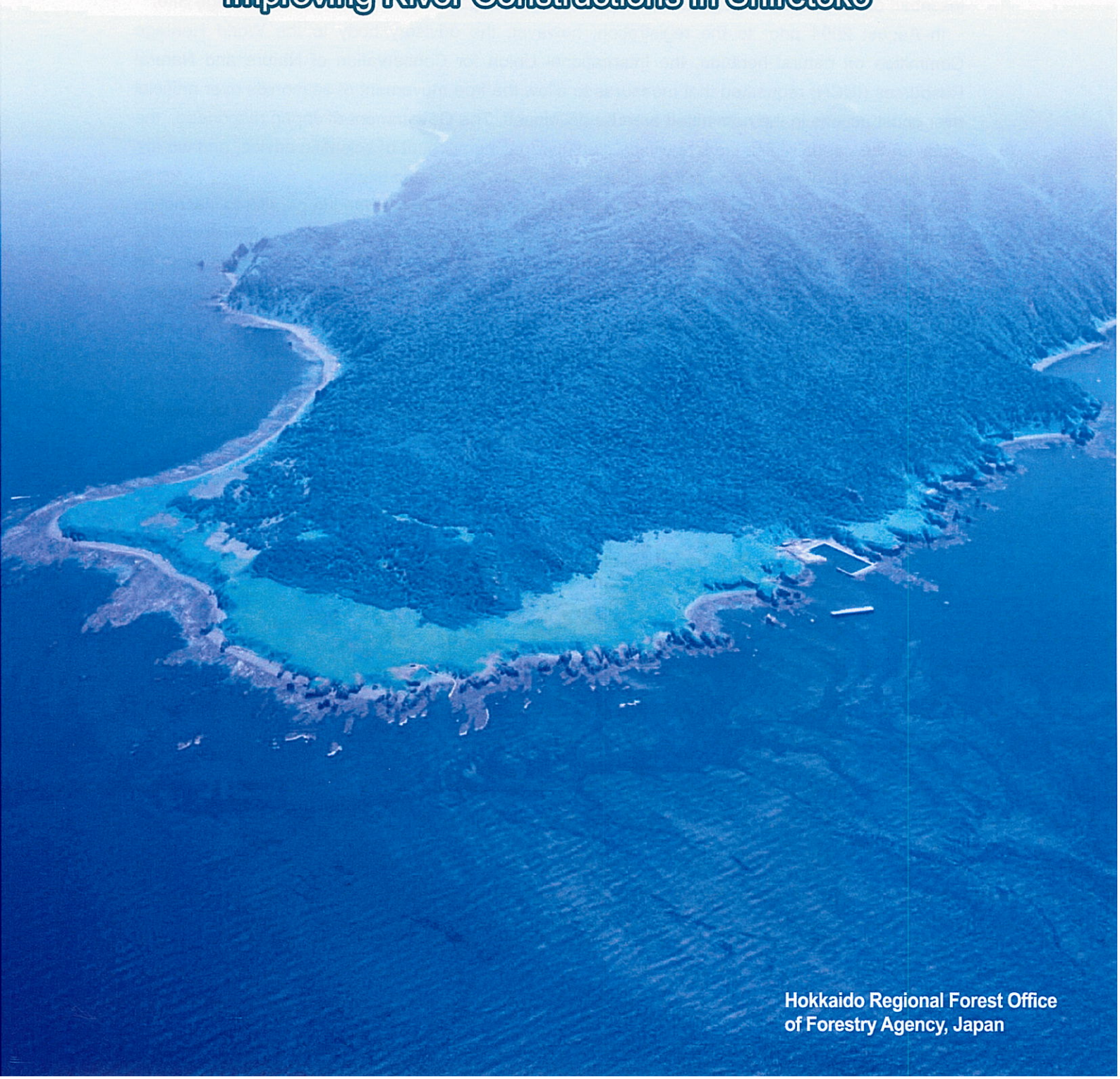
Challenge to Create Dams That Protect Our Lives and Support Salmon

