SOUTHERN ENVIRONMENTAL LAW CENTER

48 Patton Avenue, Suite 304
Asheville, NC 28801

Telephone 828-258-2023
Facsimile 828-258-2024

February 11, 2025

Via Federal eRulemaking Portal

Ms. Erin Knoll
Public Comments Processing
Attn: FWS-R3-ES-2024-0152
U.S. Fish and Wildlife Service
MS: PRB/3W
5275 Leesburg Pike
Falls Church, VA 22041-3803

Re: Endangered Species Status for the Eastern Hellbender; Docket No. FWS-R3-ES-2024-0152

Dear Ms. Knoll:

The Southern Environmental Law Center submits the following comments on behalf of a broad coalition of 39 conservation groups working in the Southeast in support of the U.S. Fish and Wildlife Service's ("FWS" or "Service") proposal to list the eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*) as an endangered species under the Endangered Species Act ("ESA"). [Proposed] Endangered Species Status for the Eastern Hellbender, 89 Fed. Reg. 100,934 (Dec. 13, 2024) (to be codified at 50 C.F.R. § 17.11(h)).

Eastern hellbender populations have declined rapidly across the species' range, particularly since the 1970s, and the best available science establishes that the eastern hellbender warrants protection as an endangered species. As highlighted in our comments below, eastern hellbender populations face increasing pressures from sedimentation, water pollution, riverine habitat destruction and degradation, disease, and climate change. Our groups urge the Service to expeditiously issue a final rule listing the eastern hellbender as an endangered species, designating critical habitat for the eastern hellbender, and extending to the eastern hellbender the full protections of the ESA.

I. THE BIOLOGY AND STATUS OF THE EASTERN HELLBENDER

Eastern hellbenders have historically ranged across the mountains and foothills of the eastern United States, spanning from New York west to Missouri and south to northern Alabama and Mississippi. Today, however, eastern hellbender populations are presumed to be extirpated or have unknown status in more than 40% of the historical streams identified by the Service in which the species was previously found.[1] Since hellbender populations have been in decline

[1] *See* U.S. Fish & Wildlife Serv., Eastern Hellbender (*Cryptobranchus alleganiensis alleganiensis*) Species Status Assessment Report Version 2.1 (Nov. 2024) [hereinafter "SSA"] at 27 (hellbender populations in 253 of 626 streams presumed extirpated or status unknown).

across some parts of the species' range since at least the 1940s, however,[2] it is likely that the magnitude of loss from the species' true historical range is even higher than what has been confirmed by the Service. Of the known extant eastern hellbender populations today, only 11-12% are considered to be stable and recruiting.[3]

Based on the genetics research of Hime et al. (2016), the Service's species status assessment for the eastern hellbender divides hellbender populations into four metapopulations, which the Service has referred to as "adaptive capacity units": the Ohio River-Susquehanna River drainage ("OACU"), the Kanawha River drainage ("KACU"), the Tennessee River drainage ("TACU"), and the Missouri River drainage ("MACU"). The Missouri River drainage metapopulation has no stable recruiting populations, and in 2021, the Service listed the Missouri River drainage metapopulation as an endangered distinct population segment. 86 Fed. Reg. 13,465 (March 9, 2021). The eastern hellbender subspecies as a whole,[4] however, is similarly endangered, as acknowledged by the Service's 2024 listing proposal. 89 Fed. Reg. 100,934. As of the Service's most recent species status assessment, the Kanawha River drainage has only 6 stable and recruiting populations out of 65 historical streams (9.2%), the Tennessee River drainage has only 26 stable and recruiting populations out of 297 historical streams (8.8%), and the Ohio River-Susquehanna River drainage has only 10 stable and recruiting populations out of 259 historical streams (3.9%).[5] The population survey data summarized in that species status assessment, however, predates the impacts of Hurricane Helene, which devasted hellbenders and their habitat across many previously high-quality segments of the Tennessee River drainage.[6] Thus, the current number of stable and recruiting populations in the Tennessee River drainage is presently unknown but can now reasonably be assumed to be fewer than reflected in the 2024 species status assessment. Both within and between the four metapopulations, extant populations can face both natural barriers to movement and gene flow as well as increasing barriers from anthropogenic habitat fragmentation and degradation. Small and isolated populations across the eastern hellbender's range are susceptible to the adverse effects of genetic drift and are less likely to be able to withstand stochastic events such as severe storms, chemical spills, or disease outbreaks.

As discussed in further detail below, experts have identified sedimentation as the leading threat to hellbenders across their range. Hellbenders are also threatened by degraded water quality from various sources, including runoff from agriculture and development, chemical pollution, septic discharges, and deforestation. Direct adverse modification of hellbender habitats

---

[2] *Id.* at 26 (noting that eastern hellbender abundance has decreased across its range, "with reduced numbers observed as early as 1948 (citing Swanson 1948, p. 363)).

[3] Based on Table 4.1 of the SSA, 373 streams with extant populations, only 42 (11.26%) are listed by the Service as stable recruiting. *See id.* at 27; *see also id.* at 4. Elsewhere, the SSA also states that there are 371 currently extant populations, of which 45 (12%) are stable or recruiting. *Id.* at 59.

[4] Hellbenders are divided into two subspecies: the Ozark hellbender (*Cryptobranchus alleganiensis bishopi*), which inhabits Ozark streams in southern Missouri and northern Arkansas and was listed as endangered in 2011 (76 Fed. Reg. 61,956 (Oct. 6, 2011)), and the eastern hellbender (*Cryptobranchus alleganiensis alleganiensis*), which is considered in the current listing proposal.

[5] SSA at 27.

[6] *See generally* Amphibian and Reptile Conservancy, Letter to USFWS Regarding Impacts of Hurricane Helene on Hellbenders (Dec. 3, 2024) [hereinafter "ARC Helene Letter"]. A copy of the ARC Helene Letter with precise location information redacted is provided as Attachment 1 to these comments; an unredacted copy of the letter previously provided by ARC to the Service is available upon request.

further threatens the species, including through dams and impoundments and activities such as gravel mining and off-highway vehicle crossings in their streams. Hellbenders are additionally threatened by disease outbreaks, which have been catastrophic across other amphibian populations, and have historically suffered from illegal collection. They are also threatened by climate change in various ways, including through rising water temperatures, increased storm and flood risk, and droughts.

The hellbender's unique biology and life history explain why the species is so severely threatened by these risks. Hellbenders are exceptionally large (reaching nearly two feet in length) and long-lived aquatic salamanders that have been suggested to live beyond 50 years in the wild.[7] Hellbenders are entirely aquatic and rely on well-oxygenated water for respiration. Young hellbenders retain their gills for about 1.5 to 2 years after hatching, and adult hellbenders breathe through their skin, using highly vascularized lateral skin folds to increase the surface area for absorption of dissolved oxygen. This cutaneous respiration method makes hellbenders particularly sensitive to chemical pollutants in water, and severe sedimentation can limit their respiration ability by both physically obstructing the exchange of oxygen across tissues and reducing the amount of dissolved oxygen available in their water. Additionally, hellbenders, which are nocturnal, spend their days resting beneath river rocks and boulders and locomote primarily by walking along stream bottoms. This behavior further exposes hellbenders to chemical pollutants, including endocrine disrupting compounds, that tend to bind to sediment and precipitate to stream bottoms.[8]

Hellbenders rely on large river rocks and boulders for daytime shelter, as well as for breeding—egg clutches are deposited under large rocks where they are externally fertilized and subsequently guarded by a male hellbender for 45 to 75 days until hatching to protect the clutch from cannibalization.[9] Both direct interference with the rocky substrate of hellbender habitat, such as from activities like instream gravel mining, and indirect alteration of hellbender habitat can reduce the suitability of hellbender habitat and impair hellbender survival. For example, sedimentation may fill in the interstices of gravel cover, reduce stream depth, and alter stream flows, making hellbenders more vulnerable to predation, and interfering with breeding by reducing the availability of nesting habitat and physically suffocating eggs and larvae.[10] Hellbenders maintain relatively small home ranges, which, combined with their external fertilization breeding method, limits their capacity to colonize near stream reaches.[11]

Due to the long-lived nature of the species, maintaining both annual recruitment and high adult survivorship is important to the future viability of a hellbender population. Thus, survivorship of adults alone in a senescent non-recruiting population is not a sufficient indicator of the population's overall viability and health. While precise minimum effective population sizes for hellbenders can be difficult to estimate (Service-elicited minimum population sizes

---

[7] SSA at 17 (citing Horchler 2010, p. 19).
[8] *See id.* at 34 (citing White et al. 1994, p. 176).
[9] *See id.* at 16.
[10] *See id.* at 31–32.
[11] *Id.* at 22.

ranged anywhere from 45 to 1050 hellbenders),[12] an annual population growth rate of at least 1.05 is considered necessary for a stable and recruiting population.[13]

II. THREATS TO THE EASTERN HELLBENDER IN THE SOUTH

Congress passed the ESA to conserve endangered and threatened species and the ecosystems upon which they depend.[14] Under the statute, a species is "endangered" if it "is in danger of extinction throughout all or a significant portion of its range,"[15] and a species is "threatened" if it "is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range."[16]

In determining whether a species is threatened or endangered, the Service must consider five statutory listing criteria:

> (A) the present or threatened destruction, modification, or curtailment of its habitat or range;
>
> (B) overutilization for commercial, recreational, scientific, or educational purposes;
>
> (C) disease or predation;
>
> (D) the inadequacy of existing regulatory mechanisms; and
>
> (E) other natural or manmade factors affecting its continued existence.[17]

If a species meets the definition of threatened or endangered because it is imperiled by any one or a combination of these five factors, the Service must list the species.[18] The Service must base all listing determinations "solely on the basis of the best scientific and commercial data available."[19]

On December 13, 2024, the Service proposed to list the eastern hellbender as an endangered species, finding that "the eastern hellbender is endangered due to the following threats: sedimentation; water quality degradation; habitat destruction and modification; disease; and direct mortality or removal of hellbenders from a population by collection, persecution, recreation, or gravel mining."[20]

---

[12] *Id.* at 19. *See also* S.D. Unger, T.M. Sutton, & R.N. Williams, *Projected population persistence of eastern hellbenders* (Cryptobranchus alleganiensis alleganiensis) *using a stage-structured life-history model and population viability analysis*, 21(6) J. for Nature Conservation 423–32 (2013) (Attachment 2). Experts have also noted that wide variations genetically derived minimum effective population size estimates can be attributed to insufficient sample sizes. *See* S.J. Kimble, S.D. Unger, & R.N. Williams, *Genetically derived effective population size estimates of herpetofaunal species should be used with caution*, 87(2) J. Wildlife Mgmt. 22340 (2023) (Attachment 3).
[13] SSA at 18.
[14] 16 U.S.C. § 1531(b).
[15] *Id*. § 1532(6).
[16] *Id*. § 1532(20).
[17] *Id*. § 1533(a)(1).
[18] *Id*. § 1533(1).
[19] *Id*. § 1533(b)(1)(A).
[20] 89 Fed. Reg. at 100,935.

We focus the following comments on the myriad threats to hellbenders and their habitat that put hellbenders at risk of extinction across the Southern Appalachian region, the inadequacy of existing regulatory mechanisms to mitigate these threats, and the need to additionally designate critical habitat to effectively protect and conserve the species. The undersigned organizations urge the Service to quickly finalize its proposal to list the eastern hellbender as endangered and grant hellbenders the legal protections they require.

A. Water Quality Degradation

Water quality degradation impairs hellbender habitat and causes direct mortality of hellbenders. Harmful substances enter streams through several sources, including from agriculture, roads, domestic water treatment, mining, and other unpermitted discharges in the forms of sediment and water runoff. Hellbenders' permeable skin allows direct exposure to chemicals that are present in waterways, and pollutants from these sources, even in small quantities, can alter physiological processes as well as increase vulnerability to other threats.[21]

i. Sedimentation

Sedimentation poses the most serious threat to the eastern hellbender "in every major river system in the range of the species" across all geographical units.[22] Sedimentation refers to the addition of sands, silts, or other fine soil particles into waterways.[23] This addition degrades water quality conditions necessary for hellbender survival and physically alters habitat conditions required by hellbenders, especially hellbender juveniles.

