

Chemical Dispersants and the Clean Water Act

The following material is an excerpt from the Lawrence Anthony Earth Organization, Science and Technology Committee research paper entitled:

A Call for a Twenty-First Century Solution in Oil Spill Response — Updated September 2014. While it is recommended that the complete research paper is studied, this excerpt is being made widely available as critical information for educational purposes.

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The complete research paper can be ordered online at www.protectmarinelifenow.org

Dedicated to and in Memory of Walter B. Parker (1926-2014),
an invaluable advisor to the Lawrence Anthony Earth Organization

A lover and guardian of Earth's seas and complex ecosystems, Mr. Parker, who internationally opposed the use of dispersants since 1968, peer reviewed this paper and asked that we continue our work to implement effective non-toxic solutions in oil spill response. Mr. Parker held many key positions including serving as Oil Spill Commission Chairman in 1990 and was appointed by President Clinton to the U.S. Arctic Research Commission in 1995. He helped to oversee Alaska's progression as a young state, influencing the formulation and implementation of such major legislation as the National Fisheries Act, Alaska National Interest Lands and Conservation Act, and Oil Pollution Act.

Mr. Parker's unwavering devotion to Alaska was accentuated by his service as a senior fellow at the Institute of the North at Alaska Pacific University. He recently served on the boards of the Prince William Sound Science Center, Oil Spill Recovery Institute, Prince William Sound Regional Citizens' Advisory Council, Pacific Environment, and North Pacific Research Board and was awarded the Alaska Center for the Environment Lifetime Achievement Award in 2002.

His guidance will be sorely missed but lives on through this work and the work of many dedicated groups carrying forth his important environmental protection legacy.

The Case against Corexit and Other Dispersants

Obsolete Cleanup Technology Must be Brought up to Match the Exceedingly Advanced Levels of Exploration and Drilling Tech

The limitations and issues with our current *preapproved* oil spill response systems and tools are illustrated using the BP-DWH blowout and oil spill response as an example. Although spill/spray/injection volumes have been debated, multiple reports indicate that at least 5 million barrels of oil were released into the Gulf of Mexico, with an unprecedented volume of nearly 2 million gallons of Corexit dispersants applied for mitigation purposes. Despite the fact that chemical dispersants such as these have a stated purpose of protection of shorelines and wildlife by sinking and dispersing the oil below the surface, preventing the oiling of sensitive habitats, feathers, and fur; the mix of Macondo oil and Corexit had mutagenic,^{vi} teratogenic,^{vii} and other harmful effects on the marine food web and is still having such an impact at the time of this writing, now four years later.¹ This response method is intended to break the oil into fine particles, making it more easily biodegradable by indigenous oil-metabolizing microbes. That intent, however, is *not* achieved but instead has an end product of preventing biodegradation and causing a gassing off or transference of toxic compounds from water to air, sediment, soil, or other mediums, rendering the “unsightly goo” invisible but, nevertheless, easily detectable and still capable of harming the ecosystem; hence, little oil is in fact removed from the environment using dispersant chemicals. Additionally, with the unprecedented high quantities of chemical dispersants injected at the site of the blowout, 5,000 feet beneath the surface waters, the bioaccumulative and long-term negative effects on the plankton and subsequently all life throughout the food web raise important concerns.²

For instance, a Woods Hole Oceanographic Institute study found that dispersants were suspended within an oil-gas-laden plume in the deep ocean and had still not degraded

some three months after they were applied.³ DOSS (dioctyl sodium sulfosuccinate),^{viii} a component of Corexit, contributed to this plume, acting as a biocide^{ix} and killing the native microbes in the region, effectively retarding the natural biodegradation process.⁴ This may account for oil that had sunk but

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ascended again and was redistributed onto shorelines after storms, such as Hurricane Isaac, triggering a second cleanup effort.^{5,6} Official responses to these concerns do not address these problems today any better than they did in the past. Regulators are now calling for more costly long-term studies, stating that “*effects are still uncertain and a better understanding is still needed.*”⁷ Thirty years of experience with questionable cleanup results from scores of major oil spills that have contributed to the collapse of some fisheries and negative human health impacts should be enough.⁸ These impacts have been documented by various research facilities and, as a result, it can be argued that adequate data exists to be able to judge that present modes of spill response are unsatisfactory for the task at hand.⁹