Improving River Constructions in Shiretoko



Hokkaido Regional Forest Office
of Forestry Agency, Japan

Introduction

The Shiretoko Peninsula is located between the Sea of Okhotsk and the Nemuro Strait at the northeastern tip of Hokkaido Island. It retains diverse ecosystems comprising the primeval environments and rare wildlife species from the coastline to the peaks of 1,600-m high backbone mountains. Abundant phytoplankton transported by the seasonal sea ice supports the rich marine ecosystem, and chum salmon and pink salmon run upstream in spawning seasons. Salmon migrating upstream to spawn become a food source for terrestrial species, such as the brown bear and eagle species. Salmon died after spawning are decomposed by aquatic and terrestrial organisms, returning nutrients to forests, lakes and rivers.

Thus, highly valued for its unique ecosystems formed by the interaction between the marine and terrestrial environments and the important animal and plant species, the Shiretoko Peninsula was inscribed on the World Heritage List in July 2005 as the Japan's third World Natural Heritage Site.

In August 2004 prior to the registration, however, the advisory body to the World Heritage Committee on natural heritage, the International Union for Conservation of Nature and Natural Resources (IUCN) requested that measures to allow the free movement of salmonids over artificial river constructions in the nominated area be developed. The Government of Japan responded, 'the study on the needs of fish ladders will be continued taking account of scientific advice, and we are prepared to take measures including installing ladders on as-needed basis'.

To address this issue, the River Construction Working Group was formed in parallel to inscription on the World Heritage List in July 2005, having a joint office of three bodies - Ministry of the Environment, Forestry Agency and the Hokkaido Government. The River Construction Working Group held 12 meetings by January 2008 and conducted the assessment of the constructions located in the rivers within the registered area and in their lower reaches.

This booklet was compiled to promote wide public understanding about the pertinent organizations' efforts against river constructions in Shiretoko. We hope readers will, after reading this booklet, enhance their understanding about the role of disaster prevention works and the efforts to improve these constructions for salmon migration.

March 2008
Hokkaido Regional Forest Office

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Landform, geology and river characteristics of Shiretoko

Landform and geology of Shiretoko

The name Shiretoko is derived from the Ainu word 'Shireutoku', which means 'the end of the mother earth.' Located at the northeastern tip of Hokkaido Island, Shiretoko is a narrow peninsula with a length of approximately 70 km and width of 15 km at its central part. It is lined with the Sea of Okhotsk in the west and the Nemuro Strait in the east. The Shiretoko mountain range, including the highest peak, Mt. Rausu, at its center and Mts. Shiretoko, Iou and Onnebetsu, runs along the center of the peninsula. The peninsula is steep with little flat ground between the peaks and along the coastline.

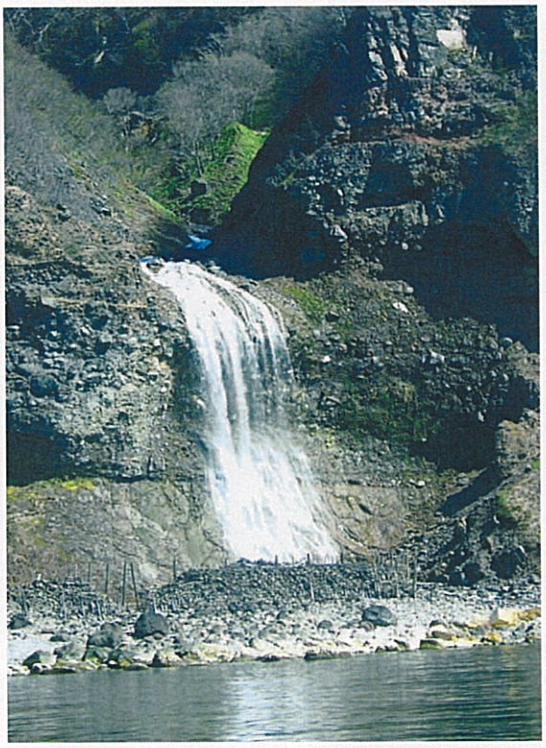
The Shiretoko Peninsula is formed by volcanic activities, and the geology consists of fragile rocks called green tuff and volcanic ejecta. It is also known that some areas undergo metamorphic changes by volcanic activities, and frequent land failures and landslides occur in the peninsula. As a result, sediment and rocks are actively supplied into the rivers, indicating that the river environment is geologically unstable.