Sedimentation can reduce stream and river depth where soil particles accumulate, increasing water temperatures to uncomfortable or intolerable levels for the species.[24] Additionally, sedimentation can lower dissolved oxygen levels and introduce chemical contaminants into hellbender environments, for example, through pesticides that bind to silt particles.[25] Eastern hellbender biology makes the species especially vulnerable to direct contaminant exposure.[26] Additionally, sedimentation alters the physical habitat hellbenders require by reducing the variability and abundance of interstitial spaces among coarse substrates, which is required both for young (both larval and juvenile) hellbenders and hellbender food sources like crayfish.[27] Once fine sediments imbed into cobble in streams and rivers at a presence of 50% or greater, juvenile hellbenders are unable to burrow, and sedimentation has been shown generally to suffocate hellbender eggs and reduce their viability.[28] Finally, sedimentation can impact adult hellbender habitat needs by "burying shelter and nest rocks," making them inaccessible for use.[29]

---

[21] SSA at 32.
[22] *Id.* at 31.
[23] *Id.*
[24] *Id.*
[25] *Id.* at 32.
[26] *Id.*
[27] *Id.* at 31–32.
[28] *Id.*
[29] *Id.* at 32.

Sedimentation across the hellbender range can be traced to agriculture, silviculture, oil and gas development, residential development, road construction, and instream gravel mining, amongst other causes.[30]

1. Silviculture and associated roadbuilding

Silviculture can threaten hellbender survival where timber production activities, including associated roadbuilding, lead to increased sedimentation in hellbender habitat. This is true on private and public lands alike. Often, stretches of public land represent the highest quality, most contiguous hellbender habitat in parts of the species' range. Timber production is not only permitted within but mandated for national forests under the Multiple Use Sustained Yield Act,[31] which can include areas of relatively high hellbender density.

According to the U.S. Forest Service, "[s]edimentation commonly poses the greatest risk to water quality from forest management."[32] Silviculture presents sedimentation risks at a number of stages. First, the actual removal of trees disturbs root systems that hold soils in place, which can allow particles to slide downhill or downstream into nearby waterways, especially during and after heavy rains or in erosion-prone ecosystems.[33] Additionally, the machines used to fell and haul trees spin across the project area, disturbing soils and destabilizing ground cover.[34] This is especially true for projects carried out on steep slopes, where both gravity and increased runoff velocity pose formidable threats to soil stability once disturbed by project activity.[35]

Additionally, logging activities within national forests require the use of roads that cut through wooded areas to permit movement of timber machinery to project sites. In some cases, depending on project location, logging requires construction of roads to reach remote areas of the forest. These existing and new roads pose additional threats of sedimentation from construction, long term exposure of soil without root engagement, and the burden of traffic pressure (from timber machinery and/or the public).[36] Though national forests put in place guidelines for minimizing sedimentation from these activities, in practice, ineffective policies and underfunding for implementation leave streams and rivers at risk of serious damage from sedimentation.

Take, for example, the Nantahala-Pisgah National Forest, which spans western North Carolina and nears eastern Tennessee and northern Georgia, the areas of healthiest hellbender populations in the TACU.[37] More than 30% of known eastern hellbender occurrences in the state

[30] *Id.* at 31.
[31] The Multiple Use Sustained Yield Act states that "the national forests are established and shall be administered for outdoor recreation, range, timber, watershed, and wildlife and fish purposes," requiring the U.S. Forest Service to balance each of those aims during management. 16 U.S.C. § 528.
[32] FEIS for the Nantahala-Pisgah Forest Plan, 3-76 (Attachment 4).
[33] *See, e.g.*, Emily Carter, Robert Rummer, & Bryce Stokes, *Evaluation of site impacts associated with three silvicultural prescriptions in an upland hardwood stand in northern Alabama, USA*, 30 Biomass and BioEnergy 1025–34 (2006) (Attachment 5).
[34] *Id.*
[35] *See, e.g.*, FEIS for the Nantahala-Pisgah Forest Plan, 3-49 (Attachment 6) (discussing necessity for alternative harvest methods on steep slopes inclining 40% or more).
[36] *Id.* at FEIS at 3-57 (Attachment 7); 3-73 (Attachment 8).
[37] SSA at 63.

of North Carolina occur on the combined Nantahala-Pisgah National Forest.[38] Of these known occurrences, more than 50% occur within 100 meters of a road or trail used for either silviculture, recreation, or both.[39]

Independent study has called into question the validity of the protective measures relied upon by the Forest Service to reduce sedimentation risk in these areas, and more concerningly, highlighted how rarely the agency has the funds to apply them to existing Forest Service roads. The Pisgah National Forest has the funds to maintain "less than 13% of its road network, resulting in a $41 million backlog in road maintenance," implying that protective measures are allowed to erode in the remaining areas.[40] Indeed, this same study found that "[m]any forest road stream crossings utilize culverts that, either through neglect due to maintenance backlog or poor initial design and construction, create barriers to aquatic organism passage and/or contribute to accelerated erosion and stream sedimentation."[41] The study, included at Attachment 11, details how the backlog of Forest Service road maintenance has caused "many forest roads to become impassible and riddled with [protective soil guidance] violations."[42]

Where continued threats to water quality conditions from sedimentation permeate areas like the Nantahala-Pisgah National Forest (which represent the most contiguous habitat in the strongest part of the range for hellbenders in the TACU), additional conservation measures become even more important for the survival of the species. These conditions counsel for finalization of the species' endangered status, especially in light of continued degradation of this important habitat after recent storm damage from Hurricane Helene,[43] *see* infra II(E)(ii), and a new Nantahala-Pisgah National Forest management plan (finalized in 2023) which allows a quintupling of timber harvest (and associated road construction).[44]

ii. Runoff from Agriculture and Land Development

Much of the water in rivers throughout the Southeast comes directly from runoff: water that flows across land surfaces, collecting pollutants found on the landscape as it goes. [45] These pollutants, accordingly, eventually enter hellbender habitat. Agriculture runoff is a significant source of such pollutants and affects water quality across the hellbender's range.[46] Specifically,

---

[38] FEIS for the Nantahala-Pisgah Forest Plan, 3-337 (Attachment 9).
[39] *Id.* at 3-341 (Attachment 10).
[40] Kara Grosse, Antje Lang, Caitlin Ryan, *Analysis of Forest Road Conditions and the Impact on Water Quality and Aquatic Organisms in the Pisgah-Nantahala National Forests* at 2 (2015) (Attachment 11) (citing the Pisgah National Forest Transportation Analysis Process 2012) (Attachment 12).
[41] *Id.* at 3.
[42] *Id.*
[43] *See also* FEIS for the Nantahala-Pisgah Forest Plan at 3-20 to 3-21 (Attachment 13) (noting that the "potential for severe storms is expected to increase in the future, including more intense hurricanes making landfall in the southern US" and explaining that "[i]ncreases in heavy downpours and more intense hurricanes can lead to greater erosion and more sedimentation in our waterways). As discussed in section E, this prediction about further habitat damage has already come to bear.
[44] FEIS for the Nantahala-Pisgah Forest Plan at 2-26 to 2-29 (Attachment 14) (discussing land operable for timber harvest by alternative, including Alternative A (the no-action alternative representing the old management plan) and Alternative E (selected for the new plan content)).
[45] U.S. Geological Survey, *Rivers, Streams, and Creeks* (June 6, 2018), https://www.usgs.gov/special-topics/water-science-school/science/rivers-streams-and-creeks (Attachment 15).
[46] SSA at 32.

nutrients in fertilizers used for farming, pesticides applied to crops and fields, and livestock waste found on agricultural lands are carried into streams by precipitation runoff and irrigation flows. The threat this poses to hellbenders is especially pronounced, as much of the hellbender's historic range occurs on what are now privately owned agricultural lands.[47] Agriculture runoff causes an increase in nitrogen and phosphorus in the watershed which decreases the amount of dissolved oxygen present in waterways. Because hellbenders breathe through their skin and are dependent on highly oxygenated waters, this decline can be catastrophic.

Fuel oils from roads, domestic water treatment plant discharges, septic system discharges, and other unpermitted discharges related to human activity also contribute to water quality degradation in hellbender habitat.[48] Development acts as a catalyst for each of these sources and has significantly increased across the Southeast since 2020.[49] Specifically, between April 1, 2020 and July 1, 2023, North Carolina's population increased by nearly 400,000 people.[50] Tennessee and Georgia have also experienced significant population increases in the same timeframe. In addition to an influx in year-round residents, vacation and rental properties are widely, and rapidly, being built across the mountains of North Carolina, Tennessee, Georgia, Virginia, and West Virginia.[51] Collectively, this development has transformed previously rural areas throughout the hellbender's current range.

This trend is troubling for hellbenders for a variety of reasons. For one, the decrease in permeable surfaces associated with unrestrained development exacerbates runoff—and consequently, the pollutants that are carried by it. Second, development is typically accompanied by an increase in road construction; increased road density has been shown to negatively affect water quality and cause population extirpation of hellbenders both because it leads to an increase in runoff of fuel oil, heavy metals, and other vehicle-related contaminants, and because construction itself contributes pollutants and sediment to waterways.[52] For example, a study in Great Smoky Mountains National Park found that both fish and salamanders were absent in park streams "following exposure of acid-forming rock during road construction," which has largely been attributed to lowered PH and raised dissolved metal concentrations.[53] *See also* supra II(A)(i)(1), discussing the threats of sedimentation from roadways in the silviculture context.

---

[47] Nat. Res. Conservation Serv., *Defenders of the Hellbender*, U.S. Dep't of Agric. (Apr. 20, 2022), https://www.nrcs.usda.gov/conservation-basics/conservation-by-state/north-carolina/news/defenders-of-the-hellbender (Attachment 16) ("Much of the hellbender's historic range occurs on what are now privately owned agricultural land, which means agricultural producers are also key to the recovery of this vulnerable species.").
[48] SSA at 32.
[49] Pew Trusts, *Southern States Gain Residents the Fastest* (May 17, 2023), https://www.pewtrusts.org/en/research-and-analysis/articles/2023/05/17/southern-states-gain-residents-the-fastest (Attachment 17).
[50] Michael Cline, *North Carolina's Strong Population Growth Continues*, N.C. Office of State Budget and Mgmt. (Dec. 20, 2023), https://www.osbm.nc.gov/blog/2023/12/20/north-carolinas-strong-population-growth-continues (Attachment 18).
[51] *See e.g.*, Sally Kestin, *Vacation rentals: Explosive growth brings jobs, money, but some say it contributes to housing shortage*, Smoky Mountain News (July 12, 2023), https://smokymountainnews.com/archives/item/35970-vacation-rentals-explosive-growth-brings-jobs-money-but-some-say-it-contributes-to-housing-shortage (Attachment 19).
[52] S.M. Wineland et al., *Using environmental DNA and occupancy modelling to identify drivers of eastern hellbender* (Cryptobranchus alleganiensis alleganiensis) *extirpation*, Freshwater Biology 1–14 (2018) (Attachment 20).
[53] SSA at 35.

Finally, unsustainable development also acts as a catalyst for an increase in wastewater discharges which, in turn, add pollutants such as phosphorous and nitrogen directly to waterways.[54] As with agricultural runoff, these pollutants reduce the amount of dissolved oxygen in waterways and contribute to a decline in stream ecosystem functioning. In Western North Carolina alone, where a high concentration of healthy eastern hellbender populations are found, many new wastewater treatment plant discharges have been permitted into cold-water streams which contain potential hellbender habitat.[55] As just one example, the North Carolina Department of Environmental Quality recently permitted a wastewater treatment plant's effluent discharge, which includes allowances for ammonia nitrogen, fecal coliform, chlorine, and suspended solids—each of which are harmful to water quality, into the Laurel Fork of the Watauga River nearby where numerous healthy hellbender populations have been documented.[56] Indeed, this particular discharge was located within a few miles of some of the most robust and stable documented hellbender population locations.[57] The permit failed to ascribe temperature limits to the discharge—an omission typical of these permits; this is problematic because wastewater treatment effluent can increase stream temperature and impact aquatic communities, including hellbenders.[58] Even though many of these permitted treatment plant discharges are small, collectively, they can spell a death by a thousand cuts for water quality in previously clean and healthy streams.

