Walleye Status in Montana

Zach Shattuck, Mike Ruggles, and Eric Roberts
Montana Fish, Wildlife & Parks

Photo: Paul Vecsei

General Definitions

- Native: a species or subspecies that historically occurred in Montana and has not been introduced by humans directly or as a result of human activity.
  - e.g., Paddlefish, Lake Trout in Elk Lake
- Nonnative: a species or subspecies not native to Montana.
  - e.g., Smallmouth Bass, Lake Trout in FP
- Wild (either native or nonnative): a species or subspecies that has been established and is self-sustaining.
  - e.g., Rainbow Trout in MR, Walleye in CF, Longnose Dace
- Stocked (either native or nonnative): a species or subspecies that relies on stocking to persist.
  - e.g., Rainbow Trout in CF, Walleye in FP, Pallid Sturgeon.

Native Fish Species Designation

- Montana Natural Heritage Program (MNHP) serves as the state's information source for animals, plants, plant communities, and now invasive species.
- Focus on species and communities that are rare, threatened, and/or have declining trends and as a result are at risk or potentially at risk of extirpation in Montana.
- Collaboratively work with Montana Fish, Wildlife & Parks (MFWP) to utilize a long history of collection information as basis for species designations and weight of evidence.

http://fwp.mt.gov/fishAndWildlife/management/nativeFish.html

Montana’s Fish Species of Concern

- Species of Concern (SOC) are native taxa that are at-risk due to declining population trends, threats to their habitats, restricted distribution, and/or other factors.
- Designation as a SOC or Potential SOC is based on the Montana Status Rank, and is not a statutory or regulatory classification.
- Status determinations are made by MNHP and MFWP biologists in consultation with representatives of the Montana Chapter of the American Fisheries Society, and other experts.

http://mtnhp.org/SpeciesOfConcern/?AorP=a

Montana's Fish Species of Concern

RANK		DEFINITION
G1	S1	High risk. Highly vulnerable to global extinction or state extirpation. Extremely limited and/or rapidly declining population numbers, range, and/or habitat.
G2	S2	At risk. Vulnerable to global extinction or state extirpation. Very limited and/or potentially declining population numbers, range, and/or habitat.
G3	S3	Potentially at risk. Potentially vulnerable even though it may be abundant in some areas. Limited and/or declining numbers, range, and/or habitat.
G4	S4	Apparently secure. May be quite rare in parts of its range, and/or suspected to be declining.
G5	S5	Not vulnerable in most of its range. Common, widespread, and abundant, although it may be rare in parts of its range.
GX	SX	Extinct or Extirpated. Species is presumed to be extinct throughout its range or extirpated in state. Not located despite intensive searches and small likelihood that it will ever be rediscovered.
GH	SH	Historical. Known from records usually 40 or more years old; may be rediscovered
GNR	SNR	Not ranked as of yet.
GU	SU	Unrankable due to lack of information or substantially conflicting information on status.
GNA	SNA	A conservation status rank is not applicable as a result of being; not present, nonnative, long-distance migrant with accidental occurrence, or a hybrid without conservation value.

http://mtnhp.org/SpeciesOfConcern/?AorP=a

Montana's Fish Species of Concern

RANK	SPECIES	RANK	SPECIES	RANK	SPECIES
S1	Kootenai River White Sturgeon	S2	Yellowstone Cutthroat Trout	S3	Northern Redbelly Dace
S1	Pallid Sturgeon	S2	Westslope Cutthroat Trout	S3	N. Redbelly Dace X Finescale Dace
S1	Shortnose Gar	S2	Bull Trout	S3	Pygmy Whitefish
S1	Sicklefin Chub	S2	Lake Trout	S3	Torrent Sculpin
S1	Columbia River Redband Trout	S2	Trout-perch	S3	Spoonhead Sculpin
S1	Arctic Grayling	S2	Sauger	S3	Deepwater Sculpin
S2	Paddlefish	S2S3	Sturgeon Chub	S3	Iowa Darter
S2	Northern Pearl Dace	S2S3	Blue Sucker		

http://mtnhp.org/SpeciesOfConcern/?AorP=a

Fish Species of Concern

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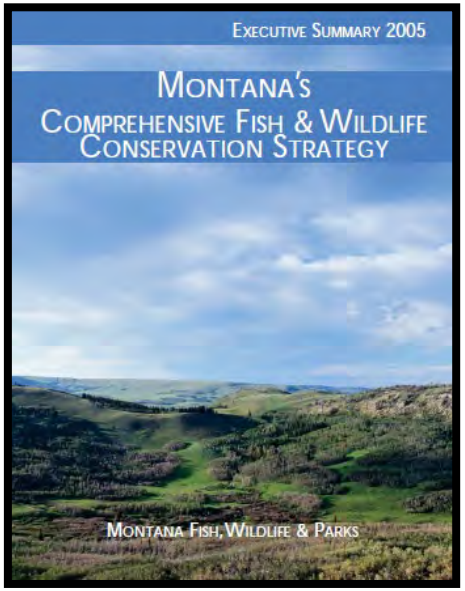
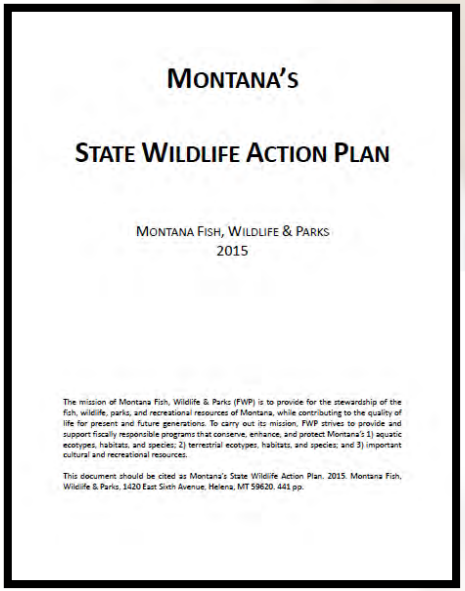
S2	Paddlefish	S2S3	Sturgeon Chub	S3	Iowa Darter
S2	Northern Pearl Dace	S2S3	Blue Sucker		

http://mtnhp.org/SpeciesOfConcern/?AorP=a

Montana's SWAP

- State Wildlife Action Plan (formerly CFWCS)
- Part of State Wildlife Grant, est. 2000
- Updated every 10-years
- Large landscape-level impacts
- Short-term inventory projects





Montana's

State Wildlife Action Plan

Montana Fish, Wildlife & Parks
2015

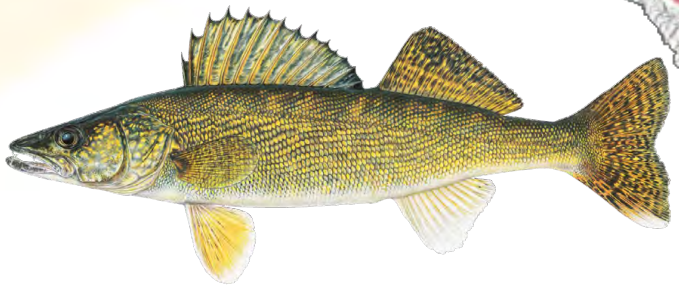
The mission of Montana Fish, Wildlife & Parks (FWP) is to provide for the stewardship of the fish, wildlife, parks, and recreational resources of Montana, while contributing to the quality of life for present and future generations. To carry out its mission, FWP strives to provide and support fiscally responsible programs that conserve, enhance, and protect Montana's 1) aquatic ecotypes, habitats, and species; 2) terrestrial ecotypes, habitats, and species; and 3) important cultural and recreational resources.

This document should be cited as Montana's State Wildlife Action Plan. 2015. Montana Fish, Wildlife & Parks, 1420 East Sixth Avenue, Helena, MT 59620. 441 pp.

http://fwp.mt.gov/fishAndWildlife/conservationInAction/swap2015Plan.html

Walleye in Montana

- A Montana Status Rank is not applicable (SNA) because the species is considered nonnative or introduced.
- Walleye are considered common, widespread, and not vulnerable in most of its range (G5).



http://fieldguide.mt.gov/speciesDetail.aspx?elcode=AFCQC05020

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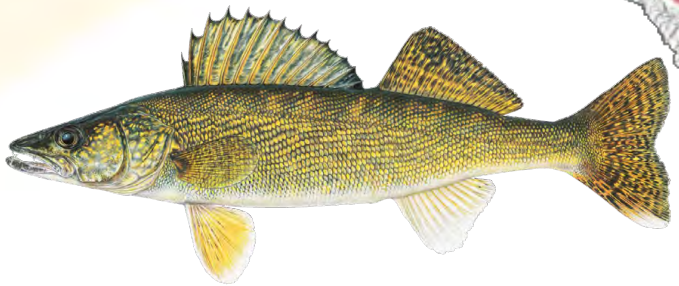

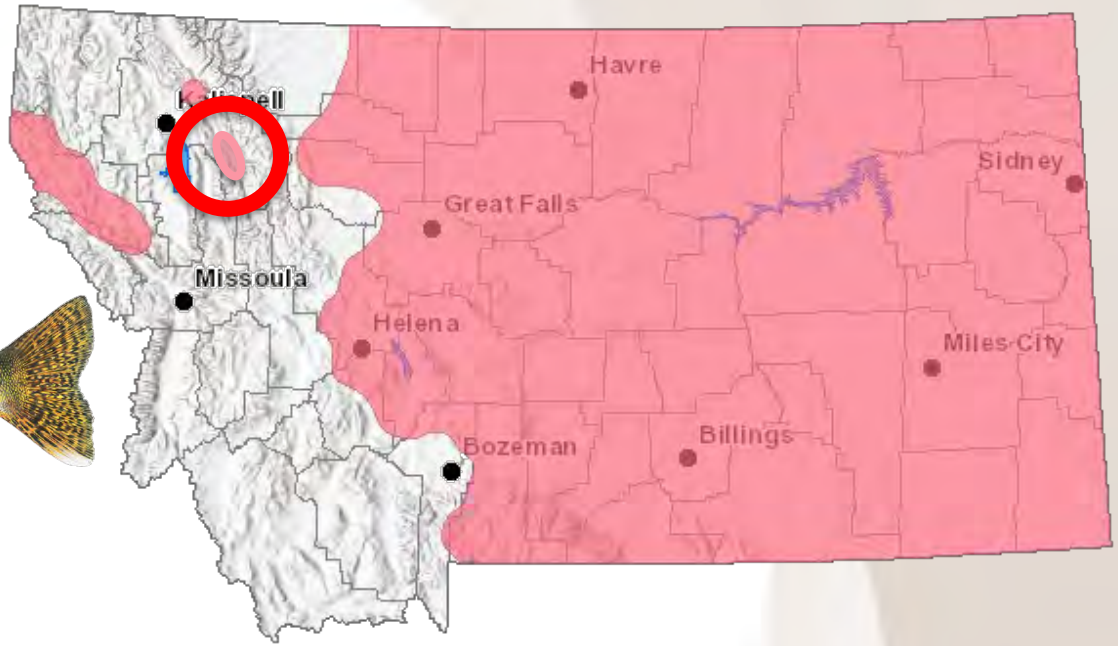

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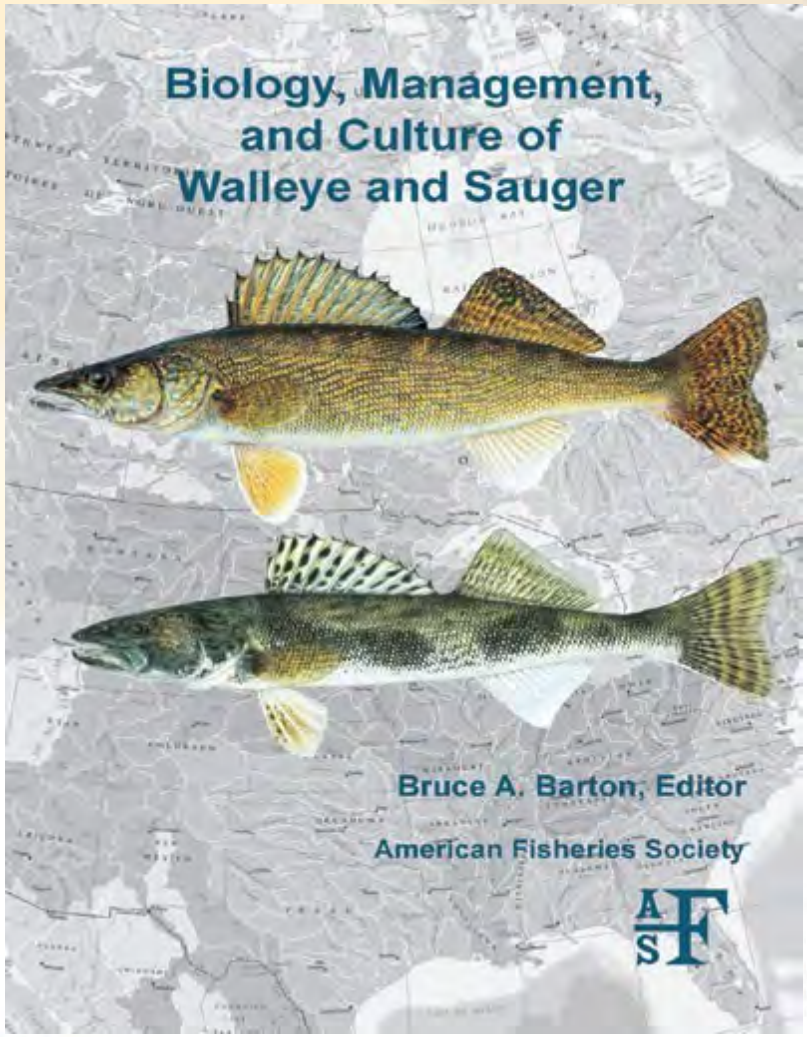

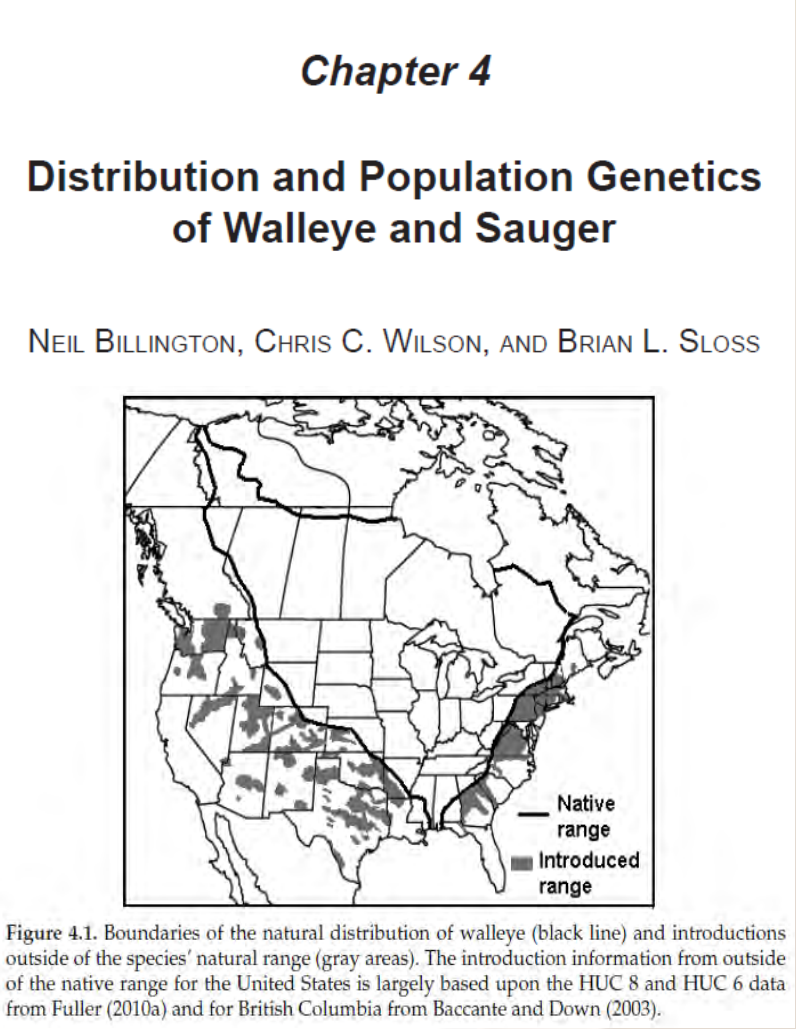

Chapter 4

Distribution and Population Genetics of Walleye and Sauger

NEIL BILLINGTON, CHRIS C. WILSON, AND BRIAN L. SLOSS

Figure 4.1. Boundaries of the natural distribution of walleye (black line) and introductions outside of the species' natural range (gray areas). The introduction information from outside of the native range for the United States is largely based upon the HUC 8 and HUC 6 data from Fuller (2010a) and for British Columbia from Baccante and Down (2003).

