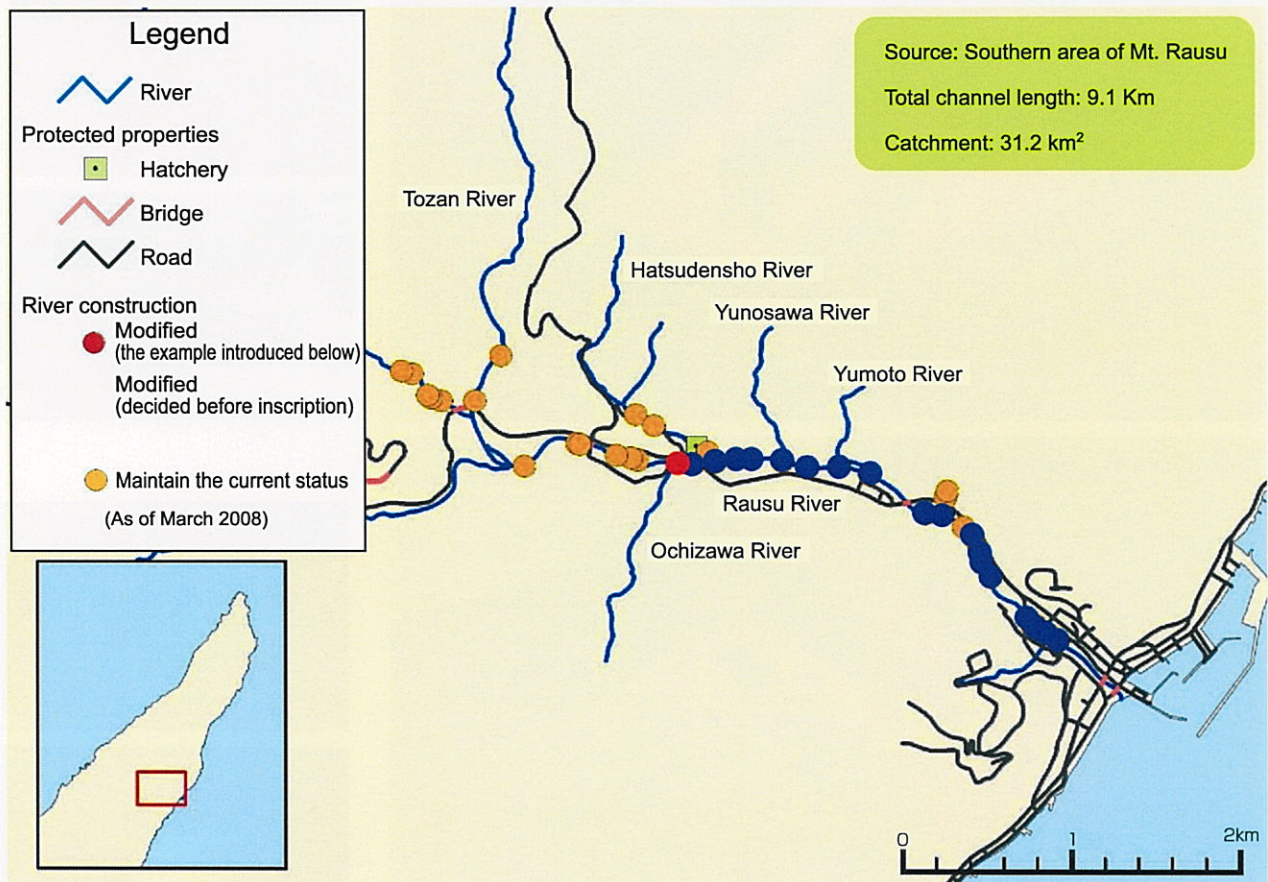


### Design Features

The construction and maintenance costs were minimized, while its design allowed fish migration, the retention of the original functions as a check dam and the conservation of the mountain stream environment. The sidewalls of the pools were changed to trapezoids in order to prevent flow conditions from disturbing fish passage, ensure adequate pool depth and discharge sediment efficiently from the fishway.

# Rausu River

## Overview of the River



### Land use and properties

- National Route 334 (Trans-Shiretoko Highway) has been constructed along the mainstream Rausu River.
- There are a salmon hatchery and a hot spring resort in the middle reaches, and the downtown of Rausu, a National Route, Rausu Fishing Port, and other properties in the lower reaches.

### Past disasters

- The 1961 monsoon rainstorm and the 1965 typhoon triggered debris flows.
- The 1966 rainstorm caused damages in the lower reaches.

### Distribution of river constructions

- A total of 38 river constructions have been constructed in the Rausu River catchment. Of these, 18 groundsills, constructed by Hokkaido Government, were modified by installing fishway facilities.

### Salmonid distribution

- Chum salmon, pink salmon and dolly varden have been confirmed.
- Hatch-and-release of salmon and trout has been practiced.