Similarly, water quality throughout the hellbender's range is affected by septic system discharges. Many vacation rentals—including RVs, cabins, and tiny homes found along riverways throughout the Appalachian mountains—and new homes built in remote areas are not connected to municipal wastewater systems and instead utilize septic systems. As with wastewater treatment plants, septic systems contribute nitrogen and phosphorous to waterways, and depending on how well they are maintained, septic systems are also capable of contributing harmful pathogens and nitrates to surface waters.[59] These harms are unpredictable because septic systems are typically maintained by the property owner themselves and receive little to no regulatory oversight once initially permitted.[60] Accordingly, the effects of septic systems can vary widely based on abstract local dynamics.

Lastly, we must consider the pollution load to our streams and rivers because of Hurricane Helene. Vast areas of the hellbender's range experienced, and continue to experience, severe pollution impacts. The Tennessee Department of Environment and Conservation issued water contact advisories for portions of East Tennessee in response to widespread flooding from

---

[54] *See, e.g.*, *id.* at 32–33.
[55] *Id.* at 63.
[56] N.C. Dep't of Env't Quality, *Issuance of NPDES Permit NC0038041* (2023) (Attachment 21).
[57] *See, e.g.*, ARC Helene Letter at 6.
[58] Catherine Adams et al., *Impact of wastewater treatment plant effluent on the winter thermal regime of two urban Colorado South Platte tributaries*, 11 Frontiers in Env't Sci. (2023), https://www.frontiersin.org/journals/environmental-science/articles/10.3389/fenvs.2023.1120412/full (Attachment 22).
[59] U.S. Env't Prot. Agency, *Septic System Impacts on Water Sources* (July 2024), https://www.epa.gov/septic/septic-system-impacts-water-sources (Attachment 23).
[60] *See* SSA at 32–33 (discussing the water quality impacts of failing septic systems).

Hurricane Helene including surface waters in the Nolichucky, French Broad, Pigeon, Doe and Watauga River watersheds.[61]

Floodwaters carried runoff pollution of fuel oils and contaminants from industrial sites and roadways, and fertilizers and contaminants from agricultural lands into rivers.[62] Waterways in the region experienced pollution from human and animal waste and from massive amounts of human structures and objects washing into waterways, many of which are likely to become chronic sources of contaminants.

iii. Other Adverse Impacts of Deforestation

Flood aftermath and both flood-related and independent deforestation also pose a continued threat to hellbenders. In many states like Georgia and North Carolina, the "highest Eastern Hellbender densities have been found in streams with wide, undisturbed forested buffers."[63] Indeed, riparian forest cover of the stream catchment upstream of hellbender populations was the "best predictor" of species density in Virginia.[64] By contrast, studies have "rarely found Eastern Hellbenders in areas without intact forested buffers" in Pennsylvania.[65] There are a number of reasons for these correlations. For one, decreased canopy cover is associated with increased water temperatures, which can be detrimental to hellbender survival.[66] Additionally, male hellbenders have been shown to be three times more likely to cannibalize their entire clutch of eggs in areas of low forest cover (defined as <63%), with the central hypothesis being that this is a result of sedimentation and water chemistry changes (such as to conductivity) that together lower egg viability.[67] This hypothesis is in line with other research on forest cover and water chemistry, which has found conductivity to be "strongly negatively correlated" with canopy cover.[68]

iv. Mining

Mining activities, and the legacies they leave behind, also cause serious declines in water quality that are harmful to hellbenders. Coal mining in particular has significantly degraded hellbender habitat for decades, rendering many streams in the species' historic range

---

[61] *See* Tenn. Dep't of Env't & Conservation, *Results of TDEC Evaluation of Water Quality Impacts Resulting from Hurricane Helene* (Jan. 13, 2025), https://www.tn.gov/content/dam/tn/environment/water/watershed-planning/wr_wq-advisories-post-helene-sampling-report-2025-01-13.pdf (Attachment 24).
[62] Frank Graff, *Hellbenders Take a Hit from Helene*, PBS News (Oct. 18, 2024) https://www.pbsnc.org/blogs/science/an-iconic-salamander-species-struggles-after-hurricane-helene/ (Attachment 25).

[63] SSA at 38. (citing Catherine Jachowski & William Hopkins, *Loss of catchment-wide riparian forest cover is associated with reduced recruitment in a long-lived amphibian*, 220 Biological Conservation 220–221 (2018)).
[64] *Id.*
[65] *Id.*
[66] *See, e.g.,* SSA at 15, 21–22 (discussing stream temperatures and hellbender presence); SSA at 41 (linking rising water temperatures and disease); SSA at 48 (discussing higher temperatures and reduced dissolved oxygen, leading to lowered hellbender immune function and reproductive success).
[67] *Id.* (citing William Hopkins et al., *Filial Cannibalism Leads to Chronic Nest Failure of Eastern Hellbender Salamanders* (Cryptobranchus alleganiensis), 202 Am. Naturalist 92–106 (2023)).
[68] Amber Pitt et al., *Decline of a giant salamander assessed with historical records, environmental DNA and multi-scale habitat data*, 62 Freshwater Biology 967–976, 2017 (Attachment 26).

unsuitable.[69] And coal mining poses ongoing threats. Specifically, valley fill impacts from mountain top removal operations prevalent across central Appalachia permanently bury streams, contribute heavy concentrations of chemical ions and selenium to downstream waterways, degrade water quality to lethal levels, and degrade aquatic communities.[70] Further, coal preparation often requires the use of slurry ponds in which harmful residue is stored. These ponds contribute pollutants to downstream waterways during heavy rains as well as pose a threat of structural failure.[71]

Quartz and feldspar mines also pose a continued threat to the hellbender. In North Carolina, for example, several quartz mines discharge toxic mining wastes into the cold, high-elevation waters of the North Toe River—some of the best remaining habitat for hellbenders in the area. Instream data from the North Toe show frequent exceedances of state water quality standards for fluoride, a chemical used during quartz processing.[72] Several of these mines also discharge chloride into the North Toe at around 10 to 25 times the state water quality standard. And in 2018, a hydrofluoric acid spill from one facility caused a fish kill and forced North Carolina to close the North Toe to the public.[73] In addition to point-source pollution, sediment runoff from these mines have also contributed to water-quality impairments in the North Toe River for years. Despite these issues—in prime hellbender habitat no less—the North Carolina Department of Environmental Quality has allowed the mines' Clean Water Act Section 402 discharge permits to lapse and has failed to issue updated permits for seven years and counting.[74]

Abandoned mine sites, which are widespread and numerous throughout the hellbender's range, including in Southern Appalachia, are another ongoing threat posed by coal mining's

---

[69] This problem is markedly widespread as the locations of both current and historical coal mining activities share significant overlap with the hellbenders' range. Coal mining is—or has been in the past several decades—prevalent in Pennsylvania, Ohio, West Virginia, Kentucky, Maryland and Virginia. NatureServe Explorer, *Hellbender Species Page* (2024), https://explorer.natureserve.org/Taxon/ELEMENT_GLOBAL.2.105670/Cryptobranchus_alleganiensis (Attachment 27).

[70] U.S. Env't Prot. Agency, *The Effects Of Mountaintop Mines And Valley Fills On Aquatic Ecosystems Of The Central Appalachian Coalfields* (2011), https://assessments.epa.gov/risk/document/&deid=225743 (Attachment 28).

[71] In 2000 a slurry impoundment failure in Martin County, Kentucky resulted in a spill so massive that three creeks and a river were impacted and nearly 1.7 million fish were killed. *See* Kevin Frey et al., *Impacts of the Martin County coal slurry spill on fishery resources in Eastern Kentucky streams: a case study*, Proceedings of the Annual Conference of Southeast Association of Fish and Wildlife Agencies, 55: 95–104 (2001) (Attachment 29). An ongoing major pollution event from improperly stored mine waste is currently contaminating the Guyandotte River and tributaries in West Virginia. *See* Briana Heany, *Residents along Indian Creek are filing dozens of lawsuits against mining companies*, W.Va. Public Broadcasting (Au. 22, 2024), https://wvpublic.org/resident-along-indian-creek-are-filing-dozens-of-lawsuits-against-mining-companies/ (Attachment 30).

[72] N.C. Dep't of Env't Quality, *The Feldspar Corporation Permit # NC0000353* (Jan. 7, 2019), https://www.deq.nc.gov/news/events/feldspar-corporation-permit-nc0000353 (noting the North Toe is "water quality limited" for fluoride).

[73] *See* Kimberly King, *Dozens of fish in North Toe River killed after quarry leak, state officials say*, WLOS (July 17, 2018), https://wlos.com/news/local/dozens-of-fish-in-north-toe-river-killed-after-quarry-leak-state-officials-say (Attachment 31); Karen Chavez, *Sewage spill in Spruce Pine forces closure of North Toe River to public*, Asheville Citizen Times (July 19, 2018), https://www.citizen-times.com/story/news/local/2018/07/19/spruce-pines-north-toe-river-suffers-acid-leaksewagespill/800103002/ (Attachment 32); N.C. Dep't of Env't Quality, Assessment of Civil Penalty for Violations of the Reporting Requirements (Case No.: LM2018- 0051), NPDES Permit No. 0000353 (Feb. 4, 2019).

[74] *See, e.g.*, N.C. Dep't of Env't Quality, *Quartz Corp/Pine Mountain Permit #NC0000400* (Jan. 7, 2019), https://www.deq.nc.gov/news/events/quartz-corppine-mountain-permit-nc0000400-1 (proposing permit for renewal in 2019).

legacy.[75] When shallow subsurface water and surface water from rainfall and snowmelt flow through former mine locations, sulfuric acid is formed; the acidic water then leaches heavy metals from the rocks it encounters.[76] The highly toxic resulting mixture enters the watershed and degrades water quality far below what hellbenders can withstand. Mine reclamation programs exist to help mediate this threat, but progress is extremely slow and not without its own associated risks to hellbenders.[77] For instance, certain abandoned mine lands' reclamation involves a transformation from previously permeable, revegetated surfaces to shopping centers, parking lots, and other industrial uses. As with the risks related to development, this shift leads to increased pollutant loads entering waterways.[78] Enhancing the problem, even sites "reclaimed" without development in mind typically see little meaningful environmental progress.[79] For example, reclamation measures are can be meager, merely involving the construction of gravel ditches intended to be "restored streams" which do little to prevent toxic contaminants from poisoning downstream waterways.[80] Designating the eastern hellbender as endangered will offer a meaningful way to ensure that development-focused reclamation projects are responsibly planned around hellbender populations and that they do not exacerbate pollution loads in their habitat. The listing will also offer subject-matter experts a crucial mechanism for interagency coordination to develop productive mitigation measures that can accompany reclamation efforts and ensure that they achieve their intended environmental goals.

B. Direct Destruction and Modification of Aquatic Habitat

i. Impoundments

Hellbender habitat is significantly altered through the construction and presence of artificial impoundments. Dams alter the chemical and physical conditions of hellbender habitat

---

[75] *See* Carl Zipper et al., *Coal's Legacy in Appalachia: Lands, waters, and people,* 8 The Extractive Industries and Society 100990 (2021) (Attachment 33). For instance, the Virginia Department of Energy estimates that there are 4,000 abandoned mineral mine lands in the commonwealth. *See* Va. Dep't of Energy, *Guide to Virginia's Abandoned Mine Lands*, https://energy.virginia.gov/mineral-mining/documents/BROCHURES/AMML.pdf (Attachment 34).

[76] U.S. Env't Prot. Agency, *Abandoned Mine Drainage* (Nov. 13, 2024), https://www.epa.gov/nps/abandoned-mine-drainage#:~:text=Heavy%20metals%20can%20be%20leached,on%20humans%2C%20animals%20and%20plants (Attachment 35).

