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Agricultural Waste Management
Field Handbook

Chapter 1 Laws, Regulations, Policy, and Water Quality Criteria

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651.0100 Federal laws

(a) Introduction

Laws, regulations, and policies associated with manure management change due to advances in science and technology, changes in social and political objectives, and from knowledge gained through experience with their implementation. This chapter provides a reasonable introduction, overview, and background to these laws and policies, but it should not be substituted for a direct familiarity of the legal and policy documents themselves.

Many environmental laws enacted by Congress are enforced by the U.S. Environmental Protection Agency (EPA). The EPA issues regulations for prevention of air and water pollution, protection of drinking water, proper solid waste management, and control of pesticide use. Their broad regulatory powers related to air and water pollution and solid waste management are of great interest to the agricultural producer and to agencies, such as the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), that provide technical assistance to producers. State public health and environmental control agencies generally are responsible for implementing Federal and State control programs.

(b) Air

Federal legislative efforts to regulate air pollution began with the passage of the Air Pollution Control Act in 1955. The Clean Air Act was originally passed in 1963 with significant amendments in 1970, 1977, and 1990. The 1990 Clean Air Act Amendments (CAAA) introduced sweeping changes to the Clean Air Act and is the basis for many of the existing air quality regulations in the United States.

Since the Clean Air Act is the underlying environmental law for air quality in the United States, regulatory agencies, such as the EPA and other State and local regulatory agencies, must promulgate specific regulations to implement the Clean Air Act. The Federal regulations promulgated by the EPA can be found in Title 40 of the Code of Federal Regulations (CFR). Each State and local regulatory agency must implement regulations that are as stringent as, or more stringent than, the Federal regulations. Each of these sets of regulations addresses air quality concerns from many different types of air pollutant emission sources.

Federal regulations implementing the Clean Air Act include the establishment of National Ambient Air Quality Standards (NAAQS), as well as emissions standards for various pollutants and sources. These regulations currently do not address odors or greenhouse gases; however, these pollutants may be regulated at the State or local level. On the Federal level, emissions of importance to agriculture, such as particulate matter and ozone, as well as their precursor emissions, are regulated.

There are currently no specific exemptions or exclusions for agriculture in the Federal Clean Air Act regulations.

(c) Water

Federal legislation for protection of water quality began with the Rivers and Harbors Act of 1886 and 1889. In 1948, the Federal Water Pollution Prevention Act set a national policy for prevention, control, and abatement of water pollution. It was amended in 1956. The Federal role in water pollution control was expanded by the Water Quality Act of 1965, Clear Water Restoration Act of 1966, and Water Quality Improvement Act of 1970.

The Federal Water Pollution Control Act of 1972, Public Law 92–500, was passed so that the effectiveness and speed of implementation of water pollution control could be improved. This is to be accomplished by increasing Federal responsibility for establishing standards and providing greater involvement in their implementation and enforcement. The objective is to restore the chemical, physical, and biological integrity of the Nation's water. To achieve this objective, the law set a national goal of no discharge of pollutants into the Nation's water by 1985. Water of the United States is defined in the 40 CFR, part 122, to include wetlands and intermittent streams, as well as conventional lakes, ponds, rivers, streams, and the territorial seas.

Under section 303(d) of the 1972 Clean Water Act, States, territories, and authorized tribes are required to develop lists of impaired waters. These impaired

waters do not meet water quality standards that have been set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology. The law requires that these jurisdictions establish priority rankings for waters on the lists and develop estimates of the Total Maximum Daily Load (TMDL) for these waters. A TMDL is a calculation of the maximum amount of a pollutant that a water body can receive and still safely meet water quality standards.

The Clean Water Act of 1977, Public Law 95–217, changed the 1972 amendments by providing more easily attainable objectives and time schedules. It strengthened the 1972 law's basic requirement that operators of point source discharges, such as those from industrial and municipal facilities, feedlots, and other discrete significant sources, obtain a permit specifying allowable amounts and constituents of effluents and a schedule for achieving compliance. The permits are known as National Pollutant Discharge Elimination System (NPDES) permits (see section 651.0101(a) of this chapter). The Clean Water Act has been modified in several instances since 1977.

(d) Other Federal actions of interest to agriculture

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), commonly known as Superfund, was enacted in 1980 to provide broad Federal authority to respond to releases of hazardous substances that might endanger public health. The CERCLA requires reporting to EPA when a facility releases to the ambient air or water greater than a "reportable quantity" (100 pounds in a 24-hour period) of a hazardous substance. The EPA is authorized to require long-term remedial action that permanently and significantly reduces threats to public health. Originally focused on hazardous wastes from industrial plants, the increased size and consolidation of animal feeding operations has raised the possibility that the emission of substances like ammonia and hydrogen sulfide from such operations may be subject to the notification provisions of CERCLA (EPA 2005).

The Emergency Planning and Community Right-to-Know Act (EPCRA) was enacted in 1986. It establishes requirements for Federal, State and local governments, Indian Tribes, and industry regarding emergency planning and "Community Right-to-Know" reporting on hazardous and toxic chemicals. The Community Right-to-Know provisions help increase the public's knowledge and access to information on chemicals at individual facilities, their uses, and releases into the environment. States and communities, working with facilities, can use the information to improve chemical safety and protect public health and the environment. The EPCRA was passed in response to concerns regarding the environmental and safety hazards posed by the storage and handling of toxic chemicals. These concerns were triggered by the disaster in Bhopal, India, in which more than 2,000 people suffered death or serious injury from the accidental release of methyl isocyanate. To reduce the likelihood of such a disaster in the United States, Congress imposed requirements on both States and regulated facilities.

The National Environmental Policy Act (NEPA) is the basic national charter for protection of the environment. The NEPA establishes a process used during planning to produce better decisions for protection and enhancement of the environment. The process uses Environmental Assessments and Environmental Impact Statements to ensure that Federal agencies use "all practical means and measures" to protect and improve the environment. The NRCS procedures for environmental evaluations of proposed animal waste control facilities will meet the intent of NEPA.

Criteria for Classification of Solid Waste Disposal Facilities and Practices, Federal Register, Vol. 44, No. 179, September 13, 1979, defines requirements for land application of organic materials.

Water Quality Criteria, Federal Register, Vol. 45, No. 231, November 28, 1980, established the criteria for 64 waterborne constituents, which provided updated values for "Quality Criteria for Water" published by EPA.

The 1986 Amendments to the Safe Drinking Water Act, Public Law 99–339, established requirements for a new series of regulations covering such topics as filtration, disinfection, bacteria, and virus control. This law also set maximum contaminant levels for a large number of organic and inorganic chemicals including nitrates/nitrites, selenium, and many agricultural pesticides.