Shiretoko exhibits steep slopes from the mountain peaks to the coastline.

Rivers in Shiretoko

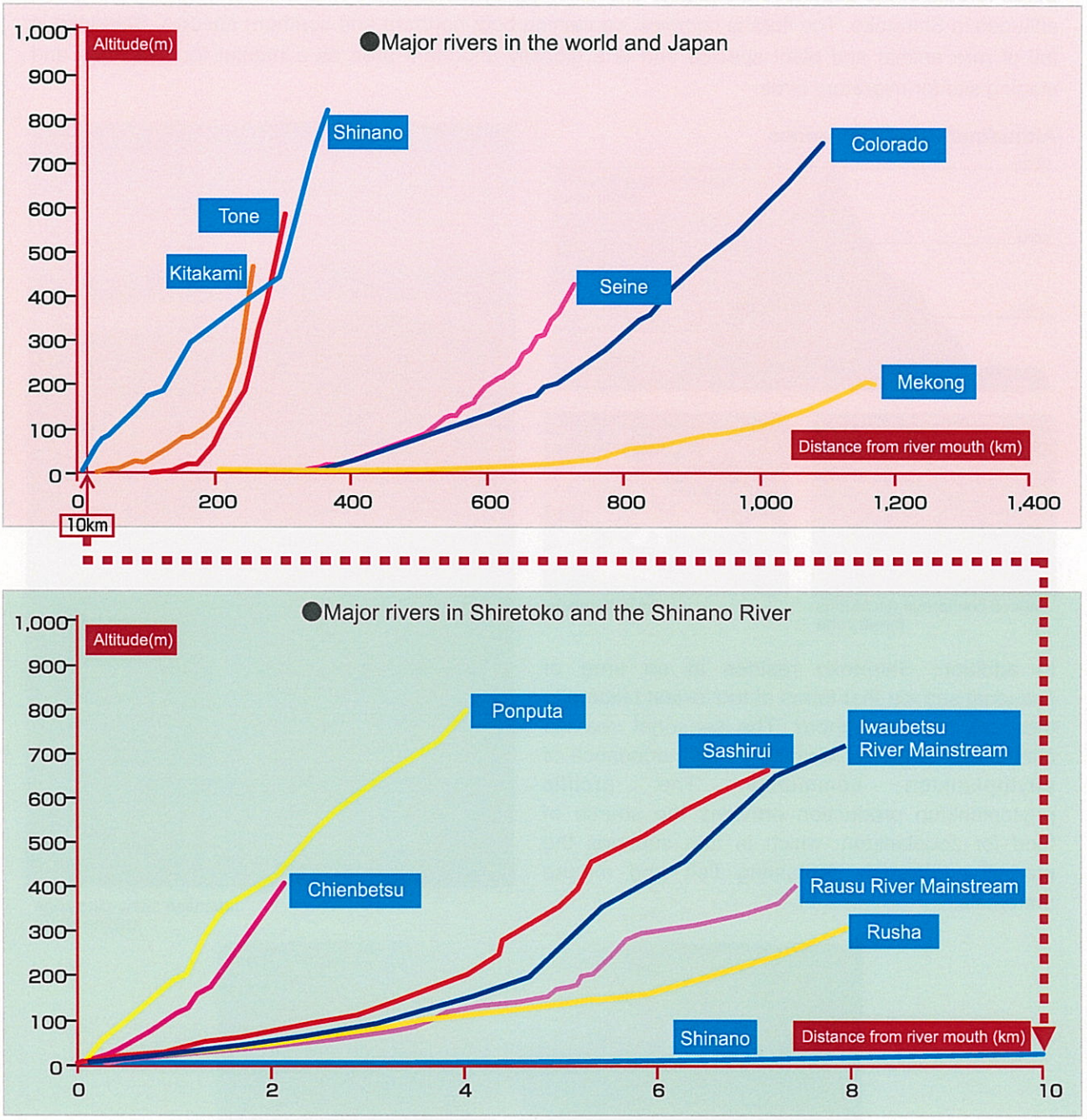
Japan is one of the most mountainous countries in the world. The rivers are characterized by their higher gradient relative to the world's major rivers, as well as their short lengths and small catchments. Rainfall quickly travels down in the rivers, abruptly changing their discharge.

