



Evaluation of Walleye Status in Montana

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Following presentation of the draft Statewide Fisheries Program and Guide to the Fish and Wildlife Commission in the fall of 2018, several interested individuals felt there was evidence that Walleye should be classified as a native species in Montana. Montana Fish, Wildlife & Parks (FWP) took this claim seriously and extensive efforts were devoted over the past three months to evaluate the species' history in the state. The Division conducted an extensive literature review of Walleye status in Montana. Additionally, staff contacted fisheries professionals across the country including National and State Chapters of the American Fisheries Society (AFS), fisheries professionals from surrounding states and provinces, and other professionals who specialize in classifying distribution of animals.

FWP presented a paper on the native status of Walleye at the annual meeting of the Montana Chapter of the American Fisheries Society in Billings on February 1. The intent of this talk was to encourage discussion amongst fisheries professionals and to solicit any information that would aid in designating Walleye as native or nonnative. A similar presentation was made by FWP staff in Helena on February 28 in a public forum. This meeting included an extensive question and answer session between FWP and attendees and was broadcast live over Facebook by Walleye advocates. Summarized below are results from this review.

A native species is defined as one that has historically occurred in the drainage and has not been introduced by humans. The understanding that Walleye are nonnative in Montana has long been held by notable ichthyologists in the region and has been expressed in numerous publications (e.g., Bailey and Allum 1962; Brown 1971; Cross et al. 1987; Baxter and Stone 1995; Holton and Johnson 2003; Galat et al. 2005; Hoagstrom et al. 2006, 2007; Fuller and Neilson 2015). At the center of the renewed interest in the designation of Walleye in Montana, is a figure illustrating the natural distribution of Walleye that appears to include Montana waters east of Glacier National Park and southeast to the northwest corner of Wyoming (Billington et al. 2011). This figure was included in the chapter, "Distribution and population genetics of Walleye and Sauger" in the special symposium, *Biology, Management, and Culture of Walleye and Sauger* (Barton (ed.) 2011). However, the associated text in the article did not accurately depict what was shown in the figure. The lack of clarity was compounded when additional references were found to exhibit a similar pattern; a figure illustrating a native distribution for Walleye that included portions of Montana with vague descriptions that failed to mention, or allude to, Montana in context (e.g., Scott and Crossman 1973; Lee et al. 1980; Trautman 1981; Page and Burr 1991). Some of the discrepancies in the figures could be attributed to the scale at which watersheds were binarily populated for native distribution of Walleye. However, it was clear that aspects of historical fish collections, stocking history, fossil records, and zoogeographic processes would be necessary to gain a full understanding of indigenous Walleye distribution.

Historical fish collections made in Montana, and early articles published on the subject, spanned 1803-1906 (Lewis et al. 1814; Girard 1858; Suckley 1860; Jordan 1878; Cope 1879; Jordan 1891; Evermann 1892; Eigenmann 1894; Evermann and Cox 1896; Henshall 1906). While numerous species were collected and described during this timeframe, many of which are often collected in the same habitats as Walleye, no Walleye collections were made. Furthermore, no percid species (e.g., Walleye, Sauger, Yellow Perch) were collected upstream of the Great Falls until after Yellow Perch were stocked in 1890 upstream of Black Eagle Dam and in 1898 in Lake Sewell (Henshall 1906; Alvord 1991). Records in Montana support this lack of presence for Walleye. The first recorded stocking of Walleye in Montana occurred in 1922 in Nelson Reservoir (Gould 1995). Following this initial introduction, more than 12 million Walleye were imported, stocked, and established in most major waterbodies across eastern and central Montana (e.g., Milk R., Missouri R., Tongue R., Yellowstone R., Fort Peck Res., Lake Helena, Tongue R. Res.) from 1933 to 1951 (FWP 2019). In 1989 the first Walleye was collected in Canyon Ferry Reservoir by FWP during routine fisheries population monitoring (Alvord 1991; Spence 2001). No empirical evidence has been found that establishes Walleye as being present in any Montana waters prior to human introductions.

