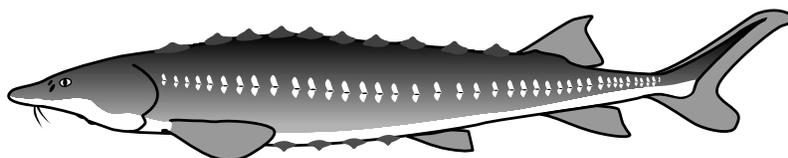


# WHITE STURGEON

*Acipenser transmontanus* Richardson

Family Acipenseridae



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## STATUS

Global rank: G4

Provincial rank: S2

COSEWIC designation: VULNERABLE

Provincial listing: RED

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## RANGE

Pacific slope of North America from Aleutian Islands, Alaska to Monterey, California (Lee *et al.* 1980).

## RANGE IN B.C.

Found in the mainstems of the Fraser, Nechako, Stuart, Columbia, and Kootenay rivers, and in Fraser, Takla, Trembleur, Stuart, Kootenay, Arrow, Slokan, Duncan and Williams lakes; ventures into the lower portions of some of the larger tributaries of the upper and lower Fraser (Bowron, McGregor, and Harrison rivers). Prior to dam construction, they were found in the upper Columbia River; anglers have reported sturgeon in Trout Lake and Lake Revelstoke. There have also been unconfirmed reports from the Kettle River, below Cascade, and the outlet of Christina Lake. In the past, there have been several unconfirmed reports of white sturgeon in the Kennedy and Cowichan rivers on Vancouver Island. Recent captures from the mouths of the Somas and Cowichan rivers have been confirmed (E.D. Lane, pers. comm.).

## ECOSECTIONS

Fraser Lowland  
Southern Pacific Ranges  
Eastern Pacific Ranges  
Cariboo Basin  
Pavilion Ranges

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Fraser River Basin  
McGregor Plateau  
Cariboo Plateau  
Nechako Lowland  
Quesnel Lowlands  
Bulkley Basin  
Babine Upland  
Leeward Pacific Ranges  
Manson Plateau  
Upper Fraser Trench  
Southern Columbia Mountains  
Selkirk Foothills  
Central Columbia Mountains  
Northern Kootenay Mountains

## MAJOR WATERSHEDS

Fraser River  
Harrison River  
Nechako River  
Stuart River  
McGregor River  
Columbia River  
Kootenay River

## ELEVATION

0 - 689 m

## HABITAT

The white sturgeon is found in large, cool rivers or streams. In some areas (e.g., in San Francisco Bay and off the Columbia River mouth) it is known to move into the ocean; there are no such marine records for British Columbia (Lane 1991). Although most British Columbia sturgeon live in large rivers, several populations are either restricted to large lakes or spend a considerable amount of time within them. For example, certain individuals in the Kootenay River migrate to Kootenay Lake in the late autumn to spend the winter at great depths (Apperson and Anders 1991), and groups are often seen basking near the surface of Williams, Trembleur and Harrison lakes in the spring (D. Cadden, J. Legget, and M. Rosenau, pers. comm.). In the upper Kootenai River of Idaho and Montana, mature sturgeon utilized flowing water from 0.03 to 0.61 m/s, with a mode of 0.24 m/s (Apperson and Anders 1991). The same fish utilized depths of 3-30 m in the river, with a mode of 9 m; in Kootenay Lake they moved between 10 and 100.5 m in the lake, with a bimodal distribution at about 55 and 90 m.

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Females used significantly deeper water than males during winter, and both sexes used significantly deeper water in winter than in spring or summer (Apperson and Anders 1991).

They appear to require deep, fast rapids for spawning (K.A. Apperson, pers. comm.) which probably explains the observed fry recruitment failures under regulated conditions. Regulation may also reduce or eliminate juvenile rearing areas. Lane (1991) believes that the warmer backwaters of rivers are an important habitat for juvenile sturgeon in the summer.

## FEEDING HABITS

In the past, white sturgeon were believed to be primarily bottom feeders; we now know that they also consume swimming fish. Young feed mostly on the larvae of aquatic insects, crustaceans, and molluscs where available. A high portion of the diet of larger sturgeon consists of fish, particularly in the northern parts of their range.

