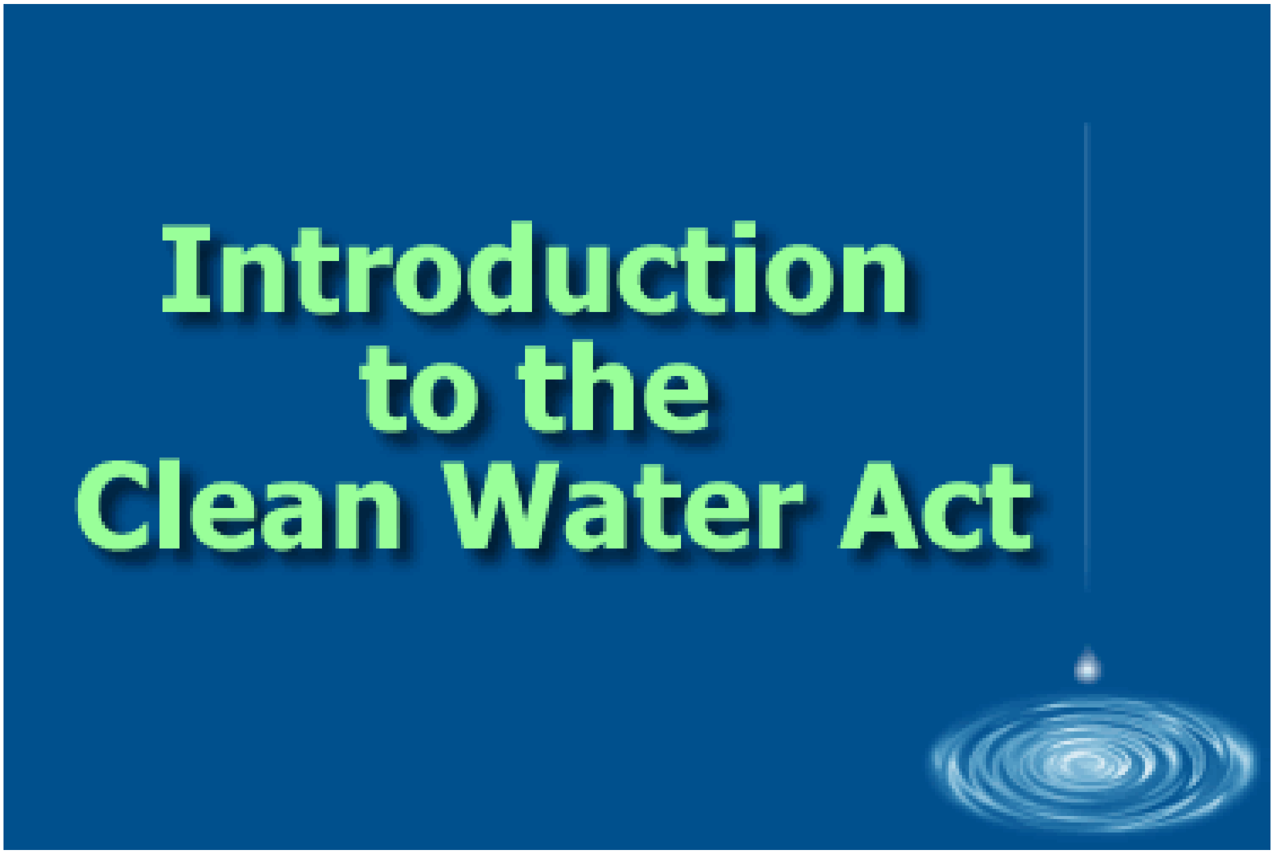
U.S. Environmental Protection Agency

Watershed Academy Web

Distance Learning Modules on Watershed Management
http://www.epa.gov/watertrain



NOTICE: This PDF file was adapted from an on-line training module of the EPA's ***Watershed Academy Web***, found at http://www.epa.gov/watertrain. To the extent possible, it contains the same material as the on-line version. Some interactive parts of the module had to be reformatted for this non-interactive text presentation. Review questions are included at the end of the file as a self-test.

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Introduction to the Clean Water Act

The Clean Water Act (CWA) is the cornerstone of surface water quality protection in the United States. (The Act does not deal directly with ground water nor with water quantity issues.) The statute employs a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

For many years following the passage of CWA in 1972, EPA, states, and Indian tribes focused mainly on the chemical aspects of the "integrity" goal. During the last decade, however, more attention has been given to physical and biological integrity. Also, in the early decades of the Act's implementation, efforts focused on regulating discharges from traditional "point source" facilities, such as municipal sewage plants and industrial facilities, with little attention paid to runoff from streets, construction sites, farms, and other "wet-weather" sources.

Starting in the late 1980s, efforts to address polluted runoff have increased significantly. For "nonpoint" runoff, voluntary programs, including cost-sharing with landowners are the key tool. For "wet weather point sources" like urban storm sewer systems and construction sites, a regulatory approach is being employed.

Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach.

Web Resources

The entire text of the CWA can be found at: http://www.epa.gov/r5water/cwa.htm

CWA: The Big Picture

Figure 1 provides further details on what will be discussed in this module.

This module goes through the major CWA programs in the following sequence:

1) water quality standards,
2) antidegradation policy,
3) waterbody monitoring and assessment,

4) reports on condition of the nation's waters,
5) total maximum daily loads (TMDLs),
6) NPDES permit program for point sources,
7) Section 319 program for nonpoint sources,
8) Section 404 program regulating filling of wetlands and other waters;
9) Section 401 state water quality certification;
10) state revolving loan fund (SRF).

Throughout the module, terms in bold and underlined may be found in the glossary at the end of this document. This course may take several hours to complete. Students may vary the depth of the course by choosing to focus on particular sub-sections of this module. Also, throughout the module, links to other websites are provided that cover particular programs or topics in detail. These are strictly optional, and not essential to understanding the basics of the CWA. Exploring these additional informational resources can easily double or triple the amount of time it takes to navigate this module.

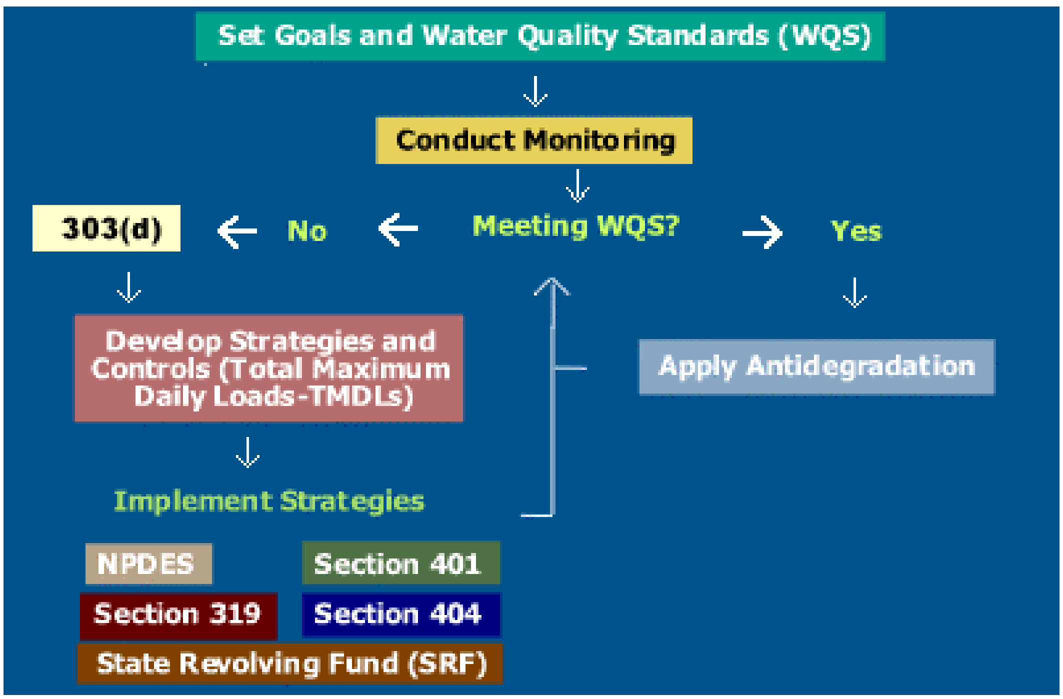


Figure 1

Brief Overview of Key CWA Elements

First, **<u>water quality standards (WQS)</u>** consistent with the statutory goals of the CWA must be established. Then waterbodies are monitored to determine whether the WQS are met.

If all WQS are met, then **<u>antidegradation</u>** policies and programs are employed to keep the water quality at acceptable levels. **<u>Ambient monitoring</u>** is also needed to ensure that this is the case.

If the waterbody is not meeting WQS, a strategy for meeting these standards must be developed. The most common type of strategy is the development of a **Total Maximum Daily Load (TMDL)**. TMDLs determine what level of pollutant load would be consistent with meeting WQS. TMDLs also allocate acceptable loads among sources of the relevant pollutants.

Necessary reductions in pollutant loading are achieved by implementing strategies authorized by the CWA, along with any other tools available from federal, state, and local governments and nongovernmental organizations. Key CWA tools include the following:

- NPDES permit program
  Covers point sources of pollution discharging into a surface waterbody.
- Section 319
  Addresses nonpoint sources of pollution, such as most farming and forestry operations, largely through grants.
- Section 404
  Regulates the placement of dredged or fill materials into wetlands and other Waters of the United States.
- Section 401
  Requires federal agencies to obtain certification from the state, territory, or Indian tribes before issuing permits that would result in increased pollutant loads to a waterbody. The certification is issued only if such increased loads would not cause or contribute to exceedances of water quality standards.
- State Revolving Funds (SRF)
  Provides large amounts of money in the form of loans for municipal point sources, nonpoint sources, and other activities.

After implementation of these strategies, ambient conditions are again measured and compared to ambient water quality standards. If standards are now met, only occasional monitoring is needed. If standards are still not being met, then a revised strategy is developed and implemented, followed by more ambient monitoring. This iterative process must be repeated until standards are met.

Introduction to WQS

Water quality standards (WQS) are aimed at translating the broad goals of the CWA into waterbody-specific objectives. Ideally, WQS should be expressed in terms that allow quantifiable measurement (Figure 2). WQS, like the CWA overall, apply only to the waters of the United States. As defined in the CWA, "waters of the United States" apply only to surface waters–rivers, lakes, estuaries, coastal waters, and wetlands. Not all surface waters are legally "waters of the United States." Generally, however, those waters include the following:

- All interstate waters
- Intrastate waters used in interstate and/or foreign commerce
- Tributaries of the above
- Territorial seas at the cyclical high tide mark
- Wetlands adjacent to all the above

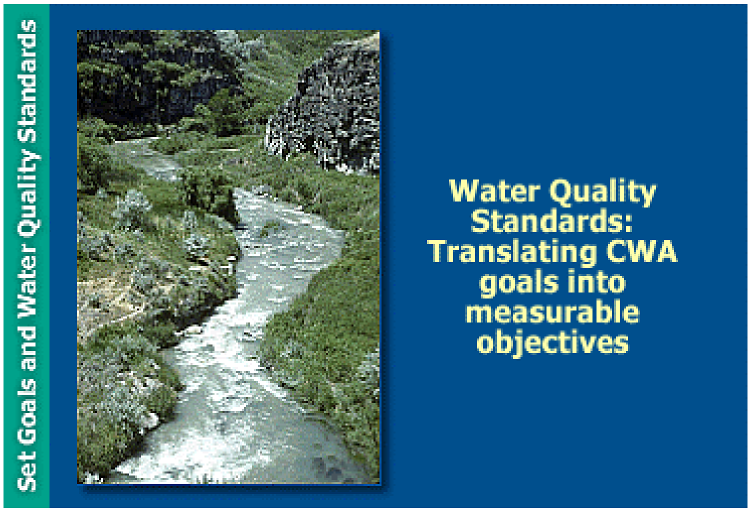


Figure 2

The exact dividing line between "waters of the United States" according to the CWA and other waters can be hard to determine, especially with regard to smaller streams, **ephemeral** waterbodies, and wetlands not adjacent to other "waters of the United States." In fact, the delineation changes from time to time, as new court rulings are handed down, new regulations are issued, or the Act itself is modified.

As indicated by the placement of WQS in all parts of the waterbody system illustrated in Figure 3, water quality standards should be set for all surface waters meeting the definition of "waters of the United States."

States, territories, and designated tribes can, using their own authorities, adopt standards for additional surface waters. Also, though the CWA does not require WQS for ground water, states, tribes, and territories can use their own authorities to set targets for ground water.

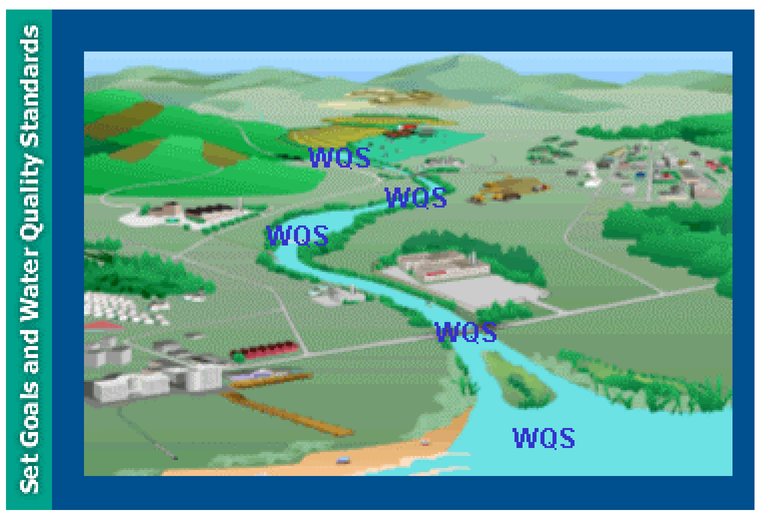


Figure 3

Designated uses, water quality criteria, and an antidegradation policy constitute the three major components of Water Quality Standards Program (Figure 4).

The designated uses (DUs) of a waterbody are those uses that society, through various units of government, determines should be attained in the waterbody. The DUs are the goals set for the waterbody. In some cases, these uses have already been attained, but sometimes conditions in a waterbody do not support all the DUs.

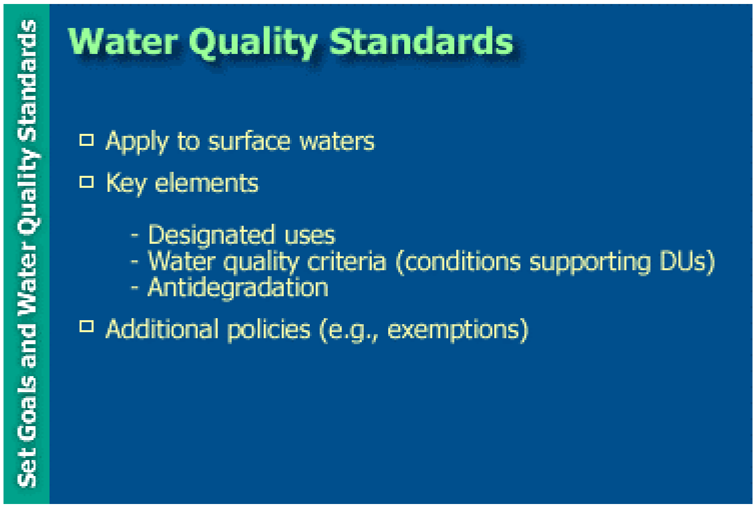


Figure 4

Water quality criteria (WQC) are descriptions of the conditions in a waterbody necessary to support the DUs. These can be expressed as concentrations of pollutants, temperature, pH, turbidity units, toxicity units, or other quantitative measures. WQC can also be narrative statements such as “no toxic chemicals in toxic amounts.”

Antidegradation policies are a component of state/tribal WQS that establish a set of rules that should be followed when addressing proposed activities that could lower the quality of high quality waters, that is, those with conditions that exceed those necessary to meet the designated uses.

To understand the regulations that apply to designating uses under WQS, several key terms must be defined (Figure 5). As noted previously, a designated use is a use specified in water quality standards for each waterbody whether or not they are being attained (it might be helpful to think of these as desired uses).

The term “existing use” has a somewhat different meaning, in the context of the CWA, than one might expect. Rather than actual or current uses, it refers not only to those uses the waterbody is capable of supporting at present but also any use to which the waterbody has actually attained since November 28, 1975. Even if the waterbody is currently not supporting a use attained since November 28, 1975, for purposes of the CWA, it is still an “existing use.” (Even if there has been no documentation that a use has occurred since November 28, 1975, evidence that water quality has been sufficient to support a given use at some time since November 28, 1975 can be the basis for defining an “existing use” for a waterbody.)

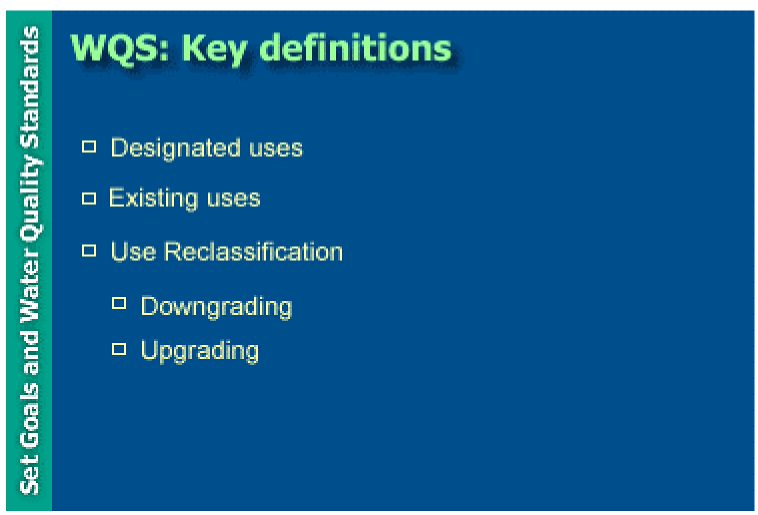


Figure 5

The process of changing a use designation is called use reclassification. The terms downgrading and upgrading are sometimes used in this context. Removing a designated use and replacing it with a “lower” use is often referred to as “downgrading”. “Upgrading” is just the reverse. It is important to note, however, that in the parlance of the CWA, the difference between a “higher” and “lower” use is a reflection of the quality of water needed to support each use. Those uses needing cleaner water are considerably "higher." The terms "high" and "low" are not intended to suggest that one use of a waterbody (fishing, for example) is inherently more important than another (industrial water supply, for example). Hence, removing from the designated uses of a waterbody one that required an average daily concentration of pollutant "x" of 20 mg/L or less, so that the next highest use was one needing concentrations of 30 mg/L or less would be a "downgrading."

Typically, the DUs assigned to a waterbody reflect the public's answer to the question, "To what uses do we, or might we want to, put this waterbody?" Answers might include: swimming, boating, water skiing, wind surfing, recreational fishing, commercial fishing, subsistence fishing, supporting communities of aquatic life, supplying water for drinking, irrigating crops and landscaping, and industrial purposes.

Commonly used use designations (Figure 6) include the following:

- Drinking water
  - Treated/untreated
- Water-based recreation
  - Noncontact/short-term/long-term
- Fishing/eating
- Aquatic life
  - Warm water species/habitat
  - Cold water species/habitat
- Agriculture water supply
- Industrial water supply

Figure 6

The terms listed in bold text are examples of subcategories of uses. For example, a water segment could be designated for "public drinking water supply (PWS)--no treatment before use." It could also be designated "PWS--treatment provided." If water from a river or lake goes through a filtration facility before being sent to a public water distribution system, then levels of certain pollutants in the raw water supply (river/lake) could be allowed to be higher than if no treatment occurred. The higher level in the raw water would be proportional to the degree to which the particular drinking water treatment plant removed that pollutant.

The subcategories under water-based recreation refer to the proportion of time in which someone engaging in certain types of activities would come into direct contact with the water. Noncontact uses would include riding in a large boat, for example. Short-term contact (that is, "secondary contact" or "partial body contact") might include jet skiing, speed boating and canoeing. Long-term contact (that is, "primary contact" or "whole body contact") would include snorkeling, swimming, kayaking and wind surfing. Obviously, it can be difficult to draw distinct lines between these different activities, because the extent of exposure can be affected by factors such as the skill of the recreationist and weather conditions. Nevertheless, such distinctions can be very important, as concentrations of pathogens and other key pollutants need to be lower in waters used for long-term contact activities than for short-term activities, if the health of users is to be protected adequately.

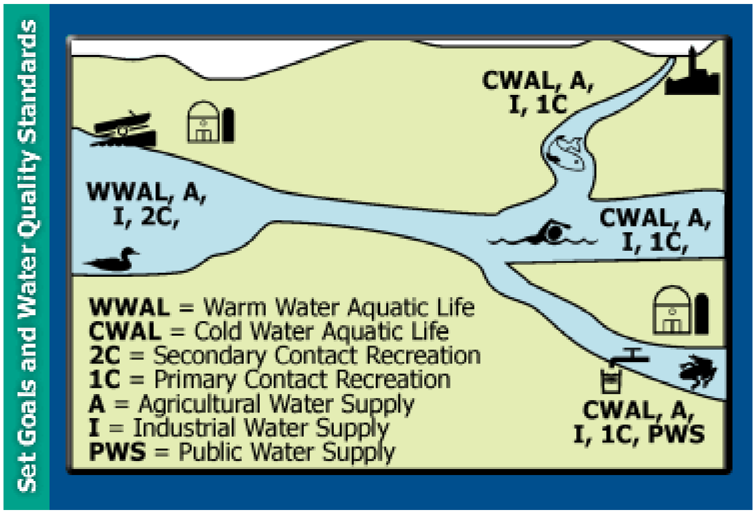


Figure 7

Warm water fisheries are those characterized by species of fish and other animals that can tolerate higher temperatures in the surrounding water than can species such as trout and salmon, whose body chemistry requires them to be in colder waters. Bass and perch are examples of warm water fish.

In general, different waterbodies, and different portions of a given waterbody, are assigned various combinations of the DUs (Figure 7). A given segment will almost always be classified for more than one DU.

Economic factors can be considered when setting the DU for a waterbody. In contrast, economics <u>cannot</u> be factored in when developing the WQC to protect a DU.

Figure 8 illustrates policies used in designating waterbodies. The first policy is that if a use is an "existing" use for a waterbody, then the waterbody must have that use in its designated uses (sometimes called use classifications). Remember, as noted previously, the term "existing use" has a special meaning in the context of water quality standards.

The second rule is simply a reflection of the CWA's "fishable/swimmable" goal (protection and propagation of fish, shellfish, and wildlife and recreation in and on the water), as articulated in EPA's regulations, which say that these uses should be designated for all waters, unless it is demonstrated that it is impractical to meet them. Only in those cases where the "downgrading" process has been followed (Figure 9) can these uses be excluded from the DUs for a waterbody.

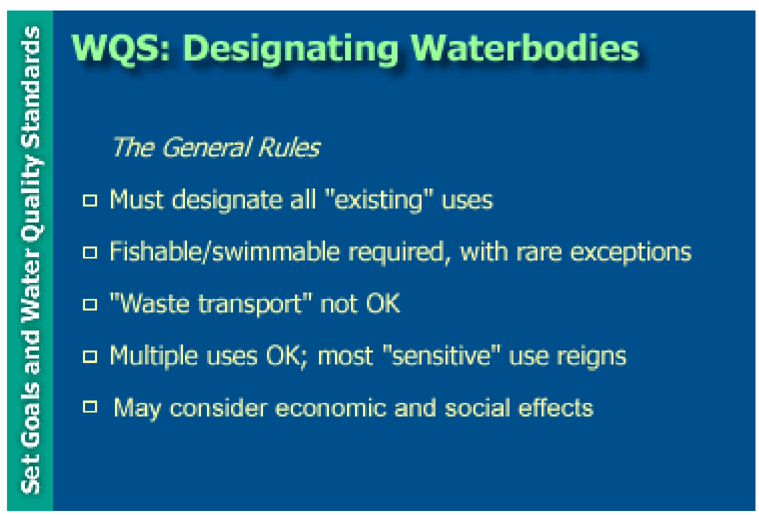


Figure 8

The third rule is that "waste transport" is not an acceptable DU, because in passing the 1972 CWA, Congress said that our nation's surface waters should no longer be used as waste conveyances or treatment systems.

