Proceedings of the Asian Carp Working Group Meeting

May 24, 2004
Columbia, Missouri

Hosted by:
U.S. Fish and Wildlife Service
Carterville Fishery Resources Office
9053 Route 148
Marion, Illinois 62959

Facilitated by:
Parks Consulting Group

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Image credits: silver carp (top left) Fish Market a.s. (Czech Republic); bighead carp (bottom right) David Riecks, UIUC/IL-IN Sea Grant.

The information contained in this report is provided as documentation of the Asian Carp Working Group meeting held May 24, 2004, in Columbia, Missouri, and does not necessarily reflect the position of the U.S. Fish & Wildlife Service.

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Acknowledgements

A considerable amount of planning went into organizing this first meeting of the Aquatic Nuisance Species Task Force Asian Carp Working Group. The success of this meeting is due to the commitment of many individuals to whom I am very grateful. I would like to thank those individuals who participated as part of the planning team for their time and efforts: Mike Armstrong, Kim Bogenschutz, Anjie Bowen, Roger Eberhardt, Mike Goehle, Thomas Goniea, Mike Hoff, Rob Klumb, Bill Mauck, Susan Parks, Jerry Rasmussen, Jay Rendall, Jay Troxel, and Jay Wesley. The work of all the people who contributed throughout the day to make the meeting a success is greatly appreciated, including the speakers: Jay Rendall, Erin Williams, Amy Benson, Cindy Kolar, Leo Nico, Ed Little, Kevin Irons, Carol Engle, and Everett Wilson; the biologist co-facilitators: Kim Bogenschutz, Mike Hoff, Bob Pitman, and Jay Troxel; and Susan Parks of Parks Consulting Group and her assistants Judy Bennett, Beth Malloy, and Donna Rook. I would also like to thank Nate Caswell for the work he put in behind the scenes over the last several months and for AV assistance during the meeting.

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Lastly, my thanks go out to all of the meeting participants for contributing the time and financial resources required to travel and participate in the meeting.

Greg Conover
Asian Carp Working Group Chair

Executive Summary

The Aquatic Nuisance Species Task Force (Task Force) is an intergovernmental entity responsible for coordination of national efforts to prevent the introduction and spread of invasive species. The Task Force requested the U.S. Fish and Wildlife Service (USFWS) lead an effort to create an Asian Carp Working Group (Working Group) to develop a national management and control plan for four species of Asian carp: bighead carp (*Hypophthalmicthys nobilis*), black carp (*Mylopharyngodon piceus*), grass carp (*Ctenopharyngodon idella*), and silver carp (*H. molitrix*).

The Working Group brings together stakeholders with different interests in Asian carp to work towards a common goal of controlling and managing these species responsibly and practically to minimize their potential adverse environmental impacts and to prevent unauthorized introductions. Successful implementation of the management and control plan is dependant upon the support and involvement of all stakeholders to eliminate potential pathways, reduce distributions and population abundances, and mitigate where possible.

The Working Group held its first meeting on May 24, 2004, in Columbia, Missouri, to begin a collaborative process for developing a national management and control plan for Asian carp. The Working Group meeting was organized to build from an Asian Carp Workshop hosted by the USFWS in St. Louis, Missouri, during April 2000. A draft framework was presented to the Working Group for consideration and included the following goals and objectives.

Goals

1. Prevent new introductions of Asian carp into the wild within the United States.
2. Control the expansion of wild populations of Asian carp.
3. Abate the harmful ecological, economic, social, and public health impacts resulting from the introduction of Asian carp into the wild.

Primary Objectives

- **Prevention and containment:** Prevent the risk of new introductions in the wild and eliminate pathways to prevent further distribution and spread of Asian carp.
- **Surveillance:** Activities to monitor the distribution of Asian carp and to forecast and detect new introductions and range expansions.
- **Eradication, control, and abatement:** Identify management actions and develop programs to eradicate or reduce population abundance, control the spread of Asian carp, and abate the harmful ecological, economic, social and public health impacts resulting from the establishment of Asian carp populations in the wild.

Secondary Objectives

- **Research needs:** Begin, continue, and expand biological field and laboratory investigations of Asian carp populations in support of preventing spread, controlling populations, and minimizing impacts.
- **Information access and management:** Develop information management systems to successfully implement coordinated management activities and provide for timely access and exchange of new data.
- **Education and outreach:** Develop educational materials and outreach programs in support of preventing spread, controlling populations, and minimizing harmful impacts of Asian carp populations.
- **Coordination and leadership:** Provide for coordinated implementation of the management and control plan and the timely access and exchange of new data, information, and developments.

Breakout sessions were conducted during the Working Group meeting to focus discussions. The focus groups were 1) Preventing Spread, 2) Detection and Monitoring, 3) Population Control and Abatement, and 4) Research and Information Exchange. Meeting participants were tasked with identifying and prioritizing strategies and developing action plans and implementation time tables to accomplish the proposed goals and objectives of the management plan.

The breakout sessions were organized to facilitate the drafting of the management and control plan. The following outline is an example of how the strategies, initiatives, and actions identified during the breakout sessions can be summarized and aligned under the objectives proposed in the draft framework for the management and control plan.

Objective: Prevention and Containment

1) Develop and enforce regulations and policies designed to reduce the risk of release of Asian carp into the wild

- Establish a national policy on Asian carp
    - Completion and implementation approval of Asian Carp Management and Control Plan
    - Decision on bighead, silver, and black carp listings as injurious species under the Lacey Act
- Promulgate and enforce existing regulations and policies
    - Review existing regulations and policies and assess their effectiveness
- Develop new federal, state, and local regulations to close existing pathways of introduction to the wild
    - Develop model regulations and policies that could be used by states without them
    - Strengthen import policy (re: disease and parasites)
    - Sale of live Asian carp in the food trade (consensus not reached on all species)
    - Bait bucket introductions

2) Identify locations that are at greatest risk of invasion via each pathway (i.e., swimming, live food, bait, aquaculture, internet/aquarium trade)

- Conduct risk assessment to determine which pathways pose risks of introductions into additional watersheds and basins
- Establish controls on all pathways

3) Construct barriers to prevent invasion of additional basins, watersheds, and sub-watersheds
- An example of a watershed connection in which additional barriers are needed is the Chicago Sanitary and Ship Canal
- An example of a location within a basin in which barrier net benefits may exceed the costs is the Upper Mississippi River

4) Implement standards and best practices to reduce the risk of unintentional release into the wild
- Increase accountability of producers through laws, tools, and tags
- Implement Hazard Analysis and Critical Control Point-type planning as a requirement for transporting and stocking species where Asian carp contamination is possible.
- Construct barriers for aquaculture systems to prevent floods from allowing escapement of Asian carp into the wild (where not yet established)
- Reduce the need for Asian carp in management of aquatic systems
  - In the wild, develop and implement management practices that minimize the need for grass carp
  - In aquaculture, develop and implement management practices that minimize the need for Asian carp

5) Develop a Triploid Certification program for bighead, silver, and black carp
- For species not listed under Lacey Act or if listing allows use of triploids in aquaculture

Objective: Surveillance

6) Develop and conduct early detection monitoring programs in locations where risk of introduction exists
- Develop a comprehensive, standardize sampling program
- Develop a rapid assessment protocol to be used when the early detection program reveals invasion
- Develop a framework so groups working together can discuss findings and report issues

7) Identify likely habitats for high priority sampling
- biodiversity hotspots
- waters of special concern
- upstream/downstream of barriers

8) Develop mechanisms to verify location, distribution, movement of captive and wild stock
- Create a mandatory reporting system for captive stock
- Sample commercial harvest for presence of black carp

Objective: Eradication, control, and abatement

9) Develop rapid response tools and teams for escapes

- including designated individual with responsibility for a geographic area

10) Develop and implement rapid response plans
- Implement rapid response plans when early detection and rapid assessment determines the presence of Asian carp at population levels and geographic scales that could allow a reasonable probability of successful eradication

11) Reduce number of fish in the wild
- Develop commercial fisheries
- Develop new markets as food fish
- Increase wild harvests – bounty, contests
- Develop an approved lists of eradication tools

Objective: Research needs

12) Develop a research framework and priorities based on needs identified for implementation of the management and control plan
- Biological research agenda
  - Biology and life history
  - Effects on native species
  - Spawning, movement, habitat, behaviors
  - Larval stage elimination and spawning adults elimination strategies
  - Field study best practices, such as sampling techniques
  - Biological controls, oral piscicides, selective toxicants, implants
  - Genetic modification
  - Pheromones
- Economic research agenda
  - Total cost/benefits analysis (in addition to risk analysis)
  - Commercial best practices, such as control and management options, aquaculture design and operations
- Social research agenda
  - Understand cultural implications of bighead carp consumer market

Objective: Information access and management

13) Develop tools and processes to facilitate information access and exchange across Governmental and non-governmental bodies
- Create/coordinate data bases of producers, operators, sampling and data protocols, research and field findings, statutes, species distribution, implementation actions
- Create and maintain website for information dissemination
- Ensure that agencies are committed to share information

Objective: Education and outreach

14) Develop an education and outreach framework and priorities based on needs identified for implementation of the management and control plan
- Identify all constituencies and their information/education needs

- Develop and implement a public education program designed to reduce the risk of spread
- Develop interdisciplinary education tools on identification, differences between species, differences in life stages, food quality
- Current laws, why they exist, and how to comply
- Best practices for resource managers, producers, haulers, inspectors, dealers, anglers, boaters
- Communicate issues, impacts, successes and needs

Objective: Coordination and leadership

15) Establish processes to facilitate coordination and leadership necessary to successfully implement the management and control plan

- Provide assistance in developing Asian carp reduction and eradication programs
- Review existing legislation, regulations, and policies pertaining to Asian carp prevention and management and provide recommendations
- Develop an advisory council to review proposed Asian carp policy/regulations and consider unintended effects

Asian Carp Working Group Meeting Objectives

Problem Statement

The Nature Conservancy identifies invasive species second only to habitat loss as the greatest threat to native ecosystems. Aquatic systems are especially vulnerable, and invasions in these ecosystems are especially difficult to contain and reverse (The Nature Conservancy 2003). Freshwater aquatic animals have been identified as the most threatened group of species in the United States. More than one-third of freshwater fishes, mollusks and amphibians dependent upon aquatic or wetland habitats are at risk (USFWS 2000).

Unintentional aquatic introductions have had harmful, even catastrophic, environmental consequences (Courtenay and Stauffer 1984, Great Lakes Commission 1992, Fuller et al. 1999). In many cases, invasive species cause a combination of economic, environmental, and health threats (National Invasive Species Council 2001). In the Great Lakes alone, approximately 140 nonindigenous aquatic organisms have become established since the 1800's. Many of these species, including sea lamprey (*Petromyzon marinus*) and zebra mussels (*Dreissena polymorpha*), have had substantial economic and ecological impacts (Great Lakes Commission 1992).

Four species of Asian carp have been introduced into U.S. river systems. Bighead carp (*Hypophthalmicthys nobilis*), grass carp (*Ctenopharyngodon idella*), and silver carp (*H. molitrix*) have established reproducing populations. Adult black carp (*Mylopharyngodon piceus*), have been captured in several locations along the Mississippi River and are suspected of having established reproducing populations. A fifth species of Asian carp, the largescale silver carp (*H. harmandi*), is not believed to have been introduced into the United States yet (USGS 2004).

Increasing accounts of wild captured black carp are causing great concern because of its threats to imperiled native mussels and snails. Large populations of bighead and silver carp have been reported throughout much of the Mississippi River basin, including the Ohio, Missouri, and Illinois rivers. An inter-basin connection threatens to allow these species to invade the Great Lakes, with potential economic and environmental impacts to this internationally important ecosystem.

Among the threats that concern biologists most about Asian carp are the species' reproductive potentials, reported abundances, potential range expansions, trophic niches and feeding rates, competition with native species for food and habitat resources, changes to aquatic food webs and habitats, and behaviors such as the silver carp's tendency to jump out of the water. The black carp, a molluscivore, has the potential to consume imperiled native mussels and snails. The effects of these species are not fully understood and it will be difficult to fully document their impacts on complex aquatic systems.

Confounding the Asian carp issue is the fact that at least three of the four species have desirable commercial applications. Grass carp have been extensively used as a biological control agent for aquatic vegetation in private and public waters. Many catfish and hybrid striped bass producers use black carp in production ponds to control snails that serve as intermediate hosts for two

different parasites, the exotic trematode (*Bolbophorus damnificus*) and the yellow grub (*Clinostomum complanatum*). Bighead carp offer a polyculture alternative to many fish farmers, providing additional economic returns. Silver carp have been used to improve water quality in production ponds and waste water treatment lagoons.

Natural resource management agencies are gravely concerned about the potential negative economic, environmental, and even human health impacts posed by wild populations of Asian carp. These fish threaten to invade additional systems throughout the U.S and warrant proactive steps to prevent further introductions and spread. The complexity of Asian carp issues will require that management and control methods be developed and coordinated by a coalition of private and public sector fisheries professionals, aquaculturists, aquatic ecologists, and resource consumers (USFWS 2000).

Background

The Aquatic Nuisance Species Task Force (Task Force) is an intergovernmental entity established under the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 (Act, 16 U.S.C. 4701-4741). The Task Force is co-chaired by the U.S. Fish and Wildlife Service (USFWS) and the National Oceanic and Atmospheric Administration. The Task Force is responsible for coordination of national efforts to prevent the introduction and spread of invasive species. Chief among these responsibilities is to develop control programs for specific high-risk invasive species, such as Asian carp.

The Task Force has determined that Asian carp are nuisance species that warrant active control by resource management agencies. To that end, the Task Force has requested that the USFWS lead an effort to create an Asian Carp Working Group (Working Group) that will draft an integrated management and control plan for Asian carp. The four species of Asian carp to be covered by this plan are bighead carp, black carp, grass carp, and silver carp.

The USFWS hosted an Asian Carp Workshop in St. Louis, Missouri, during April 2000. The purpose of that workshop was to initiate the process of gathering input for the development of a Mississippi River Basin Asian Carp Management and Control Plan. The goal of the workshop was to review status, distribution, biology; ecological and economic benefits and impacts of four Asian carp species, and to identify management and control alternatives to reduce or mitigate these impacts (USFWS 2000).

The Working Group has broad representation from federal, state, tribal, and Canadian natural resources management agencies, as well as experts from the aquaculture industry, academia, and non-governmental environmental organizations. The Working Group faces the challenge of developing a management and control plan for four invasive species that are different in many ways (e.g., commercial value, distribution in open waters, and potential adverse impacts). Perhaps even more complex in the development of an effective management and control plan will be addressing the broad range of interests and values in these species, ranging from commercial support to ardent opposition. The broad representation of stakeholders on the Working Group is intended to bring together different interests and expertise to work towards a common goal of controlling and managing these species responsibly and practically to minimize adverse environmental impacts and to prevent unauthorized introductions. Successful

implementation of the management and control plan is dependant upon the support and involvement of all stakeholders to eliminate potential pathways, reduce distributions and population abundances, and eliminate or mitigate negative impacts of Asian carp where possible. The solution for protecting our native ecosystems lies in working together.

Purpose and Expectations

The purpose of the Asian Carp Working Group meeting is to begin a collaborative process of developing an integrated national management and control plan for four species of Asian carp: bighead carp, silver carp, grass carp, and black carp. Partners and stakeholders have been invited to participate in the Working Group meeting to further develop the proposed management and control objectives, actions plans, and implementation time tables. Breakout sessions will address the topics of preventing the spread of Asian carp in the wild, detecting and monitoring, controlling wild populations of these species, and identify research and informational needs to support the successful implementation of a national management and control plan. The strategies, initiatives, and actions identified during the Working Group meeting will be used to develop an Asian Carp Management and Control Plan that will be submitted to the Task Force for implementation approval. The development of innovative strategies and the implementation of coordinated actions are paramount to the successful control and management of wild populations of Asian carp.

Approach

Asian carp and invasive species management specialist representing Federal, State, Native American, and Canadian natural resources management agencies, as well as experts from universities and research facilities, aquaculturists and their trade association representatives, ngo's and private consultants have been invited to collaborate in the development of a national management and control plan for Asian carp.

The Working Group meeting was organized to build from the Asian Carp Workshop hosted by the USFWS in April 2000. The results of that meeting are published in a proceedings document and provided essential background information to the Working Group meeting.

Breakout sessions were conducted during the Working Group meeting to focus discussions on the issues of preventing spread, detection and monitoring, population control and abatement, and research and information exchange. Meeting participants were tasked with identifying and prioritizing strategies and developing action plans and implementation time tables to accomplish the proposed goals and objectives of the management plan.

The documentation from the Working Group meeting will be used to draft an Asian Carp Management and Control Plan that will be submitted to the Task Force for implementation approval. Our partners, including the various stakeholders, have been invited to participate in the development and drafting of the management and control plan, as well as to review and provide comments on the plan as it is drafted.

Proposed Goals and Objectives

Goals

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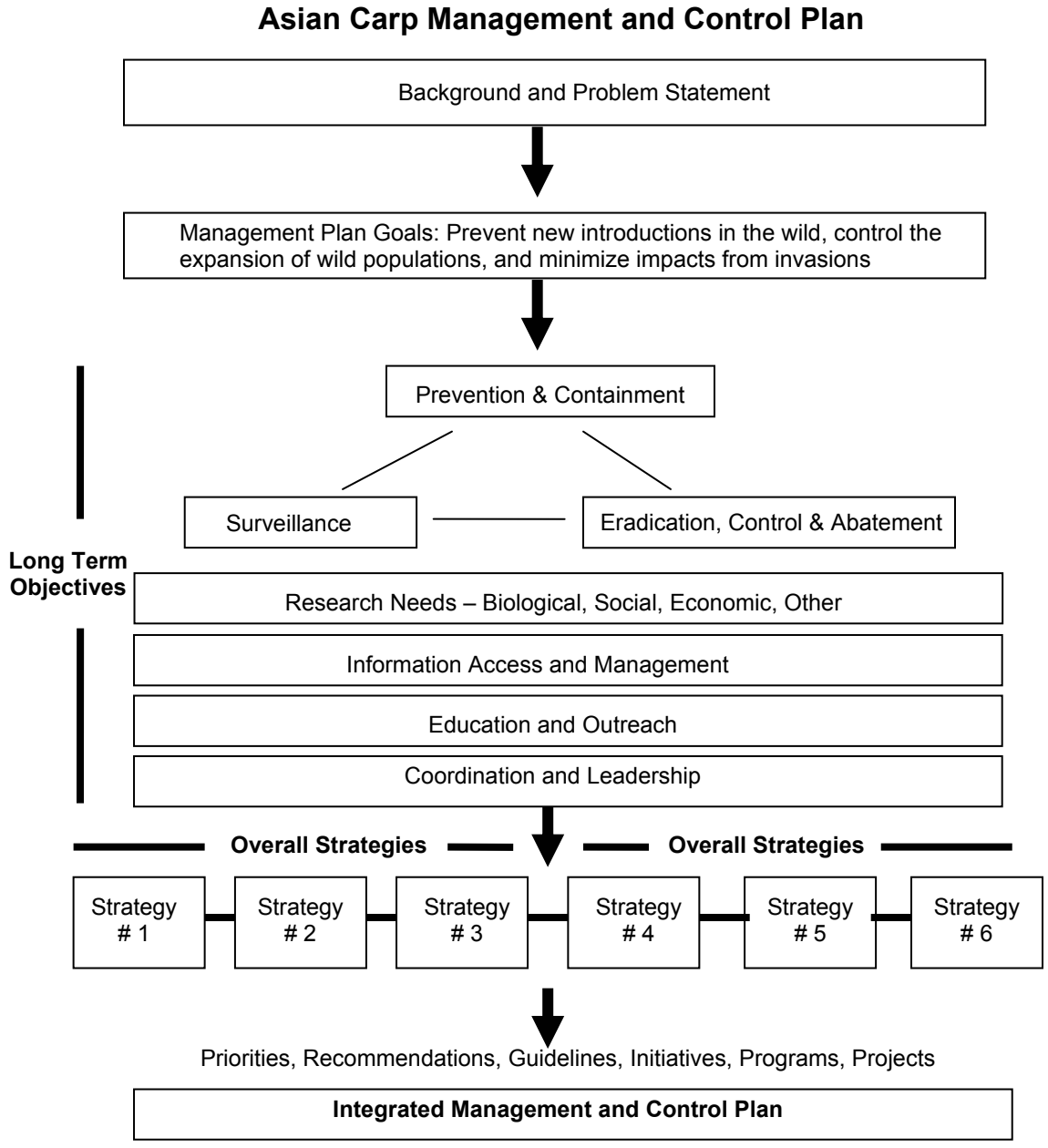
The following chart illustrates the elements that will be included in the management and control plan and how they fit together. During the Working Group meeting the coalition assembled will begin to develop and prioritize strategies, and identify the necessary priorities, recommendations, guidelines, initiatives, programs, projects, etc in support of these strategies that will become the integrated management and control plan.



Summary of Presentations

The following is a summary of the presentations that set the stage for the conference discussions. Speaker bios and slides from presentations can be found in Appendix B.

Opening Remarks - Jay Rendall

Mississippi River Basin Panel Chairperson and Minnesota Department of Natural Resources

Welcome and thanks to everyone for their participation, time, and energy to address this issue. The group is here to solve a major problem that continues to worsen and presents a major challenge. We have representation from several Federal agencies, eleven state natural resource management agencies, as well a Native American, and Canadian representatives. Many constituencies are represented here today including aquaculture, Great Lakes fisheries, and ngo's. Our challenge is to come together to create a comprehensive, integrated management and control plan for Asian carp.

Some background on how we came to be here today:

- In 2000, a conference sponsored by USFWS was held on this topic. Information was exchanged and we'll use that information here today.
- In 2003, an Aquatic Invasive Species Summit was held in Chicago.

We need to do several things to proceed:

- Recognize the magnitude of the problem. The Mississippi River Basin Panel identified Asian carp as the top basin-wide aquatic issue, affecting 28 states.
- We're all different, have different responsibilities, ideas, and opinions. We need to respect all constituencies and all points of view.
- We need to recognize that the Asian carp "bomb" has already gone off. We need to act quickly to prevent further spread.
- Many hurdles to implementation need to be addressed – this meeting is the first step.

Objectives of the Asian Carp Working Group Meeting - Greg Conover

Asian Carp Working Group Chair, USFWS, Carterville Fishery Resources Office

Good morning everyone. I would like to welcome all of you and thank you for participating in this first meeting of the Aquatic Nuisance Species Task Force's Asian Carp Working Group.

The Task Force is an inter-governmental organization responsible for coordination of national efforts to prevent the introduction and spread of invasive species. The Task Force has determined that Asian carp are nuisance species that warrant active control by resource management agencies.

The Task Force has requested that the Fish and Wildlife Service lead an effort to create an Asian Carp Working Group that will draft an integrated, national management and control plan for Asian carp. It is our desire to develop this plan in a collaborative process that includes the participation of our partners and stakeholders.

As Jay pointed out during his welcoming remarks, today's participants are from Federal, state, Native American, and Canadian natural resources management agencies, universities and research facilities, along with aquaculturists and their trade association representatives, ngo's and private consultants. We have gathered varied interests and expertise here today from across the United States and Canada.

In April 2000, the USFWS hosted an Asian Carp Management and Control Workshop in St. Louis, Missouri. This workshop was held to initiate the process of gathering input for the development of a Mississippi River Basin Asian Carp Management and Control Plan. The goal of that workshop was to review status, distribution, biology and ecological and economic benefits and impacts of four Asian carp species and to identify management and control alternatives to reduce and mitigate these impacts.

The purpose of today's meeting is to begin a collaborative process of developing a comprehensive, integrated, national management and control plan for four species of Asian carp: bighead, black, grass, and silver carp. Today's meeting will step forward from that initial workshop focused on the Mississippi River Basin to develop and prioritize strategies, action plans and implementation time tables to accomplish the goals and objectives of a national management and control plan.

Meeting participants will also have the opportunity to continue participating in the development and drafting of the management plan following today's meeting. All participants will be given the opportunity to review and comment on the plan as it is drafted.

We expect the output from today's meeting to be sufficient for development into the text of a draft management plan by a small group of cooperators. The breakout sessions and discussion topics are designed to produce output that will fit directly into the framework of the management plan and facilitate in the development of the plan.

Today's meeting will begin with a few presentations to provide us with background information on issues relative to Asian carp, developments and current issues since the 2000 workshop, and a focus on the task of developing the management and control plan. Following the presentations, we will separate into four breakout groups: preventing spread, detection and monitoring, population control and mitigation, and research and information exchange. Each group is designed to have a mix of agency and organizational representation. The groups will use the results of the 2000 workshop to begin discussing initiatives and strategies to accomplish the goals and objectives identified in the framework for the management and control plan. Each breakout group is tasked with beginning the development of actions plans and implementation time tables. Following the breakout sessions, we will reconvene in the ballroom to share the results of each group and have an open facilitated discussion.

