

7. AFTERWORD

NEXT STEPS

EPA is committed to continually improving both the quality and quantity of information available to answer important questions about the condition of air, water, land, human health, and ecological systems, and how that condition is changing over time. The results of these improvements will be communicated to the public via regular updates of EPA's Report on the Environment. Specific plans for updating the Report include:

- **EPA's 2007 ROE Science Report:** Revised editions of this Science Report will be produced every 3 years and timed to provide input to the Agency's strategic planning process. New editions will reflect revisions or additions to the ROE questions, updates and revisions of the indicators in this report, addition of new indicators, and revisions to the "Introduction" and "Discussion" sections of the report.
- **Electronic Report on the Environment (e-ROE):** EPA's e-ROE, which provides users with the ability to navigate and query the ROE content, will be updated on an ongoing basis to enable users to obtain indicator revisions as soon as they are available.
- **EPA ROE Highlights of National Trends 2007:** This document, which communicates key information in the Science Report to the interested public, will be updated periodically.

To strengthen its ability to answer the ROE questions, the Agency will work to improve current indicators and add relevant new indicators that meet the ROE definition and criteria. EPA plans to:

- Expand its ability to present indicators and supporting data at variable geographical scales.
- Strengthen existing indicators, both by resolving their limitations and by filling specific spatial and temporal gaps.
- Utilize improved research, science, and technology to develop new indicators.
- Work with the scientific community to ensure that the information reported meets EPA's high standards for science.

Partnerships with federal, state, and non-government organizations to support indicator development and improvement through coordinated research, monitoring, and data sharing will be critical to fulfilling this commitment.

CHALLENGES

Throughout this report, EPA uses indicators to answer what it believes are among the most important questions about the environment and human health. For many of these questions, the answers are incomplete. Three important challenges affect EPA's ability to answer these questions:

- Gaps and limitations in ROE indicators.
- Emerging issues that suggest potential new areas of concern for which indicators are not yet available.
- Difficulty in synthesizing and integrating information from multiple indicators to obtain a coherent understanding of their interrelationships relevant to answering the ROE questions.

1 All three areas offer opportunities for improvement in future editions of this report.

2 **Indicator Gaps and Limitations**

3 Each ROE question in this document focuses on a set of interrelated environmental issues (described in
4 the “Introduction” to the question) about which there is a good scientific understanding. In general, there
5 are ROE indicators that describe status and trends relating to some but not all of these issues. The
6 “Discussion” section for each question describes the limitations in the current indicators and their
7 underlying data, as well as gaps where no appropriate indicators are available to answer important parts of
8 the questions. EPA is working to strategically analyze gaps and limitations in order to identify priorities
9 for developing additional indicators and improving existing indicators for future reports.

10 **Emerging Issues**

11 In this report, “emerging issues” are issues whose potential to affect human health and the environment is
12 not well understood. Emerging issues pose different challenges to EPA’s ability to answer the ROE
13 questions than do indicator gaps and limitations. For example, many emerging issues have only recently
14 been described in the scientific literature and popular press. Therefore, the current state of scientific
15 understanding makes it unclear whether indicators are needed, and if so, how they should be constructed
16 and tracked. Areas where issues potentially relevant to the ROE questions are emerging include:

- 17 • **New technologies, contaminants, or environmental effects potentially related to such**
18 **contaminants.** Examples include: brominated flame retardants;^{1,2} residues of pharmaceuticals
19 and personal care products;^{3,4,5} air pollutants related to the use of alternative fuels (e.g., bio-
20 diesel);⁶ new chemicals and new uses for existing chemicals;⁷ wastes that contain multiple

¹ Rayne, S., Ikonou, M.G., and Antcliffe, B. 2003. “Rapidly increasing polybrominated diphenyl ether concentrations in the Columbia River system from 1992 to 2000.” *Environmental Science and Technology* 37(13): 2847-2854.

² Birnbaum, L.S., and D.F. Staskal. 2004. Brominated Flame Retardants: Cause for Concern? *Environmental Health Perspectives* 112(1): 9-17.

³ Daughton, C.G., and Ternes, T.A. 1999. Pharmaceuticals and Personal Care Products in the Environment: Agents of Subtle Change? *Environmental Health Perspectives* 107(suppl 6): 907-944. Online at <http://www.epa.gov/nerlesd1/chemistry/ppcp/images/errata.pdf>.

⁴ Koplín, D.W., E.T. Furlong, M.T. Meyer, E.M. Thurman, S.D. Zaugg, L.B. Barber, and H.T. Buxton. 2002. Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999–2000: A national reconnaissance. *Environmental Science and Technology* 36:1202-1211. Available at <http://pubs.acs.org/journals/esthag/36/i06/pdf/es011055j.pdf>

⁵ Lindsey, M.E., Meyer, M.T., and Thurman, E.M. 2001. Analysis of trace levels of sulfonamide and tetracycline antimicrobials in groundwater and surface water using solid-phase extraction and liquid chromatography/mass spectrometry. *Analytical Chemistry* 73(19): 4640-4646.

⁶ Morris, R.E., et al.. 2003. Impact of Biodiesel Fuels on Air Quality and Human Health. NREL/SR-540-33793. Golden, CO: National Renewable Energy Laboratory. <http://www.nrel.gov/docs/fy03osti/33793.pdf>

1 materials that are challenging to separate, particularly for recycling and reuse;⁸ the growing field
2 of nanotechnology and the potential release of engineered nanomaterials (e.g., nanoparticles) to
3 the environment;⁹ and diseases and conditions for which there is emerging evidence that exposure
4 to environmental contaminants may be a risk factor (see Section 5.3.3).
5

- 6 • **Issues for which the inherent complexity of the interactions between pollutants,
7 environmental media, and ecological systems makes it unclear what should be measured.**
8 Examples include: (1) interactions between changing climate and feedback mechanisms and the
9 effects of a wide range of pollutants on human health, water resources, ecosystems, coastal areas,
10 and other valued resources,^{10,11,12,13} including the distribution and occurrence of harmful algal
11 blooms or other pathogens;¹⁴ and (2) loss of genetic diversity, which may result in the loss of an
12 entire species if that species becomes less able to adapt to changing conditions.¹⁵
13

14 These examples are neither definitive nor prioritized, but offered simply to illustrate the types of
15 challenges that lie ahead.

16 **Synthesis and Integration**

17 Synthesizing and integrating information across multiple indicators has been a major challenge in
18 developing this report. Linkages between trends in different indicators have been noted where they are

⁷ U.S. DOE. 2000. Energy and Environmental Profile of the U.S. Chemical Industry Report prepared by Energetics Incorporated. Columbia, MD <http://www.eere.energy.gov/industry/chemicals/>

⁸ U.S. EPA 2001. Electronics: A New Opportunity for Waste Prevention, Reuse, and Recycling United States Solid Waste and EPA 530-F-01-006. Environmental Protection Emergency Response <http://www.epa.gov/epr>

⁹ Oberdörster, G., E. Oberdörster, and J. Oberdörster. 2005. Nanotoxicology: An emerging discipline evolving from studies of ultrafine particles. *Environ Health Perspect.* 113:823-39.

¹⁰ Foley, J. 2005. Atmospheric Science: Tipping Points in the Tundra. *Science* 310(5,748):627-628.

¹¹ Milkov, A.V. 2004. Global estimates of hydrate-bound gas in marine sediments: how much is really out there? *Earth Sci. Rev.* 66(3-4):183-197.

¹² Faeth, P., and Greenhalgh, S. 2000. A Climate and Environmental Strategy for U.S. Agriculture. WRI Issue Brief, World Resources Institute, Washington, DC, November 2000.

¹³ Harrison, J., and P. Matson. 2003. "Patterns and controls of nitrous oxide emissions from waters draining a subtropical agricultural valley." *Global Biogeochemical Cycles.* 17(3): 1080.

¹⁴ Daniels, N.A., and Shafaie, A. 2000. A Review of Pathogenic *Vibrio* Infections for Clinicians. *Infections in Medicine* 17(10): 665-685. Online at http://www.issc.org/Vibrio_vulnificus_Education/Published%20Vibrio%20vulnificus%20Reference%20Materials.pdf.

¹⁵ Bagley, M. J., S. E. Franson, S. A. Christ, E. R. Waits, and G. P. Toth. 2003. Genetic Diversity As An Indicator Of Ecosystem Condition And Sustainability: Utility For Regional Assessments Of Stream Condition In The Eastern United States. U.S. Environmental Protection Agency, Washington, DC, EPA/600/R-03/056.

1 clear and scientifically defensible (e.g., acid deposition and the acid neutralizing capacity in lakes and
2 streams, or air emissions and concentration of sulfur dioxide). However, in many cases, it is not clear
3 whether a trend in a human health or ecological indicator is directly linked to trends in other, potentially
4 related indicators. In developing future editions of the ROE, EPA will strive to identify approaches and
5 criteria for synthesis and integration that have a sound scientific basis.

1 **APPENDIX A:**
2 **GLOSSARY AND ACRONYMS**
3

4 This glossary provides definitions for a limited set of terms. Most of these terms are included because
5 they have a particular usage or meaning either within EPA or in the context of this report. A few others
6 are included to ensure understanding of intended meaning because they are key terms within this report.
7 This glossary does not include other scientific terms for which standard definitions are readily available.

8 [Note: Acronyms will be added at a later stage.]

9 **A**

10 **advisory:** A nonregulatory document that communicates risk information to those who may have to make
11 risk management decisions. For example, a fish consumption advisory may recommend that people limit
12 or avoid eating certain species of fish caught from certain lakes, rivers, or coastal waters. In some cases,
13 advisories may include recommendations for specific groups (such as infants, children, the elderly, or
14 women who are pregnant or may become pregnant).

15 **agricultural and animal waste:** Waste generated by the production and harvest of crops or trees or the
16 rearing of animals. Animal waste is a subset of agricultural waste and includes waste (e.g., feed waste,
17 bedding and litter, and feedlot and paddock runoff) from livestock, dairy, and other animal-related
18 agricultural and farming practices.

