

Environmental Conservation Efforts for Rivers

~ A Habitat-oriented Approach ~

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History of the River Act

1896

Birth of modern river management system

Flood management

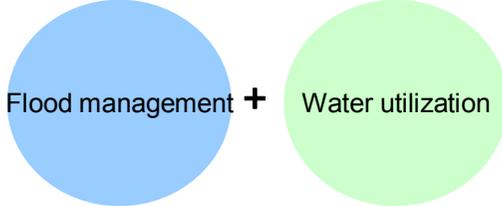


1964

Establishment of systems for systematic flood management and water utilization

- Introduction of integrated management system for river systems
- Establishment of water utilization rules and regulations

Flood management + Water utilization

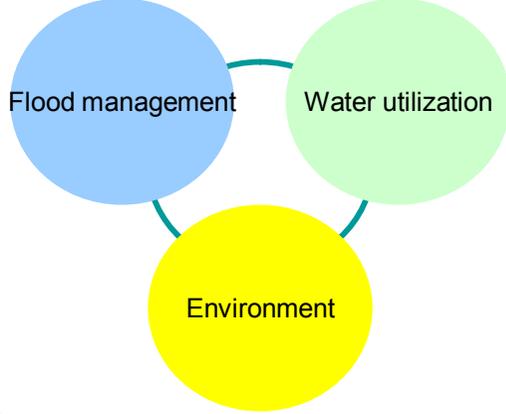


1997

Establishment of integrated river management system for flood management, water utilization and environmental conservation

- Improvement and conservation of river environment
- Introduction of a system for river planning reflecting the opinions of local community

Flood management + Water utilization + Environment



Nature-oriented River Works

Moizari River (Hokkaido)



↑ Before (May, 1994)

↓ After (August, 2004)



nature-oriented approach not without problems

- Since the issuance of the ministerial circular concerning the scheme for nature-oriented river works in 1990, various creative efforts have been made.
- In many of the projects that have been carried out, however, appropriate consideration was not given to site-specific environmental characteristics and methods used at other sites were simply imitated without taking site-specific conditions into consideration.

魚巢を作っても砂で埋まり、無理に航行させた川が求められる。国土交通省が進める自然を生かした川づくりをめぐる、国交省の専門家委員会が調査した河川の9割で趣旨に反した工事が行われていることが分かった。年に数千億円も費やす工事の大部分が不適切な工事だったことで、国交省は、異例の「不適切な工事例をつくり、指針を全国の自治体などに配布、無駄な河川工事をなくすよう求めている。(三枝玄太郎)

国交省が多自然型川づくりは、河川が本来持つ生物の生育環境を生かし、美しい自然景観をつくり出す事業。平成2年から進められ、これまでに直轄、補助事業合わせて3万件近くが行われてきた。

平成14年度の場合、河川工事全体約5500カ所のうち約7割が多自然型川づくり事業として実施されている。国直轄、補助事業だけで河川事業費は14年度当初予算で約9800億円。約7000億円が多自然型川づくり事業と推測される。

本来、多自然型川づくりの事業が想定していたのは、河原に草花が生い茂り、ピオニア(生物の生息場所となるよう環境を整備した場所)がある川づくり。川が自然のまま流れ、コンクリート製の護岸は必要最小限にするはずだった。

しかし、国交省河川局の諮問機関「多自然型川づくりレビュー委員会」(委員

長・山岸哲山 階鳥類研究所 所長)が、12年度から16年度に実施された河川の改良復旧事業や災害後の大規模改修事業など100河川を調べたところ、全体の7割でコンクリート護岸を付けていた。また9割では川幅が同じのまま、川底が浅くなっていった。レビュー委員会が集めたひどい例では、堤防が土でできて自然が豊かだったのに、コンクリート護岸で覆

ってしまったケースや、無理に川を航行させた結果、川岸の土砂などが少しの増水で流されてしまったゲースがあった。魚のすみやすい魚巢ブロックを設置したが川の土砂がたまり機能しない例などもあった。

失敗例のまとめは、扱役所が公共事業のあり方を自己批判することで珍しいが、それだけ危機感が大きいともいえる。

例えば、なぜ土の堤防をコンクリート護岸で覆ってしまったのか。調べた結果、自然の素材に由来する

国交省が不適切な一例として挙げた工事。魚巢ブロックを護岸にとりつけたが、ブロック前に土砂がたまり魚はすめない (国交省提供)

自然生かした川づくり
9割が
不自然

など、自然に優しいコンクリートの護岸を作ればコンクリートでも事足りると工事担当者も誤解していた。国交省河川局の担当者は「誤解の蔓延は予想以上」という。自然を生かした川づくりには河川工学のほかに、生態学の知識も必要。こうした専門家は極めて少なかったのも誤った川づくりの原因とみて、国交省はアドバイザーを現地に派遣したり、河川技術者を対象に研修を実施することなどを検討している。

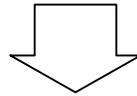
Nature-oriented river works
Ninety percent are not
nature-oriented

Sankei Shimbun, January 9, 2007

From "Nature-oriented River Works" to "Nature-oriented River Management"

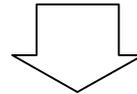
Recognized problems

- Nature-oriented river works are not supposed to be special things to do, but, on average, recent projects have been less successful than expected although there have been some successful projects.
- Nature-oriented river works are difficult to accomplish as part of post-disaster restoration projects because the time available is limited.



■ Recommendations made by the Nature-oriented Works Review Committee (May, 2006)

From "nature-oriented river works" to "nature-oriented river management"



■ Basic Policy for Nature-oriented River Management (October, 2006)

The Implementation Guideline for Nature-oriented River Works adopted in 1990 was abolished, and the Basic Guideline for Nature-oriented River Management was adopted to guide nature-oriented river management efforts.

Basic Guideline for Nature-oriented River Management

1. Definition of "nature-oriented river management"

River management performed with the aim of conserving or creating natural river habitats and diverse riverscapes, taking all natural processes of a river into account and giving consideration to harmony with community life and local history and culture

All natural processes of a river such as erosion, sediment deposition and sediment transport are taken into consideration.



Consideration is also given to community life and local history and culture.



2. Scope of application

Nature-oriented river management is fundamental to all river management efforts and is applicable to all activities performed in river management including investigation, planning, design, construction and maintenance for all Class A rivers, Class B rivers, and Class A or Class B equivalent rivers.