In short, this independent Science & Technology Board objects to the current stance asserted by the EPA, Coast Guard and NOAA that 25 percent dispersed and burned and 2–8 percent mechanically removed is good enough, “*since nature will do the rest.*” Their statistical

vi. **mutagenic.** Capable of causing or increasing the rate of unnatural mutations in living organisms.

vii. **teratogenic.** Capable of causing birth defects and negatively impacting the development of a fetus.

viii. **DOSS (dioctyl sodium sulfosuccinate).** A toxic surfactant that is a component of Corexit. Common side effects of exposure to DOSS include a breakdown of red blood cell walls and subsequent rectal bleeding, stomach pain, diarrhea, serious allergic reactions, and cramping.

ix. **biocide.** Any toxic chemical that has the potential of destroying life forms by poisoning.

reports that claim this measurement of “removal” cannot be verified and we can all agree any sizeable percent of a spill remaining is absolutely an unacceptable cleanup standard.¹⁰ We assert that the only acceptable standard for oil spill cleanup/removal is close to 100 percent remediation accomplished swiftly.¹¹

The Gulf of Mexico is one of the world’s great hydrocarbon basins and a major contributor to US energy security, delivering a quarter of the country’s total oil output. The oil and gas industry in the Gulf is also an important driver of the regional and national economy. As the Gulf expands as an oil-producing region, an increasing proportion of activity and production will take place in ultra-deep waters of 5,000 feet or greater.

The Energy Outlook report issued on November 12, 2012, by the US Energy Information Administration (EIA) states that the United States will overtake Saudi Arabia as the world’s leading oil producer by about 2017 and will become a net oil exporter by 2030.

Unfortunately, spill cleanup methods are not technologically advancing at the same urgency and pace. To their credit, numerous countries throughout the world have, however, banned or strictly limited the use of dispersants. For instance, New Zealand, Australia and India restrict usage, and in Saudi Arabia environmental policies were established against chemical dispersant usage in their waters because they are wholly dependent upon desalinization for their drinking water.

Today the Gulf of Mexico is a distressed body of water, as evidenced by lesions on fish, mutations, heightened chemical and acidic levels, and consequential health issues in humans. It has been known for decades that dispersants cause long-term damage to the entire ecosystem, so why are we using them and continuing to stockpile them at all?

With the stepping up of oil and gas production in the United States, the industry is wholly capable of employing safer drilling practices and cleanup solutions. The aftermath of the BP spill and its lessons indicate it is absolutely

imperative that new contingency plans be put in place that do not involve the use of dispersants containing toxic compounds, but instead utilize cleanup methods that factually remediate water and soil pollution and predominantly *remove toxins* so that living organisms can survive in a healthy ecosystem.

There is no life without water. The day is coming when clean water will be the new oil, as our vast underground water supply is shrinking. The Ogallala Aquifer—the largest in North America and a major source for agriculture, stretching from Texas to South Dakota—is currently being pumped at a rate 8 times greater than it can be replenished. California predicts, if more supplies are not found, that by 2020 the State will face a shortfall of clean water nearly as great as the amount that all of its cities and towns together are consuming today.¹¹⁻¹

Moving forward in this era of expanded oil production requires a shift in paradigm to more closely align with a standard of *complete removal* of pollutants, which is legally mandated by the Clean Water Act (CWA), enacted over 25 years ago. However, this has apparently been deemed unachievable by regulators and too costly by industry, and as a result, both industry and environmental interests have much of their time and resources focused on *regulating, defending and studying the effects of dispersants* instead of focusing on bringing forth, field testing, and incorporating better technology that does in fact remove all spilled oil from ocean and fresh water ecosystems.