National Management Plan for Asian Carp: Purpose and Process - Erin Williams

California & Nevada Aquatic Nuisance Species Coordinator, USFWS, Stockton California Fish & Wildlife Office

The ANTSF was authorized under NISA of 1996. Objectives of the plan include:

- Prevention
- Early detection
- Rapid response
- Control
- Research
- Reducing impacts
- Information management, and outreach
- Adaptive management

A management plan should include several elements:

- An outline of priorities – high, medium, and low
- Stages and phases of implementation
- Short and long term needs (short term means the 1st five years, medium means 5 – 10 years, and long term means 10 – 15 years)
- An implementation summary and a table to show funding needs
- A description of the deliverable outcome from the implementation plan
- In-plan and out-of-plan action items

Implementation priorities:

- Short-term: Preventing transport/spread, risk assessments, early detection, rapid response
- Long-term: Life history, control strategies, negative impacts, adaptive management

The process is to:

- Compile information
- Create draft
- Send draft out for review
- Submit to task force
- Task force reviews plan and identify actions needed by Working Group
- Change draft, if necessary
- Provide public comment in Federal Register
- Respond to public comments
- Submit final plan to task force
- Implementation.

Q: What actions from today's session might bear on the listing?

A: The listing is not on hold, waiting for this management plan

Q: Are there hard copies of the information about the 3rd goal of harmful effects? Before we make decisions we need to have this research data, not just opinions. The stakeholders who could be economically impacted are being impacted now. We need to be working together and look at best management practices.

A: Most of the information is from the FWS 2000 proceedings, which is published. It contains information about the benefits and impacts of the species. There may also be some information in the process for listing injurious species.

Q: When will the risk assessment be available?

A: USGS will submit the information about bighead carp in 1 month.

Asian Carp Distributions in the United States - Amy Benson

Fishery Biologist, USGS, Gainesville, Florida

The reported distributions of Asian carp species were assembled from information obtained primarily from reports in the scientific literature and from personal communication with people around the country with first hand experience and knowledge of these species.

Grass carp have been reported from 46 states and Ontario, Canada. Reproducing populations have been reported from the Mississippi, Missouri, Ohio, and Trinity Rivers.

Bighead carp were brought into Arkansas in 1973 and were first reported in open waters in 1981 (Ohio River) and 1984 (Yates Reservoir, AL). Bighead carp were reported from Lake Erie in 1995 and 2000 near Sandusky, Ohio and from Canadian waters in 2000. To date, bighead carp have been reported in 111 8-digit hydrologic units in 23 states and 1 province. Bighead carp have been reported in 18 new states since 2000. The distribution of bighead carp includes many reports from Texas and Alabama, to as far north as Wisconsin and Lake Erie, and east from West Virginia to west from Kansas, Nebraska, and South Dakota. Reproducing populations are reported throughout the Mississippi River from Iowa to the Gulf of Mexico, the lower Ohio River, and much of the Missouri River. Isolated occurrences have been reported from Florida to California to Lake Eerie (Ontario and Ohio).

Silver carp were also first brought into Arkansas in 1973. By 1980 commercial fishermen reported collecting them in the lower Arkansas and White River in Arkansas. Silver carp have been reported in 57 8-digit hydrologic units in 15 states. Silver carp have only been reported in 3 new states since 2000. Silver carp have been reported from fewer water bodies than bighead carp. Reproducing populations are reported throughout the Mississippi River from Iowa to the Gulf of Mexico, the lower Ohio River, and the lower Missouri River. There have been isolated reports from Arizona and Colorado.

There have only been 3 reported occurrences of black carp in the wild. Black carp are known to have escaped from aquaculture ponds into the Osage River in 1994. A 4-year old triploid black carp was collected by a commercial fisherman in 2003 in Horseshoe Lake, a Mississippi River oxbow lake in southern Illinois. A 13.3 kg black carp was confirmed collected from the Red River, Louisiana, in 2004, after a commercial fisherman reported catching funny looking grass carp for the last 8-years.

More geographic information, including maps and observation data are available on the USGS website at http://nas.er.usgs.gov.

Q: Are silver carp and bighead carp being shipped together?

A: There is non-intentional stock contamination. There are no silver carp in production.

Q: How do you verify/identify the species between bighead carp and silver carp?

A: We try to rely on expertise from the literature or reliable sources; qualifiers are in the database, including the contact name of who identified it.

Bigheaded Carps, Genus Hypophthalmichthys: Status of Biological Synopses and Risk Assessments - Cindy Kolar

Fishery Biologist, USGS, Upper Midwest Environmental Sciences Center

The U.S. Fish and Wildlife Service has been petitioned to list bighead and silver carps as injurious species under the Lacey Act. Listing under the Lacy Act is a 2-stage process – first an evaluation criteria document is completed and then a risk assessment is performed. The evaluation criteria have been submitted for bighead carp, the risk assessment will be submitted in about one month.

We thought we were working on two species but recent genetic work identified a third species -- large scale silver carp. It is very similar in appearance to silver carp. The evaluation includes:

- Discussion on native geography for each type of carp and biologic characteristics.
- A list of parasites and diseases.
- History and pathways of introduction.
- Uses, such as food, control of algae, remove excess nutrients, fisheries, production and growth of other fishes, and livestock feed. Often raised in polyculture.
- Potential distribution -- distribution of silver is very wide, bighead not as broad because of temperature range.

The risk assessment will contain seven levels of risk plus a level of certainty for each pathway. These include:

- Probability of establishment – entry potential, colonization potential, spread potential, organism within pathway
- Consequence of establishment – economic, environmental, perceived
- Organism risk potential is result – probability of establishment and consequences of establishment.

Q: Given the large fecundity, what percentage of eggs spawned are raised to adults?

A: We don't know at this time

Q: In countries where the carps are established more than 5 years, what has been economic impact on fish, invertebrates, and native plants establishments?

A: There is not a lot of information. Some studies in areas where bighead and silver carps were introduced have shown a peak in carp and then a reduction in natives, but there is not necessarily a correlation because of other problems in the area. However, in these areas, native are now harder to catch. One third of the species have not been caught in five years in one place in China. Other things were going on, but researchers have identified this as a significant factor.

Q: Are there other recognized species?

A: No. Only three species

Q: For the risk assessment, to what extent do you get input from USDA in doing risk assessment?

A: For several elements, such as probability, we don't need USDA input. We might need it on consequence of establishment. I don't know if we have received input from USDA.

Q: Are outside groups (like people from industry) involved to give input to the risk assessment?

A: A call for information was posted in the federal register; we talked to and e-mailed others.

Q: Why do these risk assessments if Fish and Wildlife doesn't need to follow the recommendations?

A: Part of the FWS process for the Lacey Act requires that a risk assessment be done. Recommendations usually aren't a part of the assessment.

Q: What is the relationship between the risk assessment and the end result?

A; Potential economic impact of regulation is part of regulation process not part of risk assessment. There is no pressure to adjust the risk assessment based on economic input. The policy makers are the ones who should consider economic input.

Q: Will recommendation be made public?

A: Yes.

Q: This really is a two-part process. The first is to assess the risk, and the second is to understand what can be done to mitigate the risk. Are you doing both steps?

A: Not sure. I haven't seen that as part of the process. What is provided in the risk assessment is only a portion of what is used to make decisions. Mitigation is up to the managers; the risk assessment only tells you if mitigation is warranted. The USGS is conducting the risk assessment and the USFWS is developing the management plan. The result of the risk assessment will be only a low-medium-high risk, which only indicates that risk mitigation is needed. The mitigation strategies will depend on the level of risk. If needed, there will be a mitigation document as a next step.

Black Carp: Life Cycle, Habitat Requirements, and Potential Range - Dr. Leo Nico (and Howard Jelks)

Research Biologist, USGS, Gainesville, Florida

The study looked at black carp life cycle, habitat requirements, and ecology. To complete their life cycle, black carp generally require access to large riverine environments, large floodplains, and rivers. Factors such as river length, water flow, salinity, water quality, food sources, predation and competition, nursery locations, amount of water turbulence, and temperature seem to be important in several scenarios.

- Adults and juveniles feed on snails and bivalve mollusks
- Benthic
- Similar to other Chinese river carps
    - Require relatively large riverine environments to successfully reproduce
    - Co-occur in same rivers
    - Spawning migrations about same time in response to similar cues
    - Often share spawning grounds and spawn together
    - Semi-pelagic eggs drift downstream
    - Require same nursery habitat
    - Overwinter in similar habitats (near bottom in deep water)
- Typically live in large floodplain rivers <500 m above sea level
- Naturally occur from subtropical to temperate regions
- Upstream spawning migration in spring-early summer triggered by increased water flows and temperature
- Spawning sites
    - High flow and turbulence
    - Often located immediately downstream from islands or near tributary
- Spawning
    - Not much known about black carp spawning behavior
- Spawning by other river carps:
    - Fertilized eggs drift in current
    - Larval carp hatch in current and quickly begin to navigate and seek nursery areas with little or no current (backwater habitats)
- Basic reproductive requirements:
    - Water velocity (0.8-1.8 m/s)
    - Water temperature (17-30^{o} C)
    - Appropriate river length – distance to downstream nursery habitat must be far enough but not too far from spawning areas
    - Combination of these factors can be used to express habitat suitability

The river length required for incubation of Chinese carp eggs is closely associated with water temperature and water velocity. At a fixed temperature of 30C, egg incubation requires about 45 river km at a velocity of 0.8 m/s but as much as 100 km at 2.8 m/s. Average weekly water temperature data from the upper Mississippi indicated the river is highly suitable for river carp reproduction.

Growth rate and age at first maturity differ among regions. Theoretically, Chinese carps inhabiting the lower Mississippi will reach first maturity a few years younger than those populating the upper Mississippi. Because the Mississippi runs N-S, the river is highly favorable to black carp – the carps could winter in the southern sections and mature more rapidly. When considering potential range of introduced black carp it is essential to distinguish between the types of environments where black carp would survive and those environments where the species would more likely establish reproducing populations.

Q: What is the over-wintering behavior?

A: The literature indicates that black carp and the other Chinese carp overwinter in the deep sections of rivers and lakes, typically staying near the bottom. Much of the information is general in nature, not necessarily pertaining to particular species.

Comment: A researcher in the audience commented that they have observed bighead and silver carp in the Missouri River to be active during the winter and that they rarely get near the bottom and will even surface feed.

Q: What do you know about recruitment success?

A: More than likely recruitment will vary from year to year, depending on annual and local environmental conditions.

Investigations of Asian Carp in the Missouri River and Potential Control Technologies
- Dr. Ed Little

Ecology Branch Chief, USGS, Columbia Environmental Research Center

Asian carp are probably the most abundant large fishes (over 6 pounds) in the Lower Missouri River. Four species of carp are of concern – grass, silver, bighead, and black. The biggest concern is with potential problems for native biota, including competition for food and space, transformation of the food web, predation of eggs and larvae of native fish, and hazard to boaters.

Uncertainties exist about the invasiveness of Asian carp. Their biology is poorly understood, their habitat use in North America is unknown, and factors limiting production, survival, and population growth are unclear. Therefore, USGS is undertaking a study with objectives that include:

- Understand habitat use and range of movements, especially in the winter. What is the mode of movement? They are capable of extensive movements, even during the winter, especially silver carp. Is cold a barrier?
- Characterize the habitats used by the Asian carp, such as water quality. Wing dam morphology, river morphology, use of ice-covered areas.
- Characterize feeding behavior, including feeding status, dietary analysis, and stable isotope technology
- Characterize the population, including length/weight distribution, male/female distribution, reproductive status, fecundity. Young of the year were absent or undetected in the Missouri River in 2003. Based on GSI, bighead carp are probably fertile for shorter periods than silver carp.

Tools available for management (barriers, traps, poisons, sterilization, fishing, electro-shocking) tend to be nonspecific and affect non-target species. These carp are difficult to treat using the usual methods. They are also difficult to capture, in that they avoid nets and are sensitive to boat movements.

An additional study is underway to determine if pheromones may be useful in controlling carp, and may increase specificity of Asian carp control. There are some strong precedents for using pheromones, and good progress has been made in recent years:

- Alarm pheromone repellants (focus on earlier life cycles, because the young are more difficult to control than the larger fish)
- Sex pheromones
- Identification and concentration of pheromones. (how to develop an extract that may be used)

Overview of INHS Asian Carp Research Issues and Projects - Dr. Kevin Irons

River Ecologist, Illinois Natural History Survey

There is an on-going, long-term resource monitoring program at Illinois River Biological Station and Great Rivers Biological Station. There are five stations on the Mississippi that collect data. The objective of the study is not specific to carp but to total fish community.

Of over 4.3 million fish collected, many are non-native. In 2001, almost 60% of catch at some stations was non-native. The biomass of non-native fish is 40-60% of the total catch at all stations.

Much of the existing research on these species is foreign and has not been translated from Chinese or Russian. An Illinois Natural History Survey (INHS) study is now capturing data about the silver carp and bighead carp. Findings include:

- In 2000, there was an exponential growth of bighead carp.
- In 2000, first year reproduction was seen for bigheads. INHS is watching growth over years.
- Silver carp mature earlier than bigheads, more males than females.
- 99% of "jumpers" are silver carp.
- The growth rate varies from year to year for both bighead and silver.

The study is looking at the effectiveness of tactics to prevent spread

- It appears that many of these species may be going through gates.
- The electronic barrier appears efficient as is sound bubble barrier, for adults. Young carp don't cross it but hide around it, and can go through a regular barrier.
- Gated burst appear to be highly effective.
- In an assessment of the electric barrier, the study found that one carp went through, possibly at the same time as a barge. Now that the power has increased, none have gotten through.
- The problem with small fish and eggs and storms and ballast water remains.
- There is increasing commercial harvest in the Illinois River of Asian carp, as opposed to buffalo harvest.

The INHS study is looking at dietary overlap with native species. There seems to be a lot of competition for the same food, with as high as 90% overlap. There is little overlap with paddlefish. The INHS study is also looking at dispersal rates. These carp species can move up to 36 miles in 4 days (nine miles per day).

The U.S. Asian Carp Industry: Economic Value and Importance - Dr. Carole Engle

Aquaculture Economist, Aquaculture/Fisheries Center, University of Arkansas at Pine Bluff

Aquaculture is commercial farming of fish. The current demand for fish and fish food exceeds natural stocks. Thus, fish farming has moved in, also reducing pressure on native populations.

Carp are a major food source, and feed a large portion of the world's population. The majority of fish farms are small businesses. They depend on Asian carp in a variety of ways. Profits from bighead carp in polyculture with catfish have enabled some farms to survive low catfish prices in recent years.

Bighead carp are co-cultured in catfish ponds and in other polycultures. The estimated return of co-culturing carp is $192/acre, which is significant. It also diversifies risk for the farmers and keeps catfish farms alive in leaner times. There is no real silver carp industry in the US.

Bighead fish are sold off farms, and are brought to market by truck. They are offloaded in warehouses, and arrive live (Asian consumers prefer a live product) at grocery stores – over 150 grocery stores in New York City alone. Bighead carp does not provide a high profit-margin, but helps to keep these stores in business. Some bighead carp are also sold in a limited number of fish markets along the Mississippi.

The economic value of this market has never been calculated in a comprehensive way. In an informal poll in Arkansas and Mississippi, where 7,300+ acres are co-cultured with catfish, farm-gate sales equal $5.3-6.2 million/year. There is additional revenue of $6.9- million along the supply chain. The loss of the bighead carp market to these businesses and the supply chain could total as much as $135 million/year, which equates to a loss of 1,000+ jobs in Arkansas and Mississippi.

Bighead carp are sold in at least 150 grocery stores in New York City alone. Some consumer tests of canned bighead carp have had good response relative to canned tuna with 75% of people polled willing to pay as much for bighead carp as for canned tuna.

There has been very little aquaculture of silver carp in the last 20 years. Silver carp are disliked by fish farmers due to their jumping habits. Silver carp has some potential for water quality improvement, because it is one of the few temperate algae eaters. Misidentification of bighead and silver carp is sometimes a problem.

Aquatic weed problems can cost up to $1 – 10 billion/year. Grass carp can be an alternative to herbicides, and are very effective regarding cost. They can be made triploid, and certified through a triploid inspection program. Grass carp are widely polycultured with catfish.

Common carp has a limited food fish market and limited baitfish market.

Increasing bird predation on fish farms has increased parasite problems as bird populations have grown. This causes mortality in fingerlings due to parasite problems. Black carp have been used

to control some of these parasites on hybrid striped bass farms, and is the most effective treatment option. On catfish farms, black carp are an integral part of controlling parasites borne by pelicans. Black carp are also used on fathead minnow farms. Black carp restrictions on hybrid striped bass farms could cause economic hardship.

Q: Do you believe that the increased numbers of bighead carp in the wild, and their capture by commercial fisherman who then market the carp, contribute or cause the demise of some fish farmers?

A: Probably not. Fish caught in the wild would probably be a supplementary market. It depends on the specific market and how it is handled.

Q: How would this be affected by volume in the wild relative to price?

A: It could drive the commercial fishery market down if not handled appropriately.

Q: Do you factor in the federal/state/tribal costs of mitigation into the economic analysis?

A: So far, there is no economic analysis of entire situation, only on the impact to economies of state and fish farming industry.

Breakout Sessions: Objectives

Purpose and Expectations

The purpose of the breakout sessions was to bring together subject matter experts to focus on a specific issue and collectively explore ideas and develop strategies, action plans, and implementation time tables that will be used to draft the management plan. The breakout sessions provided small groups a facilitated environment for constituents with various interests to discuss and understand differing views related to the issues surrounding Asian carp. The breakout sessions were intended to foster communication and understanding to lead towards the development of collaborative management plan that is accepted by all constituents and stakeholders.

Approach

The management plan objectives have been grouped into 4 topics: preventing spread, detection and monitoring, population control and abatement, and research and information exchange. Meeting participants have been pre-assigned to one of four breakout sessions to insure a mixed representation of views and perspectives within each group. Each breakout group, led by a professional consultant and a biologist co-facilitator, will begin discussing a different topic and proceed through as many topics as time allows. Breakout group discussions will begin by reviewing the ideas documented from the 2000 Workshop. Working Group participants are therefore asked to review and familiarize themselves with the Proceedings of the 2000 Workshop prior to the Working Group meeting. The breakout groups will collectively explore ideas and develop strategies, action plans, and implementation time tables that will be necessary to accomplish each objective. Each breakout session will be tasked with thoroughly discussing and developing a single topic before moving on to other topics. Following the breakout sessions, each group's results will be reported back to the full assembly for further discussion. The consultant teams will record notes on flip charts during the session, which will later be used to document the results of each session. The notes and documentation from the breakout sessions will be used by the Working Group to further develop and draft components of the management and control plan following the meeting.

Breakout Topics

This section lists the breakout groups and discussion topics. The objectives addressed by each topic are defined. Examples of actions and strategies that need developed to accomplish the objective are listed, along with considerations brought forward by the planning team while organizing the structure of the breakout sessions. The examples and considerations provided are not intended to be all inclusive lists, but rather are intended to provide sufficient information to initiate the group discussions. Other materials including summaries of the 2000 Asian Carp Workshop and a framework for the national Asian carp management and control plan were provided to the participants during the breakout sessions.

Breakout Group 1 - Preventing Spread

Objective 1: Prevention and containment

Definition: Prevent the risk of new introductions in the wild and eliminate pathways to prevent further distribution and spread of Asian carp.

Includes:

- Exhaustively consider pathways by which Asian carp can move within and between watersheds and factors that could facilitate their movements.
- Assess the risk of further infestation through each identified pathway.
- Identify management options available to reduce the risks associated with each identified pathway.
- Regulations

Considerations:

- Wild and captive populations
- Waters of special concern e.g. Great Lakes
- Potential conflicts with management actions proposed for other species, e.g. fish passage projects

Breakout Group 2 - Detection and Monitoring

Objective 2: Surveillance

Definition: Activities to monitor the distribution of Asian carp and to forecast and detect new introductions and range expansions.

Includes:

- Develop early detection programs to detect new introductions and range expansions into previously uninvaded waters.
- Assess population abundance and trends to forecast expanding populations.
- Monitor captive populations.
- Data management
- Reporting
- Enforcement

Considerations:

- Utilizing commercial fishermen for early detection

Breakout Group 3 - Population control and abatement

Objective 3: Eradication, control, and abatement

Definition: Identify management actions and develop programs to eradicate or reduce population abundance, control the spread of Asian carp, and abate the harmful ecological, economic, social and public health impacts resulting from the establishment of Asian carp populations in the wild.

Includes:

- Rapid response programs to eradicate new introductions and range expansions.
- Population reduction programs to reduce the abundance of established populations below levels where harmful impacts do not occur.
- Develop abatement actions to minimize the harmful ecological, economic, social and public health impacts resulting from the establishment of Asian carp populations.
- Coordination
- Data management

Considerations:

- Commercial harvest and marketing - must be cautious not to create a permanent demand
- Bounty system
- Promote recreational utilization/harvest – bow fishing, etc.
- Promote and encourage the marketing of dead Asian carp
- Proposed management actions may conflict with the management of other species

Breakout Group 4 - Research and Information Exchange

Objective 4: Research needs

Definition: Begin, continue, and expand biological field and laboratory investigations of Asian carp populations in support of preventing spread, controlling populations, and minimizing impacts.

Includes:

- Gather data on the biology and life history characteristics and requirements of Asian carp
- Develop environmentally sound tools and methods for eliminating or controlling Asian carp populations
- Evaluate the impact of Asian carp populations on native fish communities
- Provide information necessary to develop, implement, and evaluate management and control activities for Asian carp

Considerations:

- Translation of Asian and other foreign language literature

Objective 5: Information access and management

Definition: Develop information management systems to successfully implement coordinated management activities and provide for timely access and exchange of new data.

Includes:

- Directory of research and management activities
- Directory of key contacts and information associated with implementation actions
- Solicit and compile current prevention, management, and research activities
- Solicit and compile information on the status, expansion, and occurrence of new Asian carp populations.
- Provide management and research protocols and data reporting requirements.

Considerations:

- What data/information need to be shared
- Who will maintain the data/information systems
- Where the data/information system will be stored

Objective 6: Education and outreach

Definition: Develop educational materials and outreach programs in support of preventing spread, controlling populations, and minimizing harmful impacts of Asian carp populations.

Includes:

- Develop educational tools and outreach programs to provide to government agencies and public and private organizations to increase awareness of the problems associated with Asian carp.
- Engage government agencies and public and private organizations in preventing the spread, controlling populations, and minimizing harmful impacts of Asian carp.
- Provide for the continued supply of new information and resources in support of the implementation of the management plan.

Considerations:

- Preference of Asian community for live fish

Objective 7: Coordination and leadership

Definition: Provide for coordinated implementation of the management and control plan and the timely access and exchange of new data, information, and developments.

Includes:

- Provide national coordination and leadership to federal, state, and tribal governments and non-government organizations in preventing future introductions and spread of Asian carp populations.
- Provide assistance to federal, state, and tribal governments and public and private organizations in developing Asian carp reduction and eradication programs.
- Review existing federal and state legislation, regulations, and policies pertaining to Asian carp prevention and management and provide recommendations.
- Propose federal legislation to prevent the further introduction and spread of Asian carp.

Considerations:

Breakout Sessions: Documentation

This section provides the documentation from the four breakout sessions conducted during the Asian Carp Working Group meeting on May 24th, 2004. Each facilitator used the flipcharts and note cards generated during the breakout sessions to prepare the following summaries for their respective session. The documentation includes a list of the session participants, a summary of the key strategies that were identified by the group, a ranking of the strategies, and draft action plans for the highest priority strategies. The draft notes were reviewed and edited by the biologist co-facilitator for the respective groups.

Each group was conducted in a slightly different manner based on the individualization of the overall approach by the group's facilitation team. In some cases this resulted in a need to slightly modify or interpret a group's notes and documentation to fit a consistent format for use in this report. The documentation presented herein is intended to be an accurate account of the discussions held within each group. Any errors, omission, or misrepresentation of concepts, ideas, or concerns are unintentional and should be brought to the attention of the Asian Carp Working Group Chair.

Group 1 – Prevention

Attendee	Group
Darlene Smith	Department of Fisheries and Oceans Canada
Drew Mitchell	USDA
Edward Little	USGS
Greg & Mary Lipscomb	Randolph County Fish Farm
Jim MacLean	Ontario Ministry of Natural Resources
Jimmy Avery	NWAC, Mississippi State University
Joel Brammeier	Lake Michigan Federation
Matt Cochran	FishPro/Cochran & Wilkin, Inc.
Michael Goehle	U.S. Fish & Wildlife Service
Mike Oetker	U.S. Fish & Wildlife Service
Paul Wills	Logan Hollow Fish Farm
Paula Moore	Jones and Eaker Farms
Robert Klumb	U.S. Fish & Wildlife Service
Tom Flatt	Indiana Department of Natural Resources
Tom Mosher	Kansas Wildlife and Parks
Valerie Barko	Missouri Department of Conservation
Mike Hoff, co-facilitator	U.S. Fish & Wildlife Service
Susan Parks, facilitator	Parks Consulting Group

Summary of Strategies – Prevention

Strategy -- Establish national, inter-state policies and regulations

The first strategy is to develop new policies and regulations to prevent new introductions into the wild. The highest priority is to establish a national policy on Asian carp (possibly in conjunction with a policy on other nonindigenous species). The management plan developed from this conference will serve as a starting point for the policy. There should be a sense of urgency in the implementation of this strategy, and for it to be effective, it should be in place within the next 5 years. Other strategies and ideas should not be on hold while the policy is being developed and approved.