Rivers in the Shiretoko Peninsula originate in its precipitous mountain range in the center of the peninsula. Most of the rivers directly empty into the ocean while retaining their mountain-stream-like appearances. Rivers in Shiretoko are particularly shorter and steeper than other Japanese rivers. Many of the rivers in the tip of the peninsula form a deep canyon and cascade off the coastline cliff into the ocean.



A river cascading into the ocean

Comparison of riverbed gradient



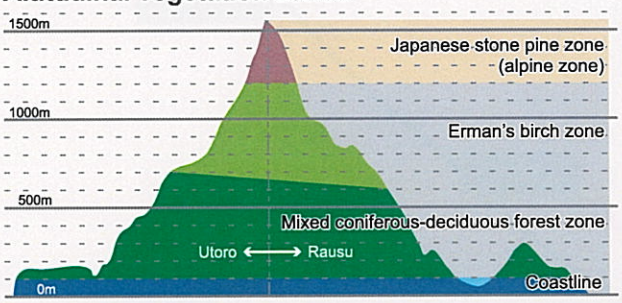
Rivers in Shiretoko are short and steep.

Nature and salmonid fishes in Shiretoko

Natural environment of Shiretoko

Scrub forests of the Japanese stone pine and other alpine plant communities are found at relatively low altitudes in Shiretoko. The flora is complex, containing both northern and southern species. Shiretoko is full of rare animal and plant species and is a globally important area as a habitat for sea birds and staging site for migratory birds.

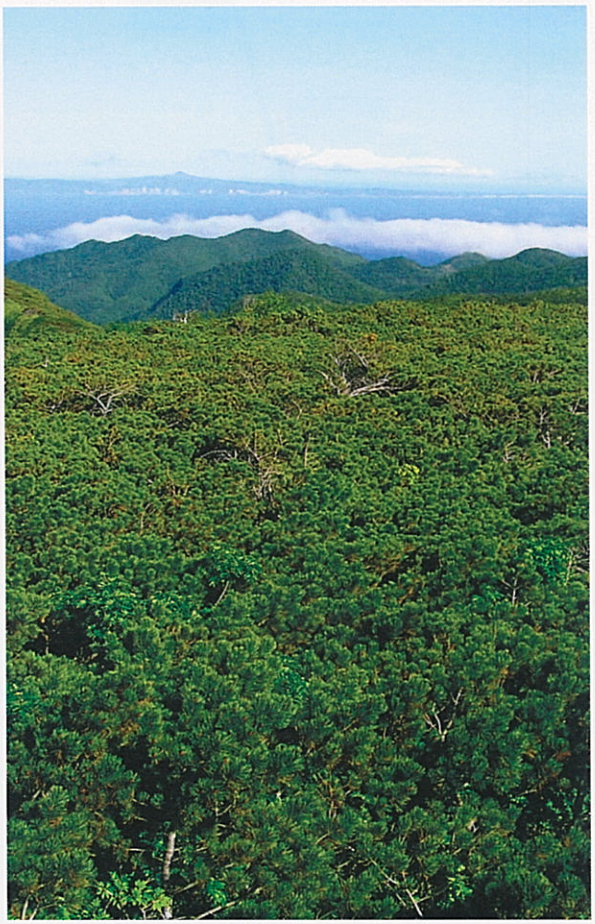
Altitudinal vegetation zones



Mixed coniferous-deciduous forest zone

Viola kitamiana

In addition, Shiretoko resides in an area of seasonal sea ice that forms at the lowest latitude in the northern hemisphere. The seasonal sea ice contributes to the extraordinary high abundance of phytoplankton community. The prolific phytoplankton production provides the source of food for zooplankton, which in turn supports the marine ecosystem containing fish and marine mammals.