National Coastal and Marine Policy, January 1989, asserts that the EPA will protect, restore, and maintain

the Nation's coastal and marine waters to protect human health and sustain living resources.

Criteria for Identifying Critical Aquifer Protection Areas—Final Rule—40 CFR 149, Federal Register, Vol. 54, No. 29, February 14, 1989, among other things, defines a critical aquifer area as one that is vulnerable to contamination; contamination is reasonably foreseeable unless a control program is implemented; contamination would cause significant economic, environmental, or social costs; and all or part of a sole source aquifer.

The 1987 Amendments to the Federal Water Pollution Control Act, Public Law 100–4, February 4, 1987, reflect the continued interest Congress has in assuring that water quality needs of the country are met. The Amendments added Section 319, "Nonpoint Source Management Programs," which requires States to assess water quality conditions and prepare and submit assessment reports to the EPA administrator. Based on State assessment reports, States are to prepare and implement water quality management plans that deal with problems in an orderly fashion. The major provisions of the section 319 amendment require State management programs to:

- identify best management practices (BMP) and measures to be undertaken to reduce pollutant loadings
- identify programs to achieve implementation of the best management practices
- schedule annual milestones for using program implementation methods and implementing the best management practices
- certify that State laws provide adequate authority to implement management programs
- assure that sources of funds and other types of assistance are available to carry out the management program

Section 319 allows for demonstration projects and hydrologic unit areas to be selected for implementation. States are required to develop and implement management programs on a watershed basis to the maximum extent practicable.

The Coastal Zone Act Reauthorization Amendments of 1990 (Public Law 101–508, Budget Reconciliation Act) amended the Coastal Zone Act of 1972 (16 USC 1455) by including requirements for coastal and Great Lakes States to develop programs for nonpoint source pollution control. Control programs are to be carried out by implementing a prescribed set of management measures. Programs are to "...serve as an update and expansion of State nonpoint source management program developed under section 319 of the Federal Water Pollution Control Act...."

651.0101 Federal regulations and rules

(a) National Pollutant Discharge Elimination System

The EPA published policies and procedures for issuance of National Pollutant Discharge Elimination System (NPDES) permits on May 22, 1973, and final regulations on March 18, 1976. These regulations established conditions under which separate storm sewers and concentrated animal feeding operations are considered point sources of pollution subject to NPDES permit requirements. On June 18, 1976, final regulations were published for silvicultural activities. On July 12, 1976, final regulations were published for agricultural activities that, in effect, defined irrigation return flows as an agricultural point source of pollution. However, in 1977, this definition was changed by Public Law 95–217, which specifically excluded irrigation return flows from NPDES regulation.

The NPDES permit requirements were consolidated with those of other EPA permit programs on May 19, 1980. They are included in the CFR, Title 40, parts 122, 123, 124, and 125. Most agricultural activities are not point sources of pollution subject to NPDES permits; however, concentrated animal feeding operations (CAFO) that discharge (or plan to discharge) are considered point sources by the EPA, and they are required to have a NPDES permit.

Most States have been granted full NPDES permitting authority by the EPA with oversight of State operations provided by the EPA. Where States do not have permitting authority, a variety of arrangements for permitting have been made. They range from the EPA doing all permitting to the EPA issuing permits for certain categories of pollutants (or operations) and the State issuing the permits for other categories.

(1) Concentrated animal feeding operations

Under the EPA CAFO rule, an animal feeding operation (AFO) is a lot or facility where animals are confined for 45 days or more a year, and crops, vegetations, forage growth, or post-harvest residues are not sustained in the normal growing season over any portion of the lot or facility. Discharge from an AFO defined as as CAFO is subject to NDPES permit requirements. A CAFO may fall into one of three types: Large CAFO, Medium CAFO, or Small CAFO based on the actual number of animals at the operation.

A Large CAFO has more than a specified number of animals by type which are confined.

A Medium CAFO has more than a specified number of animals, but less than a Large CAFO, and the animals are in contact with surface water running through the confinement area, or a constructed ditch or pipe carrying manure or wastewater from the animal housing or feeding area, or the permitting authority has designated the operation as a CAFO. The regional administrator of the EPA or the director of the State program reserves the right to designate any feedlot in this size range as a point source of pollution after an onsite inspection.

A Small CAFO has less than the minimum number of animals for designation as a Medium CAFO, and the regional administrator of the EPA or the director of the State program, after onsite inspection, determines that animals are in contact with surface waters running through the production area, and pollutants are discharged into the water of the United States through a fabricated device or directly into such water flowing through a feedlot.

Animal numbers for Large, Medium, and Small CAFOs are presented in table 1–1.

(2) Concentrated aquatic animal production facilities

NPDES permit requirements for concentrated aquatic animal production applies to direct discharges of wastewater from the following existing and new facilities:

- Facilities that produce at least 100,000 pounds a year in flow-through and recirculating systems that discharge wastewater at least 30 days a year (used primarily to raise trout, salmon, hybrid striped bass, and tilapia).
- Facilities that produce at least 100,000 pounds a year in net pens or submerged cage systems (used primarily to raise salmon).

Note: State regulations that are more stringent supersede the above criteria.

(3) NPDES permits

Point sources of pollution can be regulated by individual or general permits. Owners or operators of most point sources are required to apply for individual permits. These include some concentrated AFOs, concentrated aquatic animal production facilities, and certain silvicultural activities.

Part 122, Title 40, CFR established conditions and procedures whereby point sources can be regulated under a general permit. General permits can be made applicable to any category of point sources if the category has similar characteristics throughout the area covered by the general permit. Owners and operators are required to comply with the conditions of the general permit, but they do not have to apply for a permit.

The EPA has set the permitting requirements for CAFOs under the NPDES (40 CFR Part 122) and Effluent Limitations Guidelines and Standards (ELG) (40 CFR Part 412).

(4) Nonpoint source pollution

While concentrated animal facilities that discharge are considered point sources of pollution, other potential agricultural sources of water pollution are considered to be nonpoint sources.

Each State's comprehensive water quality plan includes controls for point sources (PS) and nonpoint sources (NPS) of water pollution. Features of point and nonpoint sources of water pollution are shown in table 1–2.