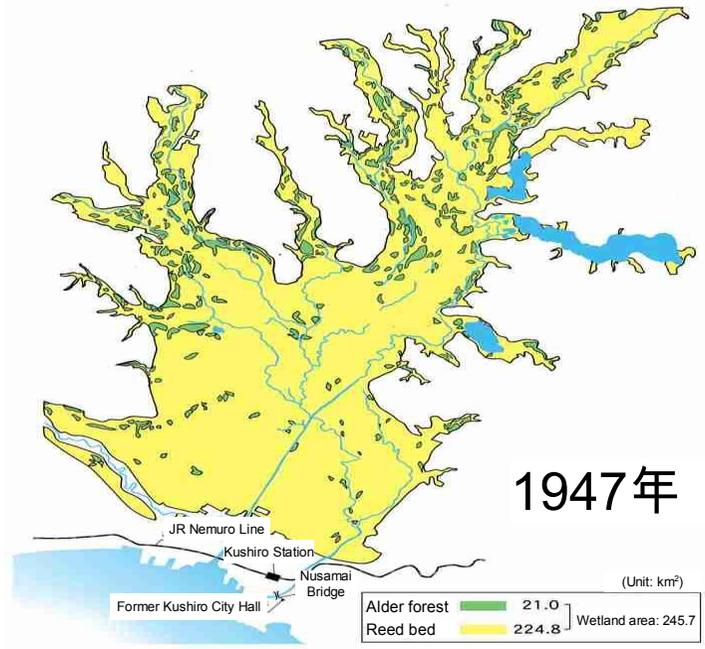
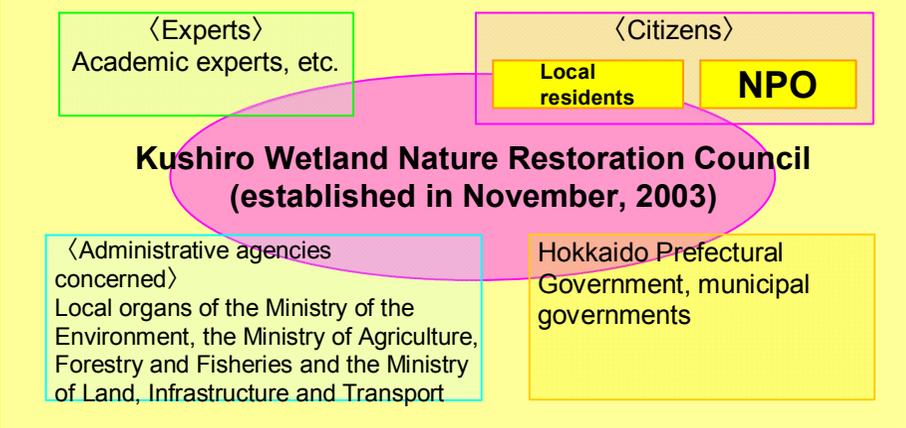
3. Basic policies

- Wherever possible, **natural characteristics and mechanisms are used effectively.**
- River management that **takes the workings of nature into consideration**
- River management that is connected to not only habitat conservation and **creation but also community life and local history and culture**
- River management that **takes into consideration river management** in general including investigation, planning, design, construction and maintenance

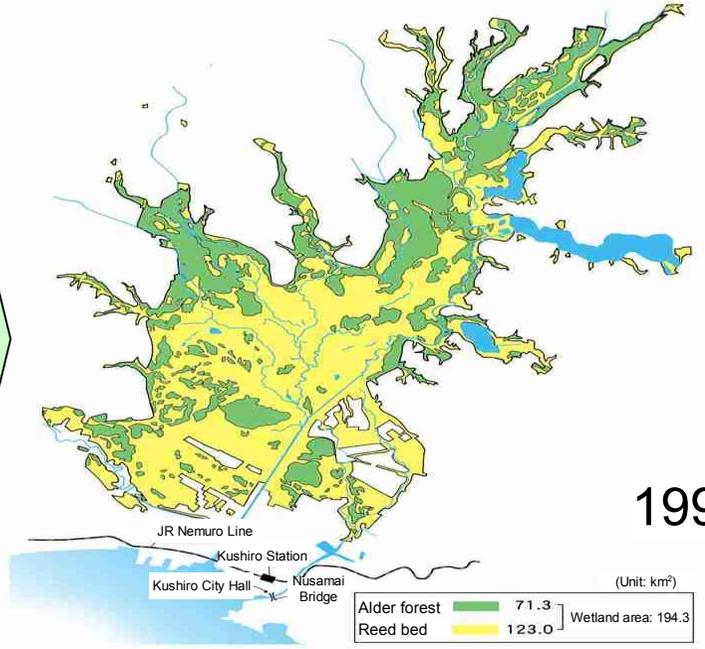
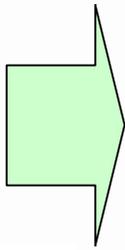
Nature Restoration Efforts (Kushiro Wetland)

- As the economic activities in the drainage basin have expanded in recent years, the area of wetland has decreased considerably.
- The long-term objective is to restore the state that existed before the registration of the wetland under the Ramsar Convention (1980). The short-term objective is to maintain the state that existed in 2000.
- In March, 2005, the Nature Restoration Council developed a nature restoration scheme for the Kushiro Wetland.

Framework of Nature Restoration Council



Wetland area: 245.7 km²

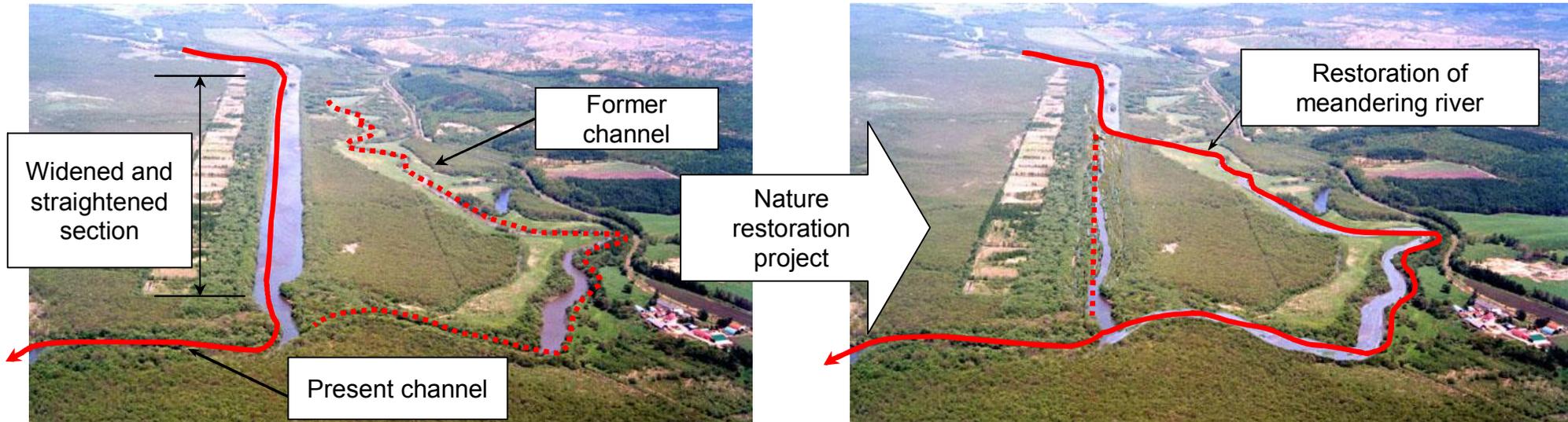


Wetland area: 194.3 km²

Nature Restoration Efforts (Kushiro Wetland)

- As part of the ongoing nature restoration efforts, the restoration of the meanders to the Kushiro River in the Kayanuma area is planned.