The fourth rule has been covered above in the WQS: Designated Use Categories slide (Figure 6). When a waterbody has been classified for more than one DU, as is usually the case, regulatory activities and other programs are "driven" by the DU that requires the cleanest water. This is simply because if one DU requires a concentration of pollutant "x" of 50 mg/L or less and a second DU requires 25 mg/L, then meeting the second DU (and the corresponding WQC of 25 mg/L) automatically results in meeting the first DU and its corresponding WQC.

The last key rule regarding the setting of DUs is that economic and social factors can be considered, although this is not required. More specifics about this will be presented in the next slide, which deals with changing DUs.

EPA regulations prohibit the removal of an "existing" or actual use from the DUs for a waterbody. However, a DU that has not been attained may be removed under limited circumstances (downgraded) (Figure 9).

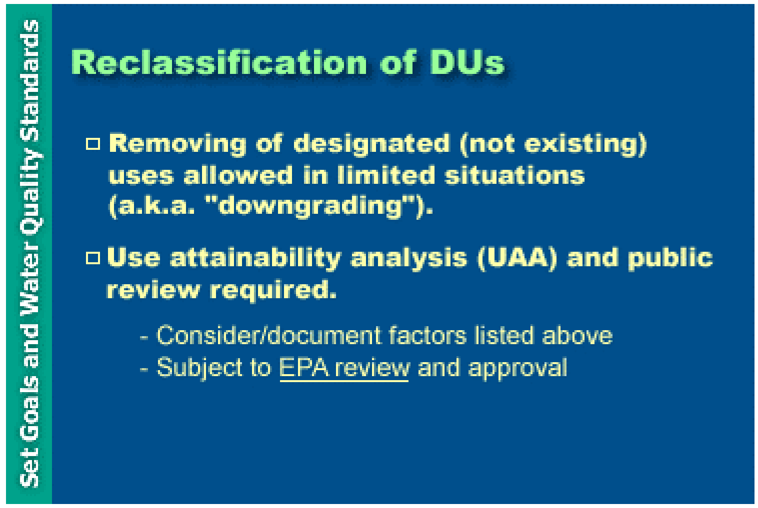


Figure 9

A key part of the process through which a state, territory, or tribe would enact a "downgrading" is called a use attainability analysis (UAA). In the UAA, the state would have to demonstrate that one or more of a limited set of situations exists.

First, it must be shown that the current DU cannot be achieved through implementation of: (1) applicable technology-based limits or point sources and (2) cost-effective and reasonable best management practices (BMPs) for nonpoint sources.

If it has been shown that DUs can't be met with the above measures, then another set of other factors should be considered. These factors are as follows:

- natural background conditions prevent attainment.
- irreversable human-caused conditions prevent attainment.
- what is needed to attain the DU would cause substantial environmental damage.
- achieving the use would involve widespread social and economic costs.

If a UAA indicated that conditions for authorizing a removal of one or more DU existed, the UAA and the accompanying proposal to downgrade a DU must go through the public review/participation process that is required for any change in a WQS and must be approved by EPA.

EPA has provided some guidance on the meaning of key terms such as "substantial and widespread social and economic costs," particularly as it relates to "point source" dischargers such as municipal sewage treatment plants and industrial facilities.

Web Resources

For more details on Use Attainability Analysis and economic impact analysis check: http://www.epa.gov/ost/econ/.

Some indication of how EPA might interpret the language regarding nonpoint sources can be obtained by looking at the guidance it has issued with regard to the nonpoint source provisions of the Coastal Zone Management Act. Additional, more recent, EPA guidance on management measures applicable to forestry and agriculture is also available

Web Resources

Details of the guidance on management measures for the Coastal Zone Management Act: http://www.epa.gov/owow/nps/MMGI/

The web site detailing guidance on Forestry is: http://www.epa.gov/owow/nps/forestrymgmt/

The website detailing guidance on Agriculture is: http://www.epa.gov/owow/nps/agmm/.

However, one must remember that the U.S. EPA has no regulatory authority over nonpoint sources, so it could not force a state to require that these BMPs be applied by normal farming operations or other nonpoint sources.

Water Quality Criteria (WQC) are levels of individual pollutants or water quality characteristics, or descriptions of conditions of a waterbody that, if met, will generally protect the designated use of the water. For a given DU, there are likely to be a number of criteria dealing with different types of conditions, as well as levels of specific chemicals. Since most waterbodies have multiple DUs, the number of WQC applicable to a given waterbody can be very substantial (Figure 10).

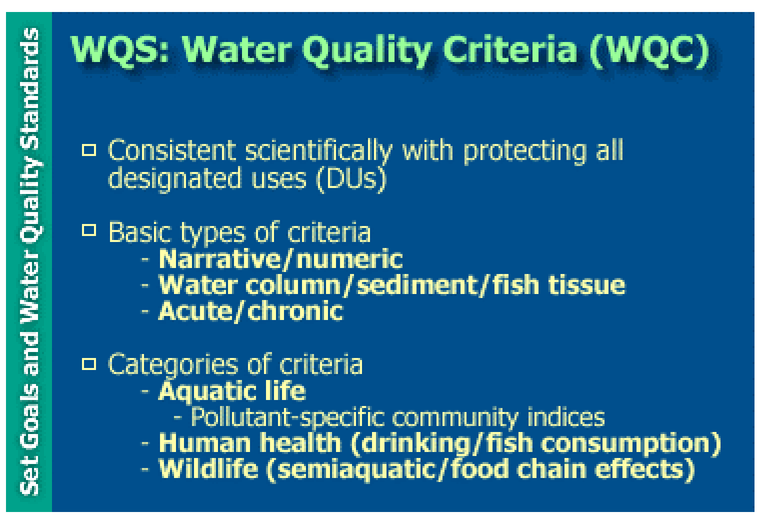


Figure 10

Water quality criteria must be scientifically consistent with attainment of DUs. This means that only scientific considerations can be taken into account when determining what water quality conditions are consistent with meeting a given DU. Economic and social impacts are not considered when developing WQC.

WQC can be divided up for descriptive purposes in many ways. For instance, numeric criteria (weekly average of 5 mg/L dissolved oxygen) can be contrasted with narrative criteria (no putrescent bottom deposits). Criteria can also be categorized according to what portion of the aquatic system they can be applied to: the water itself (water column), the bottom sediments, or the bodies of aquatic organisms (fish tissue). The duration of time to which they apply is another way of dividing WQC, with those dealing with short-term exposures (acute) being distinguished from those addressing long-term exposure (chronic).

Criteria can also be distinguished according to the types of organisms they are designed to protect. Aquatic life criteria are aimed at protecting entire communities of aquatic organisms, including a wide array of animals and various plants and microorganisms. These can be expressed as parameter specific (daily average of 30 ug/L of copper) or in terms of various "metrics" that directly measure numbers, weight, and diversity of plants and animals in a waterbody (community indices).

Human health criteria can apply to two exposure routes: (1) drinking water and (2) consuming aquatic foodstuffs.

Wildlife criteria, like human health/fish consumption criteria, deal with the effects of pollutants with high **bioaccumulation** factors. To date, EPA has issued and/or adopted fewer wildlife criteria than aquatic life or human health criteria. Such criteria are designed to protect terrestrial animals that feed upon aquatic species. Examples are ospreys, herons and other wading birds, and mink and otters.

Most state/tribal WQS require that all surface waters be free from the following:

- Putrescent or otherwise objectionable bottom deposits
- Oil, scum, and floating debris in amounts that are unsightly
- Nuisance levels of odor, color, and other conditions
- Undesirable or nuisance aquatic life
- Substances in amounts toxic to humans or aquatic life

It is not always easy to translate these rather subjective descriptions into quantitative measures. EPA guidance can be found in chapter 3, section 3.5.2, page 3-24, of the EPA *Water Quality Standards Handbook.*

Web Resources

The EPA *Water Quality Standards Handbook* is available in PDF format, (4.4MB, 46 pages) at: http://www.epa.gov/waterscience/standards/handbook/handbookch3.pdf

"No toxics in toxic amounts" does lend itself to quantitative measurement. Toxicity testing, one way to translate this narrative into a quantitative measure, will be covered later in this module.

Narrative criteria are usually applicable to all waterbodies, regardless of their use designations (Figure 11).

Numeric criteria are usually parameter specific -- they express conditions for specific measures, such as dissolved oxygen, temperature, turbidity, nitrogen, phosphorus, heavy metals such as mercury and cadmium, and synthetic organic chemicals like dioxin and PCBs. They do not consist merely of stated levels/concentrations, such as 15 ug/L or a pH above 5.0. They should also specify the span of time over which conditions must be met. This is the "duration" component of a WQC. Combining the concentration/magnitude and duration components of a WQC results in wording such as "the average 4-day concentration of pollutant X shall not exceed 50ug/L".

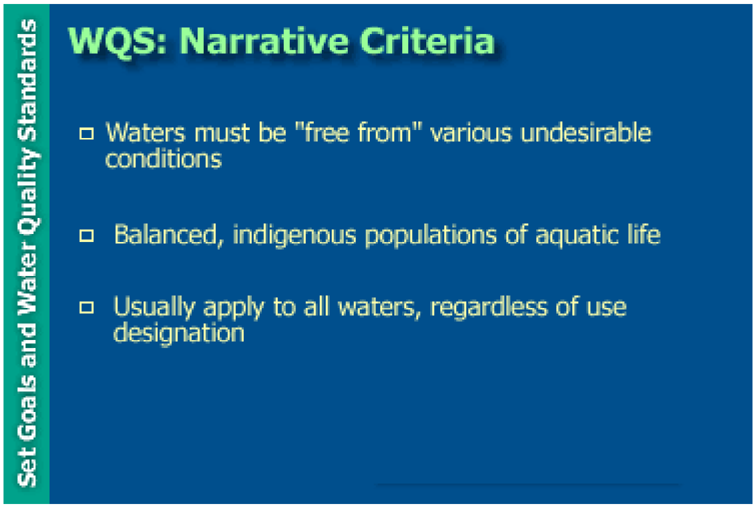


Figure 11

A numeric WQC should also indicate how often it would be acceptable to go beyond specified concentration/duration combinations. This is often called the frequency or the recurrance interval component of the WQC. For instance, for protection of aquatic life, as a general rule, EPA recommends a recurrance interval of once in 3 years. The purpose of the recurrance interval is to recognize that aquatic ecosystem can recover from impacts of exposure to harmful conditions, but to make such conditions sufficiently rare as to keep the community of aquatic organism from being in a constant state of recovery (Figure 12).

Simply because one sample has exceeded the concentration component of a WQC does not necessarily mean the WQC has been violated and a designated use affected. This is true only in the case of "instantaneous criteria" -- levels that are never to be exceeded. But if there was a criterion of 50 mg/L of "x," for a 7-day average, then having one sample at a concentration above 50 mg/L would not "prove" that this criterion had actually been exceeded. Likewise, having just one or two samples below 50 mg/L is not a good basis for concluding a waterbody is indeed meeting WQS.

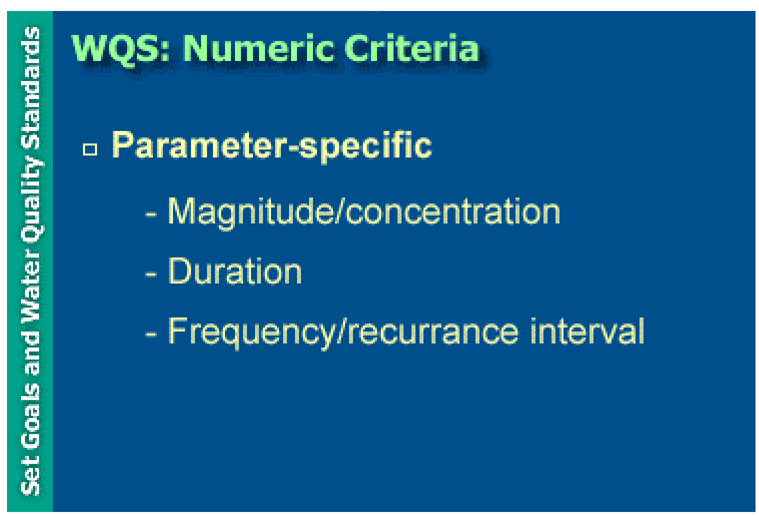


Figure 12

EPA publishes recommended water quality criteria corresponding to a number of key designated uses. For aquatic life uses, criteria for both short-term (acute) and long-term (chronic) exposures are provided. Different criteria for freshwater systems and marine (saline) systems are often provided. Most human health criteria, except certain pathogens, address chronic exposures.

Web Resources
Check the USEPA Office of Science and Technology Water Quality Standards web site: http://www.epa.gov/waterscience/standards/.

States, tribes, and territories are not required to adopt the exact numbers that EPA has published, but once EPA has issued a criterion for a parameter, they must adopt a corresponding criterion. Such criteria must provide the same level of protection as EPA's, and state/tribe must document that this is the case (Figure 13).

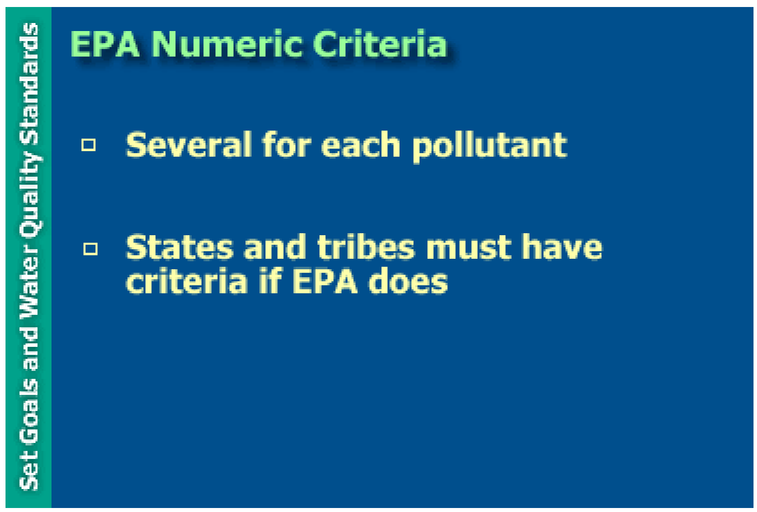


Figure 13

Figure 14 illustrates several basic principles regarding WQC. Note that the toxicity of pollutants differs depending on whether they are in fresh or salt water environments. However, there is no predictable pattern as to whether a pollutant is more or less toxic in fresh vs. salt water (copper is more toxic in marine water, cadmium in fresh water).

On the other hand, the chronic criterion for a pollutant is always more stringent than the acute criterion, as shown by the cadmium numbers in figure 14. This is because of the well-known fact that long-term exposure to lower concentrations of contaminants can cause exactly the same negative effects as short-term exposure to much higher pollutant levels.

Finally, figure 14 illustrates the fact that the form (or species) a pollutant is in changes its toxicity. Hexavalent chromium is much more toxic than trivalent chromium.

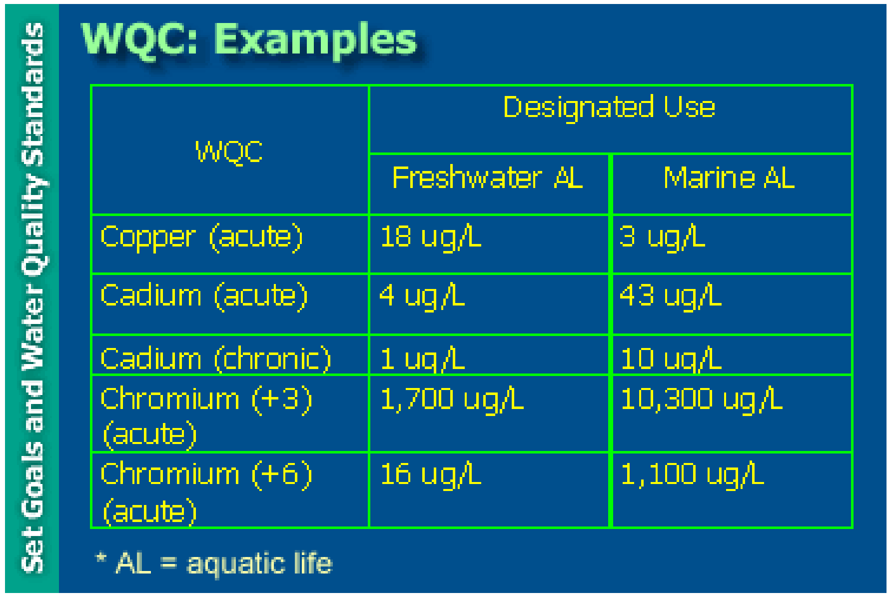
The following table (Figure 15) is another illustration of how environmental conditions can affect the impact of a pollutant in aquatic life. As the temperature of the water increases, the toxicity of ammonia (NH3) also goes up -- the criterion gets "lower." To further complicate matters, the acidity (pH) of the water also affects the toxicity of ammonia.

EPA is currently developing and issuing technical guidance that can be used to help set WQC for nutrients (nitrogen, phosphorus)

Web Resources

The USEPA Office of Science and Technology Web site on Nutrient Criteria: www.epa.gov/ost/standards/nutrient.html.

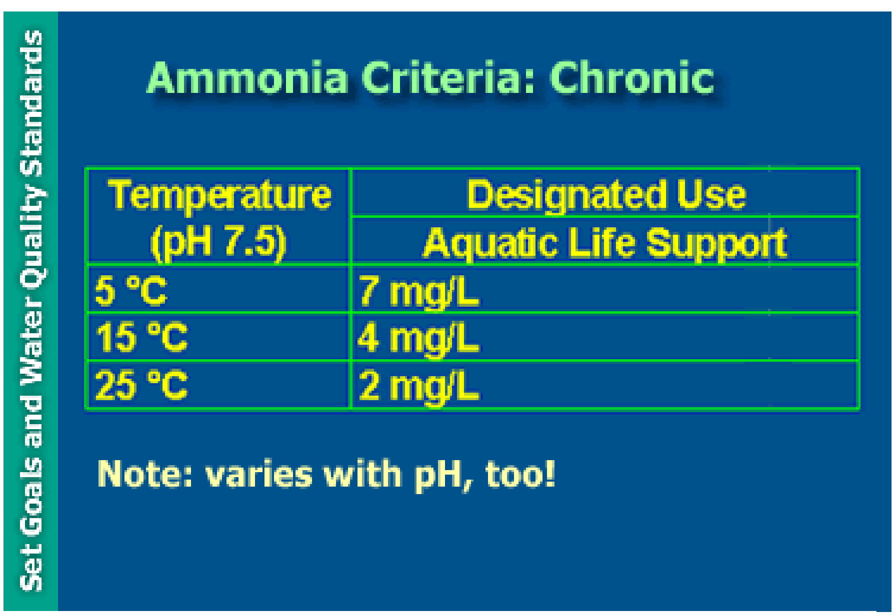
Biological criteria apply only to aquatic life designated uses. The use of biological or ecological assessments requires spending considerable time in the field collecting organisms and other data. Various techniques focus on different kinds of organisms, such as fish, large invertebrates, and/or plants.



WQC	Designated Use	
	Freshwater AL	Marine AL
Copper (acute)	18 ug/L	3 ug/L
Cadium (acute)	4 ug/L	43 ug/L
Cadium (chronic)	1 ug/L	10 ug/L
Chromium (+3) (acute)	1,700 ug/L	10,300 ug/L
Chromium (+6) (acute)	16 ug/L	1,100 ug/L

Figure 14

Once the target types of organisms have been collected, they are sorted into easily identifiable groups, usually to the family level, rather than genus or species. These are then quantified according to a variety of measures, each of which is used to indicate certain aspects of ecosystem health.



Temperature (pH 7.5)	Designated Use
	Aquatic Life Support
5 °C	7 mg/L
15 °C	4 mg/L
25 °C	2 mg/L

Figure 15

Examples of measures include **feeding guilds**, **trophic levels**, **generalists**, and **specialists**. As an example of how these metrics may be used as indicators of the health and integrity of an aquatic ecosystem, a waterbody that has mostly generalists is usually less healthy than those that have a substantial number of specialists. Likewise, a waterbody dominated by species that can tolerate very polluted conditions is generally less healthy than one dominated by pollution-intolerant species.

Symptoms of Impairment

- Larger percent of tolerant species
- Lower proportion of predators
- Higher number of generalists
- Greater proportion of exotics
- More disease, malformations, and lesions

Web Resources
The USEPA Office of Science and Technology Web site on bioassessment and biocriteria is: www.epa.gov/ost/biocriteria/index.html

The series of photos in Figure 16 shows how obvious the change in the mix of organisms can be as water quality goes from good to poor.

It is critical to recognize that bioassessments are not "absolute." The number of stonefly species that ecologists would say reflects "biological integrity" in one type of aquatic ecosystem would not necessarily be appropriate to apply to another type of waterbody. Hence, relatively unimpacted reference waterbodies for each major type of aquatic ecosystem in a state must be identified, and then the results of the biosurvey done in these waterbodies are compared with the results from surveys in other waterbodies of the same ecological category.

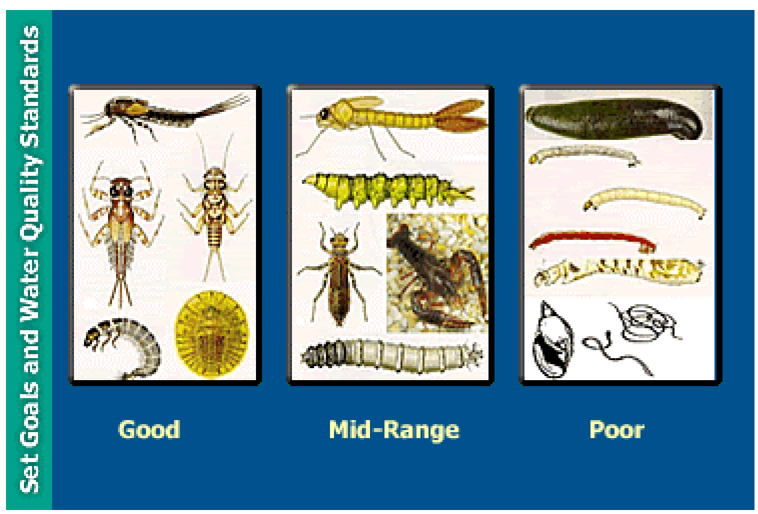


Figure 16

Around the country, citizen volunteers are collecting and interpreting biological data from streams and other waterbodies (Figure 17). EPA regulations give states, authorized tribes, and territories the flexibility to "waive" applicable WQS under certain circumstances. The two most common forms of exemptions are: (1) mixing zones and (2) stream design flows. Hence, mixing zones can be thought of as "spatial exemptions" and design flows as "temporal exemptions" (Figure 18).

Web Resources

The USEPA's Volunteer Monitoring Web site is: www.epa.gov/owow/ monitoring/vol.html

Mixing zones exempt certain portions of a waterbody from meeting applicable designated uses and water quality criteria. Such exemptions are usually employed "downstream" of point source discharges.

Figure 17

Sometimes mixing zones are divided into subzones (Figure 19). In the innermost zone, which is the zone closest to the discharge pipe, exceedance of both acute and chronic WQC may be allowed. In the outer zone, acute criteria must be met, but chronic criteria can be exceeded.

EPA policy holds that mixing zones should never extend from bank to bank in a river. There should always be a "zone of passage" in which all WQS are met. Likewise, an entire lake or reservoir should not be encompassed by a mixing zone.

Often, mixing zones are not allowed to overlap with important areas, such as popular swimming beaches, shellfish beds, and critical habitat for commercially, recreationally, or ecologically important species.

Figure 18

Design flow exemptions have also been employed primarily in the context of regulation of point sources. They waive applicability of WQS during certain periods, most commonly during extreme low flow events. Low flow exemptions are usually associated with relatively continuous discharges. Increasingly, waivers of WQS during extreme high flow events are being employed in association with municipal wet weather discharges -- combined sewer overflows, for example.

