White Sturgeon in the Columbia River Basin

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Conservation

Beamesderfer, R. C., and R. A. Farr. 1997. Alternatives for the protection and restoration of sturgeons and their habitat. Environmental Biology of Fishes 48:407–417. https://doi.org/10.1023/A:1007310916515

Reviews the life history and habitat requirements of sturgeons, alternatives for their protection and restoration in North America, and a typical protection and enhancement program in the Columbia River.

Beamesderfer, R., A. Squier, and D. Evenson. 2011. White sturgeon strategic planning workshop for the lower Columbia and lower Snake River impoundments: workshop proceedings. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=41300

Reports on a workshop organized to foster discussion and coordination among governmental, Tribal, and other organizations in support of regional sturgeon management and mitigation efforts.

Beamesderfer, R., A. Squier, and D. Evenson. 2012. Columbia River basin white sturgeon planning & passage workshop: proceedings. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=41301

Reports on a workshop organized to foster discussion and coordination among governmental, Tribal, and other organizations in support of regional sturgeon management and mitigation efforts.

Belbin, S., and D. L. VanderZwaag. 2016. White sturgeon in jeopardy: gauging the law and policy currents. Journal of International Wildlife Law & Policy 19(1):62–99. https://doi.org/10.1080/13880292.2016.1131520

Provides an overview of current policy related to white sturgeon conservation.

Brannon, E., S. Brewer, and C. Melby. 1984. Columbia River white sturgeon (*Acipenser transmontanus*) enhancement. Final Report to Bonneville Power Administration, Project No. 83-316. https://docs.cbfwl.org/StreamNet_References/BPAsn29595.pdf

Reports on studies to examine and define the early life history characteristics of Columbia River white sturgeon as a base from which enhancement measures could be developed.

Crossman, J. A., J. Korman, J. G. McLellan, A. L. Miller, and M. D. Howell. 2025. High densities of hatchery-origin white sturgeon suppress somatic growth rates of an endangered wild population. Ecological Applications 35(4):e70042. https://doi.org/10.1002/eap.70042

Analyzes a long-term dataset to describe growth rates of endangered white sturgeon in the transboundary section of the upper Columbia River over a 32-year period where conservation aquaculture was initiated in year 12 to prevent extirpation.

DeVore, J. D., and B. W. James. 1999. Lower Columbia River white sturgeon current stock status and management implications. Washington Department of Fish and Wildlife. Olympia, Washington. https://wdfw.wa.gov/sites/default/files/publications/00936/wdfw00936.pdf

Reports on stock status and gives management recommendations for white sturgeon in the lower Columbia River.

Duke, S., P. Anders, G. Ennis, R. Hallock, J. Hammond, S. Ireland, J. Laufle, R. Lauzier, L. Lockhard, B. Marotz, V. L. Paragamian, and R. Westerhof. 1999. Recovery plan for Kootenai River white sturgeon (*Acipenser transmontanus*). Journal of Applied Ichthyology 15:157-163. https://doi.org/10.1111/j.1439-0426.1999.tb00226.x

Describes the process of preparing a Kootenai River white sturgeon draft recovery plan by the US Fish and Wildlife Service in cooperation with other agencies in the US and Canada.

Farr, R. A., and T. A. Jones. 2014. Status and biology of Columbia River white sturgeon (aka what we know about Columbia River white sturgeon and how we know it). Oregon Department of Fish and Wildlife. https://docs.cbfwl.org/StreamNet_References/ORsn53594.pdf

Summarizes research done by ODFW from 1989-2014 to determine the status and habitat requirements of white sturgeon in the Columbia River.

Fickeisen, D. H., D. A. Meitzel, and D. D. Dauble. 1984. White sturgeon research needs: workshop results. Report to Bonneville Power Administration. https://docs.cbfwl.org/StreamNet_References/BPAsn29452.pdf

Describes the results of a workshop conducted to facilitate efforts by BPA's Division of Fish and Wildlife to develop a research program for Columbia River basin white sturgeon.

Hildebrand, L. R., A. Drauch Schreier, K. Lepla, S. O. McAdam, J. McLellan, M. J. Parsley, V. L. Paragamian, and S. P. Young. 2016. Status of white sturgeon (*Acipenser transmontanus* Richardson, 1863) throughout the species range, threats to survival, and prognosis for the future. Journal of Applied Ichthyology 32:261-312. https://doi.org/10.1111/jai.13243

Provides a review of current knowledge on white sturgeon life history, ecology, physiology, behavior, genetics, and the status of white sturgeon in each drainage of their range.

Hildebrand, L., C. McLeod, and S. McKenzie. 1999. Status and management of white sturgeon in the Columbia River in British Columbia, Canada: an overview. Journal of Applied Ichthyology 15:164-172. https://doi.org/10.1111/j.1439-0426.1999.tb00227.x

Discusses the history of dam development on the Columbia River and implications to white sturgeon from a historical perspective.

Idaho Department of Fish and Game. 2008. Management plan for the conservation of Snake River white sturgeon in Idaho. Idaho Department of Fish and Game, Boise. https://docs.cbfwl.org/StreamNet_References/ORsn53592.pdf

Provides policy direction to staff to ensure the long-term persistence of the species within in its historical range.

Irvine, R. L., D. C. Schmidt, and L. R. Hildebrand. 2007. Population status of white sturgeon in the Lower Columbia River within Canada. Transactions of the American Fisheries Society 136(6):1472–1479. https://doi.org/10.1577/T06-190.1

Determines the status and population attributes of white sturgeon between Hugh L. Keenleyside Dam and the U.S.-Canada border.

Jager, H. I., M. J. Parsley, J. J. Cech, R. L. McLaughlin, P. S. Forsythe, R. F. Elliott, and B. M. Pracheil. 2016. Reconnecting fragmented sturgeon populations in North American Rivers. Fisheries 41(3):140–148. https://doi.org/10.1080/03632415.2015.1132705

Outlines an adaptive approach to implementing dam passage that begins with temporary programs and structures and monitors success both at the scale of individual fish at individual dams and the scale of metapopulations in a river basin.

Johnson, P., J. Crossman, A. Miller, B. Nichols, J. McLellan, M. Howell, and A. Schreier. 2025. Conservation aquaculture of wild-origin offspring preserves genetic diversity in an endangered population of white sturgeon. Conservation Genetics 26:335–346. https://doi.org/10.1007/s10592-024-01670-2

Evaluates the performance of a conservation agriculture program in capturing the wild population's genetic diversity.

Justice, C., B. J. Pyper, R. C. P. Beamesderfer, V. L. Paragamian, P. J. Rust, M. D. Neufeld, and S. C. Ireland. 2009. Evidence of density- and size-dependent mortality in hatchery-reared juvenile white sturgeon (*Acipenser transmontanus*) in the Kootenai River. Canadian Journal of Fisheries and Aquatic Sciences 66(5):802–815. https://doi.org/10.1139/F09-034

Evaluates effects of stocking level and size-at-release on survival rates of hatchery-reared juvenile white sturgeon in the Kootenai River using Cormack–Jolly–Seber and related models implemented in Program MARK.

Kappenman, K. M., and B. L. Parker. 2007. Ghost nets in the Columbia River: methods for locating and removing derelict gill nets in a large river and an assessment of impact to white sturgeon. North American Journal of Fisheries Management 27(3):804–809. https://doi.org/10.1577/M06-052.1

Investigates the effect of lost nets in the Columbia River on white sturgeon.

Kootenai Tribe of Idaho. 2006. Kootenai River white sturgeon conservation aquaculture program, 1990-2005. Kootenai Tribe of Idaho, Bonners Ferry, Idaho. https://www.cbfish.org/Document.mvc/Viewer/P107863

Provides an overview of the first 15 years of the Kootenai River White Sturgeon Conservation Aquaculture Program.

Nelson, T. C., W. J. Gazey, K. K. English, and M. L. Rosenau. 2013. Status of white sturgeon in the Lower Fraser River, British Columbia. Fisheries 38(5):197–209. https://doi.org/10.1080/03632415.2013.777664

Utilizes a model to provide annual population estimates by size/age group and location, based on tag release and recapture data.

