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ON BEHALF OF:
NATURAL RESOURCES DEFENSE COUNCIL

BEFORE THE U.S. CONGRESS
COMMITTEE ON ENERGY AND COMMERCE
SUBCOMMITTEE ON ENERGY AND THE ENVIRONMENT

AT HEARING ENTITLED:

ENDOCRINE DISRUPTING CHEMICALS IN DRINKING WATER: RISKS TO HUMAN HEALTH AND THE ENVIRONMENT

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Thank you for the opportunity to submit testimony to this Committee. My name is Gina Solomon, and I am a Senior Scientist at the Natural Resources Defense Council (NRDC). NRDC is a not-for-profit environmental advocacy organization with over one million members and activists whose mission is to safeguard the Earth: its people, its plants and animals and the natural systems on which all life depends. In addition to my work at NRDC, I am an Associate Clinical Professor of Medicine at the University of California at San Francisco (UCSF) where I am the Director of the Occupational and Environmental Medicine Residency and Fellowship Program, and the Associate Director of the Pediatric Environmental Health Specialty Unit. I have subspecialty training and expertise in environmental medicine, and have done research, education, and advocacy for over 15 years to protect people from contaminants in their food, air and drinking water, and from hazardous pesticides.

I served on the U.S. Environmental Protection Agency (EPA) Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) from 1996-1998, the National Academy of Sciences Committee on Toxicity Testing and Assessment of Environmental Agents from 2004-2007, and the EPA Science Advisory Board Drinking Water Committee from 2004 through the present. My educational and professional credentials are supplied in the attached *Curriculum Vitae*.

Endocrine Disruptors in Water: A Widespread Problem

There are serious concerns about contaminants in our nation's drinking water and source waters. Fish have been found in numerous rivers, including the Potomac, with disrupted sexual development -- specifically feminized male fish. When this finding was first noted in England in the 1990's,[1] it was considered possibly a fluke. But what was once a localized, spotty observation is now being recognized as a widespread, pervasive phenomenon. Four months ago, scientists from the U.S. Geological Survey reported finding intersex fish in one third of sites surveyed in eight river basins (the Apalachicola, Colorado, Columbia, Mobile, Mississippi, Pee Dee, Rio Grande, and Savannah river basins).[2] The problems were most severe in the Southeastern United States (see Appendix 1 for a map of locations where intersex fish were found).

The same kind of thing happened with deformed frogs: local observations in the Midwest led to the eventual realization that these amphibian abnormalities are widespread. A recent review by researchers at Yale University concluded that the mystery of these deformities remains unsolved.[3] Even the alligators in Florida's Lake Apopka with the famously tiny penises are not alone: research in other Florida lakes has revealed that the male deformities just keep turning up.[4] Essentially, wherever researchers look, they are finding problems with sexual development in wildlife. Now the question is: what does this mean for humans? Some scientists are concerned that increased incidence of cancer of the testis, prostate, and breast, along with increases in birth defects of the penis, might mean that humans are not immune to the problems in our environment.

Scientists have come up with a term to describe this general phenomenon: endocrine disruption. An endocrine disruptor is defined as "an exogenous agent or mixture of agents that interferes or alters the synthesis, secretion, transport, metabolism, binding action, or elimination of hormones that are present in the body and are responsible for homeostasis, growth, neurological signaling, reproduction and developmental processes."[5] In other words, endocrine disruptors are chemicals that interfere with the body's key signaling pathways, and they can cause harm, especially during fetal and early life development.

Multiple contaminants are turning up in our nation's waterways, including in water millions of people rely on for drinking. Studies by the U.S. Geological Survey (USGS) have revealed an unsavory mix of pharmaceuticals, steroid hormones, unregulated pesticides, flame retardants, rocket fuel chemicals, plasticizers, detergents, and stain repellants in both the surface water and the groundwater we rely on for drinking, and in our drinking water itself.[6] [7] [8] The USGS surface water study found a median of seven and as many as 38 chemical contaminants in any given water sample (see Appendix 2 for more details). Among the chemicals most commonly detected in this national survey are known and suspected endocrine disruptors, including triclosan, alkylphenols and alkylphenol polyethoxylates, bisphenol A, and estriol. As a scientist, I wish I could tell you these chemicals are unlikely to be a problem at the concentrations measured. Unfortunately I can't tell you that, because my assessment of the data suggests a problem.

