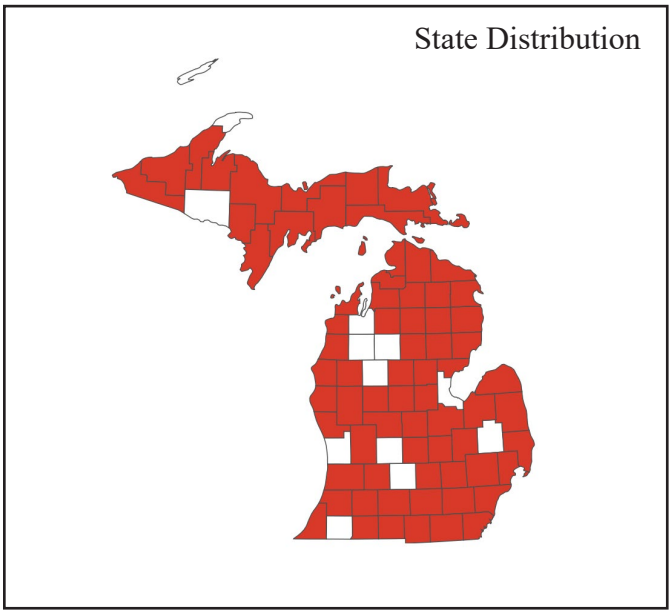
# *Necturus maculosus* Rafinesque — Mudpuppy




Best Survey Period


**Status:** State special concern

**Global and State Rank:** G5 (Globally Secure) / S3S4 (Vulnerable to Apparently Secure)

**Family:** Proteidae (Olms, waterdogs, mudpuppies)

**Total Range:** The mudpuppy's range occurs in eastern North America, extending from southeastern Manitoba, eastern North Dakota, northeastern South Dakota, southern Minnesota, eastern Iowa, eastern Kansas, and Tennessee east to southern Quebec, Vermont, Connecticut, New York, and western Pennsylvania, West Virginia, Virginia, and North Carolina and south to northern Georgia, Alabama, and Mississippi (Petranka 1998, Frost 2021, NatureServe 2025). The species is considered critically imperiled (S1), imperiled (S2), or vulnerable (S3) in most states across its range in the U.S. and in Manitoba, Canada (NatureServe 2025). Its status is currently apparently secure (S4) or secure (S5) in only eight states/provinces (i.e., Kentucky, Mississippi, Missouri, North Dakota, Ohio, Tennessee, Ontario, and Quebec) in the U.S. and Canada (NatureServe 2025). Mudpuppies also have been documented in Rhode Island, Massachusetts, New Hampshire, and Maine but are considered an exotic species in these states (NatureServe 2025).

**State Distribution:** In Michigan, mudpuppies occur throughout the state and have been documented in almost every county (MNFI 2025). They can be locally abundant but have reportedly declined in some places where they were once common based on recent surveys (Harding and Mifsud 2017, Stapleton et al. 2018). Mass die-off events of this species have been documented in portions of the Detroit River, Lake St. Clair, and Lake Erie (King et al. 1997, Harding and Mifsud 2017, Stapleton et al. 2018). As a result of declines and ongoing threats to the species, the mudpuppy has been designated a species of special concern in Michigan (MNFI 2025). Systematic and targeted surveys and monitoring for this species have been limited in the state. More data are needed to fully assess and determine the status, trends, and distribution of mudpuppy populations in Michigan.

**Recognition:** The mudpuppy is the largest aquatic salamander in Michigan, with adult lengths of 20.3 to 48.2 cm (8-19 in) and most individuals reaching an average total length of around 30 cm (11.8 in) (Bishop 1941, Petranka 1998, AmphibiaWeb 2001, Harding and Mifsud 2017, AmphibiaWeb 2025). It has a **broad, flat head** with a **short snout**, small eyes, **a dark stripe through the eyes to the gills** (and sometimes extends down the side of the body), two gill slits, and **large, bushy, red-**