https://fisheries.org/bookstore/all-titles/professional-and-trade/55065p/

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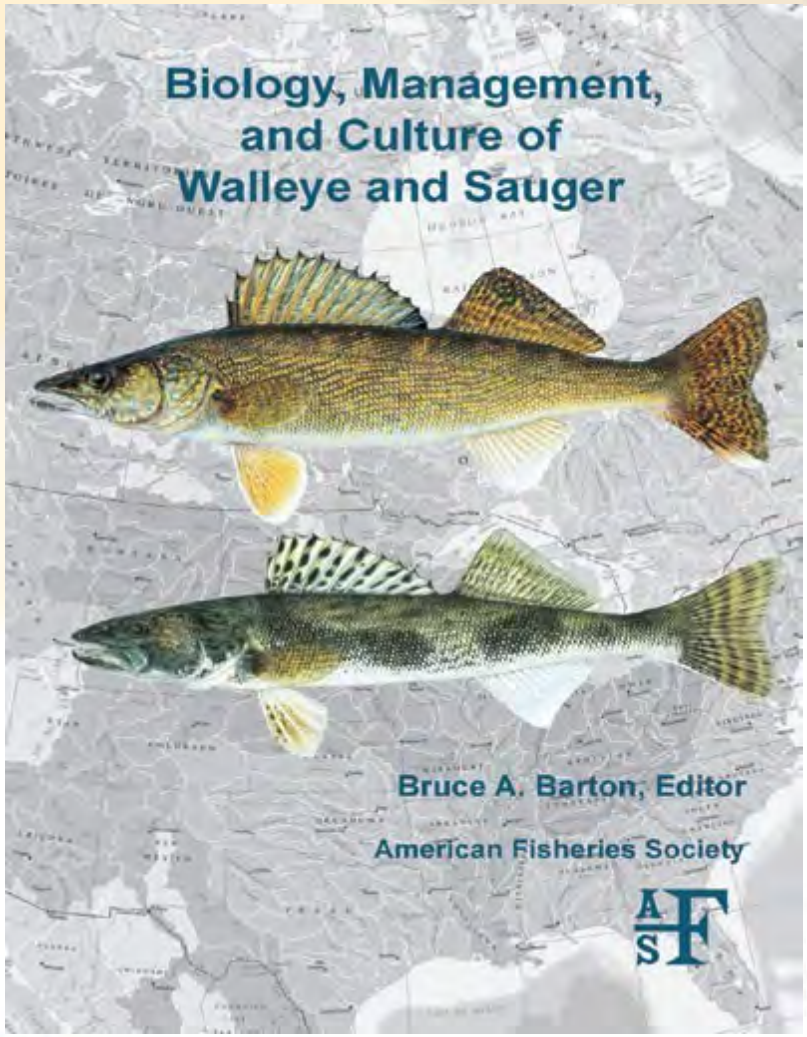

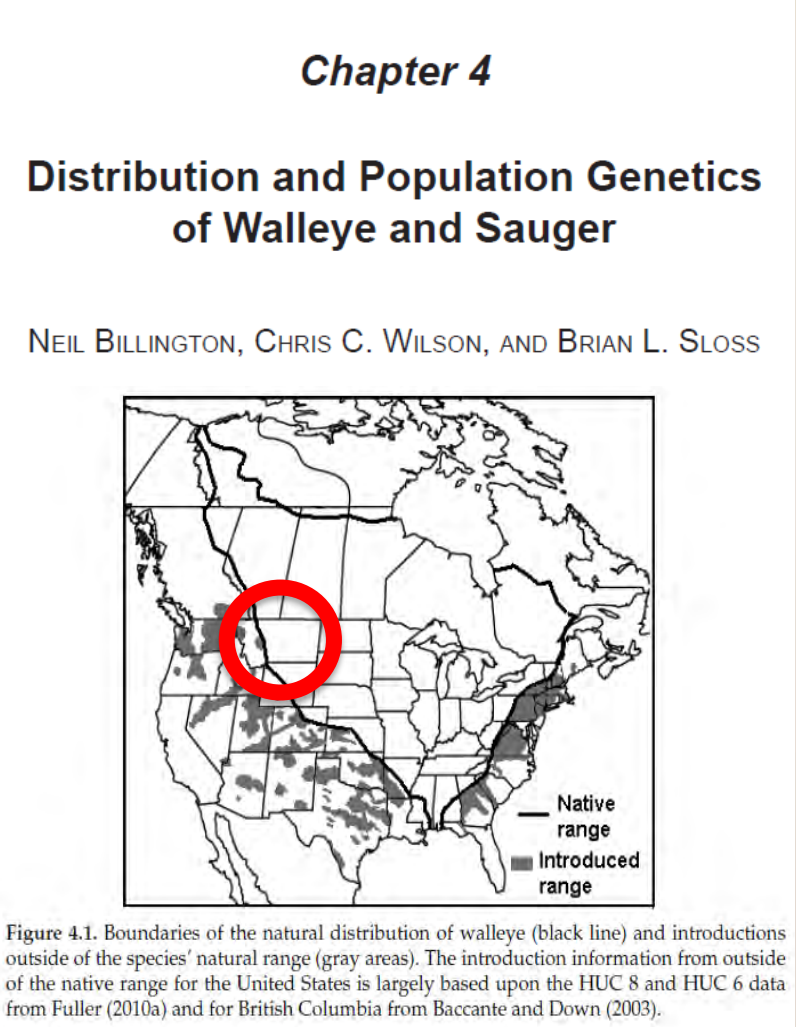

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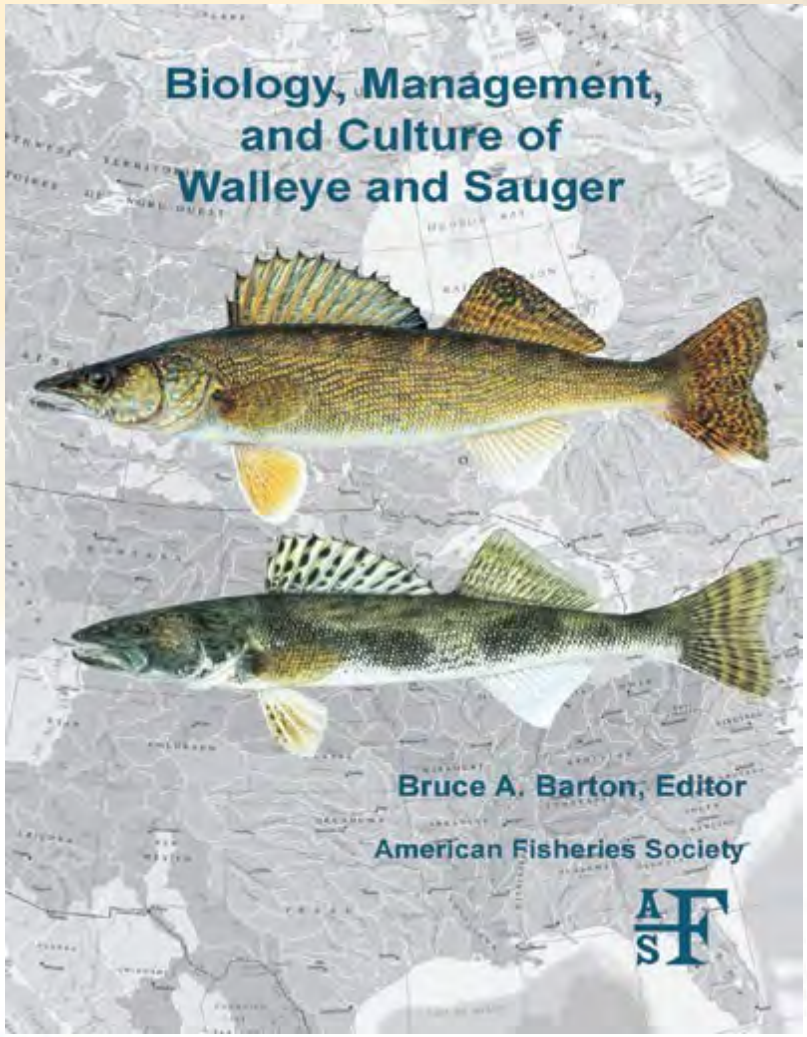

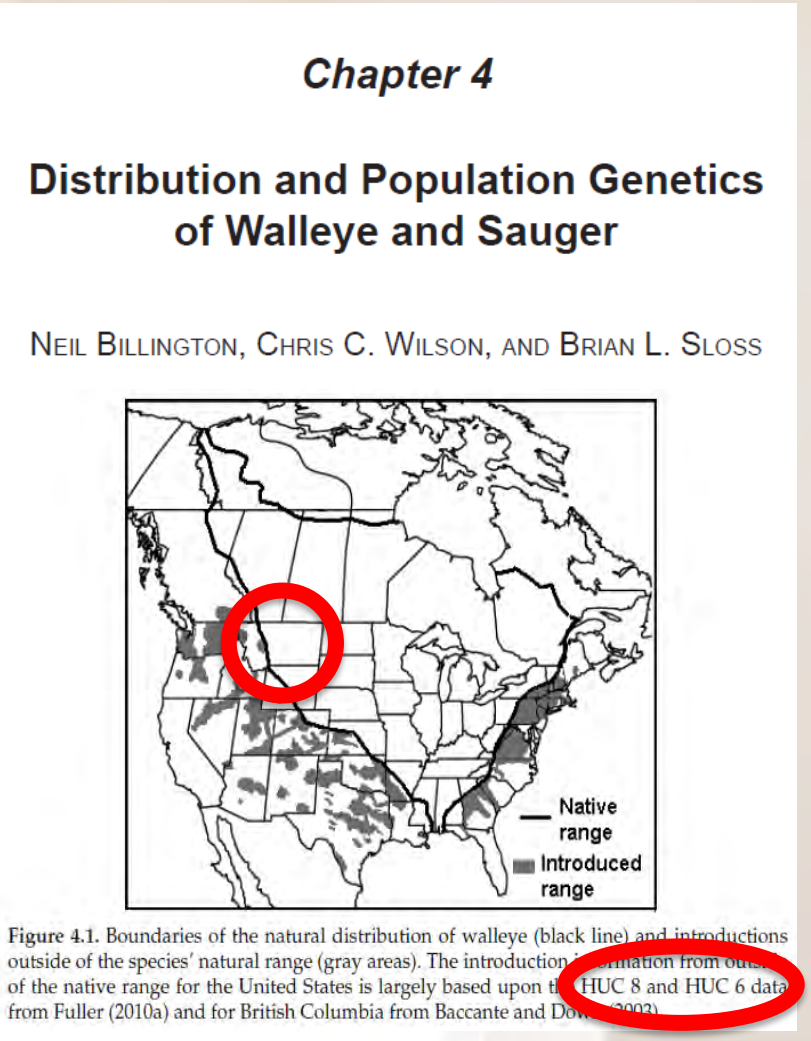

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Native range
Introduced range

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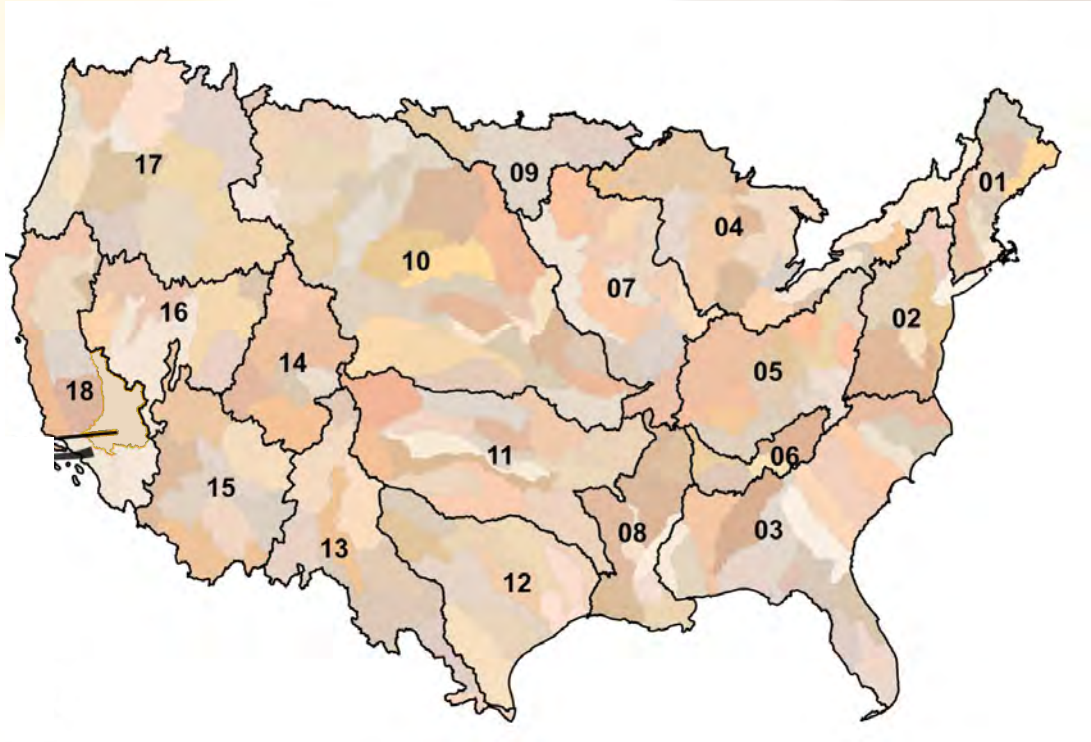
Billington et al. 2011 *in* Barton (ed.) 2011

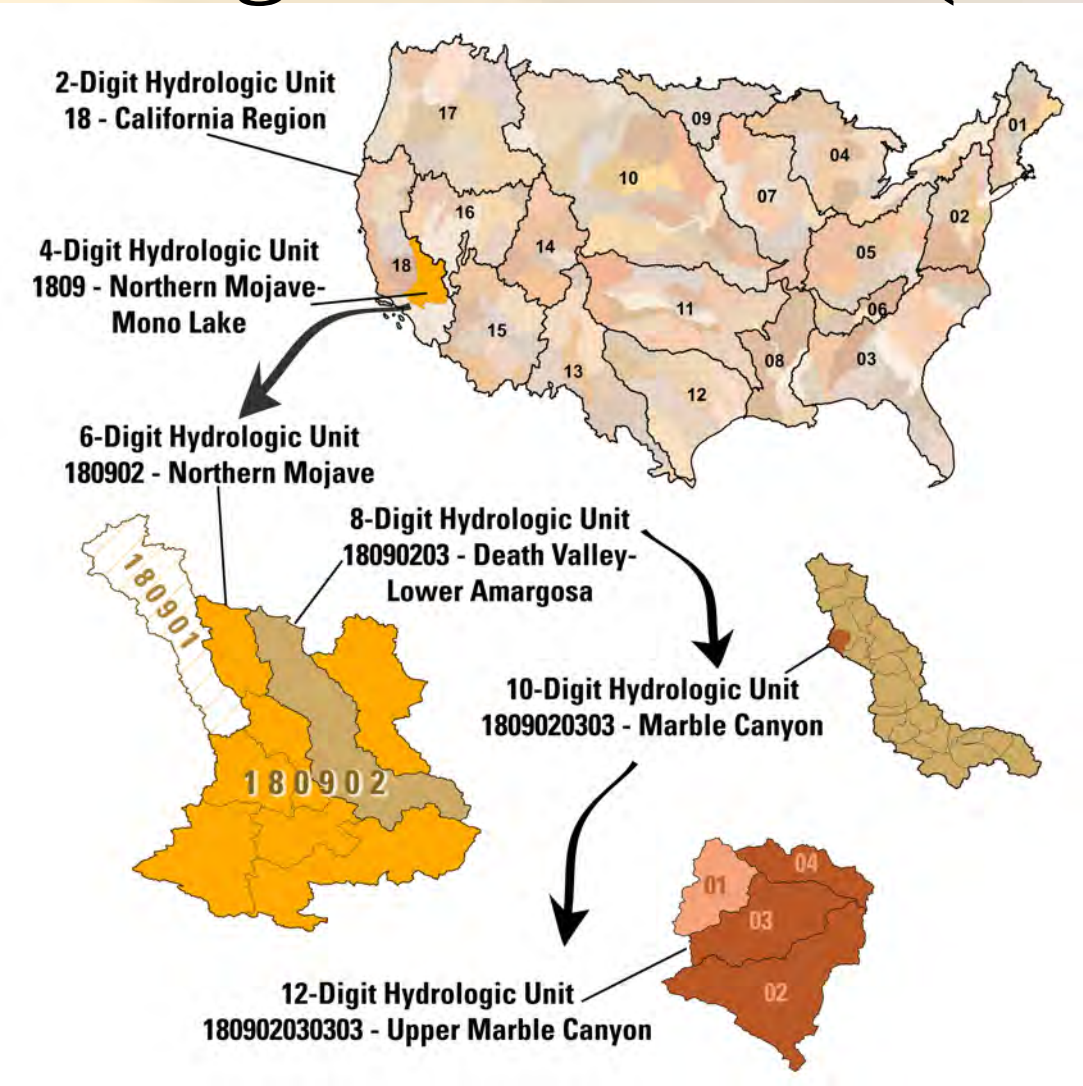
Hydrologic Unit Code (HUC)

- Initiated in 1972 by USGS for standardization.
- Utilized HUCs to classify and divide geographic areas into:
  - Region (2-digit), Subregion (4-digit), Basin (6-digit), Subbasin (8-digit), Watershed (10-digit), and Subwatershed (12-digit).



https://www.usgs.gov/media/images/watershed-boundary-dataset-structure-visualization

Hydrologic Unit Code (HUC)



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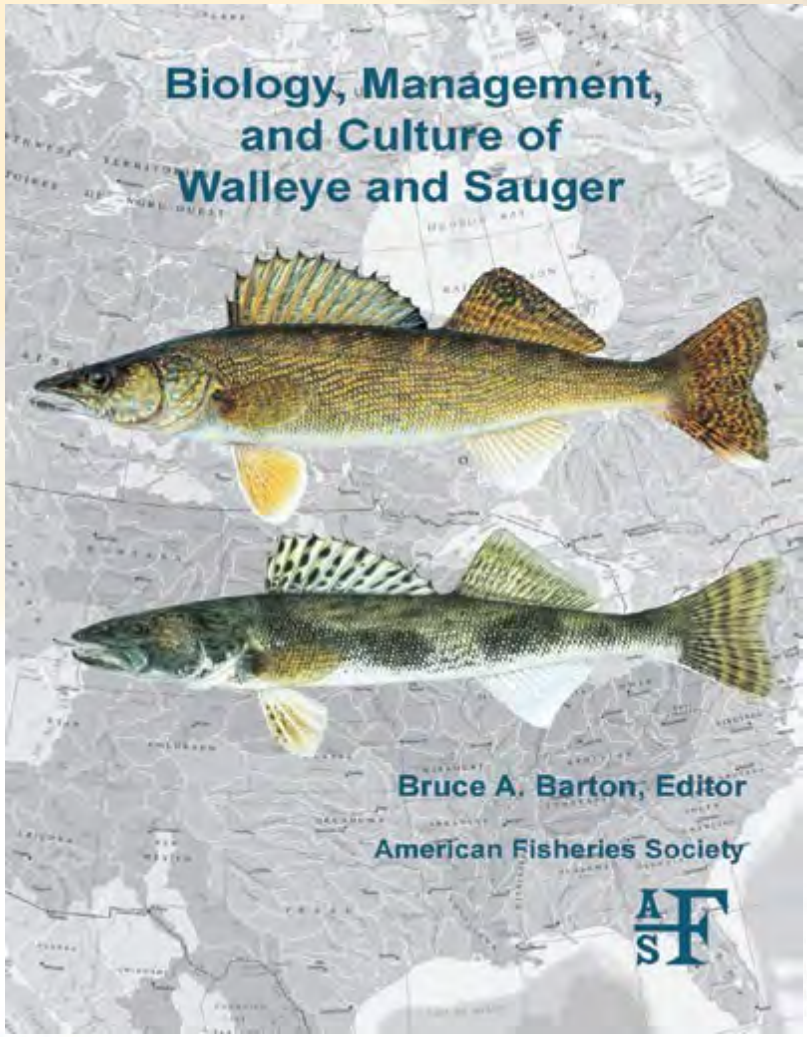

