A photograph of a salmon leaping over a waterfall. The fish is in mid-air, its body arched, with its mouth open. The water is white and turbulent as the fish jumps. The background is a grey, rocky waterfall.

Hatchery vs. Wild Salmonid Symposium Research, Management, and Reform in the Pacific Northwest

**Oregon Chapter of the American Fisheries Society
Portland, Oregon - January 22-23, 2015**

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Oregon Hatchery Research Center (OHRC)



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Oregon Hatchery Research Center (OHRC)



A cooperative effort between:

Oregon Department of Fish and Wildlife

and

**Oregon State University
Department of Fisheries and Wildlife**

“VS”

- Is it “VS”?
- Should it be “&”?
- Should it be “Or”?
- Should it be “not”?

Scott RJ, Judge KA, Ramster K, **Noakes** DLG, **Beamish** FWH. 2005. Interactions between naturalised exotic salmonids and reintroduced Atlantic salmon in a Lake Ontario tributary. *Ecology of Freshwater Fish* 14: 402–405.

Shifting the Balance: Towards Sustainable Salmon Populations and Fisheries of the Future

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How?

“the four **H**”

Harvest

Hydropower (dams)

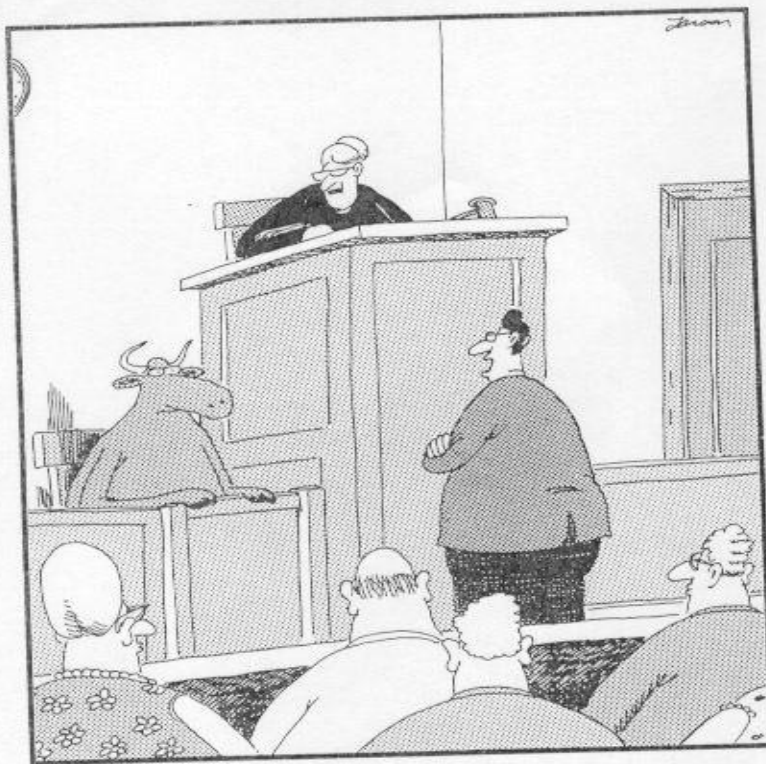
Hatcheries

Habitat



OSU
Oregon State
UNIVERSITY

WHY?



"Look. We know how you did it — how is no longer the question. What we now want to know is why. . . . Why now, brown cow?"

Technology

“Technology” was the “cause”

Can “Technology” be the “cure”?



Industrial Revolution

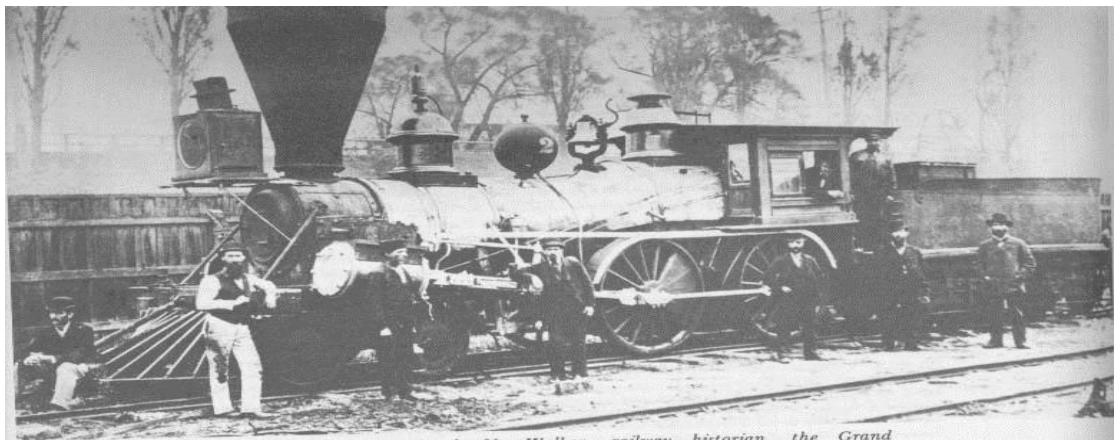
- 1760 – 1830
- Great Britain – western Europe – USA
- “revolutions”
- “mass emigration/immigration”
 - 1600 – 1770 – “colonial” – east coast USA
 - 1850 – 1930 – “go west young men and women”

