Draft Environmental Assessment for Listing Black Carp (*Mylopharyngodon piceus*) as Injurious under the Lacey Act

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Abstract

We consider three alternatives for the proposed action to list all forms of black carp (*Mylopharyngodon piceus*) as an injurious species under the Lacey Act: 1) no action, 2) listing as injurious all (both diploid and triploid) live black carp, gametes and eggs, and 3) listing as injurious only diploid live black carp, gametes and eggs.

This action is being considered in order to protect native freshwater mollusks and native fishes from the potential negative impacts of black carp by listing them as injurious and preventing their importation and interstate movement. The Service's preferred alternative is to list all (diploid and triploid) live black carp, gametes and eggs as injurious under the Lacey Act (Alternative 2).

The regulations contained in 50 CFR part 16 implement the Lacey Act (18 U.S.C. § 42) as amended. Under the terms of the law, the Secretary of the Interior is authorized to prescribe by regulation those wild mammals, wild birds, fish (including mollusks and crustaceans), amphibians, reptiles, and the offspring or eggs of any of the aforementioned, which are injurious to human beings, to the interests of agriculture, horticulture, or forestry, or to the wildlife or wildlife resources of the U.S. Wild mammals, wild birds, fish, mollusks, crustaceans, amphibians, and reptiles are the only organisms that can be added to the injurious wildlife list. The lists of injurious wildlife species are at 50 CFR 16.11-15.

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1) Purpose

The purpose of the proposed action to list all forms of live black carp (*Mylopharyngodon piceus*), gametes and eggs as an injurious species under the Lacey Act is to prevent the importation and interstate movement of black carp, thereby preventing spread beyond their current locations and their introduction into natural waters of the United States (U.S.). This action is being considered in order to protect native freshwater mollusks, native fishes and other animals that rely on mollusks for food from the potential negative impacts of black carp by listing them as injurious and preventing their importation and interstate movement. It is not being considered to prohibit the current use of black carp within a state.

2) Need

The need for the proposed action to add all forms of live black carp to the list of injurious wildlife under the Lacey Act developed as a result of the increased use of black carp to control exotic trematodes in fish culture and black carps potential impacts on native mollusks. The increased reproduction, use and interstate transportation of triploid and diploid black carp is likely to result in unintentional and intentional releases into the wild and therefore poses increased risks to native mollusks and fishes. The intent of this environmental assessment is to assess the impacts of three alternatives associated with adding black carp to the list of injurious wildlife under the Lacey Act.

The U.S. Fish and Wildlife Service (Service) has the responsibility of prohibiting the importation and interstate movement of those species found to be injurious under the Lacey Act. The regulations contained in 50 CFR part 16 implement the Lacey Act (18 U.S.C. § 42) as amended. Under the terms of the law, the Secretary of the Interior is authorized to prescribe by regulation those wild mammals, wild birds, fish (including mollusks and crustaceans), amphibians, reptiles, and the offspring or eggs of any of the aforementioned, which are injurious to human beings, to the interests of agriculture, horticulture, or forestry, or to the wildlife or wildlife resources of the U.S. Wild mammals, wild birds, fish, mollusks, crustaceans, amphibians, and reptiles are the only organisms that can be added to the injurious wildlife list. The lists of injurious wildlife species are at 50 CFR 16.11-15.

If black carp are determined to be injurious, then as with all listed injurious animals, their importation into, or transportation between, States, the District of Columbia, the Commonwealth of Puerto Rico, or any territory or possession of the U.S. by any means whatsoever would be prohibited, except by permit for zoological, educational, medical, or scientific purposes (in accordance with permit regulations at 50 CFR 16.22), or by Federal agencies without a permit solely for their own use, upon filing a written declaration with the District Director of Customs and the U.S. Fish and Wildlife Service Inspector at the port of entry. In addition, no live black carp, gametes or eggs imported or transported under permit could be sold, donated, traded, loaned, or transferred to any other person or institution unless such person or institution has a permit issued by the Director of the U.S. Fish and Wildlife Service. The interstate transportation of any live black carp, gametes or eggs currently held in the U.S. for any purposes not permitted would be prohibited. The proposed rule would not prohibit intrastate transport or possession of black carp within States, where it is not currently prohibited by the State. Any regulation pertaining to the use of black carp within States would continue to be the responsibility of each State.

3) Decisions that Need to be Made:

The Service is the lead agency for the proposed action. The Service decision is whether live, triploid and/or diploid black carp and their gametes and viable eggs, are an injurious species and should be added to the list of injurious wildlife under the Lacey Act. In addition, the Service

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decision is whether or not the environmental consequences of any of the alternatives would be significant, and determining to prepare either a Finding of No Significant Impact or an Environmental Impact Statement.

4) Background

In February 2000, the U.S. Fish and Wildlife Service received a petition from the Mississippi Interstate Cooperative Resources Association to list the black carp under the injurious Wildlife Provision of the Lacey Act. The petition was based on Mississippi River Basin State concerns about the potential impacts of black carp on native freshwater mussels and snails in the Mississippi River Basin.

On October 23, 2002, the U.S. Fish and Wildlife Service received a petition signed by 25 members of Congress representing the Great Lakes region to add bighead carp, silver carp and black carp to the list of injurious wildlife under the Lacey Act. Various agencies, organizations and individuals are concerned that additional escapements of black carp will result in establishment of populations that will impact imperiled, native mussels.

About 30 black carp escaped from a fish farm in Missouri into the Osage River, Missouri River Basin, in April 1994. The first specimen reported from the wild was captured in March 2003 from Horseshoe Lake, Illinois. Analysis of a scale sample from the specimen caught in Horseshoe Lake determined that the fish was four years old, indicating that the fish did not escape into the Osage River in 1994. Since then, a specimen was captured in the lower Red River, Louisiana in April 2004 by an angler that said he had been catching them occasionally in the area for several years, and one specimen was captured in June 2004 in the Mississippi River near Lock and Dam 24 near Clarksville, Missouri (Meersman 2004, Nico and Williams 2003, USGS website).