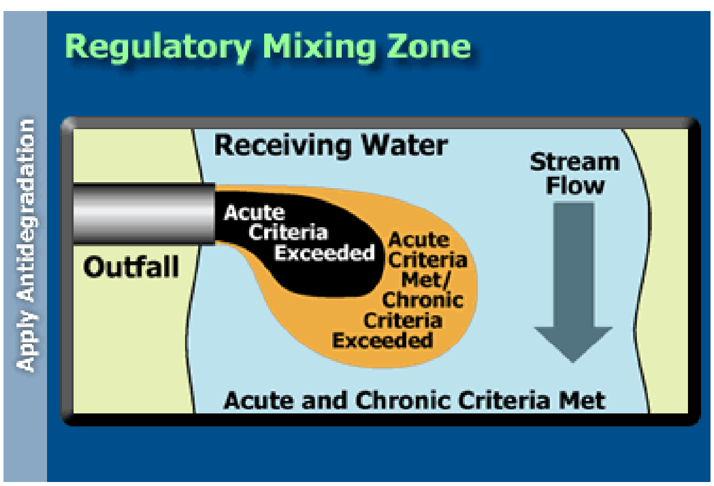


Figure 19

This bell-shaped curve in Figure 20 illustrates the basic idea of temporal WQS exemptions. Standards must be met in the vast majority of flow conditions. They are waived only during rare events, represented by the areas on the "outside" of the two dotted lines, each of which delineates one of the "tails" of the curve.

Such exemptions provide a means of avoiding the imposition of extremely high costs upon regulated discharges, as meeting WQS under any and all circumstances would likely be very expensive. Narrative WQC apply in all parts of the waterbody at all times.

Antidegradation

To protect the existing uses of waters, and to protect waters with water quality better than is necessary to meet the DU, a set of policies called "antidegradation" comes into play (Figure 21). The purpose of these policies is to keep clean waters clean. States, tribes, and territories usually cover this program as part of their water quality standards regulations.

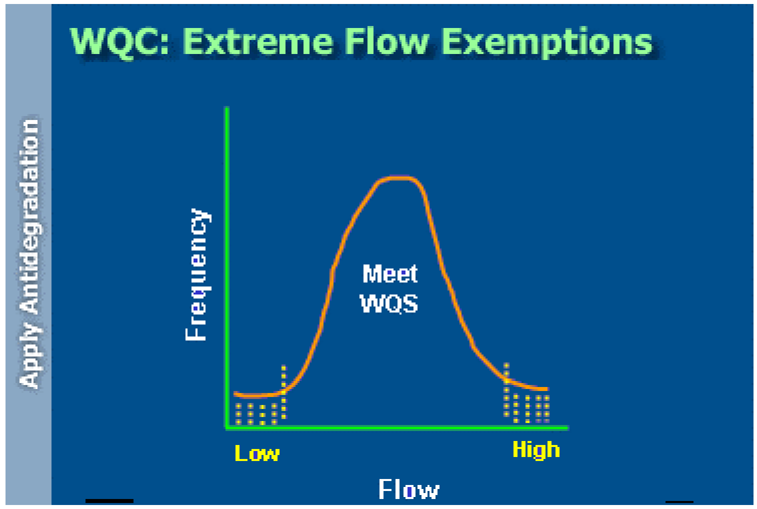


Figure 20

Antidegradation Policies

This component of water quality standards programs focuses on waters that are "better than standards" -- they have high water quality (Figure 22).

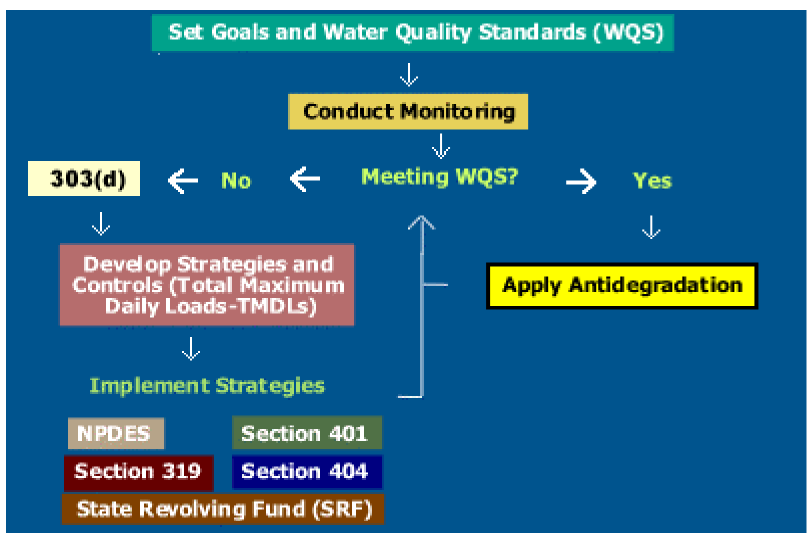


Figure 21

Antidegradation applies parameter by parameter in general. This means that if 6 designated uses are assigned to a waterbody, and 5 of those uses are impaired, antidegradation policies still apply to the protection of the 1 attained use. Likewise, if pollution levels are greater (worse) than the criteria for 28 of 30 parameters, antidegradation would still apply to the 2 parameters for which waterbody conditions are better than the criteria. Use attainment is not based solely on whether a given use is actually occurring but also on whether the conditions in the waterbody could fully support or protect the use.

Hence, a waterbody could have antidegradation apply to some uses and criteria, whereas a cleanup strategy, such as a Total Maximum Daily Load (TMDL) would be needed, for others (Figure 23).

Figure 22

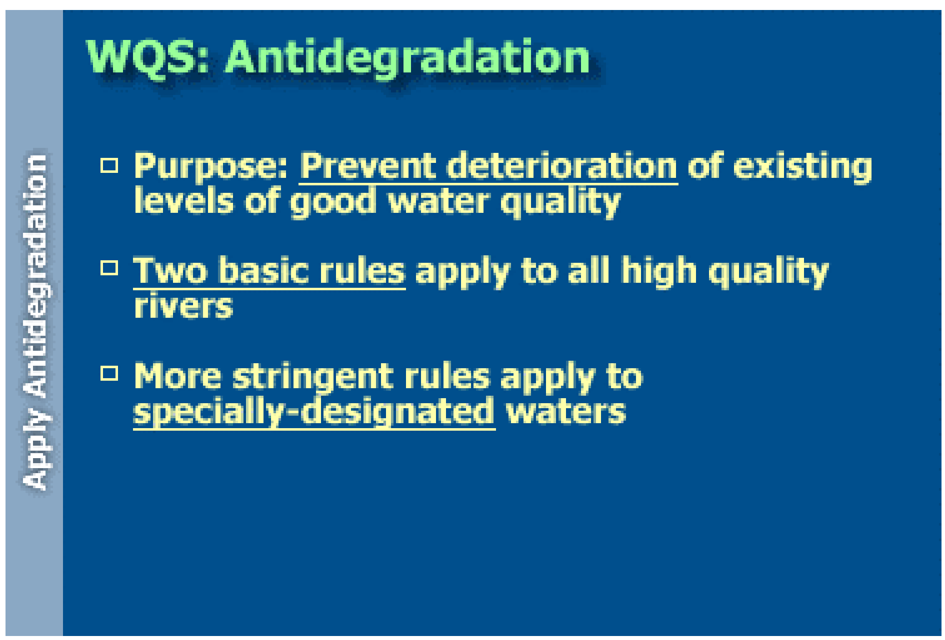


Figure 23

Antidegradation

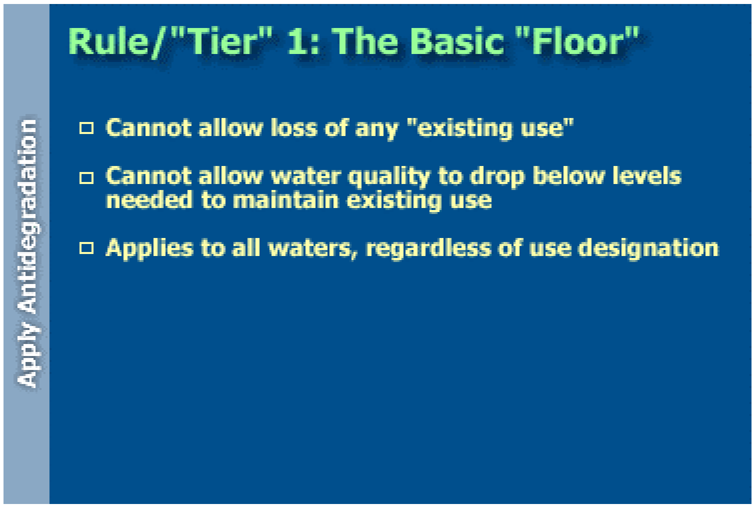


Figure 24

Rule/Tier 1: (Figure 24) This is the "bottom line" rule in antidegradation. Under no circumstances should the condition of a high quality/clean waterbody deteriorate to such a degree that one or more of the existing uses can no longer be supported, if such degradation could be prevented by use of CWA authorities.

EPA, territories, authorized tribes, and state water agencies should not allow (e.g., issue an NPDES permit to a new source) any activity that would result in the loss of any existing use. This reflects an overall policy of "locking in" uses and levels of water quality necessary to meet those uses, once they have been attained.

Rule/Tier 2: (Figure 25) is aimed at preventing "freefall" of ambient water quality, that is, having the water quality decline, from being considerably better than WQS down to just barely meeting WQS. For example, if the actual level of pollutant "x" in a waterbody is 18 mg/L, and the WQC for "x" is 25 mg/L, a potential point source discharger does not have an automatic right to get a permit to discharge the pollutant in quantities that would raise the concentration of "x" up to 24.999 mg/L.

To authorize a discharge that would result in substantial degradation of water quality (but not loss of an existing use or a violation of a water quality criterion) a state, tribe, or territory must show that the conditions surrounding the proposed increase in pollutant loadings meet certain criteria:

- The degradation cannot be avoided through application of required technology-based requirements for "point sources" and achieved "all cost-effective and reasonable BMPs for nonpoint sources."
- Allowing a lowering of water quality is "necessary to accomodate important economic or social development."

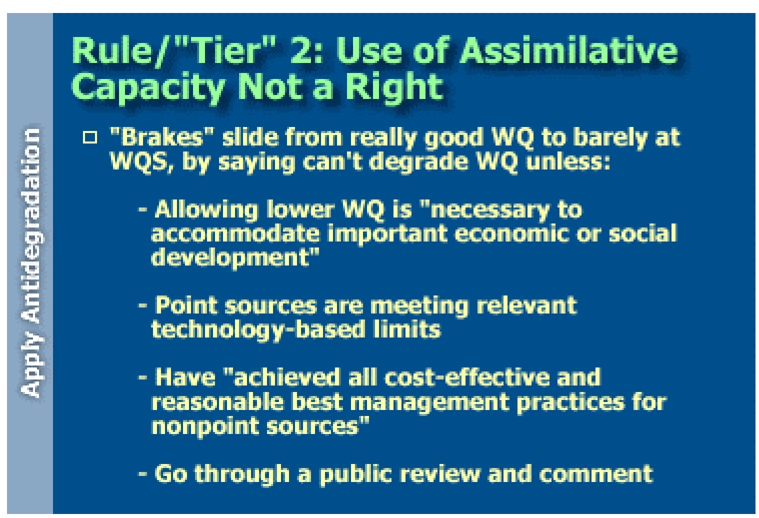


Figure 25

NOTE: The second condition is addressed only after it has been determined that the first condition applies to the situation in question.

Both Rule/Tier 1 and Rule/Tier 2 apply to all "better than WQS" waters, regardless of what the designated uses for the waterbody may be.

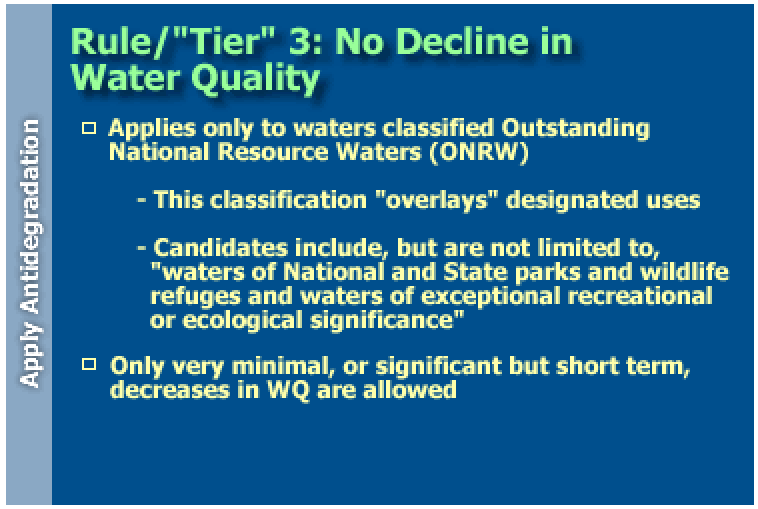


Figure 26

Rule/Tier 3: (Figure 26) A third and most stringent set of antidegradation rules applies only to waters specially designated by a state, territory, or tribe. EPA regulations refer to such waters as Outstanding National Resource Waters. States often use the term Outstanding Resource Waters. The "candidate" waterbody types are merely suggestions that EPA has provided regarding the kinds of waterbodies that states, tribes, and territories might choose to designate for Tier 3 level protection.

Figure 27 attempts to summarize all the key provisions of antidegradation. In this hypothetical example, the acute criterion for toxic pollutant "x" is 18 mg/L and the concentration of "x" in the waterbody is 10 mg/L. Since the ambient concentration of "x" is lower than the criterion concentration, antidegradation applies.

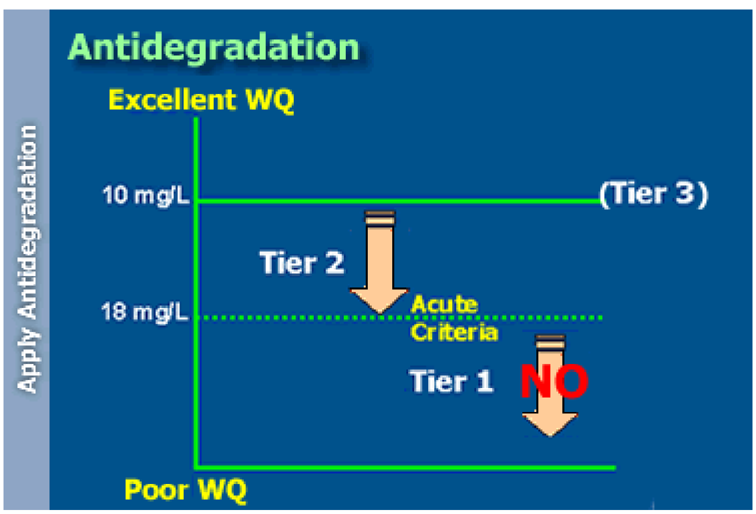


Figure 27

Rule/Tier 1 of antidegradation means that under no circumstances can the state, authorized tribe, or territory allow regulated activities to increase the level of "x" beyond the criterion (18 mg/L). Allowing levels of "x" to go beyond the criterion would result in impairment of the existing uses that the criterion is designed to protect. Hence, "Tier 1" appears to the right of the arrow with "NO" superimposed, in the area of the graph where concentrations of "x" would be greater than 18 mg/L.

The broken arrow going from the existing concentration (10 mg/L) to the criterion (18 mg/L) is meant to indicate Rule/Tier 2 of antidegradation. Lowering of water quality from high levels down to ones barely better than applicable criteria is not prohibited, but it can take place only in very limited circumstances.

Tier 3 appears to the right of the line corresponding to the existing level of "x" in the waterbody (10 mg/L), to indicate that for Tier 3-designated waters, virtually no degradation of water quality would be allowed. (Tier 3 is placed in parentheses as a reminder that Tier 3 applies only to specially designated waters.)

EPA must approve the WQS adopted by states, authorized tribes, and territories. If EPA ultimately decides that it cannot reach agreement with a state, tribe, or territory, the Agency can promulgate substitute WQS by going through the formal federal rulemaking process (Figure 28).

Opportunities for public comment on proposed WQS are provided at a minimum of two steps in the approval process.

The responsibility for establishing WQS has always been vested in the states and territories, however EPA must assign WQS authority to tribes. Tribes must meet certain tests before they can assume WQS programs (Figure 29). Before the tribes are given such authorization, EPA must set WQS on Indian lands.

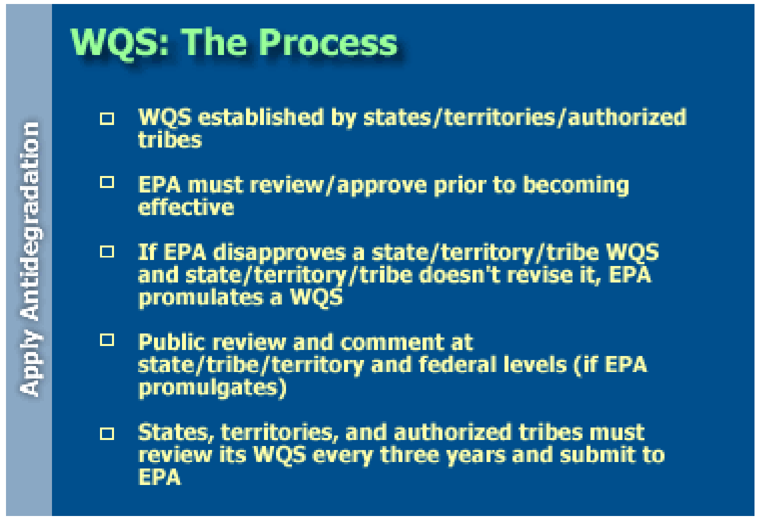


Figure 28

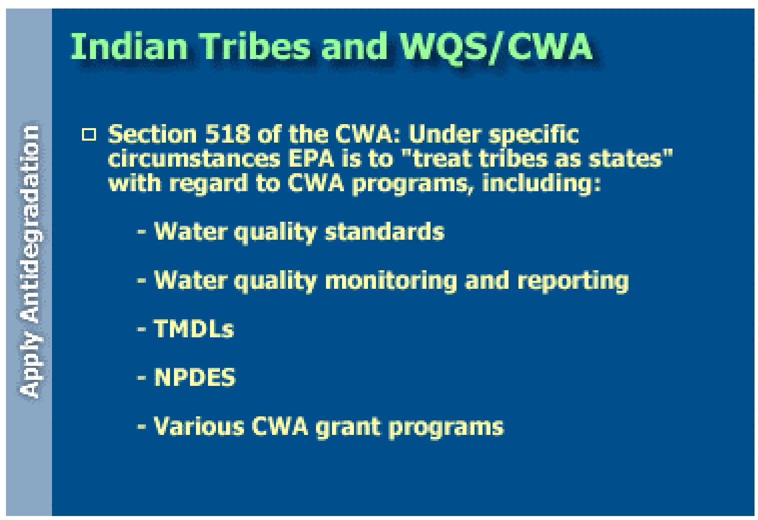


Figure 29

Web Resources

The USEPA-Office of Science and Technology's Water Quality Criteria and Standards Program web site: www.epa.gov/waterscience/standards

Monitoring

First, water quality standards (WQS) consistent with the statutory goals of the CWA must be established. Then waterbodies should be monitored to determine whether the WQS are being met.

The responsibility for monitoring of rivers, lakes, bays, wetlands, estuaries, and nearshore marine waters falls primarily on the states. Contrary to what many believe, EPA does not operate a large national network of water quality monitoring stations, though it is involved in a number of monitoring projects across the country at any given time.

Unfortunately, most states do not have the funding required to carry out ambient monitoring on the scale needed to keep close track of the conditon of our nation's surface waters. Most of the waters in the United States are not monitored several times a year or even once over a period of several years (Figure 30). A high degree of uncertainty, therefore, is associated with what can be said about the condition of most rivers, lakes, bays, and other surface waters.

In order to be virtually certain that WQS *are* being met, instruments capable of performing continuous monitoring and analysis would need to be employed. Unfortunately, this is rarely the case, particularly for certain types of pollutants like synthetic organic chemicals. Consequently agencies are usually able to make only statistical inferences -- often at high levels of uncertainty -- as to whether a waterbody *is* actually *meeting* WQS."

On the other hand, considerably less data is needed to have strong evidence that WQS is *not* being *met* (ie-WQC are exceeded.) This assymetry in needed amounts of data is due simply to the fact that severe harm can come to to aquatic ecosystems (and virtually all forms of life) from brief (minutes, hours) exposure to high levels of contaminants. Hence, proving that such short term conditions occurred *at no time* over a given period of years requires essentially continuous monitoring. On the other hand, if available data represents only a small fraction of the time period in question, and those limited data points include one or more exceedances of specified magnitude/duration combinations, then simple probability tells us that collection of a substantial number of additional samples will reveal additional exceedances. Therefore, we can be very confident that WQC are being exceeded several times instream during the specified periods.

Conduct Monitoring

Percent of Waterbodies Assessed

Waterbody Type	Total Size	Amount Assessed* (% of Total)
Rivers (miles)	3,692,830	699,946 (19%)
Lakes (acres)	40,603,893	17,339,080 (43%)
Estuaries (sq. miles)	87,369	31,072 (36%)

*Includes waterbodies assessed as not attainable for one or more uses.

Note: Percentages may not add up to 100% due to rounding.

Figure 30

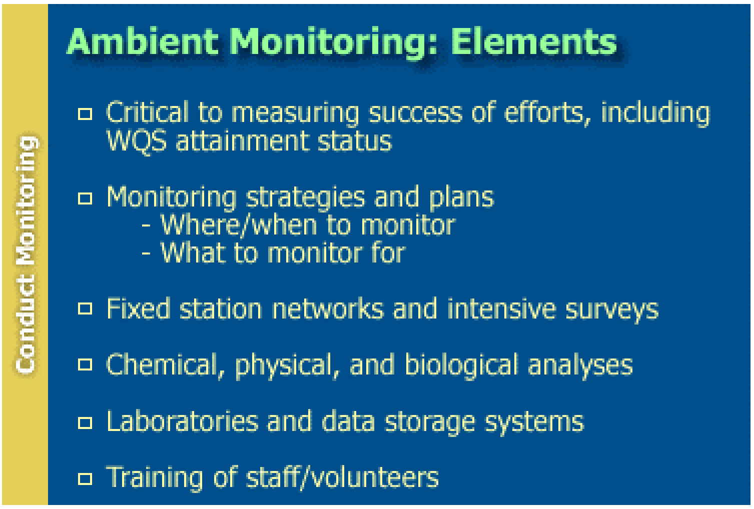


Figure 31

Decisions about what, where, and when to monitor are most important, and the answers to these questions can vary depending on the purpose of the monitoring program.

For example, if the program is supposed to measure the effectiveness of the CWA's regulatory program dealing with "point sources," then monitoring should generally take place just above and just below the discharge pipes coming from such sources. In addition, it would usually make most sense to analyze for pollutants that are covered in the source's permit. On the other hand, if the aim is to get an overall picture of water quality in a state (e.g., what percentage of waters are meeting WQS), then a statistically chosen random set of sampling locations would usually be best. Moreover, the types of pollutants to be tested for would need to be broader than just those known to be coming from a particular type of discharger. Currently, state **ambient monitoring** programs tend to be focused on waters that the state has declared impaired or suspects is polluted (Figure 31).

States, tribes, and territories are required to provide the results of their monitoring efforts in the form of two reports, submitted to EPA and made available to the public (Figure 32). These reports are generally submitted on April 1 of every even-numbered year (i.e., biennially).

The first report is the "305(b) Report," after the requiring section of the CWA. It should include all that which the state, tribe, or territory knows about all its waters -- healthy, threatened, and impaired.

The second is the "303(d) List" and should include only those waters that are either threatened or impaired. (Waters attaining WQS should not be on the list).