Here's what I can tell you: wildlife populations are showing signs of harm, many of these chemicals are not eliminated by conventional drinking water treatment, and mixtures of these chemicals are present in our water supply. Although they are at low levels in water, hormones are known to have effects even in trace amounts. Furthermore, biomonitoring studies have detected these chemicals in our bodies.[9] Water is certainly not the only source of these chemicals, but trace amounts from one source add up with traces from other sources, and the sum total becomes a problem. The Endocrine Society evaluated the science on endocrine disruptors last year and concluded:

> *The evidence for adverse reproductive outcomes (infertility, cancers, malformations) from exposure to endocrine disrupting chemicals is strong, and there is mounting evidence for effects on other endocrine systems, including thyroid, neuroendocrine, obesity and metabolism, and insulin and glucose homeostasis.*[10]

The Endocrine Society is the premier professional organization devoted to research on hormones and the clinical practice of endocrinology, comprised of over 14,000 research scientists and physicians from over 100 countries. This statement has since been endorsed by the American Medical Association. The American Chemical Society just issued a similar statement with additional recommendations for: "More rapid advancement of the congressionally-mandated effort by the EPA, called the Endocrine Disruptor Screening Program (EDSP)."[11]

There are two opportunities for action on this issue: First, many chemicals have never been adequately tested for their toxicity, and especially not for their endocrine effects; EPA's Endocrine Disruptor Screening Program which was supposed to accomplish this goal has yet to live up to its promise; Second, some of the chemicals in our water supply are known endocrine disruptors and can alter hormone function and disrupt development even when they are in very dilute concentrations, yet EPA has not yet taken action to appropriately regulate these hazards.

EPA's Endocrine Disruptor Screening Program (EDSP): A Missed Opportunity

In 1996, EPA created the Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) in response to a Congressional mandate in the Food Quality Protection Act and authorization in the Safe Drinking Water Act Amendments of 1996. These laws specified that EPA:

> *develop a screening program, using appropriate validated test systems and other scientifically relevant information, to determine whether certain substances may have an effect in humans that is similar to an effect produced by a naturally occurring estrogen, or other such endocrine effect as the Administrator may designate.*

The laws required EPA to develop a screening program by August 1998, to implement the program by August 1999, and to report on the program's progress by August 2000. Unfortunately, EPA is now about a decade behind.

EDSTAC was composed of representatives from industry, government, environmental and public health groups, and academia. The committee members were charged with developing consensus-based recommendations for a screening program that would provide EPA the necessary information to make regulatory decisions about the endocrine effects of chemicals.

I served on the EDSTAC, and it was an intense experience. The Committee struggled under time pressure, and delivered a final report by the statutory deadline of August 1998.[12] Over a period of 20 months, the committee fashioned a groundbreaking priority setting, screening and testing approach that encompasses the universe of chemicals in use today, evaluates a range of human health and ecological effects, and recommends a feasible, health-protective, approach:

- The committee recognized that problems with endocrine disruption go beyond estrogen, and called for screening of chemicals for interference with male androgens, and with thyroid hormone.
- The EDSTAC recommended the use of new technology to rapidly pre-screen numerous chemicals to see if they interact with hormone receptors *in vitro* (in the "test-tube"). The committee recommended that this technology be used to rapidly evaluate the ten thousand most widely-used chemicals within one year.
- Another new approach was a computer-based tracking system allowing information about health effects and exposure to be collected in one place to facilitate prioritization. Some people would be stunned that such a database didn't exist then, and still doesn't exist to this day.

- Finally, the committee urged EPA to accept nominations from the public of chemicals or *chemical mixtures* for expedited testing. This would allow workers, or impacted communities to press for more information about chemicals to which they are exposed.

Unfortunately, the vision of the EDSTAC was never realized. EPA missed deadline after deadline and became bogged down in an endless "do loop" of validation. It is discouraging to report that EPA scrapped the rapid "high-throughput pre-screen", has still failed to validate the definitive "tier 2" tests, and has never created the Endocrine Disruptor Priority Setting Database. The nominations process was also discarded, as was the Committee's unanimous recommendation to test six priority chemical mixtures (Table 1). EPA finally implemented the program, over a decade late, when it issued the first test orders on October 29, 2009; only 67 chemicals are on the list for this first round of screening – mostly pesticides, including a number of chemicals that are already well-known endocrine disruptors.[13] What a wasted opportunity. Meanwhile tens of thousands of chemicals in daily use, in consumer products and even in foods, have not been tested, and contaminants continue to build up in our water supply.

Table 1: EDSTAC Priority Chemical Mixtures

a) Contaminants in human breast milk
b) Phytoestrogens in soy-based infant formulas
c) Mixtures of chemicals most commonly found at hazardous waste sites
d) Common pesticide/fertilizer mixtures found in surface water
e) Disinfection byproducts commonly found in drinking water
f) Gasoline

Endocrine Disruptor Screening and Testing Advisory Committee (EDSTAC) Final Report. pp. 4-49 – 4-51

Section 136 of the SDWA Amendments states that:

> *in addition to the substances referred to in (FQPA), the Administrator may provide for testing under the screening program authorized by (FQPA) for any other substance that may be found in sources of drinking water if the Administrator determines that a substantial population may be exposed to such substance.*

Unfortunately EPA has not yet used the authority granted by Congress under the SDWA, and has not prioritized drinking water contaminants for testing.