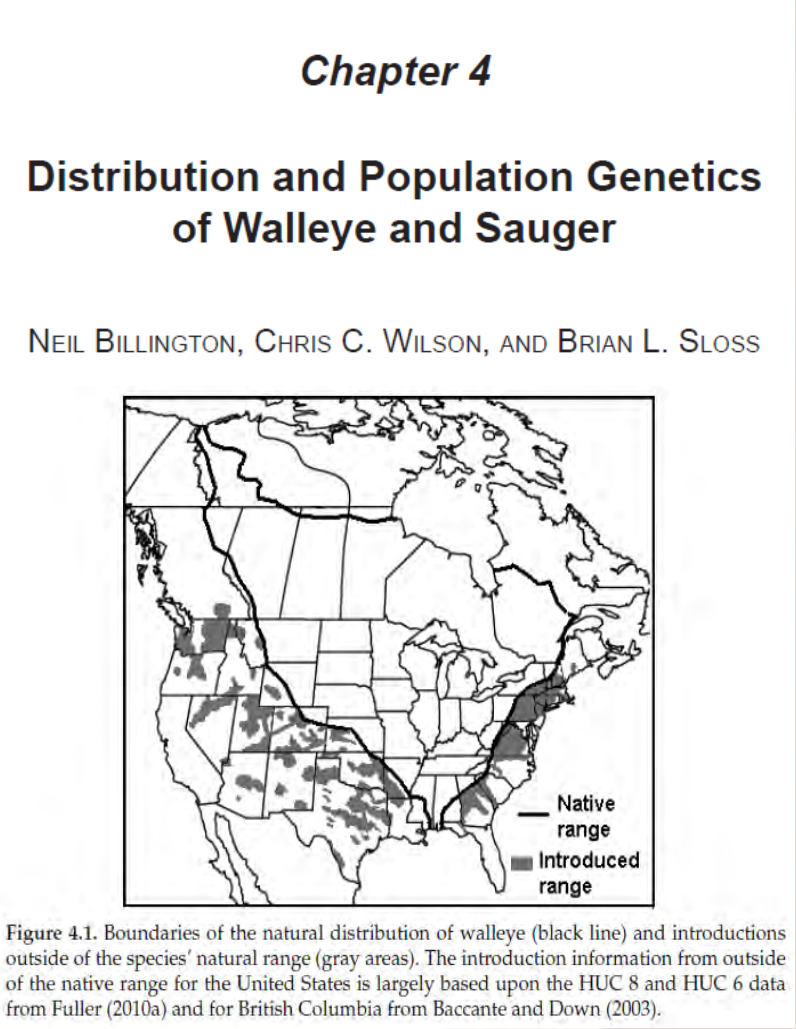

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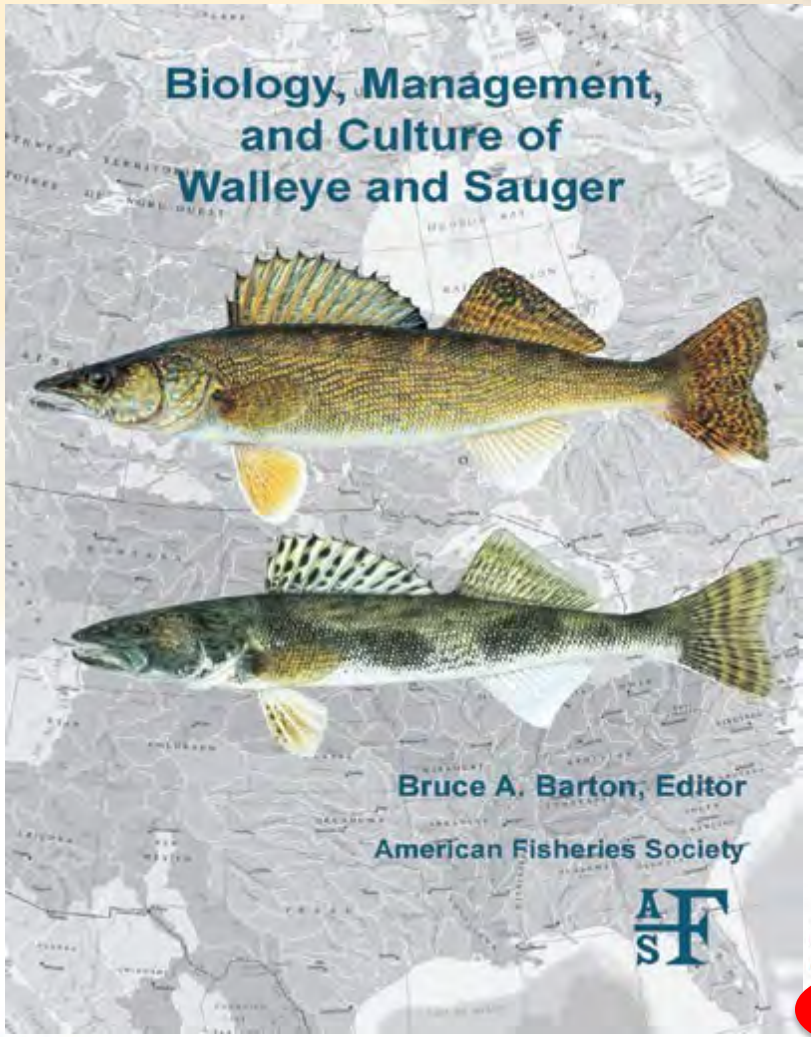

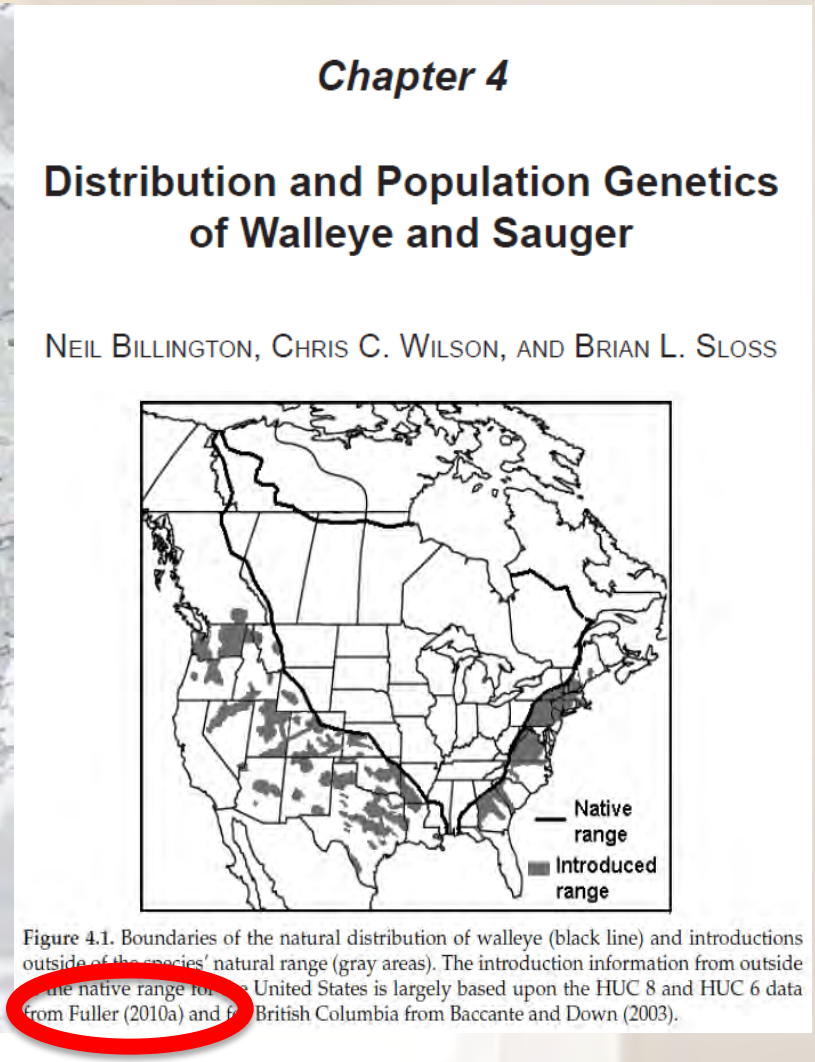

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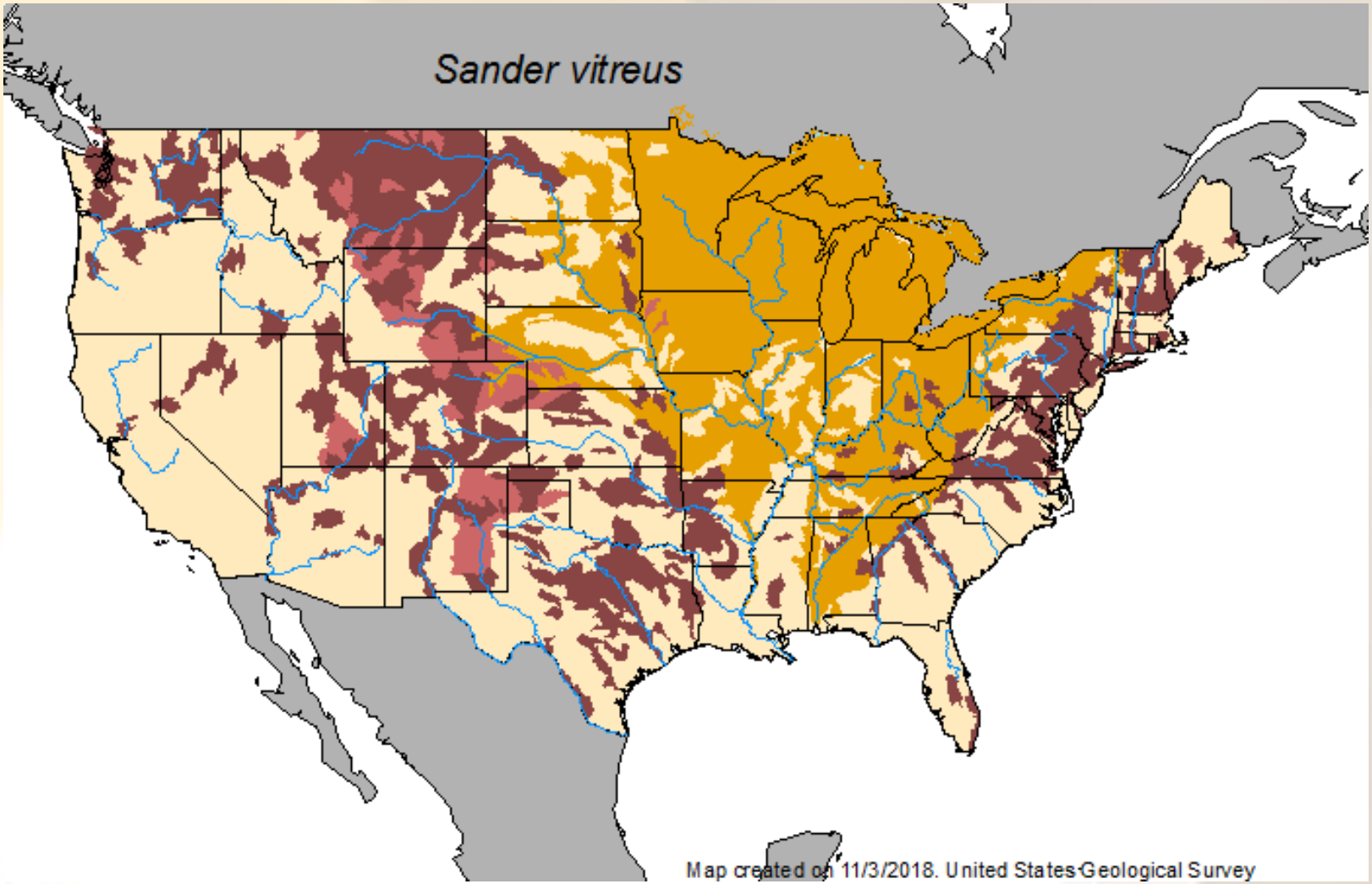

Fuller and Neilson 2015; https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=831

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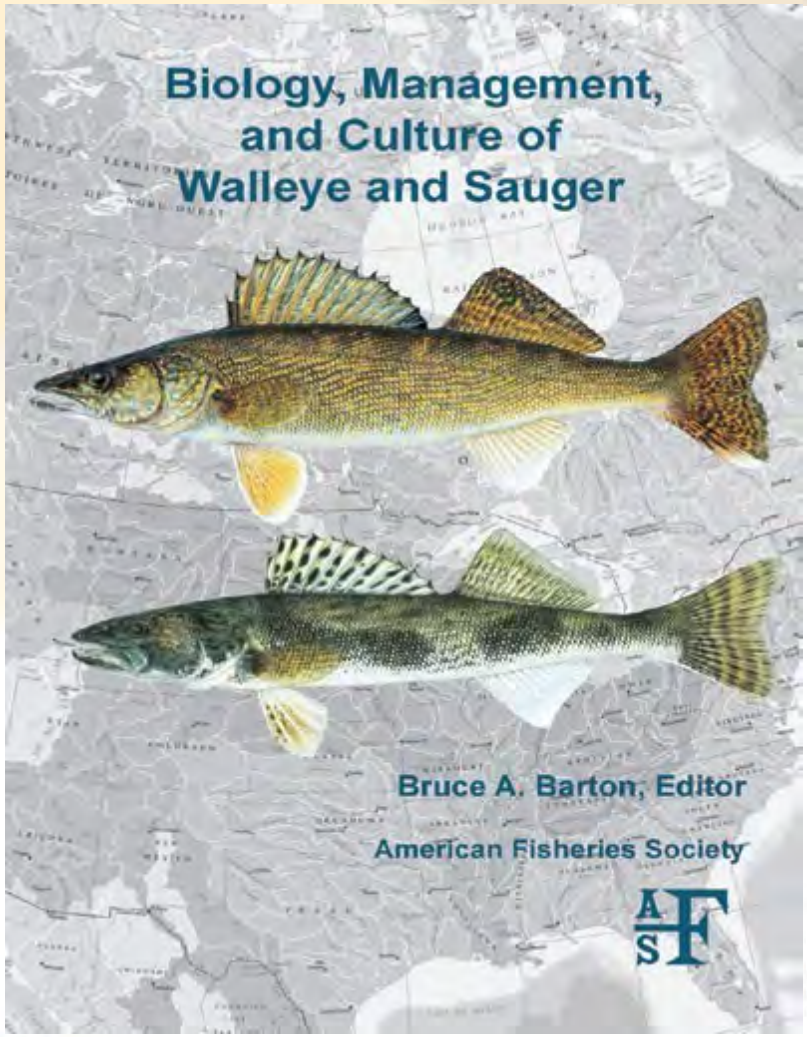