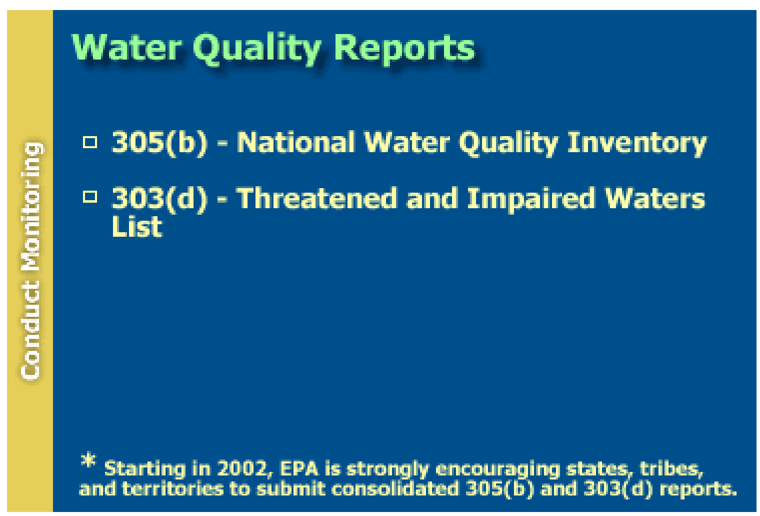


Figure 32

Web Resources

EPA's Monitoring and Assessing Water Quality Web site is: www.epa.gov/owow/monitoring/monintr.html

EPA's 305(b) Web site is: www.epa.gov/305b/2000report

Starting in 2002, EPA is asking states, tribes, and territories to submit the information previously contained in separate 305(b) and 303(d) reports in one consolidated format. Under this new approach, all waters would be placed in one of five categories. These categories are defined by the amount of information available regarding a waterbody and the condition of the waterbody (For more information on the "2002 Integrated Water Quality Monitoring and Assessment Report" check the Web site: www.epa.gov/owow/tmdl/2002wqma.html)

In addition to the information on the condition of all waters in the state, tribal land, or territory, the 305(b) report should also provide information on which pollutants (chemicals, sediments, nutrients, metals, temperature, pH) and other stressors (altered flows, modification of the stream channel, introduction of exotic invasive species) are the most common causes of impairment to waterbodies and what are the most common sources of those stressors. The report should also include a discussion of progress made toward meeting the CWA's goals since the time of the last 305(b) Report (Figure 33)

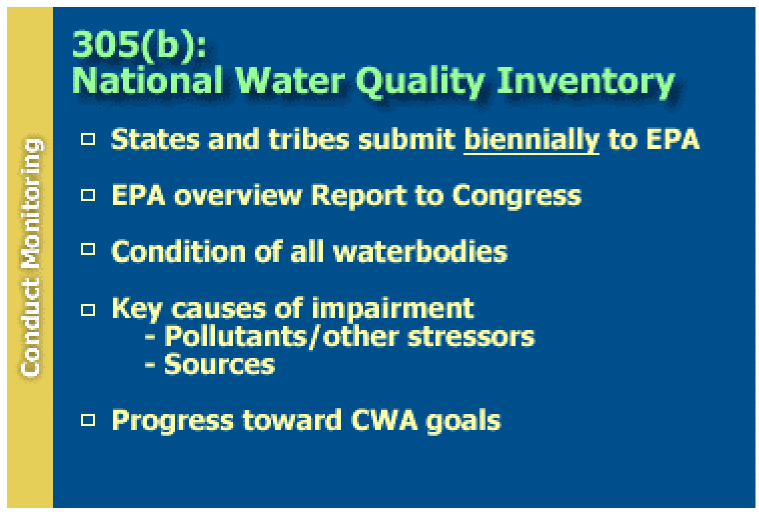
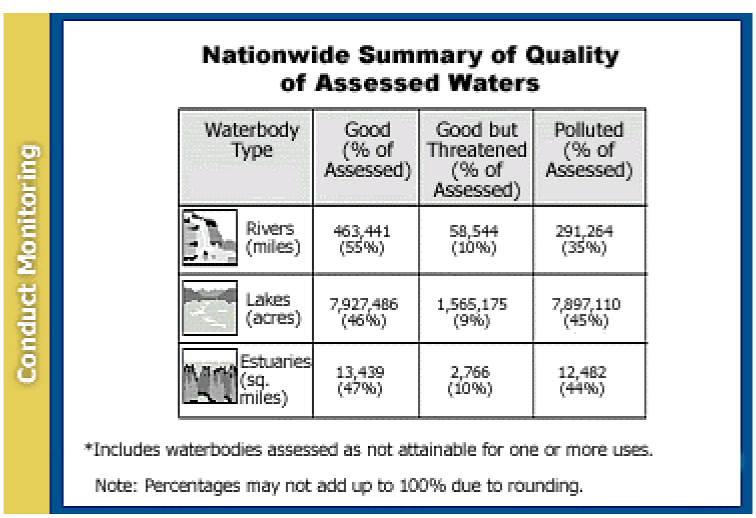


Figure 33

Figure 34 shows a summary of the condition of assessed waters, nationwide.



Waterbody Type	Good (% of Assessed)	Good but Threatened (% of Assessed)	Polluted (% of Assessed)
Rivers (miles)	463,441 (55%)	58,544 (10%)	291,264 (35%)
Lakes (acres)	7,927,486 (46%)	1,565,175 (9%)	7,897,110 (45%)
Estuaries (sq. miles)	13,439 (47%)	2,766 (10%)	12,482 (44%)

*Includes waterbodies assessed as not attainable for one or more uses.

Note: Percentages may not add up to 100% due to rounding.

Figure 34

If monitoring and assessment indicate that for some uses and/or parameters, a waterbody or segment is not meeting WQS, then that water is considered "impaired" and goes on a special list called the "303(d) list," named after the section of the CWA that calls upon states, approved tribes, and territories to create such lists.

The 303(d) list should include not only currently impaired waterbodies but also waters believed to be threatened that are likely to become impaired (i.e., not meet WQS) by the time the next 303(d) list is due (Figure 35).

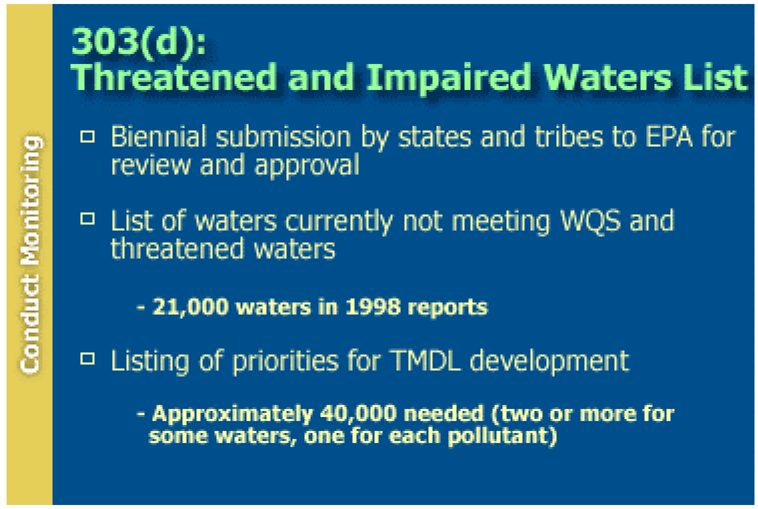


Figure 35

Current EPA regulations call for 303(d) lists to include only waters impaired by "pollutants," not those impaired by other types of "pollution" (altered flow and/or channel modification). If it is certain that a waterbody's impairment is not caused by a "pollutant" but is due to another type of "pollution" such as flow, the waterbody does not need to be on the 303(d) list. If, however, biological monitoring indicates there is impairment of aquatic life uses, but it is not clear whether a pollutant is at least one of the reasons, the water should be on the 303(d) list, and further analysis to identify the causes are needed. Waters impaired by "non-pollutant pollution" should be identified in 305(b) reports.

EPA guidance documents mention a number of different types of data and information that are considered "exiting and readily available." EPA has stated that such data include: (1) evidence of exceedance of a numeric WQC, (2) direct evidence of beneficial use impairment, (3) evidence that narrative standards are not being met, and (4) results of computer modeling of the waterbodies. EPA also requires that data from sources other than the state agency itself -- federal agencies, universities, volunteer monitoring groups -- must be considered if they meet the state's requirements for data quality.

Some of the above actions may initially seem obvious, such as evidence of numeric WQC exceedances. But even this can be subject to debate. For instance, suppose you are dealing with a WQC expressed as a 30-day average concentration of pollutant "x," and you have only two data points for the relevant 30-day period, each representing just one "grab sample." Suppose both were higher (more polluted) than the WQC. Should this water be listed as "impaired," or should more data be collected before putting the water on 303(d) list?

How would you measure impairment of a designated use directly? Use of a biological assessment of aquatic life uses could be one method. Epidemiological studies showing a correlation between people swimming in the water and incidence of waterborne disease could be a direct measure of impairment of contact and recreation uses.

How should narrative WQC be interpreted? For example, how much "scum or floating debris" would constitute an exceedance? Would algal mats floating on a surface of the lake represent an exceedance of this narrative WQC, or perhaps of an "undesirable or nuisance aquatic life" narrative?

What if water quality computer modeling studies indicated that WQC would be exceeded at critical low flows, but actual monitoring data available from numerous samples from more typical flow conditions showed no exceedances of criteria. Should the waterbody be listed?

What level of training for volunteer monitors and what extent of quality assurance/quality control (QA/QC) measures should be required before data collected via volunteer monitoring efforts could be used as the basis of putting a waterbody on the 303(d) list?

Web Resources

The Web site called the Atlas of American Waters reflects a national picture of waterbody impairment as reported in the 1998 303(d) list and can be found at: www.epa.gov/owow/tmdl/atlas/.

The table shown in Figure 36 was compiled by EPA from information submitted in the states' 1998 and 2000 305(b) reports and represents the number of waterbodies for which the listed stressors or categories of stressors were cited as a cause of impairment.

The sediment referred to here is clean sediment/silt, not toxics-laden bottom sediments. Nutrients are phosphorus and/or nitrogen. "Other habitat alterations" means dams, channelization, bank destabilization, and removal of riparian vegetation, but usually not flow alteration. Organics refers to synthetic organics, not naturally occurring organic materials. Noxious aquatic plants includes blooms of blue-green algae and invasive species such as hydrilla.

The two most common causes of impairment, nutrients (nitrogen and phosphorus) and clean sediments, are parameters for which EPA and most states do not currently have numeric WQC. EPA is in the process of issuing criteria guidance for nutrients. Visit the EPA Office of Science and Technology's (OST) nutrient criteria homepage at www.epa.gov/ost/standards/nutrient.html.

Not all categories of stressors are mutually exclusive. For example, impaired biologic community is a condition that could result from any number of stressors (e.g., flow alteration, pH, temperature, and/or metals) listed in the table, but it could also mean impairments resulting from the introduction of exotic species. Fish consumption advisories would overlap with pesticides, metals, and/or organics.

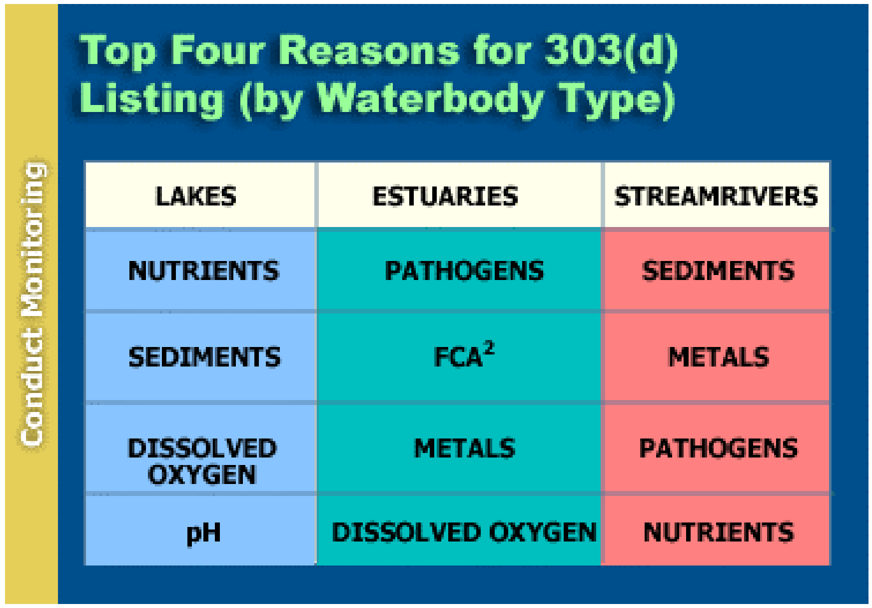
Conduct Monitoring

Top 15 Causes of Impairment 1998 and 2000

Cause of Impairment	Count
Sediments	6,133
Pathogens	5,281
Nutrients	4,773
Metals	3,984
Dissolved Oxygen	3,772
Other Habitat Alterations	2,112
Temperature	1,884
pH	1,798
Impaired Biologic Community	1,440
Pesticides	1,432
Flow Alterations	1,099
Mercury	1,088
Organics	1,069
Noxious Aquatic Plants	831
Ammonia	752
Total	37,448

Figure 36

IMPORTANT NOTE: The precise numbers presented in these tables should not be assigned a great deal of significance. Even the exact order in which the different stressors are listed should not be considered definitive. What can be said with considerable confidence is that the three most fequently encountered causes of impairment are nutrients, pathogens and sediments. By contrast "toxic chemicals" such as metals, pesticides, synthetic organics, and ammonia are not as frequently encountered. (This is not to say that toxics need not be addressed in those waterbodies where they are a problem.)



LAKES	ESTUARIES	STREAMRIVERS
NUTRIENTS	PATHOGENS	SEDIMENTS
SEDIMENTS	FCA[2]	METALS
DISSOLVED OXYGEN	METALS	PATHOGENS
pH	DISSOLVED OXYGEN	NUTRIENTS

Figure 37

The graph in Figure 37 shows that the most commonly cited causes of impairment vary from one major waterbody type to another. Of course, this does not mean that the key pollutants for a particular river, lake, or estuary would reflect the national picture shown here.

Because of the implementation of CWA regulatory programs controlling point sources of pollution over the last three decades, industrial facilities and municipal sewage treatment plants no longer are the major cause of impairment of most of the nation's surface waters. On the other hand, diffuse sources of precipitation-induced runoff (nonpoint sources under the CWA) are the sole cause of impairment of nearly half of the waters that states, territories, and authorized tribes list in their 303(d) reports. It is also likely that in many of the 50 percent of the impaired waters where both point and nonpoint sources are significant contributors, nonpoint sources contribute considerably more pollutant loads than do point sources (Figure 38).

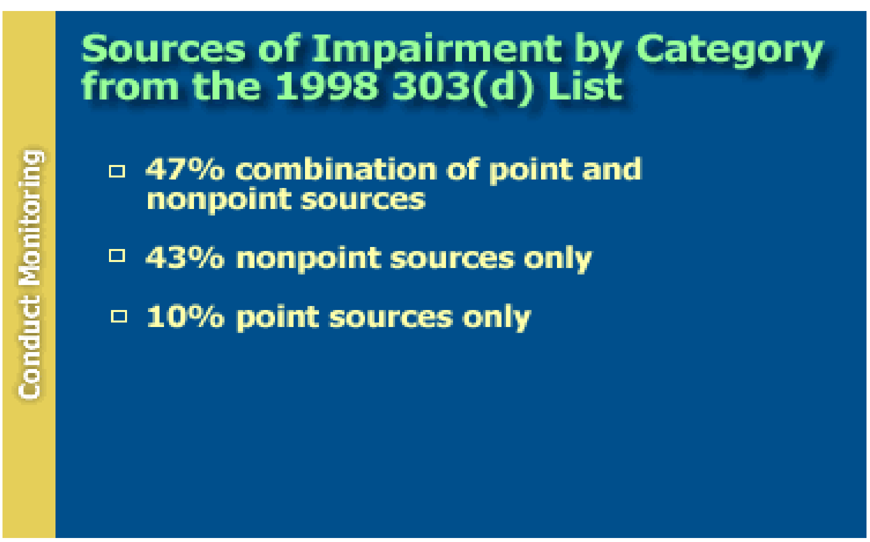


Figure 38

TMDLs

If monitoring and assessment indicate that a waterbody or segment is impaired by one or more pollutants, and it is therefore placed on the 303(d) list, then the relevant entity (state, territory, or authorized tribe) is required to develop a strategy that would lead to attainment of WQS (Figure 39).

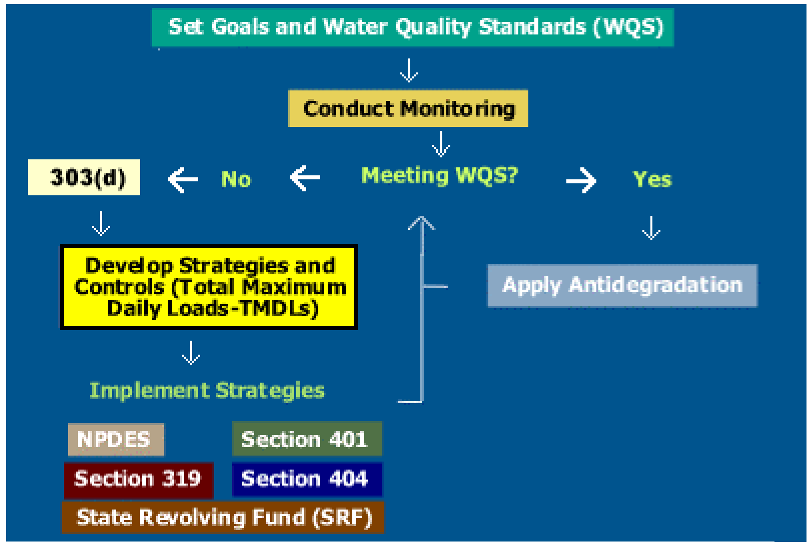


Figure 39

Note: The CWA requires that Total Maximum Daily Loads (TMDLs) be developed only for waters affected by pollutants where implementation of the technology-based controls imposed upon point sources by the CWA and EPA regulations would not result in achievement of WQS. At this point in the history of the CWA, most point sources have been issued NPDES permits with technology-based discharge limits. In addition, a substantial fraction of point sources also have more stringent water quality-based permit limits. But because nonpoint sources are major contributors of pollutant loads to many waterbodies, even these more stringent limits on point sources have not resulted in attainment of WQS

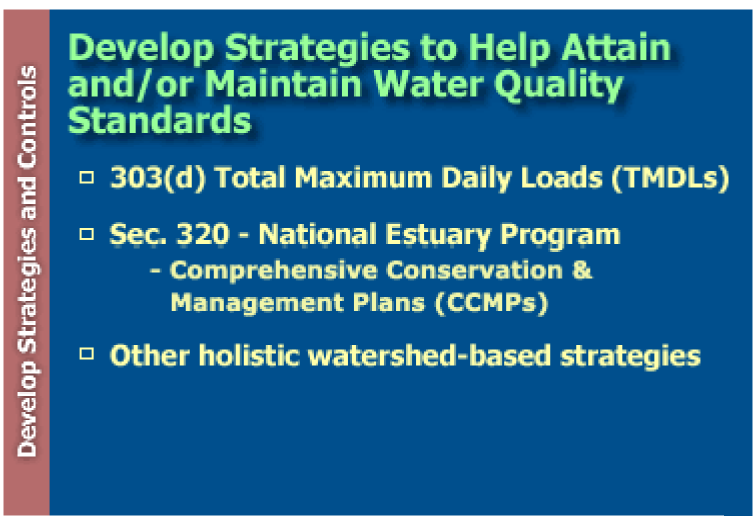


Figure 40

Such strategies must consist of a TMDL or another comprehensive strategy that includes a functional equivalent of a TMDL. In essence, TMDLs are “pollutant budgets” for a specific waterbody or segment, that if not exceeded, would result in attainment of WQS (Figure 40).

One somewhat unique program is authorized by Section 320 of the CWA, the National Estuary Program (Figure 41).

Web Resources
EPA’s National Estuary Program: www.epa.gov/owow/estuaries

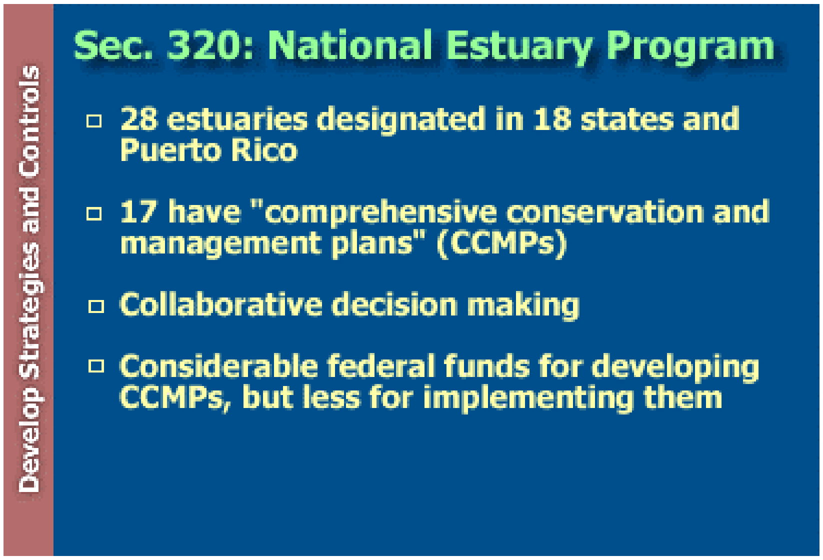


Figure 41

TMDLs (Figure 42), are required for "pollutants," but not for all forms of "pollution." Pollutants include clean sediments, nutrients (nitrogen and phosphorus), pathogens, acids/bases, heat, metals, cyanide, and synthetic organic chemicals. As noted previously, pollution includes all pollutants but also includes flow alterations and physical habitat modifications.

At least one TMDL must be done for every waterbody or segment impaired by one or more pollutants. TMDLs are done pollutant by pollutant, although if a waterbody or segment were impaired by two or more pollutants, the TMDLs for each pollutant could be done simultaneously.

EPA is encouraging states, tribes, and territories to do TMDLs on a "watershed basis" (e.g., to "bundle" TMDLs together) in order to realize program efficiencies and foster more holistic analysis. Ideally, TMDLs would be incorporated into comprehensive watershed strategies. Such strategies would address protection of high quality waters (antidegradation) as well as restoration of impaired segments (TMDLs). They would also address the full array of activities affecting the waterbody. Finally, such strategies would be the product of collaborative efforts between a wide variety of stakeholders.

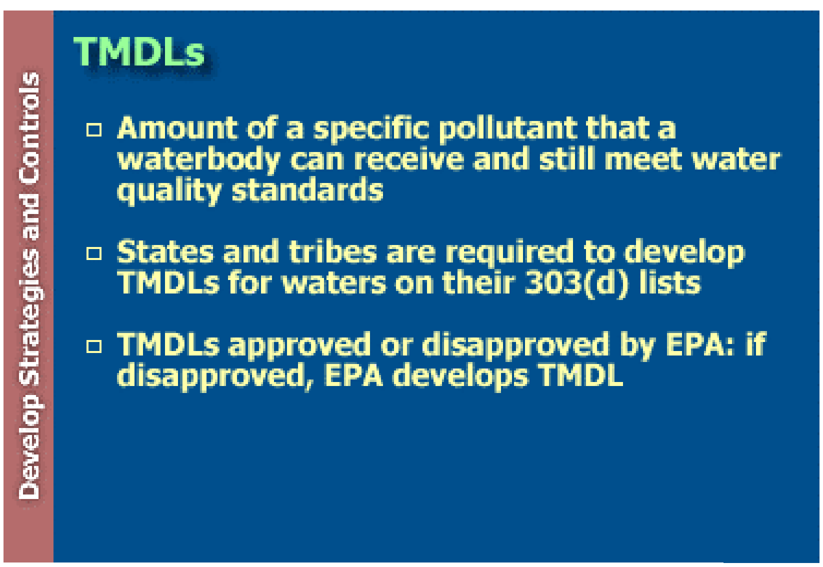


Figure 42

TMDLs must be submitted to EPA for review and approval/disapproval. If EPA ultimately decides that it cannot approve a TMDL that has been submitted, the Agency would need to develop and promulgate what it considers to be an acceptable TMDL. Doing so requires going through the formal federal rulemaking process.

Elements of a TMDL

The first element of a TMDL is "the allowable load," also referred to as the pollutant "cap" (Figure 43). It is basically a budget for a particular pollutant in a particular body of water, or an expression of the "carrying capacity." This is the loading rate that would be consistent with meeting the WQC for the pollutant in question. The cap is usually derived through use of mathematical models, probably computer based.