Absence of Walleye in the Missouri River in Montana is attributed to paucity of suitable habitat for Walleye following the last glaciation. High sediment load and shallow braided channels are more suitable for large river species, such as Sauger, Paddlefish, Pallid Sturgeon, Shovelnose Sturgeon, and Blue Sucker (Cross et al. 1987; Hoagstrom and Berry 2006). Walleye were likely present lower in the Missouri River basin (near present day South Dakota) and may have found their way further up the Missouri River for short periods (Hoagstrom and Berry 2006); however, there are no records of Walleye presence in Montana in early fish collections or in the fossil record. Documented early stockings of Walleye in Montana saw limited success, and Walleye abundance was limited in the State until dams and accompanying river regulation improved water clarity.

FWP staff corresponded with professionals throughout the fisheries science community seeking guidance on this issue. Local Walleye advocates provided contact information for Dr. Brian Sloss, one of the co-authors of the “Distribution and population genetics of Walleye and Sauger” article referenced above and Dr. Bruce Barton who edited the edition. When contacted by FWP, Dr. Sloss had already spoken with a Montana Walleye advocate. Dr. Sloss indicated that the map from the article was based on previous iterations of maps depicting similar native walleye distributions. He spoke with other authors from that symposium and all agreed that geographic range is not an area of specialty and they assumed watershed connectivity based on the absence of historical barriers (e.g., waterfalls) between the Dakotas and Montana. Dr. Sloss mentioned that Dr. Neil Billington, another co-author, was a more avid zoogeographical enthusiast than he; however, Dr. Billington passed away in 2017. Dr. Sloss recommended engaging John Bruner to discuss zoogeographical distribution of Walleye. Dr. Sloss was surprised that this map was getting so much attention, especially since similar maps have been used previously in other publications.

Dr. Bruce Barton, editor of *Biology, Management, and Culture of Walleye and Sauger*, provided some additional background on the editing and review of the symposium. Dr. Barton said that after review of historic collections, he could not understand why Montana might have been included within Walleye native range. Dr. Barton indicated that in hindsight he wished he had taken a closer look at some figures in the book to scrutinize further, as the Chapter 4 figure was likely drawn too generally and not as accurate as it could have been. However, under the deadlines that were imposed, and the breadth of information covered inclusion of a figure without corroborating text was an oversight. Dr. Barton also acknowledged that John Bruner from the University of Alberta is an expert in palaeoichthyology and would be a useful contact on this subject. Dr. Barton also recommended contacting Mike Bozek for more information on the subject.

Prior to contacting Drs. Sloss and Barton, FWP staff received an unsolicited email from Mr. John C. Bruner from the University of Alberta. Mr. Bruner had seen a Facebook video of the February 28 public presentation. Mr. Bruner's email read: "I saw your presentation on "Walleye are a nonnative fish of Montana." You convinced me. I thought you did a really good job in a somewhat hostile environment. Especially, since you put that together in two months. Really impressive." Mr. Bruner also provided some additional references regarding fossil records of percids in southern Alberta and the U.S. Further, Mr. Bruner shared the presentation and his assessment with the American Fisheries Society Walleye Technical Committee, which consists of fisheries professionals engaged in Walleye management and research throughout North America. To date, no one on the Walleye Technical Committee has refuted FWP's assessment of Walleye status in Montana.

FWP staff conferred with numerous other fisheries professionals through phone calls and email throughout the US. To date, none have contested FWP's assessment that Walleye are not native to Montana. Besides those mentioned above, other individuals contacted by FWP staff include: Leanne Roulson, AFS 2nd Vice President; Michael Bozek, Regional Program Manager, National Park Service; Scott Gangl, North Dakota Game and Fish Fisheries Management Section Leader; Bryce Maxell, Program Coordinator, Montana Natural Heritage Program; Dan Bachen, Senior Zoologist, Montana Natural Heritage Program; Dirk Miller, Deputy Chief of Fisheries, Wyoming Game and Fish Department; Dr. Eric Hallerman, Professor, Virginia Tech University; Eric Best, Science and Technology Program, US Bureau of Reclamation; Harry Crockett, Native Aquatic Species Coordinator, Colorado Parks and Wildlife.