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**or maroon-colored external gills behind the head** (Petranka 1998, AmphibiaWeb 2001, Harding and Mifsud 2017, AmphibiaWeb 2025). The body and tail are generally **rusty brown to gray or black with scattered bluish-black spots or blotches** (sometimes merging to form stripes) (Petranka 1998, AmphibiaWeb 2001, Siebert 2008, AmphibiaWeb 2025). The **underside is usually white, pale gray, yellow or brown**, sometimes with dark bluish black spots (Petranka 1998, AmphibiaWeb 2001, Siebert 2008, AmphibiaWeb 2025). The **tail is vertically flattened or compressed**, and there are **four toes on the front and hind feet** (Petranka 1998, AmphibiaWeb 2001, Siebert 2008, AmphibiaWeb 2025). Adult males and females look similar except that males have swollen cloacae during the breeding season and two prominent backward-pointing protrusions (papillae) behind the vent whereas the female's cloaca is slit-like and usually light-colored (Petranka 1998, AmphibiaWeb 2001, Siebert 2008, AmphibiaWeb 2025). Mudpuppies have slimy skins and no scales.

Hatchlings measure 21-25 mm (0.8–1 in) in total length and have a dark band that extends down the midline of the back and is bordered by a light yellow stripe on both sides and a broad dark band below the yellow stripes along the sides of the body (Bishop 1926, Bishop 1941, Shoop 1965, Petranka 1998, AmphibiaWeb 2001, AmphibiaWeb 2025). Juveniles have the same body color pattern as hatchlings but are even more striking with yellow and black stripes along the body (Petranka 1998). The juvenile color pattern becomes more like that of adults beginning at 13-15 cm (5-6 in) total length (Bishop 1941, Petranka 1998, AmphibiaWeb 2001, AmphibiaWeb 2025).




**Best Survey Time:** Surveys can be conducted during any time of year since mudpuppies are active year-round. However, the effectiveness of different survey methods varies depending on the time of year and type of habitat. Trapping using modified steel minnow traps has been one of the most common and effective survey methods for mudpuppies, particularly in deep and turbid water, in late fall through early spring (i.e., November-late March/early April) when water temperatures are cooler (e.g., below 5°C or 18°C [41°F or 64°F] depending on the study) (McDaniel et al. 2009, Chellman and Parrish 2010, Graeter et al. 2013, Craig et al. 2015, Murphy et al. 2016). Modified "Briggler traps" which are box traps constructed of aluminum and plastic mesh that have been used for hellbender surveys also have been found to be effective (Briggler et al. 2013). Large number of trap nights are recommended as capture rates tend to be low (Murphy et al. 2016). Manual surveys, which consist of wading or floating upstream while overturning large flat rocks under which mudpuppies may be hiding, are effective in clear, shallow water conditions and in late summer and early fall (August-October) during warmer water temperatures (Nickerson et al. 2002, Murphy et al. 2016). Seining works best in debris-laden (e.g., leaf litter) streams and rivers that are absent of large flat rocks during March-July (Matson 1990, Murphy et al. 2016). This survey method consists of dragging a seine net through a river or stream with at least one person disturbing debris, rock piles and other cover ahead of the seine in order to dislodge mudpuppies from their habitats on the bottom of the streams (Craig Murphy et al. 2016). Electroshocking works well in areas with few rocks and high conductivity and has been found to be effective at different times of the year; but there are several potential drawbacks to these surveys, including reduced effectiveness and potential risks to larval mudpuppies (Shoop and Gunning 1967, Matson 1990, Nickerson and Krysko 2003, Schmidt et al. 2004, VanDeValk and Coleman 2010, Murphy et al. 2016). Other less common survey methods, typically used to sample for fish, include fish trapnets, set lines, fyke nets, cement anchors, and eggmats (Shoop and Gunning 1967, Bonin et al. 1995, VanDeValk and Coleman 2010, Craig et al. 2015, Murphy et al. 2016). Trapping with minnow traps and set lines tend to capture large adults and/or larger juveniles, while manual surveys and seining seem to be more effective at capturing smaller individuals and juvenile and larval mudpuppies (Craig et al. 2015, Murphy et al. 2016).

