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THE SNAKEHEAD WAR: ADMINISTRATIVE RULE- MAKING AND LEGISLATIVE STRATEGIES TO MINIMIZE DESTRUCTION BY THE NORTHERN SNAKEHEAD

JOSHUA RICE*

INTRODUCTION: THE HORROR STORY IN OUR MIDST

A. *The Snakehead: A Narrative*

It's a sunny day. The weather is perfect, the water is warm, the wind is blowing, and picnic supplies are on sale. All along the Eastern Coast of the United States, people flock to their nearest pond for a day of relaxation and frolicking in perfect conditions. However, unknown to most of the adventurers, conditions are far from perfect. Just below the water, a menace preys. Large, hostile, and nearly reptilian, the monster lurks, eating native species, and gnawing on the heels of visitors. Somewhere, in the deep end of any given pond, somebody shrieks and swims for the shore, positive a monster targeted them. And they're not without justification. Something bit them. Something ugly. Something out of a nightmare. Enter: the *northern snakehead*.

The northern snakehead (*Channa argus* in binomial nomenclature) nips at your heels.¹ The northern snakehead eats your state's fish.² Like some kind of Lovecraftian vacuum, the snakehead bites with vampiric teeth, eats, breeds, and repeats.³

B. *Their Biology, Behavior, and Bad Attitude*

The snakeheads of issue in America belong to the *Channa* genus, indicating their Asian origins.⁴ Two species of snakeheads are of particular

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¹ IN. DEPT OF NAT'L RES., AQUATIC INVASIVE SPECIES: SNAKEHEAD 1, 4 (2005), *available at* <http://www.in.gov/dnr/files/SNAKEHEADS.pdf> [<https://perma.cc/K4BP-PXU8>] ("There is also a threat to humans. At least one species . . . has been known to attack humans . . .").

² *Id.* at 4.

³ *Id.* at 3–4.

⁴ *Id.* at 1.

issue, and this Note will focus on the aforementioned northern snakehead, but it will occasionally mention the bullseye snakehead (*Channa marulius*).⁵ In general, snakeheads are large freshwater fish with many species on average measuring several feet at adulthood.⁶ Unlike most fish, snakeheads rise to the surface to breathe air, and even more peculiar, this ability allows them to travel over land for short distances.⁷ Accordingly, snakeheads can introduce themselves to new bodies of water, provided they are within “walking” distance.⁸ Pesky, resilient, and predatory, the northern snakehead’s unique characteristics make it an enemy of native fish and their habitats.⁹

The northern snakehead’s growth, like any animal, is affected by its environment, but across the Atlantic coast, observers can consistently expect to see adult snakeheads hovering around three feet in length.¹⁰ Though this may seem relatively diminutive when compared to other large fish, the northern snakehead can tip the scales at over 15 pounds; in fact, a Virginia man caught a world-record snakehead, officially measured at 17 pounds, 6 ounces.¹¹ These giants compete for territory with other fish, especially those native to North America, including anglers’ favorites like largemouth bass, crappie, and various other panfish.¹² For the most part, bullseye snakeheads exhibit the same characteristics; the most apparent difference between the species is coloration: bullseyes have scales forming large colored spots.¹³

⁵ WALTER R. COURTENAY, JR. & JAMES D. WILLIAMS, SNAKEHEADS (PISCES, CHANNIDAE)—A BIOLOGICAL SYNOPSIS AND RISK ASSESSMENT 83 (U.S. GEO. SURVEY 2004) (The bullseye snakehead is worth examining because it poses similar, but distinct policy and ecological issues in Florida, which is also similarly affected by northern snakeheads.).

⁶ U.S. FISH & WILDLIFE SERV. DIV. OF ENVTL. QUALITY, BRANCH OF INVASIVE SPECIES, INVASIVE SPECIES PROGRAM SNAKEHEADS—THE NEWEST AQUATIC INVADER (July 2002).

⁷ *Id.*

⁸ *Id.* (“[T]hese fish are air-breathers and are capable of overland migration.”).

⁹ *Id.*

¹⁰ SNAKEHEAD SCIENTIFIC ADVISORY PANEL, FIRST REPORT TO THE MARYLAND SECRETARY OF NATURAL RESOURCES (July 2002). The estimate of “around three feet” comes from data specific to Maryland, where the Department of Natural Resources cites them to be just below that figure. *Id.*

¹¹ Bill Chappell, *World-Record Snakehead Fish Caught in U.S.*, NAT’L PUB. RADIO (Aug. 8, 2013), <http://www.npr.org/blogs/thetwo-way/2013/08/08/210141705/world-record-snakehead-fish-caught-in-u-s> [<https://perma.cc/GW9P-XPAE>].

¹² Frank Jernejcic, *Attack of the Alien Invaders*, W.VA. WILDLIFE MAG. (2004), http://www.wvdnr.gov/wildlife/magazine/Archive/04Summer/Attack_of_the_Alien_Invaders.shtm [<https://perma.cc/6T9W-KJUB>]. “When transplanted to other waters, however, they can cause problems for native organisms by altering habitats, introducing diseases, creating excessive competition for food and space, or diluting gene pools through hybridization.”

¹³ COURTENAY & WILLIAMS, *supra* note 5, at 83.

C. *The Problem*

Simply put, snakeheads eat a lot, and they're not exactly discerning diners.¹⁴ Feeding on everything from perch, to bugs, frogs, and even mammals, snakeheads are opportunists and will devour whatever they can to maintain their energy.¹⁵ Immediately, this causes stress on native species; more competition for food means fewer of any given species can maintain their numbers while another species increases.¹⁶ For example, assuming one adult northern snakehead eats as much as one largemouth bass, one will either have to forgo its current food source, find an alternative, or perish.¹⁷ Critics of the plan to reduce snakeheads cry out, saying that if one species is more dominant, so be it.¹⁸

However, the trouble doesn't end at displacement of fish, or even their populations dropping. Diminishing fish populations are only the first link in an environmental chain culminating in both ecological and economic damage.¹⁹ Obviously, fish serve more purposes to humans than just being a food source. In the United States, fishing generates billions of dollars for state governments, private captains, and fisheries.²⁰ Perhaps the most direct example of the snakeheads' destructive nature is their effect on fishermen. As snakeheads devour and displace native fish, local anglers have less incentive to fish, which reduces the market for fish, and hurts license and permitting sales, a massive source of income for many state agencies.²¹

Beyond their ecological effects, the snakeheads' aggressive nature hurts people personally.²² Though this is a minor concern, scientists

¹⁴ NAT'L BIO. INFO. INFRASTRUCTURE & IUCN/SSC INVASIVE SPECIES SPECIALIST GRP., CHANNA ARGUS (FISH) (2009), [http://www.issg.org/database/species/ecology.asp?si=380&fr=1&sts=\[https://perma.cc/EL9L-D9GB\]](http://www.issg.org/database/species/ecology.asp?si=380&fr=1&sts=[https://perma.cc/EL9L-D9GB]) ("[P]rey often consisting of loach, bream, carp and perch.").

¹⁵ *See id.*; *see also* AQUATIC INVASIVE SPECIES, *supra* note 1, at 3.