Table 1–1 EPA CAFOs classified as Large, Medium, and Small according to species animal numbers

Species	Large CAFO	Medium CAFO	Small CAFO
Beef cattle	1,000 or more	300 to 999	Less than 300
Veal	1,000 or more	300 to 999	Less than 300
Mature dairy cattle	700 or more	200 to 699	Less than 200
Dairy heifers	1,000 or more	300 to 999	Less than 300
Swine (55 lb or more)	2,500 or more	750 to 2,499	Less than 750
Swine (<55 lb)	10,000 or more	3,000 to 9,999	Less than 3,000
Turkeys	55,000 or more	16,500 to 54,999	Less than 16,500
Laying hens or broilers [1/]	30,000 or more	9,000 to 29,999	Less than 9,000
Laying hens [2/]	82,000 or more	25,000 to 81,999	Less than 25,000
Chickens except laying hens	125,000 or more	37,500 to 124,999	Less than 35,500
Ducks [1/]	5,000 or more	1,500 to 4,999	Less than 1,500
Ducks [2/]	30,000 or more	10,000 to 29,999	Less than 10,000
Sheep or lambs	10,000 or more	3,000 to 9,999	Less than 3,000
Horses	500 or more	150 to 499	Less than 150

1/ Only applicable to poultry operations with liquid manure systems;
2/ Other than liquid manure systems
Note: State regulations that are more stringent supersede the above criteria.

Table 1–2 Typical features of point and nonpoint sources of water pollution

Point sources	Nonpoint sources
Relatively steady flow over time	Flows usually occur at random and intermittent intervals following rain, snow melt, or ground thaw events
Adverse impacts most severe during periods of low stream flow or cumulative in lakes	Adverse impacts most severe during or following storm events or cumulative in lakes
Pollutants enter watercourses at identifiable points	Pollutants enter watercourses at many, often unidentifiable, points

The prescribed approach used for control of NPS is often different from that used for PS. PS controls generally rely on collection and treatment of potential pollutants. NPS control methods, on the other hand, are typically based on management of potential pollutants including such practices as land application of manure.

Individual States have been given the responsibility by EPA to formulate a comprehensive water quality plan for control of various pollutants and specific steps for selecting systems of practices. The choice of particular practices from those approved by the State depends on the site-specific conditions. The selection of practices for a particular case is related to the pollutant or pollutants that need to be controlled, type of agricultural activity contributing the pollutant or pollutants, and site-specific characteristics.

Water pollution laws form the foundation for a control program by specifying broad objectives and providing mechanisms to obtain them. However, legislation cannot define the important details and methods of implementation for programs that are conducted by such natural resource management agencies as the NRCS. Legislation can specify goals, standards, criteria, and other guidelines, but each program must be individually developed at the local level.

(b) CERCLA/EPCRA reporting rule for air releases of hazardous substances from animal waste at farms

The EPA has established rules for reporting requirements and associated reporting exemptions of releases of hazardous substances to the Federal government and State and local governments as required by the CERCLA and EPCRA. These include the rules for reporting the release of ammonia and hydrogen from manure management facilities at AFOs and CAFOs.

651.0102 State responsibilities

All State laws dealing with air and water quality and disposal of solid wastes must meet the minimum requirements of the Federal laws. Most States have such laws. Many have laws, rules, or regulations specifically addressing management of agricultural wastes in terms of surface and ground water quality requirements, management facilities, land application, and odors. Many of the State laws, rules, and regulations are more stringent than those promulgated by the Federal Government. In the absence of State requirements, the EPA assumes enforcement. As mentioned previously, odors and greenhouse gases are not currently regulated on the Federal level, although States may have implemented rules and regulations for these air emissions.

651.0103 State laws and regulations

Each State should supplement this section with information on State laws and regulations or reference where this information is located (see 450–GM, Part 405.03).

651.0104 Owner/producer responsibilities

All work in which the NRCS assists farmers and landowners must meet the minimum requirements of Federal, State, and local laws, rules, and regulations. Landowners, producers, and operators are responsible for obtaining required approvals and permits and for operating facilities in accordance with these laws, rules, and regulations.

651.0105 Safety

Safety is an important aspect of planning, design, construction, and operation of an agricultural waste management system (AWMS). The NRCS policy as it pertains to an AWMS includes:

- notification of utility companies when utilities are in the vicinity of engineering investigations or construction activities (National Engineering Manual (NEM), part 503)
- incorporating safety measures into structures (NEM, part 503)
- informing decisionmaker and contractor of safety requirements at preconstruction conferences (NEM, part 512.13)
- safety requirements for construction activities under formal NRCS contracting (Federal Acquisition Regulations, Clause 52.236–13, and 29 CFR 1910 and 1926)
- safety requirements for construction contracts under locally awarded contracts (120–V–CG-CAM (National Contracts, Grants, and Cooperative Agreements Manual, part 516)
- safety requirements for construction by informal contracting acquired by the decisionmaker (110–GM (General Manual), part 402.4)
- withdrawing NRCS assistance if unsafe construction conditions are not corrected (110–GM, part 402.13)

651.0106 Policies—Federal, USDA, and NRCS

The policies that guide involvement of USDA agencies in pollution abatement activities are in the following documents:

(a) USDA nonpoint source water quality policy

This policy (Department Regulation 9500–7, December 5, 1986) gives the key instructions for agencies of the USDA to follow concerning nonpoint source pollution. Some of the instructions are:

- ensure that actions and programs conform with the nonpoint source water quality plans adopted by State and local governments
- coordinate water quality activities with appropriate public and private institutions
- promote the improvement, protection, restoration, and the maintenance of water quality to support beneficial uses
- integrate water quality concepts, considerations, and management techniques into appropriate programs, research, and modes of assistance to landowners and land users
- provide Federal assistance in accordance with overall environmental policy and other procedural directives developed by the USDA
- encourage the use of best management practices (BMP) as the mechanism to meet Federal, State, and local water quality requirements for agricultural and silvicultural lands
- train agency personnel in surface water and ground water quality concepts to a level commensurate with their responsibility

(b) USDA policy for ground water quality

The foundation of this policy, Department Regulation No. 9500–8, November 9, 1987, is in support of “prudent use and careful management of nutrients and other agricultural chemicals” and in advocating and fostering programs, activities, and practices to avoid

ground water contamination. To bolster this position, USDA agencies will continue to conduct research, monitoring, assessment, and evaluation of chemical management; provide information, education, and technical assistance to private landowners in using practices that minimize risks; and provide information and education to people and communities in rural areas about protecting wells from pathogens and nutrients and other agricultural chemicals.

