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Great River Landscapes and Deltas of the World: A Conversation with Kenneth R. Olson

Editorial board[1]

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Abstract

This interview with Professor Kenneth R. Olson explores the environmental, historical, and political dimensions of the world's great river landscapes and deltas. Drawing on decades of interdisciplinary research in soil science, freshwater systems, environmental degradation, and war-related ecological impacts, Olson reflects on how rivers function not only as physical landscapes but also as complex socio-political systems shaped by human intervention, engineering, military conflict, and climate change. Particular attention is given to the Mississippi River flood events, the Mekong Delta, the environmental consequences of herbicide warfare during the Vietnam War, and the long-term impacts of unexploded ordnance and toxic contamination in Southeast Asia. The discussion highlights the importance of field-based research, scientific independence, environmental archiving, and interdisciplinary collaboration in understanding global ecological crises. Olson also addresses the vulnerability of the world's deltas to subsidence, sea-level rise, pollution, and unsustainable development, emphasizing the urgent need for long-term environmental stewardship and open scientific communication.

Keywords: Great River Landscapes, Deltas, Freshwater Systems, Soil Science, Environmental Pollution, Warfare Ecology, Mekong River, Mississippi River, Agent Orange, Flooding, Climate Change, Environmental History, Interdisciplinary Research.

Key Points

1. Rivers are not only natural systems but also political, historical, economic, and military landscapes shaped by human decisions and interventions.
2. Modern warfare has caused long-term environmental and human health damage through chemical contamination, herbicide use, bombing campaigns, and destruction of freshwater ecosystems.

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3. The world's major deltas, especially in Southeast Asia, are increasingly threatened by land subsidence, sea-level rise, erosion, pollution, and unsustainable development.
4. Independent interdisciplinary research and direct field observation ("boots on the ground") are essential for understanding environmental crises and documenting ecological consequences of war and flooding.
5. Scientific publishing, open archives, and long-term preservation of environmental records are critical for future research, historical accountability, and learning from past environmental mistakes.

Introduction

Interview conducted on May 13, 2026.

Prepared for the journal "Pollution and Diseases."

Professor Kenneth R. Olson (Figures 1 to 3) is an American soil scientist, environmental researcher, and author whose work focuses on great river landscapes, environmental degradation, flooding, war-related ecological damage, and freshwater systems around the world. In this interview, he reflects on decades of interdisciplinary research, the environmental consequences of war, and the future of the world's great rivers and deltas.

INTERVIEW

What originally inspired your long-term interest in rivers and landscapes?

During the Great Flood of 2008 on the Mississippi and Ohio Rivers, the Embarrass River — whose headwaters are located in Champaign County, Illinois, near where I live — overflowed, and several levees were breached. I decided to visit Sainte Marie, the site of the levee failures, and discovered extensive soil damage that was not observed at other flooded locations without levees.

I began documenting the soil damage caused by the levee breaches and later traveled to the Upper Mississippi River to assess flood-related damage on agricultural lands. I submitted my first paper on the impact of flooding on agricultural lands to the Journal of Soil and Water Conservation. Before publication, the journal editor forwarded the paper to the planning committee of the 2008 Soil and Water Conservation Society Annual Meeting. The committee invited me to present my findings in Arizona, and I accepted, later serving on a panel discussing the impacts of the 2008 floods.

Two papers were subsequently published: a co-authored panel paper on the impacts of flooding from the Mississippi River and its tributaries on Midwestern agricultural lands, and my own paper examining flooding impacts along the Ohio River and its tributaries.

I later researched the effects of the 1993 levee breaches in the Len Small Levee and Drainage District in southwestern Illinois and published those findings in 2011. After

the Great Flood of 2011, I continued assessing soil damage along the Mississippi and Missouri Rivers and their tributaries.

The most severe levee breaches occurred near the confluence of the Ohio and Mississippi Rivers in the New Madrid Floodway in Missouri. There, the U.S. Army Corps of Engineers intentionally breached the Birds Point levee with explosives to relieve pressure on the Cairo, Illinois floodwall system, which was at risk of overtopping. The story received national attention and ultimately rekindled my long-term interest in studying great river landscapes.