The United States has the greatest diversity of freshwater mussels in the world. About 1,000 species occur globally, and 297 species and subspecies are native to the U.S. (Turgeon et al. 1988). Seventy species of the mussels native to the U.S. are federally listed as endangered or threatened, and many other species have declined in abundance and distribution (USFWS data 2004). Within the last 50 years this rich fauna has been decimated by impoundments, sedimentation, channelization and dredging, water pollution, and, more recently, the nonindigenous zebra mussel (*Dreissena polymorpha*) (NNMCC 1998, Williams and Neves Undated). Mussels were an important natural resource for Native Americans, who used them for food, tools, and jewelry (Williams and Neves Undated). During the late 1800's and early 1900's, mussel shells supported an important commercial fishery; shells were used to manufacture pearl buttons until the advent of plastic buttons in the 1940's (Williams and Neves Undated).

Freshwater mussels are a renewable resource, providing considerable ecological and economic benefits to the nation. They are ecologically important as a food source for many aquatic and terrestrial animals; they improve water quality by filtering contaminants, sediments, and nutrients from our rivers; and because they are sensitive to toxic chemicals, they serve as an early-warning system to alert us of water quality problems (NNMCC 1998). The annual shell value to the mussel industry has been estimated at $40-$50 million (NNMCC 1998). The mussel shells are used in the cultured pearl and jewelry industries, and the shell harvest provides employment to about 10,000 residents, primarily in the Mississippi River basin (NNMCC 1998).

There are over 600 species of freshwater snails widely distributed across the streams, rivers, and lakes of North America, which is about 15% of the world’s diversity of this taxonomic group. The greatest species richness is associated with flowing waters (streams and rivers) (Johnson 2003). Snails are an important source of food for native wildlife and many species are

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used as water quality indicators. Freshwater snails can be found living at the bottoms of large lakes and rivers as well as small streams and ponds; some species have been recorded at depths of over 100 feet (Johnson 2003). Nearly ten percent of all freshwater snails are extinct and 32 snails are listed as threatened or endangered in the U.S. (USFWS data 2004). This rate of imperilment exceeds every other major animal group in North America, even freshwater mussels (Johnson 2003). Like mussels, dam construction and other channel modifications, siltation, and industrial and agricultural pollution have all degraded the river habitats on which snails depend. Conservation and recovery efforts for freshwater snails include artificial culture, water pollution control, and most importantly, habitat protection and restoration (Johnson 2003).

A detailed description of the black carp biology and natural history, history of the importation into, and shipment of black carp within, the U.S. is provided by Nico and Williams (2003) in the draft black carp risk assessment. A synopsis of that history follows:

Black carp, also known as snail carp, Chinese black carp, black amur, Chinese roach, or black Chinese roach, is a freshwater fish that inhabits lakes and lower reaches of large, fast moving rivers. The species inhabits most major drainages of eastern Asia from about 22°N to about 51°N latitude.

Black carp typically grow to more than 1.5 meters in length and weigh, on average, 15 kilograms. They reportedly can weigh up to 70 kilograms. Individuals of the species are known to live to at least 15 years of age. Black carp reach sexual maturity from 6 to 11 years of age, with females occasionally at 3 years. They reproduce annually. Spawning occurs in their natural range when water temperatures are at least 65.5ºF, water levels are rising, and mollusks are available. They spawn upstream in rivers and their eggs drift downstream. The eggs are carried by currents into floodplain lakes, smaller streams, and channels with little to no current. Female black carp can produce an average of 1-3 million eggs each year, depending on body size.

Black carp feed on zooplankton and fingerlings when small. As adults, powerful teeth permit the black carp to crush the thick shells of large mollusks (mussels and snails) and they have a gape width much larger than most native mollusk-eating fish. Reports indicate that the fish can usually handle any food item that it can get into its mouth. In some instances, the fish is able to crack the edge of a shell, extract soft parts, and then spit out shell fragments. A four year old black carp was shown to eat, on average, 3-4 pounds of zebra mussels per day.

Black carp are currently being maintained in research and fish production facilities in Arkansas, Louisiana, Mississippi, Missouri, North Carolina, Oklahoma, and Texas. The predominant use of black carp in the U.S. is for biological control of snails that are intermediate hosts in the life cycle of two trematodes, which affect cultured channel catfish, hybrid striped bass and baitfish. Black carp originally entered the U.S. in the early 1970s as a "contaminant" in imported grass carp (*Ctenopharyngodon idella*) stocks. Young black carp are difficult to distinguish from young grass carp.

The second introduction of black carp into the U.S. occurred in the early 1980s for control of yellow grub (*Clinostomum spp.),* a trematode parasite, in fish culture ponds. The species was also imported by a Mississippi fish farmer during the early 1980s and by a fish farm operation in Missouri during the period 1986-1988. Yellow grub is a trematode parasite that infects fish, and causes economic losses to baitfish and hybrid striped bass farmers. The life cycle of the grub involves snails and fishes as intermediate hosts, and fish-eating birds as final hosts. A second trematode parasite, *Bolbophorus confusus*, has also shown up in snails in channel catfish (*Ictalurus punctatus*) culture ponds. Snail populations in fish production ponds may be controlled by lime, copper sulfate, weed control, crayfish and potentially native fish. However, chemical treatment for snails is limited because chemical agents can be detrimental to fish, or it can have decreased effectiveness due to wind and temperature conditions and pond size. Clearing of aquatic plants has been found to be effective in reducing snail numbers, but is time consuming in large-scale operations. (Service note: We understand that Bayluscide has

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been used as a molluscicide in aquaculture ponds, but because it is toxic to aquatic invertebrates and fish, a Special Use permit must be issued by Environmental Protection Agency.)