The result of the decade of foot-dragging on testing chemicals for hormonal activity means that the vast majority of chemicals in our water supply and environment are "unknowns" when it comes to their hormonal effects. Due to the well-known flaws in the Toxic Substances Control Act (TSCA), almost all chemicals come onto the market with no toxicity information, and older chemicals remain untested too. The EPA Office of the Inspector General's report, released just last week outlines these problems clearly.[14] As a scientist, this absence of data appalls me. As a physician, it puts me in a position where I cannot counsel many of my patients because I don't have the data I need.

Known Endocrine Disruptors in Drinking Water: Regulatory Action Needed Now

Not all chemicals are of unknown toxicity. Some chemicals have been tested and are already flagged as known endocrine disruptors. I'd like to highlight three examples of such chemicals that are crying out for EPA action: perchlorate, plastic chemicals (including bisphenol A and phthalates), and steroid hormones.

The SDWA requires EPA every five years to publish a list of currently unregulated contaminants that should be considered for potential regulation. EPA is then required to make a final determination about whether or not to regulate at least five of the contaminants identified on the Candidate Contaminant List (CCL). To date, the Candidate Contaminant List listing process has gone through 3 iterations, beginning in 1998 with the publication of CCL1 and then CCL2 in 2005. CCL1 contained 50 chemical contaminants, including industrial organic chemicals, pesticides, and inorganic chemicals; in July 2003, EPA decided not to regulate any of the nine chemicals it evaluated on the CCL1. CCL2 consisted of a subset of the chemical contaminants listed on CCL1; and in May 2007, EPA again decided not to regulate any of the 11 chemicals it considered from the CCL2.

The CCL3, finalized on October 8, 2009, contains 104 chemicals or chemical groups. Several important endocrine disrupting chemicals are on this list, including perchlorate and several steroid hormones. Other important endocrine disruptors that are known to be water contaminants, such as bisphenol A and other phthalates, are not on the CCL3. Only one of the chemicals I'm going to talk about today - bis(2-ethylhexyl) phthalate - has been regulated by EPA under the SDWA – and it wasn't even regulated on the basis of endocrine disruption.

Perchlorate

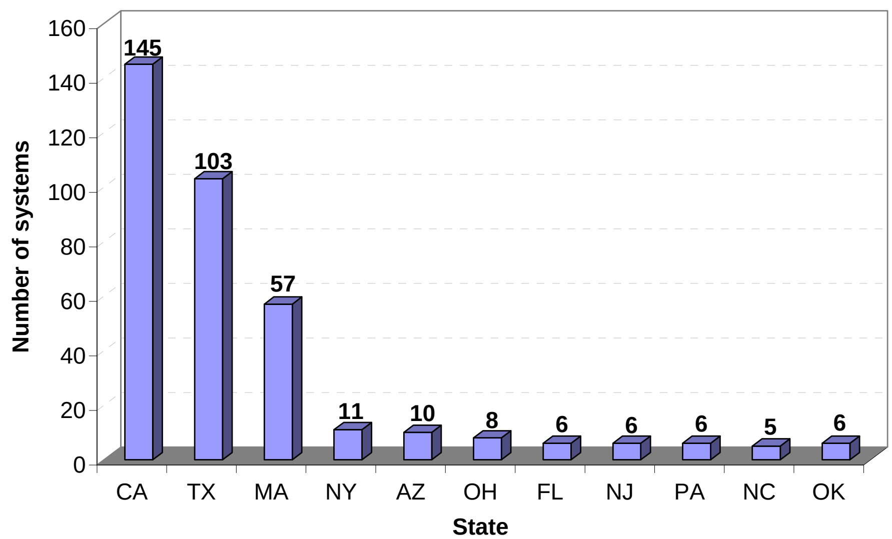
Perchlorate has emerged as an important threat to drinking water sources over vast areas of the United States, with over 400 public water systems, large and small, reporting perchlorate in their water. As a result, millions of people are being exposed to this chemical in their drinking water. Perchlorate is on the EPA's Candidate Contaminate List 3 (CCL3). It was also on the CCL2, and was the subject of an Unregulated Contaminant Monitoring Rule (UCMR). It has been a significant problem since the late-1990's, but unfortunately EPA has not even begun the process of setting a drinking water standard for this chemical. Individual states are left to do the best they can, and the result is a wide-ranging patchwork of standards around the country, and many states with no enforceable drinking water standard.

Perchlorate is a contaminant that comes from rocket fuel, fireworks, road flares, fertilizer, and other sources. It is known to interfere with the normal function of the thyroid gland.[15] Iodine is needed by the thyroid in order to create thyroid hormones. Normally, iodine is transported into the thyroid gland through an energy-requiring mechanism called the sodium-iodide symporter. Perchlorate blocks this transport and prevents uptake of iodine into the gland, therefore interfering with the production of these vital hormones.