At what point did you realize that rivers are not only geographical systems, but also political, historical, and ecological systems?

In 2011, I began writing about the man-induced levee breaches in the New Madrid Floodway (Figures 4 to 19) and gradually realized how deeply rivers are connected to political, historical, and ecological processes. I started to observe the broad consequences of humanity's attempts to control river flooding.

After publishing my article on the extensive soil damage caused by the levee breach in the New Madrid Floodway, I concluded that the damage had been far greater than the U.S. Army Corps of Engineers had anticipated. One important factor was a lawsuit filed by the Missouri Attorney General in federal court to stop the Corps from opening the floodway by breaching the Birds Point levee and flooding Missouri farmland.

The legal battle delayed the operation for four days and eventually reached the U.S. Supreme Court. Justice Samuel Alito Jr. ruled on a Sunday that the Corps had the authority to open the federal floodway in order to relieve pressure on the Cairo, Illinois floodwall and levee system, which was close to being overtopped. By that time, water levels near the confluence of the Mississippi and Ohio Rivers had risen an additional four feet, and the city of Cairo had to be evacuated.

Because of the delay, the erosive force of the floodwaters rushing through the levee breach — created using TNT explosives — became far more destructive than it would have been if the floodway had been opened earlier. The additional water volume created a deep crater lake near the breach and carved massive gullies through adjacent agricultural fields, some thousands of feet long, approximately 70 feet wide, and 10 feet deep.

After my paper was published in the Journal of Soil and Water Conservation, a reader forwarded a copy to the Missouri Attorney General. He contacted me directly and objected to my conclusion that the delay caused by the lawsuit contributed to the excessive soil damage. He believed the U.S. Army Corps of Engineers alone should bear responsibility.

At that moment, I felt somewhat like "a deer caught in the headlights." The Attorney General wanted me to publish a retraction, but I refused because I believed my findings were scientifically correct. Since he had already sued the Corps all the way to the U.S. Supreme Court, I became concerned that I might also face legal action.

Fortunately, my department head advised me to contact the University of Illinois Legal Counsel before responding. I met with one of the university attorneys, who recommended that I explain my findings in writing and request that any future communication from the Attorney General's office be directed through university legal counsel. I followed that advice, and it turned out to be the last contact I ever had with the Missouri Attorney General's office.

The experience demonstrated to me that rivers are never only physical landscapes. They are also political systems, shaped by law, engineering, history, economics, and human decisions — often with enormous environmental consequences.

Your books combine soil science, geography, environmental history, war studies, and ecology. Why is interdisciplinary research so important today?

I found that each great river I researched and studied had a different story to tell. Sometimes it was flooding of agricultural lands and crop loss, other times it was a soil erosion and land degradation problem, or land and water pollution, or urbanization, or industrial use, or a land use change, or a management problem, or the river was an invasion pathway with a rich military history.

Which river system has impressed you the most during your career and why?

I have studied many rivers throughout my career, but as a U.S. Army Vietnam Era veteran, I would have to choose the Mekong (Lancang) River (Figures 20 to 32). Traveling along the Mekong River by car and boat in 2016, from the South China Sea to the Chinese border, was the adventure of a lifetime.

As a result of that experience, I went on to write approximately 28 refereed journal articles and two books about the Mekong River, the Mekong Delta, and its tributaries.

Why is this topic still underestimated globally?

Good question. I think one reason is that the media often requires government and military approval to access battlefields during ongoing wars or conflicts. Journalists and environmental scientists are frequently restricted by the military for safety or political reasons. Without access to the battlefield, reporters and scientists cannot fully document or report on the environmental impacts of war.

A good example is the Second Indochina War. The war in Laos was conducted by the CIA under the supervision of the U.S. State Department Ambassador to Laos. The CIA relied heavily on aircraft to drop bombs and spray herbicides containing dioxin TCDD and/or arsenic, rather than using ground troops. Since the U.S. military officially had no "boots on the ground" in Laos, there were no embedded reporters assigned to cover operations inside the country.