Black carp are used as a biological control because they eat infected snails in channel catfish, baitfish and hybrid striped bass ponds but are not susceptible to the trematode. Controlling the trematodes by using black carp is preferable to other methods available for aquaculture producers. Other fishes that are indigenous to the U.S., including the pumpkinseed sunfish, freshwater drum, copper redhorse, river redhorse, and robust redhorse, hold potential to be used for snail control in aquaculture ponds.

Black carp can either be triploids (sterile) or diploids (capable of reproduction). Triploid fish are created by adding an additional chromosome (3 total) to induce sterility. Triploidy is one management tool to prevent reproduction and population increases in stocked fish. Externally, triploid fish are indistinguishable from diploid fish. Triploidy is often confirmed by use of a Coulter Counter® with a channelyzer. Another procedure using a flow cytometer draws a subsample of newly hatched fish to estimate the percentage of triploid fish; however the ploidy of each fish is not verified.

There are questions about the effectiveness of the sterility of triploid fish and the methods used to determine ploidy. Research conducted at the USGS Columbia Environmental Science Center demonstrated that: 1) the aquaculture industry standard for determining ploidy (i.e., Coulter Counter method) classified 1,000 black carp as triploid but two of them were found to be diploid using a more accurate method (i.e., flow cytometry), 2) triploid grass carp males produced viable sperm, and 3) triploid, immature grass carp females were producing ova that appeared to be maturing (Tillitt 2003). Additional research is ongoing.

Though they may not be able to reproduce, triploid fish can cause ecological impacts if introduced to natural waters. Triploid black carp, which live to be 15+ years old, can compete with native fish for food and prey on mollusks and fingerlings, including those that are considered threatened and endangered. Black carp are molluscivores (mussel and snail feeders) and have the potential to negatively affect mollusks, fish, turtles, and waterfowl that rely on mollusks as a food source, if established in natural waters. A single black carp could eat more than 20,000 pounds of mollusks or other food sources during its life.

5) Public Involvement

The Service published a Notice/Review of Information in the Federal Register on June 2, 2000 as the first step in the rulemaking process (Volume 65, pages 35314-35315). The Service received 124 responses during the public comment period that closed August 1, 2000. A Proposed Rule to add black carp to the list of injurious fishes under the Lacey Act was published in the Federal Register on July 30, 2002 (Volume 67, pages 49280-49284). The Service received 81 comments on the Proposed Rule. In an effort to gather additional economic and ecological information, a notice was published in the Federal Register reopening the public comment period on the proposed rule on June 4, 2003 (Volume 68, pages 33431-33432). The Service received 22 responses during the comment period that closed August 4, 2003.

6) Alternatives, Including the Proposed Action

Three alternatives were considered in this assessment: 1) no action, 2) listing as injurious all (both diploid and triploid) live black carp, gametes and eggs, and 3) listing as injurious only diploid live black carp, gametes and eggs. As a practical matter, none of the

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alternatives considered would reduce the risk of environmental impacts in states where black carp is already being used.

Alternative 1: No Action

The No Action Alternative refers to no action being taken to list live black carp as an injurious species under the Lacey Act, which would allow the continued importation and interstate transport of both triploid and diploid black carp, gametes and eggs. Releases of black carp into natural waters of the U.S. are likely to occur again and the species could become established in U.S. waters, threaten recovery of native freshwater mollusks that are threatened or endangered under the Endangered Species Act and potentially degrade habitat for native fishes. Reduced populations of mussels caused by black carp predation could result in degraded water quality, reduced recreational harvest of fish, and decreased mussel shell revenue.

The introduction or establishment of black carp may have negative impacts on humans primarily from the loss of native aquatic mollusk biodiversity, distribution, and abundance. Based on the food habits and habitat preferences of the black carp, it could become established in the habitat supporting most of the federally listed freshwater mussels and about one-third of the federally listed aquatic snails. Freshwater mollusks play an important ecological role in maintaining the health of aquatic ecosystems. Black carp could impact stream communities where snails play an important role as grazers of attached algae and mussels act as filters for phytoplankton. Reduction of snail and mussel populations in those ecosystems could facilitate production of algae mats that may upset the natural balance of wildlife habitats. These losses would affect the aesthetic, recreational, and economic values currently provided by native mollusks and healthy ecosystems. Educational values of mollusks would also be diminished through the loss of biodiversity and ecosystem health. Black carp also have the potential to negatively affect the cultured pearl industry through predation on commercial mussel species, which are harvested to provide the raw material for cultured pearls.

Alternative 2: List as Injurious All (Diploid and Triploid) Black Carp (Proposed Action)

Under this Alternative, the Service would list both diploid and triploid live black carp as injurious wildlife under the Lacey Act, which would prohibit importation, and interstate transport of live black carp, gametes or eggs. The proposed rule would not prohibit intrastate transport or possession of black carp within States, where permitted by the State.

If black carp (diploid and triploid) are listed as injurious wildlife under the Lacey Act, the discounted 10-year cost to the catfish production industry is less than $356,000[1] (USFWS 2005). The value of native mussels was estimated in 1998 to be $40-$50 million (NNMCC 1998). Black carp may also impact the ability to restore imperiled mussels, snails and fishes.

The ability and effectiveness of measures to prevent escape or establishment of black carp are believed to be low. Even with protective measures in place, it is unlikely they would eliminate risks of accidental escape from facilities. Those facilities that are located in floodplains and susceptible to natural storm events may be particularly vulnerable. This alternative would reduce the risk of future escapement in those states where it does not already exist by prohibiting importation and interstate transportation. The risk of escape of black carp within those states where it is already being used is not affected by this alternative.