(c) NRCS water quality policy

General Manual (GM), title 460, part 401, subpart A, establishes responsibilities in support of implementing water quality activities from the NRCS Chief through the various national office levels to the NRCS state conservationists. Some of the more important requirements are that the State Conservationists have the responsibility to:

- assist local soil and water conservation districts, other Federal and State Government agencies, and the private sector to identify and treat nonpoint source pollution problems
- ensure that actions, investments, and programs conform with water quality nonpoint source pollution programs by State and local governments
- incorporate BMP as part of Resource Management Systems (RMS), which are the most effective and practical means of preventing or controlling pollutants from nonpoint sources
- encourage landowners and land users to treat each acre within its capability and according to its needs for both surface and ground water quality protection and improvement
- cooperate with local conservation districts in developing conservation plans that use RMS to minimize pollution problems from animal wastes, nutrients, pesticides, salts, sediments, and related pollutants
- maintain adequately trained personnel in surface water and ground water quality concepts and management techniques

(d) NRCS conservation planning policy

General Manual (GM), title 180, Part 409, establishes NRCS policy for providing conservation planning assistance to clients. The objective in conservation planning is to help each client attain sustainable use and sound management of soil, water, air, plant, and animal resources. The purpose is to prevent the degradation of resources and to ensure their sustained use and productivity, while considering the client's economic and social needs.

Conservation planning guidance makes recommendations on the appropriate levels of assistance that may be provided for managing such activities as livestock waste, food processing waste, pesticides, and municipal wastewater and sewage sludge.

Livestock waste—Inventory, planning, and application assistance may be provided for agricultural waste management systems if the wastes are to be used for a beneficial purpose, such as use of water, nutrients, and organic material.

Food processing waste—Inventory, planning, and application assistance may be provided to farmers, ranchers, and food processors for waste management systems that include beneficial use of water, nutrients, and organic material. The NRCS does not often provide planning and application assistance to large corporate food processors. Traditionally, inventory, planning, and application assistance have been provided to smaller, family owned and operated food processing companies that grow the products that they process.

Pesticides—Inventory and planning assistance can be provided for a wide range of activities related to use and management of pesticides and waste pesticides. Application according to label, equipment operator protection, spill cleanup, equipment cleaning, container disposal, storage and transport, and filling and mixing areas are included. The use and management of pesticide waste should be carried out using guidelines and procedures jointly developed with the Cooperative Extension Service, experiment stations, and the pesticide industry.

Municipal wastewater and sewage sludge—The NRCS generally does not provide independent planning where wastewater or sludge is applied to land

owned or controlled by a municipality or industry or where land applications are used strictly for disposal. The NRCS may provide planners in the private sector with soils and conservation practice information that can used for erosion control, nutrient management, vegetation management, and irrigation management. The NRCS may provide planning assistance to private land owners of agricultural land receiving municipal or industrial waste. Municipal or industrial waste must be applied according to EPA regulations (40 CFR Parts 403 (Pretreatment), 503 (Biosolids), 257 (Industrial Sludges), and other State and/or local regulations regarding the use of biosolids as a nutrient source). This will require monitoring the accumulation of potential pollutants and heavy metals including arsenic, cadmium, copper, lead, mercury, selenium, and zinc. (Sludge from municipal wastewater treatment facilities is solid waste, which comes under the purview of Public Law 580, Solid Waste Disposal Act, or Resource Conservation and Recovery Act of 1976.)

(e) NRCS Comprehensive Nutrient Management Planning policy

Comprehensive nutrient management plans (CNMPs) are developed in accordance with NRCS CNMP policy. GM 190, Part 405 establishes NRCS policy for Comprehensive Nutrient Management Plans (CNMP); GM 190, Part 405.11 delivers Minimal Requirements Essential for Providing CNMP Technical Assistance; the Field Office Technical Guide, Section III contains the CNMP technical criteria associated with specific elements of a CNMP; and the National CNMP Field Handbook details the steps of CNMP development and implementation, associated software, and automation of the process. From GM 190 Part 405:

A. A CNMP is a conservation plan for an AFO or user of the by-products of an AFO that:

(1) Must include the following:

(a) The production area including the animal confinement, feed and other raw materials storage areas, animal mortality facilities, and the manure handling containment or storage areas; and

(b) The land treatment area, including any land under control of the AFO owner or operator, whether it is owned, rented, or leased, and to which manure or process wastewater is, or might be, applied for crop, hay, pasture production, or other uses;

(2) Meets NRCS FOTG Section III quality criteria for water quality (nutrients, organics, and sediments in surface and ground water) and soil erosion (sheet and rill, wind, ephemeral gully, classic gully, and irrigation induced natural resource concerns on the production area and land treatment area);

(3) Mitigates, if feasible, any excessive air emissions and/or negative impacts to air quality resource concerns that may result from practices identified in the CNMP or from existing on-farm areas/activities;

(4) Complies with Federal, State, Tribal, and local laws, regulations, and permit requirements; and

(5) Satisfies the owner/operator's production objectives.

(f) Federal policy on land application of municipal sewage sludge

The Federal Policy for Use of Municipal Sewage Sludge for the Production of Fruits and Vegetables was published in January 1981. It was jointly developed by the USDA, EPA, and Food and Drug Administration (FDA). NRCS technical assistance must be provided in conformance with the guidelines established in this document. The policy was an outgrowth of the EPA regulations, "Criteria for Classification of Solid Waste Disposal Facilities" [Federal Register, Vol. 44, No. 179 (40 CFR, Part 257), 9/13/79]. The regulation addresses land application of municipal wastewater sludge for food chain crop production. It states that through use of high quality sludge coupled with proper management procedures, the consumer should be protected from contaminated crops, and potential adverse environmental effects will be minimized.

(g) NRCS Electronic Field Office Technical Guide policy

General Manual, Section 450, Part 401, establishes the need to develop resource management plans that deal with agricultural wastes. This is supported by entries

in the Electronic Field Office Technical Guide (eFOTG) "Waste Disposal Interpretations," Section II, Soil and Site Information, 401.3(b)(2), and "Animal Wastes and Agri-Chemical Management," Section III, Resource Management Systems, 401.3(b)(3).

RMS and BMP are similar, but they have some fundamental differences. Their differences are indicated by the following definitions:

RMSs are a combination of conservation practices and management identified by primary use of land or water that, if installed, will at a minimum protect the resource base by maintaining acceptable ecological and management levels for the five resource concerns in accordance with the FOTG.

BMP, as defined in 40 CFR, Part 130, are a practice or combination of practices determined by a State after problem assessment, examination of alternative practices and appropriate public participation, to be the most effective, practicable means of preventing or reducing the amount of pollution generated by nonpoint sources to a level compatible with water quality goals. BMPs address one or more resource concerns.

(h) NRCS flood plain and wetland policy

NRCS environmental policy in GM–190, part 410, applies when waste management facilities on flood plains or wetlands are being planned. This policy restricts or requires special provision for certain agricultural waste management structures or activities within flood plains and wetlands. It is NRCS policy that flood plains be, to the extent practical, conserved, preserved, and restored to existing natural and beneficial value on base (100 year) flood plains as a part of technical and financial assistance in programs NRCS administers. A permit may be necessary to comply with the Clean Water Act, section 404(b)(1), if earth is filled or removed on the flood plain. If AWMS facilities encroach on a flood plain, a building permit may be required by local agencies. It is also NRCS policy to aid in protecting, maintaining, managing, and restoring wetlands.