**Habitat:** Mudpuppies are completely aquatic and live in permanent waters including rivers, perennial streams,

ponds, inland lakes, Great Lakes bays and shallows, reservoirs, canals, and ditches (Harding and Mifsud 2017). They prefer medium to large rivers and lakes, and aquatic habitats with abundant refuges or cover, such as riprap, talus, boulder/rock piles, rocks (especially flat rock slabs), large submerged logs or woody debris, dense mats of submergent vegetation, eroded or undercut banks, and tree roots (Harding and Mifsud 2017, AmphibiaWeb 2025). They inhabit clear and silty waters and areas with or without aquatic vegetation (AmphibiaWeb 2025). Mudpuppies typically move to shallower water in the spring and move to deeper water in the summer and winter (e.g., as deep as 17 m [56 ft] in Lake Erie and 30 m [100 ft] in Lake Michigan) (Reigle 1967, Pfingsten and White 1989, Beattie 2016). Juvenile mudpuppies may use separate habitats from adults, frequently occurring in densely vegetated shallow water areas along the edges of lakes and streams (Harding and Mifsud 2017), in the substrates of pools with at least several centimeters of silt and organic debris (Matson 1990, Petranka 1998), and in riffle areas in streams (Pfingsten and White 1989, Petranka 1998).

**Biology:** Mudpuppies are active year-round (Bishop 1941, Shoop and Gunning 1967). They can be seen swimming under ice during the winter months (Morse 1904, Petranka 1998). Although mudpuppies can be active during the day and night, they are rarely seen during the day typically remaining under rocks or other cover objects and emerge at night to forage (Cagle 1954, Harris 1959, Petranka 1998, Harding and Mifsud 2017, AmphibiaWeb 2025). They may be more active during the day in heavily vegetated, muddy, or silty waters (Bishop 1926, Bishop 1941, Petranka 1998). Mudpuppies primarily walk or crawl on the bottom of rivers and lakes in search of food but can also swim through the water column (Petranka 1998, Harding and Mifsud 2017).

Mudpuppies are important components of the food chain in the aquatic ecosystems in which they occur. They feed on a variety of aquatic organisms ranging from zooplankton (e.g., *Daphnia*), insect larvae (e.g., mayfly, caddisfly, chironomid midge, odonate, and beetle larvae), worms, crustaceans ( e.g, crayfish), mollusks (e.g. snails), small fish (e.g., sculpins), amphibians (including smaller mudpuppies), fish and amphibian eggs, and carrion (Hamilton 1932, Bishop 1941, Lagler and Goellner 1941, Harris 1959, Cochran and Lyons 1985, Petranka 1998, Harding and Mifsud 2017). They have also been found to feed on the invasive round goby (*Neogobius melanostomus*) and may help control these populations (Harding and Mifsud 2017). Natural predators for mudpuppies include crayfish, predatory fishes, turtles, water snakes, herons, otters, and fishers (Bishop 1926, Bishop 1941, Collins 1993, Petranka 1998, AmphibiaWeb 2025). Mudpuppies have few defenses against predators but do possess sensory organs in their skin that help them detect prey and avoid predation (Duellman and Trueb 1986).

Mating in Michigan and other northern populations primarily occurs in the fall (late September through November) but occasional mating also can occur through the winter and early spring (through April) (Bishop 1926, Bishop 1941, Petranka 1998, Harding and Mifsud 2017). Male and female mudpuppies congregate in small groups in shallow water in the fall when the males who are usually solitary join the females in depressions beneath submerged logs and rocks (Petranka 1998, Harding and Mifsud 2017). During courtship, the male swims around the female and eventually deposits spermatophores (small, gelatinous, sperm-capped capsules) that are about 10-12 mm (0.4-0.5 in) high and 6-8 mm (0.2-0.3 in) in diameter nearby the female (Petranka 1998, Harding and Mifsud 2017). The female picks up a spermatophore with her vent and stores the sperm in her cloaca until spring (Harding and Mifsud 2017).