A decrease in circulating thyroid hormone during gestation or the first year of life can result in neurodevelopmental abnormalities leading to permanent brain dysfunction.[16] Many studies have shown subtle but lasting deficits in cognitive function, language, hearing, behavior, attention span, and vestibular function (balance) in those that had early-life or prenatal thyroid suppression.[17]

An NRDC analysis of available perchlorate data in 2005 showed that public water systems (PWS) in 27 states, the District of Columbia and two U.S. territories have reported detecting perchlorate in treated water or in their water sources, with concentrations ranging from 0.2 to 1,300 parts per billion (ppb).[18] Of 5,369 systems tested, 402 (7.5 percent) detected perchlorate in their water. California has the largest number of systems with perchlorate detections, followed by Texas and Massachusetts (see Figure 1). These are also the states with the most perchlorate monitoring conducted to date.

Figure 1: States with the largest number of water systems with perchlorate detections.



The 402 systems that have found perchlorate serve 40.8 million people.[19] There was no remarkable difference between the frequency of perchlorate contamination in PWS that had groundwater as their primary water source and those that relied on surface water. Groundwater systems accounted for 60.9 percent of all systems sampled, and for 63.7 percent of the systems with perchlorate.

U.S. EPA, the U.S. Department of Defense (DoD) and state environmental agencies have identified at least 143 sites in 31 states and the District of Columbia where perchlorate releases have occurred, as well as an additional 281 sites in 45 states, one commonwealth and the District of Columbia where perchlorate or perchlorate-containing materials have been used, manufactured, or disposed.[20] DoD facilities account for 77 of the 143 known release sites. Perchlorate releases have also been confirmed in eight federal facilities of other types, most of which belong to the Department of Energy (DoE). The remaining 58 are currently non-federal or private sites. Most of these are owned by aerospace companies, defense contractors, and explosives or pyrotechnics manufacturers.

EPA must set an enforceable drinking water standard for perchlorate that will protect pregnant women, children, and people with underlying thyroid disease or iodine deficiency. It is unconscionable that millions of people are drinking water contaminated with this known endocrine disruptor and remain unprotected.

Plasticizers: Phthalates and Bisphenol A

Phthalates are hormone-disrupting chemicals used in an enormous range of products, including air fresheners, plastic toys**,** cosmetic and personal care products (including fragrances and nail polish), vinyl, medical devices, inks and adhesives. They are also used as food additives and as inert ingredients in pesticides.

Phthalates are known to interfere with the production of male reproductive hormones in animals and likely have similar effects in humans.[21] [22] [23] Their effects in animal studies are well recognized and include lower testosterone levels, decreased sperm counts and lower sperm quality. Exposure to phthalates during development can also cause malformations of the male reproductive tract and testicular cancer. Young children and the developing fetus are most at risk.[24] [25]

National monitoring studies have found one or more phthalates in over 10 percent of streams sampled.[6] The only phthalate that has a drinking water standard is bis 2-ethylhexyl phthalate (DEHP) which has a maximum contaminant level (MCL). Unfortunately the MCL was set in July 1992, and was based on potential to cause mild gastrointestinal disturbances, nausea, and vertigo, not on endocrine disrupting effects. The other phthalates have no drinking water standards at all.

BPA, or bisphenol A, is a hormone-disrupting chemical used in making plastics and epoxy resins. BPA is used in the resin lining of all food and beverage cans. It is the building block of polycarbonate plastic and is used in a wide range of products, including clear plastic baby bottles and sippy cups, clear plastic water bottles, and other kitchen plastics such as measuring cups, drinkware and storage containers. BPA is also found in some dental sealants and fillings, medical devices, paints, epoxy adhesives and cash register receipts.

In animal studies, BPA has been shown to mimic the female hormone estrogen. Exposure to this chemical early in life is associated with pre-cancerous changes in the mammary and prostate glands, as well as altered development of the brain, causing behavioral abnormalities and earlier onset of puberty.[26] Developmental exposure to BPA at low doses has also been associated with reproductive abnormalities such as lower sperm counts, hormonal changes, enlarged prostate glands, and abnormalities in the number of chromosomes in eggs.[27] It also has been associated with obesity and insulin resistance—a condition that commonly precedes the development of diabetes.[28]

A study of Mississippi River water in Louisiana, which is used for drinking by the city of New Orleans, found numerous contaminants. Most relevant to our discussion today, monthly testing at the drinking water treatment plant in Jefferson Parish, Louisiana revealed detectable concentrations on bisphenol A in most of the samples. [29] The researchers in this study planned to determine if these widespread detections represented contamination from the laboratory, or contamination in the drinking water; no definitive results are available.[30] National groundwater sampling reported BPA in about 30 percent of groundwater samples.[7]