The ability to eradicate or control black carp populations depends on where they are found. If established in large lakes or river systems, eradication and/or control of black carp is likely impossible and they would likely become permanent members of the fish community. Additionally, controlling the spread of pathogens that black carp may carry, once they have

[1] The draft Economic Analysis of the proposed rulemaking to list black carp under the Lacey Act is available for public comment along with this draft Environmental Assessment.

been introduced in the wild, is practically impossible. No effective and feasible tools are currently available to manage black carp, should they become introduced into river systems. Chemical piscicides are the best available option, but their uses on a large scale is prohibitively expensive, can cause mortality to non-target fish and aquatic species, are not accepted by the public, and must be repeatedly used. In addition, not all life stages are equally susceptible to piscicides.

Since effective measures to control or eradicate wild black carp populations are not available, the ability to rehabilitate or recover ecosystems disturbed by the species is low. Considerable risks associated with black carp establishment in the wild relate to endangerment and extinction of native mussels and snails. Re-establishment of extirpated mussel and snail populations, if biologically possible, would be labor and cost intensive and would depend on eradication of black carp within the habitat of the mussels and snails.

Alternative 3: List as Injurious only Diploid Black Carp

Under this Alternative, the Service would list only diploid live black carp as injurious wildlife under the Lacey Act, which would prohibit importation and interstate transport of live diploid black carp, gametes or eggs. The proposed rule would not prohibit intrastate transport or any use of diploid black carp within States, where permitted by the State.

Alternative 3 would provide one advantage over the Proposed Action (Alternative 2) and the No Action alternative. Listing only diploid black carp as injurious would mean that triploid black carp could still be imported into the U.S. and transported across state lines for use.

However, implementation of Alternative 3 would result in some distinct disadvantages compared to Alternative 2, the Proposed Action. First, triploidy may not guarantee sterility (Tillitt 2003). Second, not all fish are tested for triploid versus diploid status. Because there is no physical distinction between diploid and triploid fish, enforcement of listing only diploid black carp would be practically impossible. If only diploid black carp were listed as injurious (Alternative 3) then the Service would recommend that flow cytometry be conducted on every black carp to ensure that only triploid fish were being imported or shipped across state borders. However, this is not the method used by industry at this time. The current methods of producing triploid fish do not ensure that all of the fish are triploid and certification of each fish would be expensive. Regardless of the method used, reproductively active fish (diploids) will likely be found in otherwise triploid lots of fish.

While triploidy and sterility may impede breeding of black carp in the natural environment, non-breeding populations are still likely to have substantial negative impacts on native snail and mussel populations through predation. Though they cannot reproduce, even triploid fish are likely to cause ecological impacts if they survive in the wild. Triploid fish, which can live to be 15+ years old, can compete with native fish for food and prey on threatened and endangered mollusks.

Because reproducing pairs are required to produce triploid black carp, there is still a potential for reproductively active fish to escape into the waters of those states that are producing triploids. The current methods of producing triploid fish do not ensure that all of the fish are triploid and certification of each fish would be expensive. Reproductively active fish (diploids) will likely be found in otherwise triploid lots of fish. Also, if, like grass carp, black carp triploids are not all sterile, then black carp triploids could either breed with each other or with diploid black carp. Tillitt (2003) hypothesized that sperm from triploid, male black carp can fertilize eggs of diploid, female grass carp. If those hybrids can be produced and their diet includes mollusks, then those hybrids pose a risk to populations of imperiled mollusks.

These concerns mean that shipments of triploid fish may be in reality diploid or may have the ability to propagate in the wild. Implementing this alternative may result in an increased risk of escapement of either triploid or (to a lesser extent) diploid fish as compared to the proposed action because it would allow additional states to establish black carp in

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aquaculture facilities and thus increase the possibility of escapement. The risk of escape within the states where it is already being used is not affected by this alternative.

Preferred Alternative

Because triploid and diploid black carp are likely to escape or be released into natural waters; are likely to survive or become established if escaped or released; are likely to spread if introduced; are likely to compete with native species for food; are likely to feed on native mollusks; it will be difficult to prevent, eradicate, manage, or control the spread of black carp; it will be difficult to rehabilitate or recover ecosystems disturbed by the species; and because even non-breeding (triploid) populations of black carp are likely to have considerable negative impacts on native snail and mussel populations, the Service's preferred alternative is to list all (diploid and triploid) live black carp as injurious under the Lacey Act (Alternative 2). The risk assessment conducted by the USGS concluded that the "Organisms Risk Potential" (ORP), which is calculated based on the probability and consequences of establishment, for black carp was high (Nico and Williams 2003).

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6.1 Summary Table of Alternative Actions

Actions	Alternative 1: No Action	Alternative 2: Proposed Action (List as Injurious All Black Carp)	Alternative 3: (List as Injurious only Diploid Black Carp)
Prohibit the importation of live black carp	No	Yes	Yes – Diploids No – Triploids
Prohibit the interstate transport of live black carp	No	Yes	Yes – Diploids No – Triploids
Reduced risk of escapement of diploid black carp into the wild	No	Yes. However, for states where the carp is already in use, risk will not be eliminated	Yes. However, for states where the carp is already in use, risk will not be eliminated
Reduced risk of escapement of triploid and diploid black carp into the wild	No	Yes. However, for states where the carp is already in use, risk will not be eliminated	No – Triploids Yes. However, for states where the carp is already in use, risk will not be eliminated --Diploids
Economic Impacts	Likelihood of reduction in mussel abundance, with unquantified associated loss of value in the mussel shell industry, and costs of mussel population recovery. Many other costs to natural resources, and the economies that they support.	For catfish industry during 2005-2014 estimated at a maximum of $474,000. Using the Office of Management and Budget guidance to compute the net present value discounted by 7%, the 10-year costs to the catfish industry was analyzed to be $356,000.[2] Because black carp are used in existing states, mollusks may still be impacted.	Likelihood of reduction in mussel abundance, with unquantified associated loss of value in the mussel shell industry, and costs of mussel population recovery. Many other costs to natural resources, and the economies that they support. Because black carp are used in existing states, mollusks may still be impacted. Loss of interstate movement of diploids resulting in impacts to black carp producers and other aquaculture facilities that purchase from those producers.