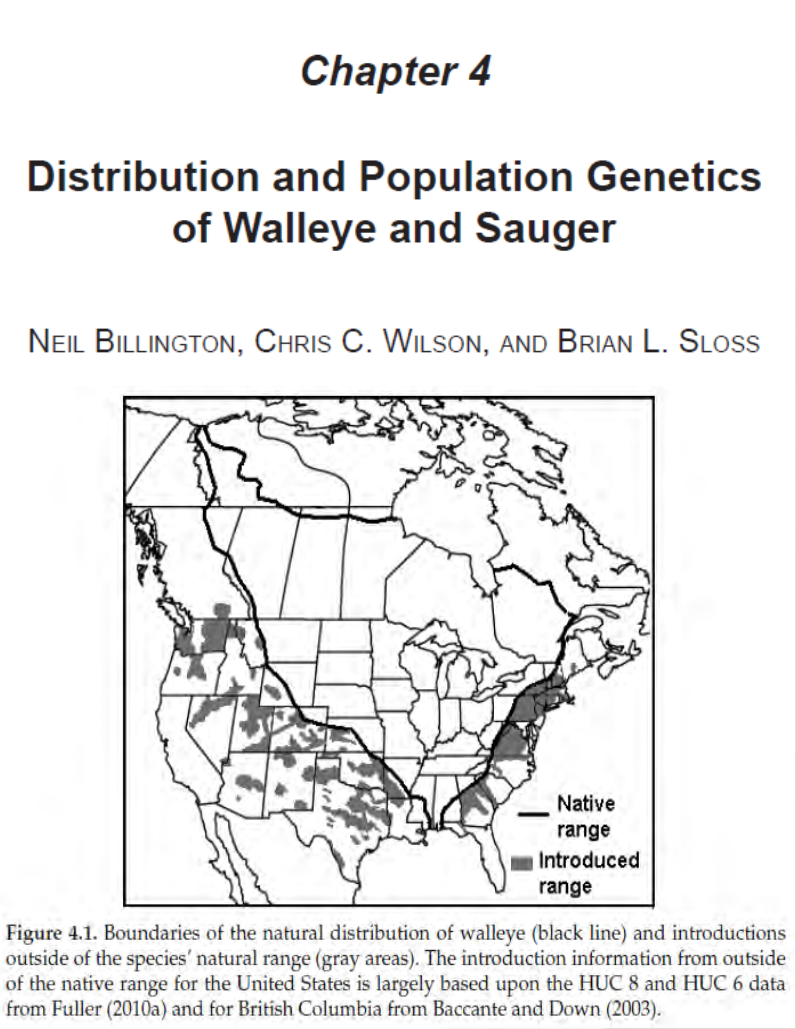

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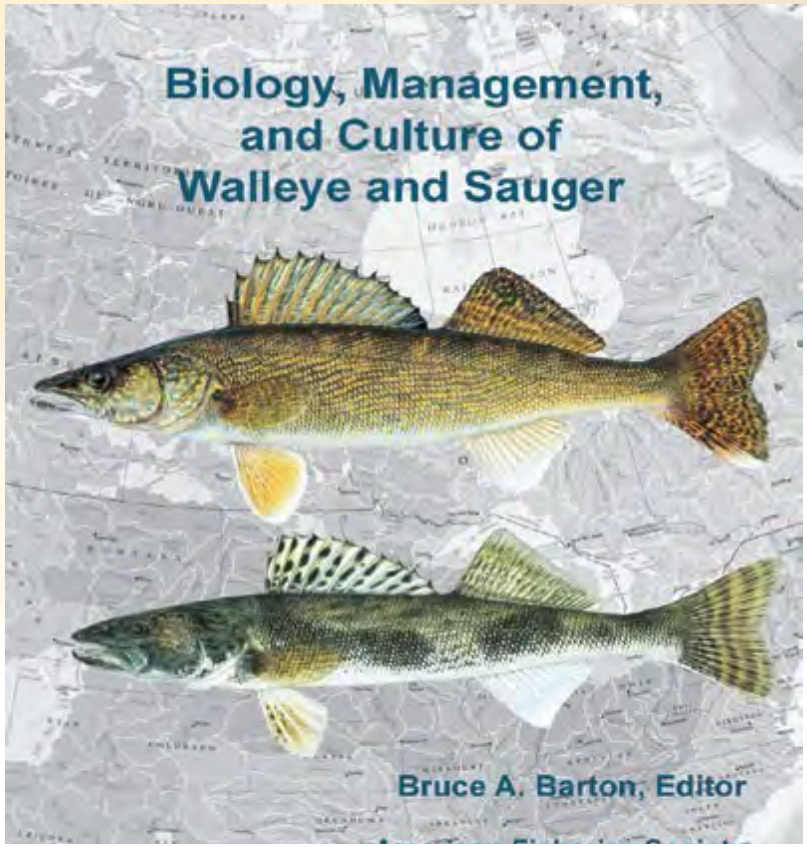

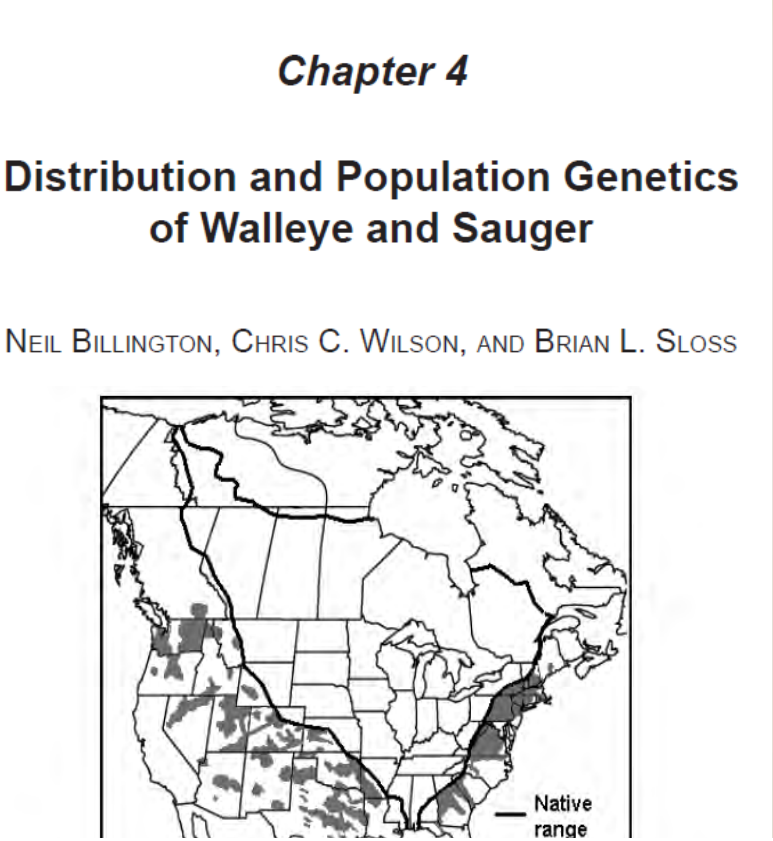

Chapter 4

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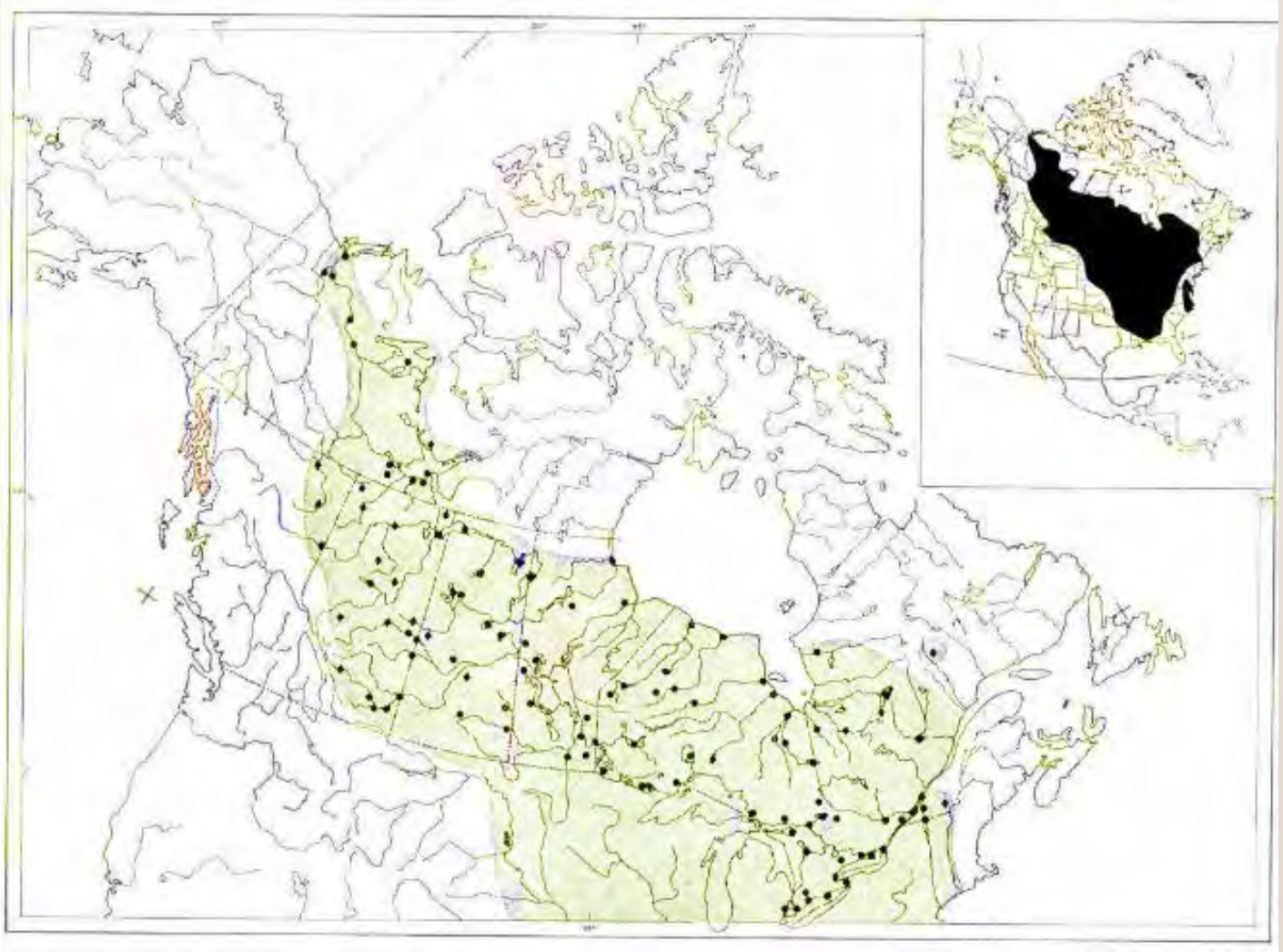
"The natural distribution ranges from as far northwest as the Mackenzie River delta, as far south as the Gulf Coast drainages of Alabama and Mississippi, and as far east as New Hampshire and central Québec (Scott and Crossman 1973; Trautman 1981; Page and Burr 1991)."
– Billington et al. 2011

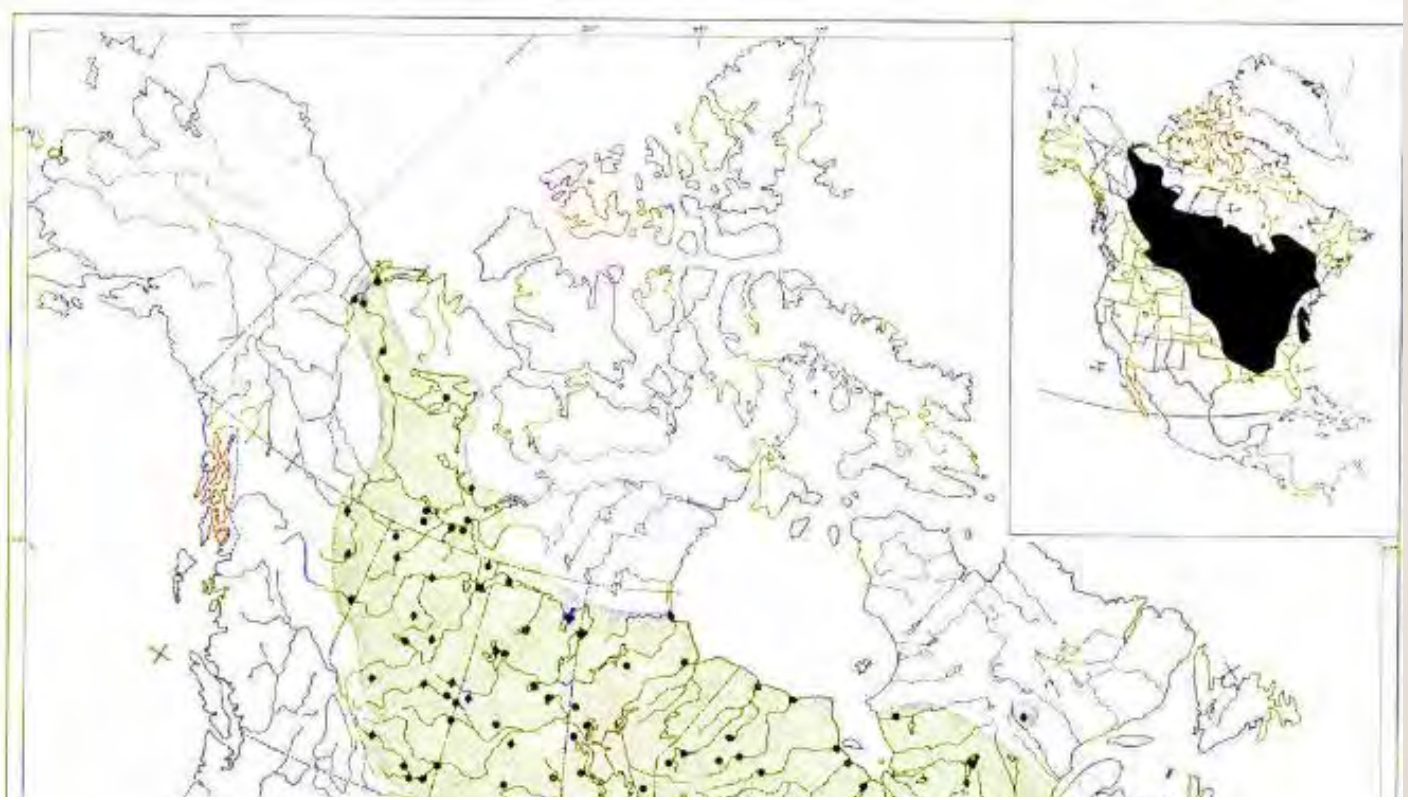
Billington et al. 2011 *in* Barton (ed.) 2011

Another Map



Scott and Crossman 1973 “Freshwater Fishes of Canada”

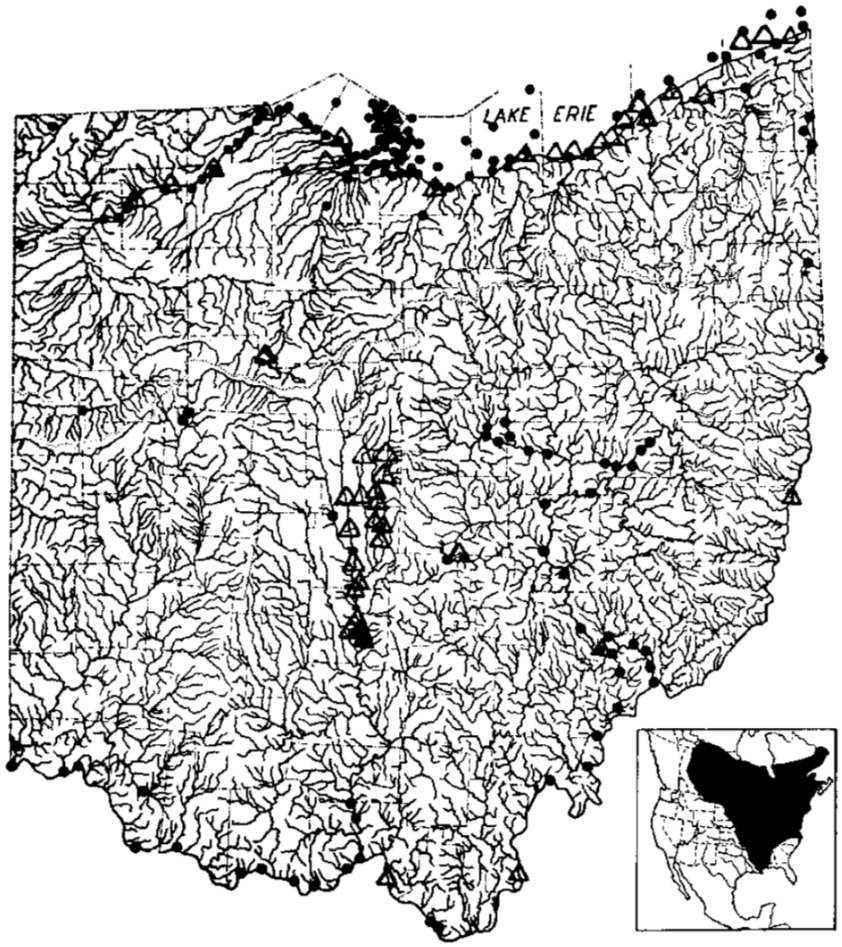
Another Map



"It occurs from Quebec south to New Hampshire, southwest to Pennsylvania, southward west of the Appalachian Mountains to the Gulf coast in Alabama, northeast to eastern Oklahoma, northeast through the eastern half of the states from Nebraska to North Dakota, north to near the Arctic coast in the Mackenzie River, southeast across James Bay to Quebec."
– Scott and Crossman 1973

Scott and Crossman 1973 "Freshwater Fishes of Canada"

Another Map

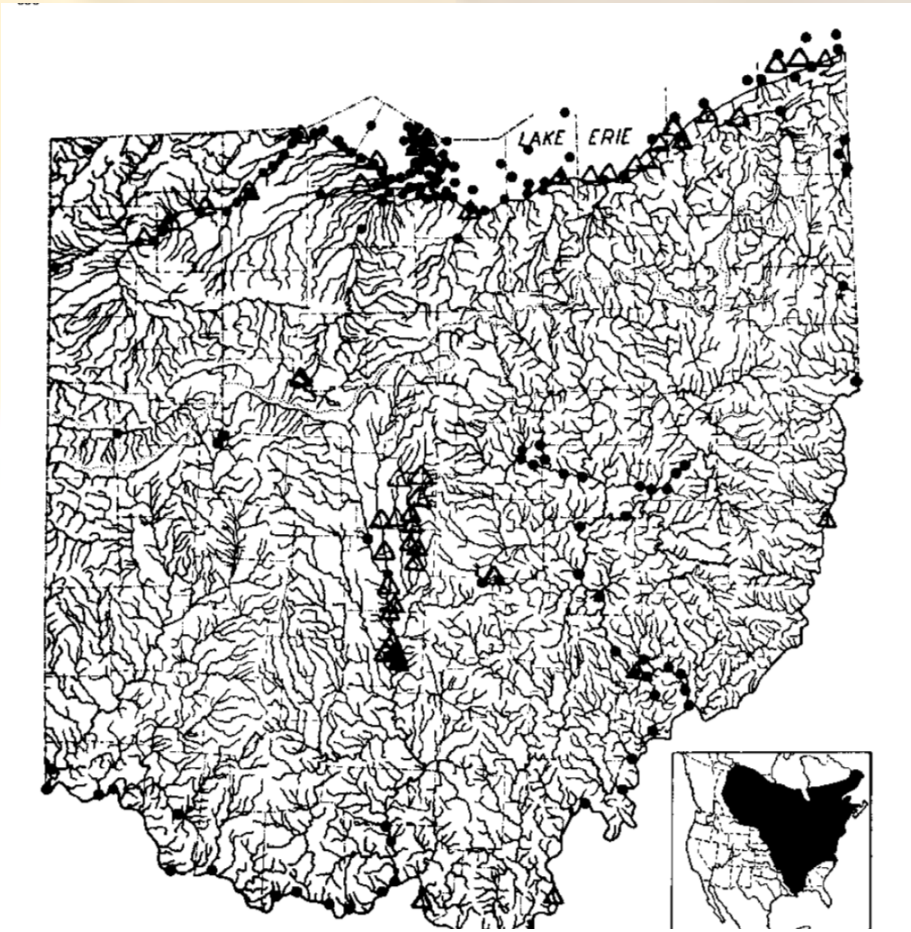


MAP 147. Walleye

Locality records. ● Before 1955. △ 1955–80.
Insert: Widely introduced within and outside of this range, western and northern limits of range indefinite.