[77] Studies demonstrate that hundreds of thousands of acres of former surface mining sites in central Appalachia are unreclaimed and relatively few reclaimed sites are used for economic development. Elizabeth E. Payne, *Reclaiming Mined Mountains*, Appalachian Voices (Dec. 2016), https://appvoices.org/2016/12/15/reclaiming-mined-mountains/ (Attachment 36).

[78] Especially troubling are projects remediated under the Abandoned Mine Land Economic Revitalization ("AMLER") Program which awards funding to projects aimed at economic development in coalfield communities. AMLER funding is available in 6 states: Alabama, Kentucky, Ohio, Pennsylvania, Virginia, and West Virginia. Accordingly, these projects have significant overlap with the hellbender's range. AMLER funding is distinct from the Office of Surface Mining's Abandoned Mine Land (AML) Reclamation Program which is designed to specifically address the hazards and environmental degradation posed by legacy coal mines.

[79] *See* Appalachian Voices, *The Modern Mine Cleanup Crisis*, https://appvoices.org/coal-impacts/modern-mine-crisis/ (Attachment 37).

[80] *See* Zipper et al., *supra* note 75 at 101002. When reclamation projects are carried out with careful planning and involve appropriate measures, they can, alternatively, lead to significant positive impacts on watersheds. However, studies indicate that even when reclamation improves water quality at the watershed level, stream biotic condition rehabilitation was limited. *See* Honghong Wei et al., *Impact of Mine Land Reforestation and Revegetation on Water Quality in a Mid-Appalachian Watershed: A Monitoring Study*, West Virginia University Graduate Theses, Dissertations, and Problem Reports (2008) (Attachment 38).

and reduce connectivity between hellbender populations, degrading environmental conditions necessary for species persistence and limiting genetic diversity.[81] These impacts are "pervasive throughout much of the range of the Eastern Hellbender."[82] In the TACU alone, hellbenders must contend with impoundments for water supply, flood control, hydroelectricity, navigation, and low-head dams.[83] The Tennessee River system, which includes "approximately 35% of the Eastern Hellbender streams of record," contains 36 major dams impounding approximately 20% of all stream miles in the system.[84] For example, the Duck River, a part of the Tennessee River system where hellbenders are known to be present, must contend with the impacts of numerous dams. The Normandy dam, a TVA-operated structure used for flood control, water supply, and recreation, stretches over 2,000 feet across the Duck River,[85] and the river and its tributaries are choked in several places by "at least 25 mill dams." [86]

Dams, by definition, modify the water levels in hellbender habitat. Impoundments reduce upstream streamflow, leading to increased sedimentation in occupied rivers and streams.[87] This can lower dissolved oxygen, introduce harmful chemical contaminants, and decrease the availability of substrate that both hellbenders and their prey rely on for survival. *See* section II(A)(i), *supra*. Dams can also lead to variable flow rates in relevant waterways, creating "unsuitable conditions" for the species altogether.[88]

The structures themselves also physically block hellbender populations from movement into previously occupied habitat.[89] These barriers reduce the ability for hellbenders to expand their range in response to increased threat pressure, making the species less able to withstand the impacts of habitat destruction and climate change. Isolation of hellbender populations in this way also limits gene flow potential, further reducing the genetic resiliency of the species, and ultimately "contribut[ing] to population declines and local extirpations."[90]

Together, these impacts from impoundments have been "specifically implicated in population declines and local extirpations."[91]

ii. Water withdrawals

Water withdrawals are another dimension of the habitat modification problem and can exacerbate or mirror the effects of impoundments. Significant water withdrawals are typically permitted by state water quality agencies and involve the removal of water from a stream, typically, for municipal or industrial use. This removal lowers stream flows and alters the character of a stream—an effect which is exacerbated during dry periods when the river is

---

[81] SSA at 36–37.
[82] *Id.*
[83] *Id.*
[84] *Id.*
[85] Normandy, Tennessee Valley Authority, https://www.tva.com/energy/our-power-system/hydroelectric/normandy (Attachment 39).
[86] SSA at 37.
[87] *Id.*
[88] *Id.*
[89] *Id.*
[90] *Id.*
[91] *Id.*

already experiencing a lower flow volume.[92] In this way, water withdrawals can deplete stream flows and severely alter instream habitat.

For example, the Duck River is a biological hotspot for a wide array of aquatic species, including hellbenders, and is experiencing an onslaught of water withdrawals in addition to impacts from the river's dams. *See* infra II(B)(i). In recent permits, the Tennessee Department of Environment Division of Water Resources has failed to impose conditions limiting the amount of water that may be withdrawn from the river during periods of low flow and drought. They have also failed to acknowledge a flow level below which designated uses for the river, such as providing habitat for fish and aquatic life, will be impaired. These failures, and the broader threat that they pose to hellbenders in the Southeast, are likely to increase as sprawling development—and concurrent demand for municipal water withdrawals—continues to grow across the region.[93]

iii. Instream Riverbed Mining

In addition to their water quality impacts, mining activities can directly destroy hellbender habitat. For example, as noted above, mountain top removal mining permanently fills in and destroys streams in valleys adjacent to mining sites—thereby killing the creatures who lived in them. Another widespread source of habitat destruction is instream gravel mining—a largely underregulated practice where sand and rock material is taken directly from streambeds, including those with known hellbender populations.[94] Specifically, the machinery used to facilitate gravel mining can crush hellbenders in addition to severely affecting their habitat by removing nest rocks and degrading the composition of the streambed. Eastern hellbenders exhibit high site-fidelity and homing capacities to the very same large, irregularly shaped, and intermittent rocks that mining processes disturb.[95]

Like with coal mining, gravel mining is especially pronounced in the hellbender's range.[96] One harmful example of how gravel mining affects hellbenders occurred in the wake of Hurricane Helene when the railroad company CSX began excavating material from the Nolichucky River in an area of the stream known to host many healthy hellbender populations to reconstruct land washed away where its railroad once stood.[97] CSX's activities altered the river's flow and navigability, caused sedimentation, and disturbed the aquatic organisms—including

---

[92] Climate change will likely exacerbate drought conditions and increase summer temperatures, compounding concerns about low summer flows in hellbender streams. *See* section E, below.

[93] While the State of Tennessee Executive Order No. 108 recently established a Duck River Watershed Planning Partnership that has the potential to curtail some of the unwieldy withdrawals on the waterbody, the effectiveness of its implementation is not yet known. For example, Governor Lee's Order directs the Tennessee Department of Environmental Conservation to engage with actions like regional drought management planning and Habitat Conservation planning – something the agency was not undertaking on its own. Tenn. Exec. Order 108, An Order to Conserve the Duck River Watershed (Nov. 20, 2024), https://app.box.com/s/6r11gat0mqs6f1mmljzygnjk9424qzz0/file/1705347370834 (Attachment 40).

[94] SSA at 39.

[95] Most hellbenders are recaptured within 10 meters of their initial capture site. Indeed, even in rare cases of displacement, adult hellbenders will attempt to find their way back to the home area. *Supra* note 69 (Attachment 27).

[96] N.C. Dep't of Env't Quality, *NC Mineral Resources – An Overview*, https://www.deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/mineral-resources/mineral-resources-faq#:~:text=Gravel%20is%20mined%20from%20the,producer%20of%20sand%20and%20gravel (Attachment 41).

[97] Jeff Keeling, *CSX Nolichucky repairs concern whitewater community*, WJHL (Nov. 18, 2024), https://www.wjhl.com/news/local/csx-nolichucky-repairs-concern-whitewater-community/ (Attachment 42).

hellbenders—that survived the flooding. CSX began working without limitation and without mitigation requirements based on verbal and informal approvals from the Army Corps of Engineers, Fish and Wildlife Service, and Forest Service.[98]

iv. OHV trails

Off highway vehicle ("OHV") trails pose another direct threat to hellbenders and their habitat. State-managed OHV trail networks are expanding in Virginia, West Virginia, Kentucky, and Tennessee. They are frequently sited in streambeds. This means that vehicles such as ATVs are driven up and down the natural streambed—in some cases, through waterways with documented hellbender populations such as the Powell River in Lee County, Virginia.[99] OHV trails are harmful to hellbenders in many of the same ways as gravel mining. Specifically, hellbenders are crushed by OHVs, their habitat is disturbed by the frequent traffic across it, and fuel oil and heavy metals associated with the vehicles themselves enter the waterway, thereby degrading water quality.[100] Despite these risks, the Virginia Department of Environmental Quality has recently stated that they view the practice as unregulatable under state rules and the Clean Water Act.[101] In other words, impacts to aquatic life and water quality in hellbender streams are currently proceeding with little to no regulatory oversight.

v. Pipelines

Oil and gas development poses a direct threat to existing hellbender habitat. "[I]nstream construction in addition to the clear-cutting and excavation of pipeline easements traversing adjacent steep and highly erodible hillsides" has direct adverse impacts on water quality and sedimentation in hellbender habitat.[102] Indeed, many pipelines are constructed in violation of state water quality standards that are supposed to protect aquatic creatures like the hellbender. For example, West Virginia issued at least 46 notices of violation to the developer of the Mountain Valley Pipeline, a 304-mile methane gas pipeline project that included 1,108 waterbody crossings and impacts to 520 separate wetlands; similarly, neighboring Virginia filed suit against Mountain Valley for hundreds of violations of state water-quality requirements.[103]

---

[98] *See Am. Whitewater v. U.S. Army Corps of Eng'rs*, No. 1:24-CV-00284-MR-WCM, 2024 WL 4867065 (W.D.N.C. Nov. 22, 2024).

[99] In 2008, the Virginia General Assembly passed legislation to create the Southwest Regional Recreation Authority ("SRRA") which is primarily responsible for the creation and management of OHV trails affecting hellbender streams in southwestern Virginia. Va. Code Ann. § 15.2-6016, *see also* Spearhead Trails, *ATV Trails* (Attachment 43). ATV user videos are posted widely on social media documenting use of stream trails throughout central Appalachia including uses in the Powell River. For example, *see* YouTube, *Pennington Gap*, https://www.youtube.com/watch?v=omVHHn6nw10&t=1584s. *See also* SSA at 15 (discussing the Licking River system and Kentucky River system in Kentucky where reports have been made OHV use of streams, which crushes and imbeds eastern hellbender rocks).

[100] *See* David Havlick, *No place distant: roads and motorized recreation on America's public lands* (Island Press 2013).

[101] *See* SELC Letter to DEQ-SWRO (Oct. 31, 2024) (Attachment 44), *see also* DEQ Reply Letter (Jan. 8, 2025) (Attachment 45).

[102] Nicholas Smeenk et al., *The Rocky Road to Eastern Hellbender Recovery in Ohio: An Evaluation of Habitat in Ohio's streams*, 185 Am. Naturalist 201 (2021) (Attachment 46).

[103] *See* Meghan Betcher et al., *Pipeline Impacts to Water Quality: Documented impacts and recommendations for improvements* (Aug. 2019), https://www.tu.org/wp-content/uploads/2019/10/Pipeline-Water-Quality-Impacts-FINAL-8-21-2019.pdf (Attachment 47).

As another example, one pipeline developer in Ohio self-reported "72 water quality violations in *one* watershed occupied by Hellbenders; many of these involved slipping hillsides in recently constructed pipeline right-of-ways, undoubtedly resulting in increases of sediment transport."[104] Plainly, pipeline construction is destroying or adversely affecting hellbender habitat across the species' range.

Impacts to hellbenders from pipeline construction stand to increase in the coming years. With the advent of hydraulic fracturing and the discovery of the Marcellus and Utica Shale, oil and gas infrastructure development has exploded across "much of the extant range of the Hellbender in Ohio," West Virginia, and Pennsylvania.[105] That development is accelerating. For instance, Pennsylvania alone could see as many as 30,000 miles of new pipeline built over the next few decades.[106] Utilities and pipeline companies are also planning a "major buildout of natural gas infrastructure" in Georgia, North Carolina, South Carolina, and Virginia over the next fifteen years.[107] Given the large degree of overlap between the Marcellus/Utica Shales and the range of the eastern hellbender, increased pipeline development poses an acute threat to hellbender populations range-wide.