7) Affected Environment

The native range of black carp includes most of the major Pacific drainages of eastern Asia in the range of latitude from about 22°N to about 51°N (Nico and Williams 2003). The grass carp, a close Asian relative with similar reproductive requirements but different diet preferences, has been stocked or expanded into all of the lower 48 States except Montana and Vermont since introduction of a triploid grass carp program. It is likely that black carp range in the U.S. would include the large river systems (Nico and Williams 2003). Black carp inhabit

[2] The draft Economic Analysis of the proposed rulemaking to list black carp under the Lacey Act is available for public comment along with this draft Environmental Assessment.

lakes and lower reaches of rivers (Welcomme 1988) and require flowing water to establish self-sustaining populations, and mollusk populations on which to feed.

Aquatic mollusks inhabit almost every conceivable freshwater habitat ranging from small ephemeral seeps and wetlands to the largest rivers at an equally wide range of temperatures (see Figure 1) (Nico and Williams 2003). Of the 35 families and more than 800 species of fishes known to occur in the fresh waters of the U.S. and Canada, a very small percentage is known to feed exclusively or primarily on mollusks (Nico and Williams 2003). The diet of subadult and adult black carp consists largely of mollusks (Nico and Williams 2003).

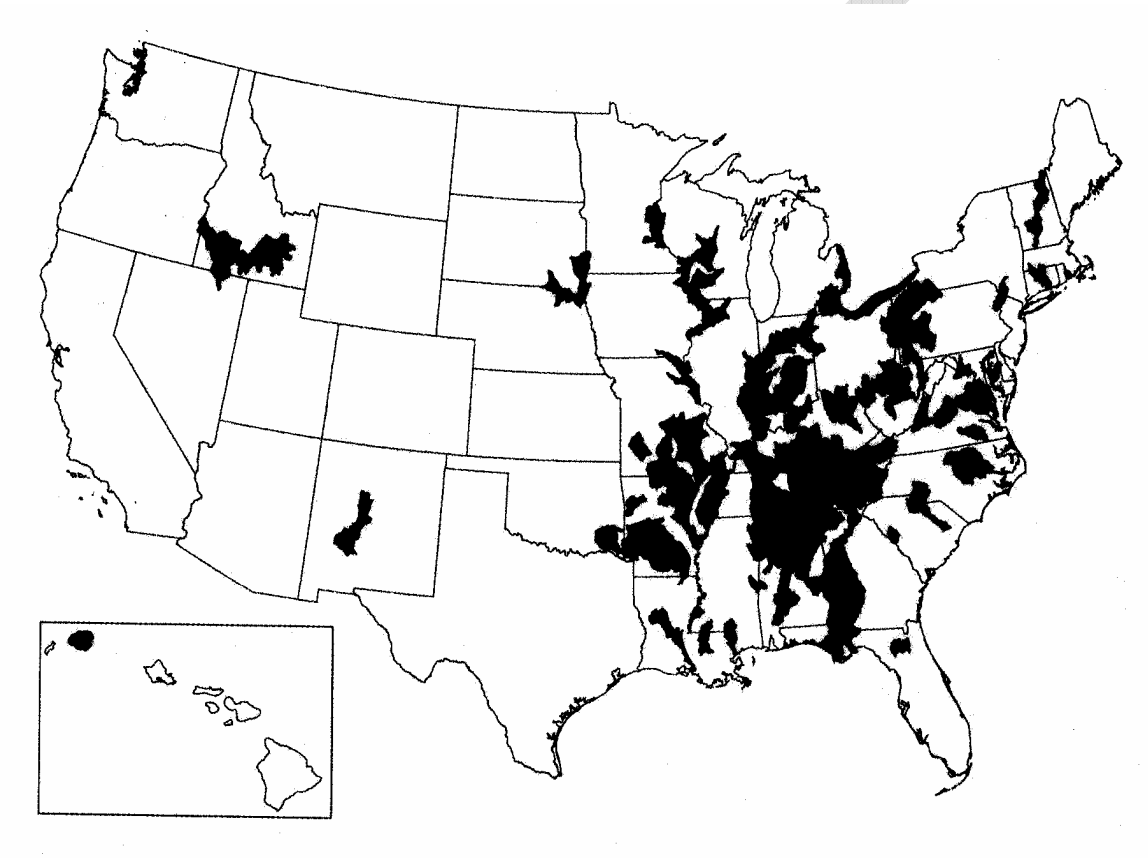

Figure 1. Watersheds of the U.S. with one or more endangered or threatened (Federal list) aquatic mollusks. Drainages shown at the Hydrologic Unit Code (HUC) 8 level. Coverage is based on a total of 54 freshwater mussels and 17 aquatic snails (Nature Serve, Arlington, VA). (Note: map does not include experimental populations (reintroductions) that are not protected as threatened or endangered species). From Nico and Williams 2003.

8) Environmental Consequences

8.1 Ecological Impacts

Alternative 1: No Action

Not listing black carp as injurious may allow for an expansion of their use to states where they are not already found, thus increasing the risk of their escape and establishment due to accidental release and, perhaps, intentional release, which would likely threaten native habitats. Black carp are superficially very similar in appearance to grass carp, *Ctenopharyngodon idella*, specifically in terms of body size and shape, position and size of fins, and position and size of the eyes. Juveniles, in particular, are difficult to distinguish from grass carp young. Nico and Williams (1996) expressed concern that if black carp become more common in U.S. aquaculture, there will be an increased risk that the species be misidentified and unintentionally introduced as "grass carp" to some areas.