19 **air pollutant:** Any substance in air that could, in high enough concentration, harm humans, animals,
20 vegetation, or material. Air pollutants can include almost any natural or artificial composition of matter
21 capable of being airborne—solid particles, liquid droplets, gases, or a combination thereof. Air pollutants
22 are often grouped in categories for ease in classification; some of the categories are sulfur compounds,
23 volatile organic compounds, particulate matter, nitrogen compounds, and radioactive compounds

24 **Air Quality Index (AQI):** An index for reporting daily air quality that characterizes air pollution levels
25 and associated health effects that might be of concern. EPA calculates the AQI for five criteria pollutants.
26 AQI values range from 0 to 500; the higher the AQI value, the greater the level of air pollution and the
27 greater the health concern. AQI values below 100 are generally thought of as satisfactory. When AQI
28 values are above 100, air quality is considered to be unhealthy—at first for certain sensitive groups of
29 people, then for everyone as AQI values get higher. Refer to EPA’s AIRNOW Web site
30 (<http://www.epa.gov/airnow>) for more information on the AQI and how it is calculated.

31 **Air Quality System (AQS):** EPA’s electronic repository of ambient air monitoring data collected by
32 EPA, state, local, and tribal air pollution control agencies from thousands of monitoring stations. AQS
33 contains monitoring data, descriptive information about monitoring stations, and data quality assurance
34 and quality control information.

35 **air toxics:** Air pollutants that cause or may cause cancer or other serious health effects, such as
36 reproductive effects or birth defects, or adverse environmental and ecological effects. Examples of toxic
37 air pollutants include benzene, found in gasoline; perchloroethylene, emitted from some dry cleaning
38 facilities; and methylene chloride, used as a solvent by a number of industries. Air toxics are also known
39 as hazardous air pollutants.

40 **anthropogenic:** Originating from humans; not naturally occurring.

1 **area source:** A source of air pollution that is released over an area that cannot be classified as a point
2 source. Area sources can include vehicles and other small engines, small businesses and household
3 activities, or biogenic sources such as a forest that releases hydrocarbons.

4 **B**

5 **baseline:** A reference condition against which changes or trends are judged—usually a set of conditions
6 that exist at a particular point in time.

7 **benchmark:** A concentration or other accepted measure against which environmental conditions are
8 compared.

9 **bioaccumulative compound:** A compound that tends to accumulate in tissues and build up in food webs.
10 Some bioaccumulative compounds can potentially have adverse effects on ecosystems or human health.

11 **biogenic source:** An air emissions source created by some sort of biological activity. Examples include
12 emissions resulting from microbial activity in soils and emissions from trees and other vegetation.
13 Emissions from biogenic sources are a subset of emissions from natural sources (see *natural source*).

14 **biological balance:** The interrelationships among organisms, including the structure of food webs and the
15 ability of ecological systems to maintain themselves over time. Balance is a dynamic characteristic, rather
16 than a fixed state.

17 **biological diversity:** The variety and variability among living organisms and the ecological complexes in
18 which they occur. Though it most often refers to the numbers of species, the term can apply to levels of
19 organization ranging from genes to ecosystems.

20 **biomarker:** A molecular or cellular indicator (or “marker”) of an event or condition (exposure, effect,
21 susceptibility) in a biological system or sample. The product of an interaction between a contaminant and
22 some target molecule or cell.

23 **biomarker of effect:** A measure of disease progression, representing a measurable alteration at the
24 molecular, cellular, or some other structural level in the body that can be recognized as a potential or
25 established adverse health effect. Such a biomarker can indicate a biological response or health effect
26 related to a chemical or other stressor; however, it is not always possible to link a biomarker with
27 exposure to a single substance.

28 **biomarker of exposure:** The level of a contaminant or its metabolite collected from the body or from
29 substances produced or excreted within biological systems. In humans, this measurement can reflect the
30 amount of the contaminant that is stored in the body, and is sometimes referred to as the body burden. It
31 indicates the level of exposure.

32 **biomarker of susceptibility:** A measurement of individual factors that can affect response to
33 environmental agents. Examples include enzymes whose presence or absence may reflect a particular
34 genetic condition.

35 **biomonitoring:** The measurement of human tissues or excreta from biological systems for direct or
36 indirect evidence of exposure to chemical, biological, or radiological substances.

37 **biotic environment:** The biological component of an ecosystem, including plants and animals.

38

1 **C**

2 **cleanup:** Action taken to deal with a release (or threat of release) of a hazardous substance that could
3 affect humans and/or the environment. This term is sometimes used interchangeably with the terms
4 “remedial action,” “removal action,” “response action,” and “corrective action.”

5 **climate change:** A term sometimes used to refer to all forms of climatic inconsistency; because the
6 Earth’s climate is never static, the term is more properly used to imply a significant change from one
7 climatic condition to another. In some cases, “climate change” has been used synonymously with “global
8 warming.” Scientists, however, tend to use “climate change” in the wider sense to also include natural
9 changes in climate.

10 **coastal waters:** Waters at the interface between terrestrial environments and the open ocean. Many
11 unique habitats lie in coastal waters—for example, estuaries, coastal wetlands, seagrass meadows, coral
12 reefs, mangrove and kelp forests, and upwelling areas.

13 **community:** In ecology, an assemblage of populations of different species within a specified location in
14 space and time. Sometimes, a particular subgrouping may be specified, such as the fish community in a
15 lake or the soil arthropod community in a forest.

16 **community water system:** A water system that supplies drinking water to 25 or more of the same people
17 year-round in their residences.

18 **condition:** The state of a resource, generally reflecting a combination of physical, chemical, and
19 biological characteristics such as temperature, water clarity, chemical composition, or the status of
20 biological communities. ROE questions address the condition of fresh surface waters, ground water,
21 wetlands, coastal waters, recreational waters, and consumable fish and shellfish. (Also see *ecological*
22 *condition*.)

23 **construction and demolition debris:** Waste materials generated during the construction, renovation, and
24 demolition of buildings, roads, and bridges. Construction and demolition debris often contains bulky,
25 heavy materials such as concrete, wood (from buildings), asphalt (from roads and roofing shingles),
26 gypsum (from drywall), metals, bricks, glass, plastics, building components (doors, windows, plumbing
27 fixtures), and trees, stumps, earth, and rock from clearing sites.

28 **contaminant:** Any physical, chemical, biological, or radiological substance or matter that has an adverse
29 effect on air, water, or soil.

30 **contaminated land:** Land that has been polluted with hazardous materials and requires cleanup or
31 remediation. Contaminated lands include sites contaminated as a result of improper handling or disposal
32 of toxic and hazardous wastes, sites where improper handling or accidents released toxic or hazardous
33 materials that are not wastes, and sites where toxics may have been deposited by wind or flooding.

34 **criteria pollutants:** A group of six widespread and common air pollutants that EPA regulates on the
35 basis of standards set to protect public health or the environment (see *National Ambient Air Quality*
36 *Standards*). The six criteria pollutants are carbon monoxide, lead, nitrogen dioxide, ozone, particulate
37 matter, and sulfur dioxide.

38

1 **D**

2 **deleted NPL site:** A site that has been deleted from the Superfund National Priorities List because its
3 cleanup goals have been met and there is no further need for federal action. See *Superfund* and *National*
4 *Priorities List*.

5 **drinking water quality:** Refers to whether contaminants are present in water that people drink—
6 including water from the tap, private wells, hauled water, untreated surface water sources, and bottled
7 water—at levels that could affect human health.

8 **drinking water standards:** Regulations that EPA sets to control the level of contaminants in the nation’s
9 drinking water. Enforceable standards include Maximum Contaminant Levels (MCLs) and Treatment
10 Techniques (TTs) (see separate entries for each). Drinking water standards apply to all public water
11 systems (see *public water system*).

12

13 **E**

14 **ecological condition:** A term referring to the state of the physical, chemical, and biological characteristics
15 of the environment, and the processes and interactions that connect them.

16 **ecological connectivity:** A term referring to the connected system of open space throughout an ecosystem
17 and adjacent ecosystems. Includes the presence of ecotones, the transitional regions between ecosystems.

18 **ecological processes:** The metabolic functions of ecosystems—energy flow, elemental cycling, and the
19 production, consumption, and decomposition of organic matter.

20 **ecological system:** A hierarchically nested area that includes all living organisms (people, plants,
21 animals, and microorganisms), their physical surroundings (such as soil, water, and air), and the natural
22 cycles that sustain them.

23 **ecoregion:** An area within which the ecosystems—and the type, quality, and quantity of environmental
24 resources—are generally similar. An ecoregion can serve as a spatial framework for the research,
25 assessment, management, and monitoring of ecosystems and ecosystem components. Several different
26 classification schemes have been developed, at various resolutions. For more information about EPA’s
27 ecoregion designations for North America, visit
28 <http://www.epa.gov/wed/pages/ecoregions/ecoregions.htm>.

29 **ecosystem:** The interacting system of a particular biological community and its non-living environmental
30 surroundings, or a class of such systems (e.g., forests or wetlands).

31 **emission factor:** The relationship between the amount of pollution produced by a particular source and
32 the amount of raw material processed. For example, an emission factor for a blast furnace making iron
33 might be pounds of particulates emitted per ton of raw materials processed.

34 **emission inventory:** A listing, by source and pollutant, of the amount of air pollutants discharged into the
35 atmosphere. Emission inventories can be based on emissions estimates, emissions measurements, or both.

36 **end state:** Any one of a number of ecosystem characteristics observed at a point in time. The term is
37 commonly used to represent the results of ecological processes.

38 **endpoint:** A biological or ecological characteristic that is the basis for evaluation or measurement.

1 **EPA Region:** One of ten EPA geographic divisions, each responsible for executing the Agency's
2 programs within a specific group of states and territories. A map of the EPA Regions is provided in
3 Figure 1-1.

4 **ephemeral waters:** Waterbodies (e.g., streams or wetlands) that contain water for brief periods, usually
5 in direct response to a precipitation event. Ephemeral waters generally flow for a shorter time period than
6 intermittent waters, although in some cases the terms are used interchangeably (see *intermittent waters*).

7 **exposure:** For humans, the amount of a chemical, physical, or biological contaminant at the outer
8 boundary of the body available for exchange or intake via inhalation, ingestion, or skin or eye contact.

9 **extent:** The amount and distribution of a resource, which may be measured in terms of spatial area,
10 volume, depth, or flow (e.g., for water resources). ROE questions address the extent of fresh surface
11 waters, ground water, wetlands, and coastal waters.

12 **extraction and mining waste:** Soil and rock generated during the process of gaining access to the ore or
13 mineral body, as well as water that infiltrates the mine during the extraction process. This category also
14 includes certain wastes associated with the beneficiation of ores and minerals, including wastes from the
15 following activities: crushing, grinding, washing, dissolution, crystallization, filtration, sorting, sizing,
16 drying, sintering, pelletizing, briquetting, calcining to remove water and/or carbon dioxide, roasting in
17 preparation for leaching (except where the roasting/leaching sequence produces a final or intermediate
18 product that does not undergo further beneficiation or processing), gravity concentration, magnetic
19 separation, electrostatic separation, floatation, ion exchange, solvent extraction, electrowinning,
20 precipitation, amalgamation, and heap, dump, vat, tank, and in situ leaching.