C. Disease

Eastern hellbenders are additionally imperiled by emerging infectious diseases. The Service has noted that disease outbreaks could cause catastrophic loss of the species on a broad scale, and small, isolated hellbender populations are particularly susceptible to loss.[108] For example, the fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*), which causes chytridiomycosis infections in amphibians, has been implicated in severe amphibian population declines and species extinctions globally.[109] *Bd* has been documented in eastern hellbender populations, but its prevalence rate and factors that may contribute to prevalence and manifestation of symptomatic chytridiomycosis in hellbenders are poorly understood at this time. Some evidence suggests that *Bd* is less prevalent in high-quality forested streams than in more disturbed or polluted habitat.[110] Additionally, while *Bd* has primarily been associated with declines in anurans, a separate species—*Batrachochytrium salamandrivorans* (*Bsal*)—has

---

[104] Smeenk et al., *supra* note 102 (emphasis added).
[105] *Id.*
[106] Jon Hurdle, *New task force seeks to manage 'massive' buildout of pipelines*, NPR (July 22, 2015), https://stateimpact.npr.org/pennsylvania/2015/07/22/new-task-force-seeks-to-manage-massive-buildout-of-pipelines/ (Attachment 48).
[107] *See* Inst. For Energy Econ. & Fin. Analysis, *Data Centers Drive Buildout of Gas Power Plans and Pipelines in the Southeast* (Jan. 2025), https://ieefa.org/sites/default/files/2025-01/UPDATED-REVIEWED-Southeast%20Gas%20Infrastructure%20and%20Data%20Cente.pdf (reporting "pipeline operators are currently proposing or constructing more than 3,300 million cubic feet (MMcf)/day of new pipeline capacity through these states") (Attachment 77). The 465+ miles of major pipeline construction in Georgia, North Carolina, South Carolina and Virginia listed in this document, *see id.* at 5–6, also does not include hundreds of pipeline miles currently proposed or under construction in Tennessee, such as the 122-mile ETNG Ridgeline Expansion Project and 32-mile Cumberland Pipeline.
[108] SSA at 39–40.
[109] *See, e.g.*, *id.* at 40 (citing Berger et al. 1998, pp. 9031–9036; Bosch et al. 2001, pp. 331–337; Lips et al. 2006, pp. 3165–3166).
[110] *See, e.g.*, E. Eskew, A. Todd, & W. A. Hopkins, *Extremely low prevalence of Batrachochytrium dendrobatidis infection in Eastern Hellbenders* (Cryptobranchus alleganiensis alleganiensis) *in Southwest Virginia, USA*, 45 Herpetological Review 425–427 (2014) (Attachment 49).

recently caused lethal chytridiomycosis in northwestern European salamanders, and the introduction of *Bsal* to hellbender habitat could be catastrophic to hellbenders. Captive studies of juvenile hellbenders have also documented an incredibly high (80-100%) mortality rate from exposure to *Ranavirus*, and hellbenders from the French Broad, Hiwassee, and Little River systems have all tested positive for *Ranavirus* DNA.[111]

These pathogens and others also present risks to hellbenders beyond the threat of acute lethal disease outbreaks. Infections with these fungal or viral pathogens can also result in detrimental sublethal effects on hellbenders, and little is known regarding the severity of the disease or how long hellbenders can remain infected with these pathogens. Cusaac et al. (2021), for example, found that exposure to glyphosate herbicides (i.e. Roundup) increased the susceptibility of juvenile hellbenders to *Ranavirus* and resulted in 100% mortality.[112] Exposure to other herbicides such as atrazine have similarly increased susceptibility of amphibian species to *Ranavirus*.[113] Thus, the disease burden from exposure to pathogens like *Bd*, *Bsal*, and *Ranavirus* can reduce individual fitness of hellbenders and result in a population that is less able to recruit and adapt to other environmental stressors that it may face. And conversely, the stress of environmental factors like pollution and habitat disturbances may make hellbenders more susceptible to the spread of disease from these pathogens.[114] Together these factors can significantly impact the health and viability of hellbender populations, emphasizing the need for vigilant monitoring and protective measures.

D. Inadequacy of Existing Regulatory Mechanisms

As described above, the eastern hellbender faces numerous threats from both the direct and indirect destruction and degradation of its aquatic habitat. Unfortunately, existing laws and regulations to protect water quality and aquatic ecosystems are insufficient in their scope and/or enforcement to safeguard the hellbender from these threats.

i. Existing regulatory mechanisms are inadequate to protect the hellbender from water-quality degradation.

Existing regulatory mechanisms are inadequate to protect the eastern hellbender from water quality degradation. To start, key sections of the Clean Water Act do not directly apply to some of the primary threats to the eastern hellbender. Specifically, nonpoint source runoff—though it is the "leading source of water quality impairment in the United States"[115]—is not directly regulated by either Section 402 or Section 404 of the Clean Water Act. Farming, silviculture, and road construction are generally exempt from these sections as well, even if they do result in point-source discharges into waters of the United States.[116] This means that the Clean

[111] SSA at 42–43.
[112] J.P. Cusaac et al., *Emerging pathogens and a current-use pesticide: potential impacts on eastern hellbenders*, 33 J. of Aquatic Animal Health 24–32 (2021) (Attachment 50).
[113] *Id.*
[114] *Id.*
[115] U.S. Env't Prot. Agency, *A National Evaluation of the Clean Water Act Section 319 Program* at 1 (Nov. 2011), https://www.epa.gov/sites/default/files/2015-09/documents/319evaluation.pdf [hereinafter "Section 319 Evaluation"] (Attachment 51).
[116] *See, e.g.*, 33 U.S.C. § 1344(f).

Water Act's most powerful provisions do little to curb the pollution most harmful to the eastern hellbender.

Even where these Clean Water Act exemptions *should not* apply, state and federal agencies are often quick to utilize them anyway. For example, Section 404 of the Clean Water Act requires a permit for the discharge of "fill material," which includes stream crossings by roads. National forests typically claim an exemption to that requirement for "construction or maintenance of . . . forest roads" used for timber management.[117] This exemption, however, is available only "in accordance with best management practices" intended to "assure that flow and circulation patterns and chemical and biological characteristics of waters of the United States are not impaired, that the reach of the waters of the United States is not reduced, and that any adverse effect on the aquatic environment will be otherwise minimized."[118] In other words, this exemption only applies where all best management practices are utilized during road construction and maintained afterwards. But National Forest road systems consistently fail to meet these standards. For example, across the Nantahala-Pisgah National Forest road system, road crossings are blocking aquatic organism passage and causing accelerated erosion and visible sediment, especially on the neglected remote roads.[119] This violates the best management practices needed to establish and maintain eligibility for the forestry road permit exemption from Section 404 of the Clean Water Act.

The few operative sections of the Clean Water Act that do apply to nonpoint-source pollution—namely Sections 303(d) and 319—are typically ineffective, inadequately funded, or both. For example, Section 303(d) of the Clean Water Act requires states to establish pollution limits for waters that do not meet state water-quality standards, including those governing sedimentation.[120] While Section 303(d) is meant to reduce point- and nonpoint-source pollution alike,[121] it has not been effectively implemented by state environmental agencies. North Carolina, for instance, has identified hundreds of "impaired" waters that are not meeting state water quality standards, yet generally has been able to develop pollution limits for only a handful of impaired waterbodies every two years.[122] Like Section 303(d), Section 319 of the Clean Water Act has also proven largely ineffective at curbing nonpoint-source pollution. Part of this is due to its flawed design; unlike Sections 303, 402, and 404, Section 319 does not impose mandatory pollution controls. Instead, it directs states to develop nonpoint-source pollution management

---

[117] *Id.* § 1344(f)(1)(E).
[118] *Id.*
[119] *See supra* note 40; section II(A)(i)(1).
[120] 33 U.S.C. § 1313(d).
[121] U.S. Env't Prot. Agency, *Decision Document for the Approval of the North Carolina Department of Environmental Quality 2018 Section 303(d) List* at 4 (May 22, 2019) (EPA's "long-standing interpretation of section 303(d)" is that the "listing requirement applies to waters impaired by point and/or nonpoint sources."), https://files.nc.gov/ncdeq/Water%20Quality/Planning/TMDL/303d/2018/20190522-NC-208-303d-Approval-Package.pdf (Attachment 52).
[122] *See* N.C. Dep't of Env't Quality, *Draft and Approved TMDLs* (around 60 total maximum daily loads developed over the past 30 years), https://www.deq.nc.gov/about/divisions/water-resources/water-planning/modeling-assessment/tmdls/draft-and-approved-tmdls (Attachment 53).

programs, which are then eligible for federal grant funding.[123] However, Section 319 has been severely underfunded from the start, and funding has declined over the past few decades.[124]

State water-quality agencies have little capacity to fill the gaps left by the Clean Water Act, in part due to chronic underfunding. For example, in responding in 2021 to comments on a Section 402 permit for the Blue Ridge Paper mill in Canton, North Carolina, North Carolina Department of Environmental Quality ("NCDEQ") staff simply wrote that the agency "has no capacity to develop their own [technology based effluent limits]"[125]—limits that are required by the Clean Water Act. A lack of sufficient state agency resources has also contributed to a backlog of expired permits, with many entities discharging under old permits with outdated conditions. According to EPA data, 26.2 percent of NCDEQ's Section 402 permits were expired as of October 2023.[126] Among these are expired permits for quartz mining facilities mentioned above.

North Carolina also knowingly fails to fulfill other aspects of its water-quality monitoring program. For instance, in its Quality Assurance Project Plan for its 2017 Ambient Monitoring System Program, which provides instream water quality data for use in Section 303(d) listing and 402 permitting, among other purposes, NCDEQ wrote, "[g]iven the significant resources required for staff and the analytical costs of such studies, it is not feasible that all waterbodies identified through this process can be sampled."[127] Moreover, agency staff have reported that, due to staffing shortages, the state has been unable to complete anywhere close to the number of sampling events scheduled as part of its monitoring required under the Clean Water Act.[128] Many of the most pervasively under-sampled basins contain habitat for the eastern hellbender.

North Carolina also provides an unfortunate case study in how water-quality standards that should benefit the hellbender are simply not being applied. North Carolina, like many Southeastern states, has special water-quality standards for "trout waters." These standards impose more stringent limits on turbidity, temperature, and dissolved oxygen, among other pollutants. Many designated "trout waters," especially headwater streams, also provide a home for other cold-water species like the eastern hellbender. For example, the headwaters of the French Broad River, the Watauga River, the New River, the Little Tennessee, and the Hiwassee

---

[123] 33 U.S.C. § 1329(h).

[124] Congressional funding has decreased in recent years from a high of $238 million in 2003 to $178 million in 2022. U.S. Env't Prot. Agency, *319 Grant Program for States and Territories*, https://www.epa.gov/nps/319-grant-program-states-and-territories (Attachment 54). What little funding does make it to the states generally does not go to address nonpoint-source pollution on the ground; in 2011, EPA found that only 9.8% of Section 319 funding is spent on water-quality project implementation, i.e. installation of best management practices. Section 319 Evaluation at 18.

[125] N.C. Dep't of Env't Quality, *Responses to Comments on Blue Ridge Paper NPDES Permit NC0000272* (Apr. 16, 2021) (Attachment 55).

[126] U.S. Env't Prot. Agency, *FY 2023 End of Year NPDES Individual State-Issued Existing Permit Backlog* (Based on ICIS-NPDES Data as of Oct. 2, 2023) (Attachment 56).

[127] N.C. Dep't of Env't Quality, *Ambient Monitoring System (AMS) Program Quality Assurance Project Plan* at 15 (Feb. 2017), https://perma.cc/3P4W-FAPM (Attachment 57).

[128] In 2021, it completed only 2,957 sampling events of the 4,125 scheduled (72%). N.C. Dep't of Env't Quality, *WSS Data Summaries for 2024 Integrated Report* (2024IR). In 2022, NCDEQ was able to complete only 2,420 sampling events of the 4,145 scheduled (58%). *Id.* Because staffing shortages varied across regional offices, some river basins were affected more than others; for instance, only 17 percent of scheduled samples were collected in the Hiwassee and Savannah basins in 2021, and only 32 percent in the Little Tennessee and French Broad basins. *Id.*

River all contain designated trout waters that support existing hellbender populations. Thus, standards to protect trout have the secondary benefit of protecting water quality for the eastern hellbender.