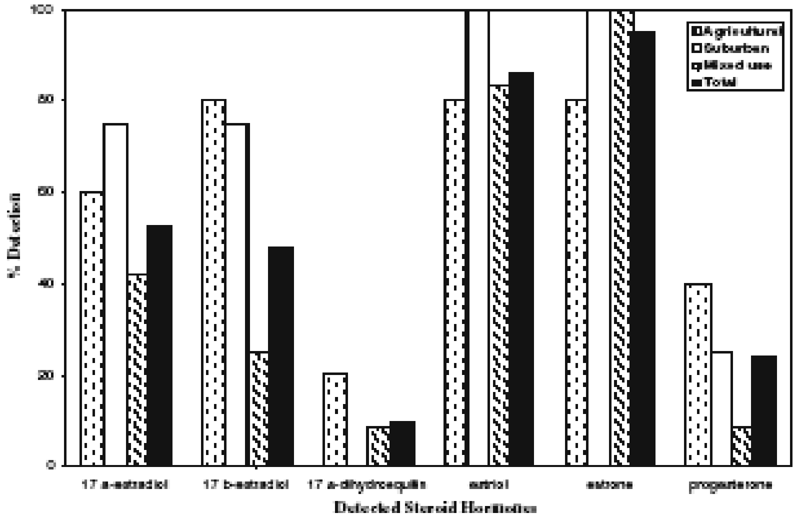
Both phthalates and bisphenol A are contaminants in wastewater. 18 of 19 wastewater samples tested in the San Francisco Bay Area contained at least one of three unregulated, widely-used endocrine disruptors – phthalates, bisphenol A, and triclosan. Two samples contained all three substances. [31] Despite sophisticated wastewater treatment, these chemicals were detected in treated waters discharged into the Bay and have also been detected in the Bay itself.[32] While wastewater treatment is extremely effective in removing biodegradable food and human waste, it was never designed to address this broad spectrum of unregulated chemical pollution.

There is no EPA drinking water standard for bisphenol A even though it is a known endocrine disruptor and a known water contaminant. Unfortunately this chemical is not even on the CCL3, so the likelihood of any appropriate EPA action to protect consumers from this chemical in drinking water appears small. Several states such as Minnesota, Washington and Connecticut, as well as major retailers such as Walmart and Target have taken action to eliminate phthalates and bisphenol A in children's products, and Congress banned phthalates in children's toys over a year ago.

Steroid Hormones

Studies of water sources around the U.S. have detected widespread contamination with steroid hormones. For example, a recent study in Pennsylvania collected data from 21 locations in suburban, agricultural, and mixed suburban/agricultural areas. At least one steroid hormone was detected in every stream; two hormones, estrone and estriol, were detected at more than 80 percent of the sampling sites (see Figure 2).[33] Potential sources of the hormones include municipal wastewater discharges, septic tanks, and animal manure.

Figure 2: Percent Detection of Steroid Hormones in Pennsylvania Surface Water Samples



An important source of hormonal contaminants in water is steroids used in livestock operations which contribute to widespread environmental contamination. Beef cattle raised in large feedlots are treated with anabolic steroids to promote the growth of muscle. One of the most common steroids used is a male sex hormone (androgen) mimic, trebolone acetate. Exposure to trebolone metabolites at concentrations as low as parts per trillion can cause masculinization of female fish and reduced fertility. [34] A recent study at an Ohio-based animal feeding operation with a capacity for 9,800 cattle found detectable concentrations of trebolone in the discharge from the facility at levels that were sufficient to induce gene expression associated with exposure to androgens.[34] Other research has found environmental androgens associated with masculinization in female fish living downstream of pulp and paper mills and concentrated animal feeding operations. These pharmaceuticals interfere not only with sex hormones but also with other hormonal systems including the thyroid gland, which is critical for proper growth and development of the brain during fetal growth, infancy, and childhood.

Confined animal feeding operations (CAFOs; also known as “factory farms”) are large-scale producers of hogs, poultry, beef or dairy cows – typically housing from thousands to tens of thousands or even hundreds of thousands of animals. These facilities often treat the animals with hormones to promote growth, and they produce enormous amounts of waste, which pose significant challenges for storage and disposal. Hog waste, for example, is typically stored in open lagoons, roughly the size of football fields. Drier animal waste, such as “chicken litter,” is stored in piles, often outside where rain can lead to runoff into nearby waters. After being stored, animal waste is typically spread on surrounding crop fields as fertilizer for crops. These “spray fields,” as well as the lagoons and litter piles, are sources of pollution that can introduce hormones, and other contaminants into our waterways.

Several important veterinary steroids that have been detected in drinking water are on the CCL3, including estriol, estrone, ethinyl estradiol, and mestranol. Some of these are also breakdown products of human pharmaceuticals. These are reasonable priority chemicals that deserve scrutiny and action. Trebolone acetate and its metabolites, are unfortunately not on the CCL3, even though they have been detected downstream of many animal feeding operations.

Recommendations to Address the Problem of Endocrine Disruptors in Drinking Water

Under the Safe Drinking Water Act and the Food Quality Protection Act, EPA has the authority and obligation to ensure the safety of our drinking water. EPA should:

- Implement testing under the endocrine disruptor screening program for priority drinking water contaminants, including all chemicals on the CCL3, as well as other chemicals in pharmaceuticals and personal care products that have been detected by USGS in surface or groundwater.
- Implement aspects of the EDSTAC report that have been ignored, such as creating the Endocrine Disruptor Priority Setting Database, integrating the High-Throughput Pre-Screen (or ToxCast) into the program for priority-setting, screening common mixtures, and inviting public nominations for testing;
- Evaluate and identify wastewater and drinking water treatment practices for removing endocrine disrupting chemicals, including pharmaceuticals;
- Work with other federal agencies and states to prevent or limit the use of hormones in agriculture.