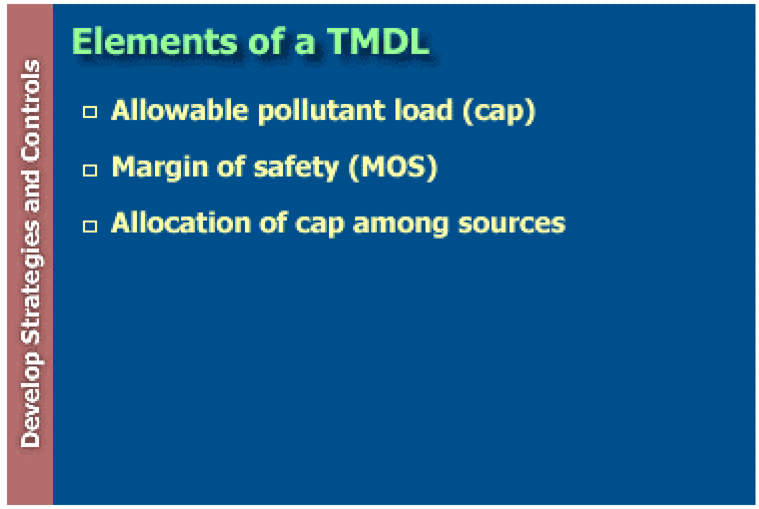


Figure 43

The CWA requires that all TMDLs include a safety factor as an extra measure of environmental protection, taking into account uncertainties associated with estimating the acceptable cap or load. This is referred to as the margin of safety (MOS).

Once the cap has been set (with the MOS factored in), the next step is to allocate that total pollutant load among various sources of the pollutant for which the TMDL has been done. This is in essence the "slicing of the pie."

TMDL Caps

TMDLs set loading caps (Figure 44) for individual pollutants such as clean sediments, nitrogen, phosphorus, coliform bacteria, temperature, copper, mercury, and PCBs. Indicators of a group of forms of pollution can also be used, such as biochemical oxygen demand (BOD), which is often used when doing TMDLs for waterbodies with low dissolved oxygen. (Again, TMDLs are not required for non pollutant forms of "pollution," such as streamflow patterns and stream channel modification.) States, territories, and authorized tribes are free to develop TMDLs for such pollutants, as they see fit. The CWA and EPA regulations put no limits on these other government entities going beyond what the Act requires.

Figure 44

Though the CWA itself uses the term Total Maximum Daily Loads, EPA has determined that loadings rates (caps) can be expressed as weekly, monthly, or even yearly loads. Which time period to use depends on the type of pollutant for which the TMDL is being done. Toxic chemicals that exhibit acute effects would probably call for daily or weekly loads, whereas nutrients and sediments could be expressed as monthly or yearly loading rates.

The CWA allows for seasonal TMDLs, that is, it allows different rates of loading at different times of the year. For example, colder waters can absorb more oxygen-demanding substances than can warm water, so allowable loadings could be higher in the winter than in the summer.

TMDL Allocations

EPA regulations use the terms Wasteload Allocations (WLA) and Load Allocations (LA) to describe loadings assigned to point and nonpoint sources, respectively (Figure 45).

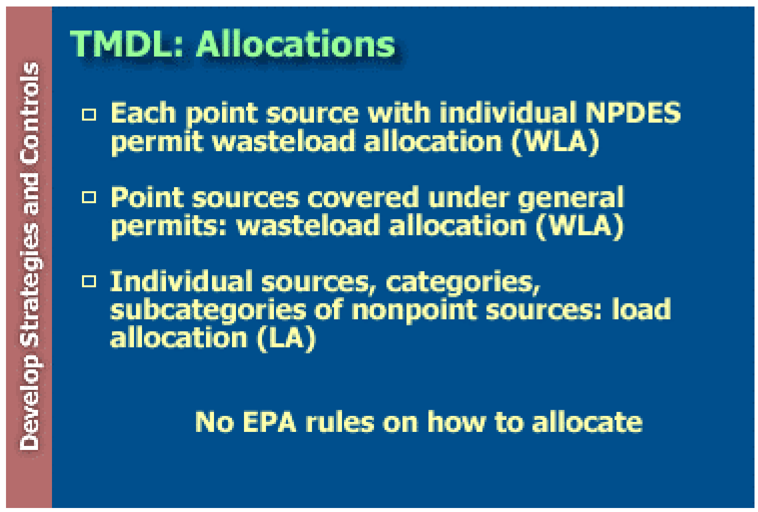


Figure 45

Generally, point sources that are required to have individual NPDES permits are also required to be assigned individual WLAs. On the other hand, a group of sources covered under a "general" NPDES permit would be assigned one collective WLA.

Although ideally, load allocations should be assigned to individual nonpoint sources, this is often not practical or even scientifically feasible; hence, loads can be assigned to categories of nonpoint sources (all soybean fields in the watershed, for example), or to geographic groupings of nonpoint sources (all in a particular subwatershed).

Even though the CWA provides no federal authority for requiring nonpoint sources to reduce their loadings of pollutants to the nation's waters, the Act does require states (and authorized territories and tribes) to develop TMDLs for waters where nonpoint sources are significant sources of pollutants. TMDLs do not create any new federal regulatory authority over any type of sources. Rather, with regard to nonpoint sources, TMDLs are simply a source of information that, for a given waterbody, should answer such questions as the following:

- Are nonpoint sources a significant contributor of pollutants to this impaired waterbody?
- What are the approximate total current loads of impairment - causing pollutants from all nonpoint sources in the watershed?
- What fraction of total loads of the pollutant(s) of concern come from nonpoint sources vs. point sources?
- What are the approximate loadings from the major categories of nonpoint sources in the watershed?

- How much do loads from nonpoint sources need to be reduced in order to achieve the water quality standards for the waterbody?
- What kinds of management measures and practices would need to be applied to various types of nonpoint sources, in order to achieve the needed load reductions?

A common misconception about TMDLs is that EPA has issued regulations specifying how the pollutant cap in a TMDL should be allocated among sources -- equal reductions for all or equal loadings from each, for example. EPA has no such regulations. States, territories, and tribes are free to allocate among sources in any way they see fit, so long as the sum of all the allocations is no greater than the overall loading cap. However, when thinking about changing the share of allowed loads among sources, it is important to realize that in all but very small waterbody segments, load **location matters**. In many cases, the farther away from the zone of impact that a loading enters into the waterbody system, the less of an effect that load will have on the impaired zone. For example, studies of large watersheds, such as Long Island Sound, have indicated that one pound of pollutant (nitrogen in the case of the Sound) discharged close to the impaired zone has the same impact on that zone as 10 pounds discharged substantially farther away. Furthermore, even after accounting for location-related relative impacts on a particular segment or zone, care must be taken to ensure that localized exceedences of WQS do not result from moving loads from one tributary/segment to another.

For more information on allocation of loads under TMDLs, check the web site: www.epa.gov/waterscience/models/allocation/def.htm

Figure 46 shows a conceptual diagram showing how loads under a TMDL might be allocated to various kinds of sources and other factors.

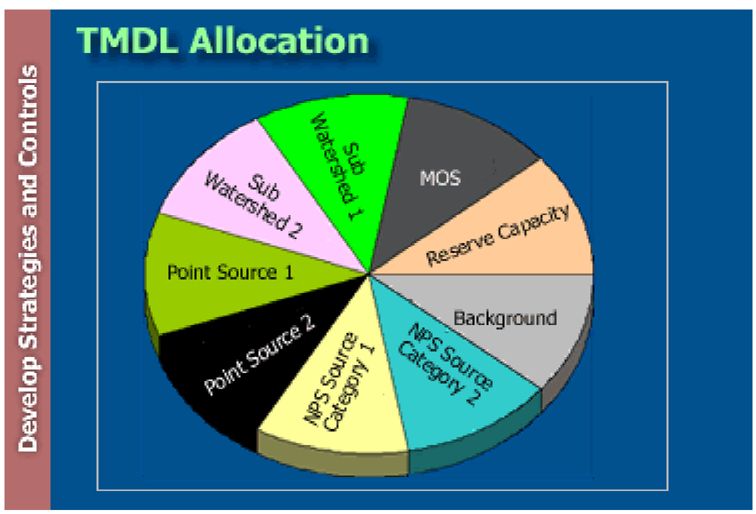


Figure 46

Margin of Safety (MOS)—Obviously, the bigger the slice of the pie, the less load that can be "given" to current or future sources.

Reserve Capacity—Deciding how much of the allowed load to assign to future growth and development presents some very interesting issues. There is an inevitable tradeoff between the interests of existing sources and those of future sources. If a TMDL does not set aside anything for the future, it will be harder to accommodate development that generates new loads of the pollutant in question. But if a relatively large amount is set aside for growth, then existing sources will get lower allocations and will therefore have to achieve greater reductions.

Background- Allocation of the total allowed load must reflect the contribution from uncontrollable sources. Of course, this would include loadings from truly natural sources. It would also include loadings from manmade sources that are essentially uncontrollable.

Nonpoint Source Categories- The next two wedges illustrate the fact that loads can be assigned to entire categories of nonpoint sources, such as all of a certain type of farming operation.

Individual Waste Load Allocations for Point Sources- A TMDL can assign different-size slices to each of these sources. These allocations in the TMDL would be the basis for each source's NPDES permit discharge limit for the pollutant addressed by the TMDL.

Load Allocation to Specific Subbasins- This could be an option in situations where there are no significant individual point sources and the subwatershed is not dominated by one or two categories of nonpoint sources.

TMDLs are not "self-implementing." (Figure 47) Hence, other authorities and programs must be used to implement the pollutant reductions called for by a TMDL or other strategy to achieve water quality standards. The exact authorities and programs a state, territory, or authorized tribe uses will depend on the type of sources present, as well as on social, political, and economic factors.

A variety of federal, state, local, and tribal authorities and programs can be brought to bear, together with initiatives from the private sector.

The CWA provides a number of regulatory and voluntary tools that can be useful in achieving needed reductions. (It is likely, however, that the CWA tools alone may not be sufficient to achieve needed reductions, especially in situations where nonpoint sources dominate loadings. Other tools may be available from other federal programs, state and local government programs, academic institutions, the business community, nongovernmental organizations such as land trusts, and other sources) (Figure 48).

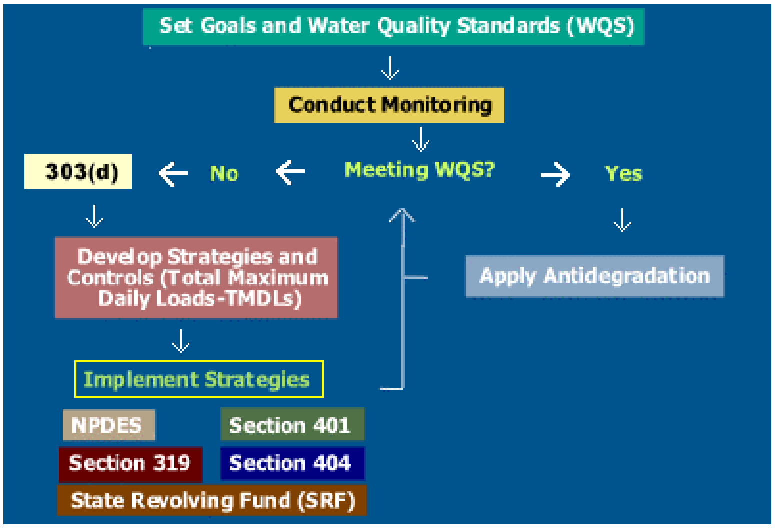


Figure 47

Web Resources

EPA's Web site on TMDLs is: www.epa.gov/owow/tmdl

Each of the CWA tools listed on Figure 48 is covered in this module. The NPDES permit program, established in Section 402 of the Clean Water Act, regulates a wide array of discharges falling under the CWA's definition of "point" sources.

The permit program established by Section 404 of the CWA deals with the placement of dredged or fill materials into wetlands and other "waters of the United States."

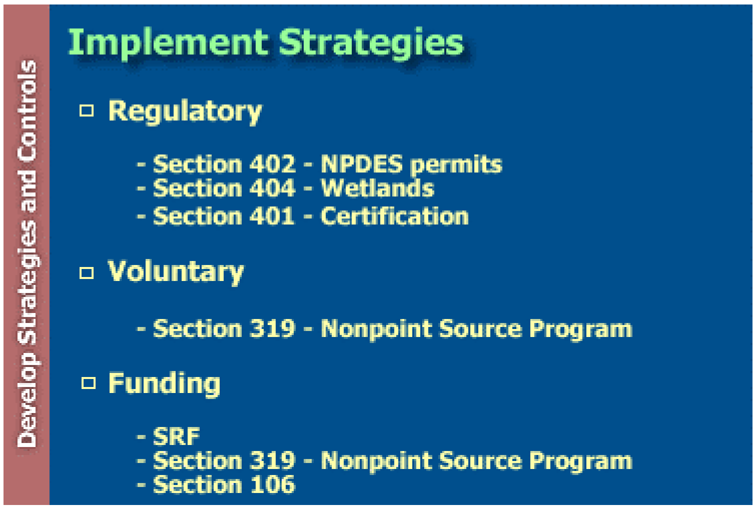


Figure 48

Section 401 of the CWA requires that before a federal agency can issue a license or permit for construction or other activity, it must have received from the state in which the affected activity would take place a written certification that the activity will not cause or contribute to a violation of relevant state water quality standards. Downstream states whose WQS might be exceeded as a result of federal approval of the activity can also play a role in the 401 process.

CWA Section 319 created a federal program that provides money to states, tribes, and territories for the development and implementation of programs aimed at reducing pollution from "nonpoint" sources of pollution. The CWA provides no federal regulatory authority over nonpoint sources, in contrast to point sources.

By far, the largest federal source of money from the CWA comes through federal grants to states for the capitalization and operation of Clean Water State Revolving Loan programs. (In 1996, Congress created a Drinking Water State Revolving Loan Program under the Safe Drinking Water Act.)

CWA Section 106 authorizes federal grants to states, tribes, and territories to support the development and operation of state programs implementing the CWA.

NPDES Program

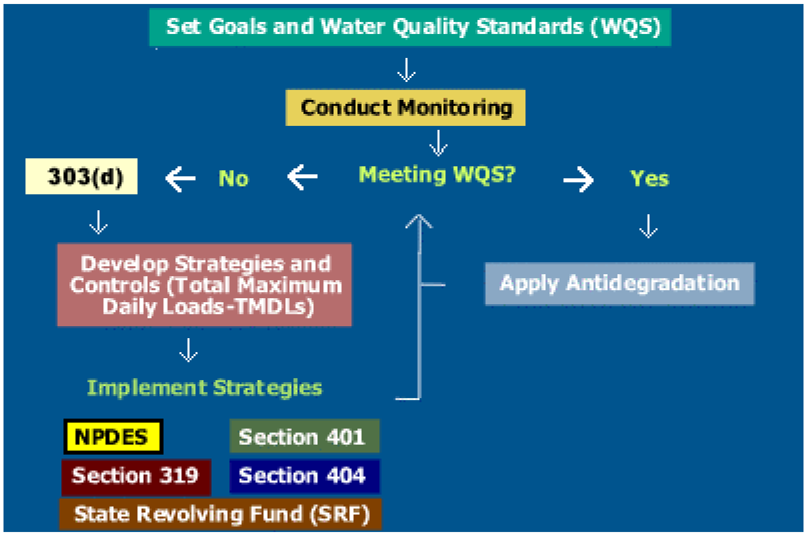


Figure 49

The CWA makes it illegal to discharge pollutants from a point source to the waters of the United States. Section 402 of the Act creates the National Pollutant Discharge Elimination System (NPDES) regulatory program (Figure 49). Point sources must obtain a discharge permit from the proper authority (usually a state, sometimes EPA, a tribe, or a territory). Though the CWA does contain a long-range goal of zero discharge of pollutants, these permits do not, as the name of this program might suggest, simply say "no discharge." Rather, they set limits on the amount of various pollutants that a source can discharge in a given time.

In most cases, the NPDES permitting program applies only to direct discharges to surface waters. Some cases in which discharges to ground water are directly hydrologically connected to a surface water have been incorporated into the NPDES program.

Figure 50

A wide variety of manmade conveyances are considered point sources, including pipes, ditches, channels, tunnels, certain kinds of ships, and offshore oil rigs (Figure 50).

NPDES permits cover industrial and municipal discharges, discharges from storm sewer systems in larger cities, storm water associated with numerous kinds of industrial activity, runoff from construction sites disturbing more than one acre, mining operations, and animal feedlots and aquaculture facilities above certain thresholds.

Special Exemptions

A number of types of discharges that meet the definition of a "point" source are not required to obtain an NPDES permit because of either statutory (congressional) or administrative (EPA) exemptions. These include the following:

- Abandoned mines on nonfederal lands (state, local, private).
- Sewage (not other types of discharges) from ships covered by EPA's Vessel Sewage Discharge Program.
- Return flows from irrigated agriculture.
- Most drainage ditches associated with logging roads.
- Most smaller feedlots and aquaculture facilities.

Also, all so-called "indirect" dischargers are not required to obtain NPDES permits. The drawing explains the difference between "direct" and "indirect" discharges (Figure 51). An indirect discharger is one that sends its wastewater into a city sewer system, so it eventually goes to a treatment plant (POTW). Though not regulated under NPDES, "indirect" discharges are covered by another CWA program, called pretreatment. "Indirect" dischargers send their wastewater into a city sewer system, which carries it to the municipal sewage treatment plant, through which it passes before entering a surface water.

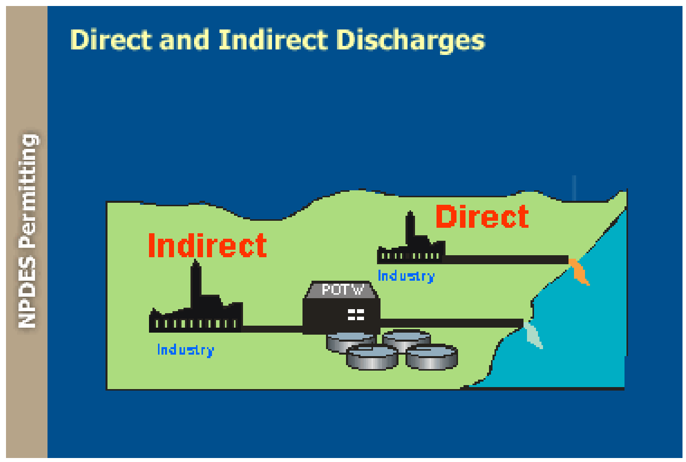


Figure 51

All permits state their issuance and expiration date. In accordance with the CWA, permit terms may not exceed 5 years. EPA's regulations require that permit applications be submitted to the permitting authority 180 days prior to discharge (if a new discharger) or permit expiration (if already an NPDES permit holder) (Figure 52).

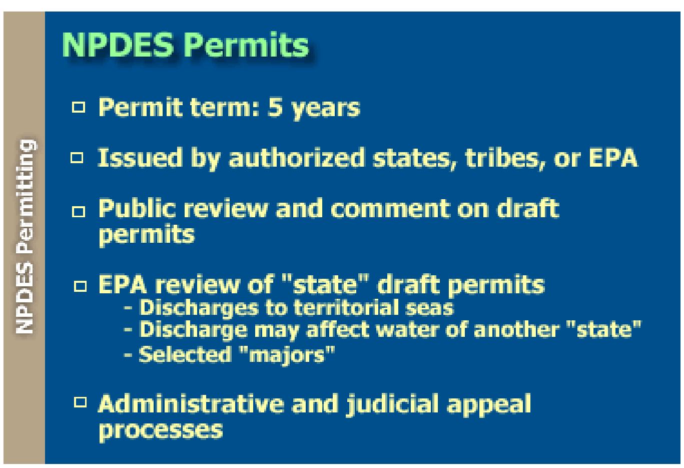


Figure 52

Who is responsible for drafting and issuing the permits?

The first thing to determine is whether the state is "authorized" to administer the NPDES program. This authorization (sometimes referred to as delegation or primacy) is granted by EPA to a state if it can demonstrate that it has a program at least as stringent as EPA's regulations.

Web Resources

Information about status of state authorization is found on this Web site:
http://cfpub.epa.gov/npdes/statestats.cfm?program_id=12

If the state does not have authorization to administer the NPDES program, then EPA will be the permitting authority. Therefore, the EPA regional office issues the permits, takes all the enforcement actions, and does the inspections and monitoring visits as necessary.

If a state, tribe, or territory has authorization then it is the permitting authority and performs all of the day-to-day permit issuance and oversight activities. In this case, EPA acts in an oversight role, providing review and guidance for the state's program. Under certain circumstances (e.g., objection to a permit, failure to enforce), EPA may determine that the state action is insufficient and may issue its own permit.

Regardless of who is the permitting authority, all draft permits must be made available for at least a 30-day public review and comment period. If the public expresses sufficient interest during the comment period or if issues require clarifications, a public hearing may be scheduled.

After a final permit has been issued, stakeholders still have access to administrative (state/EPA) or judicial (courts) appeal processes.

The NPDES program is structured to provide permit coverage to point sources in one of two ways (Figure 53): developing a unique permit for each discharger, or developing a single permit that covers a large number of similar dischargers. We call these types of coverage: individual permits and general permits, respectively.

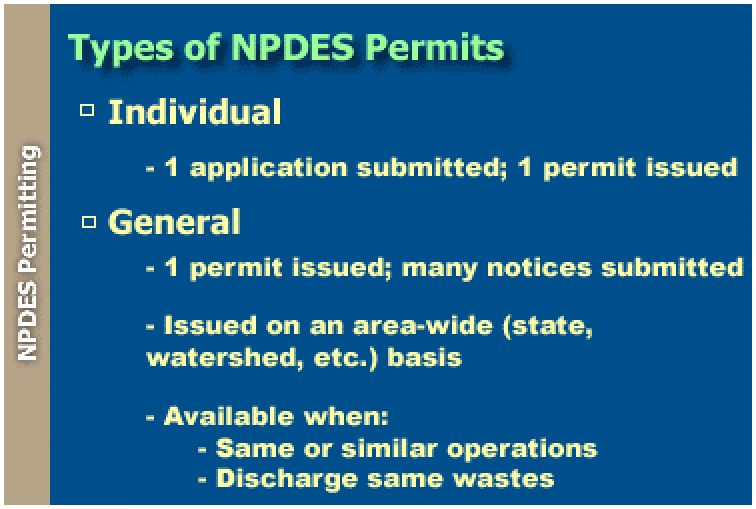


Figure 53

An individual permit is just what it sounds like. An individual facility gets its own unique permit designed for its specific discharge and situation. For example, ACME, Inc. has a process wastewater discharge to Pristine Creek. ACME completes an application that describes its operation and discharge and requests a permit to allow it to continue discharging. The permitting authority reviews the application and crafts and issues a permit that is unique to the ACME, Inc. facility and provides specific conditions that ACME must meet.

A general permit is a permit that covers a large number of similar facilities with a single permit document. In this case, the permitting authority identifies a large number of very similar facilities and determines that the permit conditions that would apply to these facilities would be virtually identical. The permitting authority then crafts and issues a general permit that can be used to cover any discharger that meets criteria established by the permitting authority. Once the general permit is issued, any dischargers that think they meet the general permit criteria can submit a Notice of Intent (or other appropriate notification) to the permitting authority requesting coverage and promising to comply with the conditions in the permit. The permitting authority can then grant coverage or require the facility to apply for an individual permit.

General permits are limited by certain regulatory and practical constraints. The regulations at 40 CFR 122.28 require the permitting authority to define the geographical area and sources. Geographical area can be just about anything (e.g., watershed, county lines, state boundaries). Sources covered can include storm water or a discharger category with similar operations, similar wastes, and needing similar limits. General permits appropriately control very numerous small sources. The more complex the discharge, the more likely an individual permit will be required.

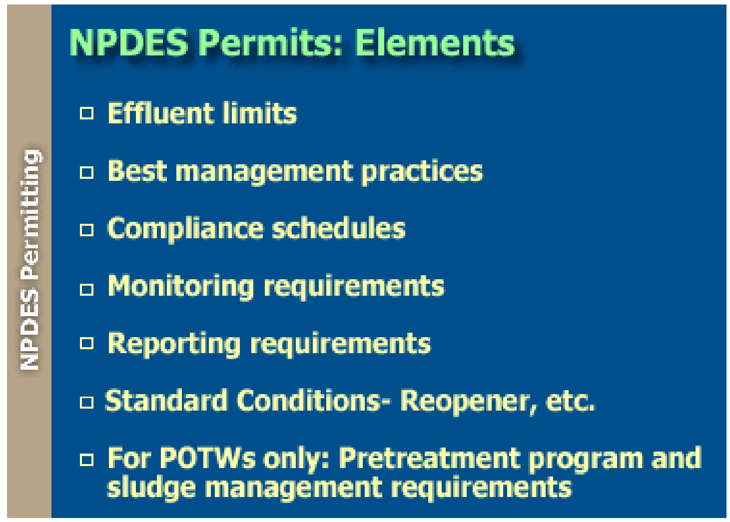


Figure 54

All individual NPDES permits include a certain set of basic elements (Figure 54).