Unfortunately, these trout waters standards are sometimes ignored. For instance, North Carolina's water-quality standard mandates that water temperatures in designated trout streams is "*in no case* to exceed 20 degrees C (68 degrees F)."[129] Despite the clear language of this provision, and despite available data showing temperature exceedances in trout waters—including the river systems listed above—NCDEQ has adopted the nonsensical position that this standard only applies in the presence of thermal dischargers.[130] And where thermal discharges are present, NCDEQ claims that it lacks data on "background conditions" to assess compliance with the temperature standard.[131] However, NCDEQ has never tried to collect data on "background conditions" in trout waters—despite EPA telling it to do so for years.[132] Thus, NCDEQ has effectively written the trout-waters temperature standard out of its own regulations. And even those standards that NCDEQ *does* apply to trout waters—like the enhanced turbidity standard—are subject to inconsistent enforcement. For example, though NCDEQ has listed multiple trout waters as impaired for turbidity as part of the 303(d) process, it has never crafted pollution limits for those waters.

In short, federal water law does not do enough to protect eastern hellbenders from threats attributable to nonpoint-source pollution. And as illustrated by North Carolina, state enforcement of nonpoint-source limits and other regulations protecting cold-water streams is spotty at best and nonexistent at worst.

ii. Existing regulatory mechanisms are inadequate to protect the eastern hellbender from direct habitat destruction and modification.

Existing regulatory mechanisms are also inadequate to protect the eastern hellbender from direct habitat destruction and modification. The U.S. Army Corps of Engineers' flawed nationwide permitting program is a prime example. Section 404(e) of the Clean Water Act allows the Corps to issue "general" dredge-and-fill permits for activities that are "similar in nature, will cause only minimal adverse environmental effects when performed separately, and will have only minimal cumulative adverse effect on the environment."[133] The Corps has taken this modest grant of authority and twisted it to create expansive nationwide permits like Nationwide Permit 12. That permit allows the Corps to authorize large oil and gas pipelines that cut through thousands of streams—including habitat for the eastern hellbender. Though these permits have significant adverse effects on the aquatic environment,[134] the Corps routinely

[129] 15A N.C. Admin. Code 2B .0211(18).
[130] Yet North Carolina has prosecuted landowners for violating the trout-waters standard by cutting streamside vegetation—which in no way involves a point-source thermal discharge.
[131] U.S. Env't Prot. Agency, *Approval of State of North Carolina's 2008 Section 303(d) List Submittal* at 13 (Mar. 9, 2010) (Attachment 58).
[132] *See, e.g.*, *id.*
[133] 33 U.S.C. § 1344(e)
[134] Betcher et al., *supra* note 103.

dismisses their effects by arbitrarily comparing them to the rest of human activity[135] or vaguely promising that they will be mitigated by unspecified mitigation measures at a later date.[136] Though courts have repeatedly found these practices violate the Clean Water Act,[137] the Corps continues to reissue a broad suite of nationwide permits every five years.

At no point during the promulgation of its nationwide permits does the Army Corps adequately analyze the effects to aquatic species like the eastern hellbender, as required by the National Environmental Policy Act ("NEPA"). Instead, the Corps illegally defers the bulk of its NEPA analysis to the "site-specific scale," where Corps district engineers review bare-bones "pre-construction notification[s]" issued by the permittee.[138] The problem with this deferral is that the Corps has determined the district engineers' site-specific study is not subject to NEPA. Which means that the Corps is effectively tiering its NEPA analysis to a non-NEPA document, "circumvent[ing] the purpose of NEPA"[139] and cutting the public out of the decision-making process. Tiering issues aside, district engineers at the site-specific level also cannot adequately analyze the *cumulative* effects of all crossings authorized by a particular *nationwide* permit—it is simply beyond their capabilities.[140] Which means that the Corps is authorizing numerous projects each year without an adequate understanding of the harm they are causing to species like the eastern hellbender.

Nationwide permits pose more than just a theoretical harm to the hellbender. By the Corps' own estimations, permits like Nationwide Permit 12 are used thousands of times each year.[141] Indeed, within the past decade the Corps has used Nationwide Permit 12 to authorize several large pipeline projects within the range of the eastern hellbender, including the Mountain Valley Pipeline, Atlantic Coast Pipeline, WB Xpress, Mountaineer Xpress, and Rover Pipeline.

---

[135] *See, e.g.*, U.S. Army Corps of Eng'rs, Decision Document Nationwide Permit 12 at 80 (2021) (Attachment 59) ("[T]he activities authorized by this NWP are just one category among many categories of human activities and natural factors that affect ocean waters, estuarine waters, lakes, wetlands, streams, and other aquatic resources, and the ecological functions and services they provide.") [hereinafter "NWP 12 Decision"].

[136] This mitigation rarely occurs. For example, the Corps estimates that only "8 percent of the NWP 12 verification will require compensatory mitigation to offset the authorized impacts to waters of the United States." NWP 12 Decision at 108. Put differently, 92% of the Nationwide Permit 12 program escapes compensatory mitigation requirements entirely.

[137] *See, e.g.*, *Coal. to Protect Puget Sound Habitat v. U.S. Army Corps of Eng'rs*, 417 F. Supp. 3d 1354, 1364 (W.D. Wash. 2019) (faulting the Corps for analyzing the effects of a nationwide permit "as a percentage of the decades or centuries of degrading activities that came before"); *Ohio Valley Env't Coal. v. Hurst*, 604 F. Supp. 2d 860, 888–89 (S.D.W. Va. 2009) (holding the Corps must "provide some explanation of how or why compensatory mitigation will reduce the cumulative adverse impacts on aquatic resources to insignificance" and that "[b]are assertions of mitigation are insufficient"). Courts have also found that the Corps must programmatically consult on its nationwide permits. *See, e.g.*, *N. Plains Res. Council v. U.S. Army Corps of Eng'rs*, 454 F. Supp. 3d 985, 990 (D. Mont.), *amended*, 460 F. Supp. 3d 1030 (D. Mont. 2020). Accordingly, if the hellbender is listed, it will be subject to ESA consultation and will presumably receive protections from the nationwide permitting program.

[138] As part of this notification process, applicants are supposed to determine themselves whether their projects affect endangered or threatened species. However, courts have found this process unlawfully delegates the Corps' responsibility under the ESA. *See, e.g.*, *N. Plains Res. Council*, 454 F. Supp. 3d at 993–94.

[139] *Kern v. U.S. Bureau of Land Mgmt.*, 284 F.3d 1062, 1073 (9th Cir. 2002).

[140] *Wy. Outdoor Council Powder River Basin Res. Council v. U.S. Army Corps of Eng'rs*, 351 F. Supp. 2d 1232, 1243 (D. Wyo. 2005) ("A determination as to whether the impacts of a general permit will be cumulatively significant cannot be foregone based on the assurance that they will be reviewed on an individual permit basis later.").

[141] *See, e.g.*, NWP 12 Decision at 108 (estimating that this nationwide permit "will be used approximately 8,110 times per year on a national basis")

As another example, the Corps is currently attempting to authorize extensive dredge-and-fill operations in the Nolichucky River Gorge using a combination of nationwide permits. The Gorge contains some of the best eastern hellbender habitat in Tennessee and North Carolina.[142] However, a private railroad is currently using nationwide permits 3, 33, and 45 to mine the Gorge's riverbed to replace fill washed away by Hurricane Helene, destroying hellbender habitat and adding immense loads of sediment to an already-stressed river system. The Corps did not assess impacts to the hellbender before issuing its authorization for the project, which will permanently impact at least 25,000 linear feet of stream.[143]

Unfortunately, attempted use of nationwide permits and other "streamlined" environmental review processes may increase in coming years. On January 20, 2025, President Trump issued a series of executive orders declaring a "national energy emergency"[144] and directing federal agencies "to eliminate all delays within their respective permitting processes, including through, but not limited to, the use of general permitting and permit by rule."[145] In addition, President Trump ordered agencies like the Corps to "identify and exercise any lawful emergency authorities available to them . . . to facilitate the identification, leasing, siting, production, transportation, refining, and generation of domestic energy resources."[146] The Corps' emergency procedures purport to allow projects in streams to be authorized without conducting NEPA studies or adhering to other Corps procedures designed to protect the environment.[147] Which means that projects across the country, including those destroying or modifying occupied hellbender habitat, could soon attempt to proceed absent site-specific environmental review—environmental review that could help avoid harm to said species.

Similarly in North Carolina, on January 2, 2025, Governor Josh Stein issued Executive Order No. 2 "Timely Repairing Private Roads and Bridges" that gives the Secretary of the North Carolina Department of Environmental Quality the authority to waive environmental regulations to expedite the repair of roads and bridges damaged by Hurricane Helene.[148] With more than 8,000 private roads and bridges damaged by the hurricane, many of them in areas of hellbender habitat in western North Carolina, repairing them with little to no environmental review could further harm the species and its habitat.

In sum, existing regulatory mechanisms that could protect the hellbender from both direct and indirect habitat destruction and modification—including the Clean Water Act, NEPA, and Corps regulations—have been hollowed out by legal exemptions, flawed general permits, and empty emergency authorities, which are now set to become the norm for water projects across the hellbender's range. These regulatory mechanisms are thus insufficient to address the myriad

---

[142] SSA at 63.
[143] *See* Complaint, *Am. Whitewater v. U.S. Army Corps of Eng'rs*, 1:24-CV-00284-MR-WCM (Nov. 18, 2024).
[144] Exec. Order Declaring a National Energy Emergency (Jan. 20, 2025).
[145] Exec. Order Unleashing American Energy (Jan. 20, 2025).
[146] Exec. Order Declaring a National Energy Emergency (Jan. 20, 2025). The executive order also purports to order agencies to use ESA emergency authorities "to facilitate the Nation's energy supply" for an unspecified amount of time. *Id.* at Sec. 5. Even if this directive were valid, ESA implementing regulations require emergency consultations to be "consistent with the requirements of sections 7(a)-(d) of the" ESA. 50 C.F.R. § 402.05(a). Among other things, these sections require agencies to avoid jeopardizing listed species or destroying designated critical habitat. *See* 16 U.S.C. § 1536(a)(2).
[147] 33 C.F.R. § 230.8.
[148] Gov. Josh Stein, Exec. Order #2 – Timely Repairing Roads and Bridges (Jan 2, 2025) (Attachment 60).

threats that have put and continue to put the eastern hellbender at risk of extinction. As such, the ESA requires the Service to list the eastern hellbender as an endangered species, in accordance with the best available science. Furthermore, affording endangered species status to the hellbender will meaningfully address these threats by requiring agencies and project proponents to thoughtfully consider the impacts of their activities, and develop mitigation and avoidance measures as appropriate, before blindly charging ahead with mining, pipeline construction, OHV trail development, or other harmful actions in hellbender habitat. The various safeguards that the Endangered Species Act provides will act as unique and necessary tools to avoid the widespread killing of hellbenders and despoliation of their habitat.