How has modern warfare changed the ecological stability of river systems and freshwater environments?

The use of chemical weapons, beginning during World War I, has resulted in serious pollution problems in freshwater environments and river systems. Because of the environmental and human health impacts associated with the manufacture, transport, and use of chemical weapons, there were international efforts to ban their use during wars and conflicts.

However, some countries, including the United States, did not sign the agreement and argued that these chemicals were merely harmless herbicides commonly used by American farmers. As a result, they were considered safe to use.

The herbicide Agent Orange (2,4-D and 2,4,5-T) was primarily used to defoliate the jungles of Southeast Asia. However, the U.S. government and military did not inform the media or the public that the herbicide 2,4,5-T contained the contaminant dioxin TCDD, which is toxic and can cause cancer in both animals and humans.

What role do rivers play in the survival and development of civilizations?

Historically, rivers have often served as both immigration and invasion pathways. In addition, river landscapes contain soils formed by sediment deposition, which are usually among the most productive soils in a region. These soils are commonly cultivated for food production.

When a river enters an ocean or sea, a delta is formed. Delta soils are also highly productive, and many large urban populations have settled on the deltas of the world.

How do environmental disasters continue to shape societies decades after military conflicts end?

Yes, this was especially true during the Second Indochina War. Thousands of bombs, including cluster bombs containing hundreds of bomblets, were dropped during the 1960s. To this day, many people in Laos are still being injured by unexploded bomblets and other unexploded ordnance.

Which regions of the world are currently the most environmentally vulnerable?

I would say the deltas, especially those in Southeast Asia. Many deltas are sinking and will eventually be covered by rising sea levels.

Historically, the natural flow and periodic flooding of great rivers resulted in regular sediment deposition. However, with the construction of dams, levees, and other hydraulic structures, sediment is often trapped behind dams or carried directly out to sea when rivers are confined by levees on both sides.

Hundreds of millions of people live on these deltas, particularly in Southeast Asia. Water extraction and the construction of heavy buildings have also contributed to land subsidence. As a result, some countries are beginning to abandon urban development in delta regions and relocate residents to higher ground.

In your opinion, what are the greatest misconceptions modern society has about environmental contamination?

When I first began studying environmental pollution in the early 1970s, my chemistry instructor used to say that "the solution to pollution is dilution." Early pollution standards established by the EPA and other agencies were based primarily on pollutant concentration, meaning the standards could often be met simply by discharging contaminants into larger bodies of water.

Eventually, these standards changed. However, industries and urban areas still frequently discharge wastewater into rivers that ultimately flow into the ocean.

Another common misconception is that rivers are self-cleaning. A city located along a river may withdraw freshwater for household and drinking purposes and later discharge treated or untreated wastewater back into the same river. Downstream communities then assume the river has sufficiently diluted or cleaned the water and extract it again for household and drinking needs, sometimes without adequate filtration systems. This cycle is often repeated all the way downstream to the sea or ocean.

What role should scientific publishing play during periods of war and global instability?

Scholars can collect important data on the environmental impacts of war. However, many countries involved in wars or conflicts restrict the publication of weapon-related scientific findings.

For example, during the Vietnam War, information concerning the environmental and human health impacts of 2,4-D and 2,4,5-T herbicides contaminated with dioxin TCDD was blocked and could not be published until after the war had ended.

Why is long-term scientific archiving and repository infrastructure important?

After a conflict or war ends, it is important to archive documents and make them available to future scholars and historians. The hope is that they can identify past mistakes and learn from them.

For example, the use of cluster bombs and herbicides containing dioxin TCDD and/or arsenic during the Second Indochina War provides important historical lessons. These lessons cannot be learned if key documents remain classified, are not archived, or are unavailable in public repositories.

When wars or conflicts are conducted in secrecy, documents are often classified, as was the case with CIA records. In the case of cluster bomb use during the Second Indochina War, the lessons learned by the U.S. military and the CIA still need to be carefully studied. However, even after 60 years, many CIA spray records remain classified and should be declassified.