Planned restoration of meandering channel



Straightened channel of the Kushiro River (Hokkaido)

Meander restoration by use of former channel

Nature Restoration Efforts (Maruyama River)

With the aim of returning oriental white storks (*Ciconia boyciana*) to nature, local residents and various government entities (Ministry of Land, Infrastructure and Transport, prefectural government (river, agriculture and forestry, environmental departments, etc.), municipalities) are jointly working for nature restoration.

Oriental White Stork Reintroduction Council

Ministry of Land, Infrastructure and Transport (Toyooka Office of River and National Highway)
Hyogo Prefectural Government (environmental departments, agriculture and forestry departments, river departments, education departments, etc.)
Toyooka Municipal Government, Kinosaki Municipal Government, Hidaka Municipal Government, Izushi Municipal Government



Wetland



- Creating a marsh in a flood detention area
- Creating a river/land ecotone, etc.

Rice paddies



- Promoting environmentally friendly agriculture
- Ensuring the continuity of rivers, water channels and rice paddies, etc.



Fishway to connect rice paddies and water channels

Rural forest



- Management of rural forests by citizens, volunteers, etc.
- Planting red pines to restore oriental white stork habitats, etc.



Red pine planting

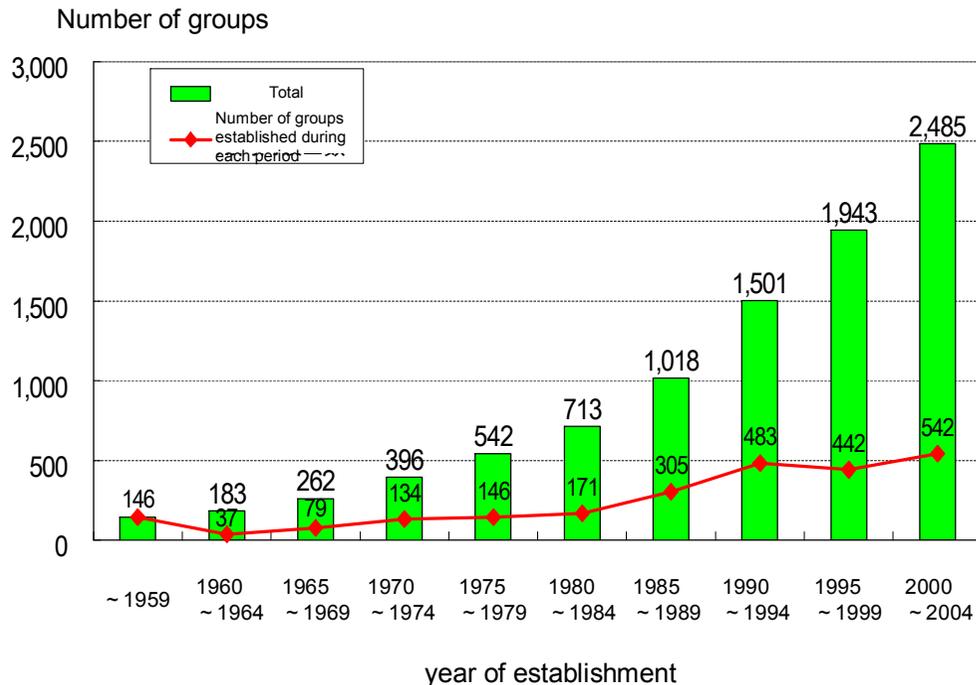
Environmental education



- Institution of environmental education programs
- Providing opportunities for hands-on activities, etc.

Cooperation with citizens groups

< Changes in the number of citizens groups engaged in river- and water-related activities >



There are 345 more groups whose year of establishment is unknown.

Source: Japan River Association, October, 2004

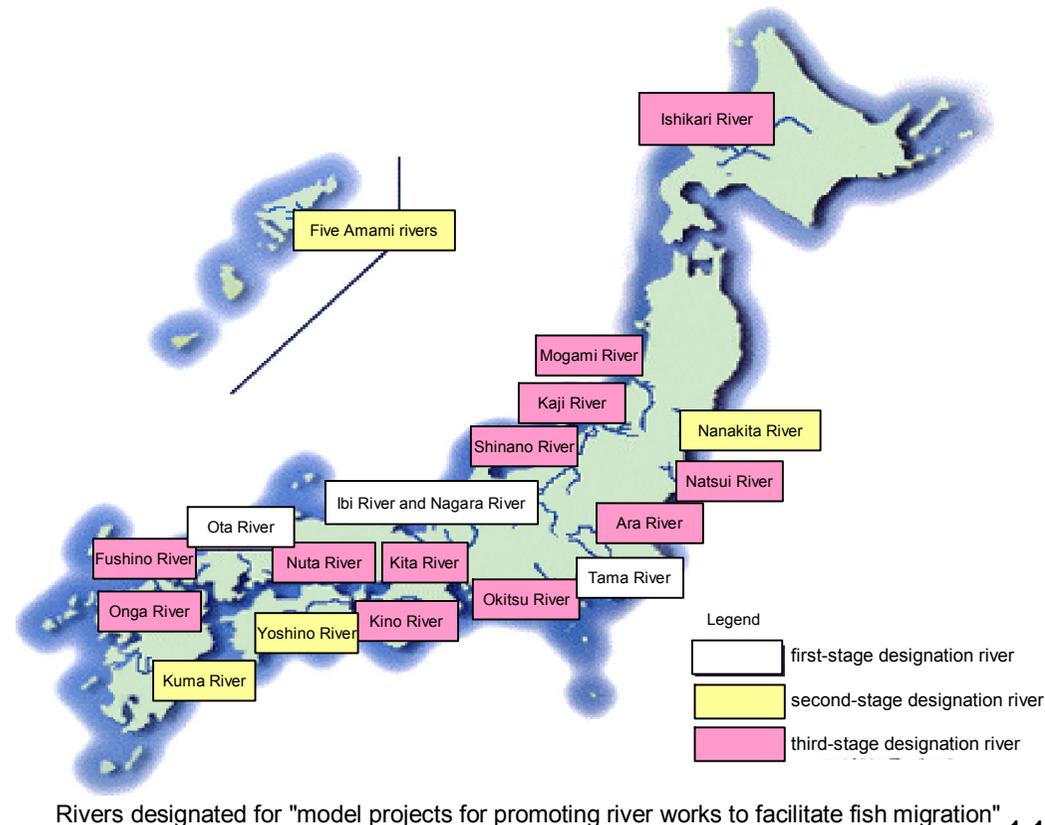
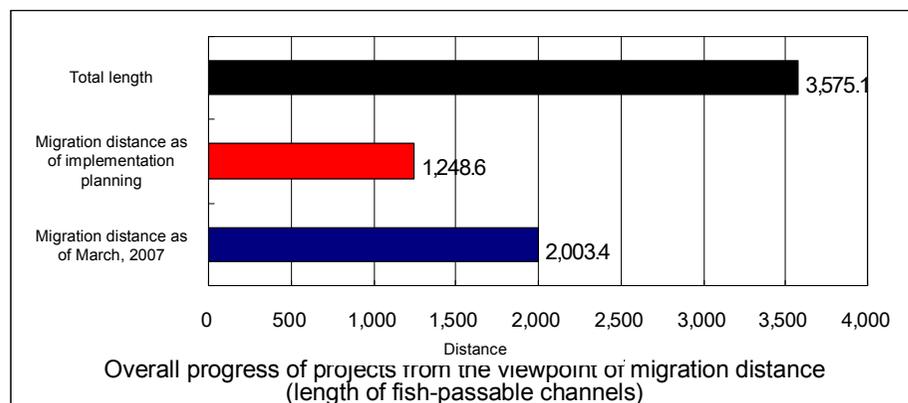
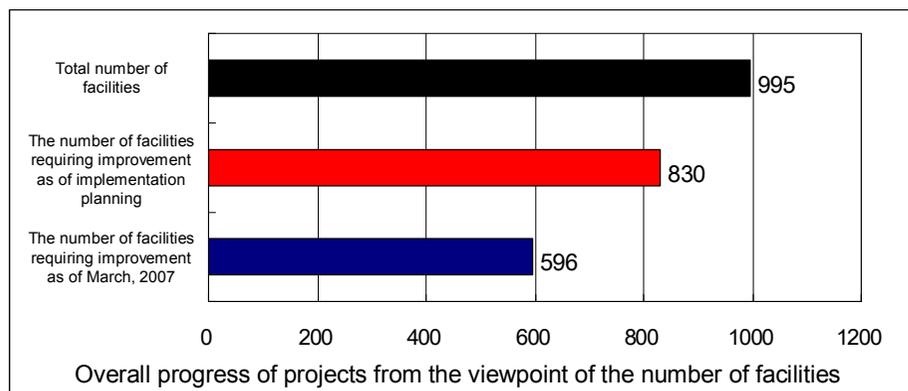
< Managing rivers in cooperation with citizens >