Trautman 1981 “The Fishes of Ohio”

Another Map



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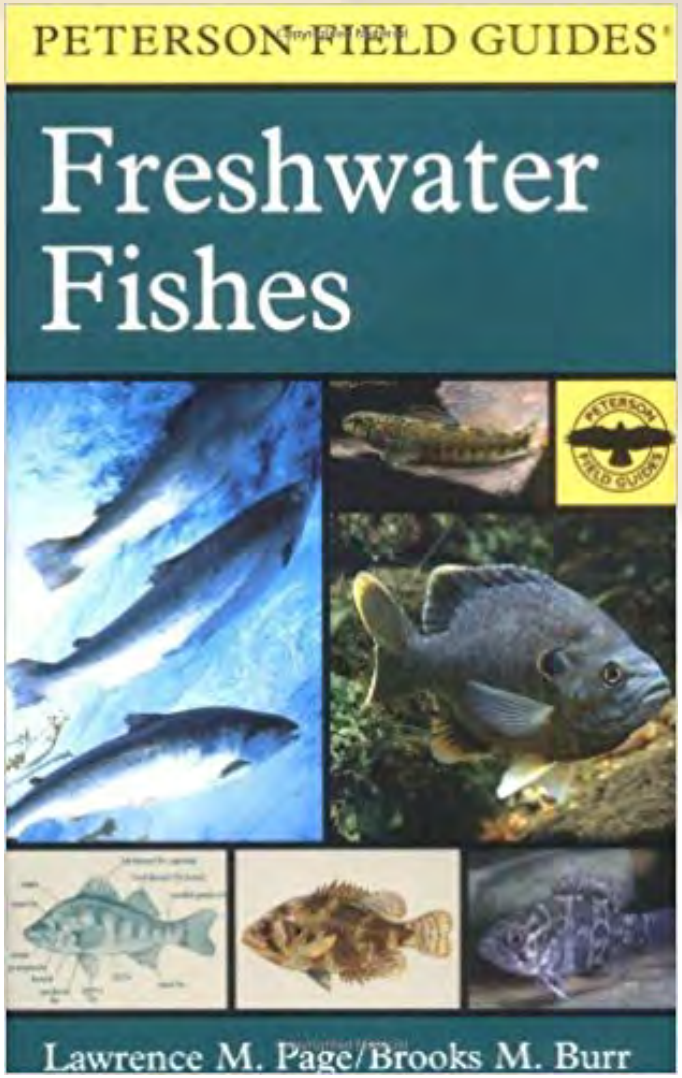

Page and Burr 1991 “A Field Guide to Freshwater Fishes: NA North of Mexico”

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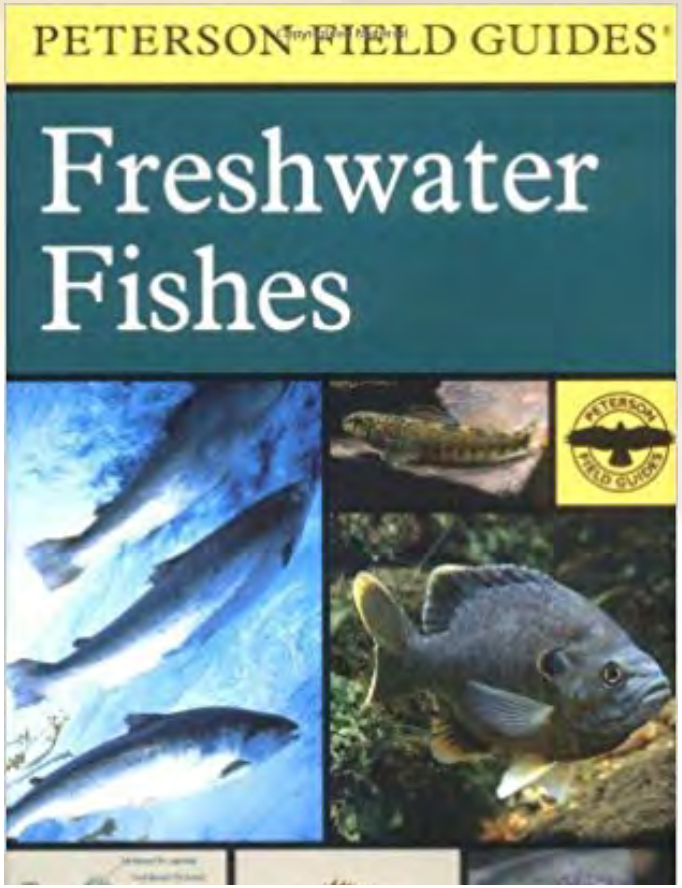


"Native to St. Lawrence-Great Lakes, Arctic, and Mississippi R. basins from QU to NT, and south to AL and AR. Widely introduced elsewhere in U.S., including Atlantic, Gulf, and Pacific drainages."
– Page and Burr 1991

Page and Burr 1991 "A Field Guide to Freshwater Fishes: NA North of Mexico"

Another Map

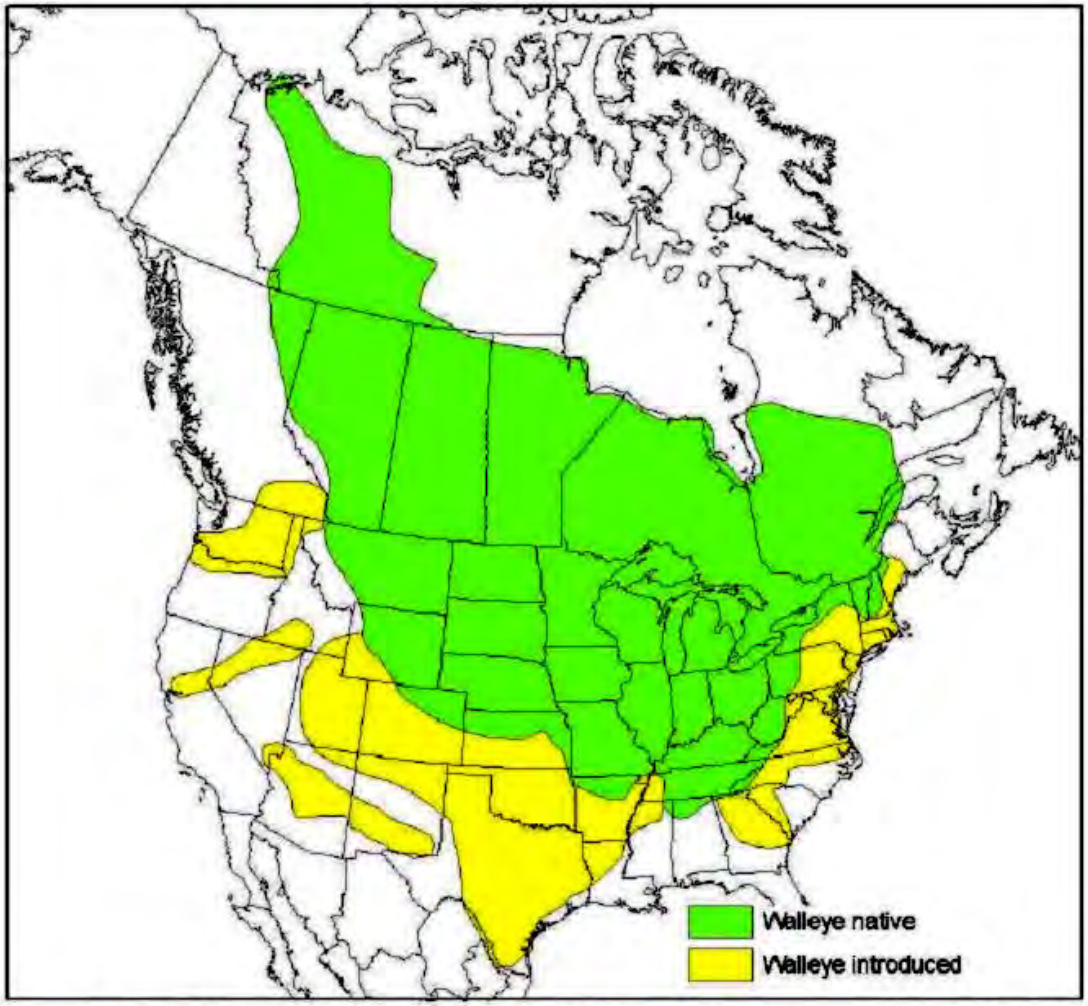
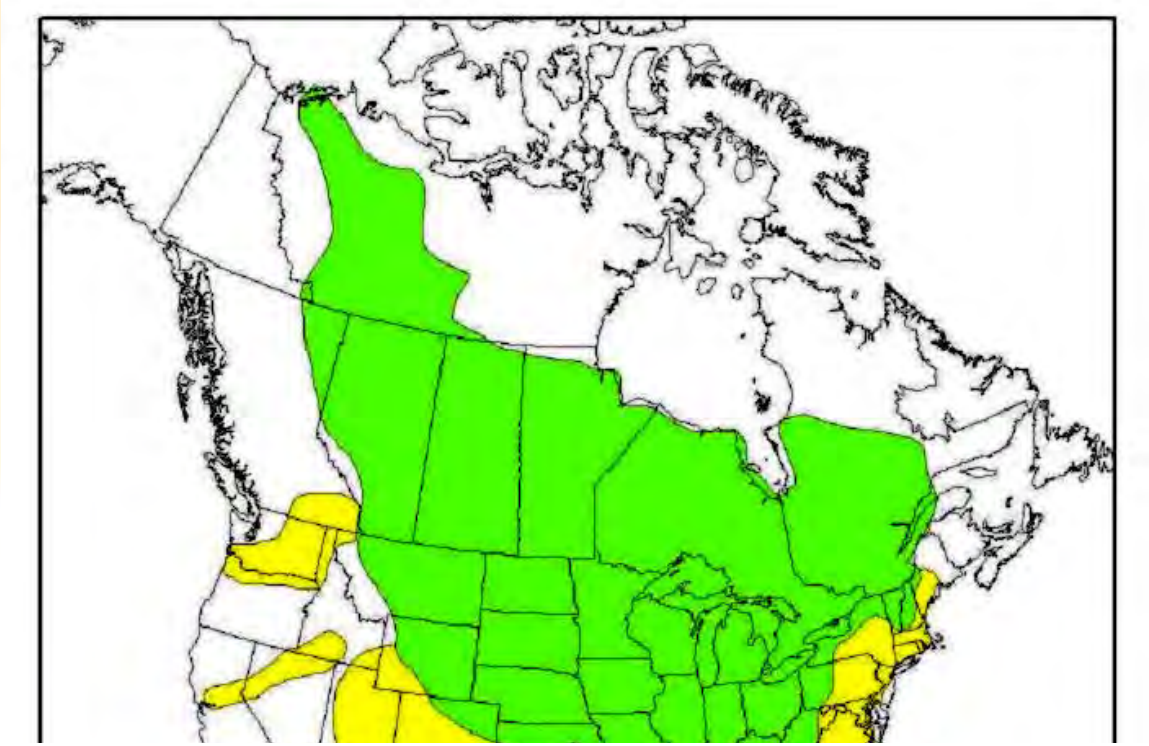


Figure 2. The North American distribution of walleye from Bradford et al. (2008)

Bradford et al. 2008 *in* Hartman 2009; featured in Billings Gazette 12/23/18

Another Map



"The native distribution of walleye in Canada extends from western Quebec to the continental divide. They are also found in the Mackenzie Basin north to the Arctic Ocean, including the Peace and Liard Rivers of northeastern BC and Alberta. The native range also includes the Great Lakes states, and the Mississippi basin south to Alabama and Arkansas. Walleye have been introduced to the Atlantic coast states, as well as most of the Western states, and in particular, the Columbia River basin in Washington (Wydoski and Whitney 2003)."
– Bradford et al. 2008

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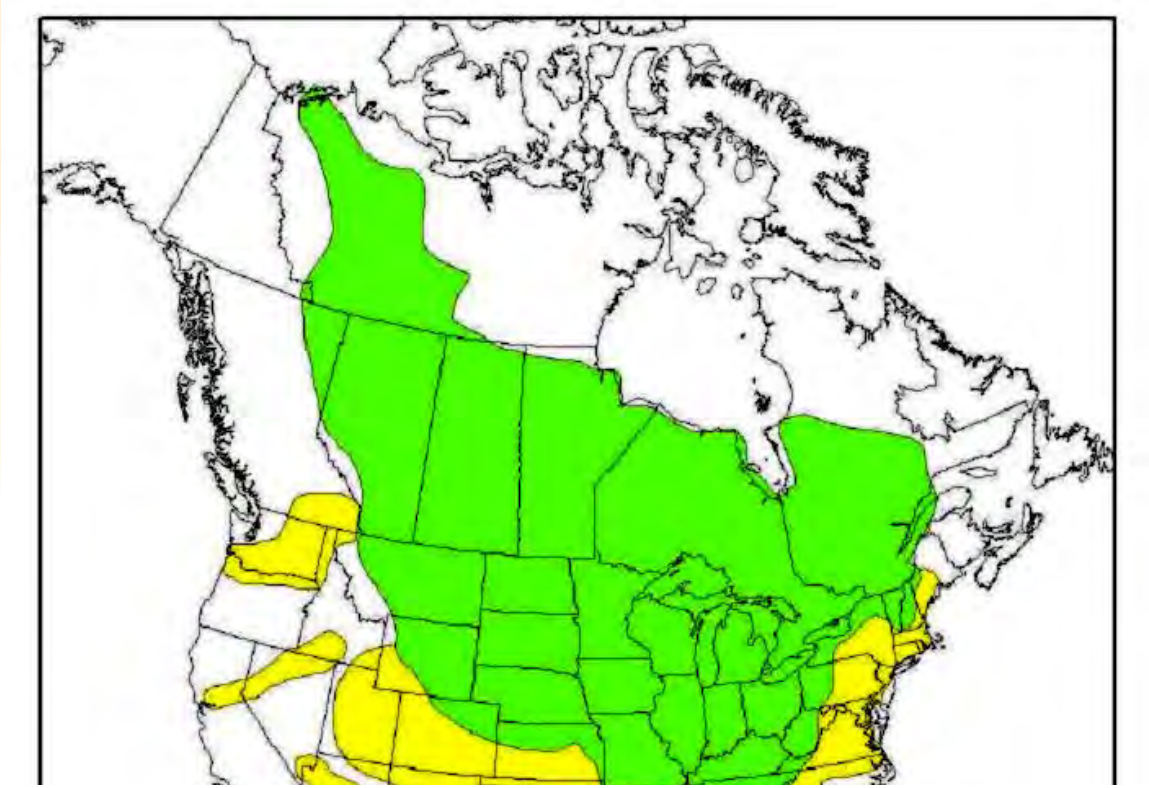

"Walleye is widely distributed in North America (Figure 2). It is usually confined to fresh water and occurs only rarely in brackish water. In the U.S., walleye occur naturally from New Hampshire, south to Pennsylvania and west of the Appalachians to the gulf coast in Alabama. Natural distribution includes the eastern parts of Nebraska, North and South Dakota (Lee et al. 1980).
– Hartman 2009