In British Columbia, sturgeon in the lower Fraser River reportedly gather in the lower reaches of the river in May to feed on eulachon (*Thaleichthys pacificus*) as these small fish move upstream to spawn (Swiatkiewicz 1989). Semakula and Larkin (1968) sampled 88 sturgeon from the lower Fraser and found that eulachon were indeed the main food item in May. From May to October, other fish that were eaten included, in order of abundance, sculpins (*Cottus* sp.), sticklebacks (*Gasterosteus aculeatus*), lampreys (*Lampetra* spp.) and, in one stomach, a young sturgeon. Invertebrates were also taken; chironomid larvae were the most common and were found in 31 of 88 samples from sturgeon of all sizes. Crayfish (*Pacifastacus* sp.), stonefly (Plecoptera) and mayfly (Ephemeroptera) larvae, mysids and planktonic crustaceans were also recorded. Many stomachs contained plant material, but it was concluded that this was largely taken incidentally. Sockeye are another important seasonal food item in the lower Fraser (McAdam 1995).

## ECOLOGY

White sturgeon can live over 100 years, reach 6 m in length and over 800 kg in weight; they are the largest North American freshwater fish.

British Columbia white sturgeon grow more slowly than those in the lower Columbia River (Dixon 1986). Within the province, individuals of inland populations grow slightly more slowly in weight than those from the lower Fraser River (Dixon 1986). In the Nechako River they reach 200 cm fork length at about 42 years,

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when they weigh about 70 kg (Dixon 1986). The oldest fish in a study of Kootenay River sturgeon was 38 years old, 203 cm long, and weighed 91 kg (Fleck and Andrusak 1977).

In California, peak spawning apparently occurs when the water temperature is 14°C to 15°C. Data for the lower Columbia suggests a range of 13-15°C (Parsley and Beckmann 1993). Laboratory rearing studies indicate that larval mortality may be high if the temperature during early life is not at least 15°C (Lane 1991).

Long-lived fish such as sturgeon tend to concentrate chemical contaminants; copper, zinc, and organochloride residues are of concern in the Kootenay River (Apperson and Anders 1991), whereas heavy metals, dioxins, and furans are of concern in the upper Fraser River (D. Cadden, pers. comm.).

## PHENOLOGY

Sturgeon tend to spend the cold months inactive, remaining in deep water in lakes or river pools. In some systems, reproductive individuals migrate upstream. Spawning occurs in conjunction with elevated spring flows.

## REPRODUCTION

In California, spawning apparently occurs between mid-March and early June (Moyle 1976); larvae hatch from eggs in 1-2 weeks. Males may reach sexual maturity in about 9 years, females in 13-16 years; individuals spawn at intervals of 4 to 11 years (Wydoski and Whitney 1979).

In general, spawning activity is assumed to occur at peak flows. Spawning is known to occur during June-July on the Pend d'Orielle (S. McAdam, pers. comm.). In the upper Kootenai River of Idaho, a concentration of reproductive sturgeon occurred 60 km upstream of the Canada-U.S. border in May 1990 (Apperson and Anders 1991). Age at first spawning seems to vary considerably; in the lower Fraser, males appear to spawn first between 11-24+ years and females between 26-34 years. However, some males have spawned twice by age 17 (Semakula and Larkin 1968).

## GLOBAL RANKING

**Known occurrences: B** — Approximately 24 collection sites from 17 waterways. (Lee *et al.* 1980).

**Abundance: D** — Can be abundant within its range.

**Range: D**

**Trend: B**

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**Protected occurrences: A**

**Threats: B** — Physical and ecological barriers created by dams and their impoundments, alterations to natural flow regimes. They are also susceptible to overfishing.

**Fragility: B**

**Other factors:** Some stocks of white sturgeon are anadromous and make extensive saltwater migrations.

**Rank: G4**

**Comments:** Populations were reduced to very low levels in the early part of this century by overfishing. They have since increased in numbers, and are widespread in range. However, spawning has failed completely in some inland populations for at least the last two decades. U.S. Fish and Wildlife Service listed the Kootenai River population as endangered on Sept. 6, 1994. Occurs in fewer than 20 rivers — the rank may be G3.

## PROVINCIAL RANKING

**Known occurrences: B** — In five major rivers and six large lakes. The occurrences in general, and especially those in the Fraser River, cover extensive geographic areas.