¹⁶ *See generally* Carrie Arnold, *Are All Invasive Species Bad?*, U.S. NEWS (Aug. 31, 2011), <http://www.usnews.com/science/articles/2011/08/31/are-all-invasive-species-bad> [<https://perma.cc/K6EY-7CKG>].

¹⁷ *See generally* AQUATIC INVASIVE SPECIES, *supra* note 1.

¹⁸ Arnold, *supra* note 16.

¹⁹ SNAKEHEAD SCIENTIFIC ADVISORY PANEL, *supra* note 10.

²⁰ *See* U.S. FISH & WILDLIFE SERVICE, 2011 NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE-ASSOCIATED RECREATION 5 (2011), *available at* <https://www.census.gov/prod/2012pubs/fhw11-nat.pdf> [<https://perma.cc/H9ML-ME3J>].

²¹ *Id.*

²² WASH. INVASIVE SPECIES COUNCIL, NORTHERN SNAKEHEAD, <http://www.invasivespecies.wa.gov/priorities/snakehead.shtml> [<https://perma.cc/7TGT-UASG>] (last visited Mar. 27, 2016) [hereinafter WASH. INVASIVE SPECIES COUNCIL].

have reported snakeheads biting at humans in order to protect their eggs; because snakeheads may breed year-round, the risk of biting is ever present.²³ There are no reports of fatal snakehead attacks, but their temperament is just another negative aspect to an invasive species that has no place in North America's ecosystems.²⁴ In addition to the physical danger of biting, snakeheads also introduce *other* new species, mostly bacteria.²⁵ Washington State's government put it succinctly: "Northern snakehead fish are voracious eaters that prey on fish, crustaceans, frogs, insects, small reptiles, birds, and mammals, with significant impacts to food chains and ecosystems. *Adults may attack humans who approach young.* These fish also can introduce diseases and parasites."²⁶

With dangers stemming from their behavior, microbial hitchhikers, and massive appetite, snakeheads pose a problem the United States desperately needs to solve.²⁷

D. Solutions

Across the United States, as far south (and east) as Florida, north as Maryland, and west as California, snakeheads keep popping up.²⁸ Each state with an established snakehead population has identified the species as a problem; however, state-by-state approaches vary greatly.²⁹ There is no national uniform system for eliminating snakeheads from state waters, and some states take the issue much more seriously than others.³⁰ States like Maryland ask for the absolute destruction *on sight* of the fish; other states suggest that anglers catching the fish report their catch.³¹ Some

²³ See *id.*

²⁴ See VA. DEP'T OF GAME & INLAND FISHERIES, *Northern Snakehead—Frequently Asked Questions*, <http://www.dgif.virginia.gov/fishing/snakehead-faq.asp> [<https://perma.cc/A7XM-JQ7T>] (Sept. 23, 2014).

²⁵ ANS TASK FORCE, NORTHERN SNAKEHEAD, <http://www.anstaskforce.gov/spoc/snakehead.php> [<https://perma.cc/HKP2-UA3R>] (last visited Mar. 27, 2016) [hereinafter ANS TASK FORCE].

²⁶ WASH. INVASIVE SPECIES COUNCIL, *supra* note 22 (emphasis added).

²⁷ *Id.* Alaska's government writes that, even though the fish is not in Alaska, its citizens "should care." *Id.*

²⁸ U.S. GEO. SURVEY, NORTHERN SNAKEHEAD—POINT MAP (Feb. 2015), available at <http://nas.er.usgs.gov/taxgroup/fish/northernsnakeheaddistribution.aspx> [<https://perma.cc/TX3U-PJWJ>] (map of snakehead sightings and catches).

²⁹ See, e.g., WASH. INVASIVE SPECIES COUNCIL, *supra* note 22; see also MD. CODE REGS. 08.02.19.06(D) (2015) (evidence that Alaska now has laws on the snakehead, and Maryland has a regulation specifically for them as well).

³⁰ *Id.*

³¹ Compare MD. FISHERY RES. OFFICE, *Northern Snakehead (Channa argus)* (2012), available at <http://dnr2.maryland.gov/fisheries/Pages/snakehead.aspx> [<https://perma.cc>

states have no internal policies at all.³² The states taking the latter approach most likely do so for two main reasons: (1) they may not have realized the threat snakeheads posed, due to their absence from the state or failure to notice, and (2) they assume that snakeheads do not yet pose a threat, based on the states' respective geographic locations and positioning of their water bodies.³³

States fall into three broad categories in regard to snakehead destruction. For the purposes of this Note, they fall into the following designations: (1) indifference, meaning no rule-making regarding snakeheads occurs in the state(s), (2) authorized destruction, meaning that people are allowed to take the snakeheads and kill them with few or no restrictions, and (3) compulsory destruction, which mandates people kill the fish upon capture; generally, states falling into this category also disallow the possession of snakeheads.³⁴

Like in any ecosystem, such a disparate mix of approaches cannot live in harmony. Lawmakers have the ability to fight the snakehead invasion with rule-making.³⁵ States must utilize their respective natural resources administrations to mandate the destruction of snakeheads *under any circumstances*. The Maryland Department of Natural Resources, Virginia Department of Game and Inland Fisheries, Florida Fish and Wildlife Conservation Commission, and all other snakehead-infected states alike must make strict, absolute rules mandating the destruction of the fish upon capture.

Such a goal will not be easy to achieve.³⁶ Therefore, states and their administrations should make an effort to incentivize destruction of

/54PW-FQAG], with *Northern Snakehead—Chesapeake Bay Program*, CHESAPEAKEBAY.NET, http://www.chesapeakebay.net/fieldguide/critter/northern_snakehead [https://perma.cc/A893-PK5K] (last visited Mar. 27, 2016).

³² See generally NAT'L INVASIVE SPECIES INFO. CTR., *Invasive Species: Aquatic Species—Northern Snakehead (Channa argus)* (Feb. 24, 2015), <http://www.invasivespeciesinfo.gov/aquatics/snakehead.shtml> [https://perma.cc/H3C3-UBS9]. Alaska is not listed; they have no exact policies for snakeheads, but do recognize the fish is a threat. See *id.*; *Invasive Species—Methods of Introduction*, ALASKA DEP'T OF FISH & GAME, <http://www.adfg.alaska.gov/index.cfm?adfg=invasive.pathways> [https://perma.cc/ZLR8-DDYB] (last visited Mar. 27, 2016).

³³ See generally WASH. INVASIVE SPECIES COUNCIL, *supra* note 22.

³⁴ See, e.g., MD. CODE REGS. 08.02.19.06 (2015).

³⁵ See, e.g., *id.* at 08.02.19.06(D) (specifically regulating snakeheads).

³⁶ Kelly Gestring, *Bullseye Snakehead in Florida; FWCC's Approach to a Non-Native Fish*, BUGWOODCLOUD.ORG, http://bugwoodcloud.org/CDN/floridainvasives/Southwest/03FFWCCs_approach_to_Nonnative_fish.pdf [https://perma.cc/6235-3MJH] (last visited Mar. 27, 2016) (stating that it is impossible to truly remove an invasive species) (PowerPoint Presentation).

the species where the threat is most dire. For example, the Florida government took this approach recently, where they instituted a “Snakehead Round Up,” and the Fish and Wildlife Conservation Commission offered bounties, drawing dozens of local teams to capture snakeheads.³⁷

Surely, there are obstacles to this rule-making: challenges will arrive from claims of religious rights, due process, and other causes of action.³⁸ However, a carefully crafted rule system should survive all of these challenges.