Nez Perce Tribe. 1997-2002. Evaluate potential means of rebuilding sturgeon populations in the Snake River between Lower Granite and Hells Canyon Dams. Annual Report to Bonneville Power Administration, Project 9700900, Portland, Oregon. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=40638

Identifies means to restore and rebuild the Snake River white population to support a sustainable annual subsistence harvest.

Nez Perce Tribe. 2005. White sturgeon management plan in the Snake River between Lower Granite and Hells Canyon dams. Report to Bonneville Power Administration, Project 1997-00-900, Portland, Oregon. https://doi.org/10.2172/890589

Describes the goals, objectives, strategies, actions, and expected evaluative timeframes for restoring the white sturgeon population in the Hells Canyon reach of the Snake River.

Oregon Department of Fish and Wildlife. 1993-1999. Effects of mitigative measures on productivity of white sturgeon populations in the Columbia River downstream from McNary Dam, and status and habitat requirements of white sturgeon populations in the Columbia and Snake Rivers upstream from McNary Dam. Annual Report to Bonneville Power Administration, Project 86-50, Portland, Oregon. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=39785

Annual report determining the effects of mitigative measures on productivity of white sturgeon populations in the Columbia River downstream from McNary Dam, and on determining the status and habitat requirements of white sturgeon populations in the Columbia and Snake rivers upstream from McNary Dam.

Oregon Department of Fish and Wildlife. 1999-2023. White sturgeon mitigation and restoration in the Columbia and Snake rivers upstream from Bonneville Dam. Annual Report to Bonneville Power Administration, Project 86-50, Portland, Oregon. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=40376

Annual report determining the effects of mitigative measures on productivity of white sturgeon populations in the Columbia River downstream from McNary Dam, and on determining the status and habitat requirements of white sturgeon populations in the Columbia and Snake rivers upstream from McNary Dam.

Oregon Department of Fish and Wildlife Ocean Salmon and Columbia River Program. 2011. Lower Columbia River and Oregon Coast white sturgeon conservation plan. Oregon Department of Fish and Wildlife, Clackamas. https://docs.cbfwl.org/StreamNet_References/ORsn53591.pdf

Provides a framework to manage and conserve white sturgeon to ensure a viable and productive population while providing sustainable harvest opportunities and other societal benefits.

Paragamian, V. 2012. Kootenai River white sturgeon: synthesis of two decades of research. Endangered Species Research 17(2):157–167. https://doi.org/10.3354/esr00407

Discusses recovery work to conserve and protect the Kootenai River white sturgeon.

Paragamian, V. L., R. C. P. Beamesderfer, and S. C. Ireland. 2005. Status, population dynamics, and future prospects of the endangered Kootenai River white sturgeon population with and without hatchery intervention. Transactions of the American Fisheries Society 134(2):518-532. https://doi.org/10.1577/T03-011.1

Synthesizes sampling data from 1977 through 2001, including extensive mark–recapture data, to provide a comprehensive and current picture of the status, population dynamics, and future prospects of Kootenai River white sturgeon.

Paragamian, V. L. and M. J. Hansen. 2008. Evaluation of recovery goals for endangered white sturgeon in the Kootenai River, Idaho. North American Journal of Fisheries Management 28(2):463-470. https://doi.org/10.1577/M06-183.1

Evaluates recovery goals for endangered white sturgeon in the Kootenai River, Idaho.

Rien, T. A., and J. A. North. 2002. White sturgeon transplants within the Columbia River. Pages 223-236 *in* van Winkle, W. editor. Biology, management and protection of North American sturgeon. American Fisheries Society, Symposium 28, Bethesda, Maryland. https://fisheries.org/doi/9781888569360-ch18/

Evaluates capture and transplantation of white sturgeon from Bonneville Dam to The Dalles Reservoir as a method to supplement natural recruitment.

Contaminants

Balistrieri, L.S. 2024. Using multiple metal mixture models to predict toxicity of riverine sediment porewater to the benthic life stage of juvenile white sturgeon (*Acipenser transmontanus*). Environmental Toxicology and Chemistry 43(1):62-73. https://doi.org/10.1002/etc.5752

Predicts the toxicity of porewater to young sturgeon using five metal mixture dose–response models and evaluates the models as tools for risk assessments.

Balistrieri, L. S., C. A. Mebane, S. E. Cox, H. J. Puglis, R. D. Calfee, and N. Wang. 2018. Potential toxicity of dissolved metal mixtures (Cd, Cu, Pb, Zn) to early life stage white sturgeon (*Acipenser transmontanus*) in the Upper Columbia River, Washington, United States. Environmental Science & Technology 52(17):9793-9800. https://doi.org/10.1021/acs.est.8b02261

Evaluates whether there is a link between the toxicity of dissolved metals across the sediment-water interface in the upper Columbia River and the survival of early life stage white sturgeon.

Bosley, C. E., and G. F. Gately, 1981. Polychlorinated biphenyls and chlorinated pesticides in Columbia River white sturgeon (*Acipenser transmontanus*). U.S. Fish and Wildlife Service, Nordland, Washington. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=13737

Investigates whether polychlorinated biphenyls and chlorinated pesticides are present in concentrations high enough to affect white sturgeon reproduction.

Dauble, D. D. and T. M. Poston. 1994. Radionuclide concentrations in white sturgeons from the Hanford Reach of the Columbia River. Transactions of the American Fisheries Society 123(4):565-573. https://doi.org/10.1577/1548-8659(1994)123<0565:RCIWSF>2.3.CO;2

Summarizes radionuclide concentrations in white sturgeons from the Columbia River during a period when several plutonium-production reactors were operating at the Hanford Site in Washington State and compares these values to those measured several years after reactor shutdown.

Feist, G. W., M. A.H. Webb, D. T. Gundersen, E. P. Foster, C. B. Schreck, A. G. Maule, and M. S. Fitzpatrick. 2005. Evidence of detrimental effects of environmental contaminants on growth and reproductive physiology of white sturgeon in impounded areas of the Columbia River. Environmental Health Perspectives 113(12):1675-1682. https://doi.org/10.1289/ehp.8072

Investigates whether wild white sturgeon from the Columbia River exhibit signs of reproductive endocrine disruption due to endocrine-disrupting chemicals.

Foster, E., M. Fitzpatrick, G. Feist, C. B. Schreck and J. Yates. 2001. Gonad organochlorine concentrations and plasma steroid levels in white sturgeon (*Acipenser transmontanus*) from the Columbia River, USA. Bulletin of Environmental Contamination and Toxicology 67:239–245. https://doi.org/10.1007/s001280116

Examines if sturgeon from an impounded section of the Columbia River had higher levels of bioaccumulative pollutants than sturgeon from the estuary and if these compounds were associated with decreased plasma steroid levels.

Foster, E., M. Fitzpatrick, G. Feist, C. B. Schreck, J. Yates, J. M. Spitsbergen, and J. R. Heidel. 2001. Plasma androgen correlation, EROD induction, reduced condition factor, and the occurrence of organochlorine pollutants in reproductively immature white sturgeon (*Acipenser transmontanus*) from the Columbia River, USA. Archives of Environmental Contamination and Toxicology 41:182–191. https://doi.org/10.1007/s002440010236

Analyzes white sturgeon plasma, liver, and gonad samples to determine a correlation between pollutants and health.

Gundersen, D. T., M. A. Webb, A. K. Fink, L. R. Kushner, G. W. Feist, M. S. Fitzpatrick, E. P. Foster, and C. B. Schreck. 2008. Using blood plasma for monitoring organochlorine contaminants in juvenile white sturgeon, *Acipenser transmontanus*, from the lower

Columbia River. Bulletin of Environmental Contamination and Toxicology 81(3):225–229. https://doi.org/10.1007/s00128-008-9417-6

Measures organochlorine pesticide concentrations in blood plasma samples from 88 juvenile white sturgeon collected from the lower Columbia River.

Little, E. E., R. D. Calfee, and G. Linder. 2012. Toxicity of copper to early-life stage Kootenai River white sturgeon, Columbia River white sturgeon, and rainbow trout. Archives of Environmental Contamination and Toxicology 63(3):400–408. https://doi.org/10.1007/s00244-012-9782-3

Analyzes the toxicity of copper on two populations of white sturgeon and rainbow trout.