Since people in Laos are still being injured by unexploded bomblets decades later, there remains an urgent need to understand the long-term environmental and human health consequences of cluster bomb use during wars and conflicts.

What motivated you to publish this book series?

After studying the Great Rivers of North America for six years and publishing approximately 12 refereed journal articles, I retired in 2014. During my years as an active faculty member, my teaching, extension, and committee responsibilities left me with little time to write a book. However, both my co-author and journal editor continually encouraged me to do so.

After retiring, my co-author and I began writing the first book, which took two years to complete. We expanded, updated, and edited the 12 journal articles into book chapters and added 13 new chapters.

Since I originally intended to write only one book — which is no longer the case — I wanted it to become a classic coffee table book with many color maps and photographs. Most of the 500 printed copies sold within eight years, and instead of producing a second printing, the publisher decided to release it as an e-book, which has now sold approximately 400 copies.

Which book in the series was the most emotionally difficult to write?

The book about Agent Blue was probably the most emotionally difficult to write. Agent Blue was an arsenic-based herbicide used to destroy rice crops and other food supplies in order to force rural Vietnamese populations to relocate to hamlets or to the slums of Saigon.

In war, there is often civilian collateral damage, including destruction of the enemy's food supply. However, it is difficult to justify destroying the food supply of your own civilian population or that of an allied nation.

Most of the Agent Blue spraying was carried out by the South Vietnamese government and military in South Vietnam, not in North Vietnam. The United States government and military supported President Diem's food denial program through the use of Agent Blue.

The CIA laboratory at Fort Detrick, Maryland developed the arsenic-based herbicide, tested it at the USDA Beltsville Agricultural Experiment Station and at other tropical locations, arranged for its transport to South Vietnam, and failed to obtain international approval for its importation and wartime use.

The U.S. military and the CIA also supplied the spraying equipment, trained Vietnamese military personnel in herbicide application, and even conducted secret missions without military insignia or uniforms.

Which discoveries surprised you the most during your research?

I was surprised to learn that the Ho Chi Minh Trail spray records in Laos and Cambodia remain classified or, when released, are heavily redacted. Even after almost 60 years, key records are still unavailable, despite the fact that they are needed to identify dioxin hotspots that require reclamation and mitigation.

How important are field expeditions and direct observation for environmental science?

I believe that “boots on the ground” are essential when researching the great river landscapes of the world, even when it is impossible for the first author to travel to a particular watershed. This may occur because a country has no diplomatic relations with the United States or because a war or conflict is ongoing.

To address this problem, I often collaborated with co-authors who were located within the watershed or country being studied. In some cases, potential co-authors declined my invitation, later asked to have their names removed, or contributed anonymously because of concerns for their own safety and the safety of their families.

Research on great river landscapes affected by the Israeli-Arab conflicts and the Russia-Ukraine war made it especially difficult to find collaborators with direct field access within those watersheds.

What advice would you give to young researchers entering environmental sciences today?

Be careful when accepting grant funding that your experimental design or survey is not structured to support an already established institutional position.

For example, when I studied the effects of soil erosion on productivity and crop yields, the funding agency wanted me to focus only on marginally productive soils, where the greatest losses would likely occur. Instead, I designed the study to also include highly productive soils, which ultimately showed only minor productivity losses.

In another study related to soil organic carbon (SOC) sequestration, many federal and university researchers used a “paired comparison” approach without a pre-treatment baseline SOC measurement. I conducted a 20-year tillage study using both methods. At the end of the study, the paired comparison method suggested that no-till farming sequestered SOC, while the pre-treatment baseline method showed that no sequestration had actually occurred. In fact, the no-till plots contained less SOC at the end of the experiment than before the study began.

If farmers had been compensated for SOC sequestration based solely on the paired comparison method, they would effectively have been paid for losing SOC at a slower rate rather than actually sequestering it.