I. THEY ARRIVE

A. *Review of Snakehead Biology*

As discussed in the Introduction, all snakeheads in North America belong to the genus *Channa*.³⁹ Their genus name comes from the Greek word “channes,” which referred to a “small anchovy.”⁴⁰ However, unlike the meek anchovy, the northern snakehead grows quickly, reaching sexual maturity in just two or three years, and reaching adult lengths of around three feet (though larger individual fish have been recorded).⁴¹ After reaching maturity, the fish tack on mass, frequently hitting double digits in weight.⁴² The world record for snakehead weight is seventeen pounds, six ounces, an ignominious record currently belonging to Virginia fisherman Caleb Newton, who caught the beast (affectionately called the “Frankenfish” by the news) in 2013.⁴³ Northern (and bullseye) snakeheads are brown for most of their body, with dark splotches covering some of their scales.⁴⁴ Shaped like a thin torpedo, the snakehead glides with hydrodynamic

³⁷ Steve Waters, *Daniel and Steve Papp win Snakehead Round Up*, SUN SENTINEL (Sept. 14, 2013), http://articles.sun-sentinel.com/2013-09-14/sports/sfl-daniel-and-steve-papp-win-snakehead-round-up-20130914_1_daniel-papp-snakehead-round-custom-baits [https://perma.cc/MH23-4JZT].

³⁸ See generally Religious Freedom Restoration Act of 1993, 42 U.S.C. § 2000b. It would be possible to challenge a law mandating automatic *killing* of the species, but the rule would likely survive under with certain caveats. This argument is discussed later in the Note.

³⁹ COURTENAY & WILLIAMS, *supra* note 5, at 23 (citing a poster from the Maryland Department of Natural Resources).

⁴⁰ *Channa argus*, FISHBASE, <http://www.fishbase.org/summary/Channa-argus.html> [https://perma.cc/RDC2-E2JX] (last visited Mar. 27, 2016).

⁴¹ COURTENAY & WILLIAMS, *supra* note 5, at 48.

⁴² AQUATIC INVASIVE SPECIES, *supra* note 1.

⁴³ Chappell, *supra* note 11.

⁴⁴ COURTENAY & WILLIAMS, *supra* note 5, at 49–50.

slickness through the water, utilizing its muscles for a burst of speed culminating in its “canine” teeth chomping down on its prey.⁴⁵ Of course, those teeth are housed in a maw that gave rise to their name. Snakeheads look reptilian, with small round eyes, a sloping, angular head, and slimy bodies.⁴⁶

Fitting with their unconventional appearance, snakeheads also exhibit abnormal mating behaviors.⁴⁷ Some snakeheads may breed year-long, unlike game fish like largemouth bass, which breed seasonally.⁴⁸ Through the year, snakeheads are dispersing thousands of eggs, quickly establishing populations and taking territory once owned by native species.⁴⁹ While protecting their young, the already aggressive snakeheads become increasingly violent and territorial, lashing out at any intruder to their nest, including humans.⁵⁰

Snakeheads also have very few, if any predators in American environments.⁵¹ Their status predatory behavior may make their hostile takeovers of waterways even easier.⁵²

B. Snakeheads Introduced to the States

Snakeheads arrived with the help of humans.⁵³ Most introductions were accidents, as is the case with many invasive and foreign species.⁵⁴ Interest in the aquarium trade is always a cause of invasive species. Private owners purchase fish for their aquariums, and occasionally, they outgrow their enclosures. Owners unwilling to kill their pets or send them elsewhere release them into wild environments, where people assume

⁴⁵ *Id.*

⁴⁶ *Id.*

⁴⁷ *Id.* at 48–49.

⁴⁸ See generally *id.* (snakehead breeding habits); VA. DEP’T OF GAME & INLAND FISHERIES, *Largemouth Bass* (*Micropterus salmoides*), <http://www.dgif.virginia.gov/wildlife/fish/details.asp?fish=010188> [<https://perma.cc/2M4H-PVH4>] (last visited Mar. 27, 2016).

⁴⁹ COURTENAY & WILLIAMS, *supra* note 5, at 48–49.

⁵⁰ AQUATIC INVASIVE SPECIES, *supra* note 1, at 3–4.

⁵¹ U.S. GEO. SURVEY, INVASIVE SPECIES PROGRAM—SNAKEHEADS, AQUATIC INVADERS (2004), available at http://www.fws.gov/fisheries/ANS/pdf_files/Snakeheads.pdf [<https://perma.cc/FJU7-VJ2Z>].

⁵² *Id.*

⁵³ *Id.*

⁵⁴ See generally FLA. FISH & WILDLIFE CONSERVATION COMM’N, NONNATIVE FRESHWATER FISH, <http://myfwc.com/wildlifehabitats/nonnatives/freshwater-fish/> [<https://perma.cc/YN6G-3A9S>] (last visited Mar. 27, 2016). Many causes of introductions stem from accidents, like flooding, which resulted in fish escaping from fisheries. *Id.*

the fish will thrive.⁵⁵ In the case of the snakehead, this was all too true. In the warm waters of North America, snakeheads took quick advantage of plentiful food and space.⁵⁶

Live snakeheads were also freely available at fish markets in past decades.⁵⁷ The Aquatic Nuisance Species Task Force suspects that the availability of snakeheads as food may have also led to their release.⁵⁸ Owners wishing to breed the fish (or simply just release them to avoid waste) may have introduced the fish to American waters, where they quickly established themselves.⁵⁹ Today, possession of live snakeheads and their marketing is a much more difficult venture, mostly owing to federal and state laws and rulemaking.⁶⁰

Timelines of snakehead proliferation are difficult to draw exactly; dates of introductions are nearly impossible to determine.⁶¹ Often, the first datum scientists and states have is the first sighting or capture of a snakehead. In California, for example, the state took notice of an individual fish in 1997.⁶² Florida spotted its first bullseye snakehead in 2000.⁶³ From that time, in most areas, populations of the fish increased.⁶⁴

C. *A Place to Call Home: Snakeheads Breed*

After their introduction to the United States, snakeheads began to do one of the things they do best: make more snakeheads.⁶⁵ Due to their year-round breeding schedule, the snakeheads were able to take root faster than other fish could; a few turned into hundreds; hundreds turned into thousands, and so on.⁶⁶

⁵⁵ ANS TASK FORCE, *supra* note 25 (“Uninformed pet owners may have also released snakeheads into the wild when they grew too big for aquarium tanks . . .”).

⁵⁶ COURTENAY & WILLIAMS, *supra* note 5, at 50. This statement may be inferred by the current infestation, and the USGS’s opinion that the fish’s “native range (24–53° N) and temperature tolerance (0–30 °C) indicates a species that, if introduced, could establish feral populations throughout most of the contiguous United States. . . .” *Id.*

⁵⁷ ANS TASK FORCE, *supra* note 25.

⁵⁸ *Id.*

⁵⁹ INVASIVE SPECIES PROGRAM SNAKEHEADS—THE NEWEST AQUATIC INVADER, *supra* note 6.

⁶⁰ See generally WASH. INVASIVE SPECIES COUNCIL, *supra* note 22.