Little, E.E., Calfee, R.D. and Linder, G. 2014, Toxicity of smelter slag-contaminated sediments from Upper Lake Roosevelt and associated metals to early life stage White Sturgeon (*Acipenser transmontanus* Richardson, 1836). Journal of Applied Ichthyology 30:1497-1507. https://doi.org/10.1111/jai.12565

Evaluates the toxicity of five smelter slag-contaminated sediments from the upper Columbia River and metals associated with those slags in 96-h exposures of white sturgeon at 8 and 30 days post-hatch.

Payne, S. E., D. R. Wise, J. W., Davis, and E. B. Nilsen. 2022. Assessment of persistent chemicals of concern in white sturgeon (*Acipenser transmontanus*) in the Hanford Reach of the Columbia River, southeastern Washington, 2009. U.S. Geological Survey Scientific Investigations Report 2022–5020. https://doi.org/10.3133/sir20225020

Analyzes white sturgeon tissues for the concentrations of individual chemicals as well as the total concentrations of four chemical classes: (1) organochlorine pesticides, (2) industrial or personal care products, (3) polybrominated diphenyl ether congeners, and (4) polychlorinated biphenyl congeners.

Puglis, H. J. 2018. The effects of metal contamination on larval white sturgeon in the upper Columbia River. Master’s Thesis. University of Missouri-Columbia. https://mospace.umsystem.edu/xmlui/handle/10355/83921

Examines the potential role of metal contamination in the decline of white sturgeon in the upper Columbia River.

Puglis, H. J., A. M. Farag, C. A. and Mebane. 2020. Copper concentrations in the Upper Columbia River as a limiting factor in white sturgeon recruitment and recovery. Integrated Environmental Assessment and Management 16(3):378-391. https://doi.org/10.1002/ieam.4240

Reviews of life history, physiology, and behavior of white sturgeon, along with data from recent toxicological studies, to determine if trace metals, especially Cu, affect survival and behavior of early life stage fish.

Tompsett, A. R., D. W. Vardy, E. Higley, J. A. Doering, M. Allan, K. Liber, J. P. Giesy, and M. Hecker. 2014. Effects of Columbia River water on early life-stages of white sturgeon (*Acipenser transmontanus*). Ecotoxicology and Environmental Safety 101:23–30. https://doi.org/10.1016/j.ecoenv.2013.12.004

Measures concentrations of metals in upper Columbia River water to assess potential impacts on juvenile white sturgeon.

Vardy, D. W., R. Santore, A. Ryan, J. P. Giesy, and M. Hecker. 2014. Acute toxicity of copper, lead, cadmium, and zinc to early life stages of white sturgeon (*Acipenser transmontanus*) in laboratory and Columbia River water. Environmental Science and Pollution Research 21:8176–8187. https://doi.org/10.1007/s11356-014-2754-6

Reports on results from acute toxicity tests for copper, cadmium, zinc, and lead from parallel studies that were conducted in laboratory water and in the field with Columbia River water.

Webb, M. A. H., G. W. Feist, M. S. Fitzpatrick, E. P. Foster, C. B. Schreck, M. Plumlee, C. Wong, and D. T. Gundersen. 2006. Mercury concentrations in gonad, liver, and muscle of white sturgeon *Acipenser transmontanus* in the Lower Columbia River. Archives of Environmental Contamination and Toxicology 50:443–451. https://doi.org/10.1007/s00244-004-0159-0

Determines the partitioning of total mercury in liver, gonad, and cheek muscle of white sturgeon in the lower Columbia River.

Distribution and Movement

Bajkov, A. D. 1951. Migration of white sturgeon (*Acipenser transmontanus*) in the Columbia River. Fish Commission Research Briefs 3(2):8-21. https://ir.library.oregonstate.edu/concern/technical_reports/vt150j866

Describes a tagging project to track the movements of white sturgeon in the Columbia River.

Brannon, E., A. Setter, J. Altick, and M. Miller. 1988. Columbia River white sturgeon genetics and early life history: population segregation and juvenile feeding behavior. Final Report to Bonneville Power Administration, Project 83-316, Portland, Oregon. https://www.cbfish.org/Document.mvc/Viewer/18952-3

Studies the feeding behavior of juvenile sturgeon, including the chemostimulant components in prey attractive to sturgeon and the sensory systems utilized by foraging sturgeon.

Chapman, C. G., and T. A. Jones. 2010. First documented spawning of white sturgeon in the lower Willamette River, Oregon. Northwest Science 84(4):327-335. https://doi.org/10.3955/046.084.0402

Provides the first documentation of white sturgeon spawning in the Willamette River.

Coon, J. C., R. R. Ringe, and T.C. Bjornn. 1977. Abundance, growth, distribution, and movements of white sturgeon in the Mid-Snake River. Report to Office of Water Research and Technology, United States Department of the Interior, Project B-026-IDA, Washington, D. C. https://www.lib.uidaho.edu/digital/iwdl/items/iwdl-197708.html

Assesses the abundance, growth, distribution, and movements of white sturgeon in the Snake River between Lower Granite and Hells Canyon dams.

Counihan, T. D., A. I. Miller, and M. J. Parsley. 1999. Indexing the relative abundance of age-0 white sturgeons in an impoundment of the lower Columbia River from highly skewed trawling data. North American Journal of Fisheries Management 19(2):520-529. https://doi.org/10.1577/1548-8675(1999)019<0520:ITRAOA>2.0.CO;2

Investigates if age-0 CPUE distributions from bottom trawl surveys violate assumptions of statistical procedures based on normal probability theory.

Crossman, J.A., G. Martel, P. N. Johnson, and K. Bray. 2011. The use of Dual-frequency IDentification SONar (DIDSON) to document white sturgeon activity in the Columbia River, Canada. Journal of Applied Ichthyology, 27:53-57. https://doi.org/10.1111/j.1439-0426.2011.01832.x

Tests the feasibility of using DIDSON for monitoring white sturgeon presence and activity near a known spawning area in the Columbia River, British Columbia.

DeVore, J., C. Tracy, and B. James. 1990. White sturgeon abundance and exploitation in the Columbia River downstream from Bonneville Dam. Columbia River Laboratory Progress Report 9X-XX, Richland, Washington. https://docs.cbfwl.org/Washington/DFW/CRProgRept-9X-XX.pdf

Summarizes progress in estimating abundance and exploitation of the lower Columbia white sturgeon population for the years 1985-1990.

Haynes, J. M. 1978. Movement and habitat studies of chinook salmon and white sturgeon. Report to U.S. Department of Energy, Contract EY-76-C-06-1830. https://doi.org/10.2172/6632297

Examines sturgeon movement patterns in relation to season, direction, and distance of travel in the river, and possible home range affinities in the mid-Columbia River.

Haynes, J. M., R. H. Gray, J. C. Montgomery. 1978. Seasonal movements of white sturgeon (*Acipenser transmontanus*) in the Mid-Columbia River. Transactions of the American Fisheries Society 107(2): 275-280. https://doi.org/10.1577/1548-8659(1978)107%3C275:SMOWSA%3E2.0.CO;2

Studies seasonal movements of 29 white sturgeon in the mid-Columbia River.

Jager, H. I. 2006. Chutes and ladders and other games we play with rivers. I. Simulated effects of upstream passage on white sturgeon. Canadian Journal of Fisheries and Aquatic Sciences 63(1):165-175. https://doi.org/10.1139/f05-226

Utilizes a population viability model to quantify the effects of upstream passage at dams on white sturgeon metapopulations inhabiting a series of long (source) and short (sink) river segments.

Jetter, C. N. 2022. Movement ecology of white sturgeon in the regulated upper Columbia River. Master's Thesis. University of Northern British Columbia, Prince George. https://doi.org/10.24124/2022/59296

Analyzes white sturgeon movement datasets from a regulated and transboundary reach of the upper Columbia River.

Jetter, C. N., J. A. Crossman, J. G. McLellan, A. L. Miller, M. A. H. Webb, and E. G. Martins. 2025. Implications of space use for recovery of White Sturgeon *Acipenser* *transmontanus* in a transboundary reach of the Upper Columbia River. Canadian Journal of Fisheries and Aquatic Sciences 82:1–17. https://doi.org/10.1139/cjfas-2024-0134

Describes how core and home ranges of sturgeon varied by environmental (country, season) and biological (age, sex, size) factors and determined residence at important habitats.