The females usually lay eggs in late May or June but can lay them as early as late April during warm springs (Bishop 1926, Bishop 1941, Fitch 1959, Petranka 1998, Harding and Mifsud 2017). Egg laying is synchronized within local populations and typically occurs within one week or less (Bishop 1941, Fitch 1959, Petranka 1998). Clutch sizes range from 18 to over 140 eggs, with average clutch sizes between 60-120 eggs (Smith 1911, Bishop 1941, Lagler and Goellner 1941, Fitch 1959, Shoop 1965, Matson 1998, Petranka 1998, Harding and Mifsud 2017). Prior to egg laying, the females construct nest sites by excavating depressions beneath rocks, logs, or other flat cover objects in water ranging from about 10 cm to 3 m (4 in to 10 ft) deep (Smith 1911, Bishop 1941, Harding and Mifsud 1997, Petranka 1998). The females deposit their eggs by turning upside down and attaching and suspending each egg from the roof of the nest cavity or depression by a short, gelatinous stalk (Petranka 1998, Harding and Mifsud 2017). The females remain with the eggs through hatching to protect them from predators (Bishop 1941). Hatching typically occurs in July and August (1-2 months after egg laying) but can occur earlier with warmer water temperatures (Smith 1911, Bishop 1941, Petranka 1998, Harding and Mifsud 2017). Most hatchlings remain in the nest cavity for at

least 6-8 weeks until the yolk sac has been absorbed and leave the nest cavity by the end of August (AmphibiaWeb 2025).

Mudpuppies can be fairly long-lived for salamanders. They may live 20-30 years or more (Bonin et al. 1995, Gendron 1999, Harding and Mifsud 2017, AmphibiaWeb 2025). They have been reported to reach sexual maturity between 5-8 years and about 175-200 mm (7-8 inches) total length (Bishop 1941, Pope 1947, AmphibiaWeb 2025).

The mudpuppy has a unique, symbiotic relationship with the salamander mussel (*Simpsonaias ambigua*), a federally and state endangered freshwater mussel species. The mudpuppy is the only known host for the larvae of the salamander mussel (USFWS 2023). The mussels' larvae (i.e., glochidia) attach and develop on the gills of mudpuppies. Mudpuppies have to be present when the salamander mussels release the glochidia or larvae in late summer (USFWS 2023). The larvae develop on the gills of mudpuppies for about 3-4 weeks until they transform into juveniles, at which point they detach from the mudpuppy and fall to the stream substrate (USFWS 2023).

**Conservation/Management:** Mudpuppy populations have declined due to a number of threats. Since mudpuppies primarily respire through their skin and exposed gills, they are vulnerable to pollutants and changes in water quality (Harding and Mifsud 2017). Chemical water pollutants, nutrient inputs (e.g., nitrates), and heavy siltation from agricultural, forestry, industrial, and/or residential sources or practices have reduced water quality in many areas (COSEWIC 2023, AmphibiaWeb 2025). Mudpuppies also are sensitive to the chemicals in lampricides used to control populations of sea lamprey (*Petromyzon marinus*), an aquatic invasive species that has significantly impacted fish populations and fisheries in the Great Lakes and some eastern states (Matson 1998, Petranka 1998, Harding and Mifsud 2017, COSEWIC 2023). Mudpuppy mortalities have been reported following lampricide (TFM) applications and have had significant adverse impacts on populations in some cases (COSEWIC 2023). Dams, dredging, improperly sized or poorly installed culverts, and road crossings can alter hydrology, fragment habitat, reduce habitat quality and connectivity, and hinder the movement of mudpuppies within and between populations (Schalk and Luhring 2010, COSEWIC 2023). Invasive species such as the zebra mussel (*Dreissena polymorpha*), quagga mussel (*Dreissena bugensis*), and Eurasian watermilfoil (*Myriophyllum spicatum*) can potentially impact mudpuppies by altering the habitat and food availability (Holman 2012, COSEWIC 2023). Mass die-offs of mudpuppies have been reported in Lake Erie and other locations and have been attributed to algal blooms and botulism outbreaks (Harding and Mifsud 2017, COSEWIC 2023). Large storms with strong winds and waves can wash mudpuppies onto shore where they can desiccate and die (Harding and Mifsud 2017, COSEWIC 2023). This species has been commercially harvested and targeted for collection for the biological supply trade, pet trade, Asian food market, and fishing bait (Pfingsten and White 1989, Bonin 1991, Gendron 1999, Holman 2012, COSEWIC 2023). Mudpuppies also have been persecuted by humans due to misunderstanding and fear due to their strange appearance and misperceptions that they are venomous or harmful to fish populations (Gendron 1999, Harding and Mifsud 2017, COSEWIC 2023). Mudpuppies also are caught incidentally by ice fishers and anglers who often throw the mudpuppies aside or leave them on the ice to die instead of removing the hook and returning them to the water because of fear or reluctance to handle them (Gendron 1999, Harding and Mifsud 2017, COSEWIC 2023).