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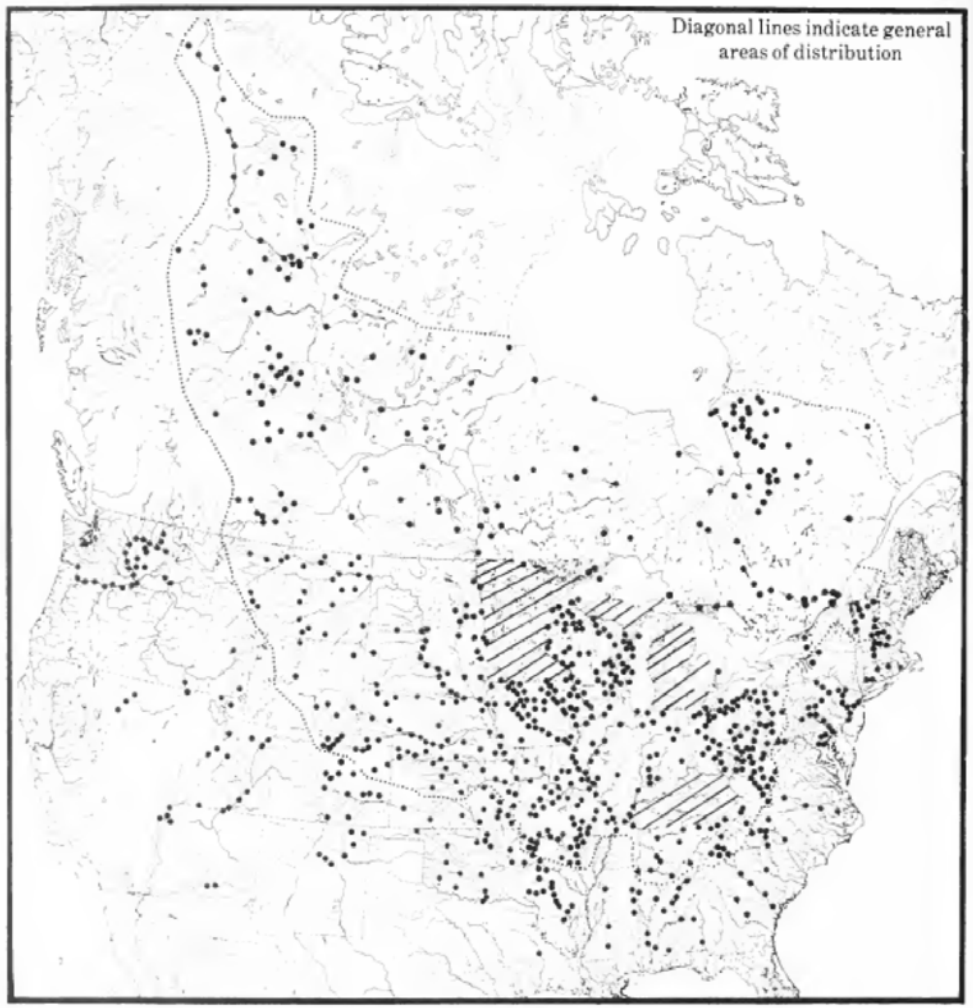
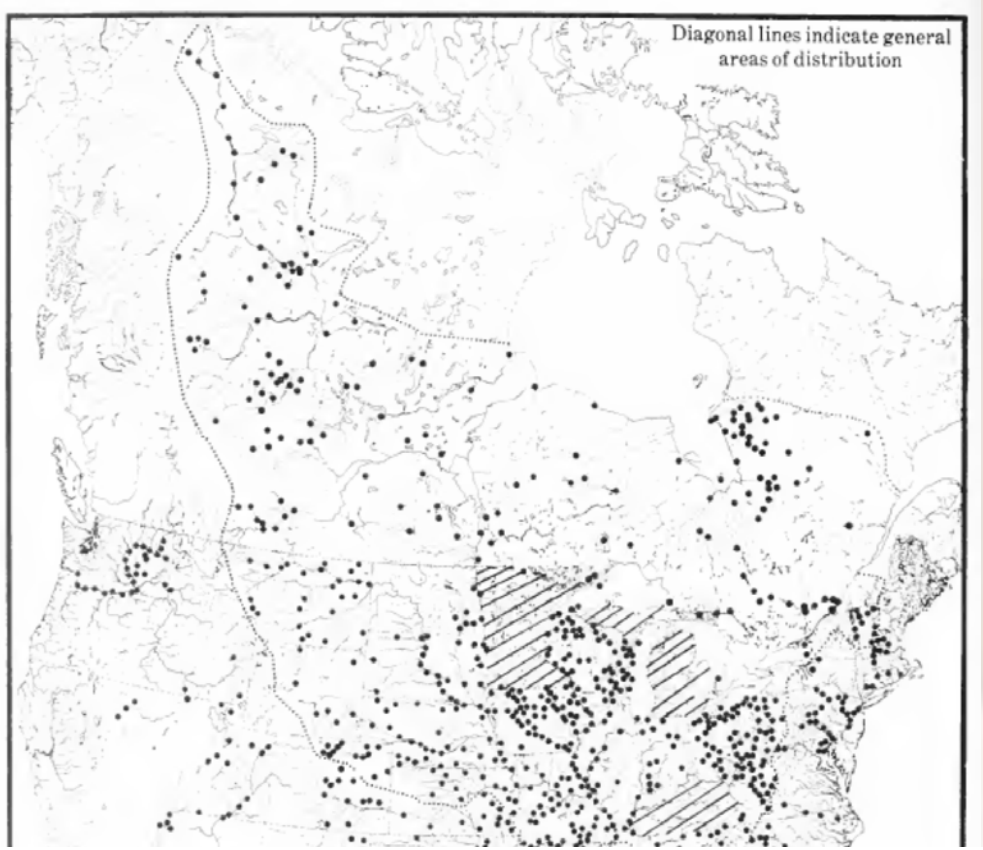


Dotted line separates native from transplanted populations

Lee et al. 1980

Another Map



"Native range believed from QU south to northern GA and AL; northwest to ND; north from Mackenzie River, Great Slave Lake, Peace River in BC to southern AT; Hudson and James Bay drainages (see Rostlund 1952; Scott and Crossman 1973; Hackney and Holbrook 1978."
– Lee et al. 1980

Dotted line separates native from transplanted populations

Lee et al. 1980

Historical Collections

- Lewis and Clark expedition of 1803-1806 (1814)
  - Goldeye, Channel Catfish, Mountain Sucker, Sauger, WCT
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- Girard (1858); Suckley (1860); Jordan (1878); Cope (1879)
  - Shovelnose Sturgeon, Flathead Chub, Sturgeon Chub, Channel Catfish, Freshwater Drum, Sauger
  - Judith R., Milk R., Missouri R., Yellowstone R.
- Jordan (1891); Evermann (1892); Eigenmann (1894)
  - Arctic Grayling, WCT, Stonecat, Rocky Mountain Sculpin, Burbot, Mountain Whitefish, Longnose Dace
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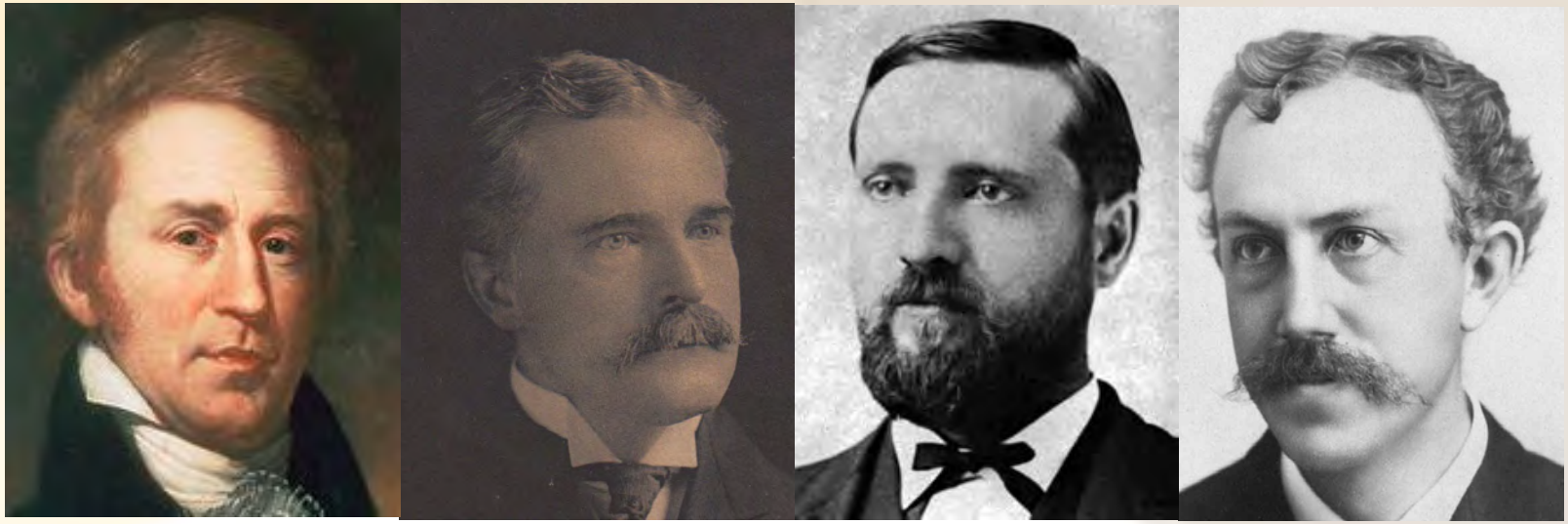

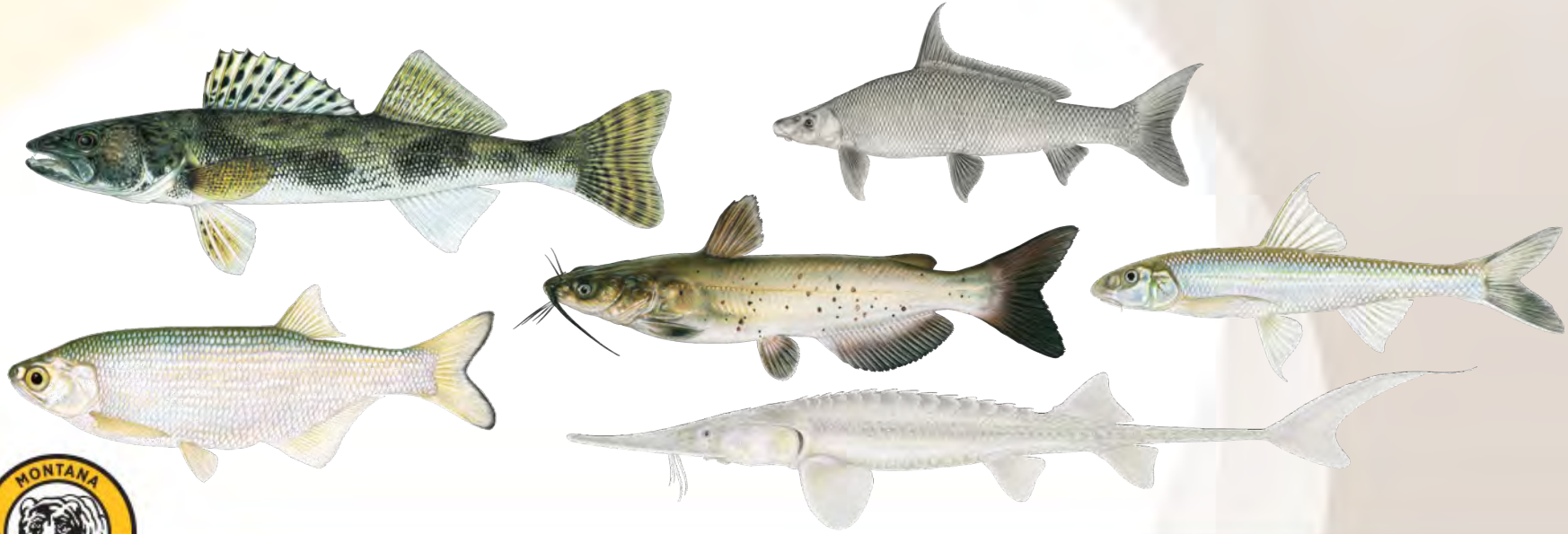

Historical Collections & Stockings

- In 1890, Black Eagle Dam was built and Yellow Perch were stocked upstream of the Great Falls (Henshall 1906).
  - No mention of Walleye present.
- In 1898, Lake Sewell (now covered by Canyon Ferry Reservoir) was stocked with Yellow Perch (Alvord 1991).
  - No mention of Walleye present.
- Henshall (1906) included 36 species native to Montana.
  - Many species identified from descriptions by Lewis and Clark (1814) and railroad surveys downstream of Great Falls (Girard 1858).
  - Typically difficult-to-sample species like Sturgeon Chub and Sicklefin Chub were included in this list.
  - Also included a list of species stocked by U.S. Bureau of Fisheries (USFWS); did not mention Walleye.

Historical Collections & Stockings

- In 1918, a fish display/aquarium was built at the Fairgrounds in Helena to showcase species cultivated in Montana and encourage use of the less-utilized species (Alvord 1991).
  - This could arguably be the first bit of outreach under the auspices of native species coordination. Walleye not included.

http://www.helenahistory.org/the_fairgrounds.htm

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- Walleye in Belle Fourche drainage thought to be from early stocking (~1915) of Walleye upstream of Orman Dam (Bailey and Allum 1962).
- In 1922, the first stocking of Walleye in Montana was said to have occurred in Nelson Reservoir (Gould 1995)

Historical Collections & Stockings

- In 1924, MFWP expressed the need for a qualified fisheries biologist (Alvord 1991).
- In 1927, the McNeil Brothers were granted permission to expand “carp” seining operations from Lake Bowdoin to Medicine Lake and to the backwaters of Nelson Reservoir (Alvord 1991).
  - In 1930, a 3,500-ft seine produced over 14 carloads of carp from Nelson Reservoir; no mention of Walleye.
- In 1932, surplus Arctic Grayling eggs were exchanged for Walleye eggs with the state of Michigan.
  - Walleye were scheduled for Missouri River reservoirs and the lower Yellowstone and Tongue rivers (Alvord 1991).

Early Walleye Stocking in Montana

- 1933-1934: 700K in Missouri River
- 1934-1951: 4.926M in Tongue River & Reservoir
- 1934-1951: 825K in Yellowstone River
- 1945-1951: 1.916M in Nelson Reservoir
- 1947: 120K in Pablo Reservoir (Flathead Drainage)
- 1947-1951: 1.1M in Milk River
- 1948: 80K in Brownes Lake (Big Hole Drainage)
- 1950-1951: 1.075M in Rainbow Lake (Clark Fork Drainage)
- 1951: 878K in Fort Peck Reservoir
- 1951: 500K in Lake Helena

https://myfwp.mt.gov/fishMT/plants/plantreport

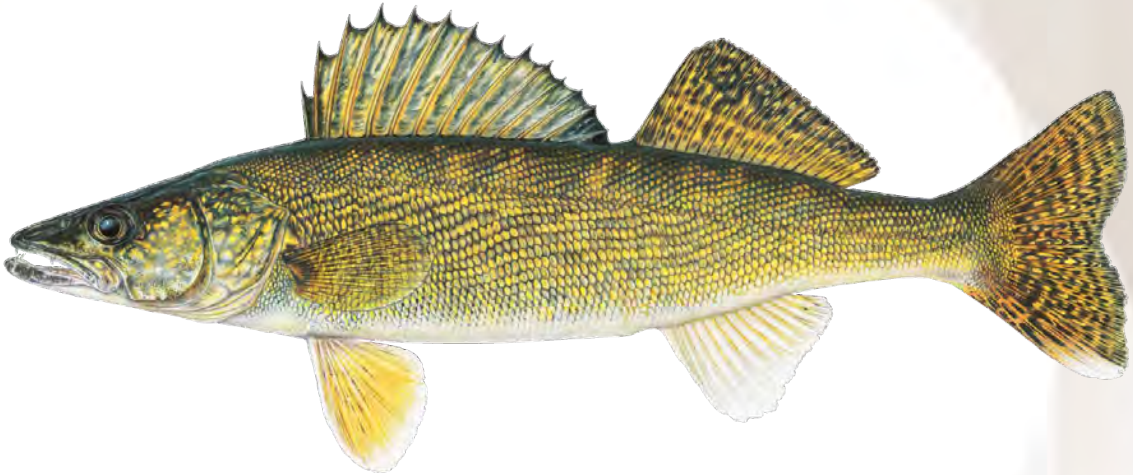
Historical Collections & Stockings

- 1945 McNeil Pike Hatchery installs a natural gas-fired heating device to raise water temperatures to reduce incubation of pike eggs (Walleye?).
- 1948, McNeil Pike Hatchery received >1M Walleye eggs from Minnesota.
- 1949 McNeil Pike Hatchery on Nelson Reservoir took >6M Walleye eggs.
- Canyon Ferry Dam closed in 1953
- 1957, Sauger already noted to have declined in Tongue River due to numerous dams and it was hoped Walleye plants would establish a more consistent fishery.

Alvord 1991

Historical Collections & Stockings

- During 1955-1989, no Walleye were collected by MFWP in regular sampling of Canyon Ferry Reservoir and no Walleye were recorded by anglers (Alvord 1991; Spence 2001).
- In 1989, MFWP collected a single Walleye in gill nets used to monitor the Canyon Ferry Reservoir Rainbow Trout fishery (Alvord 1991; Spence 2001).



The Fishes of Books

- Walleye noted not native to Cheyenne drainage or Little Missouri drainage and only found in lower portions of western tributaries of Missouri River (Bailey and Allum 1962).
- Walleye are not native to Montana but there is no reliable information on time or place of introduction (Brown 1971).
- Walleye had been introduced into Wyoming in early 1900s but did not established at that time (Baxter and Stone 1995).
- Hoagstrom et al. (2007) suggest NE, SD, ND, and KS comprise the southwestern native extent of Walleye and note stocking success was due to construction of reservoirs.

Contemporary Understanding

- Billington (1996) identified 42 Walleye haplotypes in 5 groups that showed geographic distinction, perhaps derived from separate locations of glacial refugia; however, these groups don't include MT…and, another map.
- Also, Billington (1996) showed little variation in Sauger, with 4 haplotypes identified. This is potentially due to the use of a single refuge.

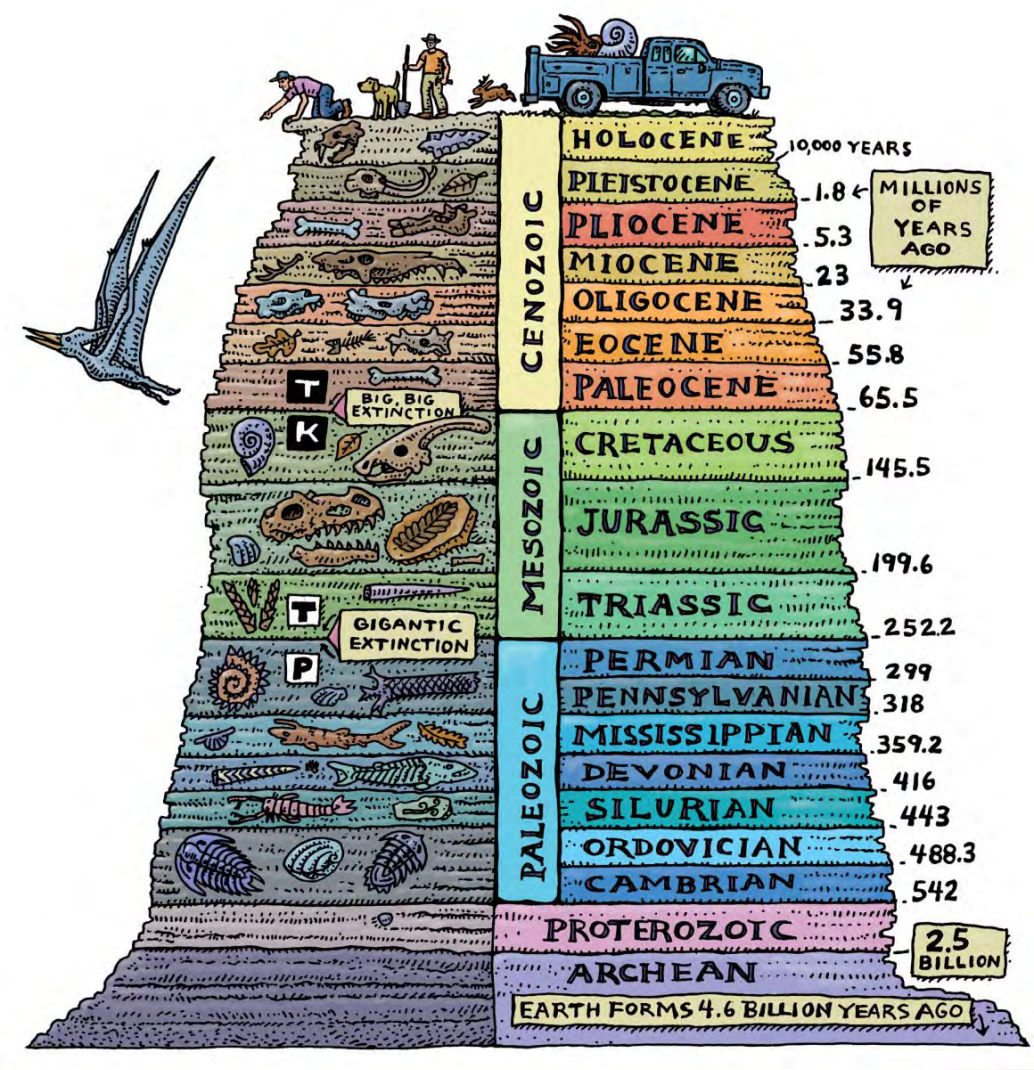
Fig. 1. Limits of the natural range of walleye (bold outline) along with generalized distribution patterns of five main walleye mtDNA haplotype groups (— A: Atlantic refugium origin. — B: Mississippian refugium origin. — C: Missourian refugium origin. — D: mixture of stocked fish of Atlantic and Mississippian refugium origin together with haplotypes thought to be typical of walleye in this region prior to stocking. — E: Mobile drainage basin haplotype).