The first is perhaps the most obvious -- a specific, numeric, measurable set of limits on the amount of various pollutants that can appear in the wastewater discharged by the facility into the nation's waters. Such limits are often expressed as concentrations, combined with allowed volumes of discharge. Or, limits can be expressed as mass discharged per unit time (day, week, and so forth). Limits must be expressed in such a way that they cannot be met simply by diluting the facility's effluents with clean water just before they are released into the receiving water.

As explained in more detail later, such limits can be either technology based or water quality based. Regardless of how they are derived, effluent limits are performance standards; a permittee is free to use any combination of process modification, recycling, end-of-pipe treatment, or other strategies to meet them.

NPDES permits can also require the use of certain structural or non-structural BMPs. For "traditional" point sources, municipal wastewater plants and industrial facilities, BMPs are supplemental to end-of-pipe performance standards. For wet weather-related point sources, such as combined sewer overflows (CSOs) and municipal and industrial storm water runoff, BMPs are often the only "control" requirements in the permit.

If meeting the effluent limits in a permit will require upgrading in-plant or wastewater treatment processes, it would not be reasonable to require compliance with such limits upon issuance of the permit (in the case of existing sources). Hence, permits for such sources can include a compliance schedule. Such schedules usually include not only a final date upon which effluent limits must be met but also interim milestones, such as dates for onset of needed construction. EPA guidance specifies that compliance schedules extend no longer than the term of the permit.

Most individual NPDES permits include detailed monitoring requirements that specify what pollutants the permittee must monitor for in their discharge, how frequently the monitoring should be done, and what sampling and analytic techniques should be used. (Though EPA and states conduct some inspections and compliance monitoring, the vast majority of data about the contents of the discharges from NPDES facilities are collected by the permittees themselves.) In the past, permits required only monitoring of the facility's discharges, but in recent years, some states have required some facilities to sample and analyze the waters into which they discharge as well.

If a permit contains monitoring requirements, it will also include reporting requirements. Permittees are required to regularly submit the results of the monitoring required in their permit. Most commonly these Discharge Monitoring Reports must be submitted monthly, but in some cases they are less frequent. (General permits often require few, if any, monitoring or reporting requirements.)

All NPDES permits include a standard set of clauses, including provisions for reopening the permit if new information or other specific circumstances justify possible changes, authority to revoke the permit for cause, and authority for the permitting authority to enter the facility and perform inspections.

A NPDES permit also includes a cover page (permitting authority, permittee, statutory and regulatory authorities, and effective/expiration dates), special conditions (e.g., studies, compliance schedules), and standard conditions (boiler plate language included in all permits). Along with a draft permit, the regulatory authority must include an explanation of how the discharge limits were derived.

Effluent Limits

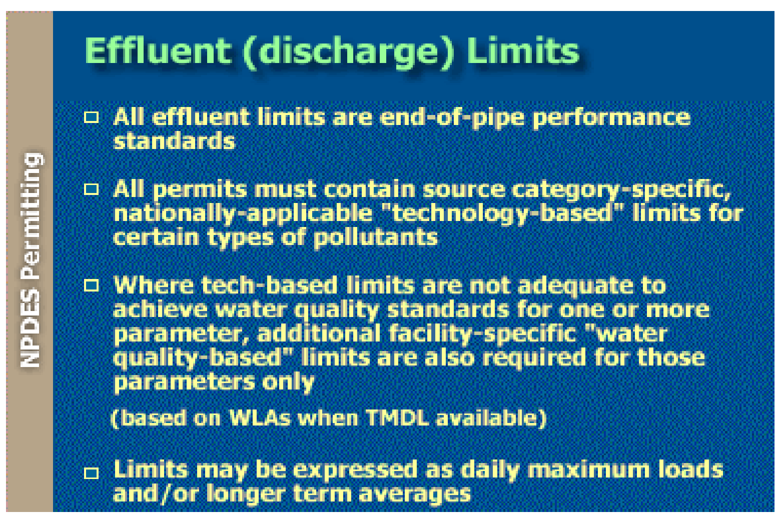


Figure 55

Technology-based effluent limits do not specify what technologies must be employed, but only the state levels of specific parameters that are allowed in the discharger's wastewater. Such limits are called "performance standards" (Figure 55).

Technology-based limits are derived from studies of facilities within a specific industrial category aimed at determining what levels of discharge, pollutant by pollutant, can be achieved using the most cost-effective set of available pollution prevention and control techniques applicable to those types of facilities. EPA publishes packages of regulations, called "effluent guidelines," which lay out performance standards for different types of facilities within major industrial categories. All dischargers within each of these subcategories are required to meet these end-of-pipe limits, regardless of the condition of the water into which they discharge, their contribution of a pollutant relative to other sources, or other "risk-based" factors.

For existing direct dischargers, effluent guidelines are referred to as best available technology economically achievable (BAT). For new sources, technology-based limits are called New Source Performance Standards. Limits for new sources are often more stringent than those for existing sources, because new facilities can employ more options for building pollution prevention systems into their in-plant processes.

(Note: EPA also includes in its effluent guidelines package for a specific industrial category technology-based limits for "indirect" dischargers. These are called "categorical pretreatment standards," and cover performance standards for both existing and new sources.

Web Resources
USEPA's effluent guidelines Web site can be found at:
http://www.epa.gov/waterscience/guide/.

Water Quality-Based Effluent Limits (WQBELs) are used when it has been determined that more stringent limits than technology-based effluent limits must be applied to a discharge in order to protect the designated use (DU) of the receiving waters. WQBELs are "back calculated" from ambient water quality standards, setting allowable pollutant levels in the effluent, which after accounting for available dilution, will meet WQS in-stream.

The permitting authority performs such calculations when a TMDL for the receiving water has not been established. When an EPA-approved TMDL is available, the effluent limits must be consistent with the wasteload allocation (WLA) assigned to the source by the TMDL.

When numeric water quality criteria are available, dilution calculations or more sophisticated mathematical models are used to determine corresponding loading rates. When only narrative standards are present, translator mechanisms can be employed. For instance, a translator for a "no toxics in toxics amount" narrative could be a limit on the overall toxicity of the discharge–a so-called Whole Effluent Toxicity (WET) limit.

WQBELs are risk based and therefore generally place much less emphasis on economic and technological factors than do technology-based limits.

Figure 56 illustrates the differences between technology-based and water quality-based approaches to setting limits on loadings of pollutants. "Waterbody" is put in parenthesis to make the point that under the technology-based approach, success is measured primarily by reductions in discharges of pollutants, not effects on receiving waters. Hence, ambient monitoring has often not been a high priority for states. .

Effluent Monitoring

Beside effluent discharge limits, permits usually include effluent monitoring requirements. Fundamentally, permitting authorities require monitoring of pollutants limited in the permit so that the permittee can demonstrate compliance with its limits. If the monitoring demonstrates noncompliance, then the data can be used as the basis for an enforcement action (Figure 57).

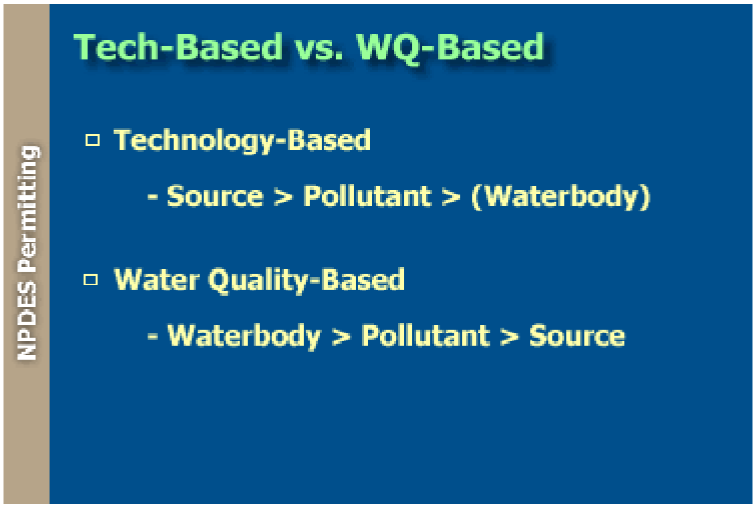


Figure 56

The permittee must retain records for all monitoring information (which includes maintenance and calibration records, strip charts, reports, etc.) for at least 3 years from the date of sampling (sewage sludge data must be maintained for 5 years).

Monitoring may also serve to provide data about treatment efficiency and to characterize effluents for permit reissuance. Instream monitoring (above and below the outfall) may also be useful to assess impacts of the discharge, but is infrequently required.

Biosolids

EPA has published national regulations dealing with municipal sludge. The focus of these regulations is on toxics, pathogens, and "vectors" (flies, mosquitoes, rodents, and other carriers of disease) (Figure 58).

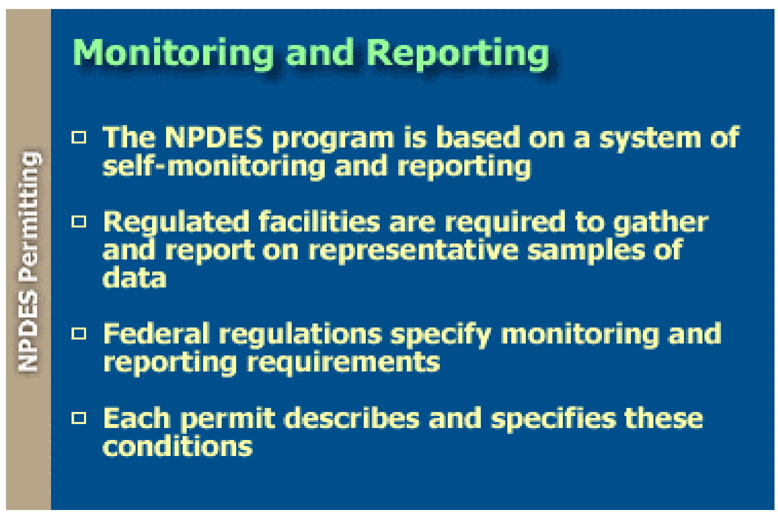


Figure 57

Sewage sludge can be disposed of in landfills, lagoons, incinerated, or land applied to serve as a soil enhancer or fertilizer (Figure 59). Land application of sewage sludge is often done on parks, golf courses, abandoned mines, and construction site restoration. It can also be applied to crops, including crops for human consumption (Figure 60).

The sludge program is designed to encourage communities to keep levels of contaminants in their sludge as low as possible. The cleaner a city's sludge is, the fewer are the federal limitations on disposal and use.

Municipal Wet Weather Flows

Figure 58

Figure 59

Figure 60

Web Resources

EPA's Bio Solids Web site is: www.epa.gov/owm/mtb/biosolids/index.htm

Initially, EPA and state water quality agencies focused on point source discharges that were essentially continuous, that is discharging at more or less the same rate year-round. Starting in the mid-1980s, attention was also directed to point source discharges that happened only during and after precipitation events–so called "wet weather flows." These included rainfall-induced runoff from industrial facilities, as well as two types of urban wet weather flows–combined sewer overflows and municipal separate storm sewers.

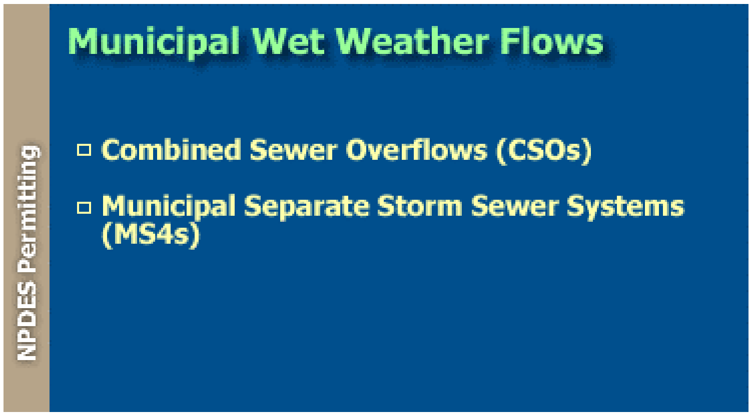


Figure 61

Combined sewer overflows, or CSOs, and municipal separate storm sewer systems, also called MS4s, are subject to regulatory control under the NPDES program (Figure 61).

A combined sewer system is one that, by design and by function, carries both sanitary sewage (wastewater from homes, offices, factories) and storm water. During dry weather these systems carry all sanitary flows to the wastewater treatment plant for treatment to levels specified in the NPDES permit. (EPA regulations prohibit untreated discharges from combined sewer systems during dry weather) (Figure 62).

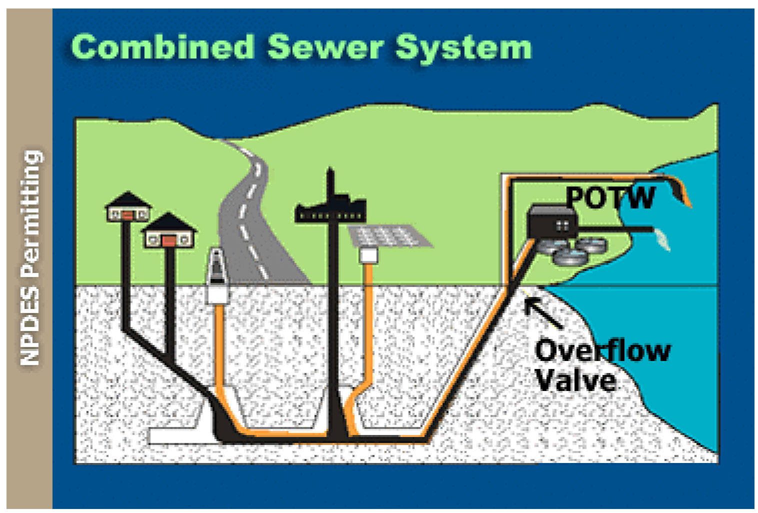


Figure 62

During periods of rainfall or snow melt, the carrying capacity of the sewer collection system may be exceeded, causing a combined sewer overflow (CSO) at relief points in the sewer system. These relief points are designed into the sewer system to prevent basement flooding, backup onto the streets or overloading of the wastewater treatment facilities.

Overflow discharges from combined systems contain not only storm water but also untreated human and industrial waste, oil and grease, metals, sediments, and floating debris. Untreated discharges from CSOs can necessitate beach closing and shell fishing restrictions, to avoid the spread of human pathogens and resulting illness.

Cities with CSOs tend to be older than those with MS4s. They are concentrated in the Northeast, the Great Lakes States, and the Pacific Northwest (Figure 63).

While combined sewer systems have one set of pipes to carry both storm water and wastewater, municipal separate storm sewer systems (MS4s) have separate lines–one set for the storm water and another set for sewage (Figure 64). MS4s that discharge to surface waters are also required to get NPDES permits, since they are, in effect, point source discharges of water mixed with various pollutants–oil and grease, metals, pesticides, pathogens, sediment and nutrients.

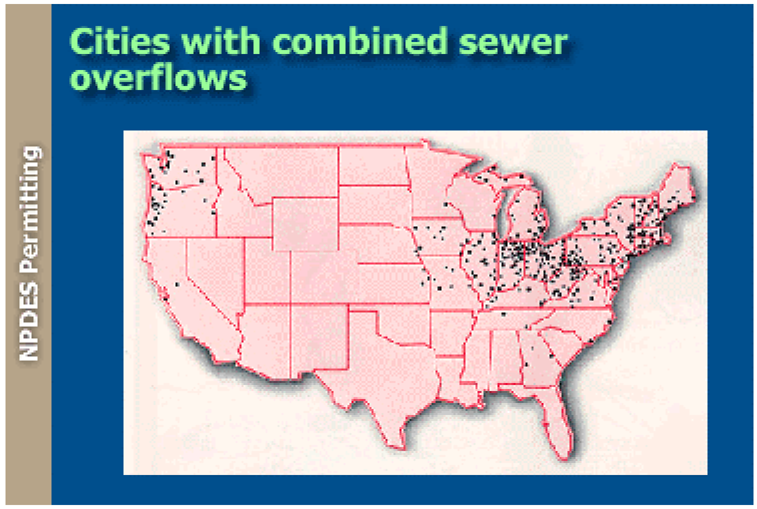


Figure 63

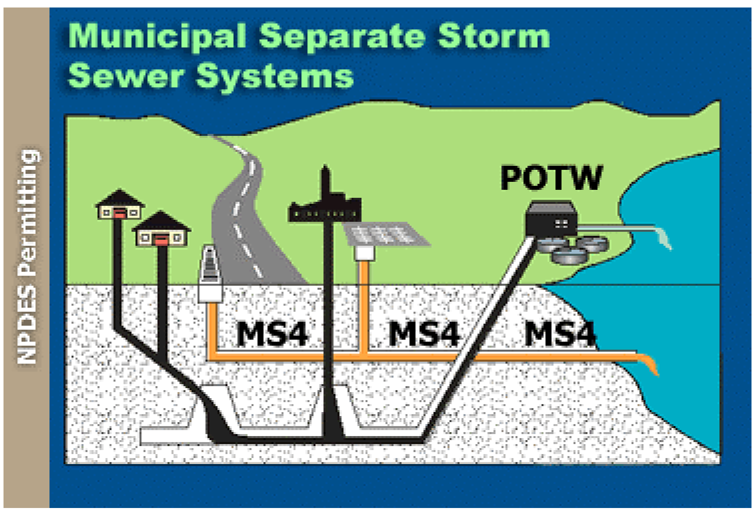


Figure 64

Because they deal with systems that are quite different from the point source discharges covered by "traditional" NPDES permits, MS4/CSO permits take a different approach in several aspects (Figure 65).

Because MS4/CSO systems often have large numbers of outfalls (discharge points), permits for such systems do not usually address outfalls individually. Rather, one permit is issued covering all the outfalls in a city's CSO or MS4.

Because we have much less experience with treating pollutants in wet weather-dependent urban discharges, and because the volume of wastewater being dealt with varies greatly, relatively few reliable and cost-effective treatment methods are available. Hence, it is difficult to predict with any precision what treatment levels can be achieved on a regular basis. Consequently, pollutant-by-pollutant end-of-pipe discharge limits are the exception rather than the rule in NPDES permits for MS4s and CSOs.

Instead, requirements for installation of certain types of structural devices or employment of various management strategies are common.

In addition, NPDES permits for urban wet weather discharges require cities to develop an overall strategic plan for addressing runoff of pollutants from various types of land use currently employed and expected in the future.

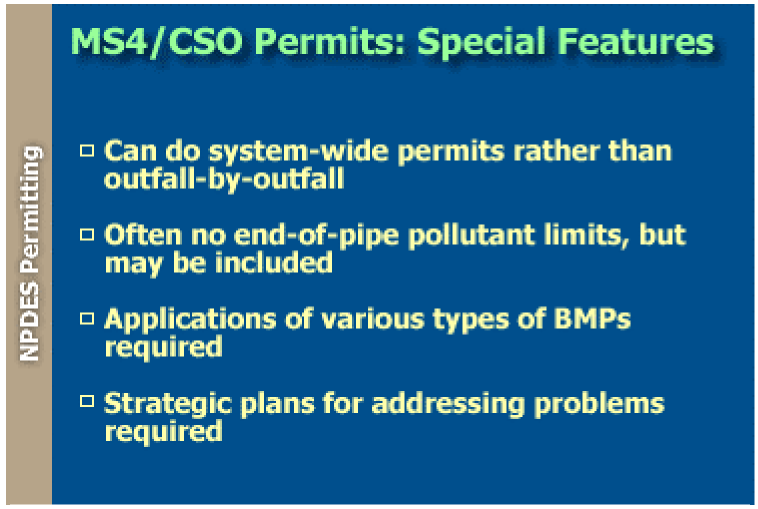


Figure 65

NPDES permits have already been issued MS4s serving more than 100,000 people.

Web Resources

USEPA's Web site for information on urban storm water BMPs is: http://cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cfm.

To receive a permit, these "Phase I" communities were required to submit detailed application forms. These applications include a wide array of information, such as what was then known about separate storm sewer pipes underneath the city and where they emerged as outfalls (discharges to surface waters).

Because of the large number of outfalls associated with most MS4s, unlike "traditional" point sources, these systems were not required to sample and analyze discharges from every outfall. Only a subset of what were thought to be outfalls representative of the system as a whole had to be tested and reported upon (Figure 66).

Cities applying for Phase I NPDES permits for their MS4s were required to develop a plan for reducing pollutant loadings into the MS4 and remove what had goten into the system regardless, to the "maximum extent practicable." They also had to provide an estimate of the degree of effectiveness of the overall program they proposed, in terms of reduction in pollutant discharges

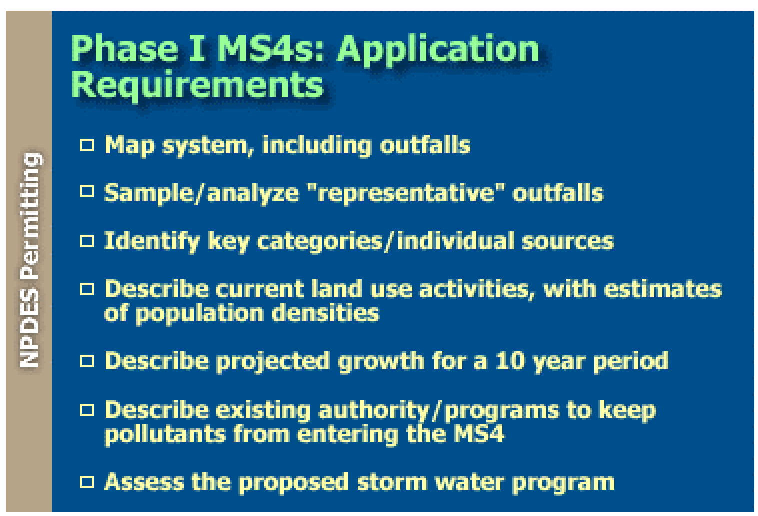


Figure 66

from MS4s and consequent changes in stream conditions.

One of the most basic requirements in permits for MS4s calls for elimination of all “non-storm water” discharges (Figure 67). The reason for this provision is that if sewage coming from homes, businesses, industries, hospitals, and other facilities goes into a MS4, that sewage will be discharged to a receiving water withough going through the municipal sewage treatment plant (because of the basic design of an MS4). Once an illegal/illicit connection has been located--in itself no small task, one option is to dig down to the point where the pipe(s) from the home/business/other waste-generating facility connect with the MS4, and move the connection over to the sanitary sewer line. Another option is to leave the connection in place, but treat it like a direct point source discharge, and require it to obtain an NPDES permit.

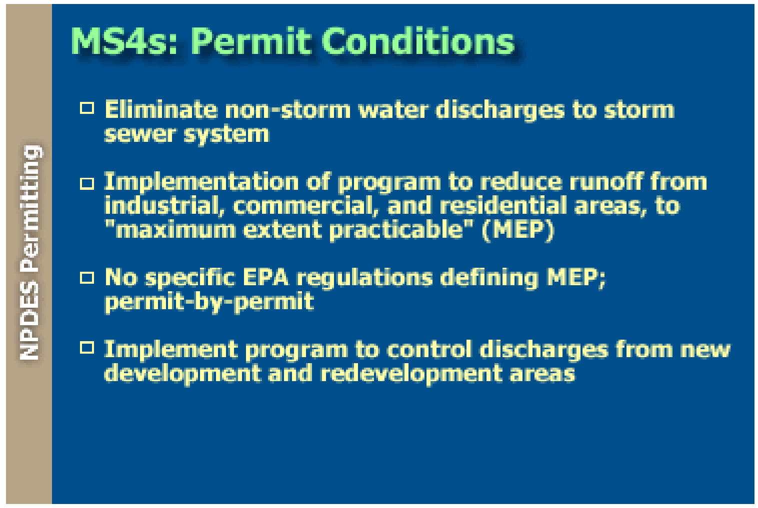


Figure 67

Another key requirement is implementation of a program to reduce loadings of pollutants in stormwater runoff from existing sources in all major urban land use categories to the “maximum extent possible” (MEP). Because EPA has not issued detailed, precise regulations or guidance regarding what activities or levels of pollutant removal constitute MEP, this key term is being defined on a MS4-by-MS4 basis.