(i) NRCS agricultural waste management conservation practice standards

National standards for agricultural waste management are in the National Handbook of Conservation Practice Standards. The field office standards are in section IV of the Field Office Technical Guide. Conservation practice standards (CPS) establish the minimum level of quality with which these practices are planned, designed, installed, operated, and maintained. The NRCS CPS can be used to address specific waste management needs of producers. Some examples are:

Waste Storage Facility (Code 313)—A waste storage impoundment made by constructing an embankment and/or excavating a pit or dugout, or by fabricating a structure. The purpose of the practice is to temporarily store wastes such as manure, wastewater, and contaminated runoff as a storage function component of an agricultural waste management system.

Animal Mortality Facility (Code 316)—An on-farm facility for the treatment or disposal of livestock and poultry carcasses. This practice may be applied as part of a conservation management system to support one of the following purposes: decrease nonpoint source pollution of surface and ground water resources, reduce the impact of odors that result from improperly handled animal mortality, decrease the likelihood of the spread of disease or other pathogens that result from the interaction of animal mortality and predators, and provide contingencies for normal and catastrophic mortality events.

Composting Facility (Code 317)—A facility to process raw manure or other raw organic by-products into biologically stable organic material. The purpose of the practice is to reduce the pollution potential of organic agricultural wastes to surface and ground water.

Waste Treatment Lagoon (Code 359)—An impoundment made by excavation or earthfill for biological treatment of animal or other agricultural wastes. The purpose of the practice is to reduce the pollution potential component of a waste management system.

Closure of Waste Impoundments (Code 360)—The closure of waste impoundments (treatment lagoons and waste storage ponds) that are no longer

used for their intended purpose in an environmentally safe manner. The purposes of this practice are to protect the quality of surface water and ground water resources, eliminate a safety hazard for humans and livestock, and safeguard the public health.

Anaerobic Digester (Code 366)—An anaerobic digester is a component of a waste management system that provides biological treatment in the absence of oxygen. The purposes of this practice are to capture biogas for energy production, manage odors, reduce the net effect of greenhouse gas emissions, and reduce pathogens.

Roofs and Covers (Code 367)—A manufactured membrane, composite material, or roof structure placed over a manure management facility. Its purpose is to provide a roof or cover for water quality improvement, air quality improvement and odor reduction, capture of biogas for energy production, or to divert clean water from manure pack and/or manure storage facilities.

Roof Runoff Management (Code 558)—A facility for collecting, controlling, and disposing of runoff from roofs. The purpose of this practice is to divert noncontaminated runoff away from areas where waste accumulates to areas where clean water can be disposed of safely.

Nutrient Management (Code 590)—Managing the amount, form, placement, and timing of application of plant nutrients. The purpose of this standard is to assure that all sources of plant nutrients, including livestock waste, are included in a fertility program designed to supply plant nutrients for optimum yields, yet minimize nutrient losses to surface and ground water.

Amendments for the Treatment of Agricultural Waste (Code 591)—Applies where the use of a chemical or biological amendment will alter the physical and chemical characteristics of the waste stream as part of a planned waste management system. This practice will improve or protect air quality, water quality, animal health, and will alter the consistency of the waste stream to facilitate implementation of a waste management system.

Feed Management (Code 592)—Managing the quantity of available nutrients fed to livestock and poultry for their intended purpose in order to supply the quantity of available nutrients required by livestock and poultry for maintenance, production, performance, and reproduction; while reducing the quantity of nutrients, especially nitrogen and phosphorus, excreted in manure by minimizing the over-feeding of these and other nutrients. This action should improve net farm income by feeding nutrients more efficiently.

Waste Treatment (Code 629)—For the mechanical, chemical, or biological treatment of agricultural waste. The purpose is to use mechanical, chemical, or biological treatment facilities and/processes as part of an agricultural waste management system. This should improve ground and surface water quality by reducing the nutrient content, organic strength, and/or pathogen levels of agricultural waste; improve air quality by reducing odors and gaseous emissions; produce value added by-products; and facilitate desirable waste handling, storage, or land application alternatives.

Solid/Liquid Waste Separation Facility (Code 632)—A filtration or screening device, settling tank, settling basin, or settling channel used to separate a portion of solids from a liquid waste stream. The purpose of the practice is to partition solids, liquids, and their associated nutrients as part of a conservation management system to improve or protect air quality, water quality, or animal health or meet management objectives.

Waste Utilization (Code 633)—using animal or other agricultural wastes on land in an environmentally acceptable manner while maintaining or improving soil and plant resources. The purpose of the practice is to safely recycle waste materials back through the soil-plant system.

Waste Transfer (Code 634)—A system using structures, conduits, or equipment to convey by-products (wastes) from agricultural operations to points of usage. The purpose of this practice is to transfer agricultural material associated with production, processing, and/or harvesting through a hopper or reception pit, a pump (if applicable), a conduit, and/or hauling equipment to a storage/treatment facility, loading area, and/or agricultural land for final utilization as a resource.

Vegetated Treatment Area (Code 635)—A component of an agricultural waste management system consisting of an area of permanent vegetation used for

agricultural wastewater treatment. The purpose of this practice is to improve water quality by reducing loading of nutrients, organics, pathogens, and other contaminants associated with livestock, poultry, and other agricultural operations

Constructed Wetland (Code 656)—An artificial ecosystem of saturated soils and hydrophytic vegetation used for water treatment. The purpose of this practice if for treatment of wastewater and contaminated runoff from agricultural processing, livestock, and aquaculture facilities or for improving the quality of storm water runoff or other water flows lacking specific water quality discharge criteria.

Many other practice standards are used to support those listed, such as those for irrigation, tillage, and cropping systems. Other conservation practice standards will be developed as needed to supplement agricultural waste management systems based on proven research development.

(j) NRCS policy on biosecurity

The NRCS policy on biosecurity can be found in the Agency's General Manual at Title 130, Part 403, Subpart H, Biosecurity Preparedness and Response.

This policy states that: "During periods of outbreak of infectious animal diseases, NRCS employees shall not enter affected areas for normal planning and implementation purposes. Entry to those areas shall only be made in response to a request from the State Veterinarian or other responsible official in order to provide guidance and assistance for mortality disposal. In those situations, biosecurity measures as directed by the responsible official shall be followed."

651.0107 Water quality criteria and standards

Water quality objectives, criteria, and standards are interrelated, but different from one another. A water quality **objective** is a goal toward which a control program is aimed. For example, an objective of Public Law 92–500 was to eliminate discharge of all pollutants into navigable streams by 1985. Objectives often represent an ideal condition.