Established populations of black carp will likely result in substantial reduction of mollusk abundance. Freshwater mollusks play an important ecological role in maintaining the health of aquatic ecosystems. Black carp could impact stream communities where snails play an important role as grazers of attached algae and mussels act as filters for phytoplankton. Reduction of snail and mussel populations in those ecosystems could facilitate production of algae mats that may upset the natural balance of wildlife habitats. These losses would affect the aesthetic, recreational, and economic values currently provided by native mollusks and healthy ecosystems. Educational values of mollusks would also be diminished through the loss of biodiversity and ecosystem health.

The ability and effectiveness of measures to prevent escape or establishment of black carp are believed to be low. Even with protective measures in place, it is unlikely they would eliminate risks of accidental escape from facilities. Those facilities that are located in floodplains and susceptible to natural storm events may be particularly vulnerable.

The ability to eradicate or control black carp populations depends on where they are found. If established in large lakes or river systems, eradication and/or control of black carp is likely impossible and they would likely become permanent members of the fish community. Additionally, controlling the spread of pathogens that black carp may carry, once they have been introduced in the wild, is practically impossible. No effective and feasible tools are currently available to manage black carp, should they become introduced into river systems. Chemical piscicides are the best available option, but their uses on a large scale is prohibitively expensive, can cause mortality to non-target fish and aquatic species, are not accepted by the public, and must be repeatedly used. In addition, not all life stages are equally susceptible to piscicides.

Since effective measures to control or eradicate wild black carp populations are not available, the ability to rehabilitate or recover ecosystems disturbed by the species is low. Considerable risks associated with black carp establishment in the wild relate to endangerment and extinction of native mussels and snails. Re-establishment of extirpated mussel and snail populations, if biologically possible, would be labor and cost intensive and would depend on eradication of black carp within the habitat of the mussels and snails.

Alternative 2: List as Injurious All (Diploid and Triploid) Black Carp (Proposed Action)

Listing diploid and triploid black carp as injurious will help protect biota in large river systems and tributaries. No negative impacts to habitats will result from listing diploid and triploid black carp. Black carp have the potential to negatively affect threatened and endangered mollusk biodiversity, distribution and abundance. Fish, turtles and waterfowl that

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rely on mollusks as a food source may also be impacted by black carp in natural waters. This alternative would not eliminate the risk to the environment in those states where the carp is already being used.

Alternative 3: List as Injurious only Diploid Black Carp

Listing diploid black carp as injurious will help protect biota in large river systems and tributaries, but these systems will still likely be at risk from triploid introductions. Triploidy may not guarantee sterility (Tillitt 2003). Fish believed to be "triploids" may actually be diploids and could potentially reproduce in natural waters in the U.S. While triploidy and sterility may impede breeding of black carp in the natural environment, non-breeding populations are still likely to have extensive negative impacts on native snail and mussel populations through predation. This alternative would not eliminate the risk to the environment in those states where the carp is already being used.

Though they cannot reproduce, even triploid fish can cause ecological impacts if introduced to natural waters. Triploid black carp, which can live to be 15+ years old, can compete with native fish for food and prey on threatened and endangered mollusks.

Only listing diploid black carp as injurious will result in the continued risk of escapement and/or release of triploids in states where they are being used as well as in states where they are not currently being used through interstate transportation. Interstate transport of triploids may still occur with the potential for accidental release even in states that do not permit their use (i.e. highway accident). Because reproducing pairs are required to produce triploid black carp, there is still a potential for reproductively active fish to escape into the natural waters of those states that are producing triploids.

The current methods of producing triploid fish may not ensure that all of the fish are triploid. Reproductively active fish (diploids) will likely be found in otherwise triploid lots of fish. Also, if, like grass carp, black carp triploids are not all sterile, then black carp triploids could either breed with each other, with diploid black carp or hybridize with grass carp. Tillitt (2003) hypothesized that sperm from triploid, male black carp can fertilize eggs of diploid, female grass carp. If those hybrids can be produced and their diet includes mollusks, then those hybrids pose a risk to populations of imperiled mollusks.

8.2 Impacts on Native Species

Alternative 1: No Action

Not listing black carp as injurious will increase the risk of escapement from states where the carp is not yet used, which may lead to the establishment of non-reproducing and reproducing populations. If black carp populations become established in the wild, this will likely result in the decline of mollusk populations and likely further imperil the 102 Federally threatened and endangered mussels and snails. Seventy species of the 297 mussels native to the U.S. are federally listed as endangered or threatened, and many other species have declined in abundance and distribution (USFWS data 2004). Nearly ten percent of all freshwater snails are extinct and 32 snails are listed as threatened or endangered in the U.S. (USFWS data 2004). This rate of imperilment exceeds every other major animal group in North America, even freshwater mussels (Johnson 2003), due to dam construction, other habitat alterations and pollution.

Mollusks are food for a variety of animals including fishes (redear sunfish, pumpkinseed sunfish, freshwater drum, snail bullhead, copper redhorse, river redhorse, robust redhorse and several catfish and sucker species), turtles (sawbacks and musk turtles), birds (snail kit, scaup and canvasback), and mammals (raccoons, otters and muskrats). Reduced mollusk abundance will result in reduced availability of food for those animals and thus provide decreased biodiversity.

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As molluscivores, black carp have the potential to negatively affect threatened and endangered mollusks, fish, turtles, and waterfowl that rely on mollusks as a food source, if established in natural waters. As adults, powerful teeth permit the black carp to crush the thick shells of large mollusks and they have a gape width much larger than most native mollusk-eating fish. Based on the food habits and habitat preferences of the black carp, it could become established in the habitat supporting most of the federally listed freshwater mussels and about one-third of the federally listed aquatic snails. Therefore, it may feed on and further threaten freshwater mussels and snails.