Two US federal laws, the Clean Water Act (CWA) and the Endangered Species Act (ESA), contain provisions that specifically ensure that dispersant approval and use will not jeopardize imperiled wildlife and the resources on which it depends. We contend that the preapproval status bestowed upon Corexit,¹² the immediate authorization of its deployment in response to the BP oil spill emergency and, finally, its use being an integral part of nationwide response planning (in which it is staged and ready for deployment in all US waters) are a clear violation of the Clean Water Act in many respects.¹³

Revitalization of the Clean Water Act

The Clean Water Act (CWA) was enacted in 1948 as the Federal Water Pollution Control Act, but the statute was significantly changed and amended in 1972 and became known as the Clean Water Act.

The following is an analysis of how current spill response systems rate against the intent of the law as expressed in the Clean Water Act.

1. The CWA establishes “*it is the national policy that the discharge of toxic pollutants in toxic amounts be prohibited*”¹⁴ [emphasis added].

2. **Toxic pollutant** defined: Toxic pollutants, a subset of hazardous substances, include pollutants that “after discharge and upon exposure, ingestion, or inhalation ... [by] any organism” will “cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions, ... or physical deformations in such organisms or their offspring” (33 U.S.C.A. § 1362).¹⁵

3. **Dispersants** (Corexit 9527, 9500, etc.) **contain toxic pollutants**, which were applied in **toxic amounts** in the Gulf of Mexico, which adversely affected human health and marine life.¹⁶

4. **Toxic amounts** defined: Relative to a multitude of environmental and other factors, “any degree of harmful impacts to any life form by exposure” would be a good working definition for the CWA expression of *toxic amounts*. Prior to May 2010, the EPA had no clear-cut guidelines for the determination of what would constitute “toxic dispersant amounts.” Further, the Agency has admitted that long-term effects of dispersants on aquatic life are unknown.¹⁷ In June 2010, in response to public concerns and reports of resultant illness over the use of Corexit dispersants in the Gulf of Mexico, the EPA conducted short-duration tests on an emergency basis to determine the *least toxic*

dispersant to use and then modified toxicity threshold levels related to the application of dispersants.¹⁸ Just prior to this, BP had also responded to the EPA’s request to find a less toxic dispersant.¹⁹ The public was then reassured by the EPA that the toxicity range of Corexit 9500 recommended by BP, fit within the LC 50^x toxicity range for aquatic organisms of >10–100 ppm (parts per million), deemed “slightly toxic” per EPA’s “five-step scale of toxicity categories used to classify pesticides” (see page 8).

With respect to this criterion, a lower toxicity number indicates a more toxic compound; thus, between 10 and 100 falls within a range considered *slightly toxic* by the EPA (Corexit 9500 was found to be in a range of 25-130 ppm). It needs to be understood however, that these toxicity thresholds are based on what amount of dispersant it takes to kill 50% of aquatic organisms in a given vicinity with a one-time exposure over a 24-96 hour period of time. Longer-term exposures and the effects on all species, their reproduction, general health and impacts on the food chain were not cited or determined which has raised questions and debate within a variety of scientific institutions conducting research in this area. It should also be noted that adding dispersants to the toxic compounds of oil, raise the overall level of toxic effects on human, marine and other species.

We question how nearly 2 million gallons of a dispersant containing 57 chemicals applied on the surface and subsea for a protracted period of time in a broad area could be deemed *not toxic amounts* and *slightly toxic*. Subsequent studies cited by the EPA and NOAA still express a noncommittal position on this point with the long-term fate of the parent components mixed with the released crude oil still unknown.^{xi}

x. **LC 50.** LC = lethal concentration. LC 50 is the concentration of a substance that is lethal to 50 percent of the test organisms in a specified time period, typically 48 or 96 hours. (See also page 22, Toxicity Values chart.)

xi. See Proceedings of the National Academy of Sciences (PNAS) Special Feature: “Science in Support of the Deepwater Horizon Response” and other citations listed in this paper.