⁶¹ *Id.* (noting that dates of discovery do not necessarily suggest when the fish was introduced).

⁶² AQUATIC INVASIVE SPECIES, *supra* note 1.

⁶³ FLA. FISH & WILDLIFE CONSERVATION COMM’N, NONNATIVE FISH—BULLSEYE SNAKEHEAD, <http://myfwc.com/wildlifehabitats/profiles/freshwater/nonnatives/bullseye-snakehead/> [<https://perma.cc/JQ45-MN3Y>] (last visited Mar. 27, 2016).

⁶⁴ AQUATIC INVASIVE SPECIES, *supra* note 1.

⁶⁵ See generally *id.*

⁶⁶ *Id.*

The environments of Atlantic waters work well for snakeheads; northern snakeheads have adapted to climates somewhat dissimilar to those in their native range.⁶⁷ Their quick breeding and adaptation to American environments jump-started their invasion; because they have few predators, their breeding was even more successful.⁶⁸

Since 1997, states have noticed snakeheads in their waters, and not just on the Atlantic or in California. People have spotted northern snakeheads north of Maryland, and even in the Midwest.⁶⁹

II. THEY EAT. THEY CONQUER.

Like an unwanted tenant, snakeheads quickly took their toll on their reluctant landlords. Both fish and fishers alike are currently affected by the snakeheads' biological characteristics. Snakeheads don't understand the state lines (much less the Commerce Clause) and have no qualms crossing across states and further establishing themselves. When they do so, states' residents (including animals) pay the price.

Snakeheads have few established predators in the areas where they are most destructive.⁷⁰ Because of this apex position, snakeheads' destructive behavior goes nearly unfettered.⁷¹ Their negative effects may be neatly separated into two categories: economic and ecological. First, snakeheads' biological characteristics may hurt the economies of individual states.

A. *Snakeheads as an Economic Threat*

Because snakeheads fight with native species for food, they quickly displace native fish.⁷² This factor, combined with their incredible appetite and position as an apex predator, quickly tips the ecological scales in their

⁶⁷ INVASIVE SPECIES PROGRAM SNAKEHEADS—THE NEWEST AQUATIC INVADER, *supra* note 6 (noting that snakeheads are found in Hawaii and Rhode Island, among other states, which is a geographical far cry from Asia).

⁶⁸ *Id.*

⁶⁹ U.S. GEO. SURVEY, *Channa argus* (Mar. 7, 2015), <http://nas2.er.usgs.gov/viewer/omap.aspx?SpeciesID=2265> [<https://perma.cc/KA44-5RZK>] (noting that snakeheads have been sighted in Illinois).

⁷⁰ U.S. GEO. SURVEY, *supra* note 51. "Because most native fishes could not eat the larger species of adult snake-heads, these snakeheads could become the top predators within the freshwater fish community."

⁷¹ *Id.*

⁷² INVASIVE SPECIES PROGRAM SNAKEHEADS—THE NEWEST AQUATIC INVADER, *supra* note 6.

favor.⁷³ As discussed in Part I, snakeheads possess the disturbing ability to rapidly colonize and transform aquatic environments. When those environments are transformed, the changes will directly affect fishing's function in the economy.

Fishing (including both salt and freshwater) is a billion-dollar industry across the Atlantic states; freshwater fishing licenses *alone* account for \$9 million of revenue in Florida annually.⁷⁴ Fisheries, private charters, imports and exports of fish, aquaculture, and similar businesses all contribute heavily to a beloved sector of America's economy.⁷⁵ Threats to this industry are therefore threats to the economy, and should be treated with high priority.

Healthy fisheries have benefits beyond just what their fish can bring them. Undoubtedly, the revenue that fishing directly generates within a state is critical; this includes the money procured from such factors as recreational licenses, admission to state parks, and special licenses.⁷⁶ However, that is only the beginning of a state-centered evaluation of fishing's economic importance. Fishing accounts for billions of dollars in auxiliary revenue, since anglers need more than just a license to fish.⁷⁷

The American Sportfishing Association estimates that expenditures on freshwater fishing alone account for around \$30 billion in retail revenue.⁷⁸ Anglers need rods, reels, line, lures, and other equipment, not to mention huge expenditures like boats. These secondary costs are integral to the economy fishing drives if evidenced only by their sheer share of the overall revenue they produce. The invasion of snakeheads may inhibit the continued productivity of this industry, since their presence presumably results in a domino effect that starts in water and ends in retail locations and states' economies.

Consider the case of the invasive sea lamprey. The sea lamprey invaded the Great Lakes area and fed on local fish, especially the lake

⁷³ *Id.*

⁷⁴ FLA. FISH & WILDLIFE CONSERVATION COMM'N, RECREATIONAL LICENSE SALES SUMMARY FOR FISCAL YEAR 2012–2013 (2013), <http://myfwc.com/media/2649973/SalesComparison12-13.pdf> [<https://perma.cc/7W9Y-EBVA>].

⁷⁵ See NAT'L OCEANIC & ATMOSPHERIC ADMIN., FISHING ECONOMICS 2011, https://www.st.nmfs.noaa.gov/economics/publications/feus/fisheries_economics_2011 [<https://perma.cc/52D3-TN68>] (last visited Mar. 27, 2016).

⁷⁶ NATIONAL SURVEY OF FISHING, HUNTING, AND WILDLIFE-ASSOCIATED RECREATION, *supra* note 20.

⁷⁷ *Id.*

⁷⁸ *Id.*

trout, which was critical to the area's economy.⁷⁹ Over the course of a few decades, Lake Huron and Superior sustained heavy casualties to their fisheries, which to some degree.⁸⁰ After sea lampreys invaded the Great Lakes (around 1830) through to the 1960s, the fish devastated the lake trout population.⁸¹ Because the sea lampreys have no value in and of themselves, they added only dead weight to the economy and ecosystem, after they replaced the valuable species like lake trout and whitefish.⁸² Minnesota's fisheries were so severely disturbed by the sea lampreys' prevalence that their administrative agencies (along with those of the other Great Lakes states) dedicated grants and action to the control and eradication of the species.⁸³

The sea lamprey example provides hundreds of years' worth of data on invasive aquatic species affecting an economically relevant fishery. However, this is only the first aspect of the destruction snakeheads cause. Scientists and lawmakers alike must be aware of the dire ecological consequences snakeheads' presence carries. What follows below is a purely scientific overview of the snakeheads' threat to America's fisheries, which should be used as motivation or justification for rulemaking on the subject.

B. Snakeheads as an Ecological Threat

In 2004, the U.S. Geological Survey published a comprehensive report on the biological and risk factors of snakeheads at large.⁸⁴ Though the report evaluated both genera of snakeheads, as well as snakeheads as an overall threat in their risk assessment, the report provides a wealth of important information on the ways snakeheads can ruin environments into which they are introduced.⁸⁵

The most pertinent section of USGS's report is a section of the risk assessment titled "Estimate environmental impact if established."⁸⁶

⁷⁹ MINN. SEA GRANT, SEA LAMPREY: THE BATTLE CONTINUES, http://www.seagrants.umn.edu/ais/sealamprey_battle [<https://perma.cc/3SXP-RBFS>] (last visited Mar. 27, 2016).