MS4 communities are also required to develop and implement a program aimed at controlling levels of polluted runoff generated by new development activity. Such controls should not only address runoff during the construction stage, but also post construction runoff.

The basic requirements applied to all CSO systems -- often referred to as the “minimum measures” -- do not include a statement of required or expected end-of-pipe concentrations of individual pollutants, as would be the case with technology-based limits on POTWs or industrial process wastewater. Rather, the nine measures are a listing of key operating principles for CSOs, all aimed at reducing the volume of wastewater that

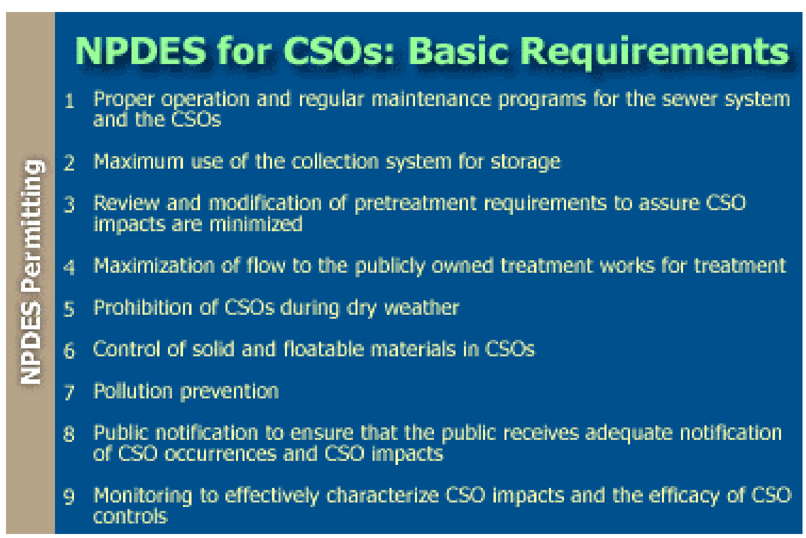


Figure 68

is routed around the POTW and lowering the amount of pollutant loads associated with CSO events (Figure 68). These principles are translated into greater detail on a CSO permit-by-permit basis. Still, most current CSO permits do not contain end-of-pipe limits.

Web Resources

USEPA's MS4 Web site: http://cfpub.epa.gov/npdes/stormwater/munic.cfm?program_id=6

EPA's CSO Web site can be found at: http://cfpub.epa.gov/npdes/home.cfm?program_id=5

EPA's industrial stormwater Web site: http://cfpub.epa.gov/npdes/stormwater/indust.cfm

Because it is often impractical to eliminate CSO events entirely, especially in major storms, communities are required to notify the public that CSO events have occurred, and that this will make it unsafe to swim in the receiving waters of CSO outfalls (discharges) for a certain period. Such notification can take the form of signs posted at popular swimming areas, radio or television public service announcements, or other means of informing the public.

Communities with CSOs are also required to develop a long-term plan for dealing with water quality problems caused by CSOs. Among the provisions of such plans are strategies for eliminating, or at least minimizing, CSO discharges to sensitive area such as locales with significant amounts of primary contact recreation (swimming), shellfish beds, drinking water supplies, and waters with threatened and endangered species and their habitats.

Operators of industrial facilities falling into 1 of 11 categories listed by EPA in its storm water regulation (several of which are listed in the accompanying slide) need an NPDES permit if the storm water is discharged directly to a surface water or goes into a municipal separate storm sewer system (MS4) . Most such operations are likely to be covered under a general NPDES permit, but some may need an individual NPDES permit (Figure 69).

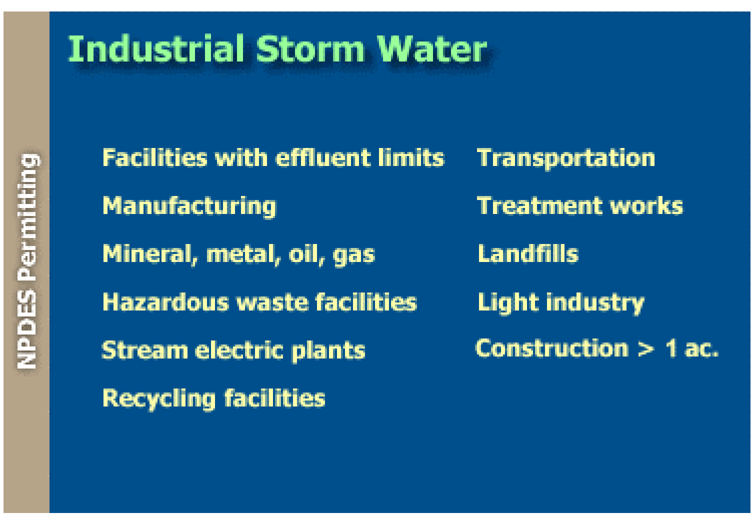


Figure 69

EPA has included the category under "storm water associated with industrial activity" runoff from construction sites (Figure 70). As of March 10, 2003, Construction activities disturbing 1 or more acres need NPDES permits. At a minimum, these permits require development of a site-specific storm water pollution prevention plan, covering both the construction and the post-construction phases of the project.

A Storm Water Pollution Prevention Plan (SWPPP) must include a site description, including a map that identifies sources of storm water discharges on the site, anticipated drainage patterns after major grading, areas where major structural and nonstructural measures will be employed, surface waters, including wetlands, and locations of discharge points to surface waters.

The SWPPP also describes measures that will be employed, including at least protection of existing vegetation wherever possible, plus stabilization of disturbed areas of site as quickly as practicable, but no more than 14 days after construction activity has ceased.

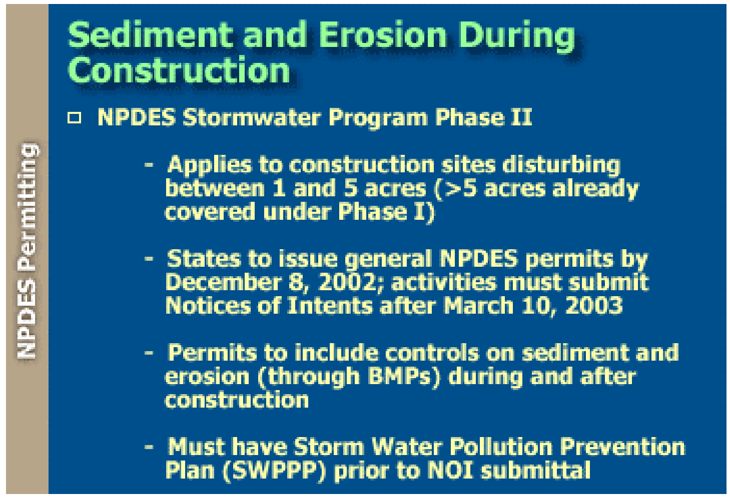


Figure 70

Permit Violations

In addition to such obvious situations as discharging without having obtained an NPDES permit and exceeding the pollutant discharge levels set forth in the permit, NPDES permittees are also in violation if they fail to comply with monitoring and reporting requirements laid out in their permit (Figure 71).

Web Resources

For more information on regulation of storm water from construction activities, check the USEPA Web site at: http://cfpub.epa.gov/npdes/stormwater/const.cfm.

Often, permits will not require attainment of effluent limits immediately upon receipt of a permit. Permittees will be given time to modify their operations and/or install new equipment. If the “compliance schedule” extends for longer than a year after permit issuance, interim milestones must be included. Examples of such interim steps are (1) completion of detailed design drawings, (2) the letting of contracts to equipment installers, and (3) onset of construction. (Such compliance schedules should, as a general rule, not extend beyond the five-year term of the project.)

Failure to meet such interim deadlines is a permit violation, just as exceedance of an effluent limit would be.

Permittees are required to notify the NPDES authority (usually a state) when they realize they have failed to comply with one or more of the permit conditions. EPA and state NPDES agencies also send inspectors to a permitted facility from time to time.

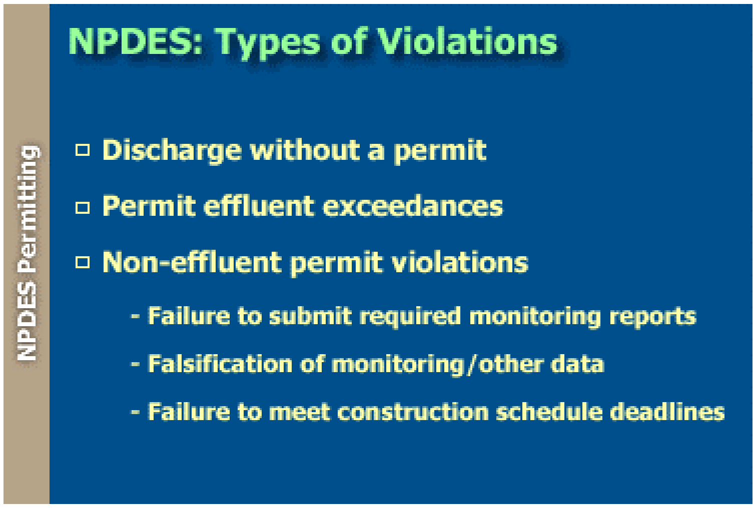


Figure 71

Enforcement

States, territories, and tribes are primarily responsible for enforcing NPDES permits when given responsibility by EPA (Figure 72). EPA takes enforcement action if these entities fail to do so. EPA must first inform the state, territory, or tribe of its belief that enforcement is necessary and give it time to take action.

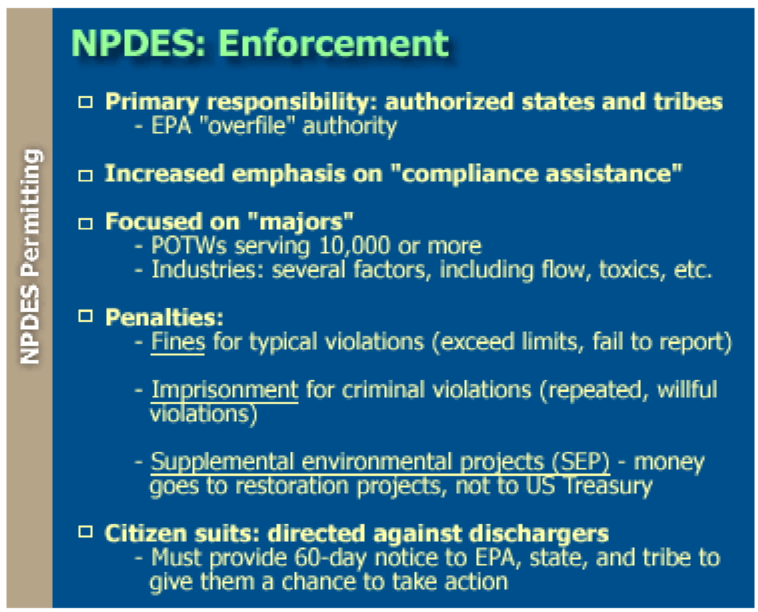


Figure 72

The NPDES program promotes compliance assistance, which helps permittees come into, and remain, in compliance with their permit, rather than going immediately to enforcement actions.

Enforcement actions include the following:

- Injunctions
- Fines for typical violations (exceed permit limits, failure to report)
- Imprisonment for criminal violations (repeated, willful violations)
- Supplemental environmental projects (SEP)

With a SEP, instead of simply paying a fine to the federal or state treasury, the violator must spend more money than the amount of the fine on a relevant environmental project, such as wetlands restoration or abandoned mine cleanup.

Citizens can also bring a lawsuit against a violator, but they must provide a 60-day notice to EPA and the state, territory, or tribe to give them time to take action against the violator.

Section 319: Nonpoint Source Program

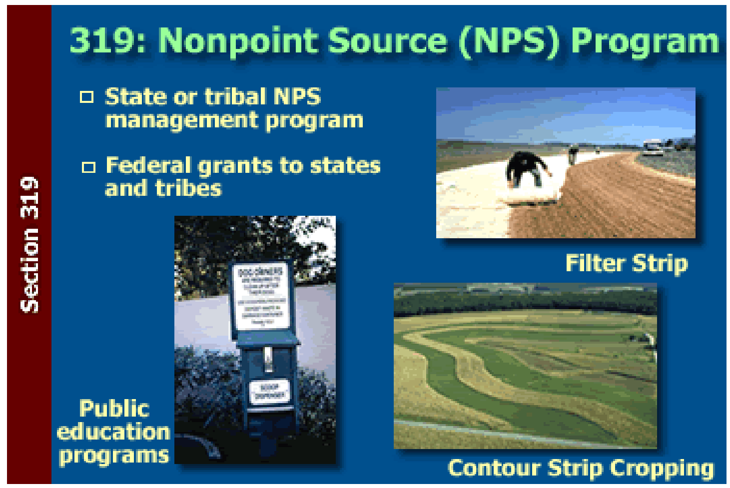


Figure 73

Nonpoint source pollution (NPS, Figure 73) represents the most significant source of pollution overall in the country. According to states' 305(b) and 303(d) reports, more miles of rivers and acres of lakes are impaired by overland runoff from rowcrop farming, livestock pasturing, and other types of nonpoint sources than by industrial facilities, municipal sewage plants, and point source runoff from municipal storm sewer systems and storm water associated with industrial activity. The most recent set of 303(d) reports indicated that more than 40 percent of all impaired waters were affected solely by nonpoint sources, while only 10 percent of impairments were caused by point source discharges alone.

The CWA does not provide a detailed definition of nonpoint sources. Rather, they are defined by exclusion -- anything not considered a "point source" according to the Act and EPA regulations. All nonpoint sources of pollution are caused by runoff of precipitation (rain and/or snow) over or through the ground. However, as noted previously, numerous types of precipitation-induced runoff are treated as point sources rather than as nonpoint sources under the CWA -- including stormwater associated with industrial activity, construction-related runoff, and discharges from municipal separate storm sewer systems (MS4s).

Atmospheric deposition is also a form of nonpoint source according to the CWA and EPA regulations: pollutants discharged into the air and returned directly or indirectly to surface waters in rainfall and snow, as well as so-called dry deposition between precipitation events. (Of course, "smokestack industries" such as fossil-fueled electric generating plants could be considered "point sources of air pollution". But the diffuse deposition of pollutants emitted by such facilities is a form of nonpoint source in the context of water pollution.)

Pollutants commonly associated with NPS include nutrients (phosphorus and nitrogen), pathogens, clean sediments, oil and grease, salt, and pesticides.

Congress chose not to address nonpoint sources through a regulatory approach, unlike its actions with "point" sources. Rather, when it added Section 319 to the CWA in 1987, it created a federal grant program that provides money to states, tribes, and territories for the development and implementation of NPS management programs (Figure 74).

Under the Clean Water Act Section 319, states, territories, and delegated tribes are required to develop nonpoint source pollution management programs (if they wish to recieve 319 funds).

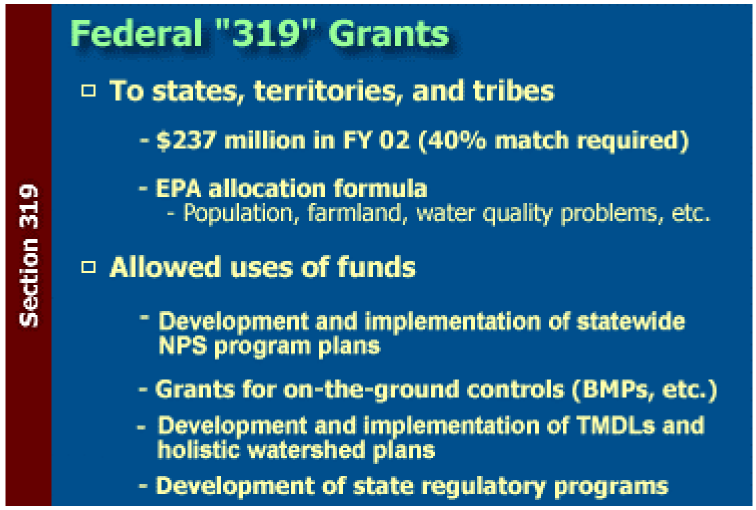


Figure 74

Once it has approved a state's nonpoint source program, EPA provides grants to these entities to implement NPS management programs under Section 319(h). Section 319 is a significant source of funding for implementing NPS management programs, but there are other federal (e.g., Farm Bill), and state, local, and private programs.

Initially, only $38 million a year was appropriated, but funding has increased significantly since then. In FY 2002, Congress appropriated $237 million for Section 319 grants. Recipients of these federal monies must provide a 40 percent match, either in dollars or in-kind services.

States and territories "pass on" a substantial fraction of the 319 funds they receive from EPA to support local nonpoint source pollution management efforts. Depending on the state or territory, a "local match" may be required.

Though there is no CWA federal regulatory authority over nonpoint sources of pollution and the Act does not require states to develop their own regulatory programs in order to obtain 319 grants, states, territories, and tribes may, at their discretion, use 319 funds to develop their own NPS regulatory programs.

Sec. 319 funds can also be used for the development and implementation of TMDLs in watersheds where nonpoint sources are a substantial contributor of loadings of the pollutant(s) causing impairment. Five percent of a state's 319 funds can be used for Clean Lakes program activities and 319 funds can be used for projects aimed at protecting groundwater.

A state, tribe, or territory receiving Section 319 funds must complete and update an NPS management plan every 5 years (Figure 75). Elements of such statewide strategies are discussed below.

States and tribes must identify waters that are impaired or threatened by nonpoint sources of pollution, develop short- and long-term goals for cleaning them up, and identify the best management practices (BMP) that will be used. The state and tribal NPS programs must also have a monitoring and evaluation plan, which is usually tied into the state 305(b) assessment and reporting program.

The BMP section of the plan requires identification of the most common types of stressors, the categories of sources of those stressors, and the types of BMPs that will be both effective and affordable in addressing the identified stressors and sources in general. (Stressors include pollutants, flow alteration, channel modification, invasive species, and others.) BMP efforts include both "statewide" and targeted elements. The former involves efforts to get a baseline level of BMPs implemented in all land uses that can generate nonpoint source pollution -- farms and forestry operations, for example. Targeted BMP efforts are aimed at having additional amounts and types of BMPs employed in the drainage of impaired or threatened waters.

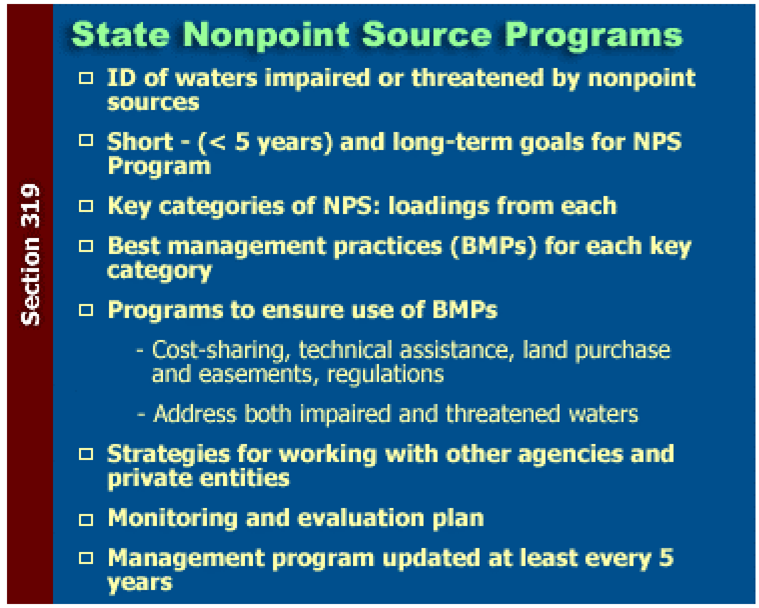


Figure 75

Nonpoint source management plans also identify strategies for working with other agencies and private entities. For example, the Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture is an extremely valuable partner in farm country, since NRCS has access to technical staff and significant cost-share funding under the Conservation Reserve Program and the Environmental Quality Improvement Program and other programs authorized in the 2002 Farm Bill.

Management plans also include the identification of federal lands and activities, which are to be managed in a manner consistent with program objectives of the 319 management plan.

Early in the life of the 319 program, EPA emphasized development of management strategies, combined with deployment of BMPs for education, demonstration, and research purposes. Recently, EPA has increased emphasis on evaluation of program effectiveness, including attempts to document the water quality benefits of BMPs and other program elements. Also, the Agency has notified states that, starting in FY 03, a sizeable portion of 319 funds should be spent on on-the-ground BMPs only if they are related to a holistic watershed plan or a TMDL specific to the area in which they are located.

Web Resources

- Nonpoint Source Page, What is NPS?: www.epa.gov/owow/nps/whatis.html
- NPS, Publications and Information Sources: www.epa.gov/owow/nps/pubs.html
- Clean Water Act, Section 319: www.epa.gov/owow/nps/cwact.html
- NPS Outreach Page: www.epa.gov/owow/nps/outreach.html

Section 404 Program

Although most commonly associated with activities that involve filling of wetlands, Section 404 actually deals with one broad type of pollution -- placement of dredged or fill material into "**waters of the United States**" (Figure 76). Wetlands are one component of "waters of the United States;" however, there are numerous other types -- intermittent streams, small perennial streams, rivers, lakes, bays, estuaries, and portions of the oceans.

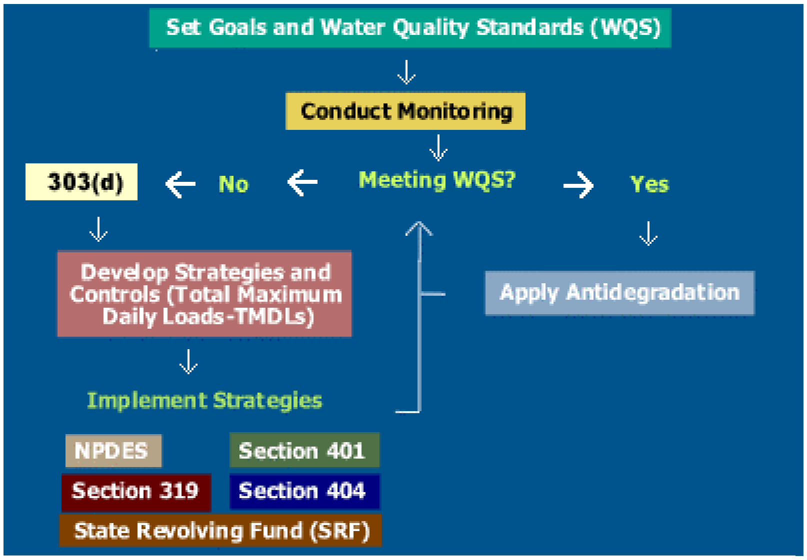


Figure 76

One of the controversial aspects of Section 404 is exactly what is and isn't a wetland. Federal regulations define wetlands as:

"Those areas that are inundated or saturated by surface or ground *water* at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of *vegetation* typically adapted for life in saturated *soil*" [33CFR328.3(b)] (italics added).

For an area to be declared a wetland, it should exhibit all three of the key features -- hydrology, wetland-dependent vegetation, and soil types associated with water-saturated conditions. However, some kinds of wetlands, such as bottomland hardwood swamps, are dry during some periods. The absence of water or saturated soil at any given moment does not render a plot "not a wetland," if the vegetation and soils indicate that wet conditions often do occur and hydrological data support this conclusion.