Congress needs to take additional steps to help address this issue, including:

- Require EPA to prioritize and screen chemicals in drinking water, including mixtures, for endocrine disrupting effects;
- Restore adequate funding for the USGS Toxic Substances Hydrology Program and the USGS National Water Quality Assessment Program (NAWQA), so more data are available on contaminants in source water and drinking water; NAWQA started with 500 sites in 1991, and has now been reduced to 113, of which only 12 are monitored annually. 86 sites are monitored only once every four years;
- Reform the Toxic Substances Control Act to require testing of chemicals for toxicity, and require EPA action to promptly regulate hazardous chemicals.

Appendix 1
Results of the USGS Survey of Intersex Fish in the United States, 1995-2004

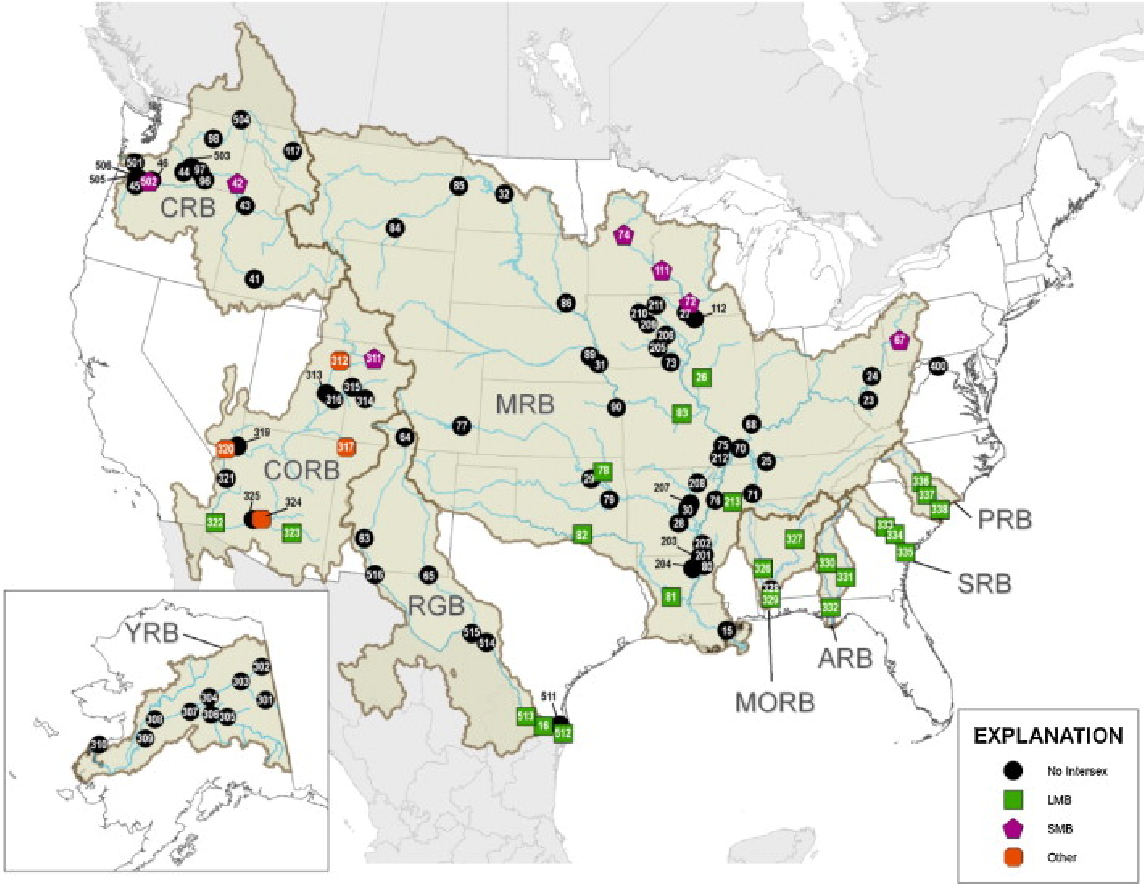
Of the 16 fish species researchers examined from 1995 to 2004, intersex was most common by far in smallmouth and largemouth bass: a third of all male smallmouth bass and a fifth of all male largemouth bass were intersex (Figure 3). This condition is primarily revealed in male fish that have immature female egg cells in their testes, but occasionally female fish will have male characteristics as well.