Industrial Revolution

- Water (hydro) power
- Steam power
- Coal
- Iron
- Chemicals



PILING LOGS AND BURNING



According to Frank N. Walker, railway historian, the Grand Trunk locomotive shown here was called the *TORONTO*, the first one built in Ontario and the one which made the initial run from Toronto to present day Aurora. It was also one of the first to travel through Guelph, Stratford and St. Marys on the way to Sarnia. The Grand Trunk line from Toronto to Sarnia was built by Gzowski and Company headed by Casimir Gzowski who arrived in Stratford by train on an unofficial inspection tour September 3, 1856. A month later on October 8th an entourage of politicians, officials and guests arrived officially. The journey to Toronto was then possible in a matter of hours instead of days. The effect on trade, business, and populations in the Huron Tract was one of instantaneous growth.

The first railway track in Stratford, however, was that of the Brantford, Buffalo and Goderich Railway in 1855 which Thomas Mercer Jones favoured in opposition to Canada Company policy, and, as a consequence lost his job. Beleaguered by financial problems the B.B. & G. did not have rolling stock to run to Stratford on their line until December 6, 1856. It reached Goderich in 1858. When Gzowski's workmen reached Stratford they threw the rusting B.B. & G. track aside and proceeded. Brantford workers returned and did likewise. Brave gangs intent upon righting wrongs continued until officials ordered a halt. Lawyers deliberated and a criss-junction was created.

Scotland - landscape







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Questions

- Who did such things?
- HOW could they do it?
- WHY did they do it?
- What were they thinking?

Pogo (Walt Kelly)



Salmon Hatcheries

- Canada – Lake Ontario - 1866
- U. K. – 1877
- Washington, Oregon – 1877
- British Columbia – 1884
- Japan – Chitose, Hokkaido – 1888
- Alaska - 1891

Salmon Hatcheries

- **National Fish Hatchery System (NFHS)** was established by the US Congress in 1871
- 1872 – Baird Hatchery, the first Federal fish hatchery, on the McCloud River in California
- Gunfight at the O. K. Corral - 1881

ACCOUNT OF OPERATIONS AT THE McCLOUD RIVER FISH-BREEDING STATIONS OF THE UNITED STATES FISH COMMISSION, FROM 1872 TO 1882, INCLUSIVE.

By LIVINGSTON STONE.

[Written by request of Professor Baird, for the London Exhibition, 1883.]

The United States salmon-breeding establishment on the McCloud River, California, which afterwards became the largest of its kind in the world, arose from small beginnings. A rough board cabin 12 feet by 14 feet, and a small set of hatching-troughs, resting on the ground, without a roof over them, constituted the McCloud River salmon-breeding station of the United States in 1872, the first year of its history. Three white men, including the writer, with the help of one or two Indians, did all the work. Our one room answered the purpose of office, kitchen, dining-room, and bed-room for all of us. Thirty thousand salmon eggs, matured for shipment, which afterwards dwindled down to 9,000 living ones at the end of their overland journey, constituted the results of the season's work. We even actually suffered, at times, for want of means. More than once my remittances from Washington being unexpectedly delayed, we were obliged to sell part of our clothing and some of the cooking utensils to obtain money for our immediate necessities. Our force was so small that we were repeatedly in danger of being robbed and murdered, and it often became necessary for the same man to work all day and two thirds of the night to complete the day's

remark
Pacific

le 162°
; saw a
lly-fish.
30" east
l whale
iftwood

43' 06"

41' 06"

e clean.
0" west.

s of pre-

7" west.
of fish

the flood of 1881, it became necessary to build the new hatching-house on still higher ground than the old one. This in time necessitated the building of a correspondingly larger wheel in order to raise the water to the increased height now demanded. The wheel that was then constructed is now running and furnishes the water for the hatching-house. It is 32 feet in diameter and rests on boats 36 feet long and 8 feet wide. Its lifting capacity is 50,000 foot-pounds a minute.

RESULTS OF OPERATIONS AT SALMON-BREEDING STATION.

In the eleven years since the salmon-breeding station has been in operation, 67,000,000 eggs have been taken, most of which have been distributed in the various States of the Union. Several million, however, have been sent to foreign countries, including Germany, France, Great Britain, Denmark, Russia, Belgium, Holland, Canada, New Zealand, Australia, and the Sandwich Islands.