Kruse-Malle, G. O. 1993. White sturgeon evaluations in the Snake River. Federal Aid in Sport Fish Restoration, Project F-73 -R-1, Job Performance Report, Boise, Idaho. https://idahodocs.contentdm.oclc.org/digital/collection/p16293coll7/id/237850/

Estimates numbers of white sturgeon residing between Swan Falls Dam and Brownlee Dam on the Snake River and from C.J. Strike Reservoir to Swan Falls Dam.

Kruse-Malle, G. O, and V. K. Moore. 1995. Snake River white sturgeon evaluations. Federal Aid in Sport Fish Restoration, Project F-73 -R-16, Boise, Idaho. http://idahodocs.contentdm.oclc.org/digital/collection/p16293coll7/id/235556/

Estimates population, age, and size frequency distributions of white sturgeon in the Snake River between C.J. Strike Dam and Brownlee Dam.

Neufeld, M. D., and P. J. Rust. 2009. Using passive sonic telemetry methods to evaluate dispersal and subsequent movements of hatchery-reared white sturgeon in the Kootenay River. Journal of Applied Ichthyology 25:27-33. https://doi.org/10.1111/j.1439-0426.2009.01336.x

Evaluates dispersal and subsequent movement of juvenile white sturgeon fitted with sonic tags and released as part of larger hatchery release groups at five sites.

North, J. A., R. C. Beamesderfer, and T. A. Rien. 1993. Distribution and movements of white sturgeon in three lower Columbia River reservoirs. Northwest Science 67(2):105-111. https://hdl.handle.net/2376/1575

Determines the distribution and movement of white sturgeon in Bonneville, The Dalles, and John Day reservoirs on the Columbia River from April through August, 1987-1991.

Paragamian, V. L., and J. P. Duehr. 2005. Variations in vertical location of Kootenai River white sturgeon during the prespawn and spawning periods. Transactions of the American Fisheries Society 134(1):261-266. https://doi.org/10.1577/FT04-071.1

Determines the general water column habitat use of Kootenai River white sturgeon during the prespawn and spawning periods and the degree of their benthic existence.

Paragamian, V. L., and G. Kruse. 2001. Kootenai River white sturgeon spawning migration behavior and a predictive model. North American Journal of Fisheries Management 21(1): 10-21. https://doi.org/10.1577/1548-8675(2001)021%3C0010:KRWSSM%3E2.0.CO;2

Monitors movement and behavior of 49 reproductively mature white sturgeon with radio and sonic telemetry from 1991 through 1997.

Paragamian, V. L. and P. Rust. 2014. Validation of a methodology to determine female white sturgeon (*Acipenser transmontanus* Richardson, 1836) habitat use within a riverscape during the spawning season. Journal of Applied Ichthyology 30:1342-1355. https://doi.org/10.1111/jai.12571

Utilizes hydrologic and bathymetric models for the riverscape of the Kootenai River, Idaho and integrates these data with radio telemetry locations of two female white sturgeon during the spawning season.

Parsley, M. J., and K. M. Kappenman. 2000. White sturgeon spawning areas in the lower Snake River. Northwest Science 74(3):192-201. https://hdl.handle.net/2376/1057

Documents 17 sturgeon spawning locations in the Snake River from the mouth to Lower Granite Dam.

Parsley, M. J., N. D. Popoff, C. D. Wright, and B. K. van der Leeuw. 2008. Seasonal and diel movements of white sturgeon in the lower Columbia River. Transactions of the American Fisheries Society 137(4):1007–1017. https://doi.org/10.1577/T07-027.1

Reports on tracking of white sturgeon movements using acoustic telemetry, providing information on diel and seasonal migrations, local movements, and site fidelity.

Parsley, M. J., C. D. Wright, B. K. van der Leeuw, E. E. Kofoot, C. A. Peery, and M. L. Moser. 2007. White Sturgeon (*Acipenser transmontanus*) passage at The Dalles Dam, Columbia River, USA. Journal of Applied Ichthyology 23(6):627–635. https://doi.org/10.1111/j.1439-0426.2007.00869.x

Monitors white sturgeon in the Columbia River, during March 2004 through November 2005 to determine timing and routes of passage and to characterize general movements.

Schreier, A. D., B. Mahardja, and B. May. 2013. Patterns of population structure vary across the range of the white sturgeon. Transactions of the American Fisheries Society 142(5):1273–1286. https://doi.org/10.1080/00028487.2013.788554

Reports results from an analysis of white sturgeon population structure within and among drainages using 13 polysomic microsatellite loci.

Sullivan, A. B., H. I. Jager, and R. Myers. 2003. Modeling white sturgeon movement in a reservoir: the effect of water quality and sturgeon density. Ecological Modelling 167(1-2):97-114. https://doi.org/10.1016/S0304-3800(03)00169-8

Describes a movement model to examine the distribution and survival of white sturgeon in a reservoir subject to large spatial and temporal variation in dissolved oxygen and temperature.

Welch, D. W., S. Turo, and S. D. Batten. 2006. Large-scale marine and freshwater movements of white sturgeon. Transactions of the American Fisheries Society 135(2):386–389. https://doi.org/10.1577/T05-197.1

Reports telemetry data on the marine and freshwater movements of a white sturgeon over a 19 month period.

Genetics

Brannon, E., S. Brewer, A. Setter, M. Miller, F. Utter, and W. Hershberger. 1985. Columbia River white sturgeon (*Acipenser transmontanus*) early life history and genetics study. Report to Bonneville Power Administration, Project 83-316. https://docs.cbfwl.org/StreamNet_References/BPAsn29690.pdf

Investigates spawning and incubation, larvae and fry distribution behavior, fry feeding responses, and stock identification of Columbia River white sturgeon.

Brannon, E., A. Setter, H. Miller, S. Brewer, G. Winans, F. Utter, L. Carperter, and W. Hershberger. 1987. Columbia River white sturgeon (*Acipenser transmontanus*) population genetics and early life history study. Final Report to Bonneville Power

Administration, Project 83-316, Portland, Oregon.
https://www.cbfish.org/Document.mvc/Viewer/18952-2

Assesses genetic variability of sturgeon populations isolated in various areas of the Columbia River and examines environmental factors in the habitat that may affect early life history success.

Brown, J. R., A. T. Beckenbach, and M. J. Smith. 1992. Influence of Pleistocene glaciations and human intervention upon mitochondrial DNA diversity in white sturgeon (*Acipenser transmontanus*) populations. Canadian Journal of Fisheries and Aquatic Sciences 49(2): 358-367. https://doi.org/10.1139/f92-041

Studies the influence of recent genetic bottlenecks on two Northwest Pacific (Columbia and Fraser Rivers) populations of white sturgeon using restriction enzyme site differences in mitochondrial DNA.

Columbia River Inter-Tribal Fish Commission. 2010-2018. Genetic monitoring of white sturgeon genetic structure and productivity in the Columbia River Basin. Report to Bonneville Power Administration, Project 2008-504-00, Portland, Oregon.
https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=45084

Characterizes the genetic population structure of white sturgeon among four impoundments in the middle Columbia River Basin: Bonneville, The Dalles, John Day, and McNary reservoirs.

Crossman, J., A.-M. Flores, A. Messmer, R. Nelson, S. McAdam, P. Johnson, P. Reece, and B. Koop. 2024. Development of eDNA protocols for detection of endangered white sturgeon (*Acipenser transmontanus*) in the wild. Environmental DNA 6(5):e70006.
https://doi.org/10.1002/edn3.70006

Optimizes an eDNA protocol to detect the presence of endangered white sturgeon in water samples.

Crossman, J. A., J. Korman, J. G. McLellan, M. D. Howell, and A. L. Miller. 2023. Competition overwhelms environment and genetic effects on growth rates of endangered White Sturgeon from a conservation aquaculture program. Canadian Journal of Fisheries and Aquatic Sciences 80(6):958–977.
https://doi.org/10.1139/cjfas-2022-0113

Uses mark-recapture data to estimate variation in growth rates due to genetic, environmental, and competition effects to evaluate the efficacy of the aquaculture program.