Alternative 2: List as Injurious All (Diploid and Triploid) Black Carp (Proposed Action)

Prohibiting the importation and interstate transportation of diploid and triploid black carp will help protect native threatened and endangered mollusk populations, and native fishes, turtles, birds and mammals, for which mollusks are food, in large river systems and their tributaries. Only positive impacts to native species will result from listing diploid and triploid black carp. None of the alternatives will eliminate the environmental risks in those states where black carp are currently used; alternative 2, by prohibiting the importation and interstate transportation of all forms, will do the most to protect freshwater mollusks.

Alternative 3: List as Injurious only Diploid Black Carp

Listing only diploid black carp as injurious will not decrease the risk of escapement of triploid (sterile) fish; the risk of escapement of triploid fish will continue at its current level. Additionally, because interstate transportation of triploid fish would not be prohibited, the risk of expansion into other States where the fish is not yet used will not be reduced. The triploid fish, if they escape, are likely to consume native mollusks, many species of which are already threatened or endangered. Fish processed as triploids may actually be diploids and could potentially reproduce in natural waters in the U.S. For these escaped fish, the environmental consequences on native species would be similar to those discussed under Alternative 1. None of the alternatives eliminate environmental risks in those states where black carp are used, but alternative 3 does not reduce the risk of interstate transportation of triploids and unintentional escape or release into natural waters.

Nearly ten percent of all freshwater snails are extinct and 32 snails are listed as threatened or endangered in the U.S. (USFWS data 2004). This rate of imperilment exceeds every other major animal group in North America, even freshwater mussels (Johnson 2003).

As adults, powerful teeth permit the black carp to crush the thick shells of large mollusks and they have a gape width much larger than most native mollusk-eating fish. Triploid black carp, which can live to be 15+ years old, can compete with native fish for food and prey on threatened and endangered mollusks.

8.3 Cumulative Impacts

Alternative 1: No Action

The No Action Alternative refers to no action being taken to list black carp as an injurious species under the Lacey Act, which would allow the continued importation and interstate transport of both triploid and diploid black carp, gametes and eggs. Releases of black carp into natural waters of the U.S. have occurred and are likely to occur again without any action taken to prohibit their transport. Risk of accidental releases from aquaculture farms would continue in states currently using black carp and additional releases may occur from aquaculture farmers in those states currently not using this method to control snails if facilities choose to adopt it. Black carp have been found in the wild in Illinois, Missouri and Louisiana. Available information indicates that the black carp is, or has been in the recent past, maintained in research or production facilities in six states including Arkansas, Louisiana, Mississippi, Missouri, North

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Carolina, Oklahoma, and Texas (Nico and Williams 1996). Many states either prohibit the possession of live black carp or require a permit for their import, possession and/or distribution of either diploid, triploid, or both, including Alabama, Florida, Georgia, Illinois, Indiana, Iowa, Louisiana, Michigan, Minnesota, Nevada, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia and Wisconsin.

The species could become established in U.S. waters, thereby imperil recovery of native freshwater mollusks that are threatened or endangered and potentially degrade habitat for native fishes. Reduced populations of mussels caused by black carp predation could result in degraded water quality, reduced recreational harvest of fish, and decreased mussel shell revenue.

Changes in mollusk habitat through human-induced habitat destruction and competition with nonindigenous species has led to alterations in species composition, loss of diversity, and lowered abundance (Nico and Williams 2003, Williams and Neves undated). Within the last 50 years mussels have been decimated by impoundments, sedimentation, channelization and dredging, water pollution, and, more recently, the nonindigenous zebra mussel (*Dreissena polymorpha*) (NNMCC 1998, Williams and Neves Undated). Like mussels, dam construction and other channel modifications, siltation, and industrial and agricultural pollution have all degraded the river habitats on which snails depend. Conservation and recovery efforts for freshwater snails include artificial culture, water pollution control, and most importantly, habitat protection and restoration (Johnson 2003).

Numerous anthropogenic changes, many which have been ongoing for more than a century, have combined to make freshwater mollusks the most endangered group of aquatic organisms in the U.S. (Master et al. 1997 and Stien et al. 1997 as described in Nico and Williams 2003). In North America, it is estimated that 43% of the 300 species of freshwater mussels are in danger of extinction and the States of Minnesota, Wisconsin, Iowa, Missouri, Illinois, Indiana, and Ohio list more than half of their 78 known mussel species as endangered, threatened, or requiring special concern (USGS/USFWS Undated). To date, freshwater mollusks in the U.S. have not experienced introduction of a nonindigenous invasive species in the form of a direct predator (Nico and Williams 2003). Presence of diploid or triploid black carp could pose a serious threat to many of the remaining populations of endangered and threatened mollusks (Nico and Williams 2003).

As the prevalence of the yellow grub (*Clinostomum spp.)* and *Bolbophorus confusus* increased in fish culture ponds, black carp use increased to control these trematode parasites. Aquaculture facilities exist outside of the states that currently use black carp, but the level of trematode infestation is unknown. If an infestation would occur in the future, these facilities may begin using black carp under the no action alternative. Under the no action alternative, black carp may be used in additional states and transported among states. The risk of floods in states where black carp are utilized and may be utilized in the future will continue to exist, as does the potential for escapement through transport accidents.

The ability to eradicate or control black carp populations depends on where they are found. If established in large lakes or river systems, eradication and/or control of black carp is likely impossible and they would likely become permanent members of the fish community. Additionally, controlling the spread of pathogens that black carp may carry, once they have been introduced in the wild, is practically impossible. No effective and feasible tools are currently available to manage black carp, should they become introduced into river systems. Chemical piscicides are the best available option, but their uses on a large scale is prohibitively expensive, can cause mortality to non-target fish and aquatic species, are not accepted by the public, and must be repeatedly used. In addition, not all life stages are equally susceptible to piscicides.

Since effective measures to control or eradicate wild black carp populations are not available, the ability to rehabilitate or recover ecosystems disturbed by the species is low.