About 15,000,000 have been hatched at the station, and the young fish placed in the McCloud and other tributaries of the Sacramento River. So great have been the benefits of this restocking of the Sacramento that the statistics of the salmon fisheries on the Sacramento show that the annual salmon catch of the river has increased 5,000,000 pounds during the last few years.

UNITED STATES TROUT PONDS.

In July, 1879, I received instructions from the United States Commission to establish a station on the McCloud River for

The fishing for parent trout in order to add to the stock already at present about three tons

I will conclude this report with a list of the most important events at the time of the commission on the McCloud River up to the present time (1881).

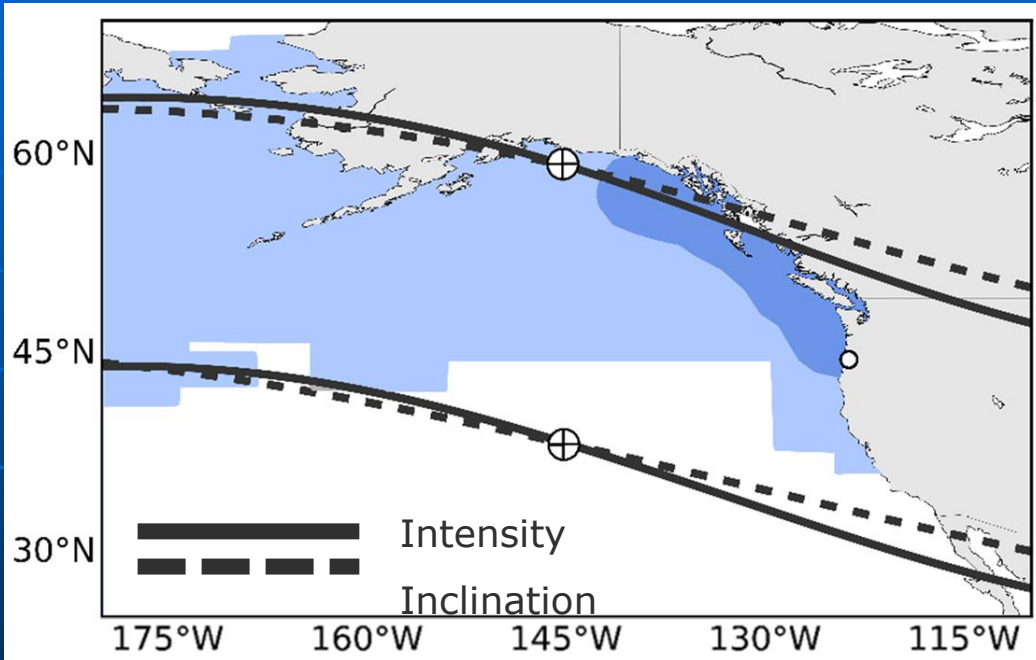
ANNUAL RECORD OF OPERATIONS AT THE SALMON-BREEDING STATION OF THE UNITED STATES FISH COMMISSION ON THE McCLOUD RIVER.

The spawning grounds of the salmon on the McCloud River. A small hatchery was originally established on a stream

Operations were begun there in 1879 and considerable results this year. The hatchery is on the coast, and the very important work could make the overland journey

Salmon-breeding station on the McCloud River. Hostile demonstrations were made by the Indians from going on. Referring

Evidence for a magnetic map

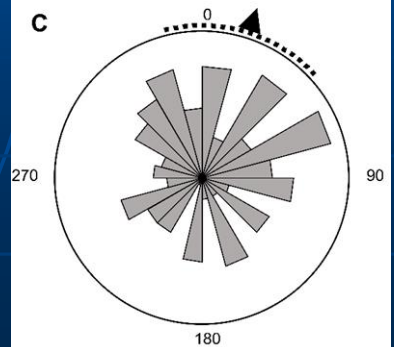
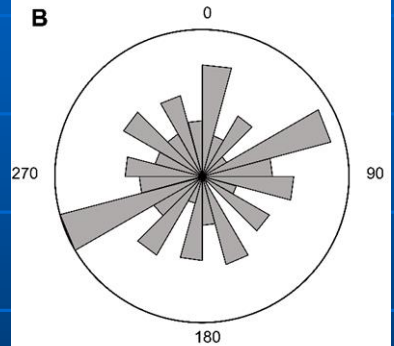
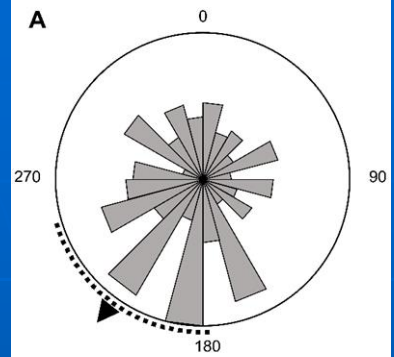