Japanese stone pine zone
(alpine zone)

Shiretoko is the southernmost point in the northern hemisphere where sea ice reaches.

Eight orders, 12 families, and 42 species of freshwater fish have been found in the rivers of Shiretoko. Twenty-eight species, about 70 % of the total number of species, are diadromous migratory fish (i.e., fish that spends part of their life cycle in the sea). It is characteristic that many of the fish species depend upon the ocean. Among them, salmonids are a food source for the brown bear and the Blakiston's fish owl, representing the Shiretoko's wildlife community.

Salmonid species in Shiretoko

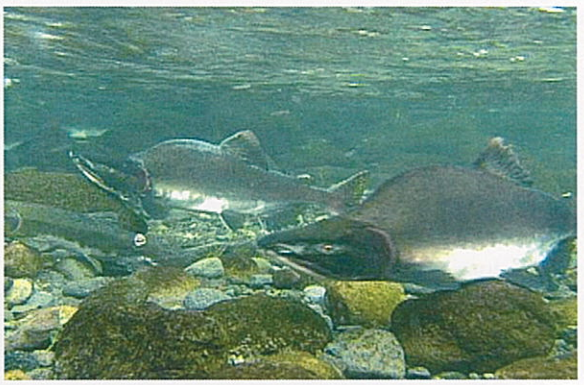
Six salmonid species naturally reproduce in the rivers in Shiretoko. The representative species, chum salmon, pink salmon, masu salmon and dolly varden, are introduced below.

● Major salmonid species in Shiretoko

Chum Salmon

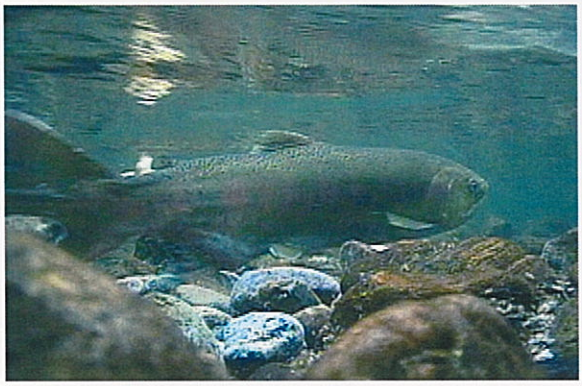
Total length: 65cm. Migrates upstream from September to February. The regions of major distribution in Japan are Hokkaido, Tohoku and Hokuriku. Called 'akiaji (the taste of autumn)' in Hokkaido. An important fishery resource.

Pink Salmon



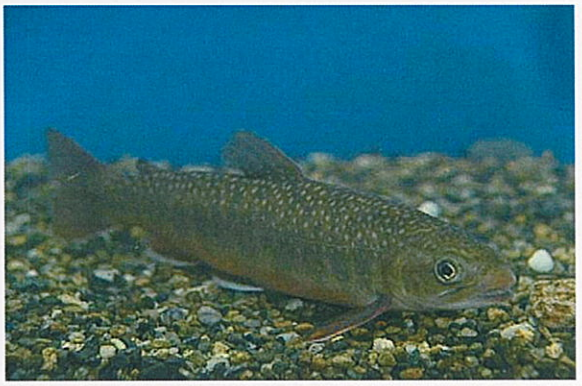
Total length: 55cm. Migrates upstream from September to October. Their natal rivers in Japan are mostly limited to the coastal areas of the Sea of Okhotsk and the Nemuro Strait. In a breeding season, males develop a large hump on their back. Also called humpy salmon.

Masu Salmon



Total length: 60cm for anadromous (sea-run) form and 30 cm for landlocked (stream-resident) form. The anadromous form migrates upstream from March to May (cherry blossom season) and stay in freshwater to mature until its spawning season between September and October. The landlocked form is called 'yamame.'