Ecotoxicity Categories for Terrestrial and Aquatic Organisms

Toxicity Category	Avian: Acute Oral Concentration (mg/kg)	Avian: Dietary Concentration (ppm)	Aquatic Organisms: Acute Concentration (ppm)	Wild Mammals: Acute Oral Concentration (mg/kg)	Non-Target Insects: Acute Concentration (pg/bee)
very highly toxic	<10	<50	<0.1	<10	
highly toxic	10-50	50-500	0.1 - 1	10 - 50	<2
moderately toxic	51-500	501-1000	>1 - 10	51 - 500	2 - 11
slightly toxic	501-2000	1001-5000	>10 - 100	501 - 2000	
practically nontoxic	>2000	>5000	>100	>2000	>11

EPA Established Thresholds Five-Step Scale of Toxicity Categories

(EPA toxicity thresholds scale can be found at http://www.epa.gov/oppefed1/ecorisk_ders/toera_analysis_eco.htm#Ecotox, and EPA Dispersant Toxicity Testing study at <http://www.epa.gov/bpspill/reports/ComparativeToxTest.Final.6.30.10.pdf>.)

Common sense would indicate that when introducing any chemical substance into a freshwater or marine ecosystem that is not native to that environment (for instance, crude oil or hydrocarbon-based dispersants), any toxicity level other than **nontoxic** would be of concern for the health of the local environment, let alone potential impacts on the regional human populations. For example, according to the New Jersey Department of Health, the presence of 2-butoxyethanol (a surfactant ingredient in Corexit 9527 and evident in 9500 per EPA 1999 NCP Notebook) has no *nontoxic* range.²⁰ The MSDS (Material Safety Data Sheet) states clearly: “Do not contaminate surface waters [with this product].”

5. The CWA and subsequent regulations (OPA 90²¹ and 40 CFR²²) call for the design of plans and actions that result in the **REMOVAL** of hazardous waste and toxic pollutants from the environment. The EPA and Coast Guard are the two primary agencies responsible for initiating, managing, and overseeing appropriate *removal* actions.

6. The now obsolete but primary response method of **dispersant** application, amounts to **using toxic pollutants to treat toxic pollutants**—a primitive and counterproductive

action that increases the toxicity of a spill by a factor of 10x or greater.²³ The mechanism of action of chemical dispersants, such as Corexit, is as a detergent. Detergents provide a solubilizing action, similar to a solvent or soap, to make oil soluble in water. The greatest immediate impact of the use of a chemical dispersant, such as Corexit, is to make the normally insoluble oil “disappear” by “dissolving” it in the water column. While the oil contamination is not seen visually by the naked eye, it is nevertheless still present in the environment and can be readily detected

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by scientific instrumentation. This “solution to pollution by dilution” is inconsistent with the original purpose of the Environmental Protection Agency and its responsibility for Clean Water Act enforcement. In other words, chemical

dispersants render the containment or removal of spilled oil impossible by making (normally) separated oil and tar-like phases soluble in water to result in maximum dilution and “dispersion” of the oil. In addition, the detergent chemical interaction from dispersants applied to a spill can act as a biocide by disrupting or lysing^{xii} the cells of biological organisms and bacteria that come into contact with these dispersants.

xii. **lyse**. To cause dissolution or destruction of cells by lysins. **lysins**. Antibodies or other agents that cause red blood cells or bacterial cells to break down.

Detergents are commonly used in laboratory and scientific research to disrupt the integrity of or dissolve (lyse) biological cell walls to release cellular contents for use in the laboratory. The effect of cell lysing is to liquefy cell wall membranes, resulting in cell death. Thus, chemical dispersants are not designed to detoxify or remove oil from the environment; they solubilize it and alter the natural biological mechanisms and defenses that marine and other life forms have against toxic chemicals increasing exposure risks from the bottom to the top of the food chain over scores of years. Human, mammalian and all marine life forms will more easily uptake toxins associated with oil when it is treated with dispersants. These chemicals also hinder nature's own oil-eating microbes.

As covered above, studies have confirmed that oil plus its associated chemical dispersants remain in the environment/water column for extended periods of time, resulting in adverse impacts on flora and fauna for up to 20 to 30 years, as occurred after the Ixtoc and Valdez spills.