Billington 1996

Contemporary Understanding

- Zhao et al. (2008) suggest contemporary growth patterns reflect patterns of evolutionary adaptations related to climatic conditions during last period of glaciation.
  - Introduced Walleye have not established long enough to adapt to new locations or environment of locations are outside range of developed plastic response.
- Little genetic difference between populations of Walleye from Fort Peck Reservoir and from the connected Yellowstone River-Tongue River (Leary et al. 2013).
  - Likely the establishment of the YR-TR population came from the FP population; corroborated by stocking history.
  - Amount of genetic divergence between the FP population and the Lake Sakakawea population suggests a recent common ancestor.

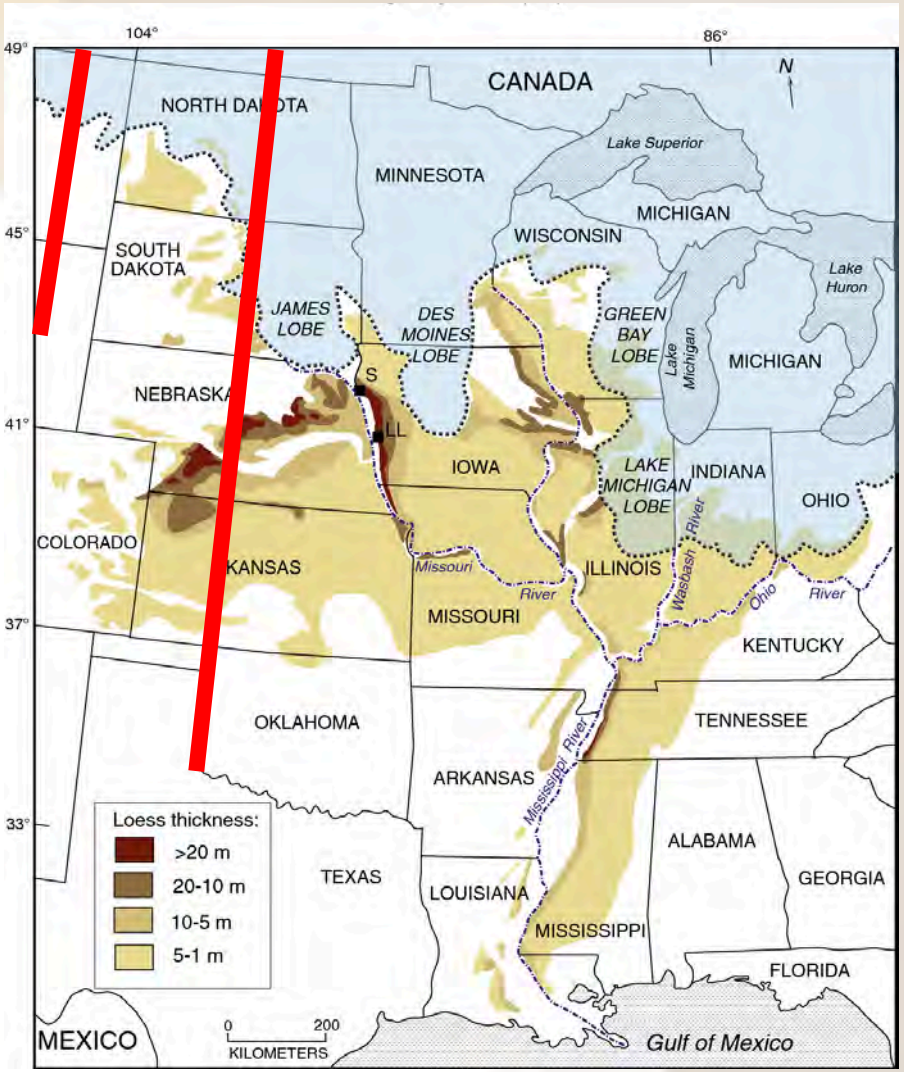
Walleye Are Not Native, But Why?



www.trollart.com/fossils1.htm

Walleye Are Not Native, But Why?

- Evermann and Cox (1896) note the “middle belt” of the Missouri River basin (between the 100th and 105th meridians) as a transition zone, characterized by species such as; Flathead Chub, Sturgeon Chub, Longnose Dace, Mississippi Silvery Minnow.



Muhs et al. 2018

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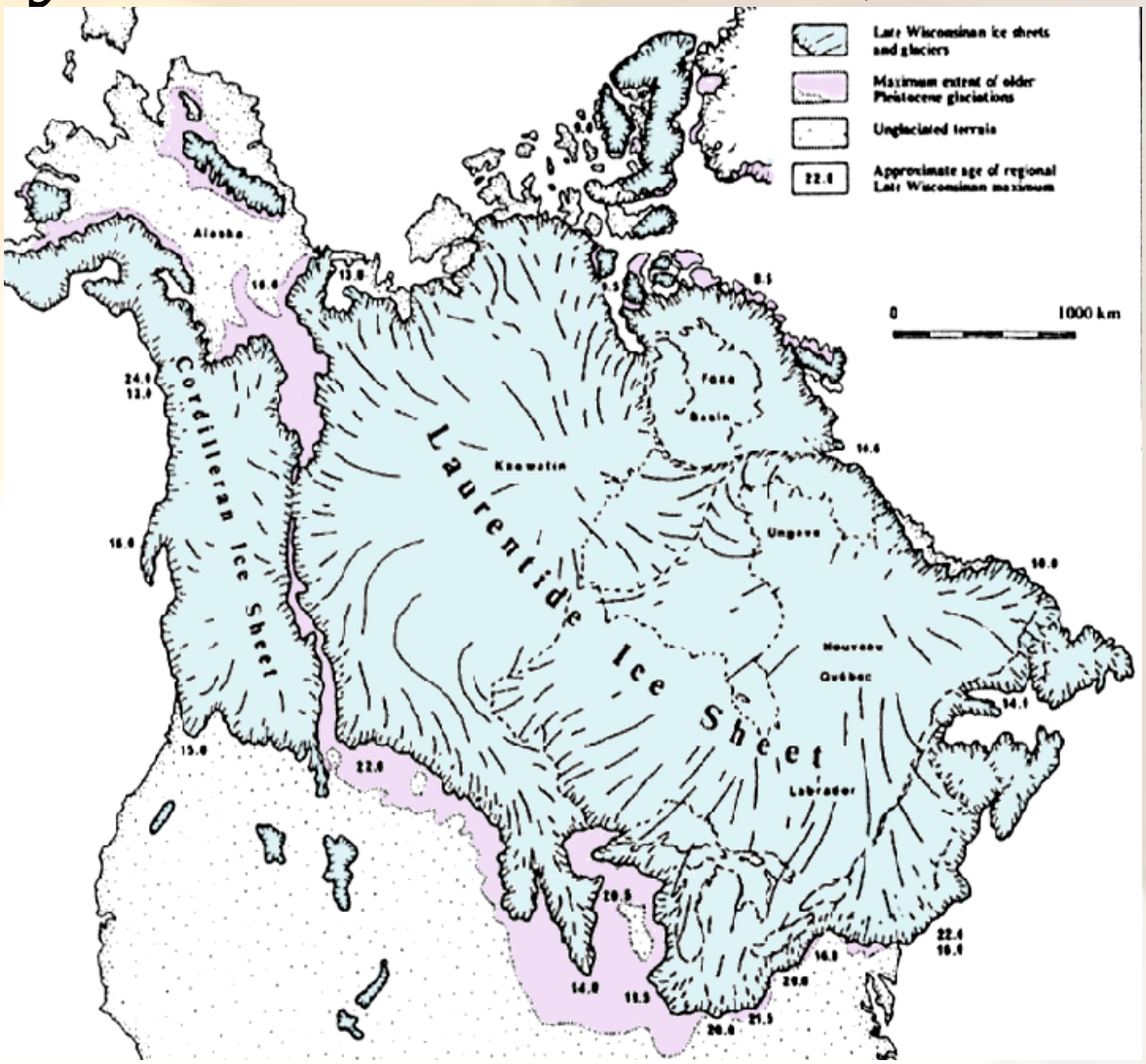

http://geology.isu.edu/Digital_Geology_Idaho/Module12/extent.gif

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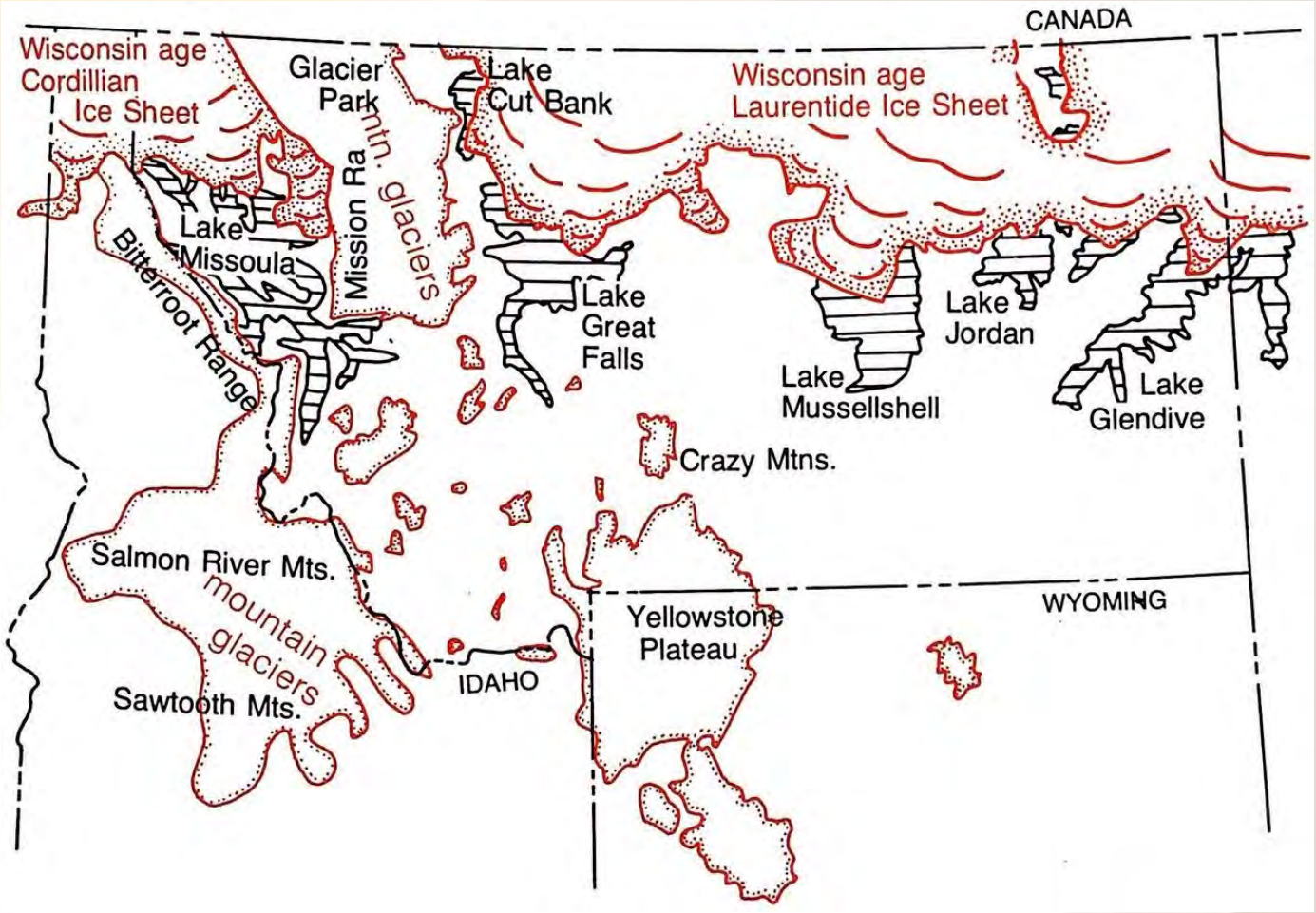
- Zoogeography



Alt and Hyndman 1986

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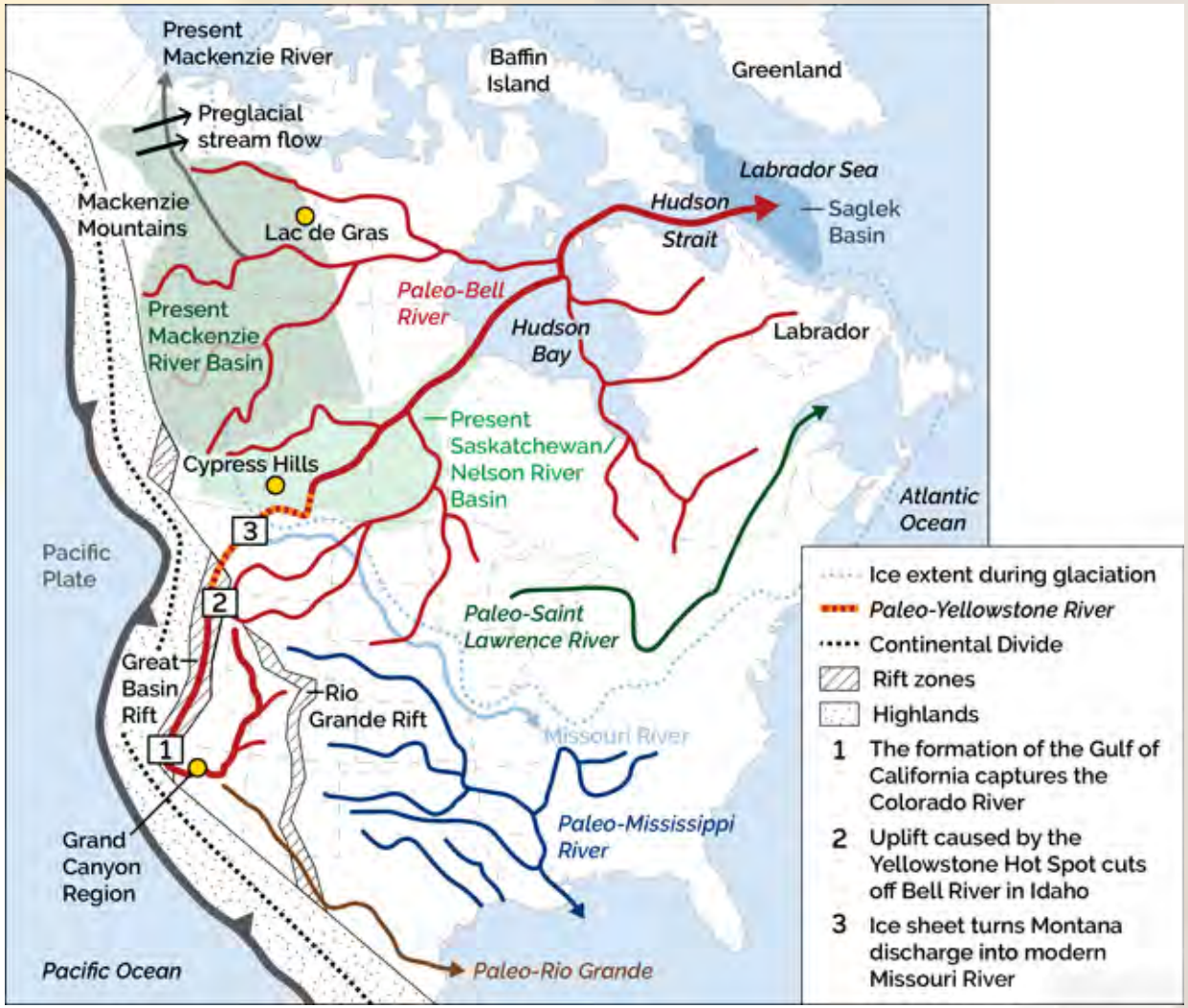

https://www.earthmagazine.org/article/paleo-bell-river-north-americas-vanished-amazon