⁸⁰ *Id.* ("For example, before sea lampreys entered the Great Lakes, Canada and the United States harvested about 15 million lbs. (6.8 million kgs) of lake trout in Lakes Huron and Superior annually. By the early 1960's the catch was only about 300,000 lbs. (136,077 kgs). The fishery was devastated.").

⁸¹ GREAT LAKES FISHERY COMM'N, SEA LAMPREY A GREAT LAKES INVADER (1999), available at <http://www.seagrants.umn.edu/downloads/x106.pdf> [<https://perma.cc/T5CC-JFTK>].

⁸² *Id.* ("Great Lakes sea lampreys themselves, traditionally, have had no economic value.").

⁸³ *Id.*

⁸⁴ COURTENAY & WILLIAMS, *supra* note 5, at 37.

⁸⁵ *See generally id.*

⁸⁶ *Id.* at 37.

Therefore, when relying on this data, decision makers should be aware of two large factors: (1) the report is still only estimating; at the time of publishing, the USGS could not make any concrete estimates; and (2) the report assumes snakeheads establish themselves, which they have.⁸⁷

As mentioned in Part I, because no American fish naturally preys on snakeheads, any biological threat they pose will not be mitigated by competition from native species.⁸⁸ Additionally, since snakeheads are so foreign, there is no chance they will interbreed, hybridize, or otherwise naturally cross with other species.⁸⁹ Accordingly, when evaluating the threat snakeheads pose, lawmakers and scientists should keep in mind that it seems nearly impossible for the fish to naturalize themselves.⁹⁰

Snakeheads present a massive danger to established endangered species and vulnerable native species.⁹¹ The USGS wrote:

Adverse impacts on threatened and endangered species would likely be high. Of all the taxa listed as endangered or threatened in U.S. aquatic habitats, 16 amphibians, 115 fishes, and 5 of the 21 crustaceans (surface dwelling crayfish and shrimp), would be the most likely to be affected. . . . Snakeheads would not have to establish a reproducing population to reduce or eliminate a fish or crustacean species confined to a small section of a stream or isolated spring habitat.⁹²

Additionally, states' efforts to eradicate the snakeheads may also result in a toll on the same waters those states are trying to protect. In a drastic experiment in the fight against snakeheads, a Maryland county applied a chemical (called rotenone), known to kill snakeheads, to ponds

⁸⁷ *Id.* at 37–39.

⁸⁸ *Id.* at 38.

⁸⁹ *Id.* at 37.

⁹⁰ Interbreeding may pose an entirely separate issue, however. *See* Press Release, Nat'l Sci. Found., Interbreeding Between Invasive and Native Salamander Species Creates Hardy Hybrids Likely to Replace Parental Populations (Sept. 18, 2007), *available at* http://www.nsf.gov/news/news_summ.jsp?cntn_id=110065 [<https://perma.cc/ND2P-9UPK>]. The National Science Foundation studied a native, endangered salamander that interbred with an invasive salamander, effectively extirpating the endangered population, since its interbred descendants have the capability to replace it. *Id.*

⁹¹ COURTENAY & WILLIAMS, *supra* note 5, at 37.

⁹² *Id.*

in the county.⁹³ While this did kill snakeheads, it also killed over one thousand pounds of native species.⁹⁴ Therefore, even if a state does actively take measures to reduce the snakehead population with chemical warfare, there will still be collateral damage, at least when using rotenone.⁹⁵

Finally, researchers and lawmakers should be aware that the northern snakehead poses a high risk of establishment and spreading.⁹⁶ Considering that Arizona has already attempted to prevent the species from entering state waters, concerned parties should be aware the species' hardy nature and adaptive strength makes it a risk in an incredible amount of environments.⁹⁷

III. STATES FIGHT BACK

As of 2014, it appears many states have taken notice of snakeheads.⁹⁸ Of those states to notice, many have enacted legal and governmental measures in order to reduce the fishes' populations.⁹⁹ Conversely, some states have enacted no legal approach to the northern snakehead at all.¹⁰⁰ Within that spectrum, from action to inaction, state rule-making schemes tend to fall into one of three distinct categories I have identified. They are (1) indifference, (2) authorized destruction, and (3) compulsory destruction. As with any administrative scheme, with more government involvement, the state must trade off the opportunity to allocate their funding elsewhere. Additionally, because more government involvement in snakehead control generally means requiring more action from private individuals, this inevitably gives rise to legal challenges from individuals who are opposed to complying with the new regulations. This Note will first discuss the three types of administrative schemes, their relative costs and benefits, their current applications, and then will advocate for one type of control for the sake of efficiency and uniformity.

⁹³ *Id.* at 22.

⁹⁴ *Id.* at 39 ("An estimated 500 kg of native fishes died and were disposed of.").

⁹⁵ *Id.*

⁹⁶ *Id.* at 40.

⁹⁷ KAMI SILVERWOOD, NORTHERN SNAKEHEAD RISK ANALYSIS FOR ARIZONA (Oct. 2011) available at http://www.azgfd.gov/h_f/documents/AIS-NorthernSnakeheadRisk.pdf [<https://perma.cc/3NQJ-Y23P>].

⁹⁸ See generally NAT'L INVASIVE SPECIES INFO. CTR., *supra* note 32 (demonstrating that certain states have enacted laws and issued notices to the community about snakeheads).

⁹⁹ *Id.*

¹⁰⁰ *Id.* States not mentioned in the report, such as Alaska, have not enacted laws specific to snakeheads.

A. *Indifference*

Though at first the idea of having no specific plan to eliminate snakeheads may seem contrived or risky, rule-makers should be aware of the option's innate quality of avoiding opportunity costs inherent in snakehead eradication. A state engaged in the indifference model will have no specific rules about snakeheads. However, this does not mean that the state will be without rules that *apply* to snakeheads. For example, the Alaska Department of Fish and Game recognizes that snakeheads (most likely *Channa argus*) would threaten the state's environments, but does not have a law specific to the fish.¹⁰¹

Despite not writing a law for snakehead control in light of the threat they may present, Alaska is still entirely aware of the risk imposed by introduction of new aquatic species.¹⁰² Alaska's legislature enacted a law proscribing the "[knowing] release, or transport, possess, import, or export for the purpose of release, into the water of the state live nonindigenous fish or live fertilized eggs of nonindigenous fish . . ."¹⁰³ This means that in Alaska, it would still be entirely illegal to release a snakehead into Alaska's waters, but the state found it unnecessary to write a law specifically for that species.

Alaska and similar states may have entirely reasonable justifications for choosing to not write specific legislation for snakeheads. In certain states, like Alaska, the threat may simply seem too remote at this point in time. Kelly Baerwaldt, a coordinator for the United States Fish and Wildlife Service, reported that preventing new species' introduction to United States waters is much more effective than remediation after the introduction.¹⁰⁴ It appears that Alaska's statutory scheme conforms tightly to this view; at this point in time, Alaska's natural administrative agencies and lawmakers recognize that snakeheads would be a detriment to their environment, and are surely aware of the threat of invasive species at large.¹⁰⁵ However, Alaska must first deal with the species that

¹⁰¹ ALASKA DEP'T OF FISH & GAME, *supra* note 32 ("Snakeheads are voracious predators and Chinese mitten crabs are anadromous, meaning they migrate up into freshwater areas to spawn. They burrow in riverbanks causing erosion, potentially endangering Pacific salmon spawning habitat.").