**Abundance: D** — Lower Fraser River population relatively abundant; sparse elsewhere.

**Range: C** — Found in the mainstems of the Fraser, Nechako, Stuart, lower Columbia, and upper Kootenay rivers, and in Fraser, Takla, Trembleur, Stuart, Kootenay, Arrow, Slokan, Duncan and Williams lakes; ventures into the lower portions of some of the larger tributaries of the upper Fraser (Bowron, McGregor rivers). Sturgeon caught at the mouths of the Somass and Cowichan rivers may be migrating Columbia River fish.

**Trend: B** — Populations in the Fraser below Quesnel are producing young, but there has been a significant decline in the number of juveniles appearing in the fishery in recent years (M. Rosenau, pers. comm.). Certainly sturgeon are much less abundant in the lower Fraser River than they were historically (Lane 1991). Other populations, such as those in the Nechako, Kootenay and Columbia rivers, are even more threatened, with very few or no young being produced or surviving in recent years (Hildebrand 1991; Apperson 1992; R.L. and L. Environmental Services 1994; D. Ableson, pers. comm.).

**Protected occurrences: A** — During 1994, the daily quota in the sport fishery was reduced to 0, effectively making the fishery catch-and-release only. The commercial and native food fisheries in the lower Fraser have also been closed.

**Threats: A** — With the exception of some Fraser River

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populations, white sturgeon may be endangered throughout their historical range in the province, primarily because of flow alteration by dams on the Nechako, Kootenay, and Columbia rivers (see Management and Stewardship section) (Hildebrand 1991; Apperson 1992; R.L. and L. Environmental Services 1994; D. Ableson, pers. comm.). An apparent decline in the eulachon (*Thaleichthys pacificus*) populations in the lower Fraser River, a major food source for sturgeon, may be a cause for concern there (M. Rosenau, pers. comm.). Loss of productive slough habitat in the Fraser Valley is probably reducing the potential for young sturgeon as well (Lane 1994). In past years, the total harvest in the lower Fraser River has probably been "close to or in excess of the carrying capacity of the species" (Lane 1991). Contamination with heavy metals and other pollutants is also of concern. Recent unexplained deaths of large fish in the lower Fraser are a serious concern.

**Rank: S2**

**Comments:** Restricted to a few major water bodies in the province. Populations throughout most of the species' historical range in British Columbia are threatened by recruitment failures. Those in the lower Fraser are producing young, but face threats from habitat loss and a possible decline in food supply.

## FUTURE NEEDS

**Research:** The spawning and rearing requirements of sturgeon in British Columbia should be studied, and the effects of dams, dredging, log booming, and chemical pollutants on breeding and survival should be investigated. Optimum flow regimes for spawning need to be studied. Diet and the effect of population changes in prey species have not been sufficiently studied. Population size and life history parameters and their relation to exploitation are a high priority for research.

**Inventory:** Population size and dynamics of most British Columbia populations are unknown — research is urgently needed. Genetic studies on stock identification, variation and exchange rates in the Fraser system are required.

## MANAGEMENT AND STEWARDSHIP

Flow rates from dams should be altered in an attempt to induce spawning in those populations that have apparently failed to produce young in recent years. Overfishing severely depleted the stocks of the Fraser River in the late 1800s and early 1900s. Our

knowledge of population size, mortality, reproductive parameters, recruitment, and habitat requirements is limited. Research into these population parameters should be a high management priority. Spawning and juvenile rearing habitats should be identified and protected.

Habitat alteration by hydroelectric dams and dyking is probably the greatest threat to the survival of white sturgeon in British Columbia. Dams have not only flooded spawning grounds and cut off migration routes, but also reduce flows while reservoirs are filled during spring freshet. Since white sturgeon spawn at this time and require deep, fast water to reproduce successfully, the latter effect may be one cause of the recent recruitment failures in the Nechako, Kootenay and Columbia rivers (Hildebrand 1991; Apperson 1992; D. Ableson and L. Fleck, pers. comm.). Dams trap nutrients normally delivered downstream. Altered flow regimes also result in abnormal mid-summer sedimentation and disruption to the aquatic food chain (D. Ableson, pers. comm.). Changes in flow regimes from the dams affecting these rivers should therefore be instituted in order to prevent the extinction of these populations (Apperson 1992). Dyking of slough and marsh habitat in the lower Fraser and Kootenay rivers has eliminated much of the potential juvenile rearing habitat for white sturgeon.

Reported reductions in the eulachon (*Thaleichthys pacificus*) population in the Fraser River is another management concern, since these fish are an important food source for spawning sturgeon (M. Rosenau, pers. comm.). The effects of chemical contaminants on survival and reproduction of white sturgeon are still largely unknown — more research is needed in the presence and effects of these in British Columbia sturgeon.