I also believe young researchers must document, publish, and stand by their findings. Sometimes this may require finding alternative funding sources or operating with very limited resources. In some cases, there may be professional risks, including loss of funding, damage to reputation, or even loss of employment. However, if your findings are correct and you persist, the truth will eventually emerge.

In my own case, there were topics I knew would not receive funding while I was still an active faculty member, so I postponed them until after retirement. My institutional research on the impact of flooding on the Great River Landscapes of North America was supported by the USDA and my university. After retiring, I expanded my work to include the impact of war on agricultural lands and freshwater systems. That research was not supported by the government or my institution.

As a result, I had to fund the work myself, assemble an international team of experts with field access in different watersheds, and collaborate on the research, writing, and publication of 28 refereed journal articles and three books on the impacts of war on agricultural lands and freshwater systems within the great river landscapes and deltas of the world.

Which environmental problems are likely to become major global issues during the next 20–30 years?

One of the greatest concerns is the future of the world's largest deltas, which are currently home to hundreds of millions of people. The major threats include land subsidence, shoreline erosion, and arsenic contamination — both natural and anthropogenic — in the groundwater systems of many of the world's largest deltas.

What do you hope readers ultimately take away from your books?

I hope readers will travel along each river with me. It is a great adventure. As Mark Twain once said, "Each river has a new story to tell every day, and all you have to do is listen."

What projects are you currently working on?

I began studying the Great River Landscapes of North America after the Great Flood of 2008. I retired in 2014, having published only 12 articles in the series, most of them focused on the Mississippi and Ohio River landscapes.

After retirement, I decided to continue researching and writing about the remaining Great River Landscapes of North America and later expanded the project to include the Great River Landscapes of the World. As a U.S. Army Vietnam Era veteran, the first international river system I chose to study was the Mekong River and Delta. That research eventually led me to examine the impact of war on agricultural lands and freshwater systems. After that, I made the study of international river landscapes affected by past and current wars and conflicts a priority. In total, I published 82 additional papers on Great River Landscapes of the World.

As I was completing the series in 2025, I realized that many potential readers do not regularly read refereed scientific journals such as the Open Journal of Soil Science. As a result, I decided to write an additional 10 books in 2025 and 2026 in order to share my findings and experiences with a broader audience.

I am currently planning national and international book tours and have submitted several books for review to the journal Pollution and Diseases. I am also working with three Vietnam War archives in Hanoi, Ho Chi Minh City, and Lubbock, Texas, to archive my 28 papers on the environmental and human health impacts of wars and conflicts.

In addition, the McCracken Library in Paducah, Kentucky is archiving all 94 of my Great River Landscapes articles in vertical files. My 11 books will be donated to libraries in Illinois, Kentucky, and the Czech Republic for exhibitions and long-term collection storage.

I have also been invited to present my books and selected chapters at a number of national and international conferences, including events in Italy, Vietnam, and the Czech Republic.

My goal is to complete my Great River Landscapes of the World mission by my 80th birthday on July 16, 2027. However, my collaborators, friends, family, and my wife Pam do not believe that will happen, since I am still enjoying these Great River Landscapes adventures far too much — and now I have the opportunity to share them with my readers.

Not long ago, you received an invitation to cooperate with the new journal "Pollution and Diseases," which you accepted. Was this invitation unexpected, and why did you decide to collaborate with a recently established journal?

I was surprised by the invitation to cooperate with the new journal, "Pollution and Diseases". It was not obvious to me why I was receiving the invitation to become involved on the editorial board, as an associate editor, and as co-chair of the Warfare, Soils and Freshwater conference. I assumed, through AI data mining, that my journal articles and books might have been identified as a potential source of new information on freshwater and soils (Great River Landscapes of the World) and warfare (warfare-soils) and fit themes of the new journal.

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The Editorial Board of the journal "Pollution and Diseases" wishes you continued scientific success, new discoveries, and inspiration in your work.

Conflict of Interest

The authors declare no conflict of interest.

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Data Availability Statement

No new data were created or analyzed in this study.

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