In recent years, citizens and NPOs concerned about rivers have become increasingly active in participating in river management by, for example, participating in environmental surveys and inspections, environmental planning, and river maintenance as part of community activities.

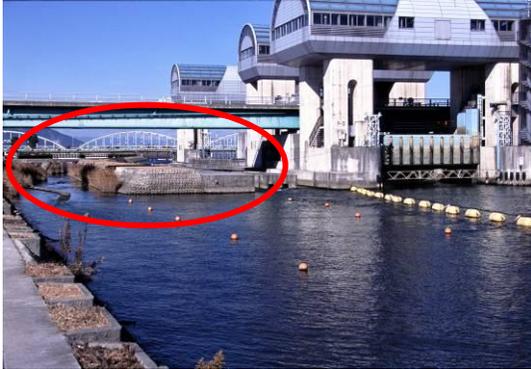
Model Projects for Promoting River Works to Facilitate Fish Migration

These model projects were started in 1991. Systematic measures, such as improving weirs, foot protection works, dams and check dams and their surroundings, constructing and improving fishways, and maintaining fishway flow rates, are taken to promote the creation of rich water environments in order to improve the river environment for migratory fish species.



Various Fish Passage Facilities (1)

**Nagara River Estuary Barrage
(Mie Prefecture)**



**Atsubetsu River Drop Structure No. 1
(Hokkaido)**



**Former Yoshino River Estuary Dam
(Tokushima Prefecture)**



Seseragi fishway

Fish ladder



A stream mimicking a natural creek was created, and a set of facilities including a seseragi (babbling) fishway and a fish ladder was constructed.



A fish ladder designed to create a variety of flow regimes by placing natural stones on the left side of the river where there is a base flow channel was constructed.



A fish ladder (width: 5.5 m) was constructed on each side of the estuary dam. The flap gates regulate the water flow so that overflow depth is kept constant.

Various Fish Passage Facilities (2)

Aono Dam

A 730-meter-long fish way was constructed to facilitate fish to overcome a height of about 21 m created by the dam. The fishway was designed as a nature-oriented fishway with three functions, namely, (1) a fish migration and habitat function, (2) an ecosystem creating function and (3) a natural park function.



Problems of Fish Passage Facilities



The entrance to the fish ladder along the right bank has become difficult to enter because of riverbed degradation downstream and the narrowness of the entrance.



Sediment accumulation near the exit of a fishway is preventing the water flow through the fishway from staying at the required level, thereby hampering fish migration.

Measures to make rivers fish-friendly

Example: a project near the Shinmachi groundsill on the Onga River (Fukuoka Prefecture)

Concurrently with the improvement of the Shinmachi groundsill carried out to facilitate fish migration, the fish habitat was improved by creating small inlets, pools, bushes, etc.

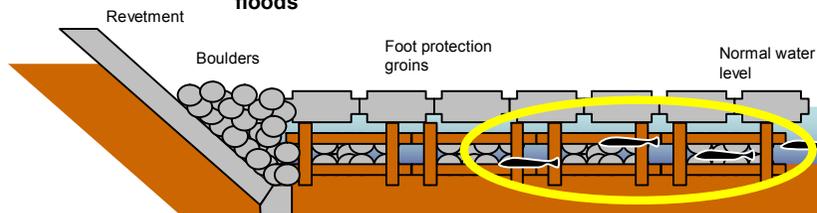


Example: a project in the Kira area on the Ara River

"Foot protection groins" built with natural stones are used to form gappy structures, stagnant pools, etc., so that diverse fish habitats are maintained.



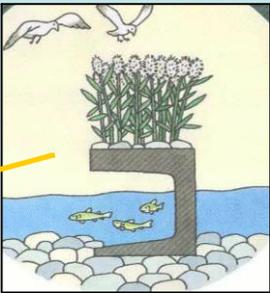
Concept of gappy structures capable of functioning as nest blocks and shelters by which to protect fish from floods



Examples of Fish Passage Facilities to Protect Fish from Birds

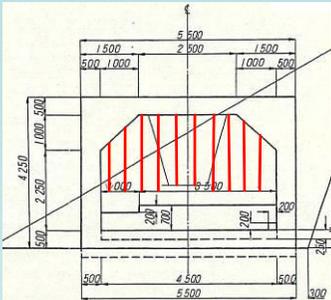
Installing fish protection blocks (Seseragi Fishway at Nagara River Estuary Barrage)

U-shaped fish protection blocks were installed in the fishway to create shelters by which to protect fish from birds.