21

22 **F**

23 **final NPL site:** A site that has been formally added to the Superfund National Priorities List. See
24 *Superfund* and *National Priorities List*.

25 **finished water:** Water that has been treated and is ready to be delivered to customers.

26 **fossil fuel combustion waste:** Waste from the combustion of oil, natural gas, or petroleum coke; the
27 combustion of coal at electric utilities and independent power-producing facilities, non-utilities, and
28 facilities with fluidized bed combustion technology; or the combustion of mixtures of coal and other fuels
29 (i.e., coburning of coal with other fuels where coal is at least 50 percent of the total fuel).

30

31 **G**

32 **global climate change:** See *climate change*.

33 **greenhouse gas:** Any gas that absorbs infrared radiation in the atmosphere. Greenhouse gases include
34 water vapor, carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), halogenated fluorocarbons
35 (HCFCs), ozone (O₃), perfluorinated carbons (PFCs), and hydrofluorocarbons (HFCs).

36

37 **H**

38 **hazardous air pollutants:** See *air toxics*.

1 **hazardous waste:** Waste with properties that make it dangerous or potentially harmful to human health
2 or the environment. The universe of hazardous wastes is large and diverse. Hazardous wastes can be
3 liquids, solids, contained gases, or sludges. They can be the by-products of manufacturing processes or
4 simply discarded commercial products, like cleaning fluids or pesticides. Hazardous waste is regulated
5 under the Resource Conservation and Recovery Act (RCRA) Subtitle C (see *RCRA hazardous waste* for
6 the regulatory definition). States can identify additional wastes as hazardous beyond those identified by
7 EPA.

8 **health-based standards:** Standards based on an evaluation of available data on existing or potential risks
9 to human health.

10 **high-priority Corrective Action site:** One of 1,714 RCRA Corrective Action Program Cleanup Baseline
11 sites, designated in 1999 as having high priority for cleanup by federal and state agencies. See *RCRA*
12 *Cleanup Baseline*.

13 **hypoxia:** The occurrence of low dissolved oxygen concentrations in water. Hypoxia is generally defined
14 with respect to saturation; because saturation levels vary with temperature and salinity, the concentration
15 that defines hypoxia may vary seasonally and geographically. In practice, scientists often use a threshold
16 of 2 parts per million, the generally accepted minimum required for most marine life to survive and
17 reproduce.

18

19 **I**

20 **impervious surface:** A hard surface area that either prevents or retards the entry of water into the soil
21 mantle or causes water to run off the surface in greater quantities or at an increased rate of flow. Common
22 impervious surfaces include rooftops, walkways, patios, driveways, parking lots, storage areas, concrete
23 or asphalt paving, and gravel roads.

24 **index:** A single number, derived from two or more environmental variables, that is intended to simplify
25 complex information. For example, the Index of Biological Integrity combines several metrics of benthic
26 community condition into a single index score.

27 **index period:** In EPA's aquatic resource monitoring, a term used to describe the portion of the year when
28 data are collected. The index period is often selected based on ecological considerations.

29 **indicator:** A numerical value derived from actual measurements of a stressor, state or ambient condition,
30 exposure, or human health or ecological condition over a specified geographic domain, whose trends over
31 time represent or draw attention to underlying trends in the condition of the environment.

32 **industrial non-hazardous waste:** Waste generated from processes associated with the production of
33 goods and products, such as electric power generation and manufacturing of materials such as pulp and
34 paper, iron and steel, glass, and concrete. This waste usually is not classified as municipal solid waste by
35 the federal government, but some states may classify it as such if it enters the municipal solid waste
36 stream.

37 **industrial source:** A term used in this report to describe air emissions sources of industrial origin. The
38 report breaks industrial sources down into contributions from selected industries, as appropriate.

39 **intermittent waters:** Waterbodies (e.g., streams or wetlands) that contain water for part of each year, due
40 to precipitation events and some ground water contributions. Intermittent streams and wetlands typically

1 contain water for weeks or months, while “ephemeral” streams and wetlands contain water for briefer
2 periods—but in some cases these terms are used interchangeably (see *ephemeral waters*).

3 **invasive species:** A non-indigenous plant or animal species that can harm the environment, human health,
4 or the economy.

5

6 **L**

7 **land treatment unit:** A site where physical, chemical, and biological processes occurring in the topsoil
8 layers (e.g., naturally occurring soil microbes and sunlight) are used to treat and contain waste. Hazardous
9 waste is applied directly to the soil surface or incorporated into the upper layers of the soil, where its
10 constituents are degraded, transformed, or immobilized. Liner systems or leachate collection and removal
11 systems are not required for land treatment units. Closure consists primarily of placing a vegetative cover
12 over the unit and certifying that hazardous constituent levels in the treatment zone do not exceed
13 background levels.

14 **landfill:** A disposal site for solid wastes spread in layers, compacted to the smallest practical volume, and
15 covered by material (e.g., soil). Landfills are designed to isolate waste from the surrounding environment
16 (e.g., ground water, rain, air). Landfills are subject to requirements that include installing and maintaining
17 a final cover, operating leachate collection and removal systems, maintaining and monitoring the leak
18 detection system, ground water monitoring, preventing storm water run-on and -off, and installing and
19 protecting surveyed benchmarks.

20

21 **M**

22 **Maximum Contaminant Level (MCL):** The highest level of a contaminant that EPA allows in drinking
23 water. MCLs are enforceable standards that ensure that drinking water does not pose either a short-term
24 or long-term health risk. EPA sets MCLs at levels that are economically and technologically feasible.
25 Some states set MCLs that are more strict than EPA’s.

26 **medical waste:** Any solid waste generated in the diagnosis, treatment, or immunization of human beings
27 or animals, in research pertaining thereto, or in the production or testing of biologicals, excluding
28 hazardous waste identified or listed under 40 CFR Part 261 or any household waste as defined in 40 CFR
29 Sub-Section 261.4(b)(1).

30 **metal mining sector:** Metal mining facilities that fall within Standard Industrial Classification Code 10
31 and must report to the Toxics Release Inventory in accordance with Section 313 of the Emergency
32 Planning and Community Right to Know Act.

33 **mobile source:** A term used to describe a wide variety of vehicles, engines, and equipment that generate
34 air pollution and that move, or can be moved, from place to place. “On-road” sources are vehicles used on
35 roads to transport passengers or freight. “Nonroad” sources include vehicles, engines, and equipment used
36 for construction, agriculture, transportation, recreation, and many other purposes.

37 **municipal solid waste:** Waste from homes, institutions, and commercial sources consisting of everyday
38 items such as product packaging, grass clippings, furniture, clothing, bottles and cans, food scraps,
39 newspapers, appliances, consumer electronics, and batteries. (Excluded from this category are municipal
40 wastewater treatment sludges, industrial process wastes, automobile bodies, combustion ash, and
41 construction and demolition debris.)

1 **N**

2 **National Ambient Air Quality Standards (NAAQS):** Standards established by EPA that apply to
3 outdoor air throughout the country. The Clean Air Act established two types of national air quality
4 standards. Primary standards set limits to protect public health, including the health of “sensitive”
5 populations such as asthmatics, children, and the elderly. Secondary standards set limits to protect public
6 welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and
7 buildings. EPA has set NAAQS for the six *criteria pollutants*.

8 **national indicator:** An ROE indicator for which nationally consistent data are available, and which helps
9 to answer an ROE question at a national scale. Some national indicators also present data broken down by
10 EPA Region. See *ROE indicator*.

11 **National Priorities List (NPL):** EPA’s list of the most serious uncontrolled or abandoned hazardous
12 waste sites identified for possible long-term remedial action under Superfund. See *Superfund*.

13 **natural source:** A term used in this report to describe any air emissions source of natural origin.
14 Examples include volcanoes, wild fires, wind-blown dust, and releases due to biological processes (see
15 *biogenic source*).

16 **non-indigenous species:** A species that has been introduced by human action, either intentionally or by
17 accident, into an area outside its natural geographical range; also called an alien, exotic, introduced, or
18 non-native species. Certain non-indigenous species are considered “invasive.” (See *invasive species*.)

19 **non-production-related waste:** Waste that is not production-related; for example, waste associated with
20 catastrophic events and cleanup actions. Toxic chemicals in non-production-related waste must be
21 reported to the Toxics Release Inventory (see *Toxics Release Inventory*).

22 **non-transient non-community water system:** A type of public water system that supplies water to 25 or
23 more of the same people at least six months per year in places other than their residences. Some examples
24 are schools, factories, office buildings, and hospitals that have their own water systems. (See *public water*
25 *system*.)

26 **nonpoint source:** A diffuse source of pollution, having no single point of origin. This term is commonly
27 used to describe water pollution caused by rainfall or snowmelt moving over and through the ground and
28 carrying natural and human-made contaminants into lakes, rivers, streams, wetlands, estuaries, other
29 coastal waters, and ground water. Atmospheric deposition and hydrologic modification are also sources of
30 nonpoint water pollution.

31 **non-public water system:** A water system that does not provide water for human consumption through at
32 least 15 service connections, or regularly serve at least 25 individuals, for at least 60 days per year.

33 **nutrient:** Any substance assimilated by living things that promotes growth. The term is generally applied
34 to nitrogen and phosphorus but is also applied to other essential and trace elements.

35

36 **O**

37 **oil and gas production waste:** Gas and oil drilling muds, oil production brines, and other waste
38 associated with exploration for, or development and production of, crude oil or natural gas.

39 **onsite treatment:** See *treatment*.

1 **ozone-depleting substance:** Any compound that contributes to stratospheric ozone depletion (see *ozone*
2 *depletion*).

3 **ozone depletion:** Destruction of the stratospheric ozone layer, which shields the earth from ultraviolet
4 radiation harmful to life. This destruction of ozone is caused by the breakdown of certain chlorine- and/or
5 bromine-containing compounds (chlorofluorocarbons or halons). These compounds break down when
6 they reach the stratosphere and then catalytically destroy ozone molecules.

7

8 **P**

9 **point source:** A fixed location or facility that discharges pollution—for example, a factory smokestack, a
10 ship, an ore pit, a ditch, or a pipe discharging treated industrial wastewater or treated sewage into a
11 waterway.