•Intersex smallmouth bass were found in a third of male bass at almost half of the sites examined in the Columbia, Colorado, and Mississippi River basins. The percentage of intersex smallmouth bass ranged from 14 to 73 percent at different sites. It was highest (73 percent) in the Mississippi River at Lake City, Minn., Yampa River at Lay, Colo. (70 percent), Salmon River at Riggins, Idaho (43 percent), and the Columbia River at Warrendale, Oreg. (67 percent).

•Intersex largemouth bass were found in nearly a fifth of the fish examined from the Colorado, Rio Grande, Mississippi, Mobile, Apalachicola, Savannah, and Pee Dee River basins; intersex was not observed in male largemouth bass from the Columbia River Basin. The percentage of intersex largemouth bass per site ranged from 8 to 91 percent and was most prevalent in the southeastern United States. The Pee Dee River at Bucksport, S.C., contained the highest percentage of intersex fish (91 percent), with high percentages occurring elsewhere on the Pee Dee too. Sixty percent of male bass examined at the Apalachicola River at Blountstown, Fla., were intersex, 50 percent in the Savannah River at Port Wentworth and Sylvania, Ga, 43 percent in the Savannah River at Augusta, Ga., and 30 percent in the Chattahoochee River at Omaha, Ga., and the Flint River at Albany, Ga. Lower percent intersex (10-25 percent) were found in bass from sites in the Mobile River in Alabama.

•In addition, relatively high proportions of intersex largemouth bass were observed at three sites in the lower Rio Grande Basin including Rio Grande at Brownsville, Texas (50 percent), Rio Grande at Falcon Dam, Texas (44 percent), and Rio Grande at Mission, Texas (20 percent). In addition, 40 percent of male largemouth bass from the Colorado River at Imperial Dam, Ariz. and at the Gila River at Hayden, Ariz., in the Colorado River Basin were intersex.

Figure 3: Locations where intersex smallmouth bass and largemouth bass were found in the United States

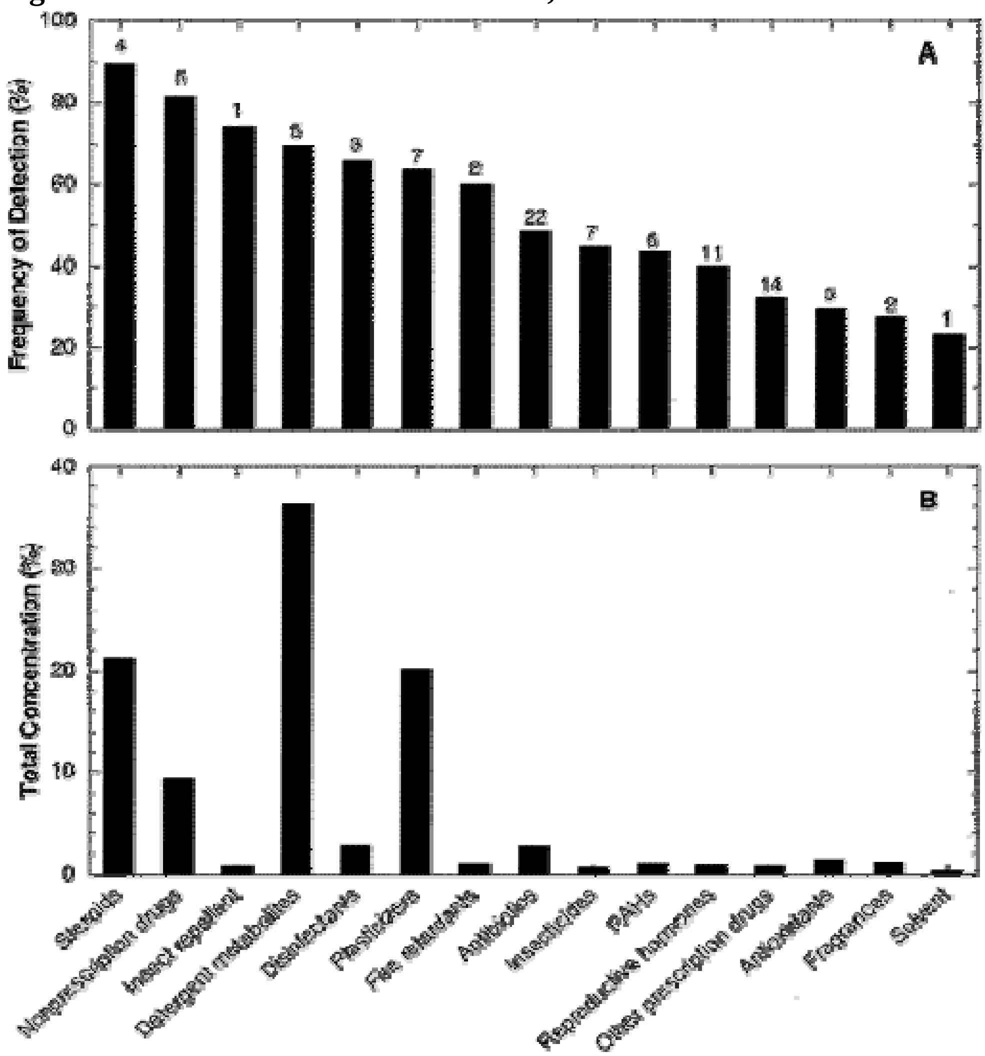


Source: Hinck JE, Blazer VS, Schmitt CJ, Papoulias DM, Tillitt DE. Widespread occurrence of intersex in black basses (Micropterus spp.) from U.S. rivers, 1995-2004. Aquat Toxicol. 2009 Oct 19;95(1):60-70.