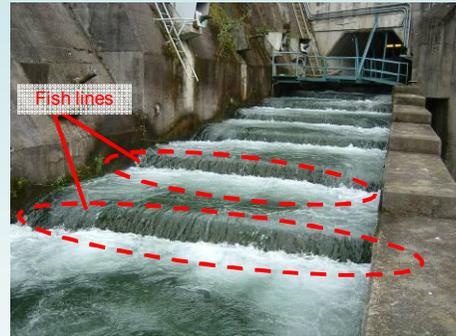



Using fish lines for protection from great cormorants (Ikeda Dam, Yoshino River, Tokushima Prefecture)

In order to prevent fish in the fishway from being preyed on by great cormorants, weighted fish lines were installed so that great cormorants cannot stay at the bulkheads because great cormorants do not want their feathers to be entangled by fish lines.



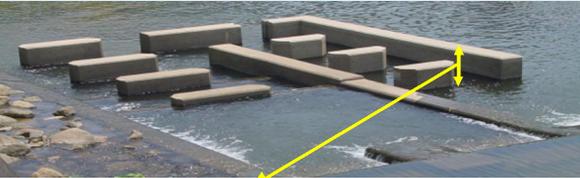
(Preventing birds from entering boxes)



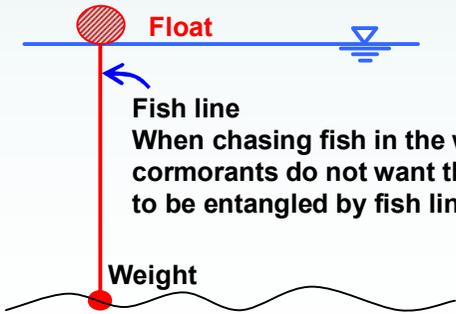
(Installation in fishway pools)

Adjusting the height of fishway bulkheads and sidewalls (Kamezu Headworks, Nuta River, Hiroshima Prefecture)

The height (distance from the water surface) of the fishway bulkheads and sidewalls has been set to 60 to 75 cm to protect fish from preying birds. This is because the reach of the beaks of large preying birds (white egret, grey heron) is about 50 cm.

Bulkheads and sidewalls designed to maintain a height from the water surface of 60 to 75 cm



Float

Fish line
When chasing fish in the water, great cormorants do not want their feathers to be entangled by fish lines.

Weight

(Installation downstream of a dam)

Improving Migration Environment by Weir Operation

Opening Chofu Diversion Weir (industrial water, Tama River) to let sweet fish swim upriver

- Open gate period: 10:00, April 12, 2007 to 24:00, June 1, 2007 (51 days)
- Migratory fish count during the above period: about 1,020,000

Welcome back to the Tama River, sweet fish

アユ、多摩川へいらっしやい

東京湾に注ぐ多摩川をアユが自由の上れるように、魚にとって最初の障壁となる調布取水堰が今春、大幅に開放されている。今月末までの予定で、川を管理する国土交通省と、堰を管理する東京都水道局の協力で初めて実現した。地元漁師も歓迎している。（小堀順之）

河口から約13kmの位置にある調布取水堰は1936年に完成した。多摩川本流の堰やダムでは最も下流にある。左岸は東京都大田区、右岸は川崎市、コンクリート製の魚道が2カ所あり、毎時、春先には跳びはねて急流を上るアユが見られる。

「海から上りたての小さなアユはまた力が弱く、魚道を上るのが難しい」と川崎川漁業協同組合の総代、山崎充彦さん(48)は語る。一番下流の調布取水堰が「最大の難関」という。

この取水堰は、工業用水と防溺が目的。今年は設置の点検で取水を中断しており、長期間、堰を開けることが可能になった。川の中ほどにある高さ1・6m、

調布取水堰を開放「自由に上って」

堰7ヶ所の起伏堰を完全に倒し、川幅の約3分の1にあたる5mほどを開放。開放で川の水位も高くなる。上流と下流の水位がそろい、生き物が自由に往来できる。

堰では調査員が連日、川を上るアユを数えている。開放が始まった4月12日からこれまで推定六十数万匹以上が上った。川崎漁協によると昨年同様推定で約127万匹が上ったが、今年はそれ以上になりそうだという。

「海と川が、調布取水堰が上った地点で見つかった。山崎さんは一力が強いテナガエビやモクズガニ、ハゼなども上れるようになる。多摩川上流では、アユ約1万匹に他業用のアユを放流している。近年は海から上る天然アユが増えており、川を上るアユは推定で約100万匹を越す年もある。

開放された調布取水堰。下流側(手前)と上流側の水位はほとんど同じになる。

多摩川を遡上(そじょう)するアユ。堰の開放前は跳びはねる光景が見られた=4月10日、川崎市で

Chofu Diversion Weir to be kept open for sweet fish migrating upriver

Asahi Shimbun, May 28, 2007

Survey on River Environment (National Survey on River Environments)

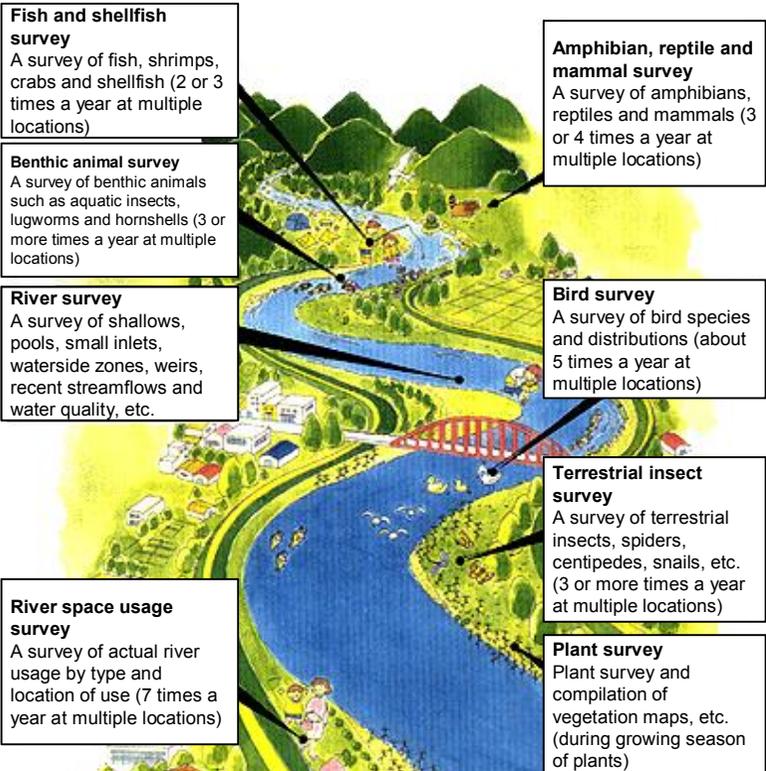
(1) Purpose

The National Survey on River Environments is a survey conducted to collect basic information on rivers from the viewpoint of biological habitat on a periodic, continual and unified basis.