12 **pollutant:** Any substance introduced into the environment that may adversely affect the usefulness of a
13 resource or the health of humans, animals, or ecosystems. For most environmental media, this term is
14 commonly understood to refer to substances introduced by human activities. In the case of air, the
15 convention is to include substances emitted from natural sources as well (see *air pollutant*).

16 **population:** In ecology, a group of interbreeding organisms occupying a particular space. In other
17 contexts, including human health, this term generally refers to the number of humans living in a
18 designated area.

19 **precursor:** In photochemistry, any compound antecedent to a pollutant. For example, volatile organic
20 compounds and nitrogen oxides react in sunlight to form ozone or other photochemical oxidants. As such,
21 VOCs and nitrogen oxides are precursors.

22 **primary pollutant:** Any pollutant that is emitted into the atmosphere directly from its source and that
23 retains the same chemical form. An example of a primary pollutant is dust that blows into the air from a
24 landfill.

25 **Priority Chemicals:** A set of chemicals, found in the nation’s products and wastes, that EPA targets for
26 voluntary reduction (or recovery and recycling if they cannot be eliminated or reduced at the source). The
27 list of Priority Chemicals is available at <http://www.epa.gov/epaoswer/hazwaste/minimize/chemlist.htm>.

28 **production-related waste:** The sum of a facility’s production-related onsite waste releases, onsite waste
29 management (recycling, treatment, and combustion for energy recovery), and offsite transfers for
30 disposal, treatment, recycling, or energy recovery. Toxic chemicals in production-related waste must be
31 reported to the Toxics Release Inventory (see *Toxics Release Inventory*).

32 **public water system:** A system that provides water for human consumption through at least 15 service
33 connections, or regularly serves at least 25 individuals, for at least 60 days per year. Public water systems
34 are divided into three categories (see *community water system*, *non-transient non-community water*
35 *system*, and *transient non-community water system*). Examples of public water systems include municipal
36 water companies, homeowner associations, schools, businesses, campgrounds, and shopping malls.

37

1 **R**

2 **radioactive waste:** Waste containing substances that emit ionizing radiation. Radioactive waste is
3 classified by regulation according to its source and/or content. The types of waste that are typically
4 considered “radioactive waste” include high-level waste, low-level waste, mixed low-level waste,
5 transuranic waste (i.e., elements heavier than uranium), and certain wastes from the extraction and
6 processing of uranium or thorium ore. Spent nuclear fuel, which is produced as a result of the controlled
7 nuclear fission process in nuclear reactors, is considered a nuclear material rather than radioactive waste.

8 **RCRA Cleanup Baseline:** A priority subset of the universe of facilities that are subject to cleanup under
9 the Resource Conservation and Recovery Act (RCRA) due to past or current treatment, storage, or
10 disposal of hazardous wastes, and that have historical releases of contamination.

11 **RCRA hazardous waste:** A national regulatory designation for certain wastes under the Resource
12 Conservation and Recovery Act (RCRA). Some wastes are given this designation because they are
13 specifically listed on one of four RCRA hazardous waste lists (see
14 <http://www.epa.gov/epaoswer/osw/hazwaste.htm>). Other wastes receive this designation because they
15 exhibit at least one of four characteristics—ignitability, corrosivity, reactivity, or toxicity.

16 **regional indicator:** An ROE indicator that helps to answer an ROE question on a smaller-than-national
17 geographic scale. A regional indicator may cover a topic for which nationally consistent data are
18 unavailable, or it may present an issue that is of particular concern within a certain geographic area. See
19 *ROE indicator*.

20 **risk factor:** A characteristic (e.g., race, sex, age, obesity) or variable (e.g., smoking, occupational
21 exposure level) associated with increased probability of an adverse effect.

22 **ROE indicator:** An indicator that meets the ROE criteria (see Box 1-1, p. 1-7) and has been peer-
23 reviewed. See *indicator*.

24

25 **S**

26 **secondary pollutant:** Any pollutant that is formed by atmospheric reactions of precursor or primary
27 emissions. Secondary pollutants undergo chemical or physical changes once they reach the atmosphere.
28 An example of a secondary pollutant is ground-level ozone, which forms from chemical reactions
29 involving airborne nitrogen oxides, airborne volatile organic compounds, and sunlight

30 **sewage sludge:** A semi-solid residue from any of a number of air or water treatment processes. When
31 treated and processed, sewage sludge becomes a nutrient-rich organic material called biosolids.

32 **stratosphere:** The layer of the atmosphere that starts about 6 to 9 miles above the Earth’s surface at mid-
33 latitudes and lies atop the troposphere. The stratosphere contains small amounts of gaseous ozone, which
34 filters out about 99 percent of the incoming ultraviolet radiation.

35 **stressor:** A physical, chemical, or biological entity that can induce adverse effects on ecosystems or
36 human health.

37 **Superfund:** A program, operated under the legislative authority of the Comprehensive Environmental
38 Response, Compensation, and Liability Act and the Superfund Amendments and Reauthorization Act,
39 that funds and carries out EPA solid waste emergency and long-term removal and remedial activities.
40 These activities include establishing the National Priorities List, investigating sites for inclusion on the

1 list, determining their priority, and conducting and/or supervising cleanup and other remedial actions. See
2 *National Priorities List*.

3

4 **T**

5 **toxic chemical:** A chemical that can produce injury if inhaled, swallowed, or absorbed through the skin.
6 **Toxics Release Inventory (TRI):** A database containing detailed information on nearly 650 chemicals
7 and chemical categories that over 23,000 industrial and other facilities manage through disposal or other
8 releases, recycling, energy recovery, or treatment.

9 **Toxics Release Inventory (TRI) chemicals:** The chemicals and chemical categories that appear on the
10 current TRI toxic chemical list. As of March 2006, the TRI toxic chemical list contains 581 individually
11 listed chemicals and 30 chemical categories (including 3 delimited categories containing 58 chemicals).
12 The list of TRI chemicals is available at <http://www.epa.gov/tri/chemical/index.htm>.

13 **Toxics Release Inventory (TRI) facilities:** The facilities that are required by Section 313 of the
14 Emergency Planning and Community Right to Know Act to report to the TRI. In the 2003 reporting year,
15 23,811 facilities reported to the TRI.

16 **transient non-community water system:** A type of public water system that provides water in a place—
17 such as a gas station or campground—where people do not remain for long periods of time. These
18 systems do not have to test or treat their water for contaminants that pose long-term health risks, because
19 fewer than 25 people drink the water over a long period. They still must test their water for microbes and
20 several chemicals. (See *public water system*.)

21 **treatment:** Any process that changes the physical, chemical, or biological character of a waste to make it
22 less of an environmental threat. Treatment can neutralize the waste, recover energy or material resources
23 from it, render it less hazardous, or make it safer to transport, store, or dispose of.

24 **Treatment Technique (TT):** A required process intended to reduce the level of a contaminant in
25 drinking water.

26 **troposphere:** The layer of the atmosphere closest to the Earth’s surface. The troposphere extends from
27 the surface up to about 6 to 9 miles.

28

29 **U**

30 **underground injection:** The technology of placing fluids underground in porous formations of rocks,
31 through wells or other conveyance systems. The fluids may be water, wastewater, or water mixed with
32 chemicals. Regulations for disposing of waste this way vary depending on type of waste. RCRA
33 hazardous waste is placed in highly regulated (Class 1) wells.

34 **urbanization:** The concentration of development in relatively small areas (cities and suburbs). The U.S.
35 Census Bureau defines “urban” as referring to areas with more than 1.5 people per acre.

36

1 **W**

2 **wadeable stream:** A stream, creek, or small river that is shallow enough to be sampled using methods
3 that involve wading into the water. Wadeable streams typically include waters classified as first through
4 fourth order in the Strahler Stream Order classification system (Strahler, 1952).

5 **wetland:** An area that is inundated or saturated by surface or ground water at a frequency and duration
6 sufficient to support, and that under normal circumstances does support, a prevalence of vegetation
7 typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs,
8 and similar areas.

1
2
3
4
5
6
7
8
9

APPENDIX B: DEVELOPMENT OF EPA'S 2007 ROE: SCIENCE REPORT

10
11
12
13
14
15
16
17
18
19
20
21
22
23

EPA's 2007 Report on the Environment: Science Report (2007 ROE SR) was developed by the U.S. Environmental Protection Agency (EPA). EPA's Office of Research and Development (ORD) led this collaborative project, which involved EPA's program and Regional offices as well as external partners. This appendix describes the key elements of the 2007 ROE development process.

Section 1.01 Laying the Foundation

24
25
26
27
28
29
30
31
32
33

EPA published its Draft Report on the Environment (2003 Draft ROE) in June 2003 and invited feedback. The Agency received comments from several sources:

- The Science Advisory Board (SAB) reviewed the 2003 Draft ROE Technical Document in March 2004, issuing draft comments shortly afterwards and publishing final comments in December 2004 (SAB, 2004).
- Through February 2004, the public provided comments on the 2003 Draft ROE Technical Document via EPA's on-line public comment system (EPA, 2004a).
- Stakeholders commented on the 2003 Draft ROE Public Report during six dialogue sessions across the nation in 2003 and early 2004 (EPA, 2004b).

34
35
36
37
38
39
40
41

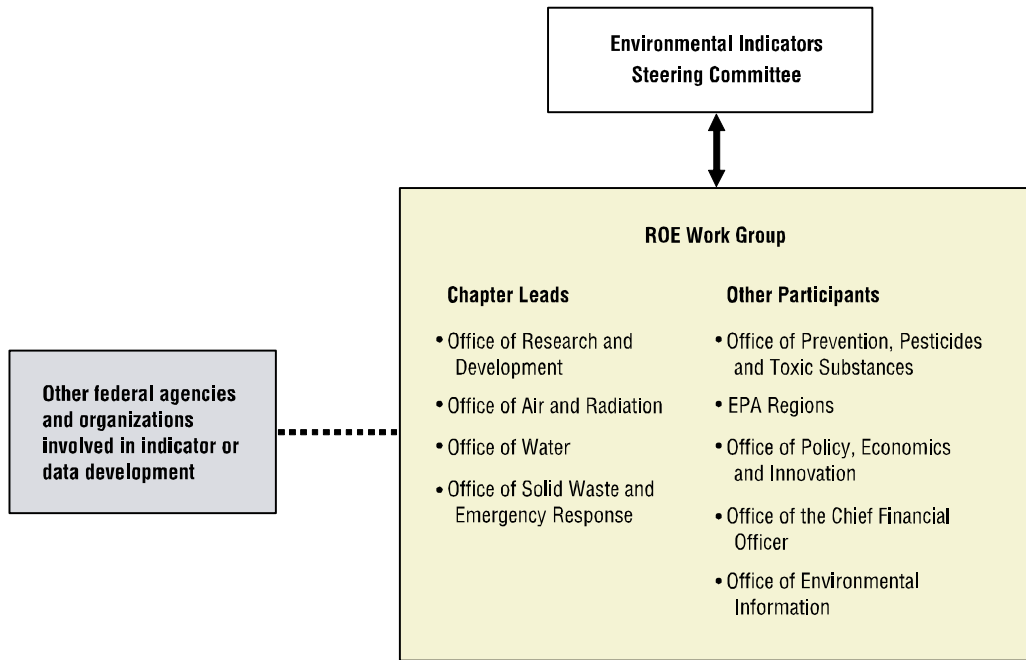
In January 2004, the EPA Administrator requested that work begin to develop the next version of the Report on the Environment. Exhibit B-1 shows the organizational structure for development of EPA's 2007 ROE: Science Report¹. A standing ROE Work Group took the lead in all phases of development. The group included five theme leads, each responsible for development for a particular chapter of the 2007 ROE, plus representatives of EPA Regions and other relevant EPA offices. During the development process, the theme leads coordinated with other federal agencies and organizations involved in indicator development or data collection. An Environmental Indicators Steering Committee, comprised of senior managers from across the Agency, oversaw development of the Science Report. The Steering Committee reviewed work group activities and draft products.