Conservation of the mudpuppy in Michigan will require maintaining and protecting extant populations, particularly those with larger population sizes and successful recruitment, and suitable habitat for this species. Captive rearing and introducing young mudpuppies may be needed to augment some populations. Improving water quality and reducing chemical contamination and siltation from agricultural, industrial and residential practices in occupied habitats would improve health and survival of mudpuppies since they are highly vulnerable to pollutants and decreased water quality. Limiting the use of lampricide for controlling sea lampreys and limiting algal blooms and botulism outbreaks in occupied sites would reduce mass mortality of mudpuppies. Maintaining or restoring the hydrology of occupied sites and removing obsolete barriers and safe passage within and between habitats or sites occupied by mudpuppies will help improve population connectivity and overall species viability. Controlling invasive species, such as zebra mussels and Eurasian watermilfoil, would help mitigate changes to aquatic communities caused by these species and benefit mudpuppy populations. When performing in-stream activities that may negatively impact mudpuppy populations, conducting surveys to determine if mudpuppies occur in or near the project area and, if so, implementing measures to reduce or mitigate any potential adverse impacts would help maintain

and protect existing populations. Mass collection and overharvesting of mudpuppies should be discontinued. Education and outreach are needed to raise awareness and reduce misunderstanding and persecution by ice fishers, anglers, and other stakeholders. It is critical to protect the mudpuppy because it is the only host of the federally and state endangered salamander mussel and is vital to conservation and recovery of this mussel.

**Research Needs:** Targeted surveys and monitoring are needed to assess and determine the mudpuppy's current status and distribution in the state. In particular, surveys and research are needed to identify large and potentially stable or viable populations in the state and obtain information on their status, viability, and site-specific ecology and threats to inform and implement effective conservation measures within these populations. Information on the status and distribution of mudpuppy populations across the state and on specific populations, particularly those that may be large and potentially stable/viable, would help prioritize populations, threats, and management actions needed to ensure the species' continued persistence in Michigan in the short and long term. Research also is needed to assess and better understand the impacts of certain threats or management practices on mudpuppy populations (e.g., impact of lampricide applications, invasive species, disease, human persecution) to determine and implement effective strategies for reducing or mitigating adverse impacts of these threats on mudpuppies.

**Related Abstracts:** Salamander mussel, slippershell, elktoe, northern riffleshell, snuffbox, round pigtoe, ellipse, lake sturgeon, lake herring/cisco, spotted gar, pugnose shiner, channel darter, river darter, common loon, bald eagle, Blanding's turtle, wood turtle, coastal fen, floodplain forest, granite bedrock lakeshore, Great Lakes marsh, limestone bedrock lakeshore, volcanic bedrock lakeshore

**Selected References**


AmphibiaWeb. 2001 Necturus maculosus: Mudpuppy <https://amphibiaweb.org/species/4226> University of California, Berkeley, CA, USA. Accessed April 8, 2025.

AmphibiaWeb. 2025. <https://amphibiaweb.org> University of California, Berkeley, CA, USA. Accessed April 8, 2025.

Beattie, A.M. 2016. Seasonality, Demographics, and Feeding Ecology of Mudpuppies (Necturus maculosus) in an Urban Lake. M.S. Thesis, Southern Illinois University, Carbondale, IL. 69 pp.

Bishop, S.C. 1926. Notes on the habits and development of the mudpuppy, Necturus maculosus (Rafinesque). New York State Museum Bulletin 268:5-60.

Bishop, S.C. 1941. Salamanders of New York. New York State Museum Bulletin 324:1-365.