Delomas, T. A., S. C. Willis, B. L. Parker, D. Miller, P. Anders, A. Schreier, and S. Narum. 2021. Genotyping single nucleotide polymorphisms and inferring ploidy by amplicon sequencing for polyploid, ploidy-variable organisms. Molecular Ecology Resources 21(7):2288–2298. https://doi.org/10.1111/1755-0998.13431

Demonstrates a strategy for developing an amplicon sequencing panel of single nucleotide polymorphisms for high-throughput genotyping of polyploid organisms using white sturgeon.

Drauch Schreier, A., and B. May. 2011. Genetic monitoring of the upper Columbia River White Sturgeon conservation aquaculture program. Report to Spokane Tribe of Indians, Wellpinit, Washington. https://www.cbfish.org/Document.mvc/Viewer/P124145

Describes genetic monitoring of the Transboundary Reach conservation aquaculture program for white sturgeon.

Jager, H. I. 2005. Genetic and demographic implications of aquaculture in white sturgeon (*Acipenser transmontanus*) conservation. Canadian Journal of Fisheries and Aquatic Sciences 62(8):1733–1745. https://doi.org/10.1139/f05-106

Employs a genetic individual-based model of white sturgeon populations in a river to examine the genetic and demographic trade-offs associated with operating a conservation hatchery.

Jay, K., J. A. Crossman, and K. T. Scribner. 2014. Estimates of effective number of breeding adults and reproductive success for white sturgeon. Transactions of the American Fisheries Society 143(5):1204–1216. https://doi.org/10.1080/00028487.2014.931301

Demonstrates that genetic techniques can be used to characterize important features of white sturgeon reproductive ecology in large rivers where census data are extremely difficult to obtain.

Johnson, P. 2024. Conservation and ecological genetics of white sturgeon in the Upper Columbia River. Doctoral Dissertation. University of California, Davis. https://www.proquest.com/openview/204a86faab05790dc353bc28365d8dce/1?cbl=18750&diss=y&pq-origsite=gscholar

Reviews and evaluates practices aimed at genetic diversity conservation in white sturgeon in the upper Columbia River.

Schreier, A., S. Stephenson, P. Rust, and S. Young. 2015. The case of the endangered Kootenai River White Sturgeon (*Acipenser transmontanus*) highlights the importance of post-release genetic monitoring in captive and supportive breeding programs. Biological Conservation 192:74–81. https://doi.org/10.1016/j.biocon.2015.09.011

Explores whether genetic monitoring of broodstock used in supportive breeding overestimates genetic diversity conservation in most year classes due to differential post-release mortality among families.

Setter, A., and E. Brannon, 1992. A summary of stock identification research on white sturgeon of the Columbia River (1985-1990). Final Report to Bonneville Power Administration, Project 89-44, Portland, Oregon. https://www.cbfish.org/Document.mvc/Viewer/97298-1

Determines what level of genetic differentiation exists among white sturgeon in the Columbia River system, using starch gel electrophoresis to enable a baseline of population genetic structure data to be assembled.

Thorstensen, M., P. Bates, K. Lepla, and A. Schreier. 2019. To breed or not to breed? Maintaining genetic diversity in white sturgeon supplementation programs. Conservation Genetics 20:997-1007. https://doi.org/10.1007/s10592-019-01190-4

Compares genetic consequences of repatriation, or collection of wild-born juveniles for captive rearing and release, and broodstock-based breeding, where wild adults are bred in captivity, in a conservation program for white sturgeon.

Willis, S. C., B. Parker, A. D. Schreier, R. Beamesderfer, D. Miller, S. Young, and S. R. Narum. 2022. Population structure of white sturgeon (*Acipenser transmontanus*) in the Columbia River inferred from single-nucleotide polymorphisms. Diversity 14(12):1045. https://doi.org/10.3390/d14121045

Utilizes a set of 325 single-nucleotide markers from white sturgeon to determine their spatial genetic structure.

Habitat

Coutant, C. C. 2004. A riparian habitat hypothesis for successful reproduction of white sturgeon. Reviews in Fisheries Science 12(1):23–73. https://doi.org/10.1080/10641260490273023

Proposes that submerged riparian habitat during seasonal high water is needed for the early development of white sturgeon.

Counihan T. D., and C. G. Chapman. 2018. Relating river discharge and water temperature to the recruitment of age-0 White Sturgeon (*Acipenser transmontanus* Richardson, 1836) in the Columbia River using over-dispersed catch data. Journal of Applied Ichthyology 34:279–289. https://doi.org/10.1111/jai.13570

Examines if river discharge and water temperature during various early life history stages are predictors of age-0 white sturgeon recruitment.

Crossman, J. A., and L. R. Hildebrand. 2014. Evaluation of spawning substrate enhancement for white sturgeon in a regulated river: Effects on larval retention and dispersal. River Research and Applications 30(1):1-10. https://doi.org/10.1002/rra.2620

Studies the larval retention and dispersal of white sturgeon in the only known spawning site used by white sturgeon in the mid-Columbia River after substrate modification.

Dudunake, T. J., M. K. Kenworthy, T. Smith, S. Stephenson, and R. S. Hardy. 2025. Influence of local river hydraulics on Kootenai River white sturgeon (*Acipenser transmontanus*) habitat selection during four spawning years, 2017–2020. Canadian Journal of Fisheries and Aquatic Sciences. 82:1-16. https://doi.org/10.1139/cjfas-2024-0244

Investigates the physical habitat preferences exhibited by white sturgeon in an intensely monitored section of the Kootenai River during four spawning years and what habitat is selected by staging white sturgeon.

Hatten, J. R., and M. J. Parsley. 2009. A spatial model of white sturgeon rearing habitat in the lower Columbia River, USA. Ecological Modelling 220(24):3638-3646. https://doi.org/10.1016/j.ecolmodel.2009.03.006

Describes the development of a GIS-based model that characterizes in a spatially explicit manner white sturgeon rearing habitat in the lower Columbia River.

Hatten, J. R., M. J. Parsley, G. J. Barton, T. R. Batt, and R. L. Fosness. 2018. Substrate and flow characteristics associated with white sturgeon recruitment in the Columbia River Basin. Heliyon 4(5):e00629. https://doi.org/10.1016/j.heliyon.2018.e00629

Identifies habitat characteristics associated with age 0+ white sturgeon recruitment in three reaches of the Columbia River Basin: Skamania reach, John Day reach, and Kootenai reach.

McAdam, D. S. 2015. Retrospective weight-of-evidence analysis identifies substrate change as the apparent cause of recruitment failure in the upper Columbia River white sturgeon (*Acipenser transmontanus*). Canadian Journal of Fisheries and Aquatic Sciences 72: 1208–1220. https://doi.org/10.1139/cjfas-2014-0423

Evaluates the potential cause of white sturgeon recruitment failure in the upper Columbia River by testing 12 recruitment-failure hypotheses based on nine criteria.

McDonald, R., J. Nelson, V. Paragamian, and G. Barton. 2010. Modeling the effect of flow and sediment transport on white sturgeon spawning habitat in the Kootenai River, Idaho. Journal of Hydraulic Engineering 136(12):1077–1092. https://doi.org/10.1061/(ASCE)HY.1943-7900.0000283

Uses a quasi-three-dimensional flow and sediment-transport model along with the locations of collected sturgeon eggs as a proxy for spawning location to gain insight into spawning-habitat selection in a reach that is currently unsuitable due to the lack of coarse substrate.

Miller, A., and M. J. Parsley. 1992. Habitat used by spawning and rearing white sturgeon in the lower Columbia. Northwest Science 66(2):139.

Investigates habitat use by spawning and rearing white sturgeon in the Columbia River downstream from McNary Dam and quantifying the available habitat.

Oregon Department of Fish and Wildlife, Washington Department of Fisheries, U.S. Fish and Wildlife Service, and National Marine Fisheries Service. 1986-1992. Status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam. Annual Report to Bonneville Power Administration, Project 86-50, Portland, Oregon. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=39797

Annual report to determine the status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam.