(2) Rivers and dams to be surveyed

Mainly state-managed rivers in 109 Class A river systems in Japan and state-managed dams and dams managed by Japan Water Agency

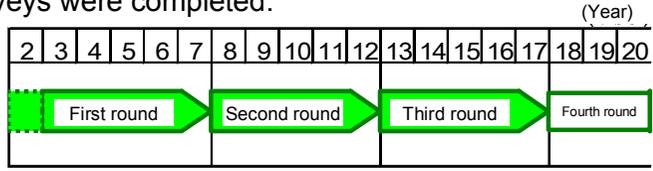
(3) Survey items



- Fish and shellfish survey**
A survey of fish, shrimps, crabs and shellfish (2 or 3 times a year at multiple locations)
- Benthic animal survey**
A survey of benthic animals such as aquatic insects, lugworms and hornshells (3 or more times a year at multiple locations)
- River survey**
A survey of shallows, pools, small inlets, waterside zones, weirs, recent streamflows and water quality, etc.
- River space usage survey**
A survey of actual river usage by type and location of use (7 times a year at multiple locations)
- Amphibian, reptile and mammal survey**
A survey of amphibians, reptiles and mammals (3 or 4 times a year at multiple locations)
- Bird survey**
A survey of bird species and distributions (about 5 times a year at multiple locations)
- Terrestrial insect survey**
A survey of terrestrial insects, spiders, centipedes, snails, etc. (3 or more times a year at multiple locations)
- Plant survey**
Plant survey and compilation of vegetation maps, etc. (during growing season of plants)

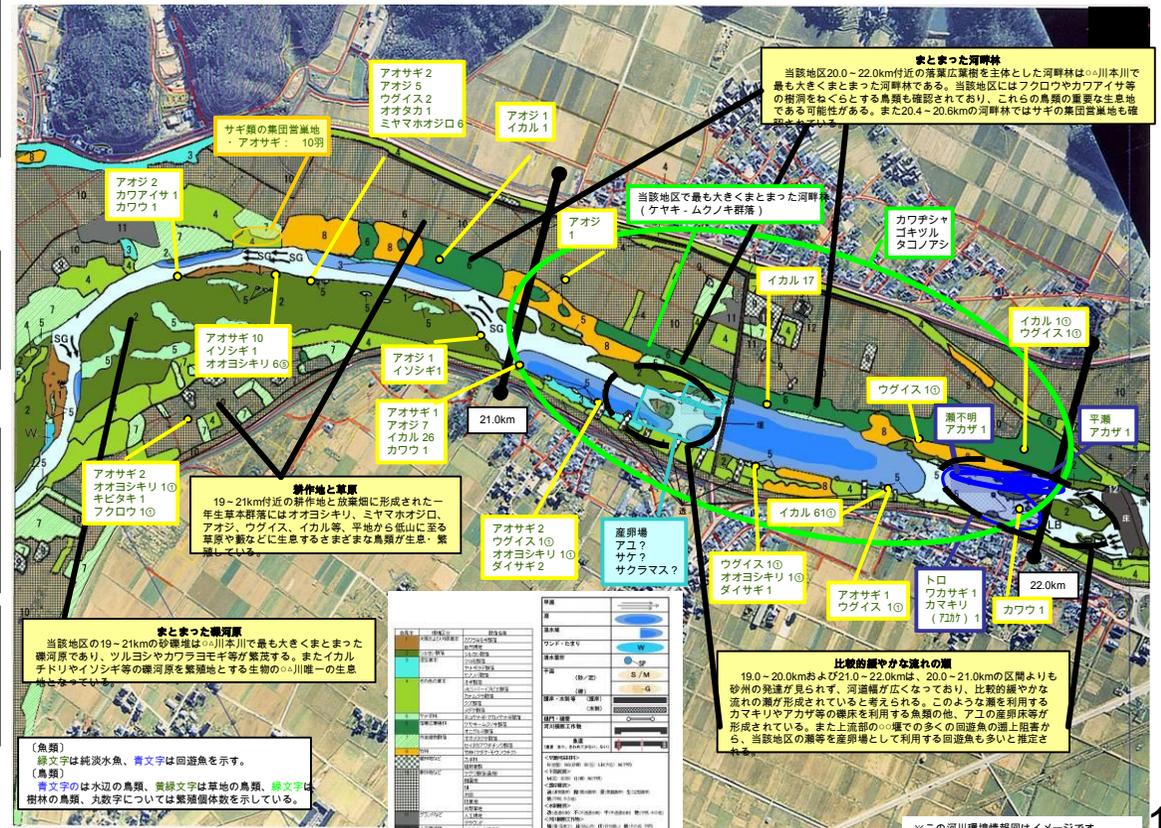
(4) Past surveys

Surveys began in 1990. The surveys were conducted so that all biological survey items were covered in a cycle of five years. By 2005, three rounds of surveys were completed.



(5) Example of use of results of National Survey on River Environments

A "River Environment Information Map" is a map showing the results of the National Survey on River Environments.



家とまいった河群林
当該地区20～22.0km付近の河川は、河川本川で最も大きくまとまった河群林である。当該地区にはフクロウやカワアイサ等の附帯をねくとする鳥類も確認されており、これらの鳥類の重要な生息地である可能性がある。また20.4～20.6kmの河群林ではサギの集団営巣地も確認されている。

家とまいった河原
当該地区の19～21kmの砂礫堆積川本川で最も大きくまとまった河原であり、ツルシヤやカラヨモギ等が繁殖する。またイカルチドリやイソシギ等の河原を繁殖地とする生物の川唯一の生息地となっている。

耕作地と草原
19～21km付近の耕作地と草原に形成された一年生草本群落にはオオシギ、ミヤマホオジロ、アオジ、ウグイス、イカル等、平地から低山に至る草原や藪などに生息するさまざまな鳥類が生息、繁殖している。

産卵場
アユ? サケ? サクラマス?

比較的緩やかな流れの川
19.0～20.0kmおよび21.0～22.0kmは、20.0～21.0kmの区間よりも砂洲の発達が見られ、河床が広くなっており、比較的緩やかな流れの川が形成されていると考えられる。このような流れを利用するカマリやアカサ等の産卵場を利用する魚類の、アユの産卵場が形成されている。また上流部の川で多くの回遊魚の遡上阻害から、当該地区の産卵場として利用する回遊魚も多いと推定される。

魚類
緑文字は純淡水魚、青文字は回遊魚を示す。
青文字のは水辺の鳥類、黄緑文字は草地の鳥類、緑文字は樹林の鳥類、丸数字については繁殖個体数を示している。

※この河川環境情報図はイメージです

Studies and Research on River Environment

Aqua Restoration Research Center

Conducts basic and applied research for the conservation and restoration of the natural environment including rivers and lakes in order to disseminate research results.