Considerable risks associated with black carp establishment in the wild relate to endangerment and extinction of native mussels and snails. Re-establishment of extirpated mussel and snail populations, if biologically possible, would be labor and cost intensive and would depend on eradication of black carp within the habitat of the mussels and snails.

If no action is taken to prohibit the importation and transportation of black carp, release or introduction of black carp to the natural waters of the U.S. will likely add to the cumulative impacts that have already impacted native, freshwater mollusks.

Alternative 2: List as Injurious All (Diploid and Triploid) Black Carp (Proposed Action)

Listing black carp (diploid and triploid) as an injurious species under the Lacey Act, would prohibit the importation and interstate transport of live black carp, gametes and eggs. This action will reduce the potential for black carp to be released into the natural environment through potential flood events in the middle and southeastern United States (although the risk of release will still exist in those states where they already occur), areas that are more likely prone to flood events. This geographic area, middle and southeastern U.S., is also important habitat for threatened and endangered mollusks.

Alternative 3: List as Injurious only Diploid Black Carp

Listing only diploid black carp as injurious would allow the continued importation and interstate transport of live triploid black carp (but not gametes or eggs), so biota in large river systems and tributaries will still likely be at risk from triploid introductions (although those states where the carp are currently being used already face this risk). Triploidy does not guarantee sterility (Tillitt 2003). Fish believed to be "triploids" may actually be diploids and could potentially reproduce in natural waters in the U.S. The current methods of producing triploid fish do not ensure that all of the fish are triploid. Reproductively active fish (diploids) may be found in otherwise triploid lots of fish. If black carp hybridizes, those hybrids could pose a risk to populations of imperiled mollusks.

While triploidy and sterility may impede breeding of black carp in the natural environment, non-breeding triploid black carp, which can live to be 15+ years old, are still likely to have extensive negative impacts on native snail and mussel populations through predation and would likely compete with native fish for food. As adults, powerful teeth permit the black carp to crush the thick shells of large mollusks and they have a gape width much larger than most native mollusk-eating fish. Reduced populations of mussels caused by black carp predation could result in degraded water quality, reduced recreational harvest of fish, and decreased mussel shell revenue.

Releases or escapes of black carp into natural waters of the U.S. have occurred at facilities through flooding, human movement and wildlife movement and are likely to occur again without any action taken to prohibit their transport. Only listing diploid black carp as injurious may result in the continued risk of escapement and/or release of triploids from states where they are not currently being used. Interstate transport of triploids may still occur with the potential for accidental release even in states that do not permit their use (i.e. highway accident). Because reproducing pairs are required to produce triploid black carp, there is still a potential for reproductively active fish to escape into the waters of those states that are producing triploids.

No effective and feasible tools are currently available to manage triploid black carp, should they become introduced into river systems. Chemical piscicides are the best available option, but their uses on a large scale is prohibitively expensive, can cause mortality to non-target fish and aquatic species, are not accepted by the public, and must be repeatedly used. Additionally, controlling the spread of pathogens that black carp may carry, once they have been introduced in the wild, is practically impossible.

Since effective measures to control or eradicate triploid black carp populations are not available, the ability to rehabilitate or recover ecosystems disturbed by the species, assuming a

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fifteen-year life span for the fish, is low. Because triploid black carp are capable of living 15+ years and eating 3-4 pounds of mollusks a day, mussels and snails face considerable risk of further endangerment and extinction if black carp are released or escape into the wild. Re-establishment of extirpated mussel and snail populations, if biologically possible, would be labor and cost intensive and would depend on eradication of triploid black carp within the habitat of the mussels and snails.

If no action is taken to prohibit the importation and transportation of triploid black carp, the risk of release or introduction of triploid black carp to the natural waters of the U.S. outside of the states where they are already used will likely add to the cumulative impacts that have already impacted native, freshwater mollusks as discussed under Alternative 1.

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9) Summary Table of Environmental Consequences by Alternative

Impacts	**Alternative 1:** No Action	**Alternative 2: Proposed Action** (List as Injurious All Black Carp)	**Alternative 3:** (List as Injurious only Diploid Black Carp)
Escape of live diploid black carp	Likely	Greatly reduced risk (Note: Some States may continue to allow possession and use of black carp) in states other than those states where they are already found. There may be reduced risk in States where they are already found	Greatly reduced risk (Note: Some States may continue to allow possession and use of black carp) in states other than those states where they are already found. There may be reduced risk in States where they are already found
Escape of live triploid black carp	Likely	Greatly reduced risk in states other those states where they are already found. There may be reduced risk in States where they are already found	No reduced risk.
Establishment of populations of black carp	Likely	Greatly reduced risk in states other than those states where they are already found. There may be reduced risk in States where they are already found	Somewhat reduced risk (less than alternative 2) in states other than states where they are already found. There may be reduced risk in States where they are already found
Reductions in mollusk populations	Likely	Greatly reduced risk in states other than those states where they are already found. There may be reduced risk in States where they are already found	Somewhat reduced risk in states (somewhat less than alternative 2) other than states where they are already found. There may be reduced risk in States where they are already found
Degradation in water quality due to reduction in mussel abundance	Likely	Greatly reduced risk in states other than those states where they are already found. There may be reduced risk in States where they are already found	Somewhat reduced risk in states (less than alternative 2) other than states where they are already found. There may be reduced risk in States where they are already found
Threatened and Endangered Mollusks	Likely reductions in some of the 102 listed mollusks	Greatly reduced risk of population reduction of 102 listed mollusks in states other than those where they are already found. There may be	Somewhat reduced risk in some of the 102 listed mollusks (less than alternative 2).

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		reduced risk in States where they are already found	
Cumulative impacts	Risk of additional impacts to threatened and endangered mollusks will not be reduced	Greatly reduced risk of additional impacts to threatened and endangered mollusks in states other than those where they are already found. There may be reduced risk in States where they are already found	Somewhat reduced risk (less than alternative 2) of additional impacts to threatened and endangered mollusks

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