Dolly Varden



Total length: 20cm. The spawning season is from October to November. Inhabits the mountain areas of Hokkaido except in the southern region. Found near the river mouth in some areas of the Shiretoko and Shakotan Peninsulas. Many spend their entire life in rivers, but the sea-run form also occurs in the Shiretoko Peninsula.

Many of these salmonid species enter rivers from the ocean in their spawning season and spawn in gravel deposits on the streambed. The maintenance of salmonid species necessitates to ensure the connectivity of the ocean and rivers and to preserve river habitat available for spawning.

Livelihood of local citizens and river constructions

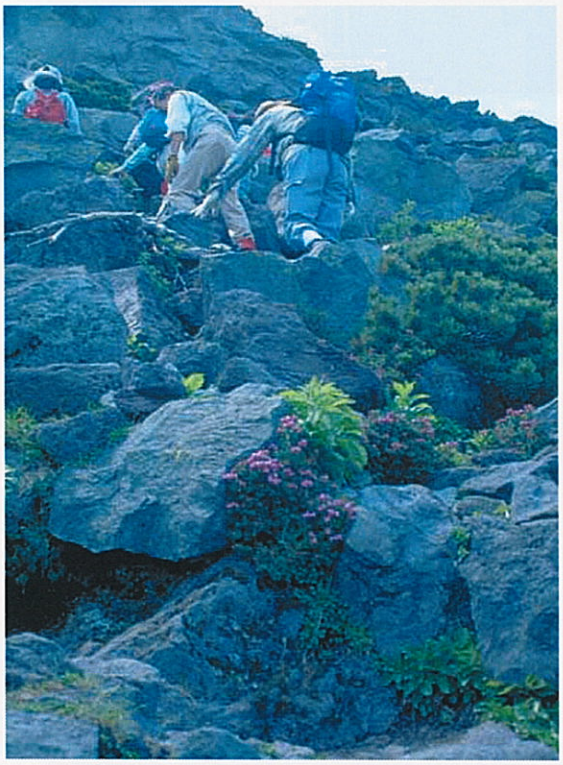
Relationships between local livelihood and rivers

Industries in Shari and Rausu

Salmonids returning from the Pacific Ocean to Shiretoko support the regional fisheries. In Shari and Rausu Towns, salmon and trout commercial fishing has been actively practiced with their catch in value making up 20 % of the total for Hokkaido. The region is also a most popular tourist spot in Hokkaido, attracting over 2.3 million visitors every year. Shari and Rausu Towns provide accommodations and visitor centers, playing a role as the foothold for sightseeing in Shiretoko. The Shiretoko region features various aspects: rare animal and plant species inhabit the rich natural environment, which is also home to many people depending on them; and mountains and rivers are formed by the unique topography and geology, attracting a large number of visitors.

● Nature and Industries in Shiretoko

Shiretoko-goko Lakes



Mountaineering in Mt. Rausu

An event that uses aquatic resources

Salmon and trout commercial fishing has been actively practiced.

Unpredictable natural disaster

On the other hand, because of its fragile geologic conditions, Shiretoko is a region with high risk of mountain-slope disasters. In the past, unexpected heavy rainfalls resulted in serious damages. One example was an incident in which debris flow swept away and buried roads and buildings. Tourists were left stranded in the site. Such natural disasters have threatened the livelihood of local citizens over and over.

Disaster control structures, including check dams, have been installed as measures to prevent or to mitigate these damages. The provision of new structures has prevented further sediment disasters, enabling construction of roads, bridges and other facilities as regional economic infrastructure.

● Record of major typhoon and cyclone disasters

[Shari]

Year	Disaster events
1979	Collapsed riverbanks; destroyed bridges and buildings; lost salmon set nets
1981	Destroyed roads; disrupted traffic
1988	Destroyed roads and buildings; damaged farmland
1992	Destroyed roads; inundated residences
1999	Landslide; inundated residences
2002	Destroyed roads

[Rausu]

Year	Disaster events
1935	Destroyed bridges and buildings; inundated residences; disrupted traffic
1947	Destroyed power generation facilities and bridges; inundated residences; landslide (killed one)
1961	Debris flow
1965	Destroyed roads, bridges and residences
1971	Landslide; lost a 'hoshiba', a facility to dry seaweed
1972	Destroyed bridges, roads and residences; landslides (killed three)
1979	Destroyed residences
1981	Destroyed residences; landslide (killed two)

Adapted and extracted from the Shari Town Regional Disaster Prevention Program and the History of Rausu Town.