The ROE Science Report is based on three fundamental components:

- (1) A series of fundamental questions about the condition of the environment and its impact on human health that the Agency considers to be most important and relevant to its mission.
- (2) An indicator definition.
- (3) Criteria against which indicators are evaluated in terms of how they answer the questions.

¹An additional organizational element, the Indicators Work Group, was added to the process as the indicators were being finalized for the July 2005 peer review. The Indicators Work Group provided coordination between the ROE Work Group and the Steering Committee.

Exhibit B-1. Organizational structure for development of the 2007 ROE Science Report



1 The first step in developing the 2007 Report on the Environment was to review and refine the 2003 Draft
 2 ROE version of these components:

- 3
- 4 • **Questions:** Over 100 EPA specialists from across the Agency were convened in the five
 5 ROE theme areas: air, water, land, human health, and ecological condition. Each theme team was
 6 charged with considering feedback and refining the ROE questions. The questions were finalized
 7 after review by the Environmental Indicators Steering Committee.
- 8
- 9 • **Indicator definition and criteria:** The 2003 Draft ROE indicator definition and criteria
 10 were refined for the 2007 ROE using an iterative process that included input from EPA specialists
 11 and review by the Environmental Indicators Steering Committee. Care was taken to ensure that
 12 the criteria were consistent with requirements of EPA’s Information Quality Guidelines.
- 13

14 **Section 1.02 Indicator Development**

15
 16 Once the questions, definition, and criteria were refined, the next step was to identify and develop
 17 indicators to answer the questions:

- 18
- 19 • 2003 Draft ROE indicators were screened against the 2007 ROE indicator definition and
 20 criteria. Many 2003 Draft ROE indicators were proposed for the 2007 ROE; some were
 21 withdrawn.
- 22
- 23 • Ideas for new indicators were solicited from across EPA, other federal agencies, and
 24 organizations. Newly proposed indicators were screened for their ability to meet the indicator
 25 definition and criteria and for their value in answering the ROE questions.

1
2 For indicators that passed screening, three components were developed:

- 3
4
- Text describing the indicator.
 - A graphic or table displaying the indicator data.
 - A metadata form that documents the data source and quality (see Box B-1).
- 7

8 The 2007 ROE development team worked with staff at other departments, agencies, and private
9 organizations that originally developed indicators or provided indicator data to ensure that indicator
10 graphics, data, and quality assurance information were up to date and accurate. Indicators were reviewed
11 by the Environmental Indicators Steering Committee.

12 13 **Section 1.03 Indicator Peer Review and Public Comment**

14
15 Once the full suite of proposed indicators was assembled, all indicators were independently peer reviewed
16 by nationally recognized experts to ensure that they were scientifically sound and properly documented,
17 met the indicator definition and criteria, and were useful for answering the questions posed in the ROE.
18 Two rounds of review were conducted:

- 19
- At a workshop in July 2005, 21 experts reviewed the initial set of 88 proposed indicators.
 - In November 2005, nine experts reviewed 11 indicators that were new or substantially revised since the July review.
- 23

24 The peer review, organized by a contractor, was conducted following Office of Management and
25 Budget's (OMB's) specifications for peer review of "Highly Influential Scientific Assessments" as
26 specified in OMB's "Final Information Quality Bulletin for Peer Review" (OMB, 2004). The reviewer
27 selection criteria, list of reviewers, charge to reviewers, and reviewer comments can be found in the peer
28 review summary report (EPA, 2006). EPA announced the peer reviews in the Federal Register and also
29 posted the proposed indicators on a website for public comment. Key questions addressed during the
30 review are listed in Box B-2. After the peer review and public comment period, EPA revised and finalized
31 the indicators. EPA's responses to reviewer and public comments are available at [\[provide url\]](#).

Box B-1. Questions Addressed in the 2007 ROE Metadata Forms

- Are the physical, chemical, or biological measurements upon which this indicator is based widely accepted as scientifically and technically valid?
- Is the sampling design and/or monitoring plan used to collect the data over time and space based on sound scientific principles?
- Is the conceptual model used to transform these measurements into an indicator widely accepted as a scientifically sound representation of the phenomenon it indicates?
- To what extent is the indicator sampling design and monitoring plan appropriate for answering the relevant question in the ROE?
- To what extent does the sampling design represent sensitive populations or ecosystems?
- Are there established reference points, thresholds or ranges of values for this indicator that unambiguously reflect the state of the environment?
- What documentation clearly and completely describes the underlying sampling and analytical procedures used?
- Is the complete data set accessible, including metadata, data-dictionaries and embedded definitions or are there confidentiality issues that may limit accessibility to the complete data set?
- Are the descriptions of the study or survey design clear, complete and sufficient to enable the study or survey to be reproduced?
- To what extent are the procedures for quality assurance and quality control of the data documented and accessible?
- Have appropriate statistical methods been used to generalize or portray data beyond the time or spatial locations where measurements were made (e.g., statistical survey inference, no generalization is possible)?
- Are uncertainty measurements or estimates available for the indicator and/or the underlying data set?
- Do the uncertainty and variability impact the conclusions that can be inferred from the data and the utility of the indicator?
- Are there limitations, or gaps in the data that may mislead a user about fundamental trends in the indicator over space or time period for which data are available?

1
2
3
4
5
6
7
8
9
10
11
12
13
14
15

Section 1.04 Science Report Review

Concurrent with indicator development, EPA’s ROE team, working with specialists across the Agency, developed the text elements of the 2007 ROE Science Report. The final indicators were incorporated into the text to produce the full 2007 ROE Science Report. This document was reviewed three times:

- Internally at EPA
- Externally by other federal agencies and the Office of Management and Budget
- Externally by EPA’s Science Advisory Board (includes public comment on the federal docket)

EPA revised the document based on comments and, after the third review, finalized it for publication in 2007 [\[provide url\]](#).

Box B-2. Charge Questions for Peer Review of the Proposed 2007 ROE Indicators

- Indicate the extent to which you think the proposed indicator is appropriate, adequate, and useful for evaluating [see footnote]?
- Indicate the extent to which you think the proposed indicator makes an important contribution to answering the specific ROE question it is intended to answer.
- To what extent do you think the indicator meets the indicator definition?
- To what extent do you think the indicator meets each of the indicator criteria?
- Do you have any suggestions for more effective graphic presentation of the data?
- Provide any additional comments, suggestions, or concerns regarding the indicator that you have not already noted earlier. In particular, note any limitations to the indicator.
- Select one: Overall, this indicator (1) ___ should be included in the ROE07 SR; (2) ___ should be included in the ROE07 SR with the modifications identified above; or (3) ___ should not be included in the ROE07 SR.
- Do any of the proposed indicators clearly seem to be more appropriate, adequate, or useful for evaluating [see footnote] than others? Do any seem to be more important than the others for answering the question(s) they are intended to answer?
- Are there any additional *national-level* indicators that make an important contribution to answering one of the ROE questions in your topic area, but were not proposed for ROE07, that you would recommend? As you consider this question, consider the list of indicators presented in ROE03 that EPA does not intend to carry forward to ROE07, along with EPA's rationale for withdrawing them. If you disagree with EPA's rationale and feel any of these indicators should be included in ROE07, please so indicate in your response to this question, along with your rationale for why they should be included.

Footnote:

This part of the charge varied according to theme area as follows:

- *Air: "...our nation's air and therefore useful for contributing to an overall picture of our nation's air"*
- *Water: "...our nation's waters and for contributing to an overall picture of our nation's waters"*
- *Chemicals on land: "...trends in chemicals used on land and their effects on human health and the environment"*
- *Land wastes: "...trends in wastes and their effects on human health and the environment"*
- *Health: "...human health and for contributing to an overall picture of human health"*
- *Ecological Condition: "...ecological conditions and therefore useful for contributing to an overall picture of ecological conditions"*

1 Section 1.05

2 Section 1.06 References

3

4 EPA, 2006. Report of the Peer Review of Proposed ROE07 Indicators. Washington, DC: EPA Office of
5 Research and Development. [Give website pdf location here](#)

6

7 EPA, 2004a. E-docket for Draft Report on the Environmental Technical Document. Docket Number:
8 OEI-2003-0030. Through February 29, 2004. Available at:

9 <http://docket.epa.gov/edkpub/do/EDKStaffCollectionDetailView?objectId=0b0007d48016af48>.

1
2 EPA, 2004b. Summary Report of the National Dialogue on the EPA Draft Report on the Environment
3 2003. EPA Office of Environmental Information. Available at:
4 http://www.epa.gov/indicators/docs/National_Dialogue_Summary_Report.pdf.
5
6 OMB, 2004. Final Information Quality Bulletin for Peer Review. December 16, 2004. Washington, DC:
7 Office of Management and Budget.
8
9 SAB, 2004. EPA's Draft Report on the Environment (ROE) 2003: An Advisory by the ROE Advisory
10 Panel of the EPA Science Advisory Board, EPA-SAB-05-004. Available at:
11 <http://www.epa.gov/science1/fiscal05.htm>.