¹⁰² *Id.*

¹⁰³ ALASKA STAT. § 16.35.210 (2014). Readers should note, however, that Alaska—like many states—still allows the proscribed behavior under certain exceptions.

¹⁰⁴ Email Interview with Kelly Baerwaldt, Asian Carp/eDNA Coordinator, U.S. Fish and Wildlife Service—Midwest Region (Nov. 20, 2014) (on file with author).

¹⁰⁵ ALASKA DEP'T OF FISH & GAME, *supra* note 32.

actually pose issues to the state's environment (such as zebra mussels or the Norway rat), because those species have an immediate effect on human life, and must be dealt with swiftly.¹⁰⁶

New Mexico also poses an interesting study of administrative approaches to snakeheads. As of 2010, the New Mexico Department of Game & Fish maintained a "Director's Species Importation List," which sets limitations on the importation of many species.¹⁰⁷ The list describes species in four groups, from I to IV, with Group I requiring no permits, and with Group IV requiring permits under incredibly specific and stringent guidelines.¹⁰⁸ The list contains over one hundred aquatic species, each classified into one of the groups.¹⁰⁹ The Department of Game & Fish affords the least latitude to individuals seeking to possess snakeheads.¹¹⁰ Here, New Mexico opted to adopt a comprehensive scheme, knocking out the legislation regarding possession of trouble-making species in one fell swoop.¹¹¹ Presumably, this centralization of legislation and rule-making is easier to administer and saves the Department time and money when they, like Alaska, have other natural issues that take precedence over a nearly nonexistent snakehead threat.

In conclusion, it appears that the method of indifference is best suited for states not currently threatened by snakeheads. States should consider their environments threatened when any of the following conditions apply: (1) there are snakeheads in state waters; (2) there is an established population of snakeheads in an adjacent state; (3) there is a reasonable likelihood that snakeheads could establish themselves in the state; or (4) snakeheads were once present in state waters. States taking this approach should do so only when the cost of administering the laws protecting state land against snakeheads outweighs the benefit of preventing the arrival of snakeheads. Of course, it is much easier to justify this approach in a state like Alaska, where snakeheads would be unable to establish themselves without human intervention. Other states, like

¹⁰⁶ ALASKA DEP'T OF FISH & GAME, *Invasive Species*, <http://www.adfg.alaska.gov/index.cfm?adfg=invasive.main> [https://perma.cc/9CVS-5WGA] (last visited Mar. 27, 2016).

¹⁰⁷ See N.M. DEP'T OF GAME & FISH, DIRECTOR'S SPECIES IMPORTATION LIST 1, *available at* http://www.wildlife.state.nm.us/download/enforcement/importation/information/Directors-Species-Importation-List-08_03_2010.pdf [https://perma.cc/8E7N-MAL6].

¹⁰⁸ *Id.* ("The importation of these species are prohibited for the general public but may be allowed for, scientific study, department approved restoration and recovery plans, zoological display, temporary events/entertainment, use as service animal or by a qualified expert.").

¹⁰⁹ *Id.*

¹¹⁰ *Id.* at 2–6.

¹¹¹ See generally *id.*

those close to the Atlantic coast, would be well-advised to consider one of the more active, stricter approaches below.

B. Authorized Destruction

States with a more present threat of snakeheads (like Florida and Virginia) have taken legal action specifically against snakeheads.¹¹² This action usually comes in one of three forms: (1) a specific statute announcing how anglers must treat snakeheads; (2) a specific administrative rule declaring how anglers must treat snakeheads; or (3) an administrative guideline specifically for snakeheads. Forms (1) and (2) are fairly perfunctory. Form (3), however, requires a little more explanation, as it is not usually a formal law. For example, the Virginia Department of Game and Inland Fisheries, published several web pages about the northern snakehead describing their biological characteristics, how they threaten the state, and how anglers who catch the fish should handle the event.¹¹³ On a "Frequently Asked Questions" page about the northern snakehead, the VGDIF explains that, while killing snakeheads is not absolutely compulsory, the Department recommends it.¹¹⁴

This approach works as a kind of purgatory between requiring active elimination of the snakehead and maintaining the ecological status quo (post-snakehead introduction). States taking this approach also likely have administrative rules and laws that prevent individuals from releasing snakeheads into native waters.¹¹⁵ However, this approach takes snakehead eradication one step further, actually encouraging people who catch the species to report it to an administrative body, kill the fish, or both.¹¹⁶ Like the indifference approach, there is no actual legal penalty

¹¹² See, e.g., VA. DEP'T OF GAME & INLAND FISHERIES, *Northern Snakehead—Frequently Asked Questions* (Sept. 23, 2014), <http://www.dgif.virginia.gov/fishing/snakehead-faq.asp> [<https://perma.cc/2373-G7XU>].

¹¹³ *Id.*

¹¹⁴ *Id.* ("Anglers are not required to report snakeheads nor are they required to kill them if caught, but the Department asks that the fish be reported and killed if possible. However, if an angler wishes to keep a legally caught northern snakehead, the fish must be killed to be in possession, and the angler must call the hotline and report the angler's last name, date of catch, location of catch and size.").

¹¹⁵ VA. CODE ANN. § 18.2-313.2 (2014). Virginia's law against introducing snakeheads works in conjunction with rules from the Department of Game and Inland Fisheries. See *id.*

¹¹⁶ See, e.g., MD. DEP'T OF NATURAL RES., *Northern Snakehead Sightings Distribution*, <http://dnr2.maryland.gov/fisheries/Pages/snakehead.aspx> [<https://perma.cc/C673-45JD>] (last visited Mar. 27, 2016) (asking anglers to kill snakeheads upon capture).

specific to snakeheads for failing to follow the state's wishes to kill the fish, which takes a bit of the bite out of any legislation, rule-making, or administrative suggestion.¹¹⁷

States appear to only take this approach once snakeheads have invaded and established a population.¹¹⁸ Because this is a laxer form of eradication, researchers and legislators may assume that it is less costly, since there would be no actual law to enforce most of the time, especially in the case of noncompulsory administrative directions. However, the cost-effectiveness (and overall effectiveness) of this approach may be limited by the self-selecting nature of those who choose to follow the state's guidelines.¹¹⁹ Anglers strictly practicing catch-and-release fishing may be morally opposed to killing a snakehead, even if the fish is invasive and the state specifically wishes to reduce their population. Therefore, the overall effectiveness of this method may be limited.

Compulsory destruction, discussed below, appears to be a more effective, final approach for legal control of snakeheads. However, it creates legal issues that authorized destruction schemes do not. Because compulsory destruction only applies to individuals who actively choose to participate, it is unlikely the law, rule, or suggestion will run into many challenges, which makes this a favorable option when interest groups or public opinion may be against a compulsory destruction scheme.

C. *Compulsory Destruction (or Removal)*

Compulsory destruction is a scheme which leaves little to the imagination. However, the classification is to some extent a misnomer. "Compulsory destruction" describes the end of the administrative scheme, but not necessarily the means; in fact, in some cases, persons possessing snakeheads may not have to physically destroy them, for reasons discussed below. This is the most aggressive approach to snakehead management. Therefore, it is likely to be the most effective in limiting the

¹¹⁷ *Id.* Maryland's guidelines suggest what anglers *can* do, not what they *must* do. *See id.*

¹¹⁸ COURTENAY & WILLIAMS, *supra* note 5, at 31 (displaying the fact that Maryland only took remediation measures once snakeheads established themselves in local waters).