Effects flow rates on fish

- Three experimental streams (combined length: 800 m) and six ponds
- Artificial floods of up to 4 t/s can be released.
- The response of riverine ecosystems can be investigated by varying river landforms, plant growth, and discharge.

River ecology research

Investigating the natural environment of rivers from the ecological point of view

River Ecology Research Group of Japan

River Ecology Research Committee

Composition

- University researchers (biology, etc.)
- Public Works Research Institute
- Government, etc.

Drawing up research plans and determining policies
Comprehensive analysis and evaluation of research results

Studies on implementation of studies and research
Conducting individual studies

Research groups

Six rivers (Tama River, Chikuma River, Kizu River, Kita River, Shibetsu River, Iwaki River)

Environmental Impact Assessment for Dams

◇ Conducting environmental impact assessment for dams

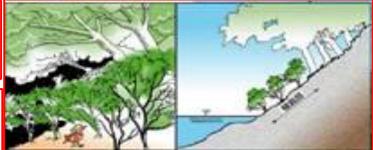
Compilation of reference books: Concepts for Environmental Impact Assessment for Dam Projects (River Project Environmental Impact Assessment Study Group, March, 2000)



◇ Implementing various environmental conservation measures

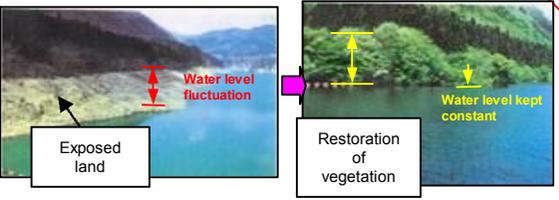
Restoring waterside vegetation by use of native species

Eliminating exposed land by restructuring existing dam groups



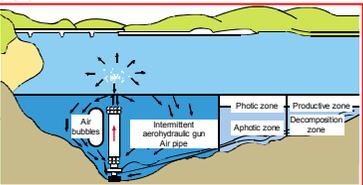
Tunneling for road relocation

Conservation measures for ecosystem (superiority) (monitoring the species of interest (birds of prey) through CCD cameras during construction and collecting information on the ecology of the species) CCD camera images



Restoring vegetation by use of native species

Preventing eutrophication by aeration



Restoring wetland

Measures related to cold water and turbid water



Mountain hawk eagle



Immediately after egg-laying



Parent bird and prey (small bird) (young bird shown above)

Conservation measures for ecosystem (typicality, migratoriness) (e.g., securing migration routes of small animals)

Transplanting of plants (conservation of important species)



Transplanting



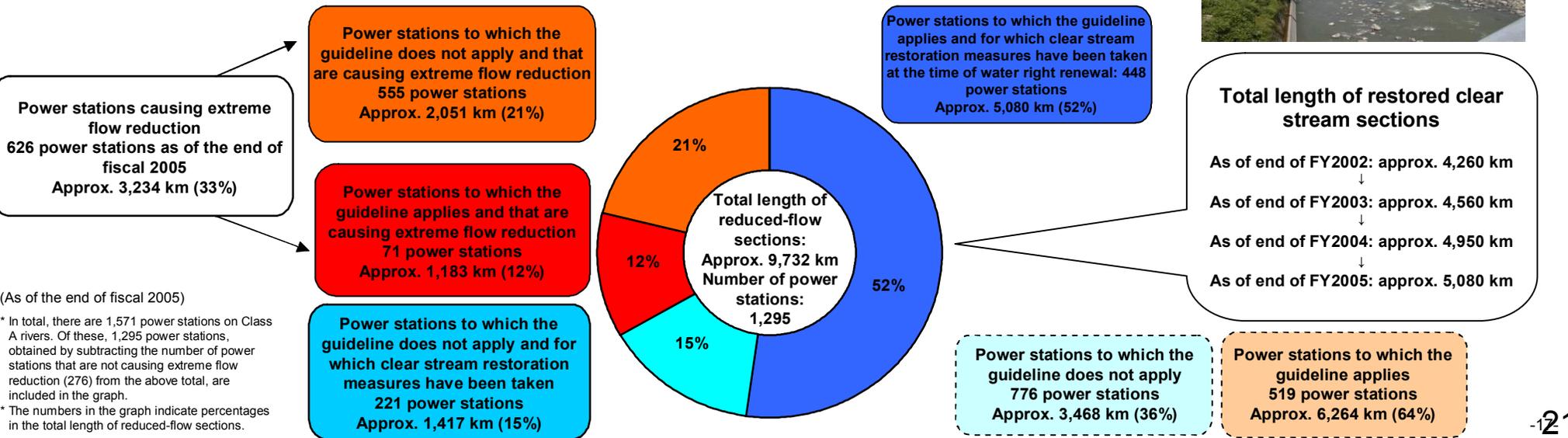
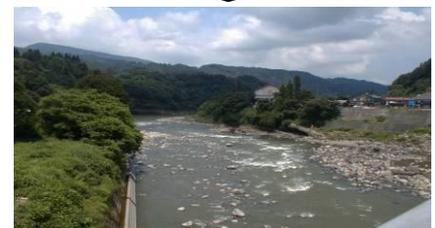
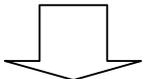
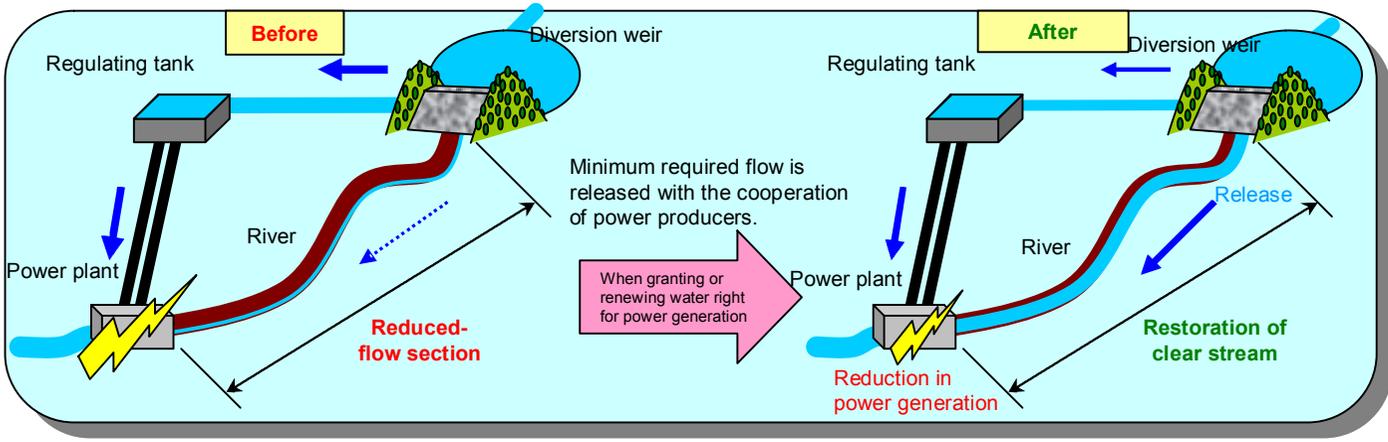
Installing transversal bedded culverts (for mammals, etc.)