Bonin, J. 1991. Survey of the mudpuppy (Necturus maculosus) incidental catches by fishermen of southern Ontario; Lakes St. Clair, Erie, Ontario and the St. Lawrence River 1991 (with a view to collecting Mudpuppies for a wetland contamination study). Canadian Wildlife Service, Environment Canada, Canada Centre for Inland Waters, Burlington, Ontario.

Bonin, J., J.L. DesGranges, C.A. Bishop, J. Rodrigue, A. Gendron, and J.E. Elliott. 1995. Comparative study of contaminants in the mudpuppy (Amphibia) and the common snapping turtle (Reptilia), St. Lawrence River, Canada. Archives of Environmental Contamination and Toxicology 28:184–194.

Briggler, J.T., B.L. McKeage, N.M. Girondo, and P.R. Pitts. 2013. Evaluation of traps to capture eastern hellbenders (Cryptobranchus alleganiensis alleganiensis) in deep water habitat. Herpetological Review 44:423-428.

Chellman, I.C. and D.L. Parrish. 2010. Developing methods for sampling mudpuppies in Vermont tributaries of Lake Champlain. Final report. State Wildlife Grants Program, Vermont Fish and Wildlife, Waterbury.

Cochran, P.A. and J.D. Lyons. 1985. Necturus maculosus (mudpuppy). Juvenile ecology. Herpetological Review 16:53.

Collins, J.T. 1993. Amphibians and Reptiles in Kansas, 3rd Edition. University of Kansas Museum of Natural History, Lawrence, Kansas, Public Education Series 13.

COSEWIC. 2023. COSEWIC assessment and status

report on the Mudpuppy Necturus maculosus, Manitoba population and Great Lakes / St. Lawrence population in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. xvi + 78 pp. Online: https://www.canada.ca/en/environment-climate-change/services/species-risk-public-registry/cosewic-assessments-status-reports/mudpuppy-2023.html.

Craig, J.M., D.A. Mifsud, A.S. Briggs, J. Boase, and G. Kennedy. 2015. Mudpuppy (Necturus maculosus maculosus) spatial distribution, breeding water depth, and use of artificial spawning habitat in the Detroit River. Herpetological Conservation and Biology 10(3): 926-934.

Duellman, W.E. and J.T. Wood. 1986. Biology of Amphibians. McGraw-Hill, New York. 670 pp.

Fitch, K.L. 1959. Observations on the nesting habits of the mudpuppy, Necturus maculosus Rafinesque. Copeia 1959:339-340.

Frost, D.R. 2021. Amphibian Species of the World (ASW): an Online Reference. Version 6.1. American Museum of Natural History, New York, USA. Online: https://amphibiansoftheworld.amnh.org/.

Gendron, A.D. 1999. Status report on the Mudpuppy, Necturus maculosus (Rafinesque), in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa, Ontario.

Graeter, G.L., K.A. Buhlmann, L.R. Wilkinson, and J.W. Gibbons (editors). 2013. Inventory and Monitoring: Recommended Techniques for Reptiles and Amphibians. Partners in Amphibian and Reptile Conservation Technical Publication IM-1, Birmingham, AL. 321 pp.

Hamilton, W.J., Jr. 1932. The food and feeding habits of some eastern salamanders. Copeia 1932:83-86.

Harding, J.H. and D. A. Mifsud. 2017. Amphibians and Reptiles of the Great Lakes Region, Revised Edition. University of Michigan Press, Ann Arbor, MI. 392 pp.

Harris, J.P., Jr. 1959. The natural history of Necturus, III. Food and feeding. Field and Laboratory 27:105-111.

Holman, J. 2012. The Amphibians and Reptiles of Michigan: A Quaternary and Recent Faunal Adventure. Wayne State University Press, Detroit, MI.

King, R., M. Oldham, W. Weller, and D. Wynn. 1997. Historic and current amphibian and reptile distributions in the island region of western Lake Erie. American Midland Naturalist 138:153-173.

Lagler, K.F. and K.E. Goellner. 1941. Notes on Necturus maculosus (Rafinesque), from Evans Lakes, Michigan. Copeia 1941:96-98.

