

Addressing the Biological Weapons, Public Health and Environmental Threats in the Aral Sea Region of Central Asia

Reynolds M. Salerno
Center for International Security
Sandia National Laboratories
February 16, 2001