Water quality **criteria**, on the other hand, represent specific, though not necessarily precise, quality characteristics that research and experience indicate are generally necessary to support various water uses. They provide a measure of suitability of water quality for a particular use and what magnitude of change is needed to make it suitable.

Water quality **standards** differ from objectives and criteria in that they represent measures required by laws or regulations. They tend to be rigid and absolute and are either met or violated. Standards provide the "teeth" for water quality legislation and also the yardstick by which performance can be evaluated. Water quality standards generally are related directly to the specific quality criteria for uses to be protected.

(a) Water quality criteria

Water quality criteria provide the best estimate, based on available research and experience, of the characteristics necessary for various uses of water. These criteria provide a basis for determining if a specific body of water is suitable for a particular purpose. Unfortunately, because of the variability in factors that influence water quality criteria, they tend to be imprecise. Nevertheless, the criteria are based on the best information available and thus should be adhered to unless State or local guidelines based on the specific local situation suggest differently.

Generally, if water quality criteria, such as those published by the EPA, are met by a particular water source for a specific use, that source for that use will be safe over a fairly large range of circumstances.

Water that does not meet a particular criterion may be suitable for a specific use, but the margin of safety for that use is reduced.

In some cases, local information and experience allow criteria to be adjusted. Because water quality criteria are not legally binding, they can be modified by State or local agencies if experience suggests criteria different from those of the EPA are more appropriate for local conditions.

Water quality criteria are continually changing, so the summary of EPA criteria given in table 1–3 may change as new and better information becomes available. For a more complete listing of water quality criteria, refer to the EPA publication "Quality Criteria for Water" published in 1986.

(b) National water quality standards

Water quality standards are legally enforceable and set maximum allowable limits of concentration for various pollutant constituents or minimum limits of favorable constituents. Typically, standards relate to water quality in a receiving stream, for example, concentration of Biochemical Oxygen Demand (BOD). However, technology-based standards are established for use of the most effective control or treatment technologies available to prevent water pollution.

The early water quality standards, which related to health, were aimed at improving domestic drinking water supplies. If a particular water source was used for drinking, it had to meet the quality standards or be treated in some fashion so that it would meet those standards. Responsibility for meeting the standards

Table 1–3 Water quality criteria (EPA 1986)

Color	For aesthetic purposes, water shall be virtually free from substances producing objectionable color. The source of the color should not exceed 75 color units in the standard platinum-cobalt scale for domestic water supply. Increased color (in combination with turbidity) should not reduce the depth of the zone of effective photosynthetic oxygen production by more than 10 percent from the seasonally established norm for aquatic life.
Dissolved oxygen	Water should contain sufficient dissolved oxygen to maintain aerobic conditions in the water column and, except as affected by natural phenomena, at the sediment-water interface for aesthetic purposes. A minimum concentration of dissolved oxygen to maintain good fish populations is 5 mg/L.
Fecal coliform bacteria	For bathing, swimming, and other body contact water recreation based on a minimum of five samples taken over 30 days, the fecal coliform bacteria should not exceed a log mean of 200 per 100 ml, nor should more than 10 percent of the total samples taken during any 30-day period exceed 400 per 100 ml; and The median fecal coliform bacteria concentration should not exceed 14 MPN (most probable number) per 100 ml with not more than 10 percent of samples exceeding 43 MPN per 100 ml for the harvesting of shellfish.
Nitrate (NO_3)	For health reasons, domestic water supplies should not have nitrate nitrogen concentrations exceeding 10 mg/L (for humans).
Nitrite (NO_2)	For heath reasons, domestic water supplies to be used by infants should not have nitrite nitrogen concentrations exceeding 1 mg/L.
Phosphorus	Criteria for phosphorus from the EPA 1986 reference are explained in chapter 3 of this handbook. See 651.0302(a)(2)(ii), Effects of phosphorus in the aquatic environment.
Solids and turbidity	For freshwater fish and other aquatic life, settleable and suspended solids should not reduce the depth of the zone of photosynthetic oxygen production by more than 10 percent from the seasonally established norm.

has typically been assigned to the user. In general, the burden of meeting standards is now moving from the water user to the potential water polluter. Water quality standards are now aimed at control of potential pollutants at the source. This change in focus, in part, has resulted in the use of standards for point sources based not only on pollutant concentrations in water, but also on the **best available technologies** for control of water pollution.

Standards for confinement feedlots and agricultural NPS pollution are technology-based and specify particular design or procedural practices. For example, NPDES permits required for confinement feedlots specify design and operation standards.

Design standards are also necessary in the definition of NPS water pollution control practices, particularly if they are structural. Procedural standards for pollution control may, for example, include such management practices as proper manure spreading or fertilizer management.

The provisions of section 303 of the 1972 Federal Water Pollution Control Act Amendments require that the State agency designated responsibility for water pollution control adopt water quality standards that have been submitted to EPA for approval.

State water quality standards are established for water uses for specific watercourses. The identification of specific water uses for watercourses is often referred to as stream classification. Stream classification is carried out by the States following State-defined procedures. The procedures generally consider:

- needs and desires of the public
- present and future demands on the watercourse
- cost of maintaining different stream qualities
- benefits expected under different control alternatives

Not all streams are classified, and those that are may not be classified in a straightforward manner. Wide variations in classification can occur along the same stream. Classification is done not only for streams, but for all natural watercourses.

Table 1–4 gives an example of a designated area classification system. Classification systems vary from State to State.

Each water use classification requires a specific quality of water. Therefore, once a designated area is classified for specific uses by the State agency responsible for water pollution control, water quality standards are defined for that area. In some cases, the pollutant assimilative capacity, water quality requirements, and other stream characteristics are not directly used in determining standards. In such cases, technology-based effluent standards are used. An example of these is the NPDES permits required of feedlot operations.

Table 1–4 Example of a designated area classification system

Class	Water uses
I	Sources of water supply for drinking or food processing purposes, requiring principally disinfection. Any other usage requiring water of lower quality.
II	Sources of water supply for drinking or food processing purposes, requiring treatment in addition to disinfection. Any other usage requiring water of lower quality.
III	Sources not used for drinking or food processing purposes, but used for swimming or other body contact recreation. Any other usage requiring water of lower quality.
IV	Sources not used for drinking or food processing purposes or body contact recreation, but used for fishing or other non-body contact recreation. Any other usage requiring water of lower quality.
V	Sources used only for agriculture or industrial supplies, fish survival, or navigation.