¹¹⁹ OECD, VOLUNTARY APPROACHES FOR ENVIRONMENTAL POLICY: EFFECTIVENESS, EFFICIENCY, AND USES IN POLICY MIXES 14 (2003) (stating that the overall effectiveness of voluntary environmental policies is still "questionable"), *available at* http://www.oecd-ilibrary.org/voluntary-approaches-for-environmental-policy_5lmqcr2k37g6.pdf?content%2fcontent%2fOECDBook%2c%2fns%2fBook&itemId=%2fcontent%2fbook%2f9789264101784-en&mimeType=application%2fpdf&containerItemId=%2fcontent%2fbook%2f9789264101784-en&accessItemIds= [https://perma.cc/HWM9-Y7NX].

continued expansion of the species. However, this type of management effort is also the most likely to draw litigation and other legal challenges, for reasons ranging from First Amendment protections to state constitutional violations.¹²⁰ A careful lawmaker should be able to circumvent or avoid this issues entirely through specially crafted legislation, discussed later in this section.

1. Components of Compulsory Destruction

At its base, a functional model of compulsory destruction or removal will require two things: (1) fishers who catch snakeheads must destroy the fish or alert the state's designated environmental authority, and (2) states must take an active approach to destroying the fish with electrofishing and other large-scale measures to supplement the grassroots efforts of anglers. These two prongs of the model aim to achieve an efficient and absolute method of reducing and eventually eliminating snakeheads from state waters, with a long-term goal of effecting positive adjustments to aquatic ecosystems by remedying the environmental damage snakeheads caused.¹²¹

Next, lawmakers and state officials will have to grapple with two large hurdles when enacting these policies: (1) the legal issue of crafting legislation immune to viable legal challenges and (2) the functional issue of enforcing the legislation.¹²² In order to approach these issues, it would be helpful to consider an example of legislation following this model, such as the original example below.

“A. In order to reduce and eliminate the populations of [specific type] snakeheads in [State], all persons fishing in public waters will be required to do the following upon catching a snakehead:

1. Humanely destroy the fish, OR¹²³

¹²⁰ See, e.g., U.S. CONST. amend. I; MD. CONST. art. 36 (allowing rights to expression, including speech and religion, which forms the basis of legal challenges to the proposed laws).

¹²¹ See generally SNAKEHEAD SCIENTIFIC ADVISORY PANEL, *supra* note 10, at 3–6 (an example of Maryland attempting to destroy snakeheads in order to mitigate damage they could cause).

¹²² See generally A. Mitchell Polinsky & Steven Shavell, *Enforcement Costs and the Optimal Magnitude and Probability of Fines*, 35 J.L. & ECON. 133, 133–34 (1992) (discussing the difficulties in designing fines and enforcing the laws behind them).

¹²³ See MD. CODE REGS. 08.02.19.06(D) (2015). Maryland only allows possession of snakeheads after they are killed, which inspired this section. *Id.*

2. Maintain possession of the live fish and surrender it to a representative of the [State environmental agency]
- B. Fishers exercising their right to destroy the fish under A(1) shall:
 1. Remove the head from the fish, AND
 2. Remove the organs from the fish, AND¹²⁴
 3. Act consistently with laws governing animal cruelty and the treatment of game animals AND
 4. Not return any part of the fish to any state freshwater body AND
 5. Report the catch to [the proper administrative agency]¹²⁵
- C. Fishers who choose to surrender the fish under A(2) shall:
 1. Notify [the proper administrative agency] AND
 2. Keep possession of the fish until [the administrative agency] takes possession of the fish
- D. Persons found to be in violation of this [rule/statute] shall be guilty of a [civil infraction or criminal violation] and subject to a penalty of [fine and/or imprisonment, to be determined by the state].¹²⁶

As displayed above, I believe the most successful legislation in the compulsory removal model will have three main components: (1) a legal obligation to remove the fish from the water permanently; (2) an alternative to killing the fish; and (3) penalties for releasing a captured fish. By compelling anglers to permanently remove snakeheads from the water, states will use the already-existing labor of their fishers.¹²⁷ Presumptively, anglers catch snakeheads each day.¹²⁸ Assuming even a minuscule

¹²⁴ MD. CODE REGS. 08.02.19.06(D)(2) (2015).

¹²⁵ This is based on Virginia's recommendations, which ask that anglers possessing deceased snakeheads alert the Virginia Department of Game and Inland Fisheries. VA. DEPT OF GAME & INLAND FISHERIES, *supra* note 24.

¹²⁶ VA. CODE ANN. § 18.2-313.2 (2014) (making violation of the snakehead release statute a misdemeanor).

¹²⁷ VA. DEPT OF GAME AND INLAND FISHERIES, *2015 River Fishing Report* (2015), <https://web.archive.org/web/20150214065558/http://www.dgif.virginia.gov/fishing/forecasts-and-reports/river-fishing-report/> [<https://perma.cc/PH74-EY4G>] (encouraging anglers to kill snakeheads, which means their already-existing labor would be applied toward the eradication effort).

¹²⁸ *Id.*

amount of anglers comply with the new law, more snakeheads will exit the ecosystem permanently. This should provide a new, steady, method of reducing the snakehead population. Policymakers may be concerned that the method is slow, but the idea that any removal of snakeheads is a good thing is not a novel position; in fact, Maryland Department of Natural Resources Inland Fisheries Director Don Cosden said, "We want you to catch and kill snakeheads."¹²⁹

2. Maryland's Example: A Lesson in Ambiguity

The state of Maryland has been exceedingly proactive regarding snakehead control; their observance of the issue and associated lawmaking dates beyond the last decade.¹³⁰ While not all of their efforts have been successful (and in some cases, they were disastrous), Maryland has been acting on the issue since 2002, when a scientific advisory panel issued recommendations about a snakehead infestation.¹³¹ As of January 2015, the Maryland Department of Natural Resources advises anglers to "kill it and *DO NOT* put it back in the water."¹³² However, it is unclear whether anglers are legally proscribed from releasing the fish. The government website asking that anglers kill the fish and keep it out of the water says that the method is what anglers "can" do, not what they must do.¹³³

The Code of Maryland Regulations has a specific section titled "Snakehead Prohibitions," which explicitly disallows persons to "import, transport, or introduce into the State any live fish or viable eggs of snakehead fish"¹³⁴ However, it is unclear whether anglers are specifically disallowed from releasing snakeheads that they catch in state waters. The snakehead regulation doesn't address catch-and-release practices that may result in snakeheads reentering the water.¹³⁵ The language most relevant to catch-and-release practices is the prohibition

¹²⁹ Don Cosden, *Snakehead Fish Reminder—Handling and the Law*, MD. DEP'T OF NAT. RES. (Mar. 12, 2010), http://www.dnr.state.md.us/fisheries/news/story.asp?story_id=49 [<https://perma.cc/LWW9-LD3X>].

¹³⁰ See generally Hillary Mayell, *Maryland Wages War on Invasive Walking Fish*, NAT'L GEO. (July 2, 2002), http://news.nationalgeographic.com/news/2002/07/0702_020702_snakehead.html [<https://perma.cc/G6UU-AVUW>] (showing that Maryland took notice in 2002, and took a proactive approach to control snakehead populations).