Appendix 2
Contaminants in Source Water in the United States

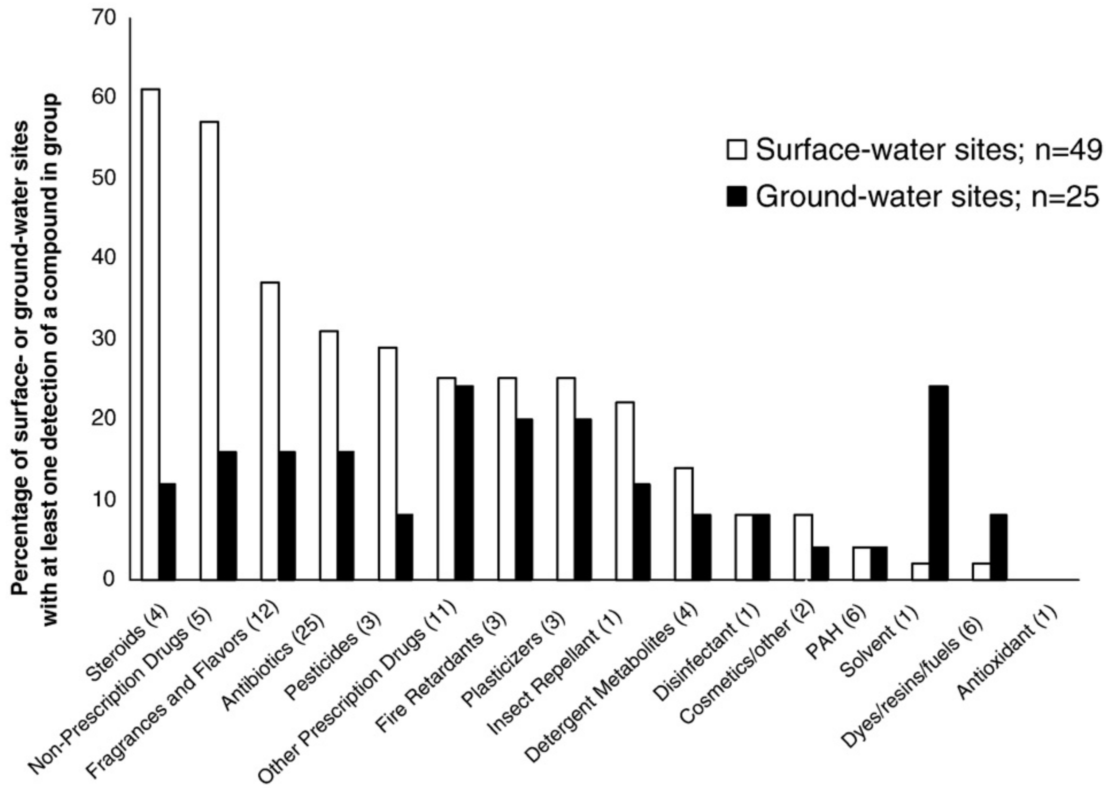
The most common unregulated contaminants detected in surface water include steroid hormones, nonprescription drugs, insect repellent, detergent chemicals, disinfectants, and plasticizers; all of these chemicals were detected at 70 percent or more of sites tested. The concentrations of the steroids, detergents, and plasticizers were among the highest of all the emerging contaminants (Figure 4). Water used as source water for drinking water systems has a lower detection frequency of unregulated compounds (Figure 5). However steroid hormones and prescription drugs were found in more than 50 percent of surface water sources of drinking water, and groundwater sources in more than 20 percent of cases contained solvents, prescription drugs, fire retardant chemicals and plasticizers.

Figure 4: Contaminants in U.S. Streams, 1999-2000



Source: Kolpin DW, Furlong ET, Meyer MT, Thurman EM, Zaugg SD, Barber LB, Buxton HT. Pharmaceuticals, hormones, and other organic wastewater contaminants in U.S. streams, 1999-2000: a national reconnaissance. Environ Sci Technol. 2002 Mar 15;36(6):1202-11.

Figure 5: Detections of organic wastewater compounds by general use category at surface- and ground-water sites.



Source: Focazio MJ, Kolpin DW, Barnes KK, Furlong ET, Meyer MT, Zaugg SD, Barber LB, Thurman ME. A national reconnaissance for pharmaceuticals and other organic wastewater contaminants in the United States--II) untreated drinking water sources. Sci Total Environ. 2008 Sep 1;402(2-3):201-16.

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