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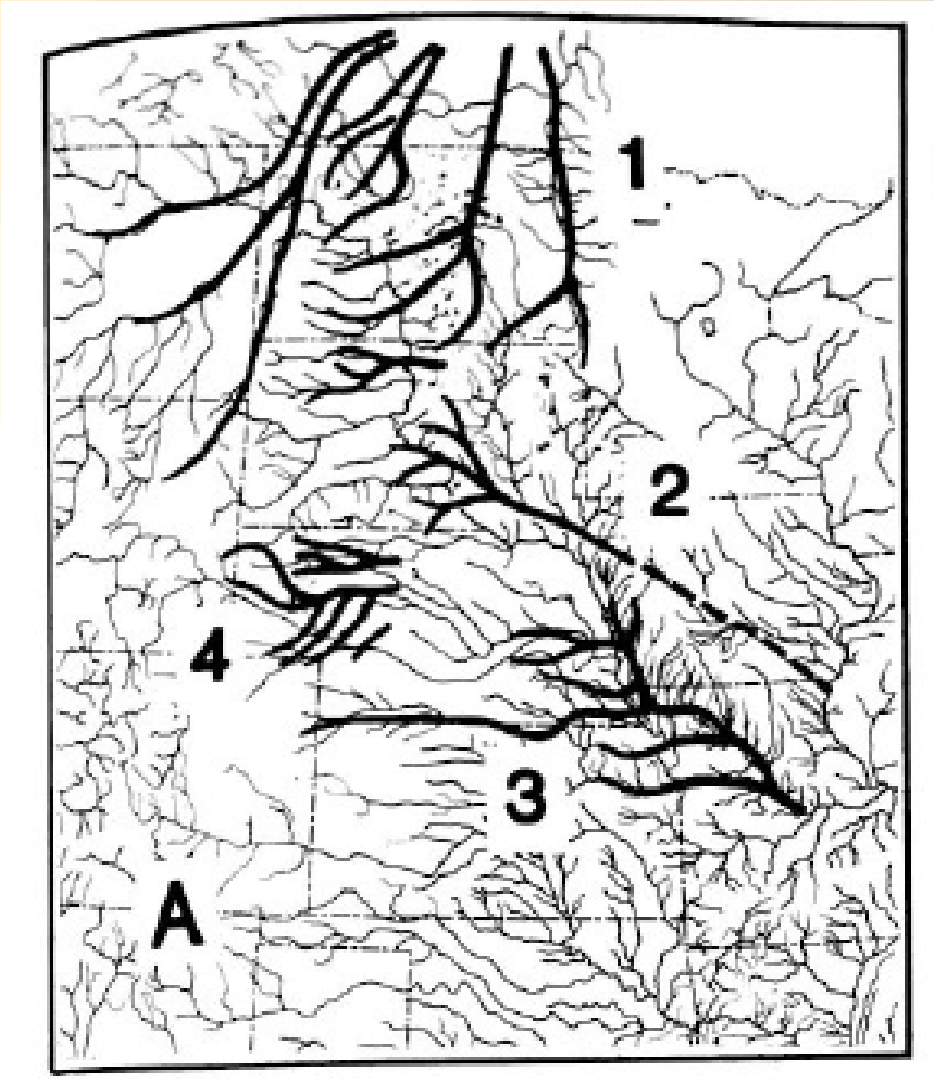

Cross et al. 1987 *in* Hocutt and Wiley (eds.) 1987

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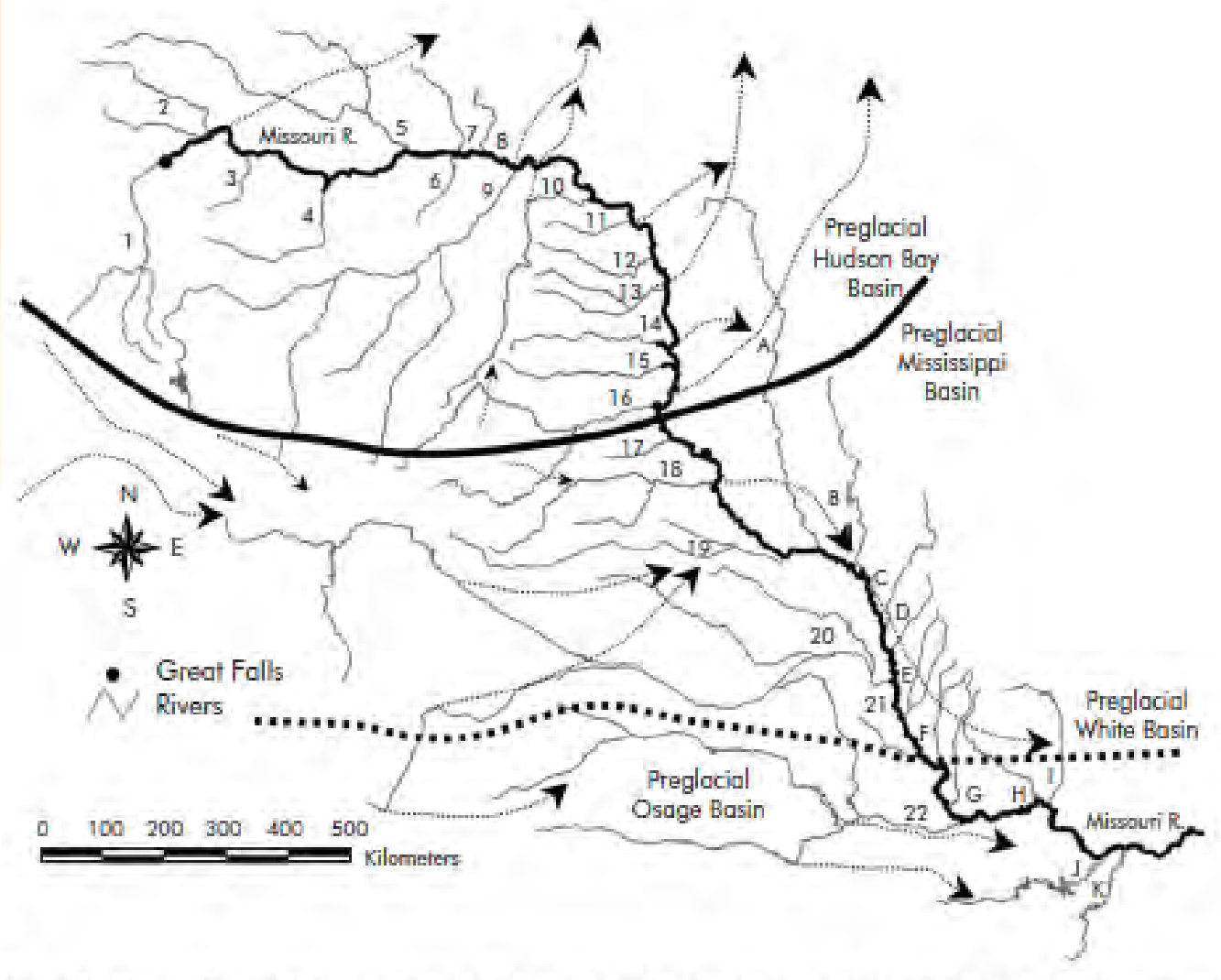

Hoagstrom and Berry 2006

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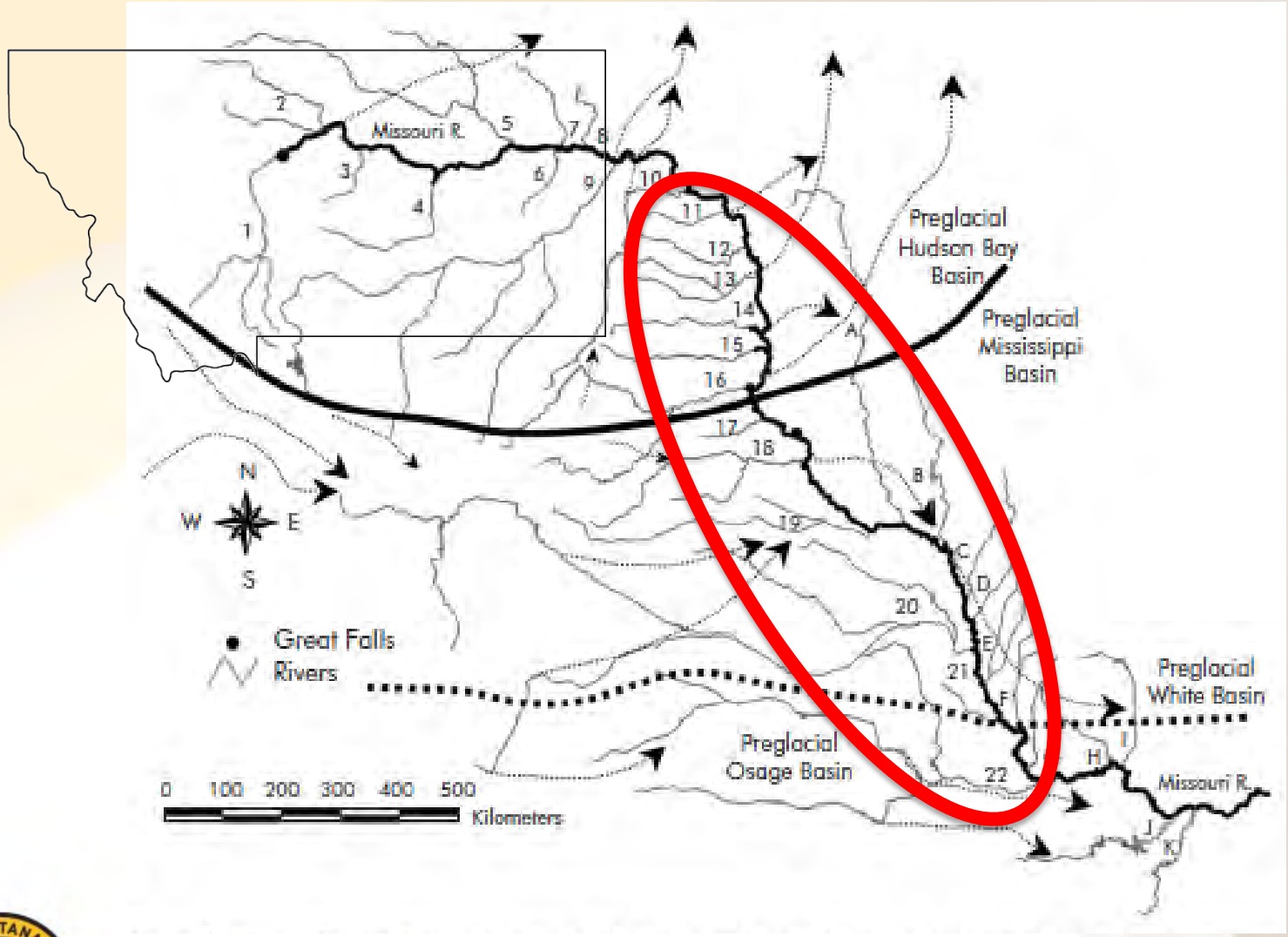


Hoagstrom and Berry 2006

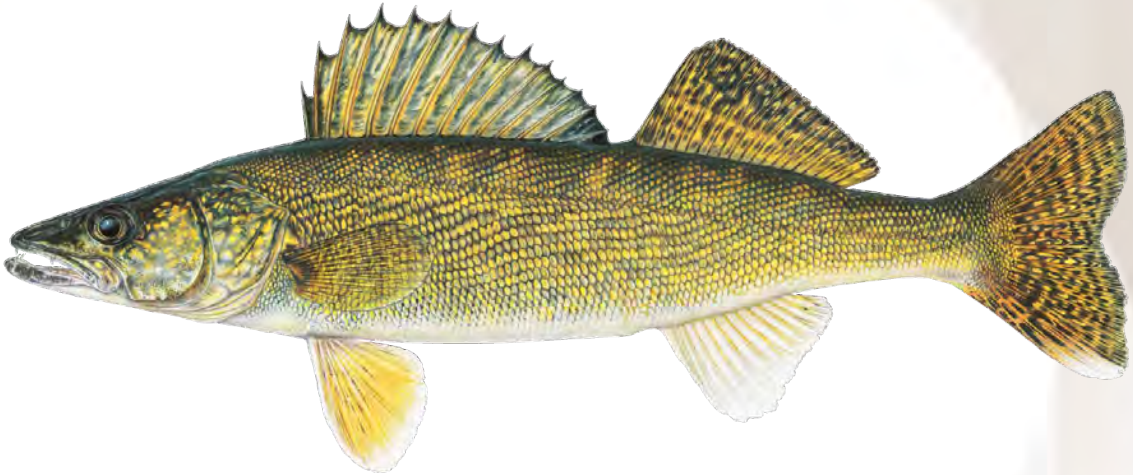
Walleye Are Not Native, But Why?

- Movement and survival in preglacial Hudson Bay basin influenced what species are present today.
  - Dispersal upstream of Great Falls occurred at this time.
- Glacial retreat left a braided and aggrading Missouri River.
  - Many tributary basins and the Missouri River itself were noted for their high sediment transport and shifting sand substrate.
- Larger basins typically included greater habitat diversity.
- Colonization reduced by distance between tributary basins.
- Establishment and persistence reduced by environmental harshness.
  - Temperature regimes, flow variability, and habitat conditions.
- Tributary basins farther west and upstream more variable.

Hoagstrom and Berry 2006

So, About That Map

- The weight of evidence does not appear to support Walleye being designated as native to Montana.
- While fisheries science continues to “stand on the shoulders of giants,” and new information can always provide clarity to otherwise vague understandings, the map used in Billington et al. (2011) does not justify a change in status of Walleye.



So, About That Map

- For reference, this issue was also brought up in 2009 as SB 15, "An Act Defining Walleye as a Native Species in Montana…"
  - Sponsored by Donald Steinbeisser (SD 19)
  - The Montana Chapter of the AFS officially opposed the bill.
  - Bill tabled in Committee and died in Standing Committee

AMERICAN FISHERIES SOCIETY
MONTANA CHAPTER

Senate Fish and Game Committee
2009 Montana Legislature
Helena, Montana

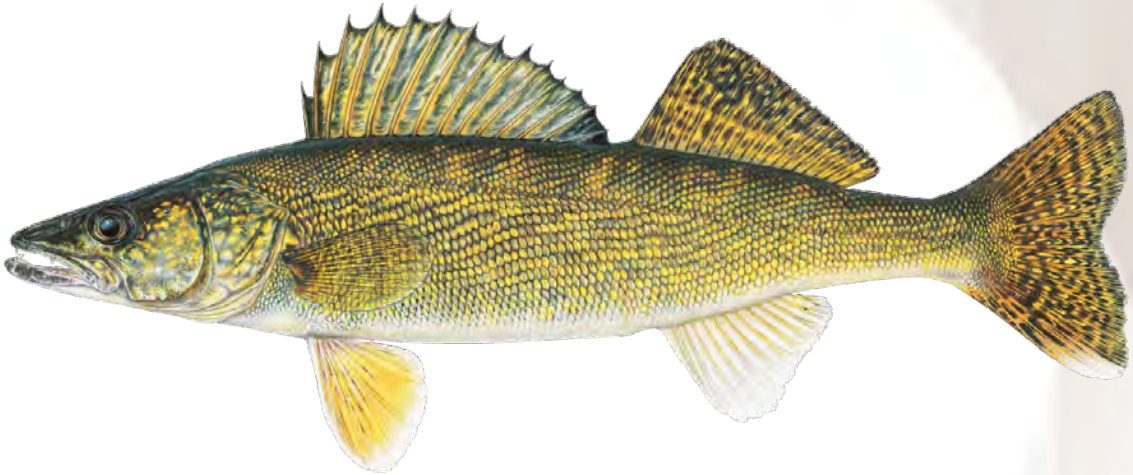
January 16, 2009

RE: Senate Bill 15 – "An Act Defining Walleye as a Native Species in Montana …"

www.fisheriessociety.org/AFSmontana/correspond/2009_0129_SB15_walleye_opposition.pdf

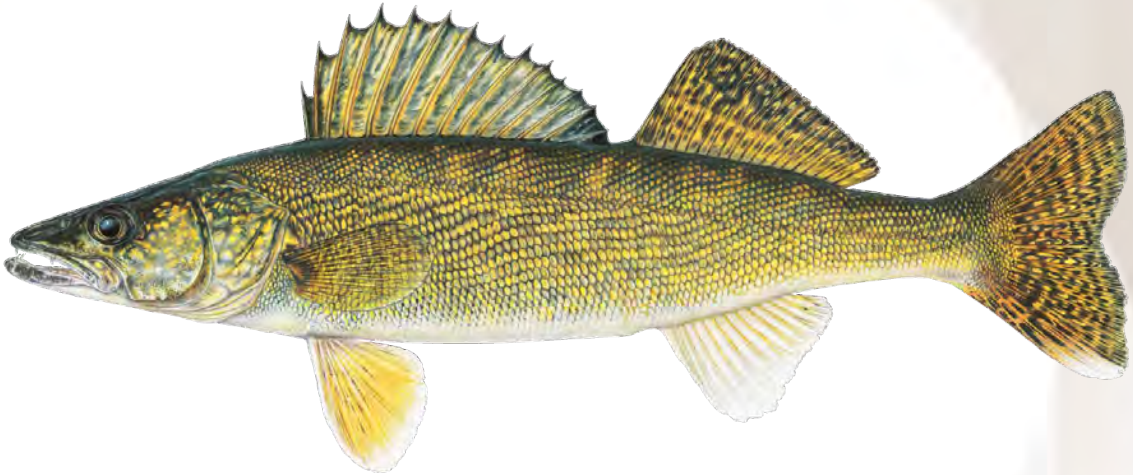
What’s Next?

- Walleye are a significant player in sport fish management in Montana.
- Continued public engagement on Walleye management issues through regulations, management plans, P&G.
- Continue this discussion with Walleyes Unlimited and Walleye advocates



Where to Improve?

- Focus on value of Walleye as a sportfish.
- Outline realistic expectations for what a fishery is capable of.
  - ID limiting factors, aspects of fishery management available in the toolbox.
- Better outreach with local clubs and small groups
- Focus on shared values and commonalities



"Science is founded on uncertainty. Each time we learn something new and surprising, the astonishment comes with the realization that we were wrong before… In truth, whenever we discover a new fact it involves the elimination of old ones."

LEWIS THOMAS: PHYSICIAN AND EDUCATOR
1980

https://www.famousscientists.org/what-is-science-quotes/

Questions