Appendix C: Comparison of Indicators Used in EPA's 2003 Draft ROE and 2007 ROE

- Indicators new to the 2007 report are listed in **bold** font
- Indicators in the 2003 report but withdrawn in 2007 are highlighted gray
- Explanation of indicators used in the 2003 Draft ROE but not in the 2007 ROE is provided at the end of this appendix

AIR CHAPTER

OUTDOOR AIR QUALITY	
2007 ROE Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Particulate Matter Emissions	Emissions: Particulate Matter (PM _{2.5} and PM ₁₀), Sulfur Dioxide, Nitrogen Oxides, and Volatile Organic Compounds
Sulfur Dioxide Emissions	
Nitrogen Oxides Emissions	
Volatile Organic Compounds Emissions	Emissions (utility): Sulfur Dioxide and Nitrogen Oxides
Lead Emissions	Lead Emissions
Air Toxics Emissions	Air Toxics Emissions
Acid Deposition	Deposition: Wet Sulfate and Wet Nitrogen
	Atmospheric Deposition of Nitrogen (From the Water Chapter)
Ambient Concentrations of Particulate Matter	Ambient Concentrations of Particulate Matter: PM _{2.5} and PM ₁₀
Ambient Concentrations of Ozone	Ambient Concentrations of Ozone: 8-hour and 1-hour
Ambient Concentrations of Lead	Ambient Concentrations of Lead
Ambient Concentrations of Benzene	Ambient Concentrations of Selected Air Toxics
Percent of Days with Air Quality Index Values Greater Than 100	Number and Percentage of Days that Metropolitan Statistical Areas (MSAs) have Air Quality Index (AQI) Values Greater than 100
Ozone Levels over North America	Ozone Levels Over North America
Concentrations of Ozone-Depleting Substances	Concentrations of Ozone-Depleting Substances (Effective Equivalent Chlorine)
Regional Haze	Visibility
Lake and Stream Acidity	Acid Sensitivity in Lakes and Streams (From the Water Chapter)
Ozone Injury to Forest Plants	Ozone Injury to Trees (From the Eco Chapter)
Carbon Monoxide Emissions	
Mercury Emissions	
Ambient Concentrations of Carbon Monoxide	
Ambient Concentrations of Nitrogen Dioxide	
Ambient Concentrations of Manganese Compounds in EPA Region 5	
Ozone and Particulate Matter Concentrations for U.S. Counties in the U.S./Mexico Border Region	

Withdrawn	Worldwide and U.S. Production of Ozone-Depleting Substances (ODSs)
Withdrawn	Number of People Living in Areas with Air Quality Levels Above the NAAQS for Particulate Matter (PM) and Ozone

GREENHOUSE GASES	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
U.S. Greenhouse Gas Emissions	
Atmospheric Concentrations of Greenhouse Gases	

INDOOR AIR QUALITY	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
U.S. Homes Above EPA's Radon Action Level	U.S. Homes Above EPA's Radon Action Levels
Blood Cotinine Level (From the Health Chapter)	Blood Cotinine Level
	Blood Cotinine Level in Children (From the Health Chapter)
Withdrawn	Percentage of Homes Where Young Children are Exposed to Environmental Tobacco Smoke

WATER CHAPTER

FRESH SURFACE WATERS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
High and Low Stream Flows	Changing Stream Flows
	Number/Duration of Dry Stream Flow Periods in Grassland/Shrublands
Nitrogen and Phosphorus Discharge from Large Rivers	Partly New Information and Part from Indicator: Movement of Nitrogen (From the Eco Chapter)
Pesticides in Streams in Agricultural Watersheds	Pesticides in Farmland Streams and Ground Water
Nitrogen and Phosphorus in Streams in Agricultural Watersheds	Nitrate in Farmland, Forested, and Urban Streams and Ground Water (part replaced, part withdrawn)
	Phosphorus in Farmland, Forested, and Urban Streams (part replaced, part withdrawn)
Benthic Macroinvertebrates in Wadeable Streams	Macroinvertebrate Biotic Integrity Index for Streams
Streambed Stability in Wadeable Streams	
Nitrogen and Phosphorus in Wadeable Streams	
Withdrawn	Altered Fresh Water Ecosystems
Withdrawn	Lake Trophic State Index
Withdrawn	Percent Urban Land Cover in Riparian Areas
Withdrawn	Agricultural Lands in Riparian Areas
Withdrawn	Sedimentation Index

Withdrawn	Phosphorus in Large Rivers
Withdrawn	Atmospheric Deposition of Mercury
Withdrawn	Chemical Contamination in Streams and Ground Water
Withdrawn	Toxic Releases to Water of Mercury, Dioxin, Lead, PCBs, and PBTs
Withdrawn	Sediment Contamination of Inland Waters
Withdrawn	Fish Index of Biotic Integrity in Streams

GROUND WATER	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Nitrate and Pesticides in Shallow Ground Water in Agricultural Areas	Pesticides in Farmland Streams and Ground Water
	Nitrate in Farmland, Forested, and Urban Streams and Ground Water (part replaced, part withdrawn)

WETLANDS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Wetland Extent, Change, and Sources of Change	Wetland Extent and Change
	Sources of Wetland Change/Loss

COASTAL WATERS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Trophic State of Coastal Waters	Water Clarity in Coastal Waters
	Dissolved Oxygen in Coastal Waters
	Chlorophyll Concentrations
	Total Nitrogen in Coastal Waters
	Total Phosphorus in Coastal Waters
Coastal Benthic Communities	Benthic Community Index for Coastal Waters
Coastal Sediment Quality	Sediment Contamination of Coastal Waters
	Sediment Toxicity in Estuaries
	Total Organic Carbon in Sediments
Submerged Aquatic Vegetation in the Chesapeake Bay	Submerged Aquatic Vegetation (changed to a Regional indicator) (From the Eco Chapter)
Hypoxia in the Gulf of Mexico and Long Island Sound	
Harmful Algal Bloom Outbreaks Along the Western Florida Coastline	
Withdrawn	Population Density in Coastal Areas

DRINKING WATER	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Population Served by Community Water Systems with No Reported Violations of Health-Based Standards	Population Served by Community Water Systems that Meet all Health-Based Standards

RECREATION IN AND ON THE WATER	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Withdrawn	Number of Beach Days that Beaches are Closed or Under Advisory

CONSUMPTION OF FISH AND SHELLFISH	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Contaminants in Lake Fish Tissue	Contaminants in Fresh Water Fish
Coastal Fish Tissue Contaminants	Chemical Contamination (From the Eco Chapter) (part withdrawn)
Withdrawn	Percent of River Miles and Lake Acres Under Fish Consumption Advisories
Withdrawn	Number of Watersheds Exceeding Health-Based National Water Quality Criteria for Mercury and PCBs in Fish Tissue

LAND CHAPTER

LAND COVER	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Land Cover	Extent of Grasslands and Shrublands
	Extent of forest area, ownership, and management
	Patches of Forest, Grassland, Shrubland, and Wetland in Urban/Suburban Areas (From the Eco Chapter)
	Ecosystem Extent (From the Eco Chapter)
Land Cover in the Puget Sound/Georgia Basin	

LAND USE	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Land Use	Extent of Urban and Suburban Lands
	Extent of Agricultural Land Uses
Urbanization and Population Change	Extent of Developed Lands (plus Land Chapter

	Intro from 2003 Draft ROE)
Withdrawn	The Farmland Landscape
Withdrawn	Sediment Runoff Potential from Croplands and Pasturelands

CHEMICALS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Fertilizer Applied for Agricultural Purposes	Fertilizer Use
Toxic Chemicals in Production-Related Wastes Released, Treated, Recycled, or Recovered for Energy Use	Quantity and Type of Toxic Chemicals Released and Managed
	Toxic Releases to Water of Mercury, Dioxin, Lead, PCBs, and PBTs
Pesticide Residues in Food	Pesticide Residues in Food
Reported Pesticide Incidents	
Withdrawn	Agricultural Pesticide Use
Withdrawn	Potential Pesticide Runoff from Farm Fields
Withdrawn	Risk of Nitrogen Export
Withdrawn	Risk of Phosphorus Export
Withdrawn	Pesticide Leaching Potential (from the Eco Chapter)

WASTE	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Quantity of Municipal Solid Waste Generated and Managed	Quantity of Municipal Solid Waste (MSW) Generated and Managed
	Number and Location of Municipal Solid Waste (MSW) Landfills (part replaced, part withdrawn)
Quantity of RCRA Hazardous Waste Generated and Managed	Quantity of RCRA Hazardous Waste Generated and Managed
	Number and Location of RCRA Hazardous Waste Management Facilities (part replaced, part withdrawn)
Withdrawn	Quantity of Radioactive Waste Generated and in Inventory
Withdrawn	Number and Location of Municipal Solid Waste (MSW) Landfills
Withdrawn	Number and Location of RCRA Hazardous Waste Management Facilities
Withdrawn	Number and Location of Superfund National Priorities List (NPL) Sites
Withdrawn	Number and Location of RCRA Corrective Action Sites

CONTAMINATED LANDS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
High-Priority Cleanup Sites Where Contaminated Ground Water Is Not Continuing to Spread Above Levels of Concern	
High-Priority Cleanup Sites with No Human Contact to Contamination in Excess of Health-Based Standards	

HUMAN HEALTH CHAPTER

HEALTH STATUS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Life Expectancy at Birth	Life Expectancy
Infant Mortality	Infant Mortality
General Mortality	

DISEASE AND CONDITIONS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Cancer Incidence	Cancer Incidence
Childhood Cancer Incidence	Childhood Cancer Incidence
Cardiovascular Disease Prevalence and Mortality	Cardiovascular Disease Mortality
	Cardiovascular Disease Prevalence
Asthma Prevalence	Asthma Prevalence
	Childhood Asthma Prevalence
Chronic Obstructive Pulmonary Disease Prevalence and Mortality	Chronic Obstructive Pulmonary Disease Mortality
Low Birthweight	Low Birthweight Incidence
Birth Defects Rates and Mortality	Deaths Due to Birth Defects
	Birth Defect Incidence
Infectious Diseases Associated with Environmental Exposures or Conditions (with the following new additions: Giardiasis, Lyme Disease, Rocky Mountain Spotted Fever, West Nile Virus, Legionellosis)	Cholera Prevalence
	Cryptosporidiosis Prevalence
	<i>E. coli</i> O157:H7 Prevalence
	Hepatitis A Prevalence
	Salmonellosis Prevalence
	Shigellosis Prevalence
Typhoid Fever Prevalence	
Preterm Delivery	
Withdrawn	Cancer Mortality
Withdrawn	Asthma Mortality
Withdrawn	Childhood Cancer Mortality
Withdrawn	Childhood Asthma Mortality