Existing regulation designed to reduce the risk of release into the wild should be enforced. Additional regulations may be needed by federal, state, and local jurisdictions.

Strategy -- Establish controls on all pathways -- aquaculture, swim, aquaria, live food, bait, stocking -- to prevent new introductions to the wild

This prevention strategy provides input into monitoring and detection, research, and control strategies. The key activities included policy changes, monitoring species not yet introduced, and design of barriers to restrict movement.

Strategy -- Increase accountability by aquaculture and live food transporters, and enforce existing regulations

This prevention strategy integrates policy and education objectives. The main focus areas are to educate transporters about existing regulations, enforce the regulations, and assess the effectiveness of them.

Strategy -- Educate the public and various stakeholders, including – federal and state agencies (including USWFS, USDA), associations, the ANS Task Force, the Asian Carp Working Group, the fishing industry, commercial producers, academia, legislators, and Canadian and Mexican partners

This prevention strategy provides input to the education strategies. The main focus is that the general public, the fishing industry, and commercial fisheries need to understand the problem and how their practices may be impacting the problem. These groups also need to know what laws exist, why they exist, and how to comply.

Strategy -- Establish and implement standards and best management practices for commercial fishers, aquariums, haulers of live fish, inspectors

This prevention strategy also relates to the research, education, and control objectives. The group wanted to reduce the risk of unintentional introduction by reducing the risks of spread by:

- Transportation
- Culture
- Sale

Strategy -- Reduce numbers of fish in the wild

The intent of this strategy is to reduce the risk of spread from existing populations to locations where populations of Asian carp have not yet become established. This strategy also relates to the control and abatement objective, but the group discussed it at length, and identified many high priority strategies, including developing commercial fisheries

Ranking of Ideas - Prevention

Species	Initiative	Group Ranking (# of votes)	Priority
	Strategy # 1 – Establish National, Inter-state Policies, and Regulations	**Total for Strategy # 1 = 82**	**High**
All Species	Develop national policy on Asian carp	Effectiveness: 12 Cost: 9 Feasibility: 13 Total: 34	
All Species	Develop and strengthen import policy (re: disease and parasites)	Effectiveness: 5 Cost: 8 Feasibility: 8 Total: 21	
All Species	Develop new regulations to prevent the sale of live Asian carp in the food trade *Consensus was not reached on preventing the sale of live grass carp and bighead carp*	Effectiveness: 5 Cost: 3 Feasibility: 4 Total: 12	
All Species	Develop regulations to prevent bait bucket introductions	Effectiveness: 8 Cost: 3 Feasibility: 4 Total: 15	
	Strategy # 2 -- Reduce numbers of fish in wild	**Total for Strategy # 2 = 56**	**Medium**
All Species	Develop commercial fisheries	Effectiveness: 13 Cost: 13 Feasibility: 15 Total: 41	
All Species	Find new uses for wild Asian carp, to get them out of the wild	Effectiveness: 4 Cost: 6 Feasibility: 6 Total: 14	
All Species	Increase harvest in Illinois rivers and understand the impact	Effectiveness: 1 Cost: 0 Feasibility: 0 Total: 1	

	Strategy # 3 – Establish controls on all pathways -- aquaculture, swim, aquariums, live food, bait, stocking -- to prevent new introductions to the wild	**Total for Strategy # 5 = 43**	**Medium**
All Species	Monitor new species not yet introduced and put policies in place to prohibit them	Effectiveness: 7 Cost: 6 Feasibility:5 Total: 18	
All Species	Prevent introduction in watersheds where Asian carp don't exist yet, through state and federal laws, methods, and management practices	Effectiveness: 14 Cost: 14 Feasibility: Total: 11	
All Species	Cautious removal of dams	Effectiveness: 0 Cost: 0 Feasibility: 0 Total: 0	
All Species	Design and construct barriers to prevent movement of Asian carp into new basins	Effectiveness: 9 Cost: 3 Feasibility: 2 Total: 14	
All Species	Restrict movement	Effectiveness: 0 Cost: 0 Feasibility: 0 Total: 0	
	Strategy # 4 -- Increase accountability by aquaculture and live food transporters, and enforce existing regulations	**Total for Strategy # 3 = 42**	**Medium**
All Species	Increase enforcement of existing laws	Effectiveness: 8 Cost: 8 Feasibility: 8 Total: 24	
All Species	Inventory existing laws and assess their effectives	Effectiveness: 5 Cost: 2 Feasibility: 2 Total: 9	
All Species	Make state penalties consistent with the risk and issue	Effectiveness: 0 Cost: 0 Feasibility: 0 Total: 0	
All Species	Increase accountability through laws and tools, tags	Effectiveness: 4 Cost: 3 Feasibility: 2 Total: 9	

	Strategy # 5 -- Public Education	**Total for Strategy # 4 = 30**	**Medium**
All Species	Public education – what they are, where they are, why they are, the impact	Effectiveness: 10 Cost: 7 Feasibility: 8 Total: 25	
All Species	Develop outreach materials to minimize risk of spread by aquaculturists	Effectiveness: 0 Cost: 0 Feasibility: 1 Total: 1	
All Species	Develop outreach materials to prevent spread via the aquarium trade	Effectiveness: Cost: 4 Feasibility: 3 Total: 3	
All Species	Educate people and industry on current laws and why they exist, and how they impact current practices	Effectiveness: 1 Cost: 0 Feasibility: 0 Total: 1	
	Strategy # 6 -- Standards and Best Management Practices	**Total for Strategy # 6 = 22**	**Medium**
All Species	Focus on hauling methods and identify best methods, scenarios for different species, large fish food, and small fish	Effectiveness: 0 Cost: 0 Feasibility: 0 Total: 0	
All Species	Create standards for producer, haulers, inspectors and dealers	Effectiveness: 0 Cost: 0 Feasibility: 0 Total: 0	
All Species	Develop controls and management plans for monitoring transport and transport contamination	Effectiveness: 4 Cost: 2 Feasibility: 1 Total: 7	
All Species	Research the cost-benefit of management and control – do we consider anything besides control?	Effectiveness: 5 Cost: 5 Feasibility: 5 Total: 15	**Medium**
All Species	Create a database of producers, operators	Effectiveness: 0 Cost: 0 Feasibility: 0 Total: 0	

The following charts list the species-specific ideas that came from the group's discussion. These ideas were not categorized into species-specific strategies because of time constraints, but the group performed a quick prioritization of the ideas.

Species	Initiative	Group Ranking (# of votes)
Grass Carp	Manage and outreach to the network between game fish, producer, buyer	Total: 8
Grass Carp	Stock only triploids (in new areas)	Total: 7
Grass Carp	Use good watershed management practices to avoid excessive foliage build-up	Total: 5
Grass Carp	Have tight state control on diploid populations	Total: 4
Grass Carp	Prevent release of diploids by aquaculture to states where not permitted	Total: 4
Grass Carp	Certify producers	Total: 4
Grass Carp	Reduce demand for use of grass carp to control vegetation	Total: 4
Grass Carp	Improve consistency in certification procedures and state regulations	Total: 4
Grass Carp	Understand the internet aquarium trade and do a risk assessment	Total: 3
Grass Carp	Education between the producer-buyer relationship	Total: 2
Grass Carp	Teach the difference between black and grass carp – especially to fisheries professionals	Total: 2
Grass Carp	Diploid, triploid facilities certification	No voting
Grass Carp	Research on options other than grass carp to achieve	No voting
Grass Carp	All states use FWS certification	No voting
Grass Carp	States do random checks on certified triploids entering states	No voting

Species	Initiative	Group Ranking (# of votes)
Black Carp	List as injurious species under the Lacey Act	Total: 9
Black Carp	Establish rules in Mississippi and Arkansas to use triploid black carp. States will make regulations to manage diploid populations	Total: 6
Black Carp	Develop alternative means for snail control	Total: 6
Black Carp	Use triploids or monosex populations	Total: 5
Black Carp	Stricter and more extensive rules for permits	Total: 2
Black Carp	Rapid response and eradication program for escapees	Total: 1

Species	Initiative	Group Ranking (# of votes)
Bighead Carp	List as injurious species under the Lacey Act; diploids only, allow only triploid bighead	Total: 7
Bighead Carp	Public education on what the bighead carp looks like, especially for bait handlers	Total: 7
Bighead Carp	Public outreach on the cultural aspects of purchase	Total: 5
Bighead Carp	National legislation on restricting movement of bighead carp	Total: 4
Bighead Carp	Allow sterile triploids under injurious species, Have state require killing fish upon sale	Total: 4
Bighead Carp	Require guaranteed triploid/sterile fish for aquaculture	Total: 1

Species	Initiative	Group Ranking (# of votes)
Silver Carp	List silver carp (both diploid and triploids) as injurious species	Total: 8
Silver Carp	Have states deny live possession (note: there may not be a precedent for this)	Total: 7
Silver Carp	Reassess need for silver carp in the U.S.	Total: 5
Silver Carp	Document where the fish came from	Total: 3

Action Items for Key Initiatives – Prevention

Initiative	**Establish a National Policy on Asian Carp**	**Notes**
Owner	TBD – NISC is a choice to consider	
Major Activities	ANS develops the Asian Carp Management Plan, which is used as input to the national policy	Should be done in parallel with work on national policy
	Identify all stakeholders and current problems • State and federal agencies • ANS task force • Asian Carp Working Group • USDA • Fishing industry • Commercial producers (Aquaculture) • Academia • Legislators • Canadian and Mexican partners	Fully understand the current problems and potential impact by assessing available information
	Determine scope and objectives of the national policy	Should it include just Asian carp, or should there be a policy on all aquatic invasive species?
	Determine if a national policy is needed. What else is needed to meet existing priority prevention plans?	Assess existing laws and see if there are gaps between current regulations and objectives for a policy.
	Involve scientists to design and perform the sound risk assessments needed to support the policy	
	Develop different scenarios or options that the policy could reflect and analyze the trade-offs of each to all stakeholder groups	Develop a phased implementation plan for the policy.
	Involve stakeholders and public for reviews	
Timetable	short-term – next 5 years	
Resources	TBD	
Cost	TBD – need to determine cost benefit	
Risk	TBD	
Issues		

Initiative	Prevent Introductions into New Watersheds	Notes
Owner	TBD	
Major Activities	Develop objectives and minimum thresholds	The minimum threshold must make sense
	Identify all stakeholders and the roles they play	Federal and state legislators. management authorities, and alliances (state management agencies, industry groups, recreation groups)
	Assess existing state laws and management practices and identify best practices and effectiveness rates	What state laws already exist and how effective are they? What are the state models that work? Can they be replicated?
	Determine if additional, new laws and management practices are required to meet objectives. Develop model legislation	It is difficult to coordinate all the Federal and State agencies. There needs to be a federal guideline that provides the "teeth" and incentives to the states. This might be via the Lacey Act.
	Work at the state level on a state-by-state basis to introduce the model legislation	In parallel, work with industry groups and other stakeholders to implement best management practices voluntarily
Timetable	Short term 1 – 5- years	Sense of urgency
Resources	TBD	
Cost	TBD	Rapid Response funds will be needed for the states to implement this initiative.
Risk	TBD	

Group 2 – Detection and Monitoring

Attendee	Group
Bill Mattes	Great Lakes Indian Fish and Wildlife Commission
Bob Hopper	Hopper-Stephens Fish Farm
Brent Bristow	U.S. Fish & Wildlife Service
Doug Nygren	Kansas Department of Wildlife and Parks
Duane Chapman	USGS
John Hargreaves	Louisiana State University, Aquaculture Research Station
Kevin Cummings	Illinois Natural History Survey
Michael Armstrong	Arkansas Fish and Wildlife Commission
Mike Welker	U.S. Forest Service
Nate Caswell	U.S. Fish & Wildlife Service
Pam Thiel	U.S. Fish & Wildlife Service
Paul Zajicek	National Association of State Aquaculture Coordinators
Steve Schainost	Nebraska Game and Parks Commission
Bob Pitman, co-facilitator	U.S. Fish & Wildlife Service
Beth Malloy, facilitator	Parks Consulting Group

Summary of Strategies – Detection and Monitoring

After sorting strategies from the 2000 meeting in species specific groupings, the group determined that nearly all strategies were common across species. After ranking each grouping of strategies, five major strategies were defined. They are:

Strategy -- Improve coordination and information exchange across governmental and non-governmental bodies.

This includes, but is not limited to a central database across all entities where all research and field findings are collected and housed for centralized information retrieval. Additionally, states all have different statutes for these issues, and it would allow for the sharing of information regarding what is working well and what is not, as well as allowing for setting common policies.

Strategy -- Develop Comprehensive State and Federal sampling program.

Today there is no established common process for all states to track and detect carp. Additionally, there is no regular forum or tool for information sharing. Because everyone does it differently, it makes it difficult to share practices and findings outside of the state boundaries.

Strategy -- Establish mandatory reporting system for captive stock (public/private/live market).

This would be a reporting mechanism that would allow an understanding of how many carp are in captivity and to help track escapes. This would be a self reporting process with teeth (for example, tied to renewal of a business license), but not an inspection process. This would also help in identifying where farms are and how many of them there are, information that is scant today.

Strategy -- Identify likely habitats for high priority sampling based on biodiversity hotspots and waters of special concern.

Because resources are limited, **s**ampling should be prioritized by the areas of most concern: Recreational areas that have value as economic drivers, water that is special due to biodiversity characteristics. We do not have a nationwide inventory of all waters that are at risk or prone to carp invasion. Activities related to inventorying and prioritizing comprise the action items of this strategy.

Strategy -- Sample commercial harvest for presence of Black Carp.

The group did not have time to discuss this strategy.

Ranking of Ideas – Detection and Monitoring

Species	Initiative	Priority
	Strategy 1 -- Improve coordination and information exchange across governmental and non-governmental bodies.	**High**
All species	Create a centralized, integrated data base	
All species	Develop guidelines for standardized monitoring	
All species	Improve state and federal reporting	
	Strategy 2 -- Develop Comprehensive State and Federal sampling program	**High**
All species	Develop information about sampling techniques	
All species	Develop comprehensive state and federal sampling program – sampling techniques, train and equip appropriate personnel	
All species	Train biology/conservation agents in I.D. of all phases of bighead and improve public outreach.	
	Strategy 3 -- Establish mandatory reporting system for captive stock (public/private/live market).	**High**
All species	Fish tagging program	
Black	Monitor black carp market – aquarium markets	
All species	Mandatory reporting for escapees	
Silver	Develop mechanisms for verifying location, distribution, and movement of captive and wild silver carp	
Black	Monitor the diploid market	**Low**

Research ideas that were was identified and put aside for the Research and Education Team:

All species	Increase funding for surveys	existing
All species	Establish the use of genetic markers	new
All species	Develop Mechanisms to verify location, distribution, movement of captive and wild carp	existing
All species	Study / determine placement mechanisms	existing
All species	Initiate larval fish studies	existing
All species	Develop outreach programs	existing

Action Items for Key Strategies – Detection and Monitoring

Strategy	**Improve Coordination and Information Exchange**	**Notes**
Owner	For the project: This Working Group For the database: USDA, NASS USGS, NAS	Some discussion of who might actually own the database, which would be different.
Major Activities	1. Inventory all available databases and gather requirements for what information is useful to agencies	Some of this data is collected in various agencies today. We should start by understanding what is out there that can be collected and shared first.
	2.Identify State Agencies that regulate and monitor	i.e. Agri and Fisheries
	3.Search other sources for data	
	4. Identify gaps in data and develop methods to begin collecting data	
Timetable	After this plan is created to 2 years out	
Resources	Permanent Funding for maintenance of the database would need to be found	
Cost	Low	
Risk	Getting all the agencies and the fisheries to buy-in may be a problem. There may be barriers to getting some of the data: it could be proprietary and may have privacy issues also.	

Strategy	**Develop Comprehensive State and Federal Sampling Program**	**Notes**
Owner	This Working Group	
Major Activities	1. Establish framework for state groups to talk	Today there is not organized framework established where groups concerned with this problem can report problems or successes or discuss findings.
	2.Identify information that is essential for all states to have to sample more effectively	i.e. Samples are needed by life stage – adult versus juvenile
	3. Identify efficient sampling methods	
	4. Be open to unconventional methods for detection.	
	5. Identify common elements that can be shared with other state agencies and integrate into database created in strategy one.	
Timetable	This could be started near term	
Resources	TBD	
Cost	TBD	
Risk	Identifying an owner will be difficult, making commitment and buy-in a problem.	

Strategy	Establish Mandatory Reporting for captive stock (public, private, live markets)	Notes
Owner	USDA and identified retail owner	
Major Activities	1. Identify targets of surveying	Today there is no inventory of private and live markets that sell or grow carp.
	2.Define reporting requirements	
	3. Identify short term and easier reporting. Low hanging fruit: First requirement could be for escapes from farms	Comment was made that if there is a big hammer when reporting, that there will not be comprehensive reporting by farms, and therefore poor compliance
	4. Identify compliance issues	The needs for the industry and burdens of reporting need to be considered when determining what is reported and how. For example, inspections would be intrusive and expensive.
	5. Identify cultural and economic issues and create contingency plans	Asian retailers may not want to work with government to comply. Fish farmers may be concerned that data will be sold to competitors. Privacy issues may make the data tough to get.
	6. Identify consequences of not reporting	Tie it to a permit
	7. Make data available via HUC	
Timetable	This could be started near term and could take 5 years	
Resources	TBD	
Cost	Vary from little to a great deal, depending on the implementation.	
Risk	Identified in activity listing.	

Strategy	**Identify likely habitats for high priority sampling based on 1) biodiversity hotspots and waters of special concern and 2) Places where carp are most likely to be found.**	**Notes**
Owner	Hotspots and Biodiversity: ANS Working Group For places where carp are most likely to be found: USGS	
Major Activities	1. For hotspots and biodiversity: survey states and NGOs for their list For places where carp are most likely to be found: Identify habitats, including spawning grounds	
	2.Identify research done to date	
	3. Based on available research, develop list of targeted habitats. Integrate into common database (strategy one) for use by cross state agencies.	
Timetable	TBD	
Resources	TBD	
Cost	TBD	
Risk		

Group 3 – Population Control & Abatement

Attendee	Group
Andy Starostka	U.S. Fish & Wildlife Service
Anita Kelly	Southern Illinois University
Carole Engle	University of Arkansas at Pine Bluff
Hugh Warren	Catfish Farmers of America
Jason Goeckler	Kansas Department of Wildlife and Parks
Jay Rendall	Minnesota Department of Natural Resources
Jerry Rasmussen	MICRA
Jim Malone	Jim Malone & Sons Inc.
Kevin Irons	Illinois Natural History Survey
Leo Nico	US Geological Survey, Gainesville FL
Marion Conover	Iowa Department of Natural Resources
Peter Sorensen	University of Minnesota
Steven Shults	Illinois Department of Natural Resources
Jay Troxel, co-facilitator	U.S. Fish & Wildlife Service
Judy Bennett, facilitator	Parks Consulting Group

Summary of Strategies – Population Control & Abatement

The group discussed several issues in addition to population control and abatement, and had many ideas to include in the strategies developed by the other break-out groups. This group also spent a significant amount of time defining the scope of the problem, as they viewed it. They stressed that two objectives of the management plan should be modified to be clear that **Asian carp in the wild** are the targets of these strategies. Specifically:

- "Control expansion of Asian carp in the wild."
- "Abate harmful impacts resulting from introduction of Asian carp in the wild."

The group developed the following high priority strategies.

Strategy -- Develop commercial harvest

This strategy applies to wild populations and sales of dead fish only. It would involve education for harvesters, and special permitting in specific locales and boundaries.

Strategy – Use triploids with strict monitoring

This is a prevention strategy that applies to commercial fisheries, and is not meant to control wild populations of Asian carp.

Strategy – Pass NAISA and state ANS plans

The states should take the lead on this, because action can occur more quickly at the state level. The ANS Task Force would have a lead role in this strategy.

Strategy -- Develop rapid response team/equipment

The purpose of this strategy would be to be prepared to act quickly in the case of escapes. This strategy would identify the needed tools, obtain funding, and create response teams with specific roles and responsibilities to carry out the agreed-to protocols.

Ranking of Ideas – Population Control and Abatement

Species	Initiative	Priority
All Species	**Strategy -- Develop commercial harvest (for human and non-human consumption).**	**High**
	Bounties	
	Develop markets	
	Public education on food quality	
All species	**Strategy -- Use triploids with strict monitoring.**	**High**
	Note: Also good for prevention; may be needed in specific areas	
All species	**Strategy -- Pass NAISA and state ANS plans.**	**High**
	States should take lead.	
All species	**Strategy -- Develop quick response team/equipment to deal with escapes.**	**High**
	Designate individual with sole responsibility to oversee elimination/control in a region (wild carp only).	
	Track and target larval stages for elimination (e.g., rotenone nursery ground) – *research need*	
	Target spawning adults for removal/elimination – *research need*	
	Use genetic modifications to interfere with reproduction. ▪ Research sterile males – *research need* ▪ Daughterless carp – *research need*	
	Accountability of release	
	Establish programs to reduce established populations levels.	Medium
	Investigate chemicals for removal of Asian carp.	Medium
	Research spawning requirements and strategies.	Medium

Ideas considered but not included in recommended actions:

- Develop toxic implant to release rotenone into body cavity to kill fish
- Develop viruses
- Develop piscicides
- Maximize economic incentives
- Introduce high dollar fishing tournaments for black carp (no catch & release)
- Restoration of altered riverine habitats
- Develop sport fishery

Additional ideas/strategies generated for other topic areas:

The following ideas were submitted on note cards by individuals, independently, without discussion or agreement from the group due to time constraints.

- Prevention
    - Full funding for Chicago electric barrier
    - Accountability/identification
    - ID/tag all fish
    - No live sales of any kind
    - Eliminate "live" fish sales
    - Market dead fish only (farm and wild)
    - Develop selective toxicants
    - Mark all "capture fish" to enhance identification and accountability for escapes
    - Develop clean species lists
    - Establish accountability standards to limit new introductions
    - Use triploids for all stocked fish
    - Restrict live fish market to triploid only *
    - Comments regarding "public health impacts" need to be evaluated objectively – what is the basis for this?
    - USDA must be involved in discussions involving farmed fish
    - Distinguish between "possible" and "likely" throughout all recommendations
    - Objectively evaluate, not assume, existence of a pathway from aquaculture, introductions could have happens decades ago, not recently
    - Distinguish between wild and farmed throughout all recommendations
    - Emphasis on stopping new pathways not yet used
    - Injurious listing for black, bighead, and silver carp
    - Make list of approved eradication tools for *
    - There must always be a distinction between wild and farm-raises
    - A federal program will best be administered by the states affected
    - State leadership is essential *

- Research
    - Rapid response – identify "tools" to be used in various situations
    - State agencies already monitor their respective populations, use their data to save time and expense *
    - Eliminate disinformation, i.e., be sure the info is verifiable and accurate, not hearsay *
    - Develop step by step plan to research wild populations of Asian carp *
    - Distinguish between wild and farmed fish throughout
    - Investigate life history for bottlenecks in development for action
    - Genetic modification (daughterless carp, sterile males, etc.)
    - Develop an integrated pest control strategy employing a variety of techniques
    - Investigate use of pheromonal attractants for use in trapping and repellents for use in barriers
    - Investigate techniques for capturing or killing different life stage (e.g., rotenone larval fish on nursery grounds, targeted removal of spawning adults)

- Detection & monitoring
    - Incentive for accurate reporting of commercial catches
    - LTRMP & like monitoring for baseline data – across basins

- Education
    - Use heavily the population and control method agreed upon
    - Realize that total control is probably impossible and try to manage the resource
    - Keep in mind that Asians are a part of our community and education to re-indoctrinate their customs is discriminatory *

Action Items for Key Strategies – Population Control and Abatement

Strategy	**Develop commercial harvest** • Applies to wild population and sales of dead fish only. (Should be considered under strict permitting for haulers and live fish markets/shops. State of Illinois procedures as example.)	**Notes**
Owner	TBD – overall coordination through ANS task Force? Many roles: o Market research: Commerce, USDA, National Marine Fisheries Service o Licensing, permitting, local regulations/laws: states o Bounties: states, APHIS (USDA), USDA - Wildlife Services o Inspection: USDA o Education: USDA Extension Services o Labeling, inspection: FDA	
Major Activities	Education for harvesters. o Done at state level. o 6 months to 2 years. o Minimal cost.	
	Identify river systems and priority locations, seasons, permits and licenses.	
	Market research – human and non-human consumption. o Would be several separate projects, some concluding earlier than others. o 3-4 years. o $250K/year.	
	Website for information dissemination. o 3-6 months. o $25K – more if information-research strategy as opposed to links.	
	Promulgate harvest regulations (per state) o 1 year. o No or minimal cost.	By-catch (issues of game fish being harvested). Possible contamination from these fish.
	Public education re: food fish. • Ongoing. • 6 months.	