7. Moreover, the *de facto* sole-sourcing and preauthorization of dispersants (large stockpiles of Corexits dominating contingency plan staging at the time of this writing), are in effect sanctioned by the EPA and USCG and other emergency response agencies to the exclusion of other less-toxic products. This, which is in operation currently, is an illegal procurement authorization of sole-sourced proprietary product categories owned by private companies. (The US government is required to foster free and open competition of products it uses to implement the CWA.) The National Response Team system overseen by the US Coast Guard

and EPA grades and lists Oil Spill Response Organizations (OSROs) based on stockpile volumes and capacity for deployment of chemical dispersants as one of its main criteria. Hence, cleanup companies are awarded contracts on this basis as an important factor in their qualifications. It should be noted that numerous manufacturers of less toxic products have experienced arbitrary regulatory hurdles of such huge proportions that many years of work, including meeting expensive EPA test requirements, have only resulted in closed doors for suppliers/companies ready to deploy these less harmful alternatives. Furthermore, this bureaucracy has also made it difficult for On-Scene Coordinators (OSCs) to request usage of dispersant alternatives (such as Bioremediation *EA Type*) already on the NCP

Using toxic pollutants to treat toxic pollutants [is] a primitive and counter-productive action that increases the toxicity by a factor of 10x or greater. ... The detergent action provided by chemical dispersants ... can act as a biocide by disrupting or lysing the tissues of biological organisms. ... The effect of cell lysing is to liquefy cell wall membranes, resulting in cell death.

Product Schedule, since these are outside the "long-established system," with no clear-cut protocols for requesting or deploying such an agent.

The US Interagency Coordinating Committee on Oil Pollution 2010–2011

Research Report (ICOPR), 2012 Biennial Report to Congress,²⁴ stated: "Some use the BP Deepwater Horizon oil spill response to suggest that oil spill technology has not changed since Exxon Valdez; however, a closer examination ... suggests otherwise." The report defends and asserts that the BP Macondo spill response was successful using "effective techniques" and "science-based decision protocols." While many aspects of this response represented a mammoth feat and genuinely sincere efforts by many competent people, there are a large number of professionals, scientists, and industry leaders who have observed that these assertions of 'successful science-based cleanup protocols' are contrary to

their aftermath which show resulting damage to the seabed, marine life, fisheries, wildlife, and the public's health and area livelihoods. This inarguably mandates major changes in methodology. At minimum, the wide chasm in differing views suggests contrary facts that require independent investigation and reconciliation.

To their credit, the plans expressed in the ICCOPR Report to Congress also emphasized *"the Interagency Committee is committed to expanding our knowledge and tools to meet future oil spill response challenges."* All concerned should welcome that open invitation and should be committed to providing expanded knowledge, working in tandem with this national committee.

8. The CWA was weakened in 2006 by two Supreme Court decisions (2001 and 2006), which established precedents resulting in reduced enforcement of the law.^{xiii} The EPA and the Army Corps of Engineers, as a result of these court decisions, changed their policies and abandoned more than 500 Clean Water Act cases being pursued, which cast doubt on how to assess what bodies of water might fall under CWA protections.

Oil spills may result in only temporary disruption to the company and industries that cause them, but they are permanent injuries for the rest of us. The purpose of the Clean Water Act is to protect us and future generations from irresponsible actions that do not take into account the long-term impacts.

It is ironic that the penalties for an oil spill are partially calculated by counts. How many dead turtles and dolphins? How many

The preapproval status bestowed upon Corexit, the immediate authorization of its deployment in response to the BP oil spill emergency, and finally, its use being an integral part of nationwide response planning (in which it is staged and ready for deployment in all US waters) are a clear violation of the Clean Water Act in many respects.

square miles of oil sheen? Penalties based on *"quantity visually gone"* encourage practices like the use of dispersants rather than incentivizing nontoxic solutions that completely remove the oil and all its toxic compounds. Open discussion between industry and

regulatory agencies to review how these penalties are calculated would be an important step in refocusing efforts on effective cleanup measures.