HUMAN EXPOSURE TO POLLUTANTS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Blood Lead Level	Blood Lead Level
	Blood Lead Level in Children
Blood Mercury Level	Blood Mercury Level
	Blood Mercury Level in children
Blood Cadmium Level	Blood Cadmium Level
Urinary Pesticide Level	Urine Organophosphate Levels to Indicate Pesticides
Blood Persistent Organic Pollutants Level	
Urinary Phthalate Level	
Withdrawn	Urine Arsenic Level
Withdrawn	Blood Volatile Organic Compound Levels

ECOLOGICAL CONDITION CHAPTER

EXTENT AND DISTRIBUTION OF ECOLOGICAL SYSTEMS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Forest Extent and Type	Extent of Area by Forest Type
	Forest Age Class
Forest Fragmentation	Forest Pattern and Fragmentation
Ecological Connectivity in EPA Region 4	
Relative Ecological Condition of Undeveloped Land in EPA Region 5	
Withdrawn	Extent of Ponds, Lakes, and Reservoirs
Withdrawn	Extent of Estuaries and Coastline

DIVERSITY AND BIOLOGICAL BALANCE	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Fish Faunal Intactness	
Bird Populations	
Non-Indigenous Species in the Estuaries of the Pacific Northwest	
Withdrawn	At-risk Native Forest Species
Withdrawn	Populations of Representative Forest Species
Withdrawn	Tree Condition
Withdrawn	At-risk Native Grassland and Shrubland Species
Withdrawn	Population Trends of Invasive and Native Non-Invasive Bird Species
Withdrawn	Non-native Fresh Water Species
Withdrawn	At-risk Fresh Water Plant Communities
Withdrawn	At-risk Native Fresh Water Species

Withdrawn	Coastal Living Habitats
Withdrawn	Fish Diversity
Withdrawn	At-risk Native Species
Withdrawn	Bird Community Index
Withdrawn	Shoreline Types

ECOLOGICAL PROCESSES	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Carbon Storage in Forests	Carbon Storage
Withdrawn	Forest Disturbance: Fire, Insects, and Disease

CRITICAL PHYSICAL AND CHEMICAL ATTRIBUTES	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
U.S. and Global Mean Temperature and Precipitation	
Sea Level	
Sea Surface Temperature	
Withdrawn	Soil Compaction
Withdrawn	Soil Erosion (Forests)
Withdrawn	Soil Erosion (Farmland)
Withdrawn	Processes Beyond the Range of Historic Variation
Withdrawn	Soil Quality Index
Withdrawn	Terrestrial Plant Growth Index

EXPOSURE TO POLLUTANTS	
ROE 2007 Indicator Title	Corresponding 2003 Draft ROE Indicator Title
Withdrawn	Animal Deaths and Deformities
Withdrawn	Fish Abnormalities
Withdrawn	Unusual Marine Mortalities

Explanation of indicators used in the 2003 Draft ROE but not in the 2007 ROE

A number of indicators were included in EPA's 2003 Draft ROE that are not included in the 2007 ROE. The general reasons for these changes are described below, followed by indicator-specific explanations.

Members of the independent scientific review panel that reviewed the draft indicators for the 2007 ROE recommended their withdrawal.

EPA's Science Advisory Board Committee review of the 2003 Draft ROE recommended EPA develop and utilize a more precise definition of "indicator" than was used for 2003 Draft ROE.

EPA developed a set of specific indicator criteria to provide a more precise conformance to Office of Management and Budget (OMB) and EPA Information Quality Guidelines.

The 2007 ROE introduced a Regional Pilot Project and developed and implemented a relevant process. Sub-national or regional indicators that were included in 2003 Draft ROE but did not go through this pilot are not included in the 2007 ROE.

When screened against these factors, a small number of the indicators in 2003 DRAFT ROE did not conform to one or more of these requirements. Explanations for not including these indicators were peer reviewed by an independent scientific panel along with the indicators in this report. Broadly speaking, the explanations for withdrawal fall into four categories, coded as follows:

(D) Definition – The indicator fails to meet the improved indicator definition for the 2007 ROE.

(C) Criteria – The indicator fails to meet one of the six indicator criteria that were established to conform to EPA Information Quality Guidelines.

(N) New indicator – The indicator is replaced by a “new” and superior indicator that was not available for the 2003 Draft ROE.

(R) Regional – The indicator is not national in scope and is not part of the 2007 ROE Regional Pilot Project.

(P) Peer Review – The independent peer review panel recommended withdrawing the indicator from the 2007 ROE.

The following information briefly explains the rationale for withdrawing specific indicators from the 2007 ROE. Each indicator is categorized as D, C, N, R, or P. The indicators are organized by chapter.

Air Chapter

Worldwide and U.S. Production of Ozone-Depleting Substances (ODSs) – C

This 2003 Draft ROE indicator presented estimates of the amount of ODSs produced worldwide in 1986 and 1999, and annual U.S. production from 1958 to 1993. This indicator was withdrawn because of issues concerning data reliability and relevance. Global ODC production data are not reliable with respect to comparability among reporting countries. The US estimates are more reliable because of legal reporting requirements and the small number of sources. However, the data set fails to account for imports, and annual production is not a good surrogate for emissions of ODCs into the environment because of the time between production and eventual entry into the environment is highly variable among the various products and recovery systems.

Number of People Living in Areas with Air Quality Levels above the NAAQS for Particulate Matter (PM) and Ozone - C

This 2003 Draft ROE indicator conveyed how many people (based on census) lived in counties where air pollutant levels at times were above the level of the NAAQS during the year stated. It was intended to give the reader some indication of the number of people potentially exposed to unhealthy air. Because of changing populations and air quality standards, however, this indicator masks actual trends in the levels of air pollutants. It is not a valid exposure indicator for the ROE because it is not based on measurement of an actual marker of exposure measured on or in individuals.

Percentage of Homes Where Young Children are Exposed to Environmental Tobacco Smoke - D

This 2003 Draft ROE indicator portrayed the percentage of homes in the U.S. in which young children were exposed to tobacco smoke in 1998 versus 1957. The survey is based on a questionnaire (do children live in the home, and does someone who smokes regularly live in the home), rather than on actual measurements of the amount of smoke actually present or the degree to which children are exposed to the resulting smoke. This indicator violates the ROE indicator definition, requiring that indicators be based on actual measurements, and the indicator “Blood Cotinine” provides a better indicator of children’s exposure to smoke.

Water Chapter

Altered Fresh Water Ecosystems - C

Percent Urban Land Cover in Riparian Areas - C

Agricultural Lands in Riparian Areas - C

These 2003 Draft ROE indicators were based on the percentage of land within 30 m of the edge of a stream or lake that is classified as urban or agriculture based on 1991 satellite data (NLCD). Baseline data are incomplete, and there are no reference points for the appropriate percentage of such cover, and it is not clear that the indicators could be reproduced with newer satellite data. There are no data for other alterations such as damming, channelization, etc.

Lake Trophic State Index – R, C

This 2003 Draft ROE indicator was based on phosphorous data collected in a one-time a statistical sample of lakes in the Northeast US during 1991-94. It is not included in the 2007 ROE Regional Pilot Project.

Sedimentation Index – R, C

This 2003 Draft ROE indicator was based on data collected on freshwater streams in the Mid Atlantic Highlands Region during a one-time 1993-94 statistical survey. It is not included in the 2007 ROE Regional Pilot Project.

Phosphorus in Large Rivers - C

The indicator was based on phosphorus concentrations in large rivers sampled periodically by the USGS National Stream Quality Accounting Network (NASQAN). Monitoring at many of the large river NASQAN sites has been discontinued.

Atmospheric Deposition of Mercury - C

This indicator was withdrawn following peer review of the indicators because trend data could not be analyzed in time to revise the indicator.

Chemical Contamination in Streams and Ground Water - C

This 2003 Draft ROE indicator was based on data from a large number of NAWQA watersheds. The sampling and analytical protocols (including the analytes measured) are not comparable across all NAWQA watersheds.

Sediment Contamination of Inland Waters - C

This 2003 Draft ROE indicator was based on reported concentrations of sediment contaminants collected by a large number of organizations focusing particularly on places where sediment contamination is perceived to be a problem (the EPA National Sediment Inventory). The database suffers from a number of limitations: the data are heavily biased toward sites at which there is a known or suspected toxicity problem and to particular geographic areas (non-representative of the nation), the data cover different dates in different locations- making estimation of trends difficult, and the data and procedures used to assign sites to a toxicity category are not uniform from watershed to watershed. It is unsuitable for trend estimation.

Fish Index of Biotic Integrity in Streams – R, C

This 2003 Draft ROE indicator was based on fish community data collected on freshwater fish in the Mid Atlantic Highlands Region during a one-time 1993-96 statistical survey. Condition cannot be assessed in streams where no fish were caught, because data were insufficient to indicate whether the stream had poor quality or simply no fish. It is not included in the 2007 ROE Regional Pilot Project.

Population Density in Coastal Areas

Discussion of population density in coastal areas was moved to the introduction of the Water Chapter section responding to the question, "What are the trends in extent and condition of *coastal waters* and their effects on human health and the environment?"

Number of Beach Days that Beaches are Closed or under Advisory - D
Percent of River Miles and Lake Acres under Fish Consumption Advisories - D

These 2003 Draft ROE indicators were based on the frequency of beach closures or fish consumption advisories as reported to EPA voluntarily by states and local government organizations. The data are not nationally or temporally consistent because of different and changing criteria for closing beaches or issuing fish consumption advisories in the different states, many of which do not involve actual water quality measurements. They are therefore administrative indicators (based on administrative action rather than actual physical measurements) and fail to meet the definition for ROE indicators.

Number of Watersheds Exceeding Health-Based National Water Quality Criteria for Mercury and PCBs in Fish Tissue - C

This 2003 Draft ROE indicator was based on voluntary reporting of Hg contamination using data that has not undergone formal QA/QC review. It is not representative of the nation, or suitable for trend monitoring.

Land Chapter

The Farmland Landscape - C

This 2003 Draft ROE indicator represented croplands and the forests or woodlots, wetlands, grasslands and shrublands, that surround or are intermingled with them, and the degree to which croplands dominate the landscape <http://www.heinzctr.org/ecosystems/farm/Indscps.shtml>. The indicator relies on data generated using early 1990's satellite data, and it is unclear whether the definition of "farmland landscape" is sufficiently precise to be replicated independently, especially with respect to any future satellite data availability.