	• $25K/state (could be funded from bounties).	
	Establish bounties. o Need to determine how many pounds are in the river. o Use for smaller populations or in lower population areas. o 6-12 months. o 40 cents/pound, which includes 20 cents in administrative costs (Estimated costs per pound) o $100K+ per State is possible.	Bounties – limit areas/count/season? Police catch? (Enforcement with strict state civil penalties is imperative.)
Timetable	See Above	
Resources	TBD	
Cost	See Above	
Risk	TBD	

Strategy	**Use triploids with strict monitoring** • Farmers check every fish. The USFWS only sub-samples. This really is 100% validation. • Must do for live fish sales.	**Notes** Prevention strategy, not for controlling wild populations.
Owner	TBD	
Major Activities	Check research.	
Timetable	TBD	
Resources	TBD	
Cost	TBD	
Risk		

Strategy	**Pass NAISA and state ANS plans**	**Notes**
Owner	Roles • States: Take the lead (Lobby Congressional delegations to pass NAISA). • Industry: lobby. • Federal government: Provide information (USFWS, Coast Guard, Army Corp of Engineers, USDA). • Overall lead: ANS Task Force (working with the states through their individual state Aquatic Nuisance Species Plans).	Can happen more quickly at the state level
Major Activities	TBD	
Timetable	1 – 2 years	
Resources	TBD	
Cost	No costs. (States/stakeholders can lobby their Congressional delegation, no special funding is needed)	
Risk		

Strategy	**Develop rapid response team/equipment**	**Notes**
Owner	Roles • Fish and Wildlife has lead. • Also involved: states (could be several agencies), USGS, Army Corp of Engineers. • Regional panels	Conducted at highest level. Need to involve/coordinate with USDA on management plan.
Major Activities	Identify available tools (chemical). • States amend management plans to add this. • $25K/state. • Includes defining parameters for response, target areas, & species. • Includes developing response actions with levels.	What can we do as soon as possible and what requires more research?
	Implement. • $25K - $1M+ per state (Hard to predict the costs; species-by-species and each case is probably different.)	
	Identify better selective tools (Pheromones). • $25K.	
Timetable	TBD	
Resources		Issue: Equipment required in addition to other direct costs (e.g., chemical, labor, etc.).
Cost	See above States and federal officials need to identify funding sources; a state grant/ fund from federal appropriations or a central fund administered by a federal agency Need to assure funding – best way is to pass NAISA.	
Risk		

Group 4 – Research and Information Exchange

Attendee	Group
Amy Benson	USGS
Bill Mauck	USGS – BRD Central Office
Chris Goddard	Great Lakes Fishery Commission
Craig Paukert	Kansas Cooperative Fish & Wildlife Research Unit, Kansas State University
Dennis Riecke	Fisheries Biologist, Brandon, MS
Hal Schramm	USGS/MS Coop Fish & Wildlife Unit
Jeff Rach	USGS
Jeff Shearer	South Dakota Game, Fish & Parks
Jim Petty	USGS - BRD Central Office
John Nickum	Consultant/writer - fish biologist
Jonathan Champion	Northeast - Midwest Institute
Mark Cornish	Corps of Engineers, Rock Island District
Mike Freeze	National Aquaculture Association
Rob Neumann	Southern Illinois University
Steve Eder	Missouri Department of Conservation
Kim Bogenschutz, co-facilitator	Iowa Department of Natural Resources
Donna Rook, facilitator	Parks Consulting Group

Summary – Research and Information Exchange

Strategy – Develop a research framework and priorities based on identified needs, to support the successful implementation of the management and control plan.

The purpose of this strategy is to develop a research framework that identifies research topics, standard sampling protocols, and data formats. A research framework will support all research and monitoring efforts related to the management and control plan. Research topics will be identified and prioritized based on input from the other 3 breakout groups. Research should be conducted in 3 categories:

- Biological (seen as primary focus of 2000 Asian Carp Workshop)
- Social/human factors
- Economic impacts/tradeoffs

Strategy – Develop tools and processes to facilitate information access and exchange to support the successful implementation of the management and control plan.

The purpose of this strategy is to facilitate access to the information needed to implement the strategies. This would include information that already exists, as well as information gathered from the other strategies, such as sampling and research.

Strategy – Develop an education and outreach framework and priorities to support the successful implementation of the management and control plan.

The purpose of this strategy is to develop an education and outreach framework that identifies the various stakeholders and their needs related to the objectives of the management and control plan. An education and outreach framework will support many strategies identified for prevention, detection and monitoring, and controlling populations. Education and outreach tools and program needs will be identified and prioritized based on input from the other 3 breakout groups.

- Education - to inform and justify; can also include behavior change. What are the education needs of the various stakeholders involved in the strategies?
- Outreach - intended to change behavior. What type of outreach is needed to ensure understanding, buy—in, and behavioral changes?

Strategy – Establish processes to facilitate coordination and leadership necessary to successfully implement the management and control plan.

The purpose of this strategy is to provide national coordination and leadership to government and non-government organizations to implement plan strategies. This includes actions that would provide oversight to consider effects and ensure balance of proposed regulations and actions.

Ranking of Ideas – Research and Information Exchange

Species	Initiative	Group Ranking (# of votes)	Priority
	Strategy – Develop a research framework and priorities based on identified needs, to support the successful implementation of the management and control plan		
	Biological Research Ideas	**Total=37**	**High**
	Effect on native species	9	High
	Stock assessment	8	High
	Develop biological controls such as viruses	7	High
	Fish tagging program	6	High
	Control and management options	4	High
	Introduce sterile males where black carp are wild	1	Medium
	Effect on habitat/ecosystem	1	Medium
	Determine spawning strategies	1	Medium
	Objectives and guidelines for standard monitoring		Low
	Establish/continue routing and standard sampling		Low
	Sample commercial harvest for presence of black carp mixed with grass carp		Low
	Develop comprehensive state & federal sampling program		Low
	Information on sampling techniques (how to catch fish)		Low
	Develop oral piscicides		Low
	Monitoring		Low
	Spawning/movement		Low
	Research spawning requirements/strategies		Low
	Movement studies		Low
	Study/determine displacement mechanisms in silver carp		Low
	Larval fish studies		Low
	Increase funding for surveys		Low
	Reassess need for silver carp in the U.S.		Low

	Gather data on the biology and life history characteristics and requirements of Asian carp		Low
	Develop environmentally sound tools and methods for eliminating or controlling Asian carp populations		Low
	Evaluate the impact of Asian carp populations on native fish communities		Low
	Provide information necessary to develop, implement and evaluate management and control activities for Asian carp		Low
	Economic Research Ideas	**Total = 14 votes**	**High**
	Assess industry demographics and economics	9	High
	Analyze site selection, design and operation of aquaculture facilities	3	Medium
	Study "wild" vs. "Farm" market	2	Medium
	Quantify value of recreation; environmental loss (USFWS document - National Survey of Fishing, Hunting and Wildlife-Related Recreation)		Low
	Perform cost-benefit analysis, not only risk analysis		Low
	Economic Analysis of severing hydraulic connection between the Cal-Sag / Chicago Sanitary and Ship Canal and Great Lakes vs. cost of electrical barrier		Low
	Social Research Ideas	**Total=1**	**High**
	Human dimensions (recreation)	1	Medium
	Develop mechanisms to verify location, distribution, movement of captive/wild silver carp		Low
	Strategy – Develop tools and processes to facilitate information access and exchange to support the successful implementation of the management and control plan.	Did not rank individual initiatives.	**High**
	Directory of research and management activities		
	Directory of key contacts and information associated with implementation actions		
	Current prevention, management, and research activities		
	Information on the status, expansion, and occurrence of new Asian carp populations.		
	Management and research protocols and data reporting requirements.		

	Strategy – Develop an education and outreach framework and priorities, to support the successful implementation of the management and control plan.	Did not rank individual initiatives.	**High**
	Monitor commercial-recreation catch (posters/cards)		
	Train biology/conservation agents in identification of all phases of bighead		
	Public education on food quality		
	Public outreach		
	Standards for producers, haulers, inspectors, dealers		
	Develop educational tools and outreach programs to provide to government agencies and public and private organizations to increase awareness of the problems associated with Asian carp		
	Engage government agencies and public and private organizations in preventing the spread, controlling populations, and minimizing harmful impacts of Asian carp		
	Provide for the continued supply of new information and resources in support of the implementation of the management plan.		
	Strategy – Establish processes to facilitate coordination and leadership necessary to successfully implement the management and control plan.	Did not rank individual initiatives.	**High**
	Provide national coordination and leadership to federal, state, and tribal governments and non-government organizations in preventing future introductions and spread of Asian carp populations.		
	Provide assistance to federal, state, and tribal governments and public and private organizations in developing Asian carp reduction and eradication programs.		
	Review existing federal and state legislation, regulations, and policies pertaining to Asian carp prevention and management and provide recommendations.		
	Propose federal legislation to prevent the further introduction and spread of Asian carp.		

Additional ideas posted for other breakout sessions:

- List as injurious species under Lacey Act (underway)
- Restrict possession
- Improve state and federal reporting
- National policy on Asian carp
- Develop and strengthen import policy (disease, parasite)
- Monitor black market (aquarium market)
- Improve consistency in certification and procedures and state regulations

Action Items for Key Strategies – Research and Information Exchange

Strategy	**Develop a research framework and priorities based on identified needs, to support the successful implementation of the management and control plan.**	**Notes**
Owner		
Major Activities	• Develop standard systems and processes to support and integrate research called out by group priorities • Identify what's been done, is in process or planned in each organization/agency • Develop standard data formats and sampling protocols related to goals/priority of sampling • State assumptions/hypotheses for sampling • Request data studies/input be in standard format and provide metadata • Ensure sampling work is both comprehensive, useful, coordinated and supports priorities of the group	Protocols will be habitat-specific but data must be common
	Research should be conducted in 3 categories: ▪ Biological (seen as primary focus of 2000 group) ▪ Social/human factors ▪ Economic impacts/tradeoffs Research topics must be selected and prioritized based on input from the other 3 groups	
Timetable	TBD	
Resources	TBD	
Cost	TBD	
Risk	TBD	
Issues		

Strategy	Strategy – Develop tools and processes to facilitate information access and exchange to support the successful implementation of the management and control plan.	Notes
Owner	TBD	
Major Activities	• Make data widely available and easily accessible (consider links from existing sites vs. common database) • Gain commitment across all agencies and interest groups to the approach • Develop an audience/constituency list and understand each group's interests and needs; work with them early and throughout the process to ensure buy-in for the result.	
Timetable	TBD	
Resources	TBD	
Cost	TBD	
Risk	TBD	

Strategy	Develop an education and outreach framework and priorities, to support the successful implementation of the management and control plan.	Notes
Owner		
Major Activities	• Provide interdisciplinary education for this group • Develop an audience/constituency list and understand each group's interests and needs; work with them early and throughout the process to ensure buy-in for the results.	
Timetable	TBD	
Resources	TBD	
Cost	TBD	
Risk	TBD	
Issues	These two goals can have different purposes: • Education is to inform and justify, can also include behavioral change • Outreach is intended to change behavior Need to ensure linkage both ways between research and education.	

Strategy	Strategy – Establish processes to facilitate coordination and leadership necessary to successfully implement the management and control plan.	Notes
Owner		

Major Activities	• Establish processes to coordinate in two directions:
	  - "Upstream" (for example, federal)
	  - "Downstream" (for example states, tribes)
	• Consider unintended effects of legislation/regulation
	  - Example: the Lacey Act in relation to Arkansas farmers of bighead carp. Apparently Canada (Ontario province?) prohibited the importation of bighead carp and now Arkansas fish farmers have thousands of bighead carp intended for that market they now have no way to dispose of.
	• Establish an Advisory Council to review proposed Asian carp policy/regulations to ensure balance between key interests/constituencies (in the past, industry has felt outnumbered)
	• Increase/improve enforcement of existing laws before seeking new ones
	• Explore non-legal/regulatory incentives, such as
	  - Contests
	  - Having industry post bonds/acquire insurance
	  - Provide tax relief/subsidies	

Timetable	TBD	
Resources	TBD	
Cost	TBD	
Risk	TBD	

Breakout Sessions: Summary

The facilitator/co-facilitator teams from each of the breakout groups agreed that the sessions provided a good forum for bring together stakeholders with differing views to have face-to-face dialogues and begin to understand each other's interest and concerns. Many key strategies for the management and control plan were identified, along with a large number of proposed initiatives and actions to accomplish these strategies. The breakout sessions provided a great deal of material that will be used to develop the management and control plan framework into a draft plan. It is important to clarify that because of the limited amount of time to discuss such complex issues many of the ideas and concerns that were raised during the breakout sessions were not thoroughly discussed and others were not addressed at all. In fact, participants expressed the need to continue the breakout group discussions before consensus could be reached on a number of issues identified throughout the day. Discussions that were begun during the breakout sessions will be continued as the management and control plan is drafted. Many participants expressed a desire to participate in developing or reviewing the draft plan.

Each breakout group was instructed to begin in-depth discussions on one of the four different topics and was encourage to proceed through as many topics as possible. In planning for the meeting, it was anticipated that each group would be able to address two topics. However, each of the four groups struggled to get completely through their primary topic. The fact that the breakout groups needed additional time to adequately cover just one topic was thoroughly discussed among the facilitation teams following the meeting.

Although the breakout groups were asked to move immediately into in-depth discussions, it was apparent, in more than one group, that the stakeholders needed to spend some initial time defining and agreeing on the problem. This is a fundamental issue that will need to be addressed in the writing of the management and control plan. A problem statement, agreeable to all stakeholders, will need to be identified early in the plan.

While consensus was reached on some points, the breakout sessions ended with the overwhelming need for more discussion amongst stakeholders. Many participants indicated that the breakout groups provided a good start, but were not adequate for discussing all of the issues in full, or for reaching consensus. The groups communicated the desire and need for the meeting to be a beginning, not an ending point, to the open dialogue that occurred during the breakout sessions and for the development of the management and control plan to be an open process that allows for continual input and review.

The ideas that were generated during the breakout sessions (i.e., the lists of strategies, actions, and work plans) will serve as starting points to be further developed during the drafting of the management and control plan. To allow for continued development of ideas and consensus building, all Working Group participants are invited to participate in the development and drafting of the management and control plan following the meeting. The following list of people are those individuals who have requested or offered to be actively involved in the development and drafting of the management and control plan.

Development and Drafting Team Volunteers

Breakout Group	Volunteer
Group 1	• Cindy Kolar • Joel Brammeier (Policy Issues) • Paula Moore • Tom Flatt
Group 2	• Duane Chapman • Mike Goehle • Paul Zajicek
Group 3	• Anita Kelly • Carole Engle
Group 4	• Bill Mauck • Hal Schramm • Jim Petty • Jimmy Avery (Education/Outreach) • John Nickum • Mike Freeze • Rob Klumb (Research)

Many of the strategies, initiatives, and actions identified by each breakout session to accomplish the three primary objectives (prevention and containment; surveillance; and eradication, control and abatement) can be grouped into a few broad categories. These common categories are: 1) coordination, policy, regulations, and enforcement; 2) industry standards, management practices, and accountability; and 3) natural resources management practices. The remaining strategies, initiatives, and actions align with the secondary objectives of information exchange and management; outreach and education; and research needs.

Although many of the strategies, initiatives, and actions address multiple objectives, each can be identified to a primary objective that it addresses. All of the strategies, initiatives, and actions identified by the breakout groups were compiled and grouped according to the primary objective addressed. The compiled results reveal that the breakout groups discussed many similar ideas, but there were also a number of opposing ideas that need to be further addressed. The drafting teams will need to identify these instances where further development and discussion of ideas is needed by the Working Group to reach consensus.

Seven tables are presented below, one for each objective, containing lists of all the strategies, initiatives, and actions proposed by the Working Group to accomplish the objectives identified for the management and control plan. Accompanying each strategy, initiative, and action is the group ranking, the species addressed, and the breakout group that identified the needed action.

Breakout Session Strategies and Actions (By Objective)

1. Prevention and containment

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group
Develop national policy on Asian carp • Asian Carp Working Group develops the Asian Carp Management and Control Plan • identify all stakeholders and current problems (state and federal agencies, ANS Task Force, Asian Carp Working Group, USDA, fishing industry, commercial producers, academia, legislators, Canadian and Mexican partners) • determine scope and objectives of the national policy • determine if national policy is needed; what else is needed to meet existing priority prevention plans? • involve scientists to design and perform the sound risk assessments needed to support the policy • develop different scenario options that the policy could reflect and analyze the trade-offs of each to all of the stakeholder • involve stakeholders and public for reviews	All	High	1
Increase enforcement of existing laws	All	High	1
Develop and strengthen import policy (re: disease and parasites?)	All	High	1
Monitor new species not yet introduced and put policies in place to prohibit them	All	High	1
Develop regulations to prevent bait bucket introductions	All	High	1
Design and construct barriers to prevent movement of Asian carp into new basins	All	High	1
Prevent introductions in watersheds where they don't exist yet through management practices	All	High	1

Develop new regulations to prevent the sale of live Asian carp in the food trade	All	High	1
Prevent new introductions in watersheds where they don't exist through methods	All	High	1
Prevent new introductions in watersheds where they don't exist yet through laws • develop objectives and minimum thresholds • identify all stakeholders and the roles they play • assess existing state laws and management practices and identify best management practices and effectiveness rates • determine if additional, new laws and management practices are required to meet objectives; develop model legislation • work at the state level on a state-by-state basis to introduce the model legislation	All	High	1
Fish tagging program	All	High	2
Pass NAISA and state ANS plans	All	High	3
Use triploids with strict monitoring	All	High	3
Accountability of releases	All	High	3
Inventory existing laws and assess their effectiveness	All	Medium	1
Increase accountability through, laws, tools, and tags	All	Medium	1
Develop controls and management plans for monitoring transport and transport contamination	All	Medium	1
List as injurious species under the Lacey Act	Black	Medium	1
List as injurious species under the Lacey Act, both diploid and triploids	Silver	Medium	1
List as injurious species under the Lacey Act, diploids only, allow triploids	Bighead	Medium	1
Stock only triploids	Grass	Medium	1

Have states deny live possession (there may not be a precedent for this)	Silver	Medium	1
Establish rules in Mississippi and Arkansas to use triploid black carp. State will make regulations to manage diploid populations.	Black	Medium	1
Develop alternative means of snail control	Black	Medium	1
Use triploid or monosex populations	Black	Medium	1
Use good watershed management practices to avoid excessive foliage build-up	Grass	Medium	1
Reassess need for silver carp in U.S.	Silver	Medium	1
National legislation on restricting movements of bighead	Bighead	Medium	1
Allow sterile triploids under injurious species. Have state require killing fish upon sale	Bighead	Medium	1
Have tight state controls on diploid populations	Grass	Medium	1
Prevent releases of diploids by aquaculture to states where not permitted	Grass	Medium	1
Improve consistency in certification procedures and state regulations	Grass	Medium	1
Certify producers	Grass	Medium	1
Make state penalties consistent with the risk and issue	All	Low	1
Cautious removal of dams	All	Low	1
Restrict movement	All	Low	1
Focus on hauling methods and identify best methods, scenarios for different species, large fish food, and small fish	All	Low	1
Create standards for producers, haulers, inspectors, and dealers	All	Low	1
Understand the internet aquarium trade and do a risk assessment	Grass	Low	1
Document where the fish came from	Silver	Low	1
Stricter and more extensive rules for permits.	Black	Low	1
Require guaranteed triploid/sterile fish for aquaculture	Bighead	Low	1
All states use FWS certification	Grass	Low	1

All states do random checks on certified triploids entering state	Grass	Low	1
Diploid, triploid facilities certification	Grass	Low	1
Provide national coordination and leadership to federal, state, and tribal governments and non-governmental organizations in preventing future introductions and spread of Asian carp populations	All	Did not rank	4
Propose federal legislation to prevent the further introduction and spread of Asian carp	All	Did not rank	4
Standards for producers, haulers, inspectors, dealers	All	Did not rank	4
Full funding for Chicago electrical barrier	All	*	3
Eliminate live fish sales	All	*	3
Develop clean species list	All	*	3
Establish accountability standards to limit new introductions	All	*	3
Use triploids for all stocked fish; must do for all live fish, check research	All	*	3
Restrict live fish market to triploid only	All	*	3
Emphasis on stopping "new" pathways	All	*	3
Accountability/identification	All	*	3
ID/tag all fish	All	*	3
mark all "captive" fish to enhance identification and accountability for escapes	All	*	3
Objectively evaluate, not assume, existence of a pathway from aquaculture	All	*	3
Injurious species listing for black, bighead, and silver carp	Silver, Bighead, Black	*	3
Marketing of dead fish only; no live sales of any kind	Silver, Bighead, Black	*	3

* not discussed by group

2. Surveillance

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group
Develop comprehensive federal and state sampling program -- sampling techniques, train and equip appropriate personnel • establish framework for state groups to talk • identify information that is essential for all states to have to sample more effectively • identify efficient sampling methods • be open to unconventional methods for detection • identify common elements that can be shared with other state agencies and integrate into a centralized database	All	High	2
Establish mandatory reporting for captive stock (public, private, live markets) • identify targets of surveys • define reporting requirements • identify short-term and easier reporting (low hanging fruit); first requirement could be for escapes from farms • identify compliance issues • identify cultural and economic issues and create contingency plans • identify consequences of not reporting • make data available by HUC	All	High	2

Identify likely habitats for high priority sampling based on 1) biodiversity hotspots and waters of special concern and 2) places where Asian carp are most likely to be found • for hotspots and biodiversity: survey states and ngo's for their lists • for places where Asian carp are most likely to be found: identify habitats, including spawning grounds • identify research done to date • based on available research, develop list of targeted habitats; integrate into common database for use across state agencies	All	High	2
Develop information about sampling techniques	All	High	2
Mandatory reporting of escapees	All	High	2
Guidelines for standardized monitoring	All	High	2
Improve state and federal reporting	All	High	2
Monitor black carp market – internet/aquarium market	Black	High	2
Develop mechanisms for verifying location, distribution, and movement of captive and wild silver carp	Silver	High	2
Monitor the diploid market	Black	Low	2
Develop mechanisms to verify location, distribution, and movement of captive and wild carp	All	Did not rank	2
Increase funding for surveys	All	Did not rank	2
Monitor commercial and recreational catch through outreach programs (posters/cards)	All	Did not rank	4
Incentives for accurate reporting of commercial catches	All	*	3
LTRMP and like monitoring for baseline data - across basins	All	*	3

* not discussed by group

3. Eradication, control, and abatement

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group
Develop commercial harvest for human and non-human consumption, including the use of bounties (applies to wild populations and sales of dead fish only) • education for harvesters • identify river systems and priority locations, seasons, permits, and licenses • market research for human and non-human consumption • website for information dissemination • promulgate harvest regulations (per state) • public education regarding food fish • establish bounties	All	High	3
Develop rapid response team and equipment • identify available tools (chemicals) • implement • identify better selective tools (pheromones)	All	High	3
Develop commercial fisheries	All	High	1
Find new uses of Asian carp to get them out of the wild	All	High	1
Designate an individual with sole responsibility to oversee elimination/control in a region (wild carp only)	All	High	3
Track and target larval stages for elimination (e.g. rotenone nursery ground)	All	High	3
Target spawning adults for removal/elimination	All	High	3
Increase harvest in Illinois Rivers and understand impact	All	Low	1
Rapid response and eradication program for escapees	Black	Low	1

Provide assistance to federal, state, and tribal governments and public and private organizations in developing Asian carp reduction and eradication programs	All	Did not rank	4
Use population control method agreed upon; realize that total control is probably impossible; manage the resource	All	*	3
Make list of approved eradication tools	All	*	3

* not discussed by group

4. Research needs

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group	Research Agenda
Develop a research framework and priorities based on identified needs • develop standard systems and processes to support and integrate research called out by group priorities • identify what's been done, is in process or planned in each organization/agency • develop standard data formats and sampling protocols related to goals/priority of sampling • state assumptions/hypotheses for sampling • request data studies/input be in standard format and provide metadata • ensure sampling work is comprehensive, useful, coordinated and supports priorities of the group • research should be conducted in 3 categories: biological, social/human factors, and economic impacts/tradeoffs	All	High	4	
Research the cost benefit of management and control – do we consider anything besides control	All	High	1	Economic
Effect on native species	All	High	4	Biological
Stock assessment	All	High	4	Biological
Develop biological controls such as viruses	All	High	4	Biological
Fish tagging programs	All	High	4	Biological
Control and management options	All	High	4	Biological
Assess industry demographics and economics	All	High	4	Biological
Develop markets	All	High	3	Biological
Effect on habitat/ecosystem	All	Medium	4	Biological
Determine spawning strategies	All	Medium	4	Biological

Analyze site selection, design, and operation of aquaculture facilities	All	Medium	4	Economic
Study "wild" vs. "farmed" market	All	Medium	4	Economic
Human dimensions (recreation)	All	Medium	4	Social
Sterile males where black carp are wild	All	Medium	3	Biological
Daughterless carp	All	Medium	3	Biological
Chemical use	All	Medium	3	Biological
Spawning requirements and strategies	All	Medium	3	Biological
Introduce sterile males where black carp are wild	Black	Medium	4	Biological
Objectives and guidelines for standard monitoring	All	Low	4	Biological
Establish/continue routing and standard sampling	All	Low	4	Biological
Develop comprehensive state and federal sampling program	All	Low	4	Biological
Information on sampling techniques (how to catch fish)	All	Low	4	Biological
Develop oral piscicides	All	Low	4	Biological
Monitoring	All	Low	4	Biological
Spawning/movement	All	Low	4	Biological
Spawning requirements/strategies	All	Low	4	Biological
Movement studies	All	Low	4	Biological
Larval fish studies	All	Low	4	Biological
Increase funding for surveys	All	Low	4	Biological
Gather data on the biology and life history characteristics and requirements of Asian carp	All	Low	4	Biological
Develop environmentally sound tools and methods for eliminating or controlling Asian carp populations	All	Low	4	Biological
Evaluate the impacts of Asian carp populations on native fish communities	All	Low	4	Biological
Provide information necessary to develop, implement, and evaluate management and control activities for Asian carp	All	Low	4	Biological

Quantify value of recreation; environmental loss (USFWS document - National Survey of Fishing, Hunting and Wildlife Related Recreation)	All	Low	4	Economic
Perform cost-benefit analysis, not only risk assessment	All	Low	4	Economic
Economic analysis of severing hydraulic connection between the Cal-Sag / Chicago Sanitary and Ship Canal and Great Lakes vs. cost of electrical barrier	All	Low	4	Economic
Sample commercial harvest for presence of black carp mixed with grass carp	Black	Low	4	Biological
Study/determine displacement mechanisms in silver carp	Silver	Low	4	Biological
Reassess need for silver carp in the U.S.	Silver	Low	4	Biological
Develop mechanisms to verify location, distribution, movement of captive/wild silver carp	Silver	Low	4	Social
Research on options other than grass carp to achieve	Grass	Low	1	Biological
Establish the use of genetic markers	All	Did not rank	2	Biological
Study and determine displacement mechanisms	All	Did not rank	2	Biological
Initiate larval fish studies	All	Did not rank	2	Biological
Develop selective toxicants	All	*	3	Biological
Rapid response - identify "tools" to be used in various situations	All	*	3	Biological
Develop step-by-step plan to research wild population of Asian carp	All	*	3	Biological
Investigate life history for bottlenecks in development	All	*	3	Biological
Genetic modifications (daughterless carp, etc.)	All	*	3	Biological

* not discussed by group

5. Information access and management

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group
Develop tools and processes to facilitate information access and exchange • make data widely available and easily accessible (consider links from existing sites vs. common databases) • gain commitment across all agencies and interest groups to the approach • develop an audience/constituency list and understand each group's interests and needs; work with constituents early and throughout process to ensure buy-in for the result	All	High	4
Improve coordination and information exchange • inventory all available databases and gather requirements for what information is useful to agencies • identify state agencies that regulate and monitor • search other sources for data • identify gaps in data and develop methods to begin collecting data	All	High	2
Create a centralized, integrated database	All	High	2
Create a database of producers and operators	All	Low	1
Directory of research and management activities	All	Did not rank	4
Directory of key contacts and information associated with implementation actions	All	Did not rank	4
Current prevention, management, and research activities	All	Did not rank	4
Information on the status, expansion, and occurrence of new Asian carp populations	All	Did not rank	4
Management and research protocols and data reporting requirements	All	Did not rank	4

Provide for the continued supply of new information and resources in support of the implementation of the management and control plan	All	Did not rank	4
State agencies already monitor their respective populations, use their data to save time and expense	All	*	3
Be sure info is verifiable and accurate, eliminate disinformation	All	*	3

* not discussed by group

6. Education and outreach

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group
Develop an education and outreach framework and priorities • provide interdisciplinary education for this group • develop an audience/constituency list and understand each groups interests and needs; work with constituents early and throughout the process to ensure buy-in for the results	All	High	4
Public education – what they are, where they are, why they are, the impact	All	High	1
Public education on food quality	All	High	3
Train biology/conservation agents in I.D. of all phases of bighead and improve public outreach.	Bighead	High	2
Manage and outreach to the network between game fish, producer, and buyer	Grass	Medium	1
Public outreach for what the bighead looks like, especially for bait handlers	Bighead	Medium	1
Public outreach on the cultural aspects of purchase	Bighead	Medium	1
Reduce demand for use of grass carp to control vegetation	Grass	Medium	1
Develop outreach materials to prevent spread via the aquarium trade	All	Low	1
Develop outreach materials to minimize risk of spread by aquaculturists	All	Low	1
Education between the producer-buyer relationship	Grass	Low	1
Educate on the difference between black and grass carp – especially to fisheries professionals	Grass	Low	1
Train biology and conservation agents in identification of all phases of bighead	All	Did not rank	4

Public education on food quality	All	Did not rank	4
Public outreach	All	Did not rank	4
Develop educational tools and outreach programs to provide to government agencies and public and private organizations to increase awareness of the problems associated with Asian carp in the wild	All	Did not rank	4
Engage government agencies and public and private organizations in preventing the spread, controlling populations, and minimizing harmful impacts of Asian carp	All	Did not rank	4
Develop outreach programs	All	Did not rank	2
Evaluate comments regarding "public health impacts"	All	*	3
Distinguish between "possible" and "likely"	All	*	3
Distinguish between "wild" and "farmed"	All	*	3
Asians are a part of our community, education to reindoctrinate their customs is discriminatory	All	*	3

* not discussed by group

7. Coordination and leadership

Strategy/Initiative (• major activities identified in work plans)	Species	Group Ranking	Breakout Group
Establish process to facilitate coordination and leadership • establish a process to coordinate in two directions ("upstream", for example federal, and "downstream", for example states and tribes • consider unintended effects of legislation/regulation • establish an Advisory Council to review proposed Asian carp policy/regulations to ensure balance between key interests/constituencies • increase/improve enforcement of existing laws before seeking new ones • explore non-legal/regulatory incentives, such as contests, having industry post bonds/acquire insurance, provide tax relief/subsidies	All	High	4
Review existing federal and state legislation, regulations, and policies pertaining to Asian carp prevention and management and provide recommendations	All	Did not rank	4
Federal program administered by states affected; state leadership is essential	All	*	3
USDA must be involved in discussions involving fish farms	All	*	3

* not discussed by group

Concluding Remarks

The results of each breakout session were reported back to the full meeting assembly in an afternoon general session. The group reports were met with few question and very little discussion. A summary of the concluding remarks that followed the group presentations are provided below.

Concluding Remarks - Greg Conover

Asian Carp Working Group Chair, USFWS, Carterville Fishery Resources Office

I would like to thank everyone for the great interactions that we had here today and for working together to understand the different perspectives and issues related to managing and controlling Asian carp populations.

The Service is charged with leading the development of the management and control plan, but the collaborative process that we have started today is intended to make this *our* plan. The collaborative development of the plan will truly be a process. We are learning each others interests, concerns, and priorities. All perspectives must be addressed and considered for this plan to be effective. We need to work with each other and we have made a great start today.

The complexity of this process was evident as I listened in on the discussions within the different groups. Considerable more discussion and interaction is needed on each of these topics. No group was able to move onto a second topic, in fact, most groups could have spent much more time on their first topic. The message I received today is there is a need and desire for more interaction and input into the development of the plan.

I have proposed an aggressive timetable but it is not set in stone and we will do what it takes to create a quality, useful plan that meets the needs of all stakeholders.

The first steps that will be taken following today's meeting are that the consultants and co-facilitators will debrief with each other and discuss each of the breakout sessions. Park's Consulting Group will begin drafting a proceedings document of today's meeting. The planning team that I worked with to develop today's meeting will work together to discuss the needs that came out of today's meeting and how best to proceed from here.

Many of you may have additional input or issues that were not brought out during today's breakout session. We are providing a number of opportunities for you to continue to bring your ideas forward for consideration. Park's Consulting Group prepared a feedback form for today's session. This form is in your packets and can be returned today or mailed or faxed to me following the meeting. This form will be provided in electronic format following today's meeting. In addition, I have requested that those individuals who are interested in further development and drafting of the management plan to notify their respective facilitation teams, or me, so that I can be in contact with you following today's meeting. I will work with these

individuals in the coming weeks to move us forward from today to begin developing and drafting the management plan. Everyone will be asked to review and provide comments on components of the management plan as they are developed.

I want to reiterate that today is a starting point, not an end point. Interaction and collaboration must and will continue. I would encourage everyone with an interest in the management plan to stay involved and communicate your ideas and concerns.

Everett Wilson would like to make a few closing comments before we depart today. Thank you everyone for your attendance and participation that made for a very productive session today.

Closing Remarks – Everett Wilson

Acting Executive Secretary Aquatic Nuisance Species Task Force, U.S. Fish & Wildlife Service, Arlington, VA

The stories in the news about snakeheads in the Potomac have made an impact on Washington DC. The House of Representative has scheduled a special hearing on snakeheads and Asian carp. This is an unprecedented event to have a full House hearing on a natural resources issue. Asian carp have Washington's attention.

I was very impressed by the efforts that I saw here today and I thank each and every one of you for giving your time to contribute in the development of this plan. I am glad to see the development of the management and control plan begun. I encourage the Working Group to work hard to develop the management and control plan and I look forward to seeing the completed plan. Thank you and have a safe trip home.

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Appendix A

Meeting Participants

Last Name	First Name	Agency
Adams	Steve	Kansas Department of Wildlife and Parks
Armstrong	Mike	Arkansas Game and Fish Commission
Avery	Jimmy	National Warmwater Aquaculture Center
Barko	Valerie	Missouri Department of Conservation
Benson	Amy	USGS
Bogenschutz	Kim	Iowa Department of Natural Resources
Brammeier	Joel	Lake Michigan Federation
Bristow	Brent	USFWS, Region 2
Candrl	James	USGS-ASCI
Caswell	Nate	USFWS, Region 3
Champion	Jonathan	Northeast-Midwest Institute
Chapman	Duane	USGS
Cochran	Matt	FishPro/Cochran & Wilken, Inc.
Conover	Greg	USFWS, Region 3
Conover	Marion	Iowa Department of Natural Resources
Cornish	Mark	USACE, Rock Island District
Cummings	Kevin	Illinois Natural History Survey
Eder	Steve	Missouri Department of Conservation
Engle	Carole	University of Arkansas at Pine Bluff
Fabacher	David	USGS-CERC
Flatt	Tom	Indiana Department of Natural Resources
Freeze	Mike	Keo Fish Farms
Goddard	Chris	Great Lakes Fishery Commission
Goeckler	Jason	Kansas Department of Wildlife and Parks

Goehle	Mike	USFWS, Region 5
Hargreaves	John	LSU Aquaculture Research Station
Hoff	Mike	USFWS, Region 3
Hopper	Bob	Hopper-Stevens Hatchery
Irons	Kevin	Illinois Natural History Survey
Kelly	Anita	Southern Illinois University
Klumb	Rob	USFWS, Region 6
Kolar	Cindy	USGS
Little	Ed	USGS
Maclean	Jim	Ontario Ministry of Natural Resources
Mattes	Bill	Great Lakes Indian Fish and Wildlife Commission
Mauck	Bill	University of Missouri - Columbia
Mitchel	Andrew	USDA
Moore	Paula	Jones & Eaker Farms
Mosher	Tom	Kansas Department of Wildlife and Parks
Neuman	Rob	Southern Illinois University
Nickum	John	USFWS, Retired
Nico	Leo	USGS
Nygren	Doug	Mississippi Interstate Cooperative Resource Association
Oetker	Mike	USFWS, Region 3
Paukert	Craig	Kansas Cooperative Fish & Wildlife Research Unit
Petty	Jim	USGS
Pitman	Bob	USFWS, Region 2
Rach	Jeff	USGS
Rasmussen	Jerry	Mississippi Interstate Cooperative Resource Association

Rendall	Jay	Minnesota Department of Natural Resources
Riecke	Dennis	Fishery Biologist
Sanders	Laura	USGS-CERC
Schainost	Steven	Nebraska Game & Parks Commission
Schlueter	Lynn	North Dakota Game and Fish Commission
Schramm	Hal	USGS, Mississippi Cooperative Fish and Wildlife Research Unit
Shearer	Jeff	South Dakota Game, Fish & Parks Department
Shults	Steve	Illinois Department of Natural Resources
Smith	Darlene	Fisheries and Oceans Canada
Sorensen	Peter	University of Minnesota
Starotska	Andy	USFWS, Region 3
Thiel	Pam	USFWS, Region 3
Troxel	Jay	USFWS, Region 4
Warren	Hugh	Catfish Farmers of America
Welker	Mike	USFS
Williams	Erin	USFWS, Region 1
Wills	Paul	Logan Hollow Fish Farm
Wilson	Everett	USFWS, WO
Zajicek	Paul	National Association of State Aquaculture Coordinators

Appendix B

ANS Task Force Welcome Letter
and
Meeting Agenda

ANS Task Force

Aquatic Nuisance Species Task Force
4401 North Fairfax Drive, Suite 322
Arlington, Virginia 22203-1622
703-358-2148 FAX: 703-358-2044
E-Mail: Everett_Wilson@fws.gov

May 24, 2004

Asian Carp Working Group Participants,

On behalf of the Aquatic Nuisance Species Task Force (ANSTF), I would like to welcome you to this meeting of the Asian Carp Working Group. The Working Group is meeting today to initiate the development of an integrated management and control plan for four species of Asian Carp. The four species of Asian carp to be covered by this plan are bighead carp, black carp, grass carp, and silver carp. This comprehensive plan will include a variety of control strategies and specific actions to be taken by federal, state, and local agencies, as well as the private sector, to limit the spread of Asian carp, prevent additional introductions, and minimize the impacts of the established populations.

Asian carp and invasive species management specialists from natural resources agencies representing the United States and Canada, as well as experts from industry, academia, and non-governmental environmental organizations have been invited here today to collaborate in the development of the management plan. The development of innovative strategies and the implementation of coordinated actions are paramount to the successful control and management of Asian carp populations. That is the task for this group of experts gathered here today.

The U.S. Fish and Wildlife Service hosted an Asian Carp Management and Control Workshop in St. Louis during April 2000. The participants in that workshop spent two days sharing information and exchanging ideas on Asian carp issues. During that workshop, economic and ecological benefits and impacts of Asian carp were identified, along with needs for preventing the spread, detecting and monitoring, and controlling populations of these species. The group gathered here today will step forward from those efforts to collaborate on the development of strategies, action plans, and implementation timetables for managing and controlling Asian carp populations. The results of today's work will culminate in a draft Asian Carp Management and Control Plan that will be submitted to the ANSTF for approval.

Established by Section 1201 of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990 (16 U.S.C. 4721)
DEDICATED TO THE PREVENTION AND CONTROL OF AQUATIC NUISANCE SPECIES.

The ANSTF is responsible for the coordination of national efforts to prevent the introduction and spread of invasive species. Chief among these responsibilities is to develop control programs for specific high-risk invasive species, such as Asian carp. We appreciate your interest and participation in this effort addressing Asian carp and look forward to seeing the draft plan.

Sincerely,

Mamie A. Parker, ANSTF Co-Chair
Assistant Director - Fisheries and Habitat Conservation
U.S. Fish and Wildlife Service

Timothy R. E. Keeney, ANSTF Co-Chair
Deputy Assistant Secretary of Commerce for Oceans and Atmosphere

Cc: ANSTF Members

A.M. General Session (8:00 – 10:15)

Welcome & Background – Jay Rendall, Mississippi River Basin Panel

Introduction

- Review meeting purpose, expectations, process and agenda – Greg Conover, USFWS
- Overview of ANSTF and expectations for management plan – Erin Williams, USFWS

Developments since 2000 Workshop

- Current distribution and status – Amy Benson, USGS
- Update on Bighead Carp and Silver Carp Risk Assessments – Cindy Kolar, USGS
- Update on Black Carp Risk Assessment – Leo Nico, USGS
- Overview of current USGS Asian carp research projects – Dr. Ed Little, USGS
- Overview of current INHS Asian carp research projects – Kevin Irons, INHS
- Industry update – Dr. Carol Engle, University of Arkansas

Prepare for breakout sessions – Susan Parks, Parks Consulting Group

Break (10:15 – 10:30)

Breakout Sessions (10:30 – 12:00)

Group 1: Preventing Spread – Windsor Ballroom III
Group 2: Detection and Monitoring – Windsor Ballroom III
Group 3: Population Control and Abatement – Parliament III
Group 4: Research and Information Exchange – Polo

Lunch Break (12:00 – 12:20)

Working lunch. Boxed lunches provided during break.

Breakout Sessions (12:20 – 3:15)

Group 1: Preventing Spread – Windsor Ballroom III
Group 2: Detection and Monitoring – Windsor Ballroom III
Group 3: Population Control and Abatement – Parliament III
Group 4: Research and Information Exchange – Polo

Break (3:15 – 3:30)

Closing Session (3:30 – 5:00)

Breakout group summaries and facilitated open discussion – summaries presented by breakout session co-facilitator or group volunteer

Next steps – Greg Conover, USFWS

Concluding remarks – Everett Wilson, USFWS

Appendix C

Draft Framework For the Asian Carp Management and Control Plan Including Strategies and Actions from Breakout Session

Purpose

Introduction

Goals

1. Prevent new introductions of Asian carp into the wild within the United States.
2. Control the expansion of wild populations of Asian carp.
3. Abate the harmful ecological, economic, and public health impacts resulting from the introduction of Asian carp into the wild.

Primary Objectives

- Prevention and containment
- Surveillance
- Eradication, control, and abatement

Secondary Objectives

- Research needs
- Information access and management
- Education and outreach
- Coordination and leadership

Objective 1: Prevention and containment

Definition: Prevent the risk of new introductions in the wild and eliminate pathways to prevent further distribution and spread of Asian carp in the wild.

Includes:

- Exhaustively consider pathways by which Asian carp can move within and between watersheds and factors that could facilitate their movements
- Assess the risk of further infestation through each identified pathway
- Identify management options available to reduce the risks associated with each identified pathway

Background

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

1) Develop and enforce regulations and policies designed to reduce the risk of release of Asian carp into the wild

- Establish a national policy on Asian carp
    - Completion and implementation approval of Asian Carp Management and Control Plan
    - Decision on bighead, silver, and black carp listings as injurious species under the Lacey Act
- Promulgate and enforce existing regulations and policies
    - Review existing regulations and policies and assess their effectiveness
- Develop new federal, state, and local regulations to close existing pathways of introduction to the wild
    - Develop model regulations and policies that could be used by states without them
    - Strengthen import policy (re: disease and parasites)
    - Sale of live Asian carp in the food trade (consensus not reached on all species)
    - Bait bucket introductions

2) Identify locations that are at greatest risk of invasion via each pathway (i.e., swimming, live food, bait, aquaculture, internet/aquarium trade)

- Conduct risk assessment to determine which pathways pose risks of introductions into additional watersheds and basins
- Establish controls on all pathways

3) Construct barriers to prevent invasion of additional basins, watersheds, and sub-watersheds

- An example of a watershed connection in which additional barriers are needed is the Chicago Sanitary and Ship Canal

- An example of a location within a basin in which barrier net benefits may exceed the costs is the Upper Mississippi River

4) Implement standards and best practices to reduce the risk of unintentional release into the wild

- Increase accountability of producers through laws, tools, and tags
- Implement Hazard Analysis and Critical Control Point-type planning as a requirement for transporting and stocking species where Asian carp contamination is possible.
- Construct barriers for aquaculture systems to prevent floods from allowing escapement of Asian carp into the wild (where not yet established)
- Reduce the need for Asian carp in management of aquatic systems
  - In the wild, develop and implement management practices that minimize the need for grass carp
  - In aquaculture, develop and implement management practices that minimize the need for Asian carp

5) Develop a Triploid Certification program for bighead, silver, and black carp

- For species not listed under Lacey Act or if listing allows use of triploids in aquaculture

Objective 2: Surveillance

Definition: Activities to monitor the distribution of Asian carp and forecast and detect new introductions and range expansions.

Includes:

- Develop early detection programs to detect new introductions and range expansions into previously uninvaded waters
- Assess population abundance and trends to forecast expanding populations.
- Monitor captive populations

Background

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

6) Develop and conduct early detection monitoring programs in locations where risk of introduction exists

- Develop a comprehensive, standardize sampling program
- Develop a rapid assessment protocol to be used when the early detection program reveals invasion
- Develop a framework so groups working together can discuss findings and report issues

7) Identify likely habitats for high priority sampling
- biodiversity hotspots
- waters of special concern
- upstream/downstream of barriers

8) Develop mechanisms to verify location, distribution, movement of captive and wild stock
- Create a mandatory reporting system for captive stock
- Sample commercial harvest for presence of black carp

Objective 3: Eradication, control, and abatement

Definition: Identify management actions and develop programs to eradicate or reduce population abundance, control the spread of Asian carp, and abate the harmful ecological, economic, social and public health impacts resulting from the establishment of Asian carp populations in the wild.

Includes:
- Rapid response programs to eradicate new introductions and range expansions
- Population control programs to reduce abundance of established populations below levels where harmful impacts do not occur
- Develop abatement actions to minimize the harmful ecological, economic, social and public health impacts resulting from the establishment of Asian carp populations

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

9) Develop rapid response tools and teams for escapes
- including designated individual with responsibility for a geographic area

10) Develop and implement rapid response plans
- Implement rapid response plans when early detection and rapid assessment determines the presence of Asian carp at population levels and geographic scales that could allow a reasonable probability of successful eradication

11) Reduce number of fish in the wild
- Develop commercial fisheries
- Develop new markets as food fish
- Increase wild harvests – bounty, contests
- Develop an approved lists of eradication tools

Objective 4: Research needs

Definition: Begin, continue, and expand biological field and laboratory investigations of Asian carp populations in support of preventing spread, controlling populations, and minimizing impacts.

Includes:

- Gather data on the biology and life history characteristics and requirements of Asian carp
- Develop environmentally sound tools and methods for eliminating or controlling Asian carp populations
- Evaluate the impact of Asian carp populations on native fish communities
- Provide information necessary to develop, implement, and evaluate management and control activities for Asian carp

Background

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

12) Develop a research framework and priorities based on needs identified for implementation of the management and control plan

- Biological research agenda
  - Biology and life history
  - Effects on native species
  - Spawning, movement, habitat, behaviors
  - Larval stage elimination and spawning adults elimination strategies
  - Field study best practices, such as sampling techniques
  - Biological controls, oral piscicides, selective toxicants, implants
  - Genetic modification
  - Pheromones
- Economic research agenda
  - Total cost/benefits analysis (in addition to risk analysis)
  - Commercial best practices, such as control and management options, aquaculture design and operations
- Social research agenda
  - Understand cultural implications of bighead carp consumer market

Objective 5: Information access and management

Definition: Develop information management systems to successfully implement coordinated management activities and provide for timely access and exchange of new data.

Includes:

- Directory of research and management activities

- Directory of key contacts and information associated with implementation actions
- Solicit and compile current prevention, management, and research activities
- Solicit and compile information on the status, expansion, and occurrence of new Asian carp populations
- Provide management and research protocols and data reporting requirements

Background

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

13) Develop tools and processes to facilitate information access and exchange across governmental and non-governmental bodies

- Create/coordinate data bases of producers, operators, sampling and data protocols, research and field findings, statutes, species distribution, implementation actions
- Create and maintain website for information dissemination
- Ensure that agencies are committed to share information

Objective 6: Education and outreach

Definition: Develop educational materials and outreach programs in support of preventing spread, controlling populations, and minimizing impacts of wild populations of Asian carp.

Includes:

- Develop educational tools and outreach programs to provide to government agencies and public and private organizations to increase awareness of the problems associated with Asian carp
- Engage government agencies and public and private organizations in preventing the spread, controlling populations, and minimizing harmful impacts of Asian carp
- Provide for the continued supply of new information and resources in support of the implementation of the management plan

Background

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

14) Develop an education and outreach framework and priorities based on needs identified for implementation of the management and control plan

- Identify all constituencies and their information/education needs
- Develop and implement a public education program designed to reduce the risk of spread
- Develop interdisciplinary education tools on identification, differences between species, differences in life stages, food quality

- Current laws, why they exist, and how to comply
- Best practices for resource managers, producers, haulers, inspectors, dealers, anglers, boaters
- Communicate issues, impacts, successes and needs

Objective 7: Coordination and leadership

Definition: Provide for coordinated implementation of the management and control plan and the timely access and exchange of new data, information, and developments.

Includes:

- Provide national coordination and leadership to federal, state, and tribal governments and non-government organizations in preventing future introductions and spread of Asian carp populations
- Provide assistance to federal, state, and tribal governments and public and private organizations in developing Asian carp reduction and eradication programs
- Review existing federal and state legislation, regulations, and policies pertaining to Asian carp prevention and management and provide recommendations
- Propose federal legislation to prevent the further introduction and spread of Asian carp

Background

Action Plan (text description of recommended actions)

Breakout Session Strategies and Actions

15) Establish processes to facilitate coordination and leadership necessary to successfully implement the management and control plan

- Provide assistance in developing Asian carp reduction and eradication programs
- Review existing legislation, regulations, and policies pertaining to Asian carp prevention and management and provide recommendations
- Develop an advisory council to review proposed Asian carp policy/regulations and consider unintended effects

Implementation Time Table

Biological Information

Appendix D

Speaker Biographies and Presentation Slides

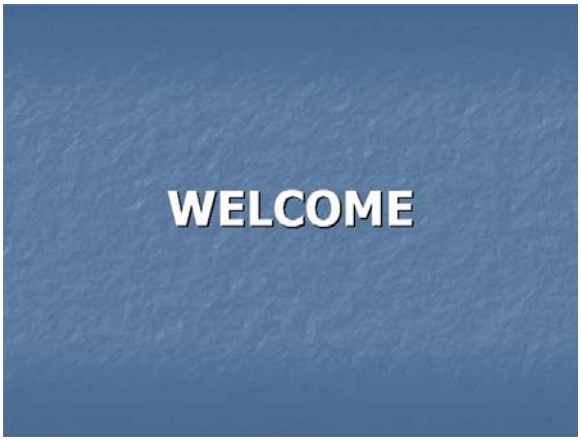
Opening Remarks - Jay Rendall

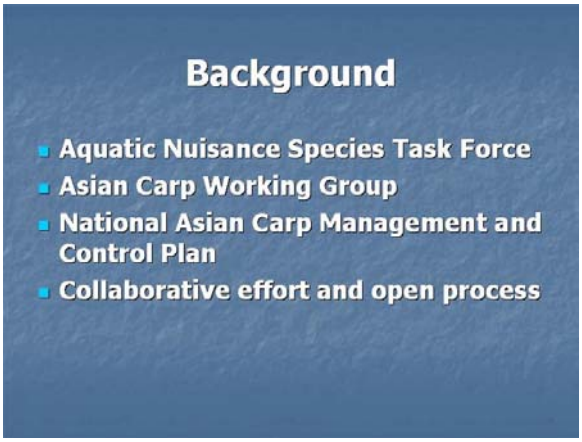
Jay Rendall is the invasive Species Program Coordinator for the Minnesota Department of Natural Resources and Chair of the Mississippi River Basin Panel on Aquatic Nuisance Species.

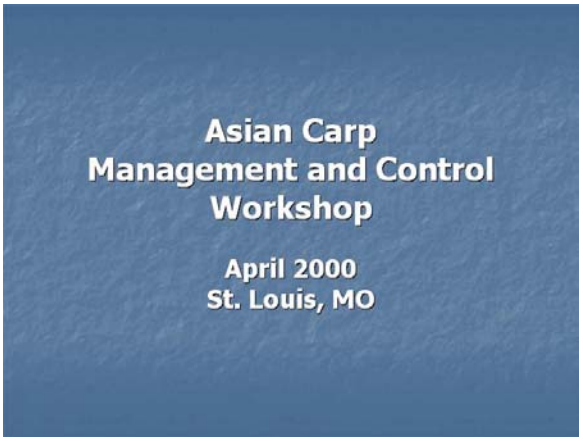
* No slides used during opening remarks.

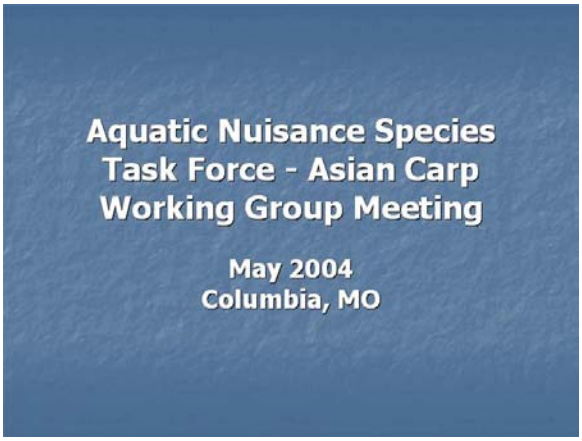
Objectives of the Asian Carp Working Group Meeting - Greg Conover

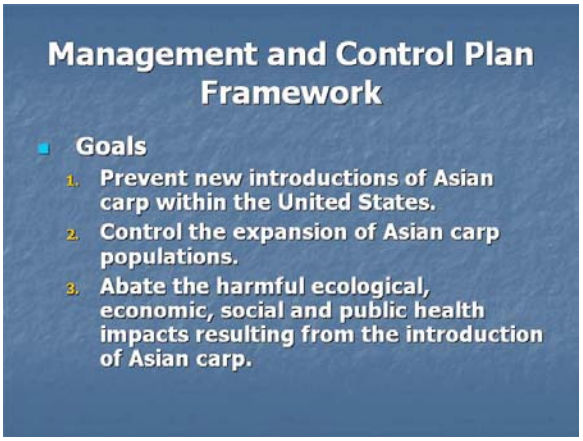
Greg Conover is a Fishery Biologist and Assistant Project Leader at the U.S. Fish & Wildlife Service's Carterville Fishery Resources Office in Marion, Illinois. Greg is also the Chair of the Aquatic Nuisance Species Task Force Asian Carp Working Group.











Secondary objectives

- Research needs
- Information access and management
- Education and outreach
- Coordination and leadership

Management and Control Plan

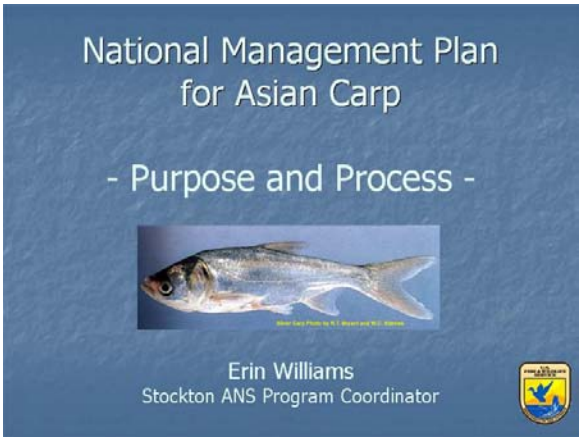
- Drafted using output from today's breakout sessions
- Participants have the opportunity to draft, review, and comment on components as they are developed
- Completed draft targeted for August 2004
- Draft submitted to ANS Task Force before Fall 2004 meeting

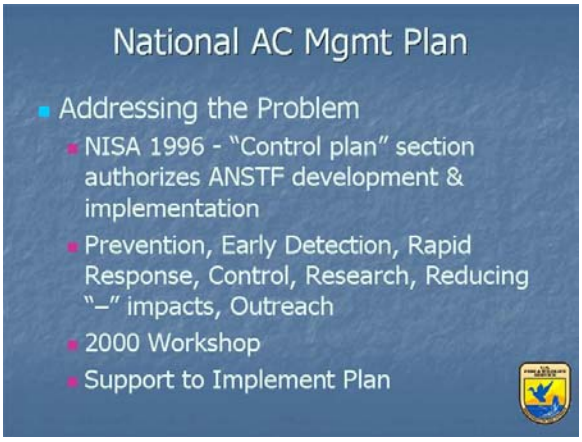
Meeting Agenda

- Background, focus, and current info
  - ANSTF expectations for management plan
  - Developments since the 2000 Workshop
- Breakout sessions
  - Mix of agency and organizations
  - Each group starts with different topic
- Closing session
  - Share results and open discussion

National Management Plan for Asian Carp: Purpose and Process - Erin Williams

Erin Williams works in the Stockton California Fish & Wildlife Office is the U.S. Fish & Wildlife Service's Aquatic Nuisance Species Coordinator for California & Nevada. Erin has assisted in the Mitten Crab Management Plan and is currently coordinating the Caulerpa Management Plan.





Implementation Priorities

- **Longer term**
  - Life History
  - Control Strategies
  - Negative Impacts
  - Adaptive Management

Process

- Compile information from ACWG members
- Plan drafted
- Draft plan sent to ACWG members for review & comment
- Draft plan submitted to ANSTF
- ANSTF reviews, requests changes or approves for public comment
- ANSTF approved draft plan submitted for Public Comment (Federal Register)
- Revisions that address PC by ACWG
- Final plan submitted to ANSTF
- ACWG works with ANSTF to implement actions, conduct research, pursue funding

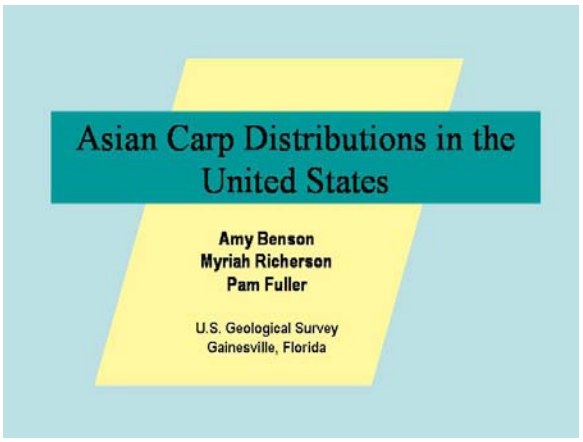
Photo: Illinois Natural History Survey

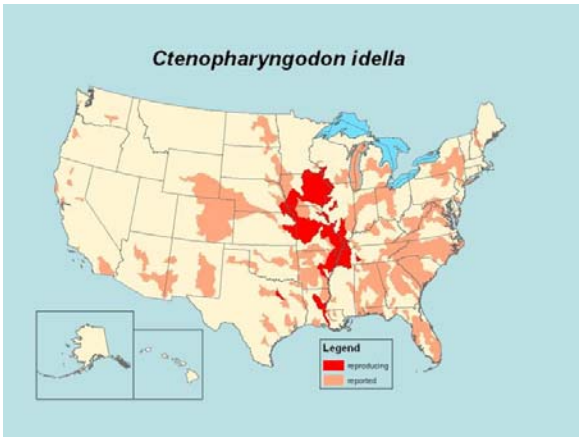
Thank you!

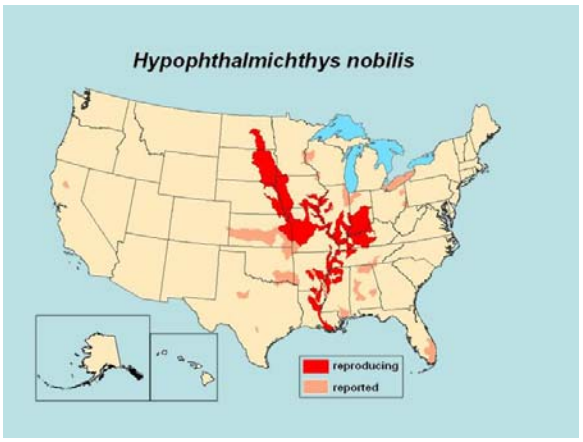
Questions?

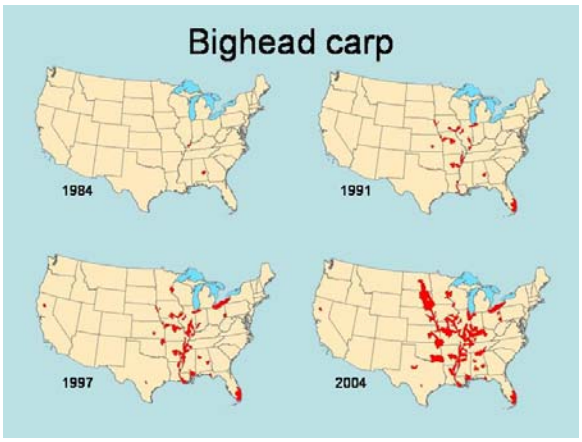
Asian Carp Distributions in the United States - Amy Benson

Amy Benson is a Fishery Biologist with U.S. Geological Survey in Gainesville, Florida. For the past 12 years she has been developing and managing a geographic information system on nonindigenous aquatic species.







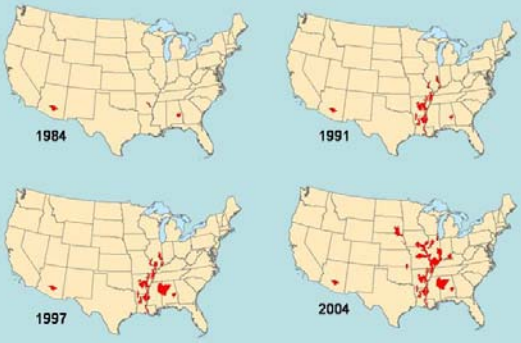


Silver carp

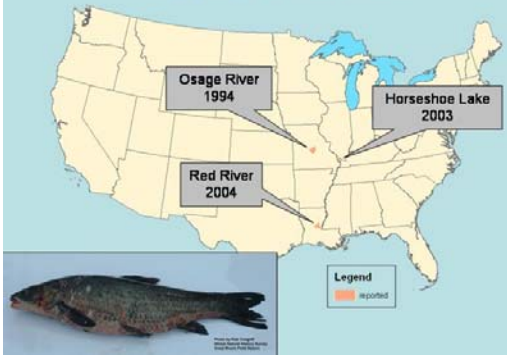
- Sougahatchee Creek, AL
- Black Warrior drainage, AL
- Wabash River - IL, IN
- Embarras River drainage, IL
- Saline River, IL
- Big Muddy River, IL
- Lake Barkley, KY
- Salt River, KY
- Kentucky Lake, KY
- Ohio River – KY, IL, OH
- Mississippi River – LA to IL
- Illinois River, IL
- Des Plaines River, IL
- Des Moines River, IA
- Little River Ditches drainage, AR
- White River, AR
- Cache River, AR
- Arkansas River, AR
- Lost Creek, AR
- Crooked Creek, AR
- Bayou Meto, AR
- Ouachita River, AR
- Saline River, AR
- Black River, AR
- Lake Conway, AR
- Red River drainage, LA
- Little River, LA
- Boeuf River, LA
- Black River, LA
- Atchafalaya River, LA
- Missouri River - MO, SD, NE
- Lamine River, MO
- Elkhorn River, NE
- Chariton River, IA

Hypophthalmichthys molitrix

Silver carp



Mylopharyngodon piceus



Cyprinus carpio

More information . . .

http://nas.er.usgs.gov

- Text searches on species name
  - Fact sheet
  - Map
  - Literature, collection and observation data
- Geographic searches by state or drainage

nas.er.usgs.gov

nas.er.usgs.gov

Specimen ID#	State	County	Locality	Year	HUC Number	Drainage Name	Status
156822	IL	Alexander	Horseshoe Lake	2003	07140108	Cache	collected
158517	LA	Avoyelles	Red River, about 3 miles above the confluence with the Old River Diversion (Mississippi River) and the head of the Atchafalaya	2004	08040301	Lower Red	unknown
36087	MO	Miller	Osage River at Osage Beach	1994	10290111	Lower Osage	unknown

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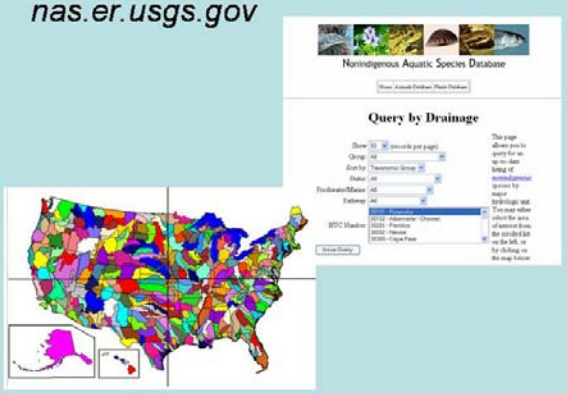

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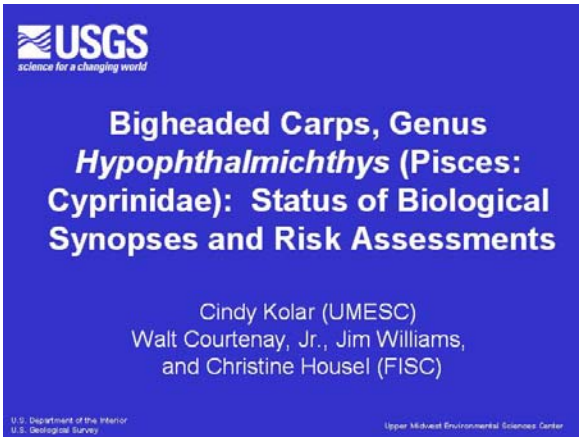
Group	Family	Scientific Name	Common Name	Exotic / Native Transplant
Fishes	Cyprinidae	Ctenopharyngodon idella	grass carp	Exotic
Fishes	Cyprinidae	Hypophthalmichthys molitrix	silver carp	Exotic
Fishes	Cyprinidae	Hypophthalmichthys nobilis	bighead carp	Exotic
Fishes	Cyprinidae	Mylopharyngodon piceus	black carp	Exotic

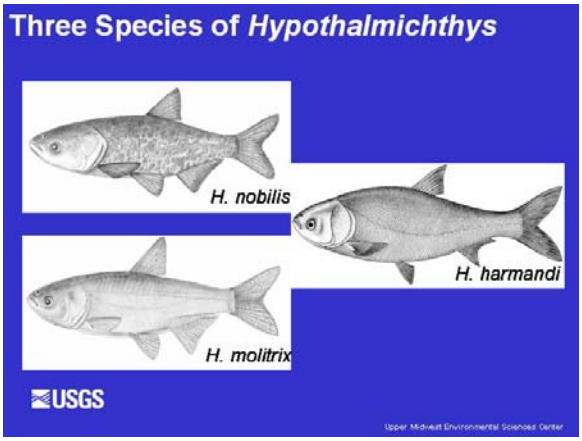
Contributors

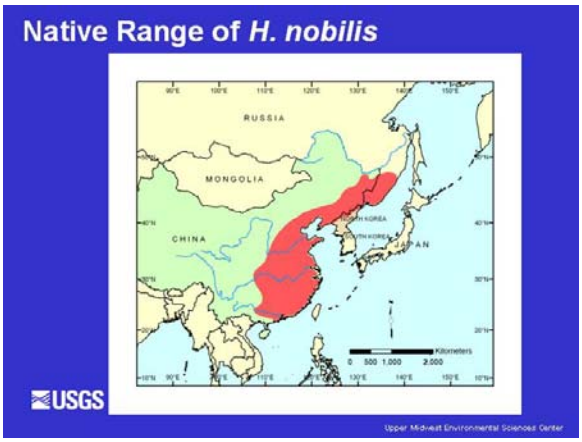
- Alabama Fish and Game
- Arizona Game and Fish
- Colorado Division of Wildlife
- Florida Game and Freshwater Fish Commission
- Geological Survey of Alabama
- Gulf States Marine Fisheries Commission
- Indiana DNR
- Illinois-Indiana Sea Grant
- Illinois Natural History Survey
- Iowa DNR
- Kentucky Dept. Fish and Wildlife Resources
- Louisiana Dept. of Wildlife and Fisheries
- Minnesota DNR
- Missouri Dept. of Conservation
- Nebraska Game and Parks
- Ohio DNR
- Ohio State University
- Oklahoma Dept. of Env. Quality
- Ontario Ministry of Natural Resources
- Southern Illinois University
- Tennessee Wildlife Resources Agency
- Texas Parks and Wildlife
- University of Kansas
- University of So. Mississippi
- U.S. Fish and Wildlife Service
- U.S. Geological Survey
- West Virginia DNR
- Wisconsin Sea Grant

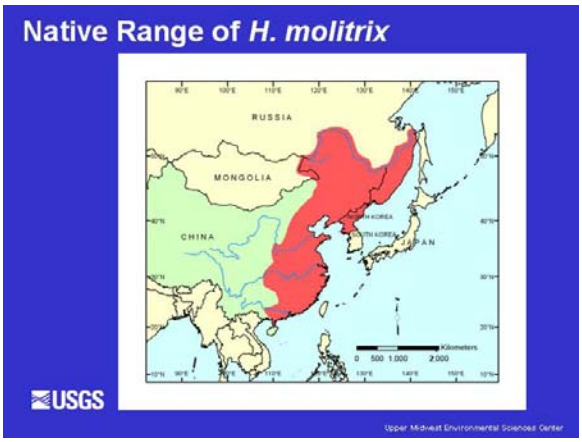
Bigheaded Carps, Genus Hypophthalmichthys: Status of Biological Synopses and Risk Assessments - Cindy Kolar

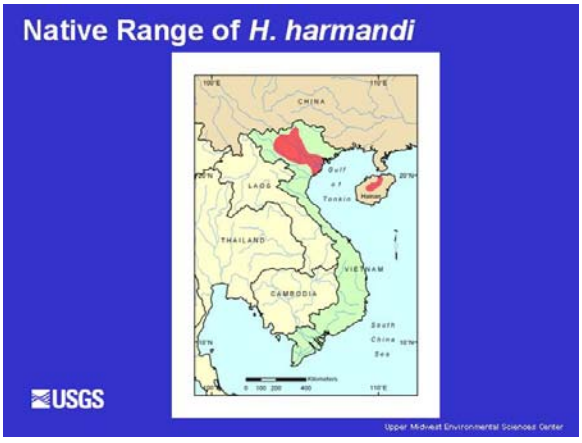
Cindy Kolar is a Fishery Biologist at the U.S. Geological Survey's Upper Midwest Environmental Sciences Center in La Crosse, Wisconsin. She is the invasive species research team leader at the Center and chairs the Risk Assessment and Research Committee of the Mississippi River Basin Panel on Aquatic Nuisance Species.

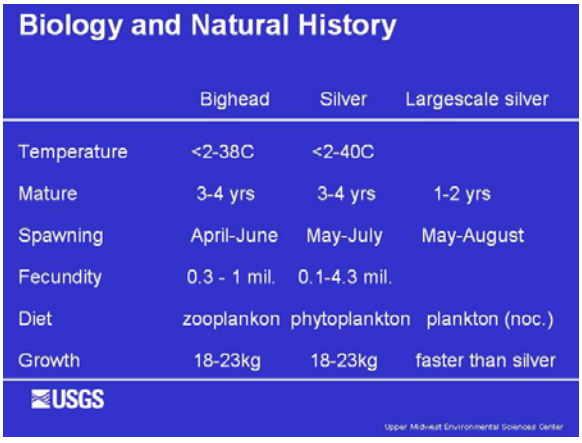












Diseases and Parasites

	Bighead	Silver	Largescale silver
Bacteria	2	8	
Viruses	1	0	
Fungi	1	1	
Protozoa	21	17	
Trematodes	6	5	2
Cestodes	3	2	
Copepods	6	3	

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History of Introduction

Bighead carp
- Introduced into 67 countries (established 22%)
- Reported from 23 US states

Silver carp
- Introduced into 84 countries (established in 29%)
- Reported from 15 US states

Largescale silver carp (hybrid)
- Introduced into 1 country
- Not reported from US

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Pathway of Introduction

Purposeful stocking
Escape from aquaculture facilities
Contaminants of purposeful stocking
Contaminants of live bait or by live bait
Live seafood markets

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Uses

Human food (silver #1, bighead #4 production)
Control of algae or zooplankton
Remove excess nutrients
Fisheries
Improve production and growth of other fishes
Livestock feed

Often raised in polyculture

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Potential Range

Given accelerated rate of spread in other countries and the US, can probably live in other areas

Probably limited by access to flowing water

Based on latitude and other characteristics of native range, would expect silver carp to have a more extensive range in the US and Canada than the bighead

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Risk Assessment

Generic Nonindigenous Aquatic Organisms Risk Analysis Review Process (RAM Committee 1996)

Seven rating elements (each with estimated risk level and level of uncertainty)

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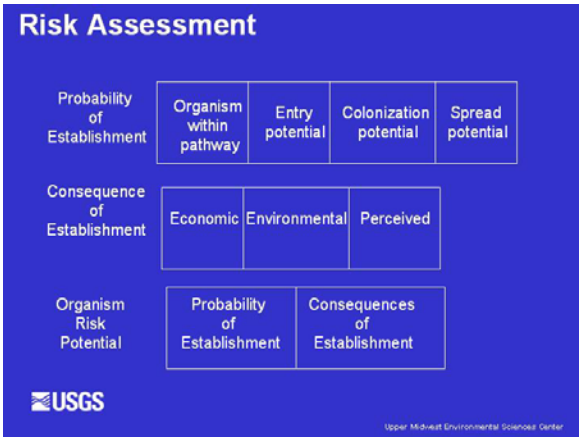
Risk Assessment
Probability of Establishment
Organism within pathway
Entry potential
Colonization potential
Spread potential
Consequence of Establishment
Economic
Environmental
Perceived
Organism Risk Potential
Probability of Establishment
Consequences of Establishment
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Black Carp: Life Cycle, Habitat Requirements, and Potential Range - Dr. Leo Nico (and Howard Jelks)

Dr. Leo Nico is a Research Biologist with the U.S. Geological Survey in Gainesville, Florida. He has been the lead on two risk assessment reports on black carp.

* Dr. Nico's slides were not available. However, Dr. Nico provided the following notes for his presentation.

TALK TITLE: BLACK CARP: Life Cycle, Habitat Requirements, & Potential Range

PRESENTED BY: Leo G. Nico & Howard L. Jelks, U.S. Geological Survey**,** Gainesville, Florida**;** E-mail: Leo_Nico@usgs.gov

TALK OUTLINE

01) Black Carp are unique among the Major Asian/Chinese River Carps:
   A) Adults & larger juveniles feed on snails and bivalve mollusks;
   B) Benthic- or bottom-dwellers (a pattern of habitat use associated with their diets).

02) Black Carp are also similar to the other Major Chinese carps
   A) All are large fish, growing to well over 1 meter long.
   B) More importantly, their life cycles, many habitat requirements, & various aspects of their ecology are very similar.

03) Chinese River Carps typically:
   A) Require relatively large riverine environments to successfully reproduce & complete their life cycles;
   B) Commonly co-occur in many of the same rivers;
   C) Make spawning migrations about the same time of year in response to similar cues;
   D) Often share the same spawning grounds & even spawn together;
   E) Have semi-pelagic eggs that drift downstream with the current;
   F) Require the same type nursery habitats for their young;
   G) Overwinter in the same or similar habitats.

04) Black Carp Riverine Environment:
   A) Typically large, floodplain rivers (generally < 500 m above sea level);
   B) Largest populations are in subtropical systems, but also naturally occur in regions with cold, harsh climates.

05) The Black Carp Life Cycle:
   A) Typically involves use of both main channel & floodplain habitats;
   B) Likely somewhat similar to some of our native migratory fishes.

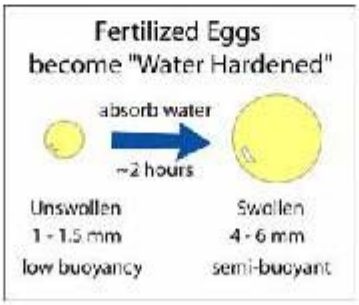
06) Spawning Migration: In spring-early summer adult Black Carp leave wintering or feeding areas, migrate upstream to spawn.

07) Main Cues are increased water flows & increased temperatures.

08) The Spawning Site: is reach with high flow & turbulence, often located immediately downstream from islands or near confluence of a tributary. Habitat is characterized by eddies & upwellings.

09) Spawning or Mating Behavior:
For Black Carp, not much is known, apparently mate in the lower or bottom portion of water column. Mating behavior of other river carps has been observed & described as a wild event involving bumping of females by males, rubbing of bodies together, rolling, splashing, rapid swimming, leaping out of the water, and swimming upside down with pectoral fins vibrating violently.

10) River carps have external fertilization. Initially, eggs have low buoyancy. After absorbing water, eggs become semi-buoyant, requiring turbulence to remain in suspension. Fertilized eggs drift downstream with current.



11) Larval carp hatch from eggs in the channel current; within short period larvae are able to navigate & seek nursery areas (e.g., backwater habitats).

12) Nursery Habitats: Areas where young feed & grow; sites with abundant food & cover; little or no current:
   A) Floodplain habitats — lakes, marshes, swamps, rice fields, side channels, etc.
   B) Main channel habitats — vegetated shore areas, reservoirs formed by dams.

13) Post-spawning adults return downstream where they feed in main channel and backwater areas.

14) Overwintering Habitat: Deep parts of main channel or deep sections of floodplain lakes. Fish remain near bottom.

15) A large river system may support multiple populations, each occurring in a reach with appropriate spawning & other habitats to complete life cycle.

16) Artificial & Modified Systems: River carps spawn in dam tailwaters; if eggs hatch about the time that they reach impounded reservoirs, then these pool habitat may serve as nursery areas for larvae.

17) Basic Reproductive Requirements:
   A) Turbulent water, sufficient to keep eggs in suspension & adrift, but not so turbulent that eggs are damaged (flow velocity about 0.8~1.8 m/s).
   B) Water temperature between about 17 and 30 C.

18) River Length is important under various scenarios.
   A) Coastal Rivers. Best example is Tone River in Japan, where introduced Chinese carp have existed for >50 years, eggs must hatch prior to estuary.
   B) River system with limited or unevenly distributed nursery habitat. Some habitats may be suitable, but not located correctly: eggs hatch downstream of suitable habitat or eggs hatch too far upstream.

19) Black Carp have broad temperature tolerance: Temperature ranges are more restrictive for early life phases of Black Carp & other carps.

20) River carp egg survival is dependent on
   A) Water temperature, &
   B) Water velocity.

   The combination of these factors can be used to express habitat suitability in river systems.

21) Hatching/incubation time of Chinese carp eggs is negatively related to water temperature.

22) River Length required for incubation of Chinese carp eggs is closely associated with water temperature and water velocity.

23) At a fixed temperature of 30 C, egg incubation requires about 45 km at a velocity of 0.8 m/s, but as much as 100 km at 1.8 m/s.

24) At constant Water Velocity (1.8 m/s), egg incubation requires about 100 km at 30 C, but as much as 240 km at 22 C.

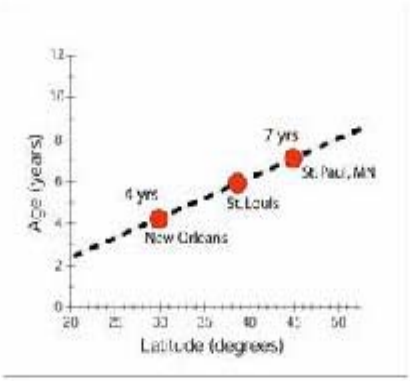
25) The relationship among variables using a power curve may be useful in making predictions about the likelihood that black carp would be able to successfully reproduce in particular river systems. If water temperature and water velocity are known, then length of river channel required for incubation can be calculated using the following formula:

$$\text{River Length (km)} = \left(\frac{\text{Temperature (C)}}{[35.631 \times Ln(\text{Velocity})] + 120.71} \right)^{-2.9087}$$

26) Average weekly water temperature data from the upper Mississippi River indicates it is highly suitable for river carp reproduction.

27) Growth rate & age at first maturity differ among regions. Black carp from southern China and other low latitude regions tend to grow more rapidly and mature at an earlier age than those inhabiting more northern locations, showing a positive correlation between age at first maturity and latitude.

28) Theoretically, Chinese carp inhabiting the lower Mississippi will reach first maturity a few years younger than those populating the upper Mississippi. Because Mississippi runs N-S, there is potential for fish to mature rapidly in southern part of basin & then colonize upper basin increasing the rate of invasion.



CONCLUSIONS

A) When considering potential range of introduced Black Carp (and also other Chinese carps), it is essential to distinguish between the types of:
   i) Environments where black carp would likely survive, versus \
   ii) Environments where the species would more likely persist through establishment of reproducing populations.

B) Temperature constraints provide only a broad predictor of the potential range and types of environments likely to be invaded. In most cases, the realized range would likely be less than that predicted by temperature tolerance alone.

C) Additional factors considered important in the survival and establishment of black carp populations, and likely useful in making predictions about their potential range, include:
   i) Other environmental tolerances (e.g., salinity and water quality);
   ii) Availability of food resources;
   iii) Habitat and spawning requirements; and
   iv) Ecological factors (e.g., predation and competition).

D) Nevertheless, Black Carp are known to survive, but not necessarily reproduce, in a wide range of conditions (e.g., above 1,500 to 2,000 meters in mountain lakes & reservoirs of western & southern China).

E) Due to the fact that these fish have life spans that exceed 10 years, potential impacts to native mollusks — even in areas where the species does not become established — is a concern.

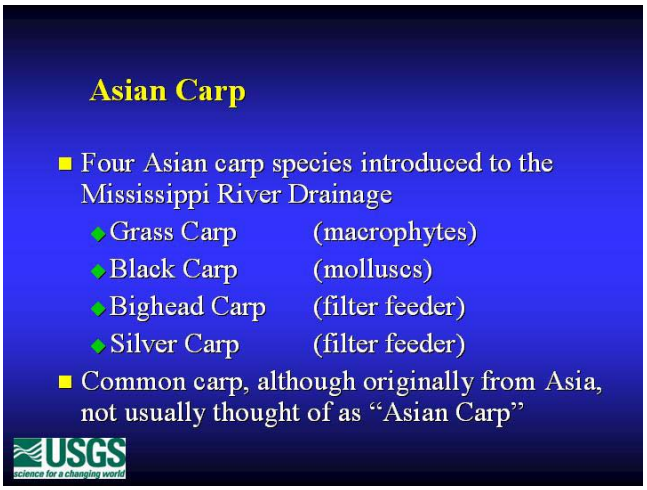
F) Background information and literature supporting this presentation is given in our upcoming book now soon to be published by the American Fisheries Society.

This talk is based on our upcoming book:

Nico, L. G., J. D. Williams, and H. L. Jelks. 2005. Black Carp: Biological synopsis and risk assessment of an introduced fish. American Fisheries Society Special Publication 31, Bethesda, Maryland. ~330 p. + Index (Book, IN PRESS).

Investigations of Asian Carp in the Missouri River and Potential Control Technologies - Dr. Ed Little

Dr. Ed Little is the Branch Chief for Ecology at the U.S. Geological Survey's Columbia Environmental Research Center in Columbia, Missouri. Dr. Little has spent 25 years working as a biologist working in the areas of behavioral toxicology, pallid sturgeon movements and habitat selection, and global change impacts to aquatic organisms. He also has research experience investigating behavioral responses of fish to olfactory and gustatory stimuli.



Potential Problems

- Competition with native fishes for food
  - Most juvenile fish and adults of some species feed on plankton
- Competition for space
  - Winter habitat most likely to be limiting
- Transformation of the food web
- Predation on eggs and larvae of native fish?
- Hazard to boaters

Uncertainties in the invasiveness of Asian carp

- Biology of Asian carp poorly understood
- Habitat use in North American waters unknown
- Factors limiting reproduction, survival and population growth unknown

Study Objectives

- Habitat use and range of movements
- Habitat characterization
- Feeding behavior
- Population dynamics
- Approaches for Asian carp management

Study Objectives

Habitat use and range of movements

- Determine activity during cold weather
- Determine and characterize locations used by the fish
- Determine characteristics and range of movements

Observed upstream movements in excess of 160 miles during warm seasons. During winter some silver carp moved in excess of 50 miles, bighead carp active over limited range.

Methods: Movements and Habitat Use

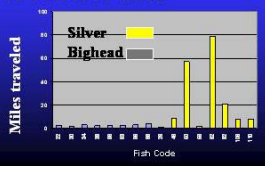
Combined radio-acoustic telemetry

52 fish tagged to date including 22 in fall of 2003

Archival tags

Depth and temp recorded every 24 minutes

Fish must be recaptured to retrieve data



Study Objectives

Characterize habitats used by Asian Carp

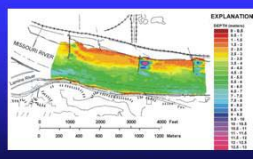
- Water quality
- Wing dam morphology
- River morphology (channel crossovers, outside bends)
- Mapping bedform, bathymetry, and 3-d water velocities
- Use of ice-covered areas

Methods:Habitat Characterization

GIS
Suite of hydroacoustic tools
- acoustic doppler current profiling
- acoustic bathymetry and sediment classification
- side-scan sonar imaging

On-site water quality profiling
Chlorophyll measurement

Fish follow thalweg during spring rise
Silver carp in areas of highest chlorophyll
Bighead avoid highly turbid areas



Bathymetry

Study Objectives

Characterize feeding behavior
- Feeding status/seasonal
- Dietary analysis
- Stable isotope technology

Silver and Bighead carp had full guts during the winter, except during periods of extreme cold or heightened turbidity

Study Objectives

Characterize population
- Length/weight distribution
- Male/female distributions
- Reproductive status/fecundity
  - Gonadosomatic index
  - Gonad staging

Young of the year absent (or undetected) in 2003. Based on GSI, bighead are probably fertile for shorter periods than silver carp.

Asian carp management tools tend to be nonspecific and affect non-target species

- Barriers
- Traps
- Poisons
- Sterilization
- Fishing
- Electro-shocking

Pheromones

- Pheromones are chemical signals that pass between organisms and mediate behavioral and physiological responses.
- Pheromones are perceived through olfactory system and are generally species-specific.
- Carp appear to have a chemically mediated social network where pheromones mediate:
  - Alarm responses
  - Social aggregation – schooling
  - Reproduction

Pheromones may increase specificity of Asian carp control

- Pheromones have been widely used in the control of insects.
- Pheromones are well developed for the control of sea lampreys. NEPA process for application in natural streams is presently underway.
- Pheromones have been proposed for controlling the spread of Eurasian Ruffe from the Great Lakes.

Study Objectives

Procedures for the management and control of Asian carp

- Alarm pheromone repellants
- Sex pheromone attracts
- Other chemical repellants and attractants

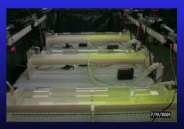
Alarm Pheromones

- Are found in cyprinids, including Asian carp, as well as other Ostariophysian species.
- Originate in epidermal club cells and are released when skin is injured as from a predator attack.
- Induce defensive responses including flight from area, avoidance of area, defensive schooling.
- May be useful in diverting fish from critical habitats

Methods: Alarm Pheromone Studies

Free-field and avoidance tests with skin extract and chemicals identified in extracts

- Mode of response
  - Schooling, freezing, escape, avoidance
- Persistence of alarm pheromone
- Habituation of response to alarm pheromone
- Ontogenetic onset of alarm reaction
- Cross-species reactivity



Sex Pheromones

- Sex pheromones are released from the gills and in urine. Aggregating pheromones may be released from surface mucus.
- Sex pheromones are likely a mixture of hormonal precursors and metabolites that vary with sexual status.
- Goldfish pheromones synchronize gonadal development and induce a sequence of behavioral responses leading to spawning.

Methods: Sex Pheromone Studies

Stream mesocosm and pond weir tests of sex attractant and chemicals identified in pheromones

- Hormone-induced sex pheromone extract
- Persistence, active space of sex pheromone
- Habituation of response to sex pheromone
- Ontogeny of sex pheromone release
- Cross-species reactivity

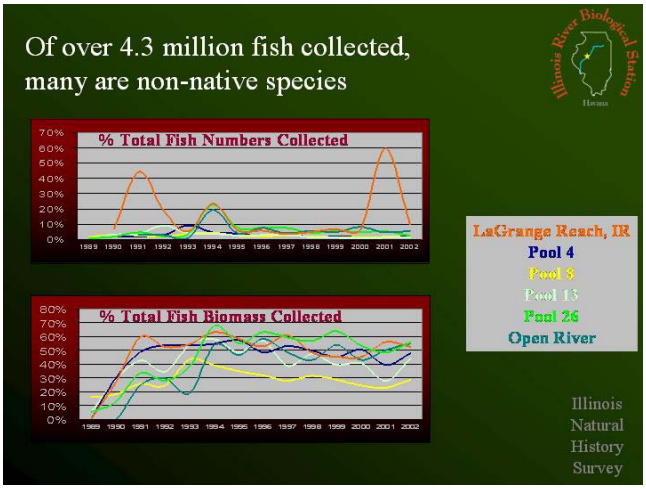
Stream mesocosms

Methods: Identification and concentration of pheromones

- Liquid Chromatography/mass spectrometry of alarm and sex pheromone extracts
- Identification of most effect fraction of pheromone extracts
- Isolation and concentration of fractions
- Field tests of efficacy of attractants and repellants in controlled field tests

Overview of INHS Asian Carp Research Issues and Projects - Kevin Irons

Kevin Irons has been working with the Long Term Resource Monitoring Program (LTRMP) since 1991 as a Fisheries Specialist and River Ecologist. Kevin works on the Illinois River out of Havana, Illinois. In addition to this work, Kevin is currently chairing an Exotic Species Team for the LTRMP and is summarizing all the non-native occurrences in Upper Mississippi River LTRMP catches.



16 TAXA
12 Species
4 hybrid crosses

CommonName	Family	GenusSpecies	Year first detected by LTRMP
Threadfin shad	Clupeidae	Dorosoma petenense	1989
Goldfish	Cyprinidae	Carassius auratus	1989
Grass carp	Cyprinidae	Ctenopharyngodon idella	1991
Common carp	Cyprinidae	Cyprinus carpio	1989
*Carp x goldfish hybrid	Cyprinidae	Cyprinus carpio x auratus	1990
Silver carp	Cyprinidae	Hypopthalmichthys molitrix	1998
Bighead carp	Cyprinidae	Hypopthalmichthys nobilis	1991
Rudd	Cyprinidae	Scardinius erythrophthalmus	2002
Muskellunge	Esocidae	Esox masquinongy	1996
Tiger muskellunge	Esocidae	Esox masquinongy x lucius	1992
Rainbow smelt	Osmeridae	Osmerus mordax	1993
Brown trout	Salmonidae	Salmo trutta	1992
White perch	Percichthyidae	Morone americana	1992
*White perch x yellow bass	Percichthyidae	M. americana x mississippiensis	2001
Striped bass	Percichthyidae	Morone saxatilis	1991
Hybrid striped bass	Percichthyidae	M. saxatilis x chrysops	1993

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Illinois Natural History Survey

Silberkarpfen
银的鲤鱼
Серебро критикует

Abb. 2 Probefänge mit dem Wurfnetz auf Pl... insbesondere auf Silberkarpfen, sind in den meiste...

Abb. 1 Dreisömmriger Silberkarpfen (*Hypophthalmichthys molitrix*) mit einer Stückmasse von 800 g.

Organmassen und chemische Zusammensetz... von Graskarpfen (*Ctenopharyngodo...* und Silberkarpfen (*Hypophthalmichth...*

Von Dr. H. JAHNICHEN

Institut für Binnenfischerei Berlin-Friedrich...

Marktage bei den chinesischen Pflanzenfressern muß a... beachtet werden. Im Heimatland China sind die A... karpfen wesentlich an der Süßwasserfischproduktion...

...ähnliche Verhältnisse herrschen in der Sowjetunion und in den Ländern Südo... ...iens. Die Pflanzenfresser gelten als hochwertige Fische und sind auf Grund ihr... ...nährungsweise und ihres ausgezeichneten Wachstums willkommene Objekte f... ...e Produktionssteigerung in Teichen und natürlichen Gewässern. ...hwierig einzuschätzen ist die Entwicklung in den traditionellen karpfenprod... ...renden Ländern Europas. Die Karpfenerzeugung ist von Jahr zu Jahr im A...

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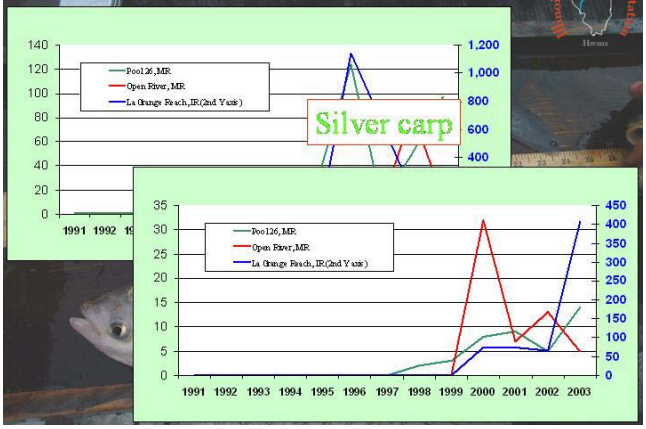
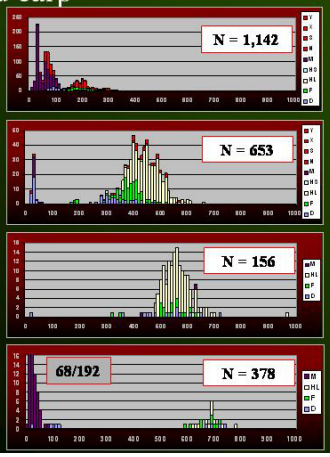
Bighead carp



Bighead carp



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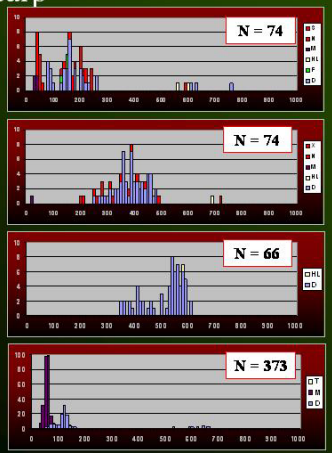
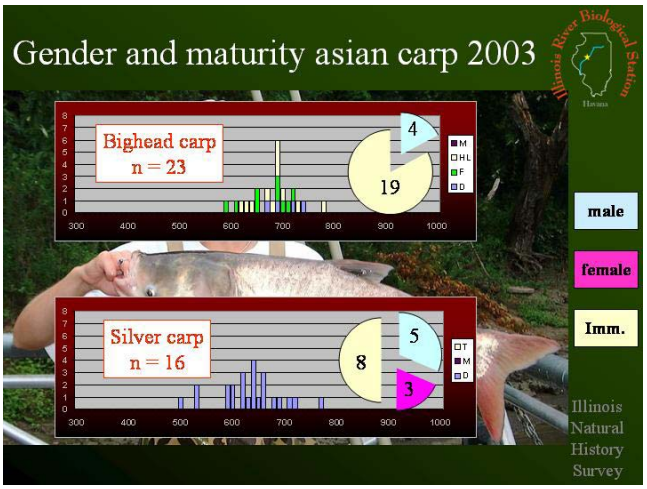
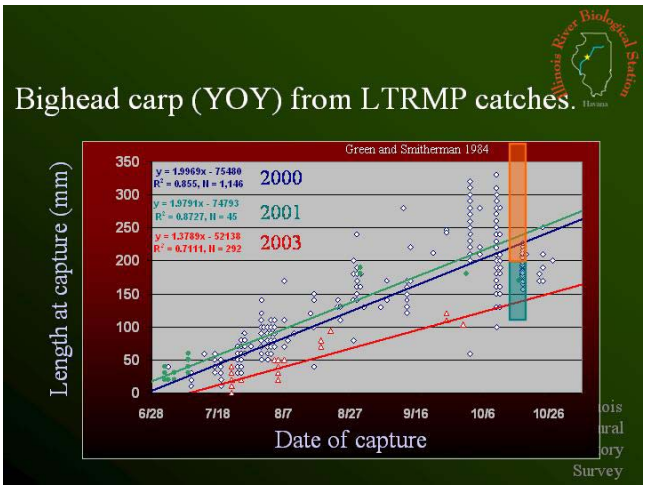
Silver carp

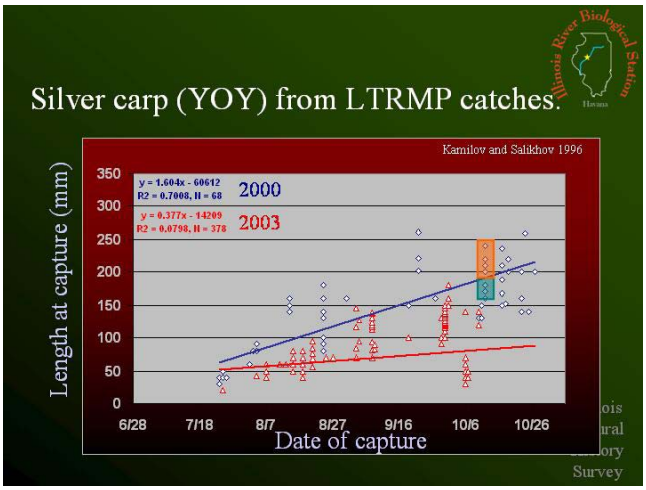


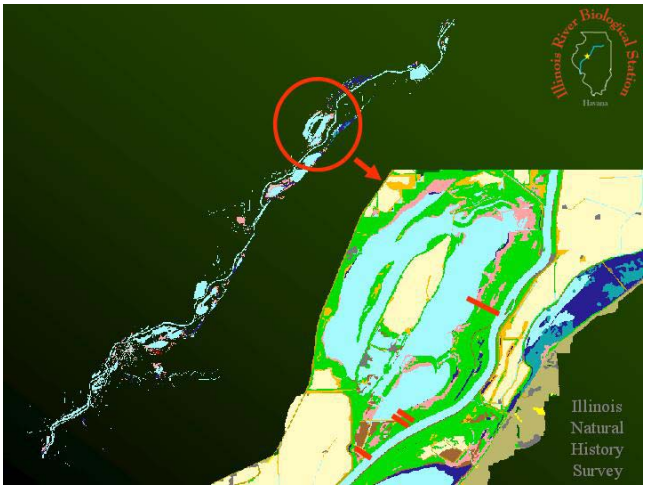
Illinois Natural History Survey


Gender and maturity asian carp 2003
Illinois River Biological Station
Bighead carp
n = 23
4
19
M
HL
F
D
male
female
Imm.
Silver carp
n = 16
8
5
3
T
M
D
Illinois
Natural
History
Survey


Illinois River Biological Station
2000
Date of capture
Length
2003
Illinois
Natural
History
Survey


Bighead carp (YOY) from LTRMP catches.
Illinois River Biological Station
Green and Smitherman 1984
y = 1.9969x - 75480
R² = 0.855, N = 1,146
2000
y = 1.9791x - 74793
R² = 0.8727, N = 45
2001
y = 1.3789x - 52138
R² = 0.7111, N = 292
2003
Length at capture (mm)
350
300
250
200
150
100
50
0
6/28
7/18
8/7
8/27
9/16
10/6
10/26
Date of capture
Survey


Silver carp (YOY) from LTRMP catches.
Illinois River Biological Station
Kamilov and Salikhov 1996
y = 1.604x - 60612
R2 = 0.7008, N = 68
2000
y = 0.377x - 14209
R2 = 0.0798, N = 378
2003
Length at capture (mm)
350
300
250
200
150
100
50
0
6/28
7/18
8/7
8/27
9/16
10/6
10/26
Date of capture
Survey


Illinois River Biological Station
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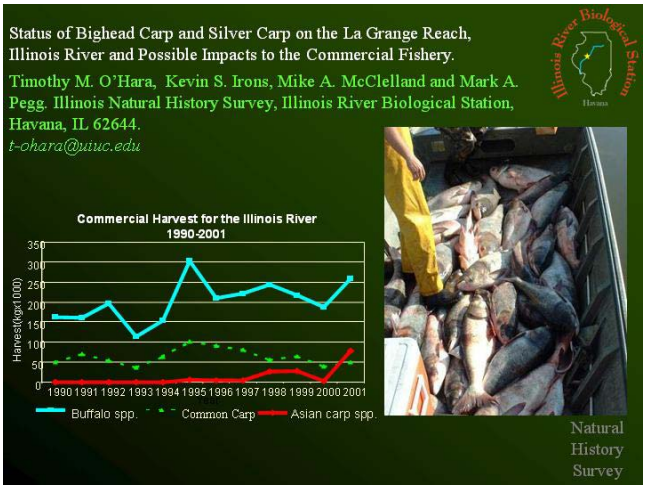
Natural
History
Survey


Status of Bighead Carp and Silver Carp on the La Grange Reach, Illinois River and Possible Impacts to the Commercial Fishery.
Illinois River Biological Station
Timothy M. O'Hara, Kevin S. Irons, Mike A. McClelland and Mark A. Pegg. Illinois Natural History Survey, Illinois River Biological Station, Havana, IL 62644.
t-ohara@uiuc.edu
Commercial Harvest for the Illinois River
1990-2001
Harvest(kgs1000)
350
300
250
200
150
100
50
0
1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001
Buffalo spp.
Common Carp
Asian carp spp.
Natural
History
Survey

Asian Carp Barrier Project

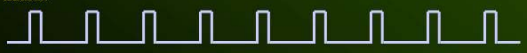
Ronald Taylor, Dr. Mark Pegg, and Dr. John Chick

National Sea Grant (NOAA), International Joint Commission (IJC)

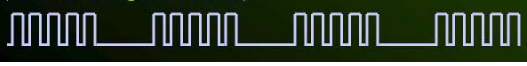
Barrier Equipment supplied by Smith – Root Inc. and FGS Ltd.

markpegg@uiuc.edu

- Both the electric barrier and experimental Sound/Bubble barrier was found to be highly effective in restricting movements of ADULT Bighead Carp
- HOWEVER, YOY SVCP were getting through both the electric barrier using the same settings that were effective for adults.



- increasing the voltage and using a "Gated Burst" Pulse has been highly effective in restricting YOY SVCP movements (with all fish being stunned/killed)



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Dietary overlap between bighead carp (H. nobilis) and silver carp (H. molitrix) with three native filter-feeding fishes of the Illinois and Mississippi Rivers

Schuyler J. Sampson, Dr. John H. Chick (INHS), and Dr. Mark A. Pegg (INHS) - Illinois-Indiana SeaGrant

schusamp@inhs.uiuc.edu

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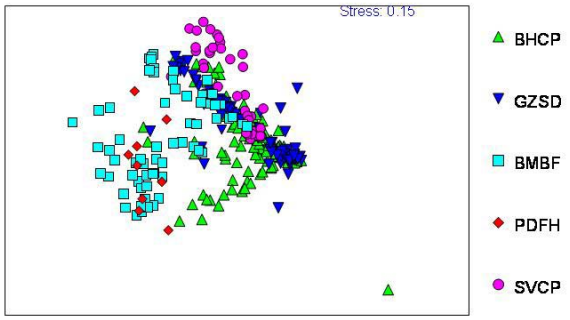
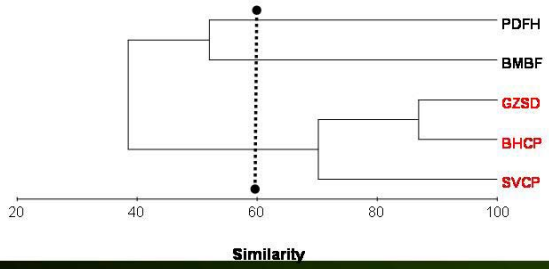
ALL SPP - NMDS (ALL BACKWATERS)



ALL BACKWATERS FROM BOTH RIVERS



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Dispersal rates of bighead carp in the Illinois River (Telemetry)

Lindsay M. Anderson, Dr. Mark A. Pegg (INHS), and Dr. Ulrich G. Reinhardt (EMU) US-EPA

- Ten implanted transmitters on adult fish – 2003 (mean length 668 mm)
- Maximum movement recorded
  - 36.1 miles in 4 days (9 miles per day)
  - 22.5 miles in 3 days (7.5 miles per day)
- Boat tracking, aerial reconnaissance
- 20 Adults and 15 juveniles 2004

Illinois Natural History Survey

Assessment of an Electric Barrier to Prevent the Dispersal of Aquatic Nuisance Fishes

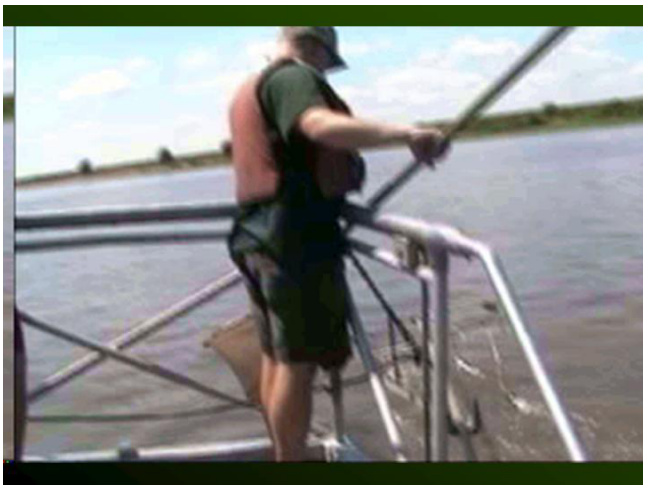
Dr. Richard Sparks (NRES-UIUC), Dr. John Dettmers (LMBS-INHS), and Ms. Traci Barkley (NRES-UIUC)

(USACE, Great Lakes Protection Fund (GLPF), USEPA-Great Lakes National Program Office, USGS, USFWS, INHS, U of I, and IDNR.)

tbarkley@uiuc.edu

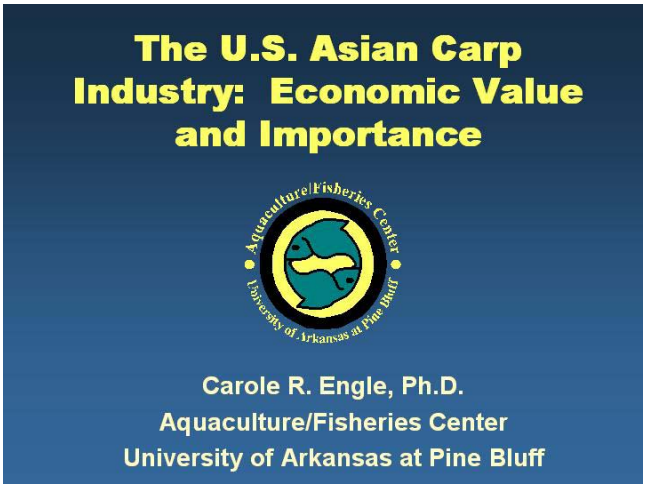
- The barrier was activated in mid-April 2002
- 97 fish (surrogate – common carp), implanted with combined radio and acoustic transmitters, have since been released downstream of the barrier – 3 April 2003 one tagged common carp breached barrier, resulted in increase of power by 50%, no subsequent breaches.
- Recommendations to Barrier Advisory Panel and the Corps of Engineers
- (1) transport of small fish and eggs in storm water that occasionally flows from the Des Plaines River across a narrow, low divide into the CSSC upstream from the barrier;
- (2) passage of fishes from the old, unused Illinois and Michigan Canal into the CSSC upstream from the barrier, again during storm events;
- (3) transport by humans during biological sampling and fishing tournaments;
- (4) transport in ballast water or as a result of pumping out leaking barges.

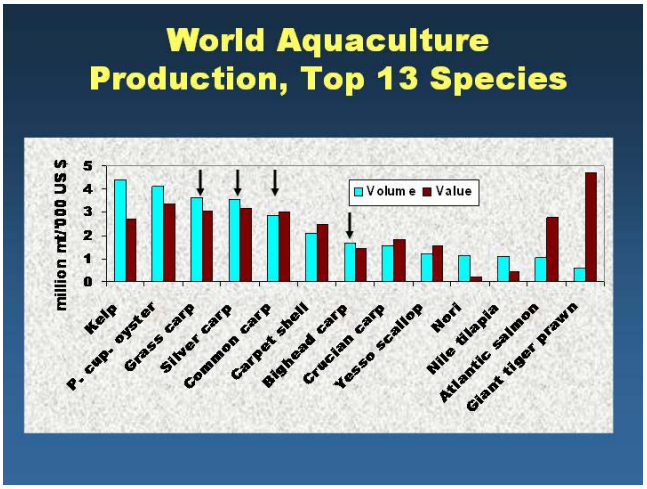
- Also noted **shadow effect** with barge traffic, new barrier will compensate

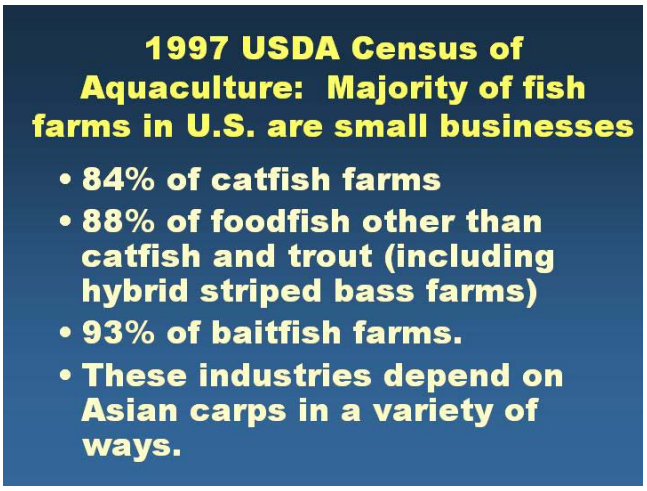


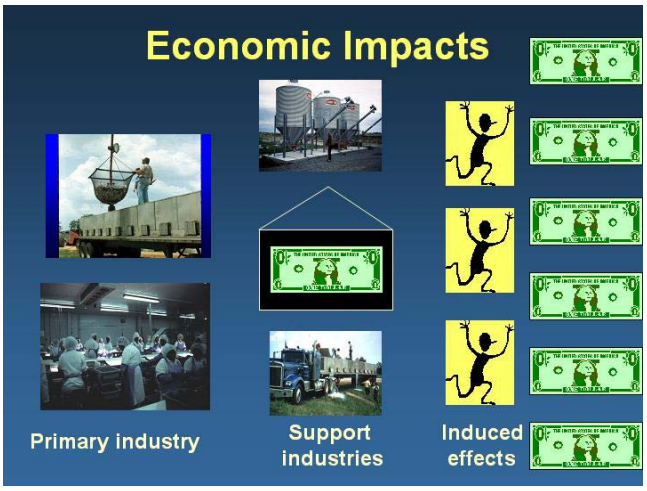
The U.S. Asian Carp Industry: Economic Value and Importance - Dr. Carole Engle

Dr. Carole Engle is an Aquaculture Economist with over 25 years experience in the analysis of economic and marketing issues related to aquaculture businesses. She received her Ph.D. in aquaculture and fisheries, with a specialization in economics, from auburn University. Dr. Engle currently continues her research and extension efforts in the economics and marketing of aquaculture and also directs the Aquaculture/Fisheries Center at the University of Arkansas at Pine Bluff. Dr. Engle is the immediate past-president of the U.S. Aquaculture Society.









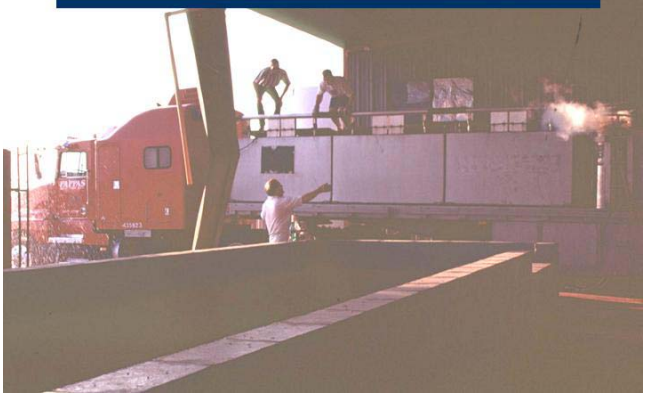
Bighead Carp

Bighead carp are co-cultured in catfish ponds & in other polycultures.

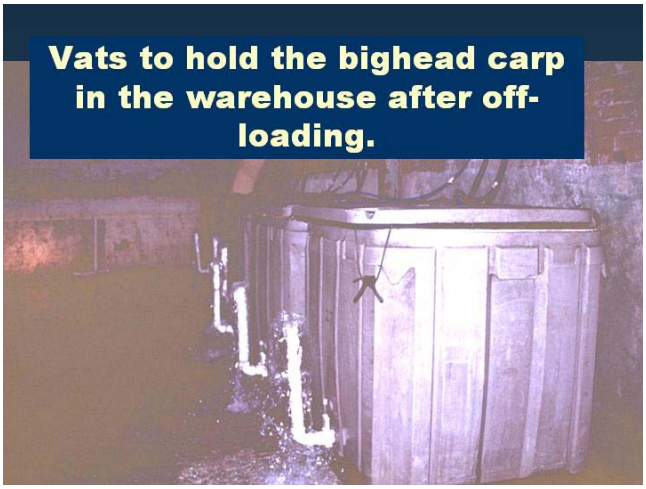
Annual Costs & Returns of Bighead Carp Raised in Catfish Ponds

- Additional net revenue from bighead = $192/acre when catfish prices good.
- Diversifies risk with a secondary crop.
- Has enabled catfish farms to survive low catfish prices of last several years.

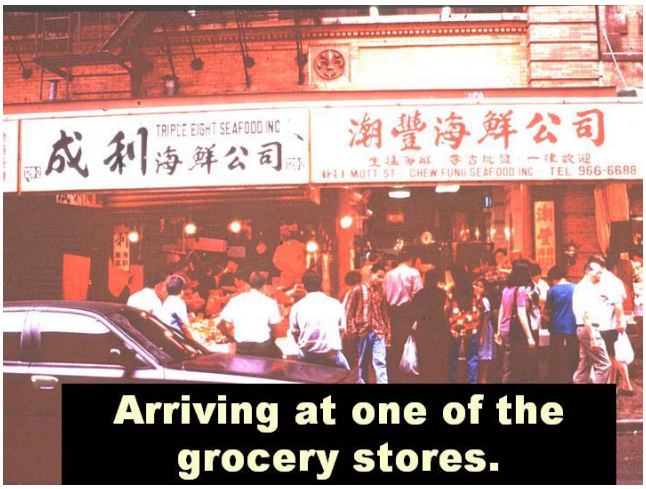
The bighead are loaded onto the livehaul truck.



Vats to hold the bighead carp in the warehouse after off-loading.

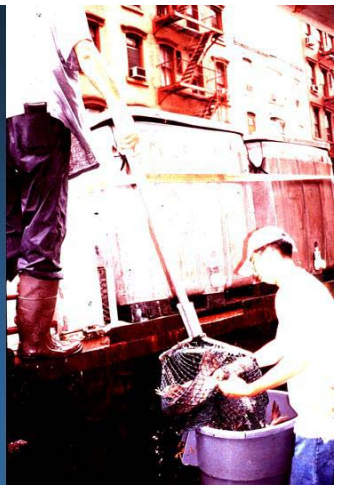


Loading tubs of bighead carp onto the city delivery truck.

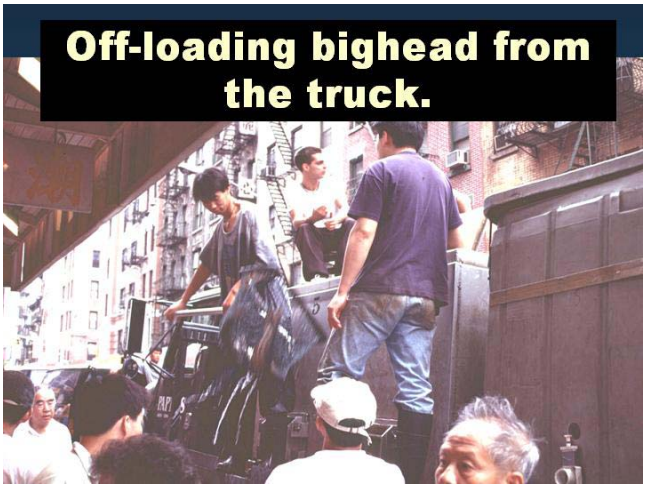


Arriving at one of the grocery stores.

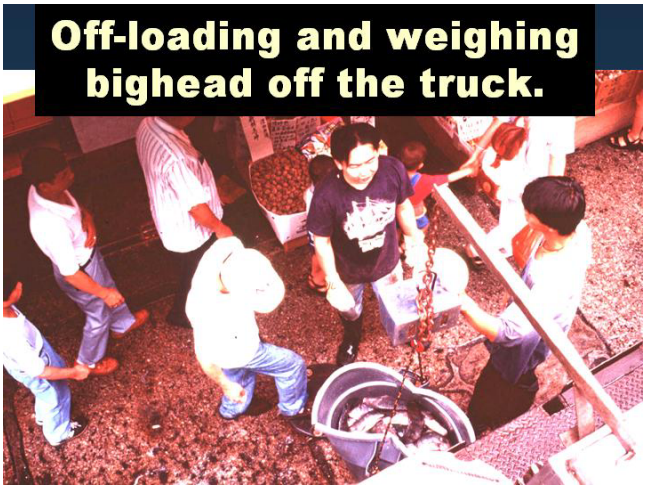
- Dipping the bighead out of the tubs.
- Over 150 retail grocery stores selling BHC in New York City alone.



Off-loading bighead from the truck.



Off-loading and weighing bighead off the truck.

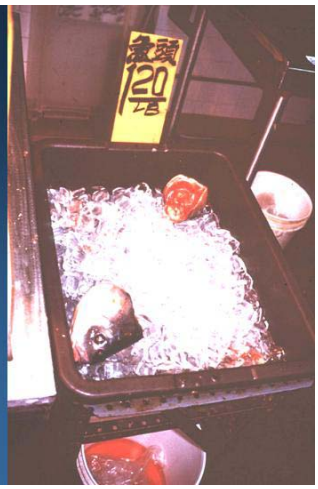


Live fish tank inside the grocery store.

Various cuts of fish. Bighead carp on right, cut with heart still beating to demonstrate freshness.

Various cuts of bighead carp offered for sale fresh on ice: heads, tails, steaks.

- Bighead carp heads offered for sale as a fresh product on ice.
- BHC are higher-volume, lower-priced product.
- Groceries depend on BHC revenue, especially during economic downturns.
- Also sold in fish markets along Miss. River.



Economic Value of Bighead Carp Industry in U.S.

- Has never been estimated in a comprehensive way.
- Includes:
  - Hatchery sales
  - Foodfish sales
  - Livehaul business
  - Wholesale business
  - Retail business

Informal poll in Arkansas and Mississippi, 2003

- 7,384 acres catfish co-cultured with bighead carp.
- Farm-gate sales: $5.3-6.2 million/yr.
- Hatchery revenue: $300,000/yr (only 1 state)
- Additional revenue of $6.09-$21.7 million/yr through supply chain after bighead carp leave farms.

Economic Impact of Bighead Carp

- Catfish farm closures without BHC sales would have meant losses >$22 million.
- Given multiplier effect, economic impact would have been >$135 million/yr.
- Equates to job loss of 1,026 jobs in impoverished Delta regions of AR & MS.
- These values are under-estimated due to incomplete data.

Canned Bighead Carp?

Consumer panels: above 4 on 5-point scale on taste, texture, aroma, & appearance.

75% willing to pay as much as for canned tuna.

Livehauler last week drove to Illinois to buy BHC from commercial fishermen, but fish were all silver carp.

Silver Carp

- Very little culture of silver carp for last 20 years.
- Disliked by fish farmers due to their jumping habits.
- Farmers prefer the docile bighead carp.
- Potential for water quality improvement.
- One of few temperate algae eaters.

Aquatic Weed Problems

$1-10 billion annual cost of aquatic weeds

Grass Carp or Herbicides?

Estimated costs ($/acre) for aquatic plant control (Greenfield et al. 2004)

Grass carp	$45-125
Mechanical cutting	$100-11,000
Mechanical harvesting	$500-900
Manual pulling	$500-2,400
Dredging, rotovation, bottom barriers, rollers	$1,100-26,200

Grass Carp

- Research has shown that triploid grass carp are essentially sterile. Allen et al. (1986)
- The triploid certification program was producer- funded and widely considered successful.

Grass carp

- Widely polycultured with catfish and other species.
- 2003 APHIS survey showed 42% of catfish farms stocked grass carp in foodfish ponds.

Common Carp

- Limited foodfish market
- Limited bait market
- Recreational value as sportfish (Cooper 1987, AFS)

Famous dishes in Shanghai

Braised black carp's hind parts

INGREDIENTS: 1 black carp hind parts, 50 g mincement
20 g fermented glutinous rice, ginger shreds, mashed garlic, hot bean sauce, rice wine, soy, sugar, vinegar, watered starch.

Black Carp

- Increasing bird predation on fish farms has increased parasite problems.
- Federal regulations to protect birds = negative externality to fish farmers.

Black carp on Hybrid Striped Bass Farms

- Control of yellow grub (*Clinostomum complanatum*)
- Causes mortality in HSB fingerlings.
- Reduces marketability of foodfish crop even with only light infestations because HSB sold whole, skin-on.

- Wui and Engle (2004) surveyed HSB industry & developed MIP model of HSB farming
- Estimated net revenue resulting from no access to black carp under a variety of treatment scenarios & farm sizes.

Farm size	Minimum	Maximum
Small	-64%	-100%
Medium	-61%	-85%
Large	-58%	-83%

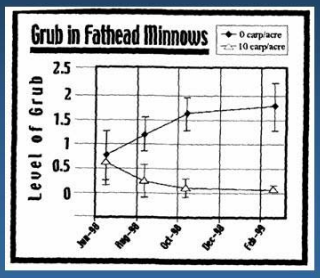
Black carp on catfish farms

- Integral part of control measures for *Bolbophorus confusus*, since late 1999.

Catfish farm losses to trematode

- Terhune et al. (2002): "severe fish losses confirmed..from multiple commercial catfish farms in Miss."
- Louisiana, two farms (490 acres and 1,200 acres): severe mortalities.
- Lost revenues LA alone = $4.47 mill., total economic effect = $34 million.
- Projected impact without effective trematode control = $365 million.
- Copper sulfate treatments alone not as effective as combined with black carp; evidence of new vector not susceptible to copper sulfate.

Black carp on fathead minnow farms



Source: Thomforde 1999

Asian Carps

- Are commercially traded in U.S. on a significant scale.
- Farmers have substantial investment in broodstock, infra-structure to produce, haul & sell.
- Restrictions on production and sale will affect large numbers of small businesses.
- Economic impact of destroying this industry will represent hundreds of millions of dollars of economic losses.

Aquaculture/Fisheries Center
University of Arkansas at Pine Bluff


Questions?