¹³¹ SNAKEHEAD SCIENTIFIC ADVISORY PANEL, *supra* note 10.

¹³² MD. DEP'T OF NATURAL RES., *supra* note 116 (emphasis added).

¹³³ *Id.*

¹³⁴ MD. CODE REGS. 08.02.19.06 (2015).

¹³⁵ *Id.*

on “introduc[ing] into the State any live fish or viable eggs of snakehead fish. . . .”¹³⁶ Code of Maryland Regulations § 08.02.19.02 provides that “‘Introduction into State waters’ means the deliberate or accidental release of an aquatic organism into State waters.”¹³⁷ However, the regulation does not define “release.”¹³⁸ There then may be a logical debate over whether anglers can release a fish back to where it lived without ever moving it very far away. For reference, even Florida, a state with a snakehead problem and extensive legislation on freshwater fish, also does not have a statutory definition of release.

Lawmakers would be wise to consider this ambiguity. Even though Maryland is on the cutting-edge of snakehead management, close examination reveals faults in their administrative scheme. Of course, the ambiguity behind the technical definition of “introduction,” “release,” or similar terms may turn out to be a non-issue. Regardless, new laws and rules should make it absolutely clear that anglers who catch snakeheads are not permitted to release the fish. This would eliminate the possibility of future litigation on the term, since the law would specifically state what anglers are allowed to do once they catch the snakehead.

3. Anticipating and Mitigating Legal Challenges to Compulsory Destruction

Lawmakers should be hesitant to compel certain behavior in a recreational activity like fishing, especially when the behavior in question has a highly sensitive nature like euthanizing fish. Unfortunately, that issue is inherent in enacting a system of compulsory destruction. On a federal Constitutional level, objectors to the compulsory destruction may raise a claim based on the Free Exercise Clause.¹³⁹ In general, the Free Exercise Clause prevents the government from interfering with the lawful, personal exercise of religion.¹⁴⁰ Of course, the Fourteenth Amendment imputes this restriction to state governments as well.¹⁴¹ Presumably, the plaintiff would argue that the statute in its entirety is unconstitutionally restrictive of their right to religion. Imagine an angler who maintains

¹³⁶ *Id.*

¹³⁷ *Id.* at 08.02.19.02 (2015).

¹³⁸ *Id.*

¹³⁹ U.S. CONST. amend. I.

¹⁴⁰ *Id.*

¹⁴¹ See U.S. CONST. amend. XIV § I; see generally *Cantwell v. Connecticut*, 310 U.S. 296 (1940).

nonviolence (which they define inflicting no suffering upon a life) as a religious tenet. Further, imagine that this angler subscribes to the belief that fish do not have the cognitive ability to feel “pain,” and that this inability makes it logically impossible for fish to suffer during catch-and-release fishing. Therefore, catch-and-release fishing is permissible under their religious ideal of nonviolence; however, assume this angler also values the absolute sanctity of life, similar to the Old Testament ideal that “you shalt not kill.”¹⁴²

Assume that this angler lives in a state adopting an administrative scheme of compulsory destruction. After reading a press release containing the language of the new law, the angler takes umbrage at the requirement that anglers “humanely destroy the fish by removing its head.”¹⁴³ This, of course, is in direct contrast to his religious beliefs, and he asserts that the statute is forcing him to kill fish, which subsequently violates the Free Exercise Clause. It is not terribly far-fetched to assume this scenario, (or one substantially similar) could occur, given the diversity of religious views in America.¹⁴⁴

This scenario is why a measure allowing anglers to turn the fish over to a state agency is so critical. States would have to take care to make sure that anglers relinquishing snakeheads do not feel like they are causing the death of the fish. This cognizance will both prevent litigation and avoid public relations issues. In order to achieve that goal, states would have to enact measures that kept snakeheads alive in captivity. They could be used for research, donated to zoos, or placed in any number of different, positive uses.¹⁴⁵

IV. THE BEGINNING OF THE END

At this point in time, it may not be too late to save U.S. waters from snakeheads. Affected states need to take notice, and they need to

¹⁴² *Exodus* 20:13.

¹⁴³ As a general example of how states suggest euthanizing a snakehead, see MD. CODE REGS. 08.02.19.06(D) (2015).

¹⁴⁴ PEW RESEARCH CTR., *Table: Religious Diversity Index Scores by Country* (Apr. 4, 2014), <http://www.pewforum.org/2014/04/04/religious-diversity-index-scores-by-country/> [<https://perma.cc/B2EX-JH4P>] (demonstrating religious diversity in America, which presumably demonstrates diversity in religious views and lifestyles).

¹⁴⁵ VA. TECH DEPT OF FISH & WILDLIFE CONSERVATION, *Northern Snakehead* (June 22, 2009), <http://fishwild.vt.edu/snakeheads/> [<https://perma.cc/GL93-2NCA>] (“Our research . . . has focused on understanding the basic biology of northern snakeheads, so that interactions with and impacts on native species can be inferred.”).

act.¹⁴⁶ Some states have even begun the difficult work; in February 2015, Virginia published a revised map of where snakeheads live.¹⁴⁷ The map paints an unfortunate picture, splotted with snakehead presence.¹⁴⁸

Finally, it appears snakeheads are no longer a mysterious scourge.¹⁴⁹ States across the Atlantic are painfully aware of the northern snakehead (and its genus-sharing counterparts).¹⁵⁰ Snakeheads are even mentioned in a new environmental horn-book.¹⁵¹ The fish are an acknowledged environmental threat, and that awareness will aid efforts to restore the environments snakeheads have hindered.¹⁵² However, as long as there are snakeheads, there are risks to the United States' aquatic environments.¹⁵³ Intervention should begin as soon as possible, and in the interest of efficiency, should take the most applied, hands-on approach. States should craft legislation requiring the removal and destruction of snakeheads in addition to the affirmative eradication methods they already employ. With careful regulations, diligent enforcement, and perhaps a bit of luck, in the future, snakeheads may fade from a monster in our midst to a distant horror story, lost as a natural anachronism in the story of environmental disturbances.

¹⁴⁶ See generally NAT'L INVASIVE SPECIES INFO. CTR., *supra* note 32 (showing that states have observed snakeheads).

¹⁴⁷ AARON BUNCH ET AL., NORTHERN SNAKEHEAD DISTRIBUTION IN VIRGINIA (Feb. 10, 2015), *available at* <http://www.dgif.virginia.gov/fishing/snakehead-fish/Northern-Snakehead-Fish-Distribution-2015.pdf> [<https://perma.cc/56AJ-XXJ7>].

¹⁴⁸ *Id.*

¹⁴⁹ NAT'L INVASIVE SPECIES INFO. CTR., *supra* note 32.

¹⁵⁰ *Id.*

¹⁵¹ NICHOLAS A. ROBINSON, ENVIRONMENTAL REGULATION OF REAL PROPERTY § 24.04 (revised ed. 2014).

¹⁵² COURTENAY & WILLIAMS, *supra* note 5, at 37.

¹⁵³ INVASIVE SPECIES PROGRAM SNAKEHEADS—THE NEWEST AQUATIC INVADER, *supra* note 6.