## PROVINCIAL DISTRIBUTION

Site:	Map Precision:	UTM Coordinates:
SOMASS RIVER Directions: At mouth.	1 km	10U 3670 54560
ROBERTS BANK Directions: South flats off mouth of Fraser River.	10 km	10U 4868 54366
FRASER RIVER, BELOW HELL'S GATE Directions: In mainstem of Fraser River, from its mouth to Hell's Gate, 10 km S of Boston Bar.	1 km	10U 5322 54475

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<b>Site:</b>	<b>Map Precision:</b>	<b>UTM Coordinates:</b>
DEAS SLOUGH Directions: Slough behind Deas Island (now a peninsula); yacht club reached by driving north from Ladner; other marina along river road northwest of Hwy 99.	100 m	10U 4955 54402
NICOMEN SLOUGH, WEST MOUTH Directions: 3 km southeast of Dewdney along west dike of Nicomen Slough, to Fraser River.	100 m	10U 5598 54434
COWICHAN RIVER	1 km	10U 4522 54015
STRAWBERRY SLOUGH MOUTH Directions: Mouth of Strawberry Slough at Fraser River [east mouth of Nicomen or Dewdney Slough]; 2 km east of main mouth of Nicomen Slough; access by boat or off south dike of Nicomen Island.	100 m	10U 5621 54439
SUMAS RIVER MOUTH Directions: Mouth of Sumas River at Fraser River.	100 m	10U 5644 54433
CHAWUTHEN CREEK MOUTH, FRASER RIVER Directions: On south side of Fraser River, 1 km w of Floods.	100 m	10U 6072 54689
FRASER RIVER, HELL'S GATE TO BIG BAR CREEK Directions: Mainstem of Fraser River; no records for tributaries (J. Cartwright, pers. comm.).	1 km	10U 5804 56089
WILLIAMS LAKE	100 m	10U 5640 57742
FRASER RIVER, BIG BAR CREEK TO WEST ROAD RIVER Directions: Mainstem of Fraser River; not known from tributaries.	1 km	10U 5491 57973
FRASER RIVER, ABOVE WEST ROAD RIVER Directions: Mainstem of Fraser River from the junction of the West Road River upstream at least to McBride, perhaps as far as Rearguard Falls above Tete Jaune Cache; also includes lower reaches of the Bowron and McGregor rivers.	1 km	10U 5255 59850
NECHAKO RIVER Directions: Mainstem of the Nechako River from its junction with the Fraser River at Prince George to about 30 km upstream of the Nautley River junction (D. Ableson, pers. comm.).	1 km	10U 4336 59867
FRASER LAKE, STELLAKO	1 km	10U 3870 59940

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Site:	Map Precision:	UTM Coordinates:
STUART LAKE Directions: Exact location(s) not known within Stuart Lake. Sturgeon should also occur in Stuart and Tachie rivers, the primary outlet and inlet streams to this lake.	10 km	10U 4000 60440
TREMBLEUR LAKE Directions: Exact location(s) within Trembleur Lake not known. Undoubtedly in Tachie and Middle rivers as well; listed as occurring in "all waters downstream of this lake" by Dixon (1986).	10 km	10U 3700 60800
TAKLA LAKE Directions: Takla Lake; no authenticated records in Driftwood River (D. Ableson, pers. comm.).	10 km	10U 3255 61300
DUNCAN LAKE Directions:	10 km	10U 50418 55660
KOOTENAY RIVER, ABOVE KOOTENAY LAKE Directions: Includes the mainstem of the Kootenay River, its delta and the extreme southern portion of Kootenay Lake.	1 km	11U 5227 54560
SLOCAN LAKE Directions: Near Wragge Creek.	1 km	114 6715 55409
COLUMBIA RIVER, BELOW KEENLEYSIDE DAM Directions: Includes all the mainstem of the Columbia from just below the Keenlyside Dam to the U.S. border; sturgeon may also use the mouth of the Kootenay River, but there are no records as yet.	1 km	11U 4443 54653 11U 4547 54279
UPPER ARROW LAKE Directions: Includes the area between Big Eddy and Storm Point, including Beaton Arm, to the mouth of the Incomappleux River.	1 km	11U 4135 56510 11U 4355 56100

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