651.0108 Agricultural impacts on the use of water

(a) Agricultural waste and its impact on water use

The value of water lies in its usefulness for a wide variety of purposes, and the quality determines its acceptability for a particular use. Therefore, a quality problem occurs when water is contaminated to a level where it is no longer acceptable for a particular use. Water quality criteria are often used to determine acceptability. Potential water pollutants derived from agricultural waste can be classified as nutrients, oxygen-demanding materials, bacteria that indicate potential presence of pathogens, sediment, suspended or dissolved materials, and agrichemicals and other organic and inorganic materials.

For water quality parameters to have meaning, they must be related to one or more beneficial uses of water. The uses include domestic, industrial, and agricultural water supplies; swimming, fishing, boating, and other forms of recreational use; and commercial navigation. Agricultural wastes are not likely to adversely affect commercial navigation.

(b) Impacts on domestic water supplies

Although only a very small amount of the water taken for domestic purposes is used for drinking, it is because of this use that domestic water is of the utmost concern and has the most stringent quality requirements.

Water withdrawn from surface watercourses for domestic or municipal supply is almost always treated to some degree to remove contaminants. In the case of individual home water supplies, this treatment might only involve chlorination to destroy pathogens or other organisms. Municipal water supplies are generally treated more extensively. Water quality concerns for domestic supplies should never be taken lightly. Failure of supplies to meet standards for even short periods of time can result in serious illness.

Quality requirements for domestic drinking water are determined by the EPA and, in some instances, include modifications and additions from the State health department. Water quality regulations for domestic supplies can be divided into two categories: primary standards related to health concerns and secondary standards pertaining to aesthetic interests.

Health associated regulations often relate to toxic levels of artificial and natural substances. Under the 1986 amendments to the Safe Drinking Water Act, the EPA set primary standards for 83 contaminants. Some of the substances that are associated with agriculture include nitrate, bacteria, selenium, lindane, toxaphene, 2–4D, aldicarb, alachlor, carbofuran, simazine, atrazine, picloram, dalapon, diquat, and dinoseb. Those regulations aimed primarily at aesthetics include such substances as foaming agents, pH, and total dissolved solids.

The primary and secondary standards for drinking water for specific constituents are listed in table 1–5.

Table 1–5 Selected primary and secondary drinking water standards as specified by the EPA

Constituent	Maximum allowed
Primary standards	
Inorganic chemicals	
Nitrate-nitrogen	10 mg/L
Selenium	0.045 mg/L*
Synthetic organic chemicals	
Lindane	0.0002 mg/L*
Toxaphene	zero*
Alachlor	zero*
Aldicarb	0.009 mg/L*
Carbofuran	0.036 mg/L*
Total coliform bacteria Total coliform no more than 1 coliform-positive sample/month for systems that analyze fewer than 40 samples/month, and no more than 5 percent of samples positive if system analyzes more than 40 samples/month	
Fecal coliform bacteria	zero*
Secondary standards	
Color	15 units
Foaming agents	0.5 mg/L
Odor numbers	3 threshold odor
Total dissolved solids	500 mg/L

* EPA units under 1986 Safe Drinking Water Act Amendments.

Surface water, especially streams, often contains many complex mixes of pollutants that are difficult to remove because levels vary widely over time. Therefore, the 1986 Safe Drinking Water Act Amendments require that all public drinking supplies from surface water undergo filtration and disinfection treatment.

Ground water, however, tends to maintain a quality that remains relatively constant over time and some substances are not present or occur only at low levels. Soil filtration removes most turbidity, color, and microorganisms, and some chemicals can be absorbed by the soil. Because of the natural purification of water as it percolates through soil, ground water is often used as a domestic supply with little treatment. However, ground water monitoring programs have recently increased because of the growing concern that this water supply source may not always be as safe as previously assumed. One of the primary problems of using ground water for domestic purposes is the lack of localized water quality information. Furthermore, localized ground water quality can be radically affected by a local source of contaminant, such as nitrate from confined livestock or other NPS.

Some of the constituents in deep ground water aquifers are associated with agricultural chemicals, but generally not livestock waste. Nitrate is the primary constituent that can pollute ground water and have manure as its source. Water contaminated by nitrate can be treated with an ion exchange process to remove the contaminant, but this can be an expensive process and is not practical for many areas.

Under certain situations livestock waste can be a source of ground water pollution other than nitrate contamination. For example, shallow aquifers that supply dug wells can be contaminated by animal waste. Aquifers overlain by porous materials, such as gravel or some types of limestone, allow pollutants to be easily transported to the ground water. In some cases, poorly designed or constructed wells or earthen manure storage ponds can be the cause of ground water contamination from livestock waste.

(c) Impacts on industrial water supplies

Industry uses water for a wide variety of purposes, so it is not surprising that water quality requirements for industry also vary widely. Several broad categories of industrial water uses include separation processes, transport of materials, cooling, chemical reactions, and product washing.

Food processing industries are of particular concern because water used to wash food influences the quality of the final product. Water quality of the supply source, however, is less important for most industrial uses than for domestic or other uses because industry possesses the technology to treat water to acceptable levels. Because this treatment can be quite expensive, however, guidelines for upper limits or concentrations of selected constituents in water supplies for some industrial uses are identified. This allows industries to treat only to the acceptable level. Table 1–6 lists the maximum allowable concentrations of constituents in raw water supplies for several industrial operations as determined by the National Academy of Sciences (1974).

Table 1–6 Maximum allowable concentrations of selected constituents in raw water supplies for industrial use (mg/L)

Constituent	Petroleum	Chemical	Paper	Textile	Cooling water
Ammonia	40	—	—	—	—
Nitrate	8	—	—	—	30
Dissolved solids	3,500	2,500	1,000	150	1,000
Suspended solids	5,000	10,000	—	1,000	5,000
Color	25	500	360	—	—

(d) Impacts on agricultural uses

Farms require a domestic water supply in addition to water used for a variety of other purposes. Livestock farmers are especially concerned with water quality for health and product quality reasons (especially milk).

A water supply that is both potable (safe to drink) and palatable (nice to drink) is most desirable for livestock consumption, although the water generally does not need to be as pure as that for human consumption. Livestock farmers must be particularly careful that the farm water supply does not become contaminated by the livestock waste. Surface ponds or tanks to which livestock have ready access are always potential candidates for contamination.

The quality of water needed for livestock consumption varies with the type and age of animals. In general, young animals are less tolerant of water that has high nitrate or fecal coliform levels. Some animals, primarily lactating ones, have a relatively high daily intake of water as compared to their body weight. The daily intake for lactating cows, for instance, may be 25 to 35 gallons of water. High water intake increases the risk of health problems resulting from poor water quality. Table 1–6 gives recommended limits of concentrations of some potentially toxic substances in drinking water for livestock. Those substances that originate on livestock farms and that often contaminate livestock water supplies include nitrates, bacteria, organic materials, and suspended solids.