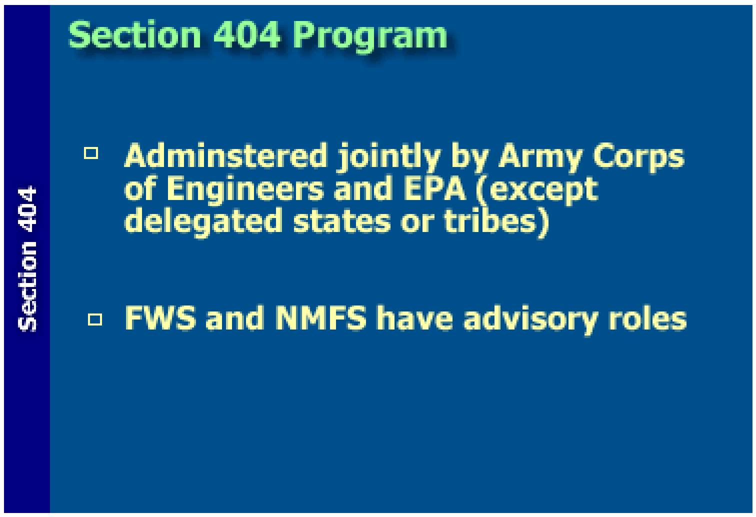


Figure 77

The 404 permit program is administered jointly by EPA and the U.S. Army Corps of Engineers (Figure 77). The Corps handles the actual issuance of permits (both individual and general); it also determines whether a particular plot of land is a wetland or water of the United States. The Corps has primary responsibility for ensuring compliance with permit conditions, although EPA also plays a role in compliance and enforcement.

The U.S. Fish and Wildlife Service and National Marine Fisheries Service play special advisory roles because of their expertise regarding wildlife habitat.

EPA issues certain guidelines and policies, including methods for determining whether a particular tract is a wetland. EPA can actually veto a Corps-issued permit (a step rarely taken.)

EPA is also responsible for determining whether portions of the 404 program should be turned over to a state, territory, or tribe. (To date only a few states have assumed 404 responsibility for nontidal waters.) When 404 authority has been given to a state, EPA oversees implementation of the program. If necessary, EPA can "take back" the program.

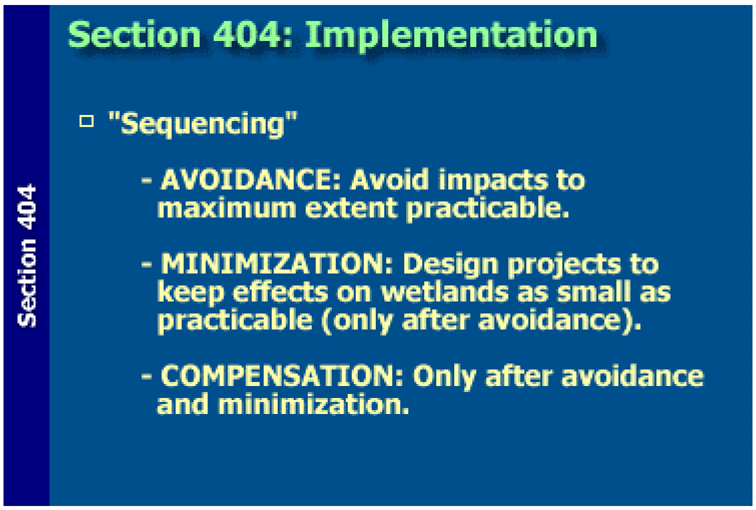


Figure 78

The essence of Section 404 policies is the concept of "sequencing." (Figure 78) This is a step-wise process, in which one must go through one step before going on to the next.

Step 1 is called "avoidance." Whenever practical, filling of waters of the United States should be avoided. A key issue in avoidance is whether the proposed activity is dependent on being located on or adjacent to a body of water. A marina, for example, would be dependent. A tennis court or shopping mall would not. Another issue is whether the plot of property on which the proposed project would be located contains sufficient amounts of dry land to accommodate the project.

If an impact on wetlands cannot be avoided entirely, then attempts to minimize the impacts are required. Often, changes in the position or design of a project can significantly reduce the amount of wetland acreage affected.

The final step in 404 sequencing is compensation. A long-standing federal policy called "no net loss" of wetlands drives compensation requirements under 404. The basic concept is that for every acre of wetland lost, at least one functionally equivalent acre of wetland must be restored. "Creation" of wetlands at sites where wetlands did not naturally occur is less acceptable than restoration of destroyed or degraded wetlands, because efforts to create wetlands have been deemed largely unsuccessful. Only in exceptional circumstances will preservation of existing healthy wetlands be accepted as mitigation for loss of wetlands permitted under Section 404.

Web Resources

- EPA's Section 404 of the Clean Water Act: An Overview web page: www.epa.gov/owow/wetlands/facts/fact10.html

- Army Corps of Engineers Regulatory Program: www.usace.army.mil/inet/functions/cw/cecwo/reg/

- Wetlands Regulations: www.epa.gov/owow/wetlands/regs.html
- State, Local, and Tribal Initiatives: www.epa.gov/owow/wetlands/initiative/
- Water Quality and 401 Certification: www.epa.gov/owow/wetlands/waterquality/
- Monitoring and Assessment: www.epa.gov/owow/wetlands/monitor/
- Wetland Restoration: www.epa.gov/owow/wetlands/restore/
- Outreach: www.epa.gov/owow/wetlands/resources/information.html

WQS Certification

Section 401(a) of the CWA requires that before issuing a license or permit that may result in any discharge to waters of the United States, a federal agency must obtain from the state in which the proposed project is located, a certification that the discharge is consistent with the CWA, including attainment of applicable state ambient water quality standards. (Figure 79) (The CWA also provides a mechanism whereby downstream states whose water quality may be affected by a federally-permitted or licensed project can engage in the 401 process.)

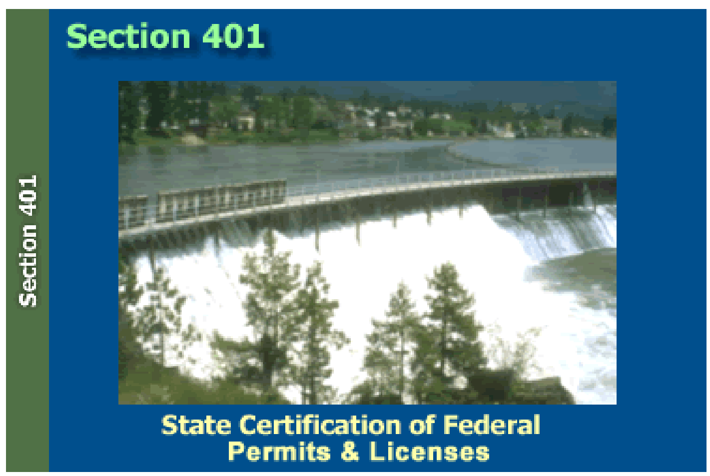


Figure 79

CWA provisions to which Section 401 certification applies include 404 permits from the Corps of Engineers and EPA-issued NPDES permits.

Section 401 certification has been a key issue in the relicensing of private hydropower dams by the Federal Energy Regulatory Commission (FERC.) In a number of cases, states have convinced FERC to include conditions in the new licenses for dams, requiring changes in dam management designed to prevent impairment of uses designated for affected waters in state water quality standards.

State Revolving Loan Funds

In 1987, Congress voted to phase out the old construction grants program for funding of municipal sewer and wastewater treatment plant upgrades, replacing it with the Clean Water State Revolving Fund (CWSRF). (Figure 80)

Figure 80

Under the CWSRF, EPA provides annual capitalization grants to states, who in turn provide low interest loans for a wide variety of water quality projects. States must match the federal funds with $1 for every $5 (20 percent match). As a result of federal capitalization grants, state match, loan repayments, and leverage bonds, the total amount of assets in all the CWSRFs is approaching $40 billion. Between $3 and $4 billion is loaned annually from CWSRFs nationwide.

Some funds are also provided to territories and tribes to be used as grants for municipal wastewater treatment projects. Territories must match the federal funds with a 20 percent match, while the tribes are not required to provide a match.

Loans are usually made at low (sometimes even no) interest. Although most loans have gone to local governments, they can also go to businesses or nonprofit organizations (Figure 81). Payback periods for loans extend to 20 years.

Most of the CWSRF dollars loaned to date have gone for construction expansion, repair, or upgrading of municipal sewage collection and treatment systems. But CWSRF loans can also be made for (1) NPS control projects consistent with a state, territorial, or tribal Section 319 program, or (2) implementation of a management plan developed under the National Estuary Program.

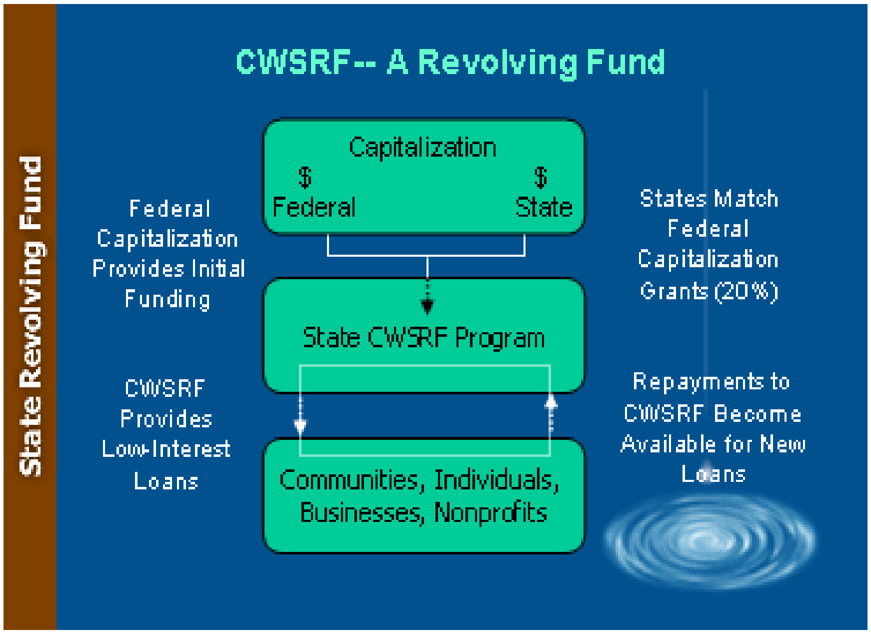


Figure 81

As of the end of 2001, over 30 CWSRFs had lent over $1.4 billion for nonpoint source projects. Such projects include loans to:

- Homeowners for repair and upgrade of septic systems
- Land trusts for purchase of sensitive lands/easements
- Purchase and restore degraded wetlands
- Dry cleaners to clean-up soil and ground water contamination on brownfields
- Farmers for equipment and structures to minimize runoff from fields

Managers of SRFs must comply with several basic requirements:

- Protect the capital (principle) in the fund -- ensure funds circulating in the CWSRF do indeed "revolve" and not diminish over the long run.
- Develop "intended use plans" -- develop project lists of upcoming loans in the next fiscal year.
- Provide for public participation and comment on intended use plans.
- Create a NEPA-like process, whereby the environmental impacts of projects getting loans are analyzed and options are considered.

Web Resources

For more information about the CWSRF and financing, check the USEPA Web site at: www.epa.gov/owm/cwfinance/index.htm

Now that you have gone through the CWA module, perhaps you would like to test what you have learned. If so, turn to page 62 for the final exam.

Also, you might be interested in a live-training version of this CWA course, which includes somewhat more detail on various topics, plus several quizzes and group exercises. Send us an inquiry indicating your interest, and telling us where you are located (city and state) and who you work for (federal agency, state agency, local government, university, nongovernmental organization, local watershed group, etc.).

Ways to contact us:

Use the online submission form on web page: page: www.epa.gov/owow/contact.html.

You may also write us at:

U.S. Environmental Protection Agency
Office of Wetlands, Oceans, and Watersheds (4501T)
1200 Pennsylvania Avenue, N.W.
Washington, D.C. 20460

Phone: 202-566-1300

E-mail: ow-owow-internet-comments@epa.gov

Glossary

Ambient Monitoring - Monitoring program with fixed station networks and intensive surveys and producing chemical, physical, and biological analyses. Ambient monitoring deals with conditions in the aquatic environment--streams, lakes, bays, estuaries, and oceans. By contrast, effluent (discharge) monitoring involves sampling and analysis of wastewater.

Antidegradation - A policy designed to prevent deterioration of existing levels of good water quality.

Bioaccumulation - The accumulation of contaminants in the tissues of organisms through any route, including respiration, ingestion, or direct contact with contaminated water, sediment, pore water, or dredged material. Such processes can result in levels of pollutants in tissues of aquatic organisms far higher than in the surrounding water.

Designated Uses - Uses that society, through state and federal governments, determines should be attained in the waterbody. Examples include warmwater aquatic ecosystems, public water supply, and recreational fishing.

Effluent Guidelines - National standards for wastewater discharges to surface waters and publicly owned treatment works (municipal sewage treatment plants). EPA issues effluent guidelines for categories of existing sources and new sources under Title III of the Clean Water Act. The standards are technology based (i.e., they are based on the performance of treatment and control technologies); they are not based on risk or impacts upon receiving waters.

Ephemeral Streams - Ephemeral waterbodies are streams, ponds, wetlands, etc. that contain water only a fraction of the time. Vernal pools and desert washes are examples. Sometime such waters are called “intermittent”. As a general rule, a waterbody is NOT excluded from the CWA definition of “waters of the U.S., simply because it is intermittent.

Feeding Guilds - The grouping of animals according to the feeding strategies they employ, whether they remain stationary and filter food out of water that passes over specialized body parts that serve as nets or sieves, dig in the bottom sediments, or chase after other animals.

Generalists - A species that can live in many different habitats and can feed on a variety of different organisms.

Nonpoint Source (NPS) Pollution - Pollution that, unlike pollution from industrial and sewage treatment plants, comes from many diffuse sources. NPS pollution is caused by rainfall or snowmelt moving over and through the ground. As the runoff moves, it picks up and carries away natural and manmade pollutants, finally depositing them into lakes, rivers, wetlands, coastal waters, and even our underground sources of drinking water. Loadings of pollutants from NPS enter waterbodies via sheet flow, rather than through a pipe, ditch or other conveyance.

Point Source of Pollution - Discrete conveyances, such as pipes or man made ditches that discharge pollutants into waters of the United States. This includes not only discharges from municipal sewage plants and industrial facilities, but also collected storm drainage from larger urban areas, certain animal feedlots and fish farms, some types of ships, tank trucks, offshore oil platforms, and collected runoff from many construction sites.

POTW - Publicly Owned Treatment Works (POTW) [40 CFR 403.3(o)] - A treatment works as defined by Section 212 of the CWA, which is owned by the state or municipality (as defined by Section 502(4) of the Act). This definition includes any devices or systems used in the storage, treatment, recycling, and reclamation of municipal sewage or industrial wastes of a liquid nature. It also includes sewers, pipes or other conveyances only if they convey wastewater to a POTW treatment plant. The term also means the municipality as defined in Section 502(4) of the CWA, which has jurisdiction over the indirect discharges to and the discharges from such a treatment works.

Specialist - A species with a very narrow range of habitat or food requirements.

Total Maximum Daily Load (TMDL) - A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources.

Trophic Levels - The energy levels or steps in a food chain or food web, i.e., primary producer, primary consumer, secondary consumer, tertiary consumer, and so forth.

Water Quality Criteria - levels of individual pollutants or water quality characteristics, or descriptions of conditions of a waterbody that, if met, will generally protect the designated use of the water.

Water Quality Standards - Includes three major components: designated uses, water quality criteria, and antidegradation provisions.

Waters of the United States - As defined in the CWA, "waters of the United States" applies only to surface waters, rivers, lakes, estuaries, coastal waters, and wetlands. Not all surface waters are legally "waters of the United States." Generally, those waters include the following:

- All interstate waters;
- Intrastate waters used in interstate and/or foreign commerce;
- Tributaries of the above;
- Territorial seas at the cyclical high tide mark; and
- Wetlands adjacent to all the above.

Wetlands - Lands where saturation with water is the dominant factor determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface (Cowardin, December 1979). Wetlands vary widely because of regional and local differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors, including human disturbance. Indeed, wetlands are found from the tundra to the tropics and on every continent except Antarctica.

> For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances

do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas."

Self Test for Clean Water Act Module

After you've completed the quiz, check your answers with the ones provided on page 63 of this document. A passing grade is 14 of 20 correct, or 70%.

1. The objectives of the Clean Water Act are to:

☐ A. Restore and maintain the integrity of the nation's waters
☐ B. Finance wastewater treatment plans and facilities
☐ C. Address polluted runoff
☐ D. Support research and demonstration projects
☐ E. All of the above

2. Currently, EPA, states, and tribes are focused solely on the portions of the Clean Water Act, dealing with discharge of pollutants from industrial sources.

☐ A. True
☐ B. False

3. Water Quality Standards are parameter-specific based on which of these factors?

☐ A. Recurrence interval/ frequency
☐ B. Duration
☐ C. Level/concentration/magnitude
☐ D. All of the above

4. A key element of the Water Quality-based approach under the CWA is the development of a Total Maximum Daily Load (TMDL).

☐ A. True
☐ B. False

5. TMDLs determine what level of ____________ would be consistent with meeting Water Quality Standards.

☐ A. stream flows
☐ B. pollutant load
☐ C. best management practice
☐ D. treatment
☐ E. None of the above

6. The CWA requires states to establish Water Quality Standards only for surface waters.

- ☐ A. True
- ☐ B. False

7. Key Clean Water Act Tools include:

- ☐ A. National Pollutant Discharge Elimination System (NPDES)
- ☐ B. Section 401 Water Quality Certification
- ☐ C. Section 319 Nonpoint Source Programs
- ☐ D. Clean Water State Revolving Fund
- ☐ E. Section 404 Regulation of discharge of dredged and fill materials
- ☐ F. All of the above

8. The three major components of the Water Quality Standards Program are:

- ☐ A. Designated use, existing use, and TMDLs
- ☐ B. Water quality criteria, antidegradation, and existing uses
- ☐ C. Antidegradation, designated use, and water quality criteria
- ☐ D. TMDLs, water quality criteria, and designated use

9. "Existing use" refers to any use to which the waterbody has been put since this date:

- ☐ A. January 10, 1978
- ☐ B. November 28, 1975
- ☐ C. October 15, 1976
- ☐ D. July 31, 1977
- ☐ E. None of the above

10. If a waterbody is no longer able to support a documented existing use, that use is no longer listed as one of the designated uses.

- ☐ A. True
- ☐ B. False

11. When a waterbody needs cleaner water to support a particular use, that use is a _________ use, and the opposite is a ___________ use.

☐ A. Lower, higher

☐ B. Higher, lower

12. _________ use is a term that answers the public's question, "To what uses do we want to be able to put this waterbody?"

☐ A. Preferred

☐ B. Wishful

☐ C. Designated

☐ D. Priority

13. Water quality criteria specify the conditions that a waterbody needs to meet a particular designated use.

☐ A. True

☐ B. False

14. ___________ criteria, like human health/fish consumption criteria, deal with the effects of pollutants with high bioaccumulation factors.

☐ A. Technical

☐ B. Wildlife

☐ C Zoological

☐ D. Human health

15. Generally, EPA scientists have indicated that most kinds of aquatic ecosystems can endure being significantly impacted once every 3 years and still remain healthy overall.

☐ A. True

☐ B. False

16. States, tribes, and territories are required to adopt in their WQS the exact numbers that EPA has published as water quality criteria.

☐ A. True

☐ B. False

17. Water quality criteria aimed at providing protection from short term exposure to __________ levels of pollutants are called __________ criteria, whereas WQC addressing long-term exposure to __________ concentrations are called __________ criteria.

☐ A. low, acute, higher, chronic

☐ B. high, acute, lower, chronic

☐ C. steady, acute, intermittent, chronic

18. A waterbody shows symptoms of impairment when it has:

☐ A. A higher percentage of tolerant species

☐ B. A lower proportion of predators

☐ C. A higher number of generalists

☐ D. A greater proportion of exotics

☐ E. More disease, malformations, and lesions

☐ F. All of the above

☐ G. None of the above

19. A _____ allows certain portions of a waterbody below a point source discharge to not meet applicable designated uses and water quality criteria.

☐ A. Designated use

☐ B. Low flow exemption

☐ C. Mixing zone

☐ D. None of the above

20. If a waterbody is attaining water quality standards, __________ policies apply.

☐ A. Antidegradation

☐ B. Designated use

☐ C. TMDL

☐ D. Degradation

☐ E. None of the above

21. The three tiers for antidegradation include:

- ☐ A. Preventing degradation that would result in loss of an existing/ attained use.
- ☐ B. Virtually no lowering of water quality, on specially designated waters
- ☐ C. Preventing “freefall” from considerably better than WQS down to just barely meeting them
- ☐ D. Bringing a waterbody to a zero level of pollution.
- ☐ E. A, B, C
- ☐ F. A, C, D

22. EPA must approve Water Quality Standards adopted by states, authorized tribes, and territories.

- ☐ A. True
- ☐ B. False

23. The CWA sets specific requirements on the amount (location, frequency) and type of ambient monitoring to be done by states.

- ☐ A. True
- ☐ B. False

24. The two biennial reports that states, tribes, and territories are required to submit providing the results of their monitoring efforts are:

- ☐ A. Section 319(a) and 301(c) reports
- ☐ B. Section 303(b) and 303(d) reports
- ☐ C. Section 401(d) and 305 Reports
- ☐ D. None of the above

25. The biennial report that includes all information that the state, tribe, or territory knows about its waters (healthy, threatened, and impaired) is the___________ Report.

- ☐ A. 319 (a)
- ☐ B. 303 (d)
- ☐ C. 303 (b)
- ☐ D. 305 (b)

26. The biennial report that should include only a list of waters that are threatened or impaired is the ___________ List.

- [ ] A. 319(a)
- [ ] B. 303(d)
- [ ] C. 303(b)
- [ ] D. 305

27. If monitoring and assessment indicate that a waterbody is impaired by nonpoint sources, and the waterbody is put on the 303 (d) list, the state, tribe, or territory must develop a regulatory strategy leading to attainment of Water Quality Standards.

- [ ] A. True
- [ ] B. False

28. TMDL strategies are required only for pollutants, not for all forms of pollution.

- [ ] A. True
- [ ] B. False

29. EPA regulations require that WQS be met within ________ years after a TMDL is approved for a waterbody.

- [ ] A. 5
- [ ] B. 10
- [ ] C. 15
- [ ] D. None of the above – there is no time limit

30. TMDLs must be reviewed and approved by EPA.

- [ ] A. True
- [ ] B. False

31. A TMDL includes an overall "budget" for a particular pollutant in a particular body of water, also known as its _______________.

- [ ] A. Pollutant "cap"
- [ ] B. Margin of safety
- [ ] C. Load allocation
- [ ] D. Wasteload allocation

32. Once the pollutant budget has been met, the next step is "slicing the pie" or allocating the pollutant load among various sources of the pollutant for which the TMDL has been developed.

- ☐ A. True
- ☐ B. False

33. TMDLs may be expressed as daily, weekly, monthly, or even yearly loads.

- ☐ A. True
- ☐ B. False

34. Wasteload Allocations apply to _________ sources.

- ☐ A. Nonpoint
- ☐ B. Point
- ☐ C. Critical
- ☐ D. None of the above

35. Load Allocations apply to _______ sources.

- ☐ A. Nonpoint
- ☐ B. Point
- ☐ C. Critical
- ☐ D. None of the above

36. Generally, point sources required to have individual NPDES permits are also required to be assigned individual Wasteload Allocations.

- ☐ A. True
- ☐ B. False

37. EPA issues regulations identifying exactly how the pollutant budget in a TMDL should be allocated among sources.

- ☐ A. True
- ☐ B. False

38. In most cases, the National Pollutant Discharge Elimination System (NPDES) permitting program applies only to direct discharges to _________.

- ☐ A. Ground water
- ☐ B. Surface water
- ☐ C. A and B

39. Examples of sources covered by NPDES permits include _____________:

- ☐ A. Abandoned mines on nonfederal lands
- ☐ B. Industrial and municipal discharges
- ☐ C. Abandoned mines on federal land
- ☐ D. Return flows from irrigated agriculture
- ☐ E. A and B
- ☐ F. B and C

40. NPDES permits must eliminate any discharge of pollutants from the permittee's operations.

- ☐ A. True
- ☐ B. False

Answers for Clean Water Act Module Self Test

Q1: E	Q2: B	Q3: D	Q4: A	Q5: B	Q6: A	Q7: F	Q8: C
Q9: B	Q10: B	Q11: B	Q12: C	Q13: A	Q14: B	Q15: A	Q16: B
Q17: B	Q18: F	Q19: C	Q20: A	Q21: E	Q22: A	Q23: B	Q24: B
Q25: D	Q26: B	Q27: B	Q28: A	Q29: D	Q30: A	Q31: A	Q32: A
Q33: A	Q34: B	Q35: A	Q36: A	Q37: B	Q38: B	Q39: F	Q40: B