Paragamian, V. L., G. Kruse, and V. Wakkinen. 2001. Spawning habitat of Kootenai River white sturgeon, post-Libby Dam. North American Journal of Fisheries Management 21(1):22-33. https://doi.org/10.1577/1548-8675(2001)021<0022:SHOKRW>2.0.CO;2

Identifies the actual and potential spawning habitats of Kootenai River white sturgeon.

Paragamian, V. L., R. McDonald, G. J. Nelson, and G. Barton. 2009. Kootenai River velocities, depth, and white sturgeon spawning site selection – a mystery unraveled?. Journal of Applied Ichthyology, 25: 640-646. https://doi.org/10.1111/j.1439-0426.2009.01364.x

Explores the empirical relationship between hydraulic conditions and white sturgeon spawning.

Paragamian, V. L., and V. D. Wakkinen. 2011. White sturgeon spawning and discharge augmentation. Fisheries Management and Ecology 18(4):314–321. https://doi.org/10.1111/j.1365-2400.2011.00785.x

Examines observed spawning events of endangered Kootenai River white sturgeon to evaluate the effects of discharge from Libby Dam on spawning.

Parsley, M. J., and L. G. Beckman. 1994. White sturgeon spawning and rearing habitat in the lower Columbia River. North American Journal of Fisheries Management 14(4): 812-827. https://doi.org/10.1577/1548-8675(1994)014%3C0812:WSSARH%3E2.3.CO;2

Provides estimates of spawning habitat for white sturgeons in the tailraces of the four dams on the lower 470 km of the Columbia River.

Parsley, M. J., L. G. Beckman, and G. T. McCabe. 1993. Spawning and rearing habitat use by white sturgeons in the Columbia River downstream from McNary Dam. Transactions of the American Fisheries Society 122(2): 217–227. https://doi.org/10.1577/1548-8659(1993)122%3C0217:SARHUB%3E2.3.CO;2

Describes spawning and rearing habitats used by white sturgeons in the lower Columbia River.

van der Leeuw, B. K., M. J. Parsley, C. D. Wright, and E. E. Kofoot. 2006, Validation of a critical assumption of the riparian habitat hypothesis for white sturgeon. U.S. Geological Survey Scientific Investigations Report 2006-5225. https://pubs.usgs.gov/sir/2006/5225/pdf/sir20065225.pdf

Determines if white sturgeon embryos, free embryos, and larvae occur in seasonally inundated riparian habitats, and characterizes surface substrates at sites where embryos, free embryos, and larvae were found.

Young, W. T., and D. L. Scarnecchia. 2005. Habitat use of juvenile white sturgeon in the Kootenai River, Idaho and British Columbia. Hydrobiologia 537:265–271. https://doi.org/10.1007/s10750-004-1639-y

Utilizes ultrasonic telemetry to assess habitat features used by 36 juvenile white sturgeon in the lower 120 km of the Kootenai River during the summer and early fall of 1999 and 2000.

Physiology and Age

Bates, P., J. Chandler, K. Lepla, and K. Steinhorst. 2014. Using mark-recapture data in an individual-based model to evaluate length-at-age differences between two Snake River white sturgeon (*Acipenser transmontanus* Richardson, 1836) populations in Idaho, USA. Journal of Applied Ichthyology 30:1319-1327. https://doi.org/10.1111/jai.12557

Utilizes an individual based model using empirical mark-recapture metrics to understand differences in stock structures of two white sturgeon populations.

Burner, L. C., and T. A. Rien. 2002. Incidence of white sturgeon deformities in two reaches of the Columbia River. California Fish and Game 88(2):57-67.

Samples two functionally isolated populations of white sturgeon to measure the occurrence of physical deformities.

Ghere, C. L., R. S. Hardy, S. M. Wilson, and M. C. Quist. 2024. Evaluation of techniques for estimating the age and growth of known-age white sturgeon. North American Journal of Fisheries Management 44(4):880–889. https://doi.org/10.1002/nafm.11021

Examines reader accuracy in age estimates, evaluates back-calculation methods, and assesses differences between growth estimates from lateral and posterior measurement transects on white sturgeon fin rays.

Hess, S. S. 1984. Age and growth of white sturgeon in the lower Columbia River, 1980-83. Oregon Department of Fish and Wildlife. https://docs.cbfwl.org/Oregon/DFW/AgeGrowthWhiteSturgeon-1980-83.pdf

Estimates growth rate of the lower Columbia River white sturgeon population using fin ray analysis.

Jay, K. J., J. A. Crossman, and K. T. Scribner. 2020. Temperature affects transition timing and phenotype between key developmental stages in white sturgeon *Acipenser transmontanus* yolk-sac larvae. Environmental Biology of Fishes 103:1149–1162. https://doi.org/10.1007/s10641-020-01007-1

Describes experiments conducted to quantify temperature-induced developmental responses of white sturgeon yolk-sac larvae reared at temperatures encountered across the species' range.

Kynard, B., E. Parker, and B. Kynard. 2010. Ontogenetic behavior of Kootenai River White Sturgeon, *Acipenser transmontanus*, with a note on body color: A laboratory study. Environmental Biology of Fishes 88:65–77. https://doi.org/10.1007/s10641-010-9618-9

Investigates the ontogenetic behavior and body color of wild Kootenai River white sturgeon.

Maskill, P. A. 2020. Description of the reproductive structure, size, growth, and condition of hatchery-origin white sturgeon in the lower Columbia River, British Columbia, Canada. Master's Thesis. Montana State University, Bozeman. https://scholarworks.montana.edu/server/api/core/bitstreams/5f09e02d-7f99-405e-bf89-63751ad48927/content

Assesses the maturity of hatchery-origin white sturgeon in the lower British Columbia portion of the Columbia River and their contributions to spawning and condition factors.

McLean, M. F., M. K. Litvak, S. J. Cooke, K. C. Hanson, D. A. Patterson, S. G. Hinch, and G. T. Crossin. 2019. Immediate physiological and behavioural response from catch-and-release of wild white sturgeon (*Acipenser transmontanus* Richardson, 1836). Fisheries Research 214:65–75. https://doi.org/10.1016/j.fishres.2019.02.002

Assesses the effects of catch-and-release angling on wild white sturgeon stress physiology and immediate post-release behavior.

Paragamian, V. L., and R. C. P. Beamesderfer. 2003. Growth estimates from tagged white sturgeon suggest that ages from fin rays underestimate true age in the Kootenai River, USA and Canada. Transactions of the American Fisheries Society 132(5):895-903. https://doi.org/10.1577/T02-120

Utilizes tagging data for 760 recaptured Kootenai River white that had been at large for as long as 23 years to examine the validity of ages assigned from pectoral fin rays.

Mojazi Amiri, B., D. W. Baker, J. D. Morgan, and C. J. Brauner. 2009. Size dependent early salinity tolerance in two sizes of juvenile white sturgeon, *Acipenser transmontanus*. Aquaculture 286(1–2):121–126. https://doi.org/10.1016/j.aquaculture.2008.08.037

Investigates the influence of size on salinity tolerance in 1 year old juvenile white sturgeon.

Rien, T. A., and R. C. Beamesderfer. 1994. Accuracy and precision of white sturgeon age estimates from pectoral fin rays. Transactions of the American Fisheries Society 123(2):255-265. https://doi.org/10.1577/1548-8659(1994)123<0255:AAPOWS>2.3.CO;2

Uses readings and recaptures of marked fish to estimate precision and accuracy of age estimates from cross sections of pectoral fin rays of white sturgeons collected in impoundments of the Columbia River.

van Poorten, B. T., and S. O. McAdam. 2010. Estimating differences in growth and metabolism in two spatially segregated groups of Columbia River white sturgeon using a field-based bioenergetics model. The Open Fish Science Journal 3: 132-141. http://dx.doi.org/10.2174/1874401X01003010132

Applies a bioenergetics modelling approach that estimates basic parameters from field data, specifically length-increment and length-at-age data for white sturgeon to assess growth and metabolism.

Webb, M. A. H., G. W. Feist, E. P. Foster, C. B. Schreck, and M. S. Fitzpatrick. 2002. Potential classification of sex and stage of gonadal maturity of wild white sturgeon using blood plasma indicators. Transactions of the American Fisheries Society 131(1):132-142. https://doi.org/10.1577/1548-8659(2002)131<0132:PCOSAS>2.0.CO;2

Develops a method of determining sex and stage of maturity of white sturgeon from the Columbia River using the blood plasma indicators testosterone, 11-ketotestosterone, estradiol, and calcium.