In light of the above, a restoration and revitalization of the Clean Water Act is in order.

xiii. See [cleanwateraction.org](http://cleanwateraction.org/article/How-the-Clean-Water-Act-Was-Weakened) article "How the Clean Water Act Was Weakened" at <http://cleanwateraction.org/mediakit/overview-clean-water-restoration-act-2009>.

Cooperative Ecology™ - A New Worldwide Movement

One of the largest and most bounteous interdependent life systems in the world, the Gulf of Mexico, has been devastated by the Deepwater Horizon disaster added to the years of cumulative pollution pouring into the Gulf from various sources. The BP response required was greater than what had been prepared for, and the agencies of response were not equipped with strategies to adequately address it. Constrained by adherence to outdated guidance that advocates the use of dispersants as a preapproved cleanup method, decision makers, especially OSCs were effectively hampered from having any other options for the selection of available alternatives and more workable solutions.

The past is behind and errors can be forgiven if action is taken by government, industry and private sectors to implement nontoxic solutions in oil spill remediation. But will it be done? It sometimes takes courage and a fearless approach to bring about change.

Renowned conservationist Dr. Lawrence Anthony, founder of the Earth Organization^{xix}, had a reputation for bold conservation initiatives, including the rescue of the Baghdad Zoo at the height of the 2003 US-led coalition invasion of Iraq, and his traverse into an off-limits and remote territory deep in the Congo jungle to negotiate with leaders of the infamous Lord's Resistance Army to get their help to protect the last living Northern White Rhinoceros. As an author of three popular non-fiction books dedicated to raising public awareness of how finite, vulnerable, and interconnected Earth's

integrated systems of plant and animal life are, Anthony coined a new term in which LAEO bases its work: *Cooperative Ecology*.

Cooperative Ecology™ (CoEco) (*noun*) is defined as the study of the mutual interdependency and cooperation of all life forms and the material world. It is based on the premise that all life forms are interdependent and engaged upon the same objective—to survive—and are acting in mutual support of this objective for their joint perpetuation. The moment life forms, including man, fall away from the concept of mutual cooperation with all other life forms and the material world, their capability to survive diminishes and becomes less effective. CoEco includes the study of man's sciences in the light of this cooperative relationship of all life forms, and it determines the value of sciences on these principles.

Whether sciences bring about a steady improvement for life forms and the material world or whether they create imbalances determines to what degree the sciences themselves are cooperating with life and, thereby, their relative value. The study includes, as well, ecological and economic policy and their impacts based on these principles. It is holistic, by necessity, and requires the interaction with, and study of, 1) the full spectrum of scientific methods and views; 2) all life forms and their interrelationships; 3) micro to macroeconomic and governmental policies; 4) religious influence; and 5) population systems. And it must, inevitably, study the interrelationships of each of the above points as they influence the environment.

The objective of Cooperative Ecology - is to generate improved science and policy that increases the survival potential and productivity for all interdependent life to a level of balanced abundance, guaranteeing mutual perpetuity.

xix. **Earth Organization.** The Earth Organization was renamed in memory of Lawrence after he passed away in 2012, now the Lawrence Anthony Earth Organization (LAEO).

Moving Forward

Unless we examine and seek an understanding of true data and engage in a worldwide effort towards truly achieving Cooperative Ecology as a necessity instilled in the minds and behaviors of mankind as a whole, life on earth, as we know it, will not sustain.

The objective of Cooperative Ecology is to generate improved science and policy that increases the survival potential and productivity for all interdependent life to a level of balanced abundance, guaranteeing mutual perpetuity.

Positive progress in achieving such an objective would be made by raising pollution removal standards up to the original intent of the Clean Water Act. This would require agreement, planning, and action by all members of industry and commerce that have the potential of creating oil spills, to only name and employ NCP-listed products that are strictly not toxic or otherwise harmful and, to set a standard in their spill countermeasure plans and cleanup protocols that insures these plans do, in fact, utilize methods that swiftly and completely *remove* oil from a spill area.



The reference notes / citations 1- 24 referred to in this excerpt can be found at: www.protectmarinelifenow.org at the Resources tab.

Respectfully submitted by the
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