E. Climate Change and Stochastic Events

The increasing risks of climate change impacts further compound many existing threats to hellbenders. The Intergovernmental Panel on Climate Change reports that human activities are estimated to have already caused approximately 1.1°C (1.98°F) of global warming above pre-industrial levels, and global warming is likely to reach 1.5°C (2.7°F) between 2030 and 2052 if temperatures continue to increase at the current rate.[149] Indeed, 2024 ranked as the warmest or second-warmest year on record for every state within the current range of the Eastern hellbender.[150] Climate change is predicted to significantly transform habitats throughout the hellbender's range, and is linked to an increased risk of severe stochastic weather events, such as Hurricane Helene, which can independently devastate hellbender populations and demolish important stretches of hellbender habitat.

i. Climate Change in the Southeast

Climate change is already affecting and will continue to affect the South in a myriad of ways, including: higher temperatures, extreme precipitation, increased drought, more frequent and intense wildfires, rising sea levels, increased flooding, higher invasive species prevalence, and increased storm severity.[151] These risks are especially pronounced for eastern hellbenders, which require very specific habitat conditions, including cool and fast-flowing water, to

[149] Intergovernmental Panel on Climate Change, *Climate Change 2023 Synthesis Report: Summary for Policymakers*, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_SPM.pdf (Attachment 61). The current 2024 SSA for the eastern hellbender utilizes climate change data from the IPCC's 2014 report. SSA at 47. Compared to the 2014 report, the 2023 report includes updated predictions, data, and studies which collectively contribute to the report's description of an increasingly dire situation. For example, compared to the 2014 report, the 2023 report predicts increased global "high risks" at lower levels of warming than previously predicted. Intergovernmental Panel on Climate Change, *Climate Change 2023 Synthesis Report*, https://www.ipcc.ch/report/ar6/syr/downloads/report/IPCC_AR6_SYR_FullVolume.pdf, at 75 (Attachment 62). The increasingly rapid deterioration of our climate that is explained in the 2023 report appears likely to continue in the coming years. For instance, coal, oil, and gas production are by far the largest contributors to climate change. *See id*. The recent Executive Order declaring an energy emergency pledges to dramatically increase coal, oil, and gas production in the United States. The White House, "Declaring a National Energy Emergency," January 20, 2025. While the specific effects of this remain to be seen, the approach appears destined to further exacerbate climate change and therefore accelerate many threats to hellbenders.

[150] NOAA National Centers for Environmental Information, Monthly National Climate Report for Annual 2024 (Jan. 2024), https://www.ncei.noaa.gov/access/monitoring/monthly-report/national/202413 (Attachment 63).

[151] USGCRP, *Fifth National Climate Assessment*, U.S. Global Change Research Program, Washington, DC, USA, (A.R. Crimmins et al., eds.2023), https://doi.org/10.7930/NCA5.2023, at Ch. 8 (Attachment 64), Ch. 22 (Attachment 65).

thrive.[152] Climate change is expected to affect several of these habitat conditions: namely, it will likely result in higher stream temperatures and lower summer stream-flows.[153] Higher stream temperatures will reduce dissolved oxygen levels, which will contribute to and exacerbate existing water quality risks.[154] Optimal hellbender growth rates occur at water temperatures of approximately 14–17°C; detrimental impacts occur both from winter cold stress and from elevated summer water temperatures; the latter is associated with reduced growth rates and lower body mass in the fall breeding season, which could reduce breeding success and in turn, population stability.[155]

The eastern U.S. is also projected to experience more extremes of both high and low stream flow.[156] Lower summer stream-flows will affect the character of waterways, likely reducing the availability of in-stream habitat. Both changes are extremely problematic for hellbenders.[157] In addition to temperature increases in downstream reaches, many streams in the southern Appalachians are projected to be impacted by increasing acidity in their upper, cooler reaches, due to atmospheric deposition of nitrogen and sulfur and low buffering capacity of the region's rocks and soils; these two factors are projected to act synergistically to constrain the suitable habitat of coldwater species even further.[158] A climate vulnerability analysis based on predictions of changing climatic suitability, landscape integrity, and land protection status found that the eastern hellbender is moderately to highly vulnerable to climate change over its entire range; in particular, climate suitability in many of the species' current strongholds in the southern Appalachians is likely to substantially decrease by 2050-2070.[159]

The potential for climate change to interact with and exacerbate the threat from diseases is also of concern. As described above, *see* section II(C), the impact to hellbenders from chytrid fungus infection by pathogens *Bd* and *Bsal* is not well understood. Research on other amphibians around the world suggests that increases in water temperature[160,161] and patterns of extreme climate events like cycles of flooding and drought,[162] both cause increased susceptibility to

---

[152] SSA at 15.
[153] *Id.* at 47–48.
[154] *Id.*
[155] K.A. Terrell et al., *Physiological impacts of temperature variability and climate warming in hellbenders* (Cryptobranchus alleganiensis), 9 Conservation Physiology (2021), https://doi.org/10.1093/conphys/coab079 (Attachment 66).
[156] B.S. Naz et al., *Effects of climate change on streamflow extremes and implications for reservoir inflow in the United States*, 556 J. of Hydrology 359–70 (2018), https://doi.org/10.1016/j.jhydrol.2017.11.027 (Attachment 67).
[157] SSA at 47–48.
[158] T.C. McDonnell et al., *Downstream Warming and Headwater Acidity May Diminish Coldwater Habitat in Southern Appalachian Mountain Streams*, 10 PLoS ONE 0134757 (2015), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0134757 (Attachment 68).
[159] W.B. Sutton et al., *Climatic and landscape vulnerability of the eastern Hellbender salamander* (Cryptobranchus alleganiensis alleganiensis), 46 Global Ecology and Conservation 02554 (2023), https://doi.org/10.1016/j.gecco.2023.e02554 (Attachment 69).
[160] P.W. Bradley et al., *Shifts in temperature influence how Batrachochytrium dendrobatidis infects amphibian larvae*, 14 PLoS One 0222237 (2019), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0222237 (Attachment 70).
[161] Jaime Bosch et al., *Climate change and outbreaks of amphibian chytridiomycosis in a montane area of Central Spain*; 274 Proc, Biological Sci. 253–60 (2007), https://pmc.ncbi.nlm.nih.gov/articles/PMC1685858/ (Attachment 71).
[162] Thais Sasso et al., *Extreme climatic events modulate chytrid infection across the landscape*, 296 Biological Conservation 110702 (2024), https://doi.org/10.1016/j.biocon.2024.110702 (Attachment 72).

chytrid fungus. Similarly, *Ranavirus* infections in frogs have also been found to increase in severity at higher temperatures.[163,164] Thus, disease and climate change could have a synergistic effect that further drives hellbender population declines.

Compounding the issue even further, hellbenders are unlikely to be able to shift to more suitable habitats in pace with the changes brought by global warming. For one, hellbenders exhibit high site fidelity and have limited mobility.[165] Further, the pre-existing issues of development and urban sprawl in the region will almost certainly hamper the ability of the species to move in response to threats. Finally, as noted above, impoundments which are prevalent across the southeast restrict hellbender movement.[166] In sum, with their range already rapidly waning, climate change stands to intensely alter the amount of suitable habitat that exists for hellbenders while simultaneously leaving few means for them to withstand the changes.

ii. Stochastic Climate Events

In addition to these broader climactic changes, hellbenders will also suffer from the occurrence of stochastic climate events such as flooding and increasingly severe storms which are projected to become more frequent with climate change.[167] Such weather events directly imperil hellbenders by mobilizing large rocks and destabilizing habitat.[168] Additionally, flooding will exacerbate water quality threats by adding significant amounts of sediment and other forms of physical pollution to waterways.[169] Similarly, increased amounts of stormwater runoff will collect a wide array of pollutants—ranging from agricultural pesticides to harmful chemicals found in structures affected by weather events—which will then enter waterways and, as explained above, can cause mortality of hellbenders.

These effects need not be imagined. Hurricane Helene, which passed over Western North Carolina as a tropical storm on September 27, 2024, brought a catastrophic 31 inches of rain to the hardest hit parts of the region and set record-breaking flood levels for several rivers.[170] Many streams, specifically, the Nolichucky River subbasin—including the North Toe River, the South Toe River, and the Cane River—the Watauga River, and the Upper French Broad subbasin, which were known to contain robust hellbender populations, sustained severe damage. Surveys

[163] Mabre Brand et al., *Water Temperature Affects Susceptibility to Ranavirus*, 13 EcoHealth 350–359 (2016). https://doi.org/10.1007/s10393-016-1120-1 (Attachment 73).
[164] Stephen Price et al., *Effects of historic and projected climate change on the range and impacts of an emerging wildlife disease*, 25 Glob Change Biology 2648–2660 (2019), https://doi.org/10.1111/gcb.14651 (Attachment 74).
[165] SSA at 47–48; *see also supra* note 69 (Attachment 27).
[166] SSA at 19.
[167] *See* Nantahala-Pisgah Forest Plan Final Environmental Assessment, 3-20 to 3-21, *supra* note 43 ("The potential for severe storms is expected to increase in the future, including more intense hurricanes making landfall in the southern US, with potential increases in flooding and landslides in mountainous landscapes. [ ] Increases in heavy downpours and more intense hurricanes can lead to greater erosion and more sedimentation in our waterways.").
[168] *See* SSA at 54 (noting that in the MACU in particular, severe floods and their associated destabilizing impact on habitat are projected to increase).
[169] *See id.* at 38 ("flood disturbance of benthic structure in streams, especially smaller streams, can lead to reduced recruitment because larval Eastern Hellbenders are dependent on gravel and cobble substrates").
[170] Hurricane Helene's impacts were exacerbated by heavy rains which inundated the region for days prior to the storm. In this way, even unnamed and more "ordinary" weather events can cause or contribute to serious flooding and the resulting habitat impacts.

completed after the storm have revealed extremely diminished hellbender populations in a region which was historically a stronghold for hellbenders.

The severe flooding associated with the storm caused significant erosion and changed the flow and structure of rivers.[171] In rivers across western North Carolina and eastern Tennessee, hellbender nest and cover rocks were destroyed, crushed, and rendered unusable on a far greater scale than from any previously documented event. A large number of reports have been made documenting hellbenders that died during the storm, including several animals which were found more than 50 feet away from the nearest river.[172] Relatedly, several hellbenders were found in the mud hundreds of feet from the nearest river and were reported to have been catatonic until put back in the river.[173] Several more displaced hellbenders have been found wandering along roadsides and living in flooded basements.[174]

Additionally, an extreme number of trees were uprooted during the storm, destabilizing banks and shifting the ecological condition of several sites near where significant hellbender populations had previously been documented.[175] These changes are likely to contribute to ongoing sedimentation and water quality concerns, *see supra* II(A)(i), and to negatively impact conditions for hellbender persistence and survival.

III. THE EASTERN HELLBENDER REQUIRES CRITICAL HABITAT PROTECTIONS

In enacting the ESA, Congress recognized that habitat loss is the primary driver of species extinction in the United States and around the world.[176] To address this, the ESA requires that whenever the Service lists a species as endangered or threatened, it must also designate areas for protection as critical habitat that are important to the conservation and recovery of the species.[177] Critical habitat may include areas that are not currently occupied by the species in addition to occupied areas.[178] The term critical habitat is defined by statute to mean—

> "(i) the specific areas within the geographical area occupied by the species, at the time it is listed . . . on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and
>
> (ii) specific areas *outside* the geographical area occupied by the species at the time it is listed . . . upon a determination by the Secretary that such areas are essential for the conservation of the species."[179]

---

[171] ARC Helene Letter at 3.
[172] *See id.* at 4 (discussing a perennial nesting site which housed 20–35 hellbenders prior to Hurricane Helene but now has no documented hellbenders).
[173] ARC Helene Letter at 9.
[174] *Id.* at 16–17.
[175] *See id.* at 6.
[176] *See* H.R. Rep. 93-412, at 5 (1973) ("The most significant [way in which man can threaten the existence of species of plants and animals] has proven also to be the most difficult to control: the destruction of critical habitat.").
[177] *See* 16 U.S.C. § 1533.
[178] *Id.* § 1532(5).
[179] *Id.* § 1532(5)(A) (emphasis added).

The ESA requires the Service to use the best available science to determine which habitat areas are critical to the conservation and recovery of listed species, 16 U.S.C. § 1533(b)(2), and the Service has repeatedly acknowledged that "[i]dentification of the habitat needs of listed species and the conservation of such habitat is *the key to recovering* endangered and threatened species."[180]

Here, the Service has found that the most severe threats to the eastern hellbender come from the destruction and degradation of its aquatic habitat via sedimentation, water quality degradation, and direct habitat destruction and degradation. Despite this, the Service also determined that it is "not prudent" to designate critical habitat for the eastern hellbender, due to the threat of unauthorized collection and trade faced by the species.

