SECTION 1
INTRODUCTION

1.1 Scope and Purpose of the Technical Guidance Manual

The primary purpose of this document is to provide technical guidance for concentrated aquatic animal production (CAPP) facilities to meet the requirements of the proposed effluent limitations guidelines and standards. This guidance manual can also be used by all aquatic animal production (AAP) facilities to reduce discharges of pollutants. The manual describes a variety of best management practices (BMPs) and other activities for use by AAP and CAAP facilities to meet the goals of the effluent limitations guidelines. EPA has found that many facilities are currently using BMPs described in this document to successfully reduce pollution loadings.

The guidance manual presents BMPs that can be applied by all sectors of the AAP industry and some BMPs that apply to specific sectors of the industry. This guidance also presents several checklists for use by facilities for BMP plan development and to assist with reporting requirements. The intended audience for the technical guidance manual includes aquaculture facility owners and managers, National Permit Discharge Elimination System (NPDES) permit writers, and other local, state, and federal decision-makers.

1.2 The Aquatic Animal Production Industry

EPA is proposing new effluent limitations guidelines and standards for three subcategories of the concentrated aquatic animal production industry including: flow-through systems, recirculating systems, and net pens.

Flow-through systems consist of single- or multiple-pass units with constantly flowing culture water, and they commonly use raceways or tanks (circular or rectangular). Flow-through systems are found throughout the United States, wherever a consistent volume of water is available. Most flow-through systems use well, spring, or stream water as a source of production water. The water source is chosen to provide a constant flow with relatively little variation in rate, temperature, or quality. Flow-through systems are the primary method used to grow salmonid species such as rainbow trout. These species require high-quality cold water with high levels of dissolved oxygen. Flow-though systems are located where water is abundant, which enables farmers to produce these types of fish cost-effectively. Some other species cultured using flow-through systems are hybrid striped bass, tilapia, and ornamentals.

Recirculating systems are highly intensive culture systems that actively filter and reuse water many times before it is discharged. These systems typically use tanks or raceways to hold the growing animals and have extensive filtration and support equipment to maintain adequate water quality. Recirculating systems use biological filtration equipment to remove ammonia from the production water. Solids removal, oxygenation, temperature control, pH management, carbon dioxide control, and disinfection are other common water treatment processes used in recirculating systems. The size of the recirculating system depends primarily on available capital to fund the project and can be designed to meet the production goals of the operator. Recirculating systems can be used to grow a number of different species. They can be used anywhere in the country because a relatively small volume of water is needed to produce a unit of product.

Net pens and cages are suspended or floating holding systems in which some cultured species are grown. These systems may be located along a shore or pier or may be anchored and floating offshore. Net pens and cages rely on tides, currents, and other natural water movement to provide a continual supply of high-quality water to the cultured animals. In most locations, net pens are designed to withstand the high-energy environments of open waters and are anchored to keep them in place during extreme weather events. Strict siting requirements typically restrict the number of units at a given site to ensure sufficient flushing to distribute wastes and prevent degradation of the bottom below and near the net pens.

EPA does not propose to establish effluent limitations guidelines for other types of production systems, including floating aquaculture production systems (e.g., mussel rafts) or for ponds; however, this manual does address practices that could be used for those systems to help reduce pollutant discharges.

EPA is not proposing regulations for discharges from the following:

- *Ponds*. The culture of aquatic animals in ponds requires high-quality water to sustain and grow the aquatic animal crop. For many aquatic animals raised in ponds, the pond itself serves as a natural biological treatment system to reduce wastes generated by the animals in the pond.

- *Lobster pounds*. Intertidal "pounds" are used for live storage and feeding of lobsters to keep wild caught animals alive pending sale.

- *Crawfish*. Crawfish are typically raised in seasonally filled shallow ponds in conjunction with plant crops. After the plant crop is harvested, remaining plant residues serve as a forage food for the crawfish.

- *Molluscan shellfish production in open waters*. For large-scale production of mollusks for food, operators typically use bottom culture, bottom-anchored racks, or floating (but tethered to the bottom) rafts in open waters. Molluscs do not require added feed because they remove nutrients (in the form of algae) from ambient waters by filtration.

- *Aquariums*. Public aquariums are AAP facilities that display a variety of aquatic animals to the public and conduct research on many different threatened and endangered aquatic species. These systems maintain low stocking densities and very clean, clear water to enhance the visual display of the animals. Discharges from aquariums are likely to be low in total suspended solids (TSS) and nutrients because of the low stocking densities.

- *Alligators*. Alligator production facilities range in size from producers with less than 100 animals to some with many thousands of animals. None of the production facilities discharge effluents from their alligator production systems. Instead, effluents are treated in one or two-stage lagoons and then land applied to crop or forested land.