Putman et al. 2014
Current Biology

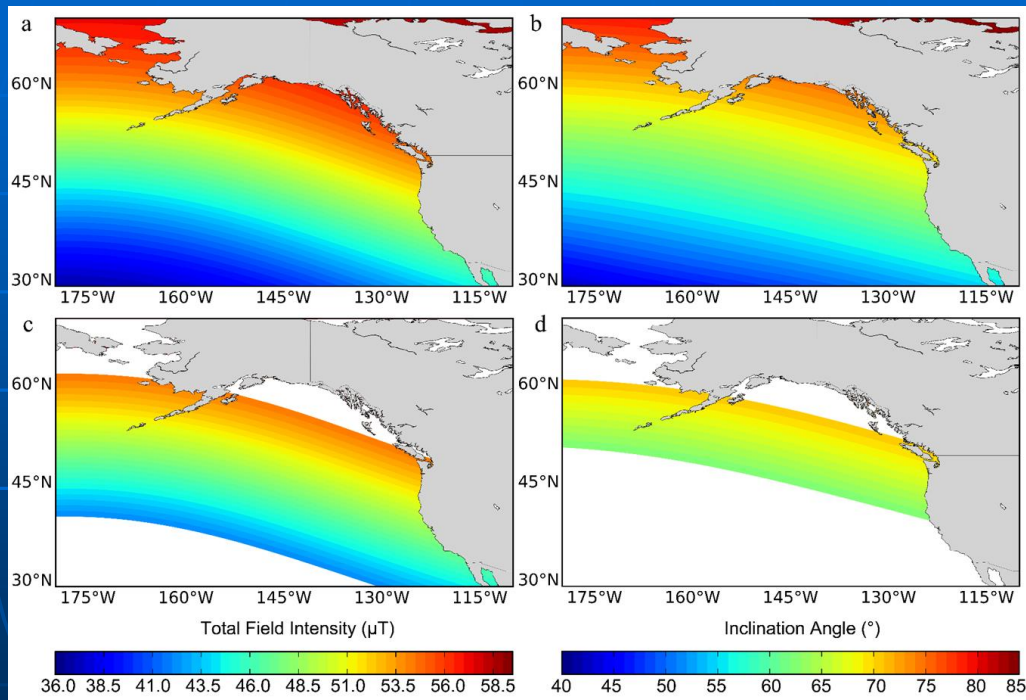
Northern field
215°
Rayleigh $r = 0.135$
Rayleigh $p = 0.014$
 $n = 233$

Ambient field
303°
Rayleigh $r = 0.048$
Rayleigh $p = 0.582$
 $n = 240$

Southern field
17°
Rayleigh $r = 0.163$
Rayleigh $p = 0.002$
 $n = 234$



Does the bizarre magnetic environment of hatcheries impair magnetic navigation in juvenile fish?

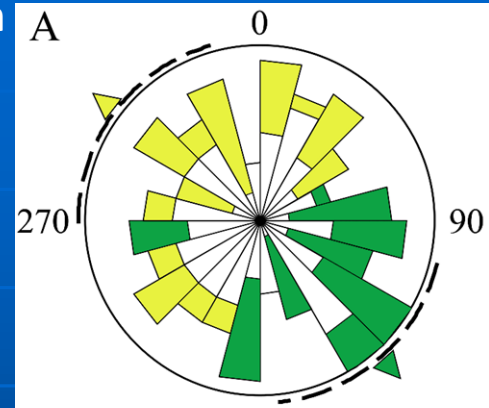


Putman et al. (2014)
Biology Letters

Steelhead trout in the Pacific Ocean

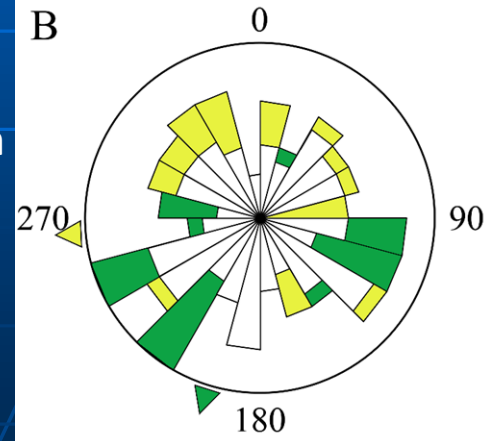
(A) Fish reared in “normal” field

Mardia-Watson-Wheeler Test
 $P = 0.00016$
 $n = 160$



(B) Fish reared in “bizarre” field

Mardia-Watson-Wheeler Test
 $P = 0.387$
 $n = 159$



Putman et al. (2014)
Biology Letters