Matson, T.O. 1990. Estimation of numbers for a riverine Necturus population before and after TFM lampricide exposure. Kirtlandia 45:33–38.

Matson, T.O. 1998. Evidence for home ranges in mudpuppies and implications for impacts due to episodic applications of the lampricide TFM. Pp. 278–287. In Lannoo, M.J. (Ed.), Status and Conservation of Midwestern Amphibians. University of Iowa Press, Iowa City, IA.

McDaniel, T.V., P.A. Martin, G.C. Barrett, K. Hughes, A.D. Gendron, L. Shirose, and C.A. Bishop. 2009. Relative abundance, age structure and body size in mudpuppy populations in southwest Ontario. Journal of Great Lakes Research 35:182–189.

Michigan Natural Features Inventory (MNFI). 2025. Michigan Natural Heritage Database, Lansing, MI.

Murphy, M.O., S.J. Price, P.M. Hime, A.N. Drayer, and D.W. Weisrock. 2016. A review of common mudpuppy (Necturus maculosus) capture methods and description of a revised trap design. Herpetological Review 47(4):575-578.

NatureServe. 2025. NatureServe Network Biodiversity Location Data accessed through NatureServe Explorer [web application]. NatureServe, Arlington, Virginia. https://explorer.natureserve.org/. (Accessed: April 8, 2025).

Nickerson, M.A. and K.L. Krysko. 2003. Surveying for hellbender salamanders, *Cryptobranchus alleganiensis* (Daudin): A review and critique. Applied Herpetology 1:37–44.

Petranka, J.W. 1998. Salamanders of the United States

and Canada. Smithsonian Institution Press, Washington and London.

Pfingsten, R. and A. White. 1989. Necturus maculosus (Rafinesque), Mudpuppy. Pp. 72-78 in R. Pfingsten and F. Downs (eds.). Salamanders of Ohio (Vol. 7). Ohio Biological Survey, Columbus, Ohio.

Pope, C.H. 1947. Amphibians and Reptiles of the Chicago Area. Chicago Natural History Museum Press, Chicago, Illinois.

Reigle, N.J., Jr. 1967. The occurrence of Necturus in deeper waters of Green Bay. Herpetologica 23:232-233.

Schalk, C. and T. Luhring. 2010. Vagility of aquatic salamanders: implications for wetland connectivity. Journal of Herpetology 44:104-109.

Schmidt, R.E., T.W. Hunsinger, T. Coote, E. Griffin-Noyes, and E. Kiviat. 2004. The mudpuppy (Necturus maculosus) in the Tidal Hudson River, with comments on its status as native. Northeastern Naturalist 11:179–188.

Shoop, C.R. 1965. Aspects of reproduction in Louisiana Necturus populations. American Midland Naturalist 74:357-367.

Shoop, C.R. and G.E. Gunning. 1967. Seasonal activity and movements of Necturus in Louisiana. Copeia 1967:732–737.

Siebert, E. 2008. "Necturus maculosus" (On-line), Animal Diversity Web. Accessed April 8, 2025 at https://animaldiversity.org/accounts/Necturus_maculosus/.

Smith, B.G. 1911. The nests and larvae of Necturus. Biological bulletin 20:191-200.

Stapleton, M.M., D.A. Mifsud, K. Greenwald, J. Boase, M. Bohling, A. Briggs, A., J. Chiotti, G. Kennedy, R. Kik IV, J.M. Hessenauer, D. Leigh, E. Roseman, A. Stedman, J. Sutherland, and M. Thomas. 2018. Mudpuppy Assessment Along the St. Clair-Detroit River System. Herpetological Resource and Management Technical Report, Chelsea, Michigan. 110 pp.

U.S. Fish and Wildlife Service (USFWS). 2023. Species status assessment report for the Salamander Mussel (Simpsonaias ambigua). Version 1.1, May 2023. Michigan Ecological Services Field Office, East Lansing, Michigan.

VanDeValk, A.J. and J.T. Coleman. 2010. A proposed weight-length relationship for the common mudpuppy. Herpetological Review 41:29.

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