The many contacts the Fisheries Division staff have made with outside contacts concur with the conclusion that there is insufficient evidence that Walleye were native to any drainage in Montana. At present, the Fisheries Division proposes no change to the status of Walleye in Montana and that it is appropriately classified as a nonnative species in Montana.

LITERATURE CITED

- Alt, D.D., and D.W. Hyndman. 1986. *Roadside Geology of Montana*. Mountain Press, Missoula, Montana. 427 pp.
- Alvord, B. 1991. *A History of Montana's Fisheries Division from 1890 to 1958*. Montana Fish, Wildlife & Parks, Helena. 115 pp.
- American Fisheries Society-Montana Chapter. 2009. Comment on Senate Bill 15 – “An Act Defining Walleye as a Native Species in Montana...” to Senate Fish and Game Committee of 2009 Montana Legislature.
www.fisheriessociety.org/AFSmontana/correspond/2009_0129_SB15_walleye_opposition.pdf.
- Bailey, R.M., and M.O. Allum. 1962. *Fishes of South Dakota*. Miscellaneous Publications, Museum of Zoology, University of Michigan 119:1-131.
- Barton, B.A., editor. 2011. *Biology, management, and culture of Walleye and Sauger*. American Fisheries Society, Bethesda, Maryland. 600 pp.
- Baxter, G.T., and M.D. Stone. 1995. *Fishes of Wyoming*. Wyoming Game and Fish Department, Cheyenne. 290 pp.
- Bellgraph, B.J. 2006. Competition potential between Sauger and Walleye in non-native sympatry: historical trends and resource overlap in the middle Missouri River, Montana. Master's thesis. Montana State University, Bozeman.
- Bellgraph, B.J., C.S. Guy, W.M. Gardner, and S.A. Leathe. 2008. Competition potential between Saugers and Walleyes in nonnative sympatry. *Transactions of the American Fisheries Society* 137:790-800.
- Billington, N. 1996. Geographical distribution of mitochondrial DNA (mtDNA) variation in Walleye, Sauger, and Yellow Perch. *Annales Zoologici Fennici* 33:699-706.
- Billington, N. 1998. Genetic variation in percids determined by mitochondrial DNA analysis. *Italian Journal of Zoology* 65(S1):35-40.
- Billington, N., C.C. Wilson, and B.L. Sloss. 2011. Distribution and population genetics of Walleye and Sauger. Pages 105-132 *in* B.A. Barton, editor. *Biology, management, and culture of Walleye and Sauger*. American Fisheries Society, Bethesda, Maryland.
- Bingham, D.M. 2011. Conservation genetics of Sauger in the upper Missouri River drainage. Master's thesis. University of Montana, Missoula.

- Bozek, M.A., D.A. Baccante, and N.P. Lester. 2011a. Walleye and Sauger life history. Pages 133-197 in B.A. Barton, editor. Biology, management, and culture of Walleye and Sauger. American Fisheries Society, Bethesda, Maryland.
- Bozek, M.A., T.J. Haxton, and J.K. Raabe. 2011b. Walleye and Sauger habitat. Pages 233-301 in B.A. Barton, editor. Biology, management, and culture of Walleye and Sauger. American Fisheries Society, Bethesda, Maryland.
- Bradford, M.J., C.P. Tovey, and L-M. Herborg. 2008. Biological risk assessment for Northern Pike (*Esox lucius*), Pumpkinseed (*Lepomis gibbosus*), and Walleye (*Sander vitreus*) in British Columbia. Canadian Science Advisory Secretariat, Research Document 2008/074.
- Brown, C.J.D. 1971. Fishes of Montana. Montana State University, Bozeman. 207 pp.
- Cavender, T.M. 1998. Development of the North American Tertiary freshwater fish fauna with a look at parallel trends found in the European record. Italian Journal of Zoology 65(S1):149-161.
- Cope, E.D. 1879. A contribution to the zoology of Montana. American Naturalist XIII(1879):432-441.
- Cross, F.B., R.L. Mayden, and J.D. Stewart. 1987. Fishes in the Western Mississippi Basin (Missouri, Arkansas and Red Rivers). Pages 363-412 in C.H. Hocutt, and E.O. Wiley, editors. The zoogeography of North American freshwater fishes. John Wiley and Sons. New York.
- Dysthe, J.C., K.J. Carim, M. Ruggles, K.S. McKelvey, M.K. Young, and M.K. Schwartz. 2017. Environmental DNA assays for the sister taxa Sauger (*Sander canadensis*) and Walleye (*Sander vitreus*). PLoS ONE 12(4): e0176459.
- Jackson, L. 2018. The Paleo-Bell River: North America's vanished Amazon. EARTH (July): <https://www.earthmagazine.org/article/paleo-bell-river-north-americas-vanished-amazon>.
- Eigenmann, C.H. 1894. Results of explorations in western Canada and the northwestern United States. Bulletin of the U.S. Fish Commission XIV:101-132.
- Evermann, B.W. 1892. Report on the establishment of fish-cultural stations in the Rocky Mountain Region and Gulf States (Vol. 205). U.S. Government Printing Office.
- Evermann, B.W., and U.O. Cox. 1896. A report upon the fishes of the Missouri River basin. Bulletin of the U.S. Fish Commission XX:325-430.
- Fuller, P., and M. Neilson. 2015. *Sander vitreus* (Mitchill, 1818). U.S. Geological Survey, Nonindigenous Aquatic Species Database, Gainesville, Florida. <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=831>.