Sediment Runoff Potential from Croplands and Pasturelands - C

This 2003 Draft ROE indicator represented the estimated sediment runoff potential for croplands and pasturelands based on topography, weather patterns, soil characteristics, and land-use land cover and cropping patterns for the U.S. and the Universal Soil Loss equation www.brc.tamus.edu/swat. The indicator addressed "potential" and not actual/current condition, and relied on a model to predict ambient characteristics based on pressure/stressor measurements, which violates a fundamental ROE protocol on the use of models in indicators. Trends in this indicator would likely be associated only with trends in land cover, cropping practices, and weather (topography and soil type are unlikely to change). No reliable spatial trend data at the appropriate scale exist for either cropping practices or land cover, and consequently trends in this indicator would be difficult to calculate.

Agricultural Pesticide Use - C

Agricultural pesticide usage data, measured at the national aggregate level for all pesticides is very difficult to interpret. From one time period to another the mix of pesticides changes, pest pressures change, agricultural practices change, agricultural acreage changes, regulatory status of key uses changes, and many other important variables change. Moreover, the effects of pesticide usage are encountered at three levels of the product's life cycle: production, usage, and residues on foods. The geographic distribution of those effects renders difficult the interpretation of national usage levels for all pesticides, taken as a group. While it is of course possible to compare magnitudes of aggregates at different times, the real significance for the environment is in the differences in the content and geographic distribution of the aggregates, not in the magnitude of the aggregate.

Potential Pesticide Runoff from Farm Fields – C
Pesticide Leaching Potential - C

These 2003 Draft ROE indicators represented the potential movement of agricultural pesticides from the site of application to ground and surface waters, based on estimates of pesticide leaching and runoff losses derived from soil properties, field characteristics, management practices, pesticide properties, and climate for 243 pesticides applied to 120 specific soils in growing 13 major agronomic crops. The indicators address "potential" and not actual/current condition, and rely on models to predict

ambient characteristics based on measurements of pressures/stressors, which violates a fundamental ROE protocol on the use of models in indicators.

Risk of Nitrogen Export - C

Risk of Phosphorus Export - C

These 2003 Draft ROE indicators represented the potential movement of N and P from the site of application to surface waters, based on a large empirical dataset relating land use to N and P observed in receiving streams over several decades at a variety of locations. The indicators address “potential” and not actual/current conditions, and rely on statistical models to predict ambient characteristics based on measurements of pressures/stressors, which violates a fundamental ROE protocol on the use of models in indicators.

Quantity of Radioactive Waste Generated and in Inventory – C

This 2003 Draft ROE indicator was based on production and inventory data collected by the Department of Energy. Although the data continue to be collected, they are no longer publicly available post-September 11, 2001; therefore ongoing data trends are not and will not be available for this indicator in the future. Moreover, the earlier data reflected two distinct periods in the history of waste generation in the nuclear weapons complex. The first reflected a period during which wastes and other materials were being generated as an integral part of the production of weapons grade nuclear materials and components. The period after 1989 reflected the cessation of large-scale production of such materials and the initiation of clean-up activities and wastes from those initiatives. Thus, even before the truncation of data in the post 9/11 period, there were significant issues with the comparability of the data over time.

Number and Location of Superfund National Priorities List (NPL) Sites - D

This 2003 Draft ROE indicator represented an administrative decision to force a cleanup, rather than an amount of waste present or removed, and therefore does not meet the 2007 ROE indicator definition.

Number and Location of RCRA Corrective Action Sites - D

This 2003 Draft ROE indicator represents an administrative decision to force a cleanup, rather than an amount of waste present or removed, and therefore does not meet the 2007 ROE indicator definition.

Human Health Chapter

Cancer Mortality - P

Childhood Cancer Mortality -P

Asthma Mortality - P

Childhood Asthma Mortality - P

The independent peer review panel recommended the removal of the cancer and asthma mortality indicators because trends in these indicators are less likely to be due to changes in environmental factors and are more likely a result of changes in social factors such as availability/access to healthcare.

Urine Arsenic Level - R

This 2003 Draft ROE indicator was based on data from EPA Region 5 only, and is not part of the 2007 ROE Regional Pilot.

Blood Volatile Organic Compound Levels - C

This 2003 Draft ROE indicator was based on a convenience sample whose representativeness cannot be determined or necessarily used as a baseline for future sampling. The indicator is based on detects only, so there is no reference level. Also, VOCs are cleared from the bloodstream rapidly (~ 1hr), so there is a significant possibility of false negatives, considering that exposures tends to be associated with occupational and indoor settings.

Ecological Condition Chapter

Extent of Ponds, Lakes, and Reservoirs - C

This 2003 Draft ROE indicator was based on data from the USGS National Wetlands Inventory. While these data are based on a valid statistical sampling design, the total amount of surface water is less than half of the area of lakes, reservoirs and ponds greater than 6 acres in size in the USGS National Hydrography Data Set. Until this discrepancy is resolved, the indicator may not satisfy the ROE criteria.

Extent of Estuaries and Coastline - C

This 2003 Draft ROE indicator was based on remote sensing data, but is unlikely to show trends unrelated to sea level rise and changing tides, so it is not a very useful indicator for trends.

At-risk Native Species - C**At-risk Native Grassland and Shrubland Species - C****At-risk Native Forest Species - C****Populations of Representative Forest Species - C****Non-native Fresh Water Species - C****At-risk Native Fresh Water Species - C****At-risk Fresh Water Plant Communities - C**

The Ecological Condition chapter was restructured from the 2003 Draft ROE organization per the recommendation of EPA's Science Advisory Board and numerous stakeholders. As such, the chapter no longer requires that the above indicators be broken out by ecosystem. In addition, the ability to track trends of many of these indicators is questionable.

Tree Condition - C

This 2003 Draft ROE indicator was based on an ongoing statistical sample of forests across the contiguous US and comprises components that relate to crown (tree canopy condition), the ratio of dead to live wood, and the fire class. This indicator likely relates more to forest management practices than to environmental condition, and for this reason has low relevance value to EPA.

Population Trends of Invasive and Native Non-Invasive Bird Species - R

This 2003 Draft ROE indicator was based on an analysis of USGS Breeding Bird Survey data in grassland and shrubland ecosystems for 5 year periods ranging from the late 1960s to 2000. Because the ecological condition questions are no longer directed at specific ecosystems types, this appears to be a regional indicator. Also, it is not clear at this time that the data for this indicator will be collected in the future.

Coastal Living Habitats - C

This 2003 Draft ROE indicator was based on remote sensing data of coastal wetlands, mudflats, sea-grass beds, etc., but the only system for which a national indicator has been developed is coastal vegetated wetlands, which already is covered in another indicator.

Fish Diversity - R

This 2003 Draft ROE indicator was based on a statistical sample of fish trawls in Mid-Atlantic estuaries during 1997-98. This indicator is not part of the 2007 ROE Regional Pilot project, and EMAP is no longer collecting fish samples to support this indicator.

Bird Community Index - R

This 2003 Draft ROE indicator was not national in scope or part of the ROE EPA Regional Pilot.

Shoreline Types - C

This 2003 Draft ROE indicator was based on NOAA's Environmental Sensitivity Index. The index is based on a standardized mapping approach, but coverage is not complete for large parts of the coastline and the data in some of the atlases are more than 15 years old. Consequently, this indicator is not appropriate for measurement of representative, national trends.

Forest Disturbance: Fire, Insects, and Disease - P

The independent peer review panel recommended that this indicator be withdrawn because it was “limited in many aspects of its coverage: temporally, spatially, and in types of disturbance. . . Ecological interpretation of disturbance patterns is difficult . . . For example, the lack of fire may actually represent an ecological disturbance, while fire suppression can lead to overcrowded forests that are more conducive to insect and disease outbreaks.” The reviewers also commented that the data were questionable and that the interdependence among the disturbance categories could result in significant double-counting. Finally, timber harvest was not included even though it disturbs more acres than fires, insects, or disease.

Soil Compaction - C

Soil Erosion – C

Forests - This 2003 Draft ROE indicator was based on an analysis of recent Forest Inventory and Analysis data on climate events, fire frequency, and forest insect and disease outbreaks, which were then compared to anecdotal data for the period 1800-1850. Because the early data are anecdotal, and because the data mostly relate to forest management practices, etc., it is proposed that this indicator has low relevance to EPA and that trend data are of questionable utility as an ROE indicator.

Farmland – This 2003 Draft ROE indicator presented an estimate of potential for erosion rather than actual erosion measurements, and relied on a model to predict ambient characteristics based on pressure/stressor measurements, which violates a fundamental ROE protocol on the use of models in indicators.

Processes Beyond the Range of Historic Variation - C

This 2003 Draft ROE indicator was based on an analysis of recent Forest Inventory and Analysis data on climate events, fire frequency, and forest insect and disease outbreaks, which were then compared to anecdotal data for the period 1800-1850. Because the early data are anecdotal, and because the data mostly relate to forest management practices, etc., it is proposed that this indicator has low relevance to EPA and that trend data are of questionable utility as an ROE indicator.

Soil Quality Index - R

This 2003 Draft ROE indicator was based on a survey of soils in the Mid Atlantic region during the 1990s, and was neither repeated and is not part of the Regional Pilot Project for 2007 ROE.

Terrestrial Plant Growth Index - P

The independent peer review panel recommended that this indicator be withdrawn because “The results are too ambiguous and not explained, or perhaps, unexplainable. . . NDVI is a crude measure of growth. [Also] The relative deviation of the Plant Growth Index (20-40%) without explanation during the period of analysis suggests that the indicator might lack the precision needed to assess national trends in productivity.”

Animal Deaths and Deformities - C

This 2003 Draft ROE indicator was based on data reported by a number of different organizations to USGS on incidences of death or deformities in waterfowl, fish, amphibians, and mammals. Trends are available only for waterfowl, and because data reporting is voluntary rather than systematic, the data are not adequate to determine actual trends versus trends in reporting.

Fish Abnormalities - C

This 2003 Draft ROE indicator was based on a statistical sample of fish trawls in estuaries in the Atlantic and Gulf, but the data are no longer being collected by EMAP to support this indicator.

Unusual Marine Mortalities - C

This 2003 Draft ROE indicator was based on voluntary reporting of unusual mortality events to NOAA. Because there is no systematic requirement to report, these data are not suitable to support national trends in the indicator.

Chemical Contamination – C

This 2003 Draft ROE indicator combined data from the USGS NAWQA program that are not consistent in terms of sampling frequency or analytical protocols. The part of this indicator presenting contaminant levels in coastal fish as measured by EPA's EMAP program was moved to a separate indicator in the water chapter: "Coastal Fish Tissue Contaminants."