1.3 Defining the Need for BMPs for the CAAP Industry

The operation of CAAP facilities has the potential to introduce a variety of pollutants and leads to other disturbances in receiving waters that might be harmful to the environment. According to the 1998 U.S. Department of Agriculture (USDA) Census of Aquaculture (USDA, 2000), there are approximately 4,200 commercial aquaculture facilities in the United States. Aquaculture has been among the fastest-growing sectors of agriculture until a recent slowdown that began several years ago caused by declining or level growth among producers of several major species.

Water quality concerns related to pollutant loads are only one of the environmental concerns associated with this industry. Other areas of concern relate to the introduction of invasive species from CAAP facilities, which can pose serious potential and observed risks to native fishery resources and wild native aquatic species from the establishment of escaped individuals (Carlton, 2001; Volpe et al., 2000). Some CAAP facilities may also use drugs, such as oxytetracycline or formalin, and chemicals, such as a variety of copper-containing pesticides, that may be released into receiving waters. For some applications of these drugs and chemicals, there is a belief that further information is needed to fully evaluate risks to ecosystems and human health associated with their use in some situations. Finally, CAAP facilities also might inadvertently introduce pathogens into receiving waters, with potentially serious adverse impacts on native biota. This guidance document describes practices that can be used by CAAP facilities to minimize the discharge of pollutants and

minimize potential adverse impacts that pollutants might have on receiving waters.

1.4 Current Regulatory Structure: NPDES Program

The NPDES regulations specify the applicability of the NPDES permit requirement to concentrated aquatic animal production facilities (40 CFR 122.24 and Appendix C to Part 122). To be a concentrated aquatic animal production facility, the facility must either meet the criteria in 40 CFR Part 122, Appendix C, or be designated on a case-by-case basis (40 CFR 122.24(b)). A hatchery, fish farm, or other facility is a concentrated aquatic animal production facility if it contains, grows, or holds aquatic animals in either of two categories: cold water or warm water. The cold water species category includes ponds, raceways, or other similar structures which discharge at least 30 days per year, but it does not include: facilities which produce less than 9,090 harvest weight kilograms (approximately 20,000 pounds) per year; and facilities which feed less than 2,272 kilograms (approximately 5,000 pounds) during the calendar month of maximum feeding. The warm water category includes ponds, raceways, or other similar structures which discharge at least 30 days per year, but it does not include: ponds which discharge only during periods of excess runoff; or facilities which produce less than 45,454 harvest weight kilograms (approximately 100,000 pounds) per year (40 CFR Part 122, Appendix C).

1.5 State BMP Programs

A number of states, including Alabama, Arizona, Arkansas, Florida, Hawaii, and Idaho, were found to have recommended BMPs for aquaculture. In addition, BMPs have been developed for specific types of species. BMPs are addressed in manuals or regulations, depending on the state. Data were collected from in-house resources and through Internet research and might not represent every state that has developed BMPs for aquaculture.

Alabama

Dr. Claude Boyd and his colleagues, with funding from the Alabama Catfish Producers (a division of the Alabama Farmers Federation) has developed a set of BMPs for aquaculture facilities in Alabama. The BMPs are described in a series of guide sheets that have been adopted by USDA's Natural Resources Conservation Service (NRCS) to supplement the Service's technical standards and guidelines (Auburn University and USDA, 2002). The NRCS technical standards are intended to be referenced in Alabama Department of Environmental Management rules or requirements promulgated for aquaculture in Alabama. The guide sheets address a variety of topics, including reducing storm runoff into ponds, managing ponds to reduce effluent volume, controlling erosion in

watersheds and on pond embankments, using settling basins and wetlands, and implementing feed management practices.

Arizona

Arizona's regulation for BMPs for feeding operations covers aquaculture facilities classified as feeding operations for purposes of regulation of discharge water quality (Statutory reference: ARS 49-245-47; CWA Section 318).

The Arizona Department of Environmental Quality has rules that regulate aquaculture through three general, goal-oriented BMPs. These BMPs address manure handling, including harvesting, stockpiling, and disposal; treatment and discharge of aquaculture effluents containing nitrogenous wastes; and closing of aquaculture facilities when they cease operation (Fitzsimmons, 1999).

Compliance with these BMPs is intended to minimize the discharge of nitrates from facilities without being too restrictive for farm operations. The draft document *Arizona Aquaculture BMPs* describes BMPs that can minimize nitrogen impacts from aquaculture facilities. A list of resources is also available for additional information about Arizona aquaculture and BMPs (Fitzsimmons, 1999).

Arkansas

The Arkansas Bait and Ornamentals Fish Growers Association (ABOFGA) developed a list of BMPs to help its members make their farms more environmentally friendly. More specifically, the Association provides a set of BMPs that help to conserve water, reduce effluent, capture solids, and manage nutrients. Members may voluntarily agree to adopt the BMPs on their farms (ABOFGA, n.d.). For more information, contact the University of Arkansas at Pine Bluff.