Debris flow damage in the Iwaubetsu River in August 1981

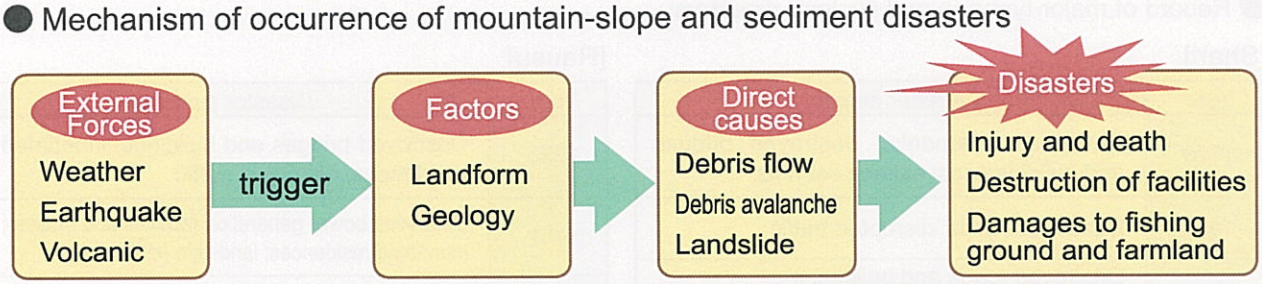
For the protection of human life and property

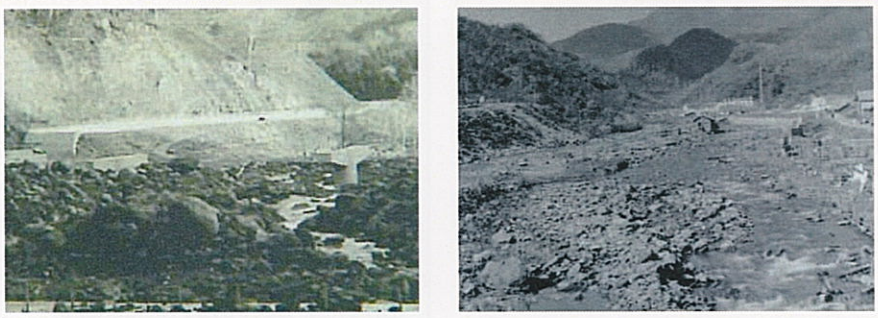
Factors causing disasters

The natural disasters caused by the movement of sediment, gravel and rocks are called 'sediment disaster'. Of these, those occurring in mountains are called 'mountain-slope disasters'.

Sediment movement is induced when external forces, such as weather conditions, earthquakes and volcanic activities, coupled with geomorphologic, geological and/or other site conditions. A steep slope with fragile ground is generally prone to debris flow, when heavy rainfall, earthquake or other forces come into play. Debris and sediment are transported downstream in elevated stream flow, causing a disaster in case that residential areas, buildings, roads, bridges and other properties are present in the lower reaches. About a half of those killed and lost by natural disasters in Japan are perished in sediment disaster.

Mechanism of occurrence of mountain-slope and sediment disasters





Debris flow damages in the Rausu River in September 1961

Purposes and functions of disaster prevention facilities

Check dams and other disaster prevention facilities have been installed to prevent or mitigate debris flow damages. The basic approach of such measures is to control sediment movement that causes a disaster.

Disaster control facility prevents the flow of a large amount of sediment at a time by controlling riverbed incision and mountain slope failure. This in turn prevents mountain-slope and sediment disasters in the lower reaches. Riverbed stabilization in the headwater reaches also promotes forest maintenance and development.

Forest maintenance and development by soil conservation facilities

Check dams can prevent sediment disasters and facilitate forest development.