While we appreciate the Service's concern with protecting hellbenders from collection, we find that here the conservation benefit to the eastern hellbender of a critical habitat designation outweighs the perceived threat of collection, making it inappropriate for the Service to invoke the application of the "not prudent" exception to the critical habitat mandate on this basis. The legislative history of Section 4(a) of the ESA makes clear that critical habitat should be designated whenever it is in the "best interest of the species to do so." H. Rept. No. 95-1625, 95th Cong. 2d Sess. 16 (1978). 40 Fed. Reg. 13022, 13014 (Feb. 27, 1980). The ESA thus allows for the Service to forego the mandated designation of critical habitat only in limited narrow circumstances when the designation of critical habitat would *not* be in the best interest of the species. Such circumstances could result, for example, if the Service determines that the "species is threatened by taking or other human activity and identification of critical habitat can be expected to increase the degree of such threat to the species." 50 C.F.R. § 424.12(a).

Here, the Service has expressed concerns that eastern hellbenders are threatened by unauthorized collection for the pet trade and that hellbenders' sedentary nature and fidelity to relatively small home ranges make them easy marks for capture. However, the Service has provided primarily decades-old anecdotal evidence of advertisements listing hellbenders for sale, rather than recent numeric data or estimates. Numeric data presented by the Service on collection from the Susquehanna and Alleghany River systems between 1750 to 1940 should not be assumed to accurately reflect current collection levels.[181]

Similarly, a large portion of the hellbender collection noted by the Service was for scientific study, rather than for the pet trade—the paper cited by the Service on the collection of Ozark hellbenders between 1969-1989 estimated that 50% were collected for scientific study.[182] Because scientific researchers are very likely to already know where to find hellbenders, and because scientific research can be legally permitted under Section 10 of the ESA, it is unreasonable for the Service to cite scientific collection statistics as part of its rationale for claiming that the designation of critical habitat would be detrimental to the species. Similarly, motivated collectors today already have access to other resources, such as citizen science reporting and online forums, to inform them of where hellbenders have been observed.

[180] Notice of Intent to Clarify the Role of Habitat in Endangered Species Conservation, 64 Fed. Reg. 31,871 (June 14, 1999).
[181] SSA at 43.
[182] *Id.* (citing Nickerson and Briggler 2007, p. 208).

To determine whether the designation of critical habitat is in fact "prudent," any collection risk created by a critical habitat designation should also be weighed against the likely benefit of critical habitat designation to the species. As discussed above, hellbenders are threatened by water quality degradation from multiple sources, including development and silviculture. The designation of critical habitat would improve the utility and efficacy of the Section 7 consultation process for federally permitted projects affecting hellbender habitat across its range, including for pipelines, road construction, national forest management, and silviculture. The consultation process could then ensure the application of best management practices to limit runoff and sedimentation and can provide better protections against direct habitat modification from in-stream gravel and rock mining, ORV trails, and other activities that directly alter the rocky substrate of river bottoms. The Service has given no rationale to support a conclusion that these and other benefits of critical habitat designation would be outweighed by the perceived risk of collection.

Furthermore, even if the designation of critical habitat would potentially increase some risk of illegal commercial collection, this risk can be sufficiently mitigated by designating river reaches at an appropriate scale so as not to disclose the exact location of hellbender nesting sites or other hotspots. For example, the Service has already designated critical habitat at a watershed or subwatershed level for other listed aquatic species.[183] Indeed, guidance from the Environmental Protection Agency uses presence/absence data at the subwatershed (HUC-12) level to evaluate the agency's consultation responsibilities.[184] Critical habitat for the eastern hellbender could therefore be designated as all streams within any watershed (HUC-10) or subwatershed (HUC-12) occupied or likely occupied by the species. This designation would be sufficiently broad to mitigate risks of illegal collection while better addressing watershed-level threats than more limited stream designations.

At minimum, the Service should designate subwatersheds (HUC-12) that have traditionally supported robust hellbender populations, contain the best examples of physical and biological features necessary to support all hellbender lifestages, are known to host unique genetic lineages of hellbenders, and/or may be particularly important to reintroducing or translocating hellbenders to support the species' recovery.

In western North Carolina, for example, we particularly encourage the Service to consider designating watersheds (HUC-10) or subwatersheds (HUC-12) within: the Hiwasee River and Ocoee River Subbasins of the Hiwasee River Basin (e.g. within the Tusquitee Creek and Spring Creek HUC-10 Watersheds); the Upper Little Tennessee, Lower Little Tennessee, and Tuckasegee River Subbasins of the Little Tennessee River Basin (e.g. within the Fontana Lake, Cheoah River, Lower Tuckasegee River, Oconaluftee River,[185] Abrams Creek, and Little

---

[183] *See, e.g.*, 88 Fed. Reg. 25,512, 25,539 (Apr. 27, 2023) ("Critical habitat was delineated by including all streams within subwatersheds (at the 12-digit hydrologic unit level) occupied by the Big Creek crayfish."); 81 Fed. Reg. 59,046, 59,068 (Aug. 26, 2016) ("Watershed boundaries or other topographic features were utilized as the [mountain yellow-legged frog critical habitat] boundary when they provided for the maintenance of the hydrology and water quality of the aquatic system"); *Id.* at 59,070 (same delineation for Yosemite toad critical habitat).
[184] U.S. Env't Prot. Agency, *Critical Habitat for Aquatic Species* (2022), https://www.epa.gov/system/files/documents/2022-03/critical-habitat-indicator-reference-sheet-20220306.pdf (Attachment 75).
[185] For the Oconaluftee River and other waterbodies that pass through tribal lands, these recommendations do not extend to the designation of lands and water under tribal jurisdiction. We defer to the intergovernmental consultation process for such determinations.

River HUC-10 Watersheds); the Upper French Broad, Pigeon River, and Nolichucky River Subbasins of the French Broad River Basin (e.g. within the French Broad River Headwaters, Davidson River, Mills River, Pigeon River Headwaters, Little Pigeon River, Cataloochee Creek, Richland Creek, South Toe River, North Toe River, and Cane River HUC-10 Watersheds); the Upper New River Subbasin of the New River Basin (e.g. within the North Fork and South Fork HUC-10 Watersheds); and the Watauga River Basin (e.g. within the Doe River, Elk River, and Watauga Lake HUC-10 Watersheds). We further recommend that the Service consider designating watersheds (HUC-10) or subwatersheds (HUC-12) within any of the foregoing river basins where they occur in Tennessee, Virginia, or Georgia, as well as surrounding watersheds that host hellbender populations in those states, including, but not limited to, the South Fork Holston, Holston, Clinch, Middle New, Upper New, Watts Bar Lake, and Middle Tennessee River Subbasins.

In addition to designating all occupied habitat areas that meet the definition of critical habitat within each of the four adaptive capacity units, we further encourage the Service to designate as critical habitat areas that will be important to supporting captive releases or translocations of hellbenders to repopulate declining or extirpated streams,[186] as well as supporting the species' capability to adapt to climate-induced range shifts. [187] For example, the Service could consider designating critical habitat in less densely populated ecoregions at the edge of the hellbender's range, such as in the Mississippi Valley Loess Plains and Southeastern Plains ecoregions, as studies have found that peripheral populations are often more tolerant to environmental variation and therefore represent important populations for future dispersal and climate change adaptation.[188]

As streams with the clean, cool fast-moving water and rocky substrate needed to support hellbenders' recovery and survival become increasingly rare,[189] it is all the more imperative that the Service fulfill its statutory obligation to protect these areas as critical habitat for the species. Providing better habitat conditions and protecting habitat from degradation can have the synergistic protective effect of reducing exogenous stressors on individual hellbenders, bolstering individual fitness and helping members of hellbender populations to be more resilient to suites of other threats that are inherently unpredictable or difficult to control, including disease outbreaks and climate-related changes in water temperature and flow patterns. Such designations may be particularly important to retaining genetic diversity from the smallest metapopulations that are most vulnerable to stochastic losses, such as in the Kanawha River drainage.[190] Because the eastern hellbender is in danger of extinction due to the degradation of its aquatic habitat from an array of sources, it is imperative that conservation efforts for the hellbender center on the protection of that habitat through critical habitat designations.

---

[186] *See* Bradley Nissen et al., *Evaluating translocation success of wild Eastern Hellbenders* (Cryptobranchus alleganiensis alleganiensis) *in Blue Ridge Ecoregion streams using pre- and post-translocation home range sizes and movement metrics*, 18 Plos ONE 0283377 (2023), https://ag.purdue.edu/department/extension/hellbender/_docs/nissen-evaluating-translocation-success-ada.pdf (Attachment 76).
[187] *See* Sutton et al. (2023), *supra* note 159.
[188] *Id.*
[189] *See, e.g.*, SSA at 53.
[190] *See id.* at 65.

IV. Conclusion

We support the Service's proposal to list the eastern hellbender as endangered and provide the species with much-needed protections under the ESA. As illustrated in these comments, the threats that put the eastern hellbender at risk of extinction across its range are starkly apparent in the Southern Appalachians, where our organizations work. Additionally, the devastating effects of Hurricane Helene on the species' prior strongholds in Western North Carolina and East Tennessee have pushed eastern hellbender populations even further towards extinction in the time since the Service completed its most recent species status assessment for the species. We urge the Service to account for these recent population losses and to closely consider threats to hellbender habitat and designate critical habitat for the species accordingly. We look forward to working with the Service to conserve and restore hellbender populations in the Southeast.

Sincerely,

Elizabeth Rasheed
Staff Attorney

Alyson Merlin
Staff Attorney

Spencer Scheidt
Staff Attorney

Abigail Hunt
Associate Attorney

On behalf of:

Alabama Rivers Alliance
Charles Miller
Policy Director

Amphibian Foundation
Mark Mandica, M.Sc
Executive Director

Allegheny-Blue Ridge Alliance
Dan Shaffer
Executive Director

Appalachian Voices
Willie Dodson
Coal Impacts Program Manager

American Rivers
Erin McCombs
Director, Southeast Conservation

Cherokee Forest Voices
Catherine Murray
Director

Coosa River Basin Initiative
Jesse Demonbreun-Chapman
Executive Director & Riverkeeper

Defenders of Wildlife
Ben Prater
Director Southeast Program

Dogwood Alliance
Treva Gear, Ed.D.
Georgia Campaign Manager

Environment Georgia
Jennette Gayer
State Director

Flint Riverkeeper
S. Gordon Rogers IV
Riverkeeper & Executive Director

Georgia Conservation Voters
Brionté McCorkle
Executive Director

Georgia ForestWatch
Maria Klouda
Acting Executive Director

Georgia Interfaith Power and Light
Codi Norred
Executive Director

Georgia Rivers
Rena Ann Peck
Executive Director

Georgia WAND
Kim Scott
Executive Director

Harpeth Conservancy
Grace Stranch
Chief Executive Officer

Highlanders for Responsible Development
Rick Lambert
President

MountainTrue
Gray Jernigan
Deputy Director & General Counsel

National Parks Conservation Association
Jeff Hunter
Southern Appalachian Director

North Carolina Chapter of the Sierra Club
Erin Carey
State Conservation Policy Director

North Carolina Wildlife Federation
Manley Fuller
Vice President of Conservation Policy

Ogeechee Riverkeeper
Damon Mullis
Riverkeeper and Executive Director

One Hundred Miles
Megan Desrosiers
President and Chief Executive Officer

Poder Latinx
Leslie Palomino
Georgia State Director

Satilla Riverkeeper
Shannon Gregory
Riverkeeper

Savannah Riverkeeper
Tonya Bonitatibus
Executive Director

Science for Georgia
Amy Sharma, PhD
Executive Director

Sierra Club
Ben Greuel
National Wildlife Campaign Manager

Tennessee Chapter of the Sierra Club
Axel Ringe
Water Quality Chair

The Clinch Coalition
Wally Smith
Vice President

The Wilderness Society
Jill Gottesman
Southeastern States Director

Virginia Conservation Network
Pat Calvert
Director,Water & Land Conservation Programs

Virginia Wilderness Committee
Ellen Stuart-Haentjens
Executive Director

Watauga Riverkeeper
Andy Hill

Waterkeeper Alliance
Daniel E. Estrin
General Counsel and Legal Director

West Virginia Highlands Conservancy
Marilyn Shoenfeld
President

Wild Alabama
Heather Tucker
Executive Director

Wild Virginia
David Sligh
Conservation Director