After transplanting

Restoring Clear Streams by Eliminating Reduced-flow Sections Downstream of Hydropower Dams

- By bypassing stream water for their power plants, conduit-type hydropower stations may considerably reduce streamflow in the downstream sections.
- To return water to these reduced-flow sections, a guideline has been determined so that the streamflow immediately downstream of the point of diversion can be maintained when renewing water rights.



(As of the end of fiscal 2005)

* In total, there are 1,571 power stations on Class A rivers. Of these, 1,295 power stations, obtained by subtracting the number of power stations that are not causing extreme flow reduction (276) from the above total, are included in the graph.

* The numbers in the graph indicate percentages in the total length of reduced-flow sections.

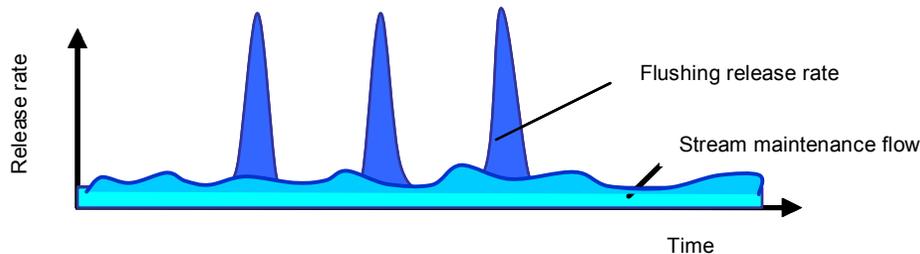
Improving Flow Regime by Flexible Dam Operation

- Flexible dam operation aims to contribute to the improvement and conservation of the river environment downstream of a dam by storing river water by use of part of the flood control capacity of the reservoir and releasing the stored water appropriately to the extent that flood control is not hampered.
- In FY2006, flexible operation tests were conducted at 24 dams.
- Various studies have been conducted on the improvement of the river environment downstream by releases of stored water.

Release patterns in flexible dam operation

Flushing release

Short-time release carried out to increase tractive force. Flushing releases are done with the aim of flushing stagnant water, removing attached algae and stimulating new algal growth.



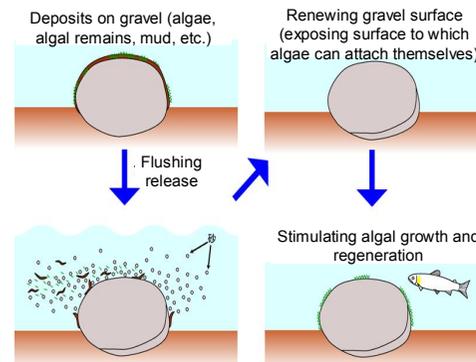
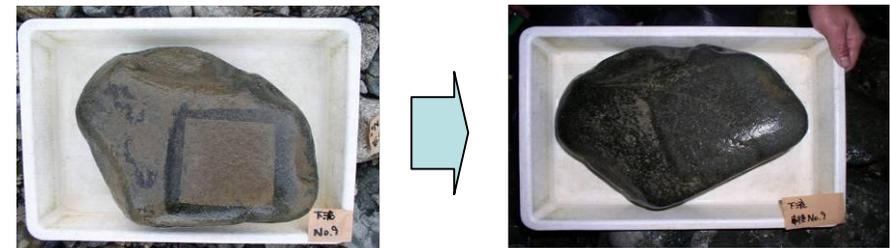
Additional release over stream maintenance flow

Continual release done in addition to stream maintenance flow with the aim of improving riverscapes, assisting migratory fish, etc.

Examples of river environment improvement by flexible dam operation

- Flushing stagnant water: Moharu Dam, Sagae Dam
- Improving riverscape: Izarigawa Dam
- Removing attached algae/stimulation of new algal growth: Sagae Dam, Managawa Dam
- Assisting migratory fish: Pirika Dam, Odo Dam

Removing attached algae and stimulating new growth (Managawa Dam)



Note: The portions shown in green indicate algae growing on the gravel surface. They differ, therefore, from green algae.

- Flushing silt and other bed materials is effective in removing attached algae.
- Sediment transport has increased algal removal by about 20%.

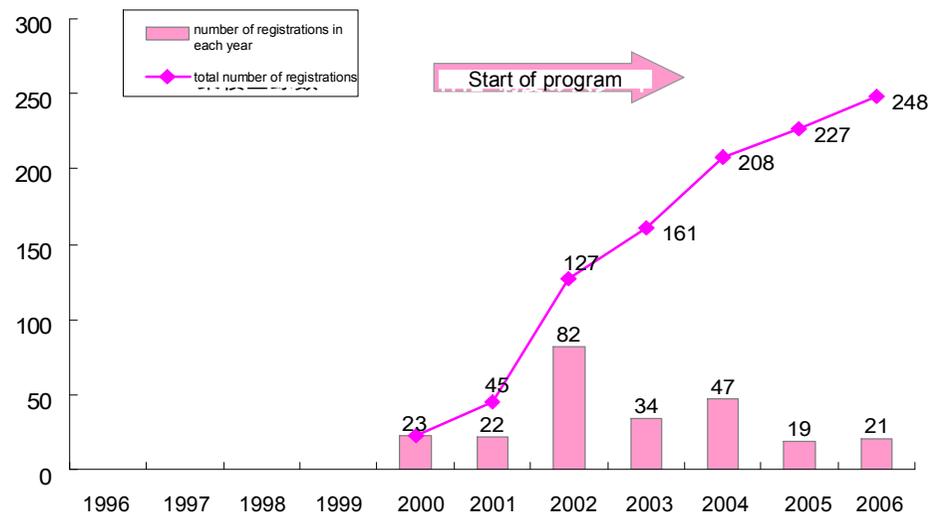
River Environment Education: Children's Riverside Rediscovery Project

- Local citizens' groups, educators, river administrators, etc., have jointly established the Children's Riverside Council.
- Children's Riverside Support Center supports various activities (e.g., lending materials and equipment, coordinating activities).
- Facilities are provided or improved if necessary through a "riverside school project."



Children's Riverside activity (Kogi River, Osaka Pref.)

Changes in the number of sites registered for Children's Riverside Rediscovery Project



Children's Riverside Rediscovery Project

Implemented jointly by the Ministry of Education, Culture Sports, Science and Technology, the Ministry of Land, Infrastructure and Transport and the Ministry of the Environment