Nitrate-nitrogen standard for human consumption is 10 milligrams per liter. No standards for livestock are established, but it is generally accepted that nitrate-nitrogen levels of over 100 milligrams per liter can adversely affect the growth and health of livestock. Most young animals should be given water in which the nitrate level is much lower than 100 milligrams per liter. The size of the animal generally affects their sensitivity to nitrate-nitrogen. For example, poultry are less tolerant to nitrate-nitrogen than swine, which are less tolerant than cattle.

Fecal coliform count should be essentially zero for calves and less than 10/100 milliliters for adult animals. A high level of suspended solids and objectionable taste, odor, and color in water can cause animals to drink less than they should. Refer to tables 1–7, 1–8, and 1–9 for specific guidance.

Water used to wash food products or food handling equipment at the farmstead, including dairy utensils, must be contaminant free (potable water appropriate for domestic supply).

Irrigation, the largest consumptive use of water nationally, requires a water supply that does not contain substances that adversely affect plant growth. Typically, livestock waste is not the source of any waterborne

Table 1–7 Recommended limits of concentration of some potentially toxic substances in drinking water for livestock (based on Carson 1981)

Substance	Safe upper limit of concentration (mg/L)	
	EPA*	NAS**
Aluminum	5.0	
Arsenic	0.02 (0.05)	0.2
Barium	(1.0)	***
Beryllium	No limit	
Boron	5.0	
Cadmium	0.05 (0.01)	0.05
Chromium	1.0 (0.05)	1.0
Cobalt	1.0	1.0
Copper	0.5 (1.0)	0.5
Fluoride	2.0	2.0
Iron	No limit (0.3)	***
Lead	0.1 (0.05)	0.1
Manganese	No limit (0.05)	***
Mercury	0.001 (0.000144)	0.01
Molybdenum	No limit	***
Nickel	(0.6)	1.0
Nitrate-N	100 (10.0)	100.0
Nitrite-N		10.0
Selenium	0.05 (0.01)	
Vanadium	0.1	0.1
Zinc	25.0 (5.0)	25.0

* EPA (standards for human drinking water are shown in parenthesis)
** National Academy of Sciences
*** Not established/no limit. Experimental data available are not sufficient to make definite recommendations

Table 1–8 Desired and potential problem levels of pollutants in livestock water supplies*

Substances	Desired range	Problem range
Total bacterial/100 ml	<200	>1,000,000
Fecal coliform/100 ml	<1	>1 for young animals; >10 for older animals
Fecal strep/100 ml	<1	>3 for young animals; >30 for older animals
pH	6.8–7.5	<5.5 or >8.5
Dissolved solids mg/L	< 500	>3,000
Total alkalinity mg/L	<400	>5,000
Sulfate mg/L	<250	>2,000
Phosphate mg/L	<1	**
Turbidity Jackson units	<30	**

* Based on research literature and field experience in northeastern United States
** Not established

Table 1–9 Effect of salinity of drinking water on livestock and poultry (Water Quality Criteria 1972)

Soluble salt (mg/L)	Effect
<1,000	Low level of salinity; present no serious burden to any class of livestock or poultry
1,000 to 2,999	Satisfactory for all classes of livestock and poultry; may cause temporary, mild diarrhea in livestock; and water droppings in poultry at higher levels; no effect on health or performance
3,000 to 4,999	Satisfactory for livestock; may cause temporary diarrhea or be refused by animals not accustomed to it; poor water for poultry causing watery feces and, at high levels, increased mortality and decreased growth (especially in turkeys)
5,000 to 6,999	Reasonable safety for dairy and beef cattle, sheep, swine, and horses; avoid use for pregnant or lactating animals; not acceptable for poultry, causes decreased growth and production or increased mortality
7,000 to 10,000	Unfit for poultry and swine; risk in using for pregnant or lactating cows, horses, sheep, the young of these species, or animals subjected to heavy heat stress or water loss; use should be avoided, although older ruminants, horses, poultry, and swine may subsist for long periods under conditions of low stress
>10,000	Risks are great; cannot be recommended for use under any conditions

substances that would harm crop growth unless excessive amounts of wastes are applied. Manure provides nutrients needed for plant growth. Very high levels of nitrate (100 to 500 mg/L) can cause quality problems for certain crops that are irrigated by sprinkler systems. High coliform concentrations in water applied to fruits or vegetables to be marketed without further processing can also be a problem. Livestock can be the source of suspended matter and, indirectly, algae, both of which can interfere with the operation of sprinkler and trickle irrigation systems. In arid regions, soils that are already high in salts can have this condition aggravated by land application of livestock waste.

(e) Impacts on recreation

Kinds of water-based recreation vary, and each has slightly different water quality requirements. For example, swimmers generally prefer crystal clear water, but fishermen prefer that the water have some plant and algae growth, which promotes fish production. Many water quality requirements for recreational uses are highly qualitative and vary from one use to another and even from one user to another. Water-based recreation can be broadly separated into contact and noncontact activities. Obviously, the contact activities present greater health concerns, which relate primarily to disease-causing microbes. Requirements for noncontact recreational activities are similar to those for promotion of aquatic life and aesthetic considerations.

Typically, the acceptability of water for contact recreation is determined by measuring the level of an "indicator organism," such as fecal coliform bacteria, that denotes the likely presence or absence of other potentially harmful organisms. The degree of risk involved is associated with the level at which the organisms are present. Indicator organisms are used because the actual disease-causing organisms are extremely difficult to routinely measure. See table 1–3 for criteria for fecal coliform bacteria.

Surveys for E. coli and enterococci bacteria can be conducted if more rigorously investigated bacterial status of bathing waters is desired. For freshwater bathing, the geometric mean of bacterial densities for E. coli should not exceed 126 per 100 milliliters, or 33 per 100 milliliters for enterococci. For marine water bathing, the geometric mean of enterococci bacteria densities should not exceed 35 per 100 milliliters. Sufficient numbers of samples, generally not less than five spaced equally over a 30-day period, should be gathered and a confidence level applied to the test results according to the intensity of use of the water. This should be accomplished before making a final judgment about the acceptability of the water for bathing purposes.

(f) Impacts on aesthetics

Manure and other waste associated with livestock production can be important sources of aesthetic degradation. For example, they can be the source of objectionable deposits, floating scum, bad odors, and nutrients that promote growth of nuisance aquatic life. Local regulations are often aimed at maintenance of aesthetic quality of watercourses.

To maintain aesthetic water quality, all water should be free from substances that:

- settle to form objectionable deposits
- float as debris, scum, or other matter to form nuisances
- produce objectionable odor, color, taste, or turbidity
- injure, are toxic, or produce adverse physiological responses in humans, animals, or plants
- produce undesirable or nuisance aquatic life

651.0109 References

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