Florida

Florida's aquaculture certificate of registration and BMP regulation requires any person engaging in aquaculture to be certified by the Florida Department of Agriculture and Consumer Services and to follow BMPs (Regulatory reference: Chapter 5L-3.003, 5L-3). *Aquaculture Best Management Practices*, a manual prepared by the Department, establishes BMPs for aquaculture facilities in Florida. By legislative mandate (Chapter 5L-3), the BMPs in the manual are intended to preserve environmental integrity while eliminating cumbersome, duplicative, and confusing environmental permitting and licensing requirements. When these BMPs are followed, facilities meet the minimum standards necessary for protecting and maintaining offsite water quality and wildlife habitat. All certified aquaculturists are required to follow the BMPs in

Chapters II through X of the manual, which address federal permitting; construction; compliance monitoring; shipment, transportation, and sale; water resources; nonnative and restricted nonnative species; health management; mortality removal; and chemical and drug handling (FDACS, 2000).

Hawaii

Hawaii recently developed a practical BMP manual to assist aquaculture farmers in managing their facilities more efficiently and complying with discharge regulations. The manual, *Best Management Practices for Hawaiian Aquaculture* (Howerton, 2001), is available from the Center for Tropical and Subtropical Aquaculture.

Hawaii is also developing a BMP for traditional use of a *loko kuapa*-style Hawaiian fish pond. Because of changes in the land tenure, decreases in native population, total loss of traditional pond management practices, and benign neglect, fishpond production has declined in Hawaii. Although Hawaii's fishpond production efficiency is too low to justify the economic cost, Hawaii is making major efforts to restore and put into service several of these traditional structures as sustainable development demonstrations and as opportunities for maintaining ties to a nearly extinct element of cultural heritage (SOEST, n.d.).

Idaho

In combination with site-specific information, *Idaho Waste Management Guidelines for Aquaculture Operations* can be used to develop a waste management plan to meet water quality goals. Such a waste management plan would address Idaho's water quality concerns associated with aquaculture in response to the federal Clean Water Act and Idaho's Water Quality Standards and Wastewater Treatment Requirements. The manual is also intended to assist aquaculture facility operators in developing BMPs to maintain discharge levels that do not violate the state's water quality standards (IDEQ, n.d.).

Other BMP Guidance Documents

BMPs have also been developed for specific species, including shrimp, hybrid striped bass, and trout. The Global Aquaculture Alliance, in *Codes of Practice for Responsible Shrimp Farming*, has compiled nine recommended codes of practice that are intended to serve as guidelines for parties who want to develop more specific national or regional codes of practice or formulate systems of BMPs for use on shrimp farms. These codes of practice address a variety of topics, including mangroves, site evaluation, design and construction, feeds and feed use, shrimp health management, therapeutic agents and other chemicals, general pond operations, effluents and solid wastes, and community and employee relations (Boyd, 1999). The purpose of the document is to provide a framework

for environmentally and socially responsible shrimp farming that is voluntary, proactive, and standardized. The document also provides a background narrative that reviews the general processes involved in shrimp farming and the environmental and social issues facing the industry (Boyd, 1999).

The Hybrid Striped Bass Industry: From Fish Farm to Consumer is a brochure that provides guidance to new and seasoned farmers in the proper handling of fish from the farm to the consumer. Although the brochure is primarily geared toward providing quality fish products to consumers, the information it provides about the use of drugs and chemicals, including pesticides and animal drugs and vaccines, can be used to benefit the environment (Jahncke et al., 1996).

The Trout Producer Quality Assurance Program of the U.S. Trout Farmer's Association (USTFA) is a two-part program that emphasizes production practices that enable facilities to decrease production costs, improve management practices, and avoid any possibilities of harmful drug or other chemical residues in fish. Part 1 discusses the principles of quality assurance, and Part 2 provides information about the highest level of quality assurance endorsed by the USTFA. Although the program addresses a variety of subjects related to trout production, the discussion on waste management and drugs and chemicals can be applied to protecting the environment (USTFA, 1994).

1.6 Overview of Guidance Manual

The following information is discussed in detail in this manual:

- Section 2 describes a checklist of requirements under the proposed effluent guidelines.
- Section 3 describes how to create a BMP Plan in compliance with the proposed regulations for flow-through, recirculating, and net pen systems.
- Section 4 describes other BMPs for all systems, including systems not included in the scope of the proposed regulation (ponds).
- Appendix A lists additional resources available to assist facilities with implementing BMPs.
- Appendix B is an example of a BMP plan developed by EPA and state regulators.
- Appendix C includes fact sheets describing BMP practices.

1.7 References

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