Aquaculture Facility Certification

Channel Catfish Farms

Best Aquaculture Practices Certification Standards, Guidelines, Sample Application/Audit

Community • Environment • Food Safety • Traceability

Channel Catfish Farms
Certification Application/Audit

INSPECTION INFORMATION – Download Electronic Form to Apply

The following questions comprise both the application form and audit for farms that apply for Best Aquaculture Practices certification. They are provided to help facilities prepare for the application process and subsequent site inspection.
To apply for certification, download and return the electronic Application Form at www.aquaculturecertification.org.

ANSWER ALL OF THE QUESTIONS. See scoring system below to perform a self-audit on the right side of the form. Following your facility's site inspection, the BAP evaluator will determine a final score based on three categories of questions:

- **Critical questions** (indicated by "C" mark) are mandatory for certification and graded as pass or fail during the inspection and review process.
- **Scored questions** (indicated by "S" mark) are assigned 0 to 3 points with the following values: 0 = Unsatisfactory, 1 = Needs major improvement, 2 = Needs minor improvement, 3 = Satisfactory.
- **Informational questions** (indicated by "I" mark) provide required data, but no score is assigned.

To be certified, applicants must comply with all (100%) of the critical inspection requirements, score at least 70% (74 of 105 points) on the scored inspection requirements and maintain specified production records for traceability for at least three months. If a facility fails any critical elements, it will not be certified, regardless of its score otherwise. After five years, certified facilities shall comply with all critical requirements and score 80% or better on the scored requirements.

Score	
Critical (P/F)	Scored (0-3)

1. Property Rights and Regulatory Compliance

C 1.1: Are documents available to prove legal land and water use by your facility? _____ Yes _____ No

I 1.1.1: List the documents you will present. (Confirmed during inspection.)

____

____

C 1.2: Are documents available to prove all business and operating licenses have been acquired by your facility? _____ Yes _____ No

I 1.2.1: List the documents you will present. (Confirmed during inspection.)

____

____

C 1.3: Are documents available to prove compliance with applicable environmental regulations for construction and operation? _____ Yes _____ No

I 1.3.1: List the documents you will present. (Confirmed during inspection.)

____

____

2. Community Relations

C 2.1: Does your facility accommodate local inhabitants by not blocking traditional access routes to fishing grounds, wetland areas and other public resources? (Prepare to provide area map showing property lines, fences, canals, ditches and other barriers. Evaluator may interview members of local community.) _____ Yes _____ No

S 2.2: Does your facility manage its water usage to avoid restricting the amount of water available to other users? _____ Yes _____ No

Subtotal	Subtotal

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Score	
Critical (P/F)	Scored (0-3)
Subtotal	Subtotal

S 2.3: List meetings, committees, correspondence, service projects or other activities that show your facility is committed to regular interaction with the local community to avoid or resolve conflicts.

____

____

3. Worker Safety and Employee Relations

I 3.1: What is the minimum wage rate, including benefits, required by local and national labor laws?

Rate and currency ________________ per time period ________________________
(e.g., hour, day, week, month)

C 3.2: Does your facility meet or exceed these wage and benefit requirements? (Present documentation during inspection.) _____ Yes _____ No

C 3.3: Does your facility comply with national labor laws, including those regarding the employment of foreign workers? (Present documentation during inspection.) _____ Yes _____ No

S 3.4: Does your facility provide employee housing that meets local and national standards (e.g., water-tight structures, adequate space, heating/cooling)? (Confirmed during inspection.) _____ Yes _____ No _____ Does Not Apply

S 3.5: Are running water, toilet and shower facilities readily available to employees? (Confirmed during inspection.) _____ Yes _____ No

S 3.6: Are living areas free of accumulated trash and garbage? (Confirmed during inspection.) _____ Yes _____ No

S 3.7: Briefly describe the basic medical care provided by your facility. (Confirmed during inspection.)

____

____

S 3.8: Is an emergency response plan prepared for serious illnesses or accidents? (Confirmed during inspection.) _____ Yes _____ No

S 3.9: Briefly describe what training in general health, safety, first aid, contamination risks and proper disposal of potentially dangerous compounds is provided to employees.

____

____

S 3.10: List the protective gear and equipment provided for employees (e.g., eye protection for welding, gloves for shop work, boots for wet areas, roll bars for tractors, shields for power take-offs). (Confirmed during inspection.)

____

____

C 3.11: Are electrical pumps and aerators wired according to standard, safe procedures? (Confirmed during inspection.) _____ Yes _____ No

S 3.12: Is a first aid kit readily available to employees? (Confirmed during inspection.) _____ Yes _____ No

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Score	
Critical (P/F)	Scored (0-3)

4. Wetland Conservation and Biodiversity Protection

I 4.1: Has net loss of sensitive wetland habitat occurred on facility property since 1999? _____ Yes _____ No
(If no, do not answer questions 4.1.1 and 4.1.2. Evaluator will adjust final score.)

C 4.1.1: Were the wetlands removed for allowable purposes? _____ Yes _____ No _____ Does Not Apply

C 4.1.2: Was the removal mitigated by restoring an area three times as large or donation to restoration? _____ Yes _____ No _____ Does Not Apply
(Confirmed during inspection of restored site or documents from restoration program.)

I 4.1.2.1: Removal was mitigated by creating or replanting a viable wetland area of ___________ square meters on or near farm

I 4.1.2.2: Removal was mitigated by contribution of U.S. $ _______________ to Restoration Program _____________________________________

S 4.2: Has your facility practiced unrequired wetland creation or restoration in abandoned production areas or elsewhere? (Documentation required.) _____ Yes _____ No

I 4.2.1: How was the stewardship demonstrated? (Documentation required.)

I 4.2.1.1: Wetland creation or restoration of ___________ square meters on or near farm

I 4.2.1.2: Contribution of U.S. $ _________________ to Restoration Program _____________________________________

C 4.3: Has your farm avoided dredge and fill activities aimed at creating new land area available for pond construction? (Documentation required.) _____ Yes _____ No

C 4.4: Are screens installed on both water inlet and water outlet pumps or pipes? _____ Yes _____ No

S 4.5: Does your facility use humane, nonlethal methods of predator control? _____ Yes _____ No

S 4.6: Are measures taken to control erosion and other impacts caused by outfalls? _____ Yes _____ No

5. Effluent Management

I 5.1: Does your farm avoid the discharge of effluents, not even draining ponds to facilitate harvesting? If answer is yes, Standard 5 does not apply. Credit will be given for questions 5.1-5.3. Proceed to Standard 6. _____ Yes _____ No

C 5.2: If no above, are records on effluent monitoring maintained and available? (Confirmed during inspection.) _____ Yes _____ No

C 5.3: Do effluent water quality concentrations comply with BAP water quality criteria, or if it was not possible to comply with BAP criteria because of high concentrations in the intake water, do concentrations reflect no increase between intake and discharge? (Confirmed during inspection.) _____ Yes _____ No

Note: Water quality measurements taken during certification inspection must meet BAP's initial criteria as outlined in the Guidelines for Standards — except as excluded above — and those of applicable government permits. Farms must continue compliance with these criteria to maintain certification and comply with BAP's final criteria within five years.

I 5.4: If effluent data is available for less than a full year, how long was this period? ______________________
(* Minimum three months data required for initial inspection.)

Subtotal	Subtotal

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Score	
Critical (P/F)	Scored (0-3)
Subtotal	Subtotal

I 5.5: What was your facility's estimated annual water use during the last calendar year? (cubic meters) ______________________________

I 5.6: What were the average annual concentrations for each variable at your facility during the last calendar year? (Confirmed during inspection.)

I 5.6.1: pH (standard units) ______________________________

I 5.6.2: Total suspended solids (mg/L) ______________________________

I 5.6.3: Soluble phosphorus (mg/L) ______________________________

I 5.6.4: Total ammonia nitrogen (mg/L) ______________________________

I 5.6.5: 5-day biochemical oxygen demand (mg/L) ______________________________

I 5.6.6: Dissolved oxygen (mg/L) ______________________________

6. Fishmeal and Fish Oil Conservation

C 6.1: Does your farm have letters or other documentation from feed suppliers that indicate typical adjusted marine product inclusion rates for feed? (Confirmed during inspection). _____ Yes _____ No

I 6.2: What was your facility's average annual feed-conversion ratio during the last calendar year? ______________________________

I 6.3: What was your facility's average annual fish-in:fish out ratio during the last calendar year? ______________________________

I 6.4: What was your facility's adjusted marine product inclusion rate during the last calendar year? ______________________________

7. Water and Soil Conservation

I 7.1: Are ponds at your facility constructed on permeable soil? (Confirmed during inspection.) _____ Yes _____ No

C 7.1.1: Are measures taken to control seepage and avoid contamination of aquifers, lakes, streams and other natural bodies of freshwater? (Observation of salt-sensitive vegetation, monitoring of on-farm well water, interviews with local community.) _____ Yes _____ No

S 7.2: Does quarterly monitoring of neighboring well and surface water show that chloride levels are not increasing due to farm operations? (Confirmed during inspection.) _____ Yes _____ No

I 7.3: Does your farm use well water in culture systems? (Confirmed during inspection.) _____ Yes _____ No

S 7.3.1: Are water levels in nearby wells monitored by regulatory agencies to establish that aquaculture is not lowering the water table? (Confirmed during inspection.) _____ Yes _____ No

S 7.3.2: Is it true that well water use has not caused ecological damage or subsidence in surrounding areas? _____ Yes _____ No

S 7.4: Are ponds managed to minimize water use through seine harvesting and other practices that result in major pond draining only at five- to 10-year intervals? _____ Yes _____ No

Score	
Critical (P/F)	Scored (0-3)
Subtotal	Subtotal

8. Control of Escapes, Use of GMOs

I 8.1: What fish species is/are cultured at your facility?