Other

Beamesderfer, R. C., T. A. Rien, and A. A. Nigro. 1995. Differences in the dynamics and potential production of impounded and unimpounded white sturgeon populations in the lower Columbia River. Transactions of the American Fisheries Society 124(6): 857-872. https://doi.org/10.1577/1548-8659(1995)124%3C0857:DITDAP%3E2.3.CO;2

Describes population dynamics, the ability of lower Columbia River white sturgeon stocks to sustain harvest, and differences among reservoir and unimpounded populations.

Becker, C. D. 1970. Marine trematode *Tubulovesicula lindbergi* (Digenea: Hemiuridae) from resident white sturgeon in the Columbia River. Journal of the Fisheries Research Board of Canada 27(7):1313-1316. https://doi.org/10.1139/f70-152

Explores the potential origins of *Tubulovesicula lindbergi* infection in white sturgeon in the mid-Columbia River.

Bellgraph, B. J., W. A. Perkins, M. C. Richmond, J. A. Serkowski, S. F. Harding, and R. A. Harnish. 2016. Lake Roosevelt white sturgeon modeling support. Pacific Northwest National Laboratory-26056. Richland, Washington. https://doi.org/10.2172/1494303

Describes the construction, validation, and calibration of a hydrodynamic and water temperature model, and individual-based sturgeon model, for the Transboundary Reach of the Columbia River and Lake Roosevelt.

Brown, R. S., K. V. Cook, B. D. Pflugrath, L. L. Rozeboom, R. C. Johnson, J. G. McLellan, T. J. Linley, Y. Gao, L. J. Baumgartner, F. E. Dowell, E. A. Miller, and T. A. White. 2013. Vulnerability of larval and juvenile white sturgeon to barotrauma: can they handle the pressure? Conservation Physiology 1(1):cot019. https://doi.org/10.1093/conphys/cot019

Describes techniques to determine which life stages of fish are vulnerable to barotrauma from expansion of internal gases during decompression.

Cohen, A. Sturgeon poaching and black market caviar: a case study. 1997. Environmental Biology of Fishes 48:423–426. https://doi.org/10.1023/A:1007388803332

Documents a United States Federal prosecution of members of a poaching ring that sold caviar derived from illegally taken Columbia River white sturgeon.

Counihan, T. D., and C. N. Frost. 1999. Influence of externally attached transmitters on the swimming performance of juvenile white sturgeon. Transactions of the American Fisheries Society 128(5):965-970. https://doi.org/10.1577/1548-8659(1999)128<0965:IOEATO>2.0.CO;2

Measures the critical swimming speed of juvenile white sturgeon equipped with externally attached dummy ultrasonic transmitters versus untagged control fish.

Counihan, T. D., A. I. Miller, M. G. Mesa, M. J. Parsley. 1997. The effects of dissolved gas supersaturation on white sturgeon larvae. Transactions of the American Fisheries Society 127: 316-322. https://doi.org/10.1577/1548-8659(1998)127%3C0316:TEODGS%3E2.0.CO;2

Assesses the effects of dissolved gas supersaturation on white sturgeon larvae.

Crossman, J. A., K. J. Jay, and L. R. Hildebrand. 2016. Describing the diet of juvenile white sturgeon in the upper Columbia River Canada with lethal and nonlethal methods. North American Journal of Fisheries Management 36(2):421–432. https://doi.org/10.1080/02755947.2015.1125976

Describes the overall composition and prey selectivity in the diet of hatchery-reared juvenile white sturgeon in the upper Columbia River, Canada.

DeVore, J. D., B. W. James, C. A. Tracy, and D. A. Hale. 1995. Dynamics and potential production of white sturgeon in the unimpounded Lower Columbia River. Transactions of the American Fisheries Society 124(6): 845-856. https://doi.org/10.1577/1548-8659(1995)124%3C0845:DAPPOW%3E2.3.CO;2

Assesses the production potential of the population based on access to marine areas, abundant food resources, and consistently favorable hydrologic conditions during the spawning period.

Elliott, J. C., and R. C. Beamesderfer. 1990. Comparison of efficiency and selectivity of three gears used to sample white sturgeon in a Columbia River reservoir. California Fish and Game 76(3):174-180.

Compares the efficiency and size selectivity of setlines, gillnets, and angling to select a cost-effective means of capturing a large number of adult and subadult white sturgeon.

Gadomski, D. M. and M. J. Parsley. 2005. Effects of turbidity, light level, and cover on predation of white sturgeon larvae by prickly sculpins. Transactions of the American Fisheries Society 134(2):369-374. https://doi.org/10.1577/T03-213.1

Examines how three factors—lower turbidity levels, higher light levels, and altered substrates—might affect predation by prickly sculpin on white sturgeon larvae.

Gadomski, D. M., and M. J. Parsley. 2005. Laboratory studies on the vulnerability of young white sturgeon to predation. North American Journal of Fisheries Management 25(2):667–674. https://doi.org/10.1577/M03-220.1

Examines if young white sturgeon are preyed upon by fishes that they would likely encounter in the natural environment and if vulnerability changes with growth.

Gadomski, D., and M. J. Parsley. 2005. Vulnerability of young white sturgeon, *Acipenser transmontanus*, to predation in the presence of alternative prey. Environmental Biology of Fishes 74:389–396. https://doi.org/10.1007/s10641-005-3038-2

Test the vulnerability of young white sturgeon to predation when alternative prey is available.

Halvorson L. J., B. J. Cady, K. M. Kappenman, B. W. James, and M. A. H. Webb. 2018. Observations of handling trauma of Columbia River adult white sturgeon, *Acipenser transmontanus* Richardson, 1836, to assess spawning sanctuary success. Journal of Applied Ichthyology 34:390–397. https://doi.org/10.1111/jai.13557

Examines 679 oversize white sturgeon for evidence of in-season angling damage.

Jager, H. I., J. A. Chandler, K. B. Lepla, and W. Van Winkle. 2001. A theoretical study of river fragmentation by dams and its effects on white sturgeon populations. Environmental Biology of Fishes 60(4):347–361. https://doi.org/10.1023/A:1011036127663

Uses an individual-based genetic metapopulation model to study the effects of fragmentation on the population viability and genetic diversity of white sturgeon.

Jager, H. I., K. Lepla, J. Chandler, P. Bates, and W. Van Winkle. 2000. Population viability analysis of white sturgeon and other riverine fishes. Environmental Science & Policy 3(Supp. 1):483-489. https://doi.org/10.1016/S1462-9011(00)00063-0

Describes an approach to population viability analysis of riverine fishes in general and Snake River white sturgeon in particular.

Jager, H. I., K. B. Lepla, W. Van Winkle, B. W. James, and S. O. McAdam. 2010. The elusive minimum viable population size for white sturgeon. Transactions of the American Fisheries Society 139(5):1551-1565. https://doi.org/10.1577/T09-069.1

Identifies extinction thresholds related to small size and inadequate habitat for white sturgeon.

Kovac, A., N. K. Pleizier, and C. J. Brauner. 2022. The effect of total dissolved gas supersaturation on gas bubble trauma in juvenile rainbow trout (*Oncorhynchus mykiss*), juvenile kokanee (*Oncorhynchus nerka*), and two age classes of white sturgeon (*Acipenser transmontanus*). Canadian Journal of Fisheries and Aquatic Sciences 79(2):249–256. https://doi.org/10.1139/cjfas-2020-0448

Assesses the vulnerability of juvenile rainbow trout (<1 year old), juvenile kokanee (<1 year old), and two ages of white sturgeon (<1 year old and 3+ years old) to gas bubble trauma.

Lamansky, J. A., Jr., K. A. Meyer, B. J. Bowersox, J. M. DuPont, B. Bentz, and K. B. Lepla. 2018. Incidence, types, and shedding and ingestion times of metallic fishing tackle in the digestive systems of white sturgeon. North American Journal of Fisheries Management 38(5):1152-1159. https://doi.org/10.1002/nafm.10220

Characterize the incidence, quantity, and type of hooks and other metal fishing tackle ingested by white sturgeon in the Hells Canyon reach of the Snake River.