- Galat, D.L., C.R. Berry, W.M. Gardner, J.C. Hendrickson, G.E. Mestl, G.J. Power, C. Stone, and M.R. Winston. 2005. Spatiotemporal patterns and changes in Missouri River fishes. Pages 249-291 in J.N. Rinne, R.M. Hughes, and B. Calamusso, editors. Historical changes in large river fish assemblages of the Americas. American Fisheries Society, Symposium 45, Bethesda, Maryland.
- Girard, C. 1858. The fishes of the Pacific Railroad Surveys. Pacific Railroad Report X:1-400.
- Gould. 1995. Gould, W.R. 1995. A report on the early distribution and sources of walleye (*Stizostedion vitreum*) in Montana. Montana Department of Fish, Wildlife and Parks, Helena.
- Hartman, G.F. 2009. A biological synopsis of Walleye (*Sander vitreus*). Canadian Manuscript Report of Fisheries and Aquatic Sciences 2888(v):1-48.
- Hayer, C.A., B.C. Harland, and C.R. Berry, Jr. 2006. Recent range extensions, name changes and status updates for selected South Dakota fishes. Proceedings of the South Dakota Academy of Science 85:247-265.
- Henshall, J.A. 1906. A List of the Fishes of Montana. Bulletin of the University of Montana 34, Biological Series 11. University of Montana, Missoula. 8 pp.
- Hoagstrom, C.W., and C.R. Berry, Jr. 2006. Island biogeography of native fish faunas among Great Plains drainage basins: basin scale features influence composition. American Fisheries Society Symposium 48:221-264.
- Hoagstrom, C.W., and C.R. Berry, Jr. 2010. The native range of Walleyes in the Missouri River drainage. North American Journal of Fisheries Management 30:642-654.
- Hoagstrom, C.W., S.S. Wall, J.G. Kral, B.G. Blackwell, and C.R. Berry. 2007. Zoogeographic patterns and faunal change of South Dakota fishes. Western North American Naturalist, 67(2):161-185.
- Leary, R., S. Painter, and A. Lodmell. 2013. University of Montana Conservation Genetics Laboratory Report #700125. Repository ID: 59594. Division of Biological Sciences, University of Montana, Missoula.
- Lee, D.S., C.R. Gilbert, C.H. Hocutt, R.E. Jenkins, D.E. McAllister, and J.R. Stauffer, Jr. 1980. Atlas of North American Freshwater Fishes. North Carolina State Museum of Natural History, Raleigh. 12:1-854.
- Lewis, M., W. Clark, and N. Biddle. 1814. History of the Expedition Under the Command of Captains Lewis and Clark, to the Sources of the Missouri, Thence Across the Rocky Mountains and Down the River Columbia to the Pacific Ocean: Performed During the Years 1804-5-6. By Order of the Government of the United States (Vol. 1). Bradford and Inskeep.