____

____

I 8.2: Are any of these fish non-native species? _____ Yes _____ No

I 8.2.1: List the non-native species.

____

____

I 8.3: Is governmental approval required for importation or use of the above species? _____ Yes _____ No

C 8.3.1: Is your facility in compliance with these government regulations? _____ Yes _____ No

I 8.3.1.1: List the documents you will present. (Confirmed during inspection.)

____

____

C 8.4: Are screens sized to retain the smallest animals present installed on water outlet pumps, pipes or sluices? (Confirmed during inspection.) _____ Yes _____ No

C 8.5: Are all incidents involving fish escapes accurately documented? (Confirmed during inspection.) _____ Yes _____ No

9. Storage and Disposal of Farm Supplies

C 9.1: Are fuel, lubricants and agricultural chemicals stored and disposed of in a safe and responsible manner? (Confirmed during inspection.) _____ Yes _____ No

S 9.2: Is it true that fuels, lubricants and agricultural chemicals are not stored near feed, in employee housing or kitchen areas, or near harvest equipment and supplies? (Confirmed during inspection.) _____ Yes _____ No

S 9.3: Are fuel, lubricants and agricultural chemical storage areas marked with warning signs and are precautions taken to prevent spills, fires and explosions? (Confirmed during inspection.) _____ Yes _____ No

S 9.4: Is garbage from housing and food waste retained in water-tight receptacles with covers to protect contents from insects, rodents and other animals? (Confirmed during inspection.) _____ Yes _____ No

S 9.5: Briefly describe how garbage and other solid waste is disposed of to comply with local regulations and avoid environmental contamination (e.g., recycling, burning, composting or placing in a landfill). (Confirmed during inspection.)

____

____

S 9.6: Describe the measures taken to prevent infestation by animal and insect vectors and pests. (Confirmed during inspection.)

____

____

S 9.7: Does secondary fuel containment conform to BAP guidelines for fuel storage? (Confirmed during inspection.) _____ Yes _____ No

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Score	
Critical (P/F)	Scored (0-3)

10. Animal Welfare

S 10.1: Does your facility apply a maximum biomass limit based on channel catfish health and survival records? (Confirmed during inspection.) _____ Yes _____ No

I 10.1.1: The maximum biomass is set at ________________ kilograms/hectare

with available aeration of ____________________ horsepower/hectare.

S 10.2: Is feeding managed to avoid stress through underfeeding or overfeeding? (Confirmed during inspection.) _____ Yes _____ No

S 10.3: Does your facility apply maximum periods for fasting, crowding and time out of water? (Confirmed during inspection.) _____ Yes _____ No

I 10.3.1: The maximum fasting period is ________________ days.

I 10.3.2: The maximum crowding period is _______________ hours.

I 10.3.3: The maximum time out of water is ______________ seconds.

S 10.4: Are regular inspections of the culture facility, water quality, and behavior and condition of fish performed? (Confirmed during inspection.) _____ Yes _____ No

S 10.5: Are disease outbreaks managed through rapid diagnosis and treatment (including vaccination by trained staff) and, when necessary, humane slaughter? (Confirmed during inspection.) _____ Yes _____ No

S 10.6: When ill, deformed or unmarketable channel catfish and unwanted species are removed, are they killed by humane techniques and the carcasses disposed of responsibly? (Confirmed during inspection.) _____ Yes _____ No

11. Drug and Chemical Management

S 11.1: Does the farm have a written health management plan that includes procedures to avoid the introduction of diseases, protocols for water quality management and fish health-monitoring and disease diagnosis techniques? (Confirmed during inspection.) _____ Yes _____ No

C 11.2: If used, are drug treatments based on recommendations and authorizations overseen by a fish health specialist only to treat diagnosed diseases in accordance with instructions on product labels and national regulations? _____ Yes _____ No _____ Do Not Use

C 11.3: Is it true that any antibiotics banned or unapproved in the producing or importing country are not used in feeds, pond additives or any other treatment that could result in residue in fish? (Confirmed during inspection.) _____ Yes _____ No

C 11.4: Is documentation available from feed manufacturers that antibiotics or other drugs are not present in non-medicated feed used at the farm? (Documentation required.) _____ Yes _____ No

I 11.5: Are medicated feeds used at your facility? (Confirmed during inspection.) _____ Yes _____ No

C 11.5.1: Are medicated feeds offered in accordance with product labels? (Documentation required.) _____ Yes _____ No

Subtotal	Subtotal

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Score	
Critical (P/F)	Scored (0-3)

C 11.6: Is it true that your farm does not use antibiotics or hormones as growth promoters? (Confirmed during inspection.) _____ Yes _____ No

S 11.7: Has a survey of chemical use been conducted to identify potential contaminants such as pesticides, PCBs and heavy metals in the surrounding watershed? (Documentation required.) _____ Yes _____ No

12. Microbial Sanitation

I 12.1: Briefly describe how domestic sewage is treated to avoid contamination of surrounding areas (e.g., sewer system, septic system, portable toilet, outhouse). (Confirmed during inspection.)

____

____

C 12.1.1: Is human waste/sewage disposed of responsibly to prevent entry into water canals, ponds or nearby water bodies? _____ Yes _____ No

13. Harvest and Transport

S 13.1: Are fish harvested and transported in a manner that maintains temperature control and minimizes stress? (Confirmed during inspection.) _____ Yes _____ No

S 13.2: Are equipment and containers used to harvest and transport fish clean and free of lubricants, fuel, metal fragments and other foreign material? (Confirmed during inspection.) _____ Yes _____ No

S 13.3: Is the adequacy of transport methods assessed through documented mortality rates? (documentation required.) _____ Yes _____ No

S 13.4: Is the duration of live fish transport kept below 12 hours to minimize stress? (Confirmed during inspection.) _____ Yes _____ No

C 13.5: Is it true that nonapproved chemicals are not applied directly or indirectly during transport? (Confirmed during inspection.) _____ Yes _____ No

Traceability Requirement

C Are traceability records maintained via the BAP-approved online traceability system for each of the specified parameters for every production unit and every production cycle to allow tracing of fish back to the unit and inputs of origin? (Confirmed during inspection.) _____ Yes _____ No

I What internal system does your facility use to maintain traceability data as defined in the Guidelines for Standards?

____

____

____

Subtotal	Subtotal

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Final Scoring — For Offical Use After Inspection

Evaluator:

I have applied the Best Aquaculture Practices guidelines to the best of my ability in completing the site inspection and assign the following score for this facility.

[ ]	Passed Critical Questions x 3.70 =	[ ] %	(Must pass all 27 items for 100%.)
[ ]	Total Scored Points x 0.95 =	[ ] %	(Must initially score at least 70%, then 80% or more after five years.)

Final Score	
Pass	**Fail**

ACC Evaluator Signature ____ Date ______________

Farm Representative:

I had the opportunity to participate in the ACC site inspection and understand the score assigned.

Farm Representative Signature ____ Date ______________

Note: Certification is not complete until payment is received for all ACC and evaluator fees.

Evaluator Comments — Attach additional sheets, if needed.

GUIDELINES — CHANNEL CATFISH FARMS

These Best Aquaculture Practices certification standards apply to the pond production of channel catfish, *Ictalurus punctatus*; blue catfish, *I. furcatus*; and hybrids thereof. The following guidelines provide perspective and clarification for the standards referenced in the Application/Audit Form. The application and guidelines were designed to assist program applicants in assessing their facilities and developing management systems for compliance with the certification standards.

The word "shall" is used throughout these guidelines to indicate mandatory provisions. For further information, please refer to the additional resources listed.

Standard 1 — Community
Property Rights and Regulatory Compliance

Farms shall comply with local and national laws and environmental regulations, and provide current documentation that demonstrates legal rights for land use, water use, construction, operation and waste disposal.

Reasons for Standard

Certified farms shall comply with applicable business-related laws and environmental regulations, including those concerning protection of sensitive habitats, effluents, operation of landfills and predator control. These regulations are needed to assure that farms provide pertinent information to governments and pay fees to support such programs. BAP requires compliance because it recognizes that not all governmental agencies have sufficient resources to effectively enforce laws.

Implementation

Regulations regarding the operation and resource use of farms vary significantly from place to place. Among other requirements, such laws can call for:

- business licenses
- aquaculture licenses
- land deeds, leases or concession agreements
- land use taxes
- construction permits
- water use permits
- effluent permits
- therapeutics use
- permits related to non-native species
- predator control permits
- well operation permits
- wetland protection.

BAP evaluators cannot know all laws that apply to channel catfish farming in all nations. Participating farms have the responsibility to obtain all necessary documentation for siting, constructing and operating their facilities.

Assistance in determining these necessary permits and licenses can be sought from governmental agencies responsible for agriculture, environmental protection, fisheries and aquaculture, water management and transportation, as well as local aquaculture associations. BAP evaluators must also become familiar with the legal requirements within the areas they service.

During the BAP site inspection, the representative of the farm shall present all necessary documents to the evaluator. All documents shall be current, and farms shall be in compliance with the requirements stipulated by the documents. For example, if a farm has an effluent discharge permit with water quality standards, those standards shall be enforced. In cases where governmental agencies have waived one or more permits, proof of these waivers shall be available.

For Additional Information

U.S. Federal Register. Effluent limitation guidelines and new source performance standards for the concentrated aquatic animal production point source category: Final rule.
U.S. Federal Register: August 23, 2004
Volume 69, Number 162, pp. 51,892-51,930
Office of the Federal Register
National Archives and Records Administration
Washington, D.C., USA

Standard 2 — Community
Community Relations

Farms shall strive to be good neighbors by respecting the rights of others engaged in rural activities or living in the vicinity.

Reasons for Standard
Aquaculture farms are often located in rural areas, where some individuals may rely on varied natural resources to supplement their livelihoods. Some local residents benefit from employment or infrastructure improvements associated with aquaculture development, but others may face limited access to areas used for fishing, hunting or recreation.

Implementation
Nearly all channel catfish farms are located on privately owned land. Farm management should attempt to accommodate traditional uses of natural resources through a cooperative attitude toward established local interests and environmental stewardship.

Farms that draw groundwater from wells should conserve water and operate facilities in a manner to avoid restricting the amount of water available to other users. Farms should maintain a neat and attractive appearance to avoid becoming an eyesore to local residents. Sanitary measures should be employed to prevent odors from dead fish or other sources from affecting nearby neighbors. Machinery should be maintained in good repair to avoid unnecessary noises that may disturb neighbors.

To avoid conflicts with local communities, farms are encouraged to communicate with local leaders by telephone, written correspondence, meetings or other means.

During facility inspection, the ACC evaluator may verify compliance with this standard through observations of the condition of facilities and equipment, and interviews with local people and farm workers. The evaluator should select the individuals for interview, rather than being provided a group of interviewees by farm management.

Standard 3 — Community
Worker Safety and Employee Relations

Farms shall comply with local and national immigration and labor laws to assure adequate worker safety, compensation and, where applicable, on-site living conditions.

Reasons for Standard
Farm work is potentially dangerous because of the types of machinery employed, the risks of drowning and electrocution, and the use of potentially hazardous materials. Workers are not always highly educated, and safety instruction may not be adequate.

Both local and foreign workers may be employed at BAP-certified facilities. In rural areas of the United States and other nations, particularly where there is a shortage of agricultural workers, instances of employment of illegal foreign laborers have been reported. Therefore, BAP certification requires proof of foreign worker documentation.

Implementation
At a minimum, certified farms shall provide legal wages, a safe working environment and, where applicable, adequate living conditions. When hiring foreign workers, farms shall require legal documentation of status. Efforts should be made to exceed the minimum requirements, because certified farms should be progressive and socially responsible.

Staff shall be given initial training, as well as regular refresher training, on safety in all areas of farm operations. A plan shall be available for obtaining prompt medical assistance for injured or ill workers. Safety equipment such as goggles, gloves, hard hats, life jackets and ear protection, should be provided when appropriate. Electrical devices such as pumps and aerators shall be correctly and safely wired. Tractors should have roll bars, shields over power take-offs and other appropriate safety devices.

Living quarters should be well ventilated and have adequate shower and toilet facilities. Food services, if provided, should provide wholesome meals for workers, with food stored and prepared in a responsible manner. Trash and garbage should not accumulate in living, food preparation or dining areas (see Standard 9). Opportunities for recreation during off-duty hours should be available.

During facility inspection, the evaluator will evaluate whether conditions comply with labor and immigration laws. The evaluator will also interview a random sample of workers to obtain their opinions about wages, safety and living conditions.

For Additional Information

Safety for Fish Farm Workers
Program guidelines developed by:
Catfish Farmers of America
USDA Southern Regional Aquaculture Center
National Aquaculture Association
http://www.cdc.gov/nasd/docs/d001701-d001800/d001756/d001756.html

Standard 4 — Environment
Wetland Conservation And Biodiversity Protection

Aquaculture facilities shall not be located in wetland areas where they displace important natural habitats. Farm operations shall not damage wetlands or reduce the biodiversity of other ecosystems. Wetland area removed for allowable purposes shall be mitigated.

Reasons for Standard

Wetlands are important components of many coastal and inland ecosystems. They represent important breeding and nursery grounds for many aquatic species and provide habitat for birds and other wildlife. Wetlands have an important role in improving the quality of water runoff before it enters streams, lakes or estuaries, and can also be an important resource to local people.

Farm operations have the potential to alter aquatic ecosystems and cause a decline in biodiversity through wetland destruction, lethal predator control and eutrophication. Erosion and sedimentation at farm outfalls can have adverse impacts on benthic biodiversity.

Implementation

Farm construction shall take place outside areas with sensitive wetland vegetation. The most reliable way of delineating wetland areas is by the type of vegetation present. Particular care should be taken to assure that hydrological conditions are not altered in a way that deprives wetland vegetation of contact with water.

Certified farms shall not discharge effluents into wetland areas to effect water treatment unless monitoring at the point of entry shows that total suspended solids concentrations comply with the limits in Standard 5.

Farms shall not dredge or fill in sensitive wetlands or wetland buffers to increase the area available for pond construction. Excessive pond construction on a flood plain can reduce the cross-sectional area of flow and increase flood levels and water velocities. This can result in water overtopping pond embankments, erosion of farm earthwork and damage to other property on the flood plain. The problem usually can be avoided if not more than 40% of the flood plain is blocked by pond embankments.

It is sometimes necessary during construction to remove wetland vegetation for access to water supplies and for drainage. This practice is allowed, provided no local regulations prohibit it. However, farms shall mitigate the damage to wetland vegetation. The most reliable procedure is to contribute to wetland restoration programs, for farm operators may not have suitable habitat and expertise for creating wetland areas. A statement from the restoration program that attests to the required minimum restoration of at least three times the wetland area lost then becomes essential.

Farms shall obey laws related to the destruction of birds and other predators. The BAP program strongly encourages farms to employ humane, nonlethal measures for predator control, even when lethal methods are permitted.

At farms supplied with water from natural sources, screens shall be installed on the intakes of water pumps to prevent impingement of aquatic animals. Screens shall also be installed on water outlets to minimize the escape of farm animals.

During initial inspection, the evaluator will record farm areas occupied by wetland vegetation. If dying wetland vegetation is observed around farms, the evaluator will deterine if the mortality is the result of farm operations. If it is, a warning will be issued, and the deficiency shall be corrected for continuation of certification. Wetland removal for unapproved purposes or failure to mitigate allowable removal will result in loss of certification.

When ponds constructed in former wetland areas are closed, embankments should be breached to restore natural water flow so that wetland vegetation can reestablish.

Prevention of erosion avoids resedimentation of soil material from effluents downstream from farms. Sedimentation can also result from the settling of particles in pond effluents.

The control of erosion from effluent involves reducing the impact energy of discharges upon soil and reducing water velocity in ditches to prevent scouring. Drainpipes should extend at least 1 m beyond embankments at an elevation near the ditch bottom. The pipe outlet area should be protected with a splash shield or riprap to reduce effluent energy. Drainpipes that discharge directly into streams should extend over the stream bank to prevent erosion and be located near the stream's normal water level.

Drainage ditches should be designed according to the type of soil and vegetation, with riprap or other structural protection applied in ditch bottoms where vegetation cannot be maintained. Grade control structures may also be necessary.

Standard 5 — Environment
Effluent Management

Aquaculture facilities shall monitor their effluents to confirm compliance with BAP effluent water quality criteria*. Water quality measurements taken during certification inspection shall meet both BAP criteria and those of applicable government permits. Facilities shall comply with BAP's final criteria within five years.

BAP Effluent Water Quality Criteria — Channel Catfish Farms

Variable (units)	Initial Value	Final Value (after 5 years)	Collection Frequency
pH (standard units)	6.0-9.5	6.0-9.0	Monthly
Total suspended solids (mg/L)	50 or less	25 or less	Quarterly
Soluble phosphorus (mg/L)	0.5 or less	0.3 or less	Monthly
Total ammonia nitrogen (mg/L)	5 or less	3 or less	Monthly
5-day biochemical oxygen demand (mg/L)	50 or less	30 or less	Quarterly
Dissolved oxygen (mg/L)	4 or more	5 or more	Monthly

* **Limited Option:** The source water for aquaculture farms can have higher concentrations of water quality variables than allowed by the initial criteria. In these cases, demonstration that the concentrations of the variables do not increase (or decrease for dissolved oxygen) between the source water and farm effluent is an acceptable alternative to compliance with the criteria.

Additional Data
After the first year of effluent monitoring, ACC will also use data provided by facilities' application forms to calculate:

- an annual water use index, determined as described below.
- annual load indices for total suspended solids, soluble phosphorus, total ammonia nitrogen and five-day biochemical oxygen demand, determined as described below.

Reasons for Standard
Only a portion of the nutrients added to aquaculture facilities to increase production is converted to animal tissue. The remainder becomes waste that can cause increased concentrations of nutrients, organic matter and suspended solids in the waters of culture systems.

Farm effluents discharged into receiving water bodies during cleaning or harvesting can contain nitrogen, phosphorus, suspended solids and organic matter at greater than ambient concentrations.

The substances in effluents can contribute to eutrophication, sedimentation and high oxygen demand in receiving water. Effluents with low dissolved oxygen concentrations or high pH can negatively affect aquatic organisms in receiving water bodies.

Effluent standards are a relatively new concept in aquaculture. The data on effluent concentrations provided by farms will be reviewed periodically and the standards modified as necessary.

Implementation
This standard is designed to demonstrate that compliance with other BAP standards through the application of good management practices is effective in reducing the volume and improving the quality of farm effluents. The water quality criteria also assure that effluents from aquaculture facilities have no greater concentrations of pollutants than effluents from other point sources.

Where possible, farms should apply practices that reduce effluent volume. Most channel catfish ponds, for example, are harvested with a grading seine that only captures market-sized fish. After partial harvest, more fingerlings are added and culture continues.

At farms supplied with naturally saline groundwater of over 550 mg/L of chloride, pond effluent should be captured in a reservoir and reused. When effluents are regularly released, applicants in the BAP program shall maintain records for effluent data (see sample forms on pages 18-19). To minimize discharges of pollutants to natural waters, farms that release effluents are encouraged to use this water for irrigation or other beneficial purposes where possible.

To confirm compliance with BAP water quality criteria at farms that practice regular water exchange, the evaluator will sample effluents during the inspection process. The sampling process shall not apply where channel catfish ponds are not drained to facilitate fish harvest.

Sampling
- Samples shall be collected near the point where effluents exit the farm property. A water control structure at the sampling site or suitable sampling method should be used to prevent mixing of effluent and water from the receiving body. In some cases, water must be taken from drain pipes extending through pond dams.

- For farms with multiple effluent outfalls, all or several outfalls shall be sampled to prepare a composite sample for analysis. Where there are more than four outfalls, three outfalls shall be selected as sampling locations.
- Water shall be collected directly from the discharge stream of pipes or dipped from the surface of ditches or canals with a clean plastic bottle. The sample will be placed on ice in a closed, insulated chest to prevent exposure to light.
- Samples or direct measurements for dissolved oxygen and pH shall be obtained between 0500 and 0700 hours, and 1300 and 1500 hours on the same day. The average of the two measurements for each variable will be used for verification of compliance.
- Samples for other variables shall be collected between 0500 and 0700 hours.
- The number of ponds being drained for harvest at the time of sampling shall be recorded.

Analyses

- Analyses may be done on farms or by a private laboratory.
- Hach and Merck water analysis equipment is approved for total ammonia nitrogen and soluble phosphorus analyses. However, evaluators can reject analytical results if sampling, in situ measure ments or lab protocols are deficient.
- Measurements for dissolved oxygen and pH taken in situ with portable meters are preferred, but analyses of these variables may be made in the laboratory.

Rules for Compliance

At least three months of effluent data are required for initial farm certification. For each variable measured monthly, at least 10 values obtained during a 12-month period shall initially comply with the criteria. After five years, the target is no more than one annual case of noncompliance for each variable. For variables measured quarterly, one noncompliance is initially permitted for each variable during a 12-month period. The target after five years is no more than one case of noncompliance for each variable during a 24-month period. When noncompliances occur, farms should make every effort to correct the problems within 90 days.

Annual Effluent Volume

After the first year of effluent monitoring, an estimation of annual effluent volume shall be determined by one of the following equations:

Equation 1
Farm discharge (m^3/y)r = Pump discharge (m^3/min) x Average time of pump operation (hr/day) x 60 min/hr x 365 days/yr

Equation 2
Farm discharge (m^3/yr) = [Volume of ponds (m^3) x Number of crops/yr] + [Volume of ponds (m^3) x Average daily water exchange rate as fraction of pond volume x Crop (days) x Number of crops/yr].

Annual Effluent Loads

Loads of water quality variables are more indicative of the pollution potential of farm effluents than separate measurements of concentrations of these variables and effluent volume. After the first year of effluent monitoring, annual effluent loads for total suspended solids, soluble phosphorus, total ammonia nitrogen and five-day biochemical oxygen demand shall be calculated as follows:

Equation 3
Load of variable (kg/yr) = Farm discharge (m^3/yr) x Average annual concentration of variable (mg/L, same as g/m^3) x 10^{-3} kg/g

Water Use and Load Indices

It is possible to comply with numerical water quality criteria by increasing the amount of water passing through a farm to dilute the concentrations of tested variables. Compliance with the water use index assures that farms meet water quality criteria through good management rather than diluting effluents before they are released into natural waters. After the first year of effluent monitoring, water use and load indices shall be estimated using the following equations:

Equation 4
Water use index (m^3/kg fish) =
Annual effluent volume (m^3) ÷
Annual fish production (kg)

Equation 5
Load index (kg variable/ton fish) =
Annual load of variable (kg/yr) ÷
Annual fish production (ton/yr).

It is important to understand that these load indices are inflated, because the effluent load of each variable does not result entirely from culture operations. Supply water contains some concentration of each variable that is not subtracted from the effluent concentration. Nevertheless, the indices show changes in water use efficiency or pollution loads.

Production Practices

Compliance with the effluent management standard usually requires farms to improve their production practices in some areas. The main practices for improving water quality are the use of stocking and feeding rates that do not exceed the assimilative capacity of ponds, application of quality feed and feed management, installation of mechanical aeration, liming of acidic ponds and erosion control.

Management practices that reduce effluent volume include harvesting by seining rather than draining, maintaining storage volume to capture normal rainfall and runoff by diverting excess runoff around ponds, and maintaining water quality by mechanical aeration rather than pond flushing.

The most reliable way of maintaining storage volume in ponds is to apply the drop-fill technique, in which water levels are allowed to fall 15 to 20 cm below overflow structures before water is added to increase the water level by no more than 10 cm.

If adoption of these practices is not sufficient to meet BAP water quality criteria, a settling basin shall be installed to provide water treatment before final discharge. The criteria shall then apply to the final outfall from the settling basin.

At some farms, vegetated ditches through which water is routed can be an effective treatment system. In other cases, the use of a natural or constructed "filter strip" can provide effective treatment for effluents before they are discharged into public waters. Effluent water flows in a thin sheet across the strips, which allows the capture of sediment, organic matter and other pollutants by deposition, infiltration, absorption, decomposition and volatilization.

Another approach is the use of retention, evaporation or percolation ponds in areas with highly porous soils. For freshwater effluent, application for irrigation purposes to fields with sustained vegetative cover at less than or equal to agronomic rates is an option.

For Additional Information

Environmental Best Management Practices For Aquaculture
C. S. Tucker and J. A. Hargreaves — 2008
Blackwell Publishing, in press
Oxford, United Kingdom

Biology and Culture of Channel Catfish
"Environmental issues"
pp. 634-657
C. E. Boyd — 2004.
C. S. Tucker and J. A. Hargreaves, Editors
Elsevier Publishing Company
Amsterdam, The Netherlands

Aquaculture and the Environment in the United States
"Characterization and Management of Effluents From Warmwater Aquaculture Ponds"
pp. 35-76
C. S. Tucker, C. E. Boyd and J. A. Hargreaves — 2002
J. R. Tomasso, Editor
U.S. Aquaculture Society
Baton Rouge, Louisiana, USA

Sample Effluent Monitoring Form: Dissolved Oxygen and pH

Date (day/month/year)	Dissolved Oxygen (mg/L)			pH (standard units)			Number of Ponds Being Harvested
	Morning	Evening	Average	Morning	Evening	Average	
_____/01/_____							
_____/02/_____							
_____/03/_____							
_____/04/_____							
_____/05/_____							
_____/06/_____							
_____/07/_____							
_____/08/_____							
_____/09/_____							
_____/10/_____							
_____/11/_____							
_____/12/_____							
Annual Average							

Sample Effluent Monitoring Form: Soluble Phosphorus, Total Ammonia Nitrogen

Date (day/month/year)	Soluble Phosphorus (mg/L)	Total Ammonia Nitrogen (mg/L)	Number of Ponds Being Harvested
_____/01/_____			
_____/02/_____			
_____/03/_____			
_____/04/_____			
_____/05/_____			
_____/06/_____			
_____/07/_____			
_____/08/_____			
_____/09/_____			
_____/10/_____			
_____/11/_____			
_____/12/_____			
Annual Average			

Sample Effluent Monitoring Form: Total Suspended Solids, 5-day Biochemical Oxygen Demand

Quarter	Date (day/month/year)	Total Suspended Solids (mg/L)	5-day Biochemical Oxygen Demand (mg/L)	Number of Ponds Being Harvested
1				
2				
3				
4				
Annual Average				

Example: Water Use, Load Indices For Farm Discharge Estimated By Pond Volume-Water Exchange Method

A farm has 100 ha of ponds that average 1 m deep, with average water exchange of 2.5% pond volume/day. There are 2.3 crops/year, and the average length of each crop is 120 days. The farm effluent contains an average of 35 mg/L total suspended solids (TSS), 0.16 mg/L soluble phosphorus (SP), 0.72 mg/L total ammonia nitrogen (TAN) and 8.1 mg/L biochemical oxygen demand (BOD). Fish production for the past year was 230,000 kg (230 tons).

Calculations:

Pond volume = 100 ha x 10,000 m^2/ha x 1 m = 1,000,000 m^3

Farm discharge = [1,000,000 m^3/crop x 2.3 crops/yr] + [1,000,000 m^3 x 0.025 pond volume/day x 120 days/crop x 2.3 crops/yr] = 9,200,000 m^3/yr

TSS load = (35 g/m^3)(9,200,000 m^3/yr)10^{-3} = 322,000 kg/yr

SP load = (0.16 g/m^3)(9,200,000 m^3/yr)10^{-3} = 1,472 kg/yr

TAN load = (0.72 g/m^3)(9,200,000 m^3/yr)10^{-3} = 6,624 kg/yr

BOD load = (8.12/m^3)(9,200,000 m^3/yr)10^{-3} = 74,520 kg/yr

$$\text{Water use index} = \frac{9{,}200{,}000 \text{ m}^3/\text{yr}}{230{,}000 \text{ kg fish/yr}} = 40 \text{ m}^3/\text{kg fish}$$

$$\text{TSS index} = \frac{322{,}000 \text{ kg/yr}}{230 \text{ tons fish}} = 1{,}400 \text{ kg TSS/ton fish}$$

$$\text{SP index} = \frac{322{,}000 \text{ kg/yr}}{230 \text{ tons fish}} = 6.4 \text{ kg SP/ton fish}$$

$$\text{TAN index} = \frac{6{,}624 \text{ kg/yr}}{230 \text{ tons fish}} = 28.8 \text{ kg TAN/ton fish}$$

$$\text{BOD index} = \frac{74{,}520 \text{ kg/yr}}{230 \text{ tons fish}} = 324 \text{ kg BOD/ton fish}$$

Example: Water Use, Load Indices For Farm Discharge Estimated By Pump Operation Method

A farm has two pumps that discharge a combined volume of 136 m^3/min. The pumps operate an average of 8 hr/day. Effluent contains 81 mg/L total suspended solids (TSS), 0.20 mg/L soluble phosphorus (SP), 1.05 mg/L total ammonia nitrogen (TAN) and 11.2 mg/L biochemical oxygen demand (BOD). Fish production during the past year was 378,000 kg (378 tons).

Calculations:

Farm discharge = 136 m^3/min x 60 min/hr x 8 hr/day x 365 days/yr = 23,827,200 m^3/yr

TSS load = (23,827,200 m^3/yr)(81 g/m^3)10^{-3} = 1,930,000 kg

SP load = (23,827,200 m^3/yr)(0.2 g/m^3)10^{-3} = 4,765 kg

TAN load = (23,827,200 m^3/yr)(1.05 g/m^3)10^{-3} = 25,018 kg

BOD load = (23,827,200 m^3/yr)(11.2 g/m^3)10^{-3} = 266,865 kg

$$\text{Water use index} = \frac{23{,}827{,}200 \text{ m}^3/\text{yr}}{378{,}000 \text{ kg fish/yr}} = 63.0 \text{ m}^3/\text{kg fish}$$

$$\text{TSS index} = \frac{1{,}930{,}000 \text{ kg/yr}}{378 \text{ tons fish}} = 5{,}106 \text{ kg TSS/ton fish}$$

$$\text{SP index} = \frac{4{,}765 \text{ kg/yr}}{378 \text{ tons fish}} = 12.6 \text{ kg SP/ton fish}$$

$$\text{TAN index} = \frac{25{,}018 \text{ kg/yr}}{378 \text{ tons fish}} = 66.2 \text{ kg TAN/ton fish}$$

$$\text{BOD index} = \frac{266{,}865 \text{ kg/yr}}{378 \text{ tons fish}} = 706 \text{ kg BOD/ton fish}$$

Standard 6 — Environment

Fishmeal and Fish Oil Conservation

Farms shall accurately monitor feed inputs and minimize the use of fishmeal and fish oil derived from wild fisheries.

Reasons for Standard

The majority of feeds manufactured for use in aquaculture contain marine products such as fishmeal and fish oil as protein and lipid sources. Although fishmeal and fish oil are renewable resources derived primarily from small fish unsuitable for human consumption, there are limits to the amounts of these products the world's oceans can supply.

The BAP program, particularly through its separate standards for aquafeed producers, therefore supports the use of wild fishery-based ingredients obtained from sustainable fisheries. In addition, it supports the use of protein feed ingredients derived from terrestrial sources, as well as fishmeal and fish oil derived as by-products from fish processing.

By improving the efficiency with which feed is converted into fish biomass, farmers can lessen the amount of fishmeal and fish oil used. More efficient feed conversion also has a direct beneficial impact on water quality and limits the release of excess nutrients to the environment.

Implementation

Channel catfish feed is typically manufactured at commercial facilities and delivered to farms. Farmers shall obtain feed from suppliers that provide reliable information on the crude protein and typical inclusion rates of fishmeal, fish oil an other marine ingredients in the feeds. Farmers shall record the charactersistics of all feeds used, the total amounts of each feed used each year and the total annual fish production.

Although BAP standards for feed conversion ratios and fish in: fish out ratios have not yet been established, producers should strive to reduce these ratios as much as practicable. Also, certified farms should maintain or lower feed conversion in the years following their initial certification.

Additional Data

Feed-Conversion Ratio

The feed-conversion ratio is a measure of the amount of feed needed to produce a unit weight of the culture species. Farms shall calculate and record FCR yearly using the following equation:

Equation 1
Feed-conversion ratio = Annual feed use (mt) ÷
Fish harvested (mt).

"Fish In:Fish Out" Ratio

The so-called "fish in:fish out" ratio compares the amount of fish consumed by the system (usually in the form of fishmeal and fish oil) with the amount of fish produced.

Channel catfish producers should strive to obtain the lowest fish in:fish out ratio practicable in order to conserve industrial fish resources. Since channel catfish diets typically incorporate only small amounts of fishmeal and fish oil, channel catfish farms often have fish in:fish out ratios of less than 1, indicating that they can actually make a net contribution to global fish supplies. Channel catfish feeds usually have less than 6 percent fishmeal. Nevertheless, research has shown that feeds with even lower levels of fish meal can perform well.

Farms shall with the assistance of the BAP evaluator calculate and record a final yearly fish in:fish out ratio taken from the table below. This table allows farmers to cross-reference their annual feed-conversion ratios from Equation 1 with an adjusted marine product inclusion rate (AMPIR) defined in Equation 2. The AMPIR is the sum of the inclusion rates of marine meals and oils (except trimmings and aquaculture products excluded below) in the feed with a correction factor to avoid double accounting.

Equation 2
AMPIR (%) = Marine meal (%) + Marine oil (%) –
[0.54 x Marine meal (%)]

The inclusion rates in Equation 2 should include any meal or oil derived from wild-caught fish, squid, krill, mollusks or any other wild marine animals. However, they should exclude meal or oil derived from fishery by-products such as trimmings, offal and squid liver powder; aquaculture by-products such as tilapia trimmings and shrimp head meal; and marine aquaculture products such as polychaetes and algae meals.

Fish In:Fish Out Ratios

FCR	Adjusted Marine Products Inclusion Rate in Feed										
	0-5%	5-10%	10-15%	15-20%	20-25%	25-30%	30-35%	35-40%	40-45%	45-50%	50-55%
3.0	0.34	1.01	1.69	2.36	3.04	3.71	4.39	5.06	5.74	6.41	7.09
2.9	0.33	0.98	1.63	2.28	2.94	3.59	4.24	4.89	5.55	6.20	6.85
2.8	0.32	0.95	1.58	2.21	2.84	3.47	4.10	4.73	5.36	5.99	6.62
2.7	0.30	0.91	1.52	2.13	2.73	3.34	3.95	4.56	5.16	5.77	6.38
2.6	0.29	0.88	1.46	2.05	2.63	3.22	3.80	4.39	4.97	5.56	6.14
2.5	0.28	0.84	1.41	1.97	2.53	3.09	3.66	4.22	4.78	5.34	5.91
2.4	0.27	0.81	1.35	1.89	2.43	2.97	3.51	4.05	4.59	5.13	5.67
2.3	0.26	0.78	1.29	1.81	2.33	2.85	3.36	3.88	4.40	4.92	5.43
2.2	0.25	0.74	1.24	1.73	2.23	2.72	3.22	3.71	4.21	4.70	5.20
2.1	0.24	0.71	1.18	1.65	2.13	2.60	3.07	3.54	4.02	4.49	4.96
2.0	0.23	0.68	1.13	1.58	2.03	2.48	2.93	3.38	3.83	4.28	4.73
1.9	0.21	0.64	1.07	1.50	1.92	2.35	2.78	3.21	3.63	4.06	4.49
1.8	0.20	0.61	1.01	1.42	1.82	2.23	2.63	3.04	3.44	3.85	4.25
1.7	0.19	0.57	0.96	1.34	1.72	2.10	2.49	2.87	3.25	3.63	4.02
1.6	0.18	0.54	0.90	1.26	1.62	1.98	2.34	2.70	3.06	3.42	3.78
1.5	0.17	0.51	0.84	1.18	1.52	1.86	2.19	2.53	2.87	3.21	3.54
1.4	0.16	0.47	0.79	1.10	1.42	1.73	2.05	2.36	2.68	2.99	3.31
1.3	0.15	0.44	0.73	1.02	1.32	1.61	1.90	2.19	2.49	2.78	3.07
1.2	0.14	0.40	0.67	0.94	1.22	1.49	1.76	2.03	2.30	2.57	2.84
1.1	0.12	0.37	0.62	0.87	1.11	1.36	1.61	1.86	2.10	2.35	2.60
1.0	0.11	0.34	0.56	0.79	1.01	1.24	1.46	1.69	1.91	2.14	2.36
0.9	0.10	0.30	0.51	0.71	0.91	1.11	1.32	1.52	1.72	1.92	2.13
0.8	0.09	0.27	0.45	0.63	0.81	0.99	1.17	1.35	1.53	1.71	1.89
0.7	0.08	0.24	0.39	0.55	0.71	0.87	1.02	1.18	1.34	1.50	1.65

Standard 7 — Environment
Soil and Water Conservation

Farm construction and operations shall not cause soil and water salinization or deplete groundwater in surrounding areas. Farms shall properly manage and dispose of sediment from ponds, canals and settling basins.

Reasons for Standard
Most channel catfish farms use groundwater from wells as a water supply. A few farms use saline groundwater of 2 to 5 ppt in ponds. Almost all channel catfish farms using freshwater treat ponds with sodium chloride to increase chloride concentration to counteract nitrite toxicity.

Channel catfish farming can cause salinization if saline water from ponds infiltrates freshwater aquifers or is discharged into freshwater lakes or streams. Farms can potentially lower water tables and negatively affect groundwater availability.

Sediments that accumulate in canals and ponds can negatively impact water movement and affect pond soil and water conditions, necessitating periodic dredging and removal. Sediments are mostly mineral soil enriched with organic material, but also contain water-soluble salt from contact with saline water. Improper disposal of salt-laden sediments from ponds can cause salinization of soil and water.

Implementation
Several practices can be adopted to lessen the risk of salinization. One of the most important is to avoid constructing ponds in highly permeable, sandy soil, or to provide clay or plastic liners to minimize seepage. Other useful practices:

- Do not discharge saline water into freshwater areas.
- Do not dispose of pond sediment on nonsaline land.
- Avoid excessive pumping of groundwater from freshwater aquifers, and do not use freshwater from wells to dilute salinity in growout ponds.

Chloride concentrations in freshwater ponds should be monitored and not be increased to more than 200 mg/L by salt additions. Salt should be stored in a manner to prevent it from containinating soil or surface water.

In freshwater levee and embankment ponds, use the drop-fill method to capture rainfall and runoff, and reduce the use of water from other sources. Water should not be added to ponds during dry weather until the water level has fallen 15 to 20 cm below the overflow level. Water should then be added to increase the water surface level by not more than 7.5 to 10 cm. This practice provides storage volume sufficient to capture normal rainfall and runoff.

Farm ponds should be surrounded by a ditch to intercept seepage. This ditch should be large enough to capture overflow from ponds following rainfall. When ponds are drained for harvest, water should be stored in a reservoir or transferred to other ponds for reuse.

When ponds must be drained into a freshwater stream, the water should be discharged when stream flow is high. The water should be discharged slowly to avoid increases in chloride concentration greater than 250 mg/L in the receiving water body.

A vegetative barrier of salt-sensitive vegetation around farms can help detect movement of salt into adjacent areas. Where freshwater from wells is used to supply ponds or other production facilities, water levels in nearby wells should be monitored by appropriate regulatory agencies to determine if aquaculture use is contributing to a decline in the water table level.

Where possible, seine harvest fish and only drain ponds at intervals of five to 10 years to renovate stock or repair earthwork. This practice conserves water, reduces effluent volume and lessens pumping costs.

Farms shall manage sediment so that it does not cause salinization or other ecological nuisances in surrounding land or water. Sediment accumulation in ponds and canals should be reduced by implementating proper earthen infrastructure design to lessen erosion and placing aerators to avoid impingement of water currents on embankments. Erosion-prone areas should be reinforced with stone or other lining materials. Bare areas should be covered with gravel or grass.

When sediment is stored, it should be confined within a diked area so that solids suspended by rainfall can be retained. When sediment must be removed, it should ideally be reused to repair pond earthworks or applied as fill material. The sediment can also be spread in a thin layer over the land and vegetative cover established.

For Additional Information

Hydrology and Water Supply for Pond Aquaculture
K. H. Yoo and C. E. Boyd — 1994
Chapman and Hall
New York, New York, USA

U.S. Army Corps of Engineers
Engineering Manual No. 1110-2-5027
"Confined Disposal of Dredged Material"
Department of the Army — 1987
U.S. Army Corps of Engineers
Washington, D.C., USA
Online at http://www.usace.army.mil/inet/usace-docs/eng-manuals/em1110-2-5027/toc.htm

Standard 8 — Environment
Control of Escapes, Use of GMOs

Certified farms shall take measures to minimize escapes of farm stock and comply with governmental regulations regarding the use of non-native species and genetically modified organisms.

Reasons for Standard
The escape of non-native culture species could lead through interbreeding to the alteration of the gene pools of local fish populations. Escapes of non-native species could also lead to competition with native species and possibly have other detrimental ecological consequences. Diseases can also be transmitted from escapees to wild fish.

In the United States, research has shown that the escape of channel catfish from farms or the release of their eggs or fingerlings from hatcheries would not lead to the alteration of the gene pools of local populations because there is no identifiable difference between the genomes of these populations.

Chinese carps or other species are sometimes stocked in channel catfish ponds for biological pest control. These fish can also escape from ponds and affect the local aquatic environment. The U.S. Fish and Wildlife Service has listed black carp and silver carp as injurious wildlife species. Refer to Federal Register — Volume 72, October 18, 2007 — 50 CFR, Part 16.

Genetically modified organisms (GMOs) are defined as organisms whose genomes have been modified by the introduction or deletion of specific genetic material. Sex-reversed organisms and their offspring, and organisms created by hybridization and polyploidy are not GMOs.

Should genetically modified channel catfish be commercialized in the future, producers shall comply with all regulations regarding such organisms. A small number of consumers who eat genetically modified foods may experience allergic reactions, while others simply do not desire them and should be provided with reliable information to enable informed food choices.

Implementation
Participating farms shall keep records of their fingerling sources and purchases, and record the number stocked in each pond for each crop. A sample Pond-Level Traceability Form that records this data is provided in the Traceability section. In the future, farms that use GMO fingerlings must also note this information. All incidents involving animal escapes shall be accurately documented.

All holding, transport and culture systems shall be designed, operated and maintained to minimize the escape of eggs, juveniles and adult animals. Ponds and other culture systems shall have intact screens on water inlets and outlets. Filter screens or devices shall be sized to retain the smallest life stage present. Acceptable filter devices include a series of mesh screens capable of screening all water, dry-bed filters constructed with gravel and sand, microscreen solids filters and pond traps with screened discharge.

Carps stocked in ponds for pest control should be triploid individuals that do not reproduce. All governmental regulations applying to the importation and use of these species shall be obeyed.

Production facilities should be constructed to prevent overtopping by storm surges, waves or flood water. When heavy rainfall is expected, pond water levels should be drawn down to prevent the rain from raising water levels and overtopping embankments.

For Additional Information

FAO Fisheries Technical Paper No. 402
Asia Regional Technical Guidelines on Health Management for the Responsible Movement of Live Aquatic Animals and the Beijing Consensus and Implementation Strategy
FAO/NACA — 2000
Rome, Italy

Standard 9 — Environment
Storage and Disposal of Farm Supplies

Fuel, lubricants and agricultural chemicals shall be stored and disposed of in a safe and responsible manner. Paper and plastic refuse shall be disposed of in a sanitary and responsible way.

Reasons for Standard
Farms use fuel, oil and grease to power and lubricate vehicles, pumps, aerators and other mechanical devices. Agricultural chemicals used in channel catfish farming include salt (sodium chloride), fertilizers, liming materials, formalin, insecticides, herbicides, parasiticides and algicides. Other products employed include preservatives, paints, disinfectants and detergents.

Fuels and some fertilizers are highly flammable and/or explosive, and pesticides, herbicides and algicides are toxic. They shall therefore be considered potential hazards to workers.

Spills or careless disposal of petroleum products and agricultural chemicals can also affect aquatic organisms and other wildlife in the immediate vicinity and result in water pollution over a wider area.

Farms generate considerable waste that can cause pollution, odors and human health hazards on the farm and in surrounding areas when not disposed of properly. Human food scraps, out-of-date feed and other organic waste can attract scavengers. Runoff from refuse piles can cause pollution and contaminate groundwater.

Empty plastic bags and other containers used for feed, fertilizer and liming materials do not decompose quickly. They can be a hazard to animals that become entangled in them.

Implementation

Fuel, lubricants and agricultural chemicals shall be labeled and stored in a manner to prevent fires, explosions and spills. Used lubricants and unwanted or out-of-date chemicals shall be disposed of in a responsible manner.

Secondary containment shall be provided for individual fuel storage tanks over 2,500 liters in volume and multiple tanks with combined storage of over 5,000 liters. The containment volume should be equivalent to 110% of individual tanks or 110% of the largest tank in a multiple-tank storage system. "Flammable Material" and "No Smoking" warning signs shall be installed at fuel storage sites.

Oil leaks from tractors, trucks and other equipment should be prevented through good maintenance. Oil changes and refueling should avoid spills, with used oil sent to a recycling center. Out-of-date chemicals and wastes collected after chemical spills shall be confined in sturdy plastic containers, labeled and sent to a hazardous waste disposal site.

Chemicals such as insecticides, herbicides, algicides and detergents shall be stored in locked, well-ventilated, watertight buildings. The buildings' concrete floors should slope to a center basin for containing spills. Warning signs shall be posted.

Fertilizers, liming materials, salt and other less hazardous agricultural chemicals should be stored under a roof, where rainfall will not wash them into surface water. Particular care shall be taken with nitrate fertilizers, which are strong oxidants that are particularly explosive when contaminated with diesel fuel or other oils. Nitrate fertilizers shall be protected from contact with petroleum products and open sparks.

Procedures should be developed for managing spills of oil, fuel, chemicals, feed, fertilizers and other products. The equipment and supplies needed for managing and cleaning up these spills shall be readily available and accessible. Workers should be trained to properly use the equipment and handle the contained waste.

Trash, garbage and other farm wastes shall not be dumped in wetlands, woodlands or other vacant land. Waste shall be burned, composted or put in a landfill in accordance with local laws. Composting shall be done by a procedure that does not create an odor problem or attract wild animals.

A plan should be made for prompt and responsible disposal of massive mortalities of culture animals by incineration, burial, composting or removal by a competent contractor.

Paper and plastic should be recycled if possible. Collection of wastes for recycling requires readily accessible waste containers that are serviced at regular intervals.

For Additional Information

Protecting Water Quality on Alabama's Farms
Alabama Soil and Water Conservation Committee — 1995
Montgomery, Alabama, USA

USDA NRCS AL Guide Sheet No. AL 701
Spill Prevention Control and Countermeasures
Available online at http://www.al.nrcs.usda.gov/SOsections/Engineering/BMPindex.html

Standard 10 — Environment
Animal Welfare

Producers shall demonstrate that all operations on farms that involve fish are designed and operated with animal welfare in mind. Employees shall be trained to provide appropriate levels of husbandry.

Reasons for Standard

Since society seeks to avoid needless animal suffering, numerous regulations address animal welfare. Although few such regulations address fish, many consumers would like to know that farmed channel catfish were produced by humane techniques. This standard seeks to assure a high level of welfare for channel catfish.

When farmed fish are exposed to continuing stress, their feed consumption and growth rate can decline. Stressed animals are also less resistant to diseases, and mortality usually increases. Animal suffering can be prevented and production efficiency enhanced by applying good husbandry techniques to avoid stressful culture conditions.

Implementation

This standard seeks to assure a high level of welfare for aquaculture species. The following good aquatic animal husbandry practices should therefore be applied.

Farms must provide well-designed facilities for holding and rearing fish with adequate space. The chemical composition of culture water should be appropriately maintained, and changes in water quality should be made slowly so the fish can adjust to the changes. High-quality feed should be offered at regular intervals that do not overfeed or underfeed the fish. Although fasting periods of two or three days are often needed to enable harvesting in hygienic conditions, they should be minimized. Feed should not be offered during periods when fish do not naturally eat due to low temperature or poor health.

Farms should minimize stressful situations during handling by limiting crowding and time out of water. Culture management should also avoid stress, injury or disease through rapid diagnosis and treatment of disease and by humane slaughter. When used, vaccination procedures should be executed by trained staff to prevent physical damage and minimize stress.

Dead animals must be frequently removed from ponds and disposed of properly. Unacceptable organisms in the pond environment must be eliminated in a humane fashion and disposed of in accordance with applicable regulations.

Farm staff should make regular inspections of the culture facility, noting water quality as well as the appearance and behavior of the fish. Swift action should be taken to correct deficiencies or symptoms.

Reliable scientific data on the effects of stocking density on fish welfare is limited, and many factors influence this relationship. Through detailed health records, farms shall demonstrate that suitable stocking densities are being employed. Maximum stocking densities shall be set with respect to fish biomass per water surface area and amount of mechanical aeration applied.

For Additional Information

Farm Animal Welfare Council
http://www.fawc.org.uk/freedoms.htm

Standard 11 — Food Safety
Drug and Chemical Management

Banned antibiotics and other drugs and chemical compounds shall not be used. Therapeutic agents shall be used as directed on product labels for control of diagnosed diseases or required water management, not prophylactic purposes.

Critical Points:

- For exported products, drugs and chemicals approved for use in producing countries may only be used if they are not banned in importing countries and residues in channel catfish products do not exceed limits set by importing nations. (See U.S. approved drug list on page 26.)
- Records for disease diagnoses should support the use of therapeutants.
- Required records for every application of drugs and other chemicals shall include the date, compound used, reason(s) for use, dose and harvest date for treated ponds.
- Statements from feed and fingerling suppliers that declare no prohibited drugs or other chemicals were applied to feed or seed are required.
- Vaccines and anaesthetics, where employed, shall be approved and used only according to manufacturers' instructions.
- Neither hormones nor antibiotics shall be used as growth promoters.
- Hormones should not be administered to animals intended for human consumption.
- FDA recommends that drugs be used judiciously. For details, see http://www.fda.gov/cvm/JUAQUATIC.htm.

Producers are encouraged to obtain the advice of fish healthcare professionals regarding the use of all medications and especially medication in feeds. However, in the United States, a prescription is required for the use of Aquaflor and all new medications.

Reasons for Standard

Some therapeutic agents can result in residues in aquaculture products that are a potential health hazard to humans. Therefore, certain compounds have been banned, and residue limits mandated for others. Apart from compromising food safety, failure to comply with such regulations can have serious economic consequences to all involved in the food supply chain.

Improper use of chemicals can harm other organisms that live around farms. Moreover, prolonged use of antibiotics can lead to antibiotic resistance in disease organisms that affect both farmed and wild fish.

Some farms are built on land previously used for agricultural or other purposes. Pesticides, heavy metals and other chemicals applied during these previous uses can remain in the land's soil and water in small amounts and be taken up by fish in production ponds. Such compounds pose a potential health risk to some elements of the human population.

Implementation

When considering site locations for new pond construction, soil samples should be taken in areas of high-risk contamination, such as low areas where runoff collects, previously used pesticide storage or disposal sites, and washing and loading sites for spray applicators and agricultural aircraft.

Good health management focuses on the prevention of disease rather than disease treatment with chemical compounds. The best ways of controlling diseases in fish aquaculture are to avoid stocking diseased fish and maintain good water quality to avoid environmental stress to fish.

Farms should develop health management plans that indicate procedures to avoid the introduction of disease, protocols to maintain water and soil quality in ponds, and fish health-monitoring and disease diagnosis techniques. Plans should also explain the steps to be taken when a diagnosed disease will be treated with approved chemicals. Lists of approved chemicals can usually be obtained from processing plants, agricultural agencies or university fisheries research and extension programs.

Drugs and Chemicals Legal for Use in Channel Catfish Culture in the United States

Approved Antibiotics
(http://www.fda.gov/cvm/drugsapprovedaqua.htm)
Terramycin 20 for Fish® (oxytetracyclene dihydrate)
Romet® 30, Romet® TC (sulfadimethoxine and ormetoprim)
Aquaflor®, Aquaflor®-CA1 (florfenicol)

Other Approved Drugs
(http://www.fda.gov/cvm/drugs approvedaqua.htm)
Chorulon® (human chorionic gonadotropin)
Finquel®, Tricaine® (tricaine methanesulfonate)
Formacide-B®, Formalin-F®, Parasite-S®, Paracide-F® (formalin)
OxyMarine®, Oxytetracycline HCL Soluble Powder-343®, Terramycin-343®, Tetroxy Aquatic® (immersion oxytetracycline)
35% Perox-Aid® (hydrogen peroxide)

Low Regulatory Priority Aquaculture Drugs
(http://www.fda.gov/cvm/Documents/LRPDrugs.pdf)
Acetic acid
Calcium chloride
Calcium oxide
Carbon dioxide gas
Fuller's earth
Ice
Magnesium sulfate
Papain
Potassium chloride
Povidone iodine
Sodium bicarbonate
Sodium chloride (salt)
Sodium sulfite
Urea and tannic acid

Regulatory Action Deferred
(http://www.fda.gov/cvm/Documents/LRPDrugs.pdf)
Copper sulfate
Potassium permanganate

Piscicides
(http://aquanic.org/jsa/wggaap/drugguide/drugguide.htm)
Fintrol Concentrate® (antimycin A)
A.K. Product of Peru Cube Powder®, CFT Legumine®, Prentox® Prenfish™ Toxicant Liquid Emulsifiable Concentrate, Prentox® Rotenone Fish Toxicant Powder®, Prentox® Synpren-Fish™ Toxicant, Chem Fish Regular®, Chem Fish Synergized®, Powdered Cube Root Manufacturing Concentrate®, Chem Fish Special® (rotenone)

Herbicides
(http://aquanic.org/jsa/wggaap/drugguide/drugguide.htm)
Copper sulfate, chelated copper compounds
2-4 D
Diquat dibromide
Endothall
Fluridone
Glyphosate
Imazapyr
Triclopyr

During inspections, evaluators shall have access to full records as described above for all applications of drugs and antibiotics. A sample Pond-Level Traceability Form that records this data is provided in the Traceability section.

Farms should conduct a survey of chemical use in the surrounding watershed to evaluate potential sources of contamination. Processing facilities will routinely analyze channel catfish samples to evaluate the possible presence of suspect pesticides, PCBs, and heavy metals to assure they are within the limits set by U.S. Food and Drug Administration HACCP criteria for environmental chemical contaminants.

Certified facilities should also routinely monitor changes in land use practices in the surrounding area that might affect chemical residue levels in farmed fish.

For Additional Information

Guide to Drug, Vaccine, and Pesticide Use in Aquaculture
Federal Joint Subcommittee on Aquaculture — 1994
Texas Agricultural Extension Service College Station
Texas, USA
April 2007 revision — http://www.aquanic.org/jsa/wgqaap/drugguide/drugguide.htm

Food Safety Issues Associated With Products From Aquaculture
Report of a Joint FAO/NACA/WHO Study Group
World Health Organization — 1999
Geneva, Switzerland

Mississippi Cooperative Extension Service Publication 1873
Catfish Quality Assurance
M. W. Bronson — 1996
Mississippi State
Mississippi, USA

Standard 12 — Food Safety
Microbial Sanitation

Human waste and untreated animal manure shall be prevented from contaminating pond waters. Domestic sewage shall be treated and not contaminate surrounding areas.

Reasons for Standard

Sewage contains microorganisms that can be harmful to humans. It can also pollute the water into which it is discharged.

There is a possibility of health hazards to humans who consume inadequately cooked fish grown in waters that receive human waste, untreated animal manure or organic fertilizers containing *Salmonella* or other food-poisoning organisms.

Implementation

Housing for owners or workers sometimes is located near channel catfish ponds. Sewage from bathrooms, kitchens and other facilities shall be treated in septic tanks. Waste oxidation lagoons are also an acceptable treatment method on large farms. In all cases, raw sewage shall not be discharged into fish ponds, farm canals or natural waters. Runoff from barns and other facilities for holding livestock shall not enter ponds.

In the unlikely case that culture water is drawn from water bodies that could receive untreated human waste in the immediate vicinity of the farm, water holding or pretreatment is recommended. Also, some farms can have toilets located near canals or waste treatment systems that discharge or leak into ponds or farm canals. Such situations shall be corrected.

For Additional Information

Food Safety Issues Associated With Products From Aquaculture
Report of a Joint FAO/NACA/WHO Study Group
World Health Organization — 1999
Geneva, Switzerland

Pond Aquaculture Water Quality Management
C. E. Boyd and C. S. Tucker — 1998
Kluwer Academic Publishers
Boston, Massachusetts, USA

Environmental Engineering
P. A. Vesilind, J. J. Peirce and R. F. Weiner — 1994
Butterworth-Heinemann
Boston, Massachusetts, USA

Standard 13 — Food Safety
Harvest and Transport

Fish shall be harvested and transported to processing plants or other markets in a manner that maintains temperature control and minimizes stress, physical damage and contamination.

Reasons for Standard

Channel catfish are typically transported live to processing plants or markets. The crowding and handling of fish during harvesting and transport is potentially stressful, so measures should be taken to prevent unnecessary animal suffering. Unclean water and transport containers can cause contamination of fish during transit from ponds to plants or markets.

Implementation

Channel catfish that are accidentally dropped on the ground during harvest shall not be left out of water to suffocate. Equipment and containers used to harvest and transport channel catfish shall be clean to avoid contamination of harvested fish by lubricants, fuel, metal fragments or other foreign materials.

Live transport of channel catfish in trucks should not take longer than 12 hours, and adequate water quality should be maintained during transport to minimize stress. This usually requires application of mechanical aeration or oxygenation in the transport containers. Temperature control may also be necessary.

The adequacy of transport methods should be assessed by documented mortality rates. Nonapproved chemicals shall not be applied directly or indirectly to fish during transport.

For Additional Information

USFDA Center for Food Safety & Applied Nutrition
Fish and Fisheries Products Hazards and Controls
Guidance: Third Edition, June 2001
Appendix 4: Bacterial Pathogen Growth and Inactivation
Available online at http://www.cfsan.fda.gov/~comm/haccp4x4.html

Traceability

Record-Keeping Requirement

To establish product traceability, the following data shall be recorded for each pond and each production cycle:

- pond identification number
- pond area or volume
- stocking date
- quantity of fingerlings stocked
- source of fingerlings (hatchery)
- antibiotic and drug use
- herbicide, algicide and other pesticide use
- manufacturer and lot number for each feed used
- harvest date
- harvest quantity
- processing plant or purchaser.

Reasons for Requirement

Product traceability is a crucial component of the BAP certification program. It interconnects links in the fish production chain and allows each processed lot to be traced back to the culture unit and inputs of origin. Results of food quality and safety analyses by accredited laboratories can also be included. Traceability ultimately assures the purchaser that all steps in the production process were taken in compliance with environmental, social and food safety standards.

Implementation

Farms can maintain paper records of the required data in notebooks or files. If possible, the information should also be transferred to computer database files, with the original files kept to allow verification of the electronic data.

Required information and other records can initially be captured on the sample form below. Each form corresponds to the harvest on a particular day from a particular culture unit.

Where the facility claims inputs such as feed or juveniles from other BAP-certified facilities, segregation of the BAP inputs and outputs, and accompanying records, are required. In addition, some buyers request that chain of custody data be added to the BAP online traceability database via the Internet. Participation in the online system is optional. On-site audits include chain of custody verification of records and product segregation.

The record-keeping process requires a high degree of care and organization. On large farms, managers could collect initial data for those fish for which they are responsible. A single clerk could then be given the task of collecting the data from pond managers and transferring it to a computer database. Farm management shall, of course, review the effort at intervals to verify it satisfies BAP requirements.

Sample Pond-Level Product Traceability Form

Farm Name		Pond Number	Pond Area (ha)
FINGERLINGS Stocking Date		**FEED** Feed Type	
Stocking Quantity		Manufacturer	
Hatchery	BAP No.	Lot Number(s)	
"No Banned Chemical Use" Statement Available? Y N		"No Banned Chemical Use" Statement Available? Y N	
THERAPEUTIC DRUG USE Compound 1		**PESTICIDE USE** Compound 1	
Disease Treated		Condition Treated	
Application Rate		Application Rate	
Application Period		Application Period	
Compound 2		Compound 2	
Disease Treated		Condition Treated	
Application Rate		Application Rate	
Application Period		Application Period	
HARVEST Harvest Date		Harvest Purchaser Name/ Address	
Harvest Quantity (kg)			