LaPatra, S. E., J. M. Groff, G. R. Jones, B. Munn, T. L. Patterson, R. A. Holt, A. K. Hauck, and R. P. Hedrick. 1994. Occurrence of white sturgeon iridovirus infections among cultured white sturgeon in the Pacific Northwest. Aquaculture 126(3-4):201-210. https://doi.org/10.1016/0044-8486(94)90036-1

Investigates the occurrence of iridovirus infections in white sturgeon from the Snake, Columbia, and Kootenai Rivers and methods to avoid transmission.

LaPatra, S. E., S. C. Ireland, J. M. Groff, K. M. Clemens, and J. T. Siple. 1999. Adaptive disease management strategies for the endangered population of Kootenai River white sturgeon. Fisheries 24(5): 6-13. https://doi.org/10.1577/1548-8446(1999)024<0006:ADMSFT>2.0.CO;2

Describes the importance of conservation aquaculture programs in certain fishery situations and how management strategies must remain flexible and must adapt to current available scientific information to provide maximum benefits.

LaPatra, S. E., and S. Mead. 2013. Assessment of the risk of white sturgeon to become infected and potential carriers of infectious pancreatic necrosis virus. Journal of Aquatic Animal Health 25(4):260-264. https://doi.org/10.1080/08997659.2013.824929

Assess whether White Sturgeon can become infected and potential carriers of infectious pancreatic necrosis virus.

Malm, G. W. 1979. White sturgeon (*Acipenser transmontanus*) population characteristics in the Bonneville Reservoir of the Columbia River: (1976-1978). U.S. Fish and Wildlife Service, Vancouver, Washington. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=30782

Reports on Bonneville Reservoir white sturgeon population characteristics to initiate the development of a management database for the resource.

McCabe Jr., G. T. 1993. Communications: Prevalence of the parasite *Cystoopsis acipenseri* (Nematoda) in juvenile white sturgeons in the lower Columbia River. Journal of Aquatic Animal Health 5(4):313-316. https://doi.org/10.1577/1548-8667(1993)005<0313:CPOTPC>2.3.CO;2

Determines the prevalence of the nematode parasite *Cystoopsis acipenseri* in juvenile white sturgeon in the lower Columbia River.

McCabe Jr., G. T., R. L. Emmett, and S. A. Hinton. 1993. Feeding ecology of juvenile white sturgeon (*Acipenser Transmontanus*) in the lower Columbia River. Northwest Science 67(3):170-180. https://hdl.handle.net/2376/1588

Studies the feeding ecology of juvenile white sturgeon in two areas of the lower Columbia River.

McCabe Jr., G. T., and C. A. Tracy. 1994. Spawning and early life history of white sturgeon, *Acipenser transmontanus*, in the lower Columbia River. Fishery Bulletin 92(4):760-772. https://spo.nmfs.noaa.gov/content/spawning-and-early-life-history-white-sturgeon-acipenser-transmontanus-lower-columbia-river

Studies the spawning and early life history of white sturgeon in the lower Columbia River downstream from Bonneville Dam from 1988 through 1991.

Miller, A. I. and L. G. Beckman. 1996. First record of predation on white sturgeon eggs by sympatric fishes. Transactions of the American Fisheries Society 125(2):338-340. https://doi.org/10.1577/1548-8659(1996)125<0338:FROPOW>2.3.CO;2

Reports on the occurrence of white sturgeon eggs in guts of four species of fish from the Columbia River.

Muir, W. D., G. T. McCabe Jr., M. J. Parsley, and S. A. Hinton. 2000. Diet of first-feeding larval and young-of-the-year white sturgeon in the lower Columbia River. Northwest Science 74(1):25-33.

Examines the diet composition of 352 larval and young-of-the year white sturgeon collected from 1989 through 1991 in the lower Columbia River.

Nelson, R. J. and D. S. O. McAdam. 2012. Historical population structure of white sturgeon in the Upper Columbia River detected with combined analysis of capture, telemetry and genetics. Journal of Applied Ichthyology 28:161-167. https://doi.org/10.1111/j.1439-0426.2011.01930.x

Describes a combined analysis of capture/recapture, sonic tracking, and genetics to examine population structure of white sturgeon of the Kootenay and upper Columbia rivers.

Ostrand, K. G., W. G. Simpson, C. D. Suski, and A. J. Bryson. 2009. Behavioral and physiological response of white sturgeon to an electrical sea lion barrier system. Marine and Coastal Fisheries 1(1):363–377. https://doi.org/10.1577/C09-039.1

Studies the potential effects of an electrical sea lion barrier on the survival, behavior, physiology, and injury of white sturgeon.

Parsley, M. J., and E. Kofoot. 2013. Capture of white sturgeon larvae downstream of The Dalles Dam, Columbia River, Oregon and Washington, 2012. USGS Open-File Report 2013-1110. https://doi.org/10.3133/ofr20131110

Reconnaissance study to determine where to deploy nets to capture white sturgeon larvae downstream of a known white sturgeon spawning area.

Parsley, M. J., N. D. Popoff, and J. G. Romine. 2011. Short-term response of subadult white sturgeon to hopper dredge disposal operations. North American Journal of Fisheries Management 31(1):1–11. https://doi.org/10.1080/02755947.2010.549033

Examines the effect of dredged-material disposal operations on the behavior of seven white sturgeon.

Reihart, R. W. 2016. Invertebrate drift in the upper Columbia River with implications for young-of-the-year white sturgeon. Master's Thesis. Eastern Washington University, Cheney. https://dc.ewu.edu/theses/403

Assesses the feeding ecology of juvenile white sturgeon based on benthic macroinvertebrate diversity.

Rieman, B. E., and R. Beamesderfer. 1990. White Sturgeon in the lower Columbia River: Is the stock overexploited? North American Journal of Fisheries Management 10: 388-396. https://doi.org/10.1577/1548-8675(1990)010%3C0388:WSITLC%3E2.3.CO;2

Uses computer simulation to examine potential yields and sustainable exploitation rates for white sturgeon in the Lower Columbia River.

Rien, T. A., R. C. P. Beamesderfer, and C. A. Foster. 1994. Retention, recognition, and effects on survival of several tags and marks for white sturgeon. California Fish and Game 80(4):161-170.

Evaluates retention and effects on survival of tags and marks applied to 7,332 white sturgeon in the Columbia River between 1987 and 1991.

Sihota, S. 2010. Swimming against the current: valuation of white sturgeon in renewal of the Columbia River Treaty. Master's Thesis. Simon Fraser University, Burnaby, British Columbia. https://summit.sfu.ca/item/15370

Uses the white sturgeon as an example of how undervalued ecosystem goods and services can be integrated into the Columbia River Treaty.

Snyder, E. B., and G. W. Minshall. An energy budget for the Kootenai River, Idaho (USA), with application for management of the Kootenai white sturgeon, *Acipenser transmontanus*. Aquatic Sciences 67:472-485. https://doi.org/10.1007/s00027-005-0791-4

Examines the potential for autotrophic productivity and organic material to support higher trophic levels in three distinct geomorphic segments of the Kootenai River.

Sprague, C. R. 1992. Reproduction and early life history of white sturgeon in the Columbia River between Bonneville and McNary dams. Northwest Science 66(2):139.

Identifies spawning and rearing locations and spawn timing for white sturgeon in the lower three pools of the Columbia River.

Tracy, C. A. 1987. Correlations between total and fork length, and length and weight for white sturgeon below Bonneville Dam. Columbia River Laboratory Progress Report 87-19, Battle Ground, Washington. https://catalog.cbfwl.org/cgi-bin/koha/opac-detail.pl?biblionumber=34364

Identifies lower Columbia River white sturgeon basic biological characteristics and the relationships between them for the purpose of establishing a database that can be compared with those from other areas.

Wesner, A. 2025. Making sturgeon count: settler colonial (de)mobilizations of fish in the Columbia River. Osiris 40:109-142. https://doi.org/10.1086/735520

Examines how practices of counting and constructing the value of fish shape are shaped by sturgeon in motion.