- Jordan, D.S. 1878. Report on the collection of fishes made by Dr. Elliott Coues, U.S.A., in Dakota and Montana during the seasons of 1873 and 1874. Bulletin of the United States Geological and Geographical Survey of the Territories IV(1878).
- Jordan, D.S. 1891. A reconnaissance of the streams and lakes of the Yellowstone National Park, Wyoming in the interest of the United States Fish Commission. Bulletin of the U.S. Fish Commission IX:41-63.
- McMahon, T.E., and D.H. Bennett. 1996. Walleye and Northern Pike: boost or bane to northwest fisheries? Fisheries 21(8):6-13.
- (MFWP) Montana Fish, Wildlife & Parks. 2015. Montana's State Wildlife Action Plan. Montana Fish, Wildlife & Parks, Helena. 441 pp.
- (MFWP) Montana Fish, Wildlife & Parks. 2019. FishMT: Fish Stocking Data. Montana Fish, Wildlife & Parks, Helena. <https://myfwp.mt.gov/fishMT/plants/plantreport>
- (MFWP) Montana Fish, Wildlife & Parks. 2019. Native Fish. Montana Fish, Wildlife & Parks, Helena. <http://fwp.mt.gov/fishAndWildlife/management/nativeFish.html>.
- (MNHP) Montana Natural Heritage Program. 2019. Species of Concern Report. Montana Natural Heritage Program, Helena. <http://mtnhp.org/SpeciesOfConcern/?AorP=a>.
- (MNHP) Montana Natural Heritage Program. 2019. Walleye – *Sander vitreus*. Montana Field Guide. Montana Natural Heritage Program, Helena. <http://FieldGuide.mt.gov/speciesDetail.aspx?elcode=AFCQC05020>
- Muhs, D.R. 2018. The geochemistry of loess: Asian and North American deposits compared. Journal of Asian Earth Sciences 155:81-115.
- Murray, A.M., and J.D. Divay. 2011. First evidence of percids (Teleostei: Perciformes) in the Miocene of North America. Canadian Journal of Earth Sciences 48(11):1419-1424.
- Page, L.M., and B.M. Burr. 1991. A Field Guide to Freshwater Fishes: North America, North of Mexico. Peterson Field Guide Series, Houghton Mifflin Company, Boston. 432 pp.
- Pflieger, W.L. 1997. The Fishes of Missouri. Missouri Department of Conservation, Jefferson City. 372 pp.
- Scott, W.B., and E.J. Crossman. 1973. Freshwater Fishes of Canada. Fisheries Research Board of Canada Bulletin 184, Ottawa. 966 pp.
- Spence. 2001. A History of Montana's Fisheries Division from 1945 to 2000. Montana Fish, Wildlife & Parks, Helena. 248 pp.

- Stepien, C.A., and A.E. Haponski. 2015. Taxonomy, distribution, and evolution of the Percidae. Pages 3-60 *in* Biology and Culture of Percid Fishes. Springer, Dordrecht.
- Suckley, G. 1860. Report upon the fishes collected on the Pacific Railroad Survey. Pacific Railroad Report XII(5):307-368.
- Trautman, M.B. 1981. The Fishes of Ohio (revised edition). The Ohio State University Press, Columbus. 782 pp.
- (USGS) U.S. Geological Survey and U.S. Department of Agriculture, Natural Resources Conservation Service. 2013. Federal Standards and Procedures for the National Watershed Boundary Dataset (WBD) (4 ed.): U.S. Geological Survey Techniques and Methods 11–A3. 63 pp. <http://pubs.usgs.gov/tm/tm11a3/>.
- (USGS) U.S. Geological Survey. 2019. Watershed Boundary Dataset structure visualization. U.S. Geological Survey, Washington, D.C. <https://www.usgs.gov/media/images/watershed-boundary-dataset-structure-visualization>
- Zhao, Y.M., B.J. Shuter, and D.A. Jackson. 2008. Life history variation parallels phylogeographical patterns in North American Walleye (*Sander vitreus*) populations. Canadian Journal of Fisheries and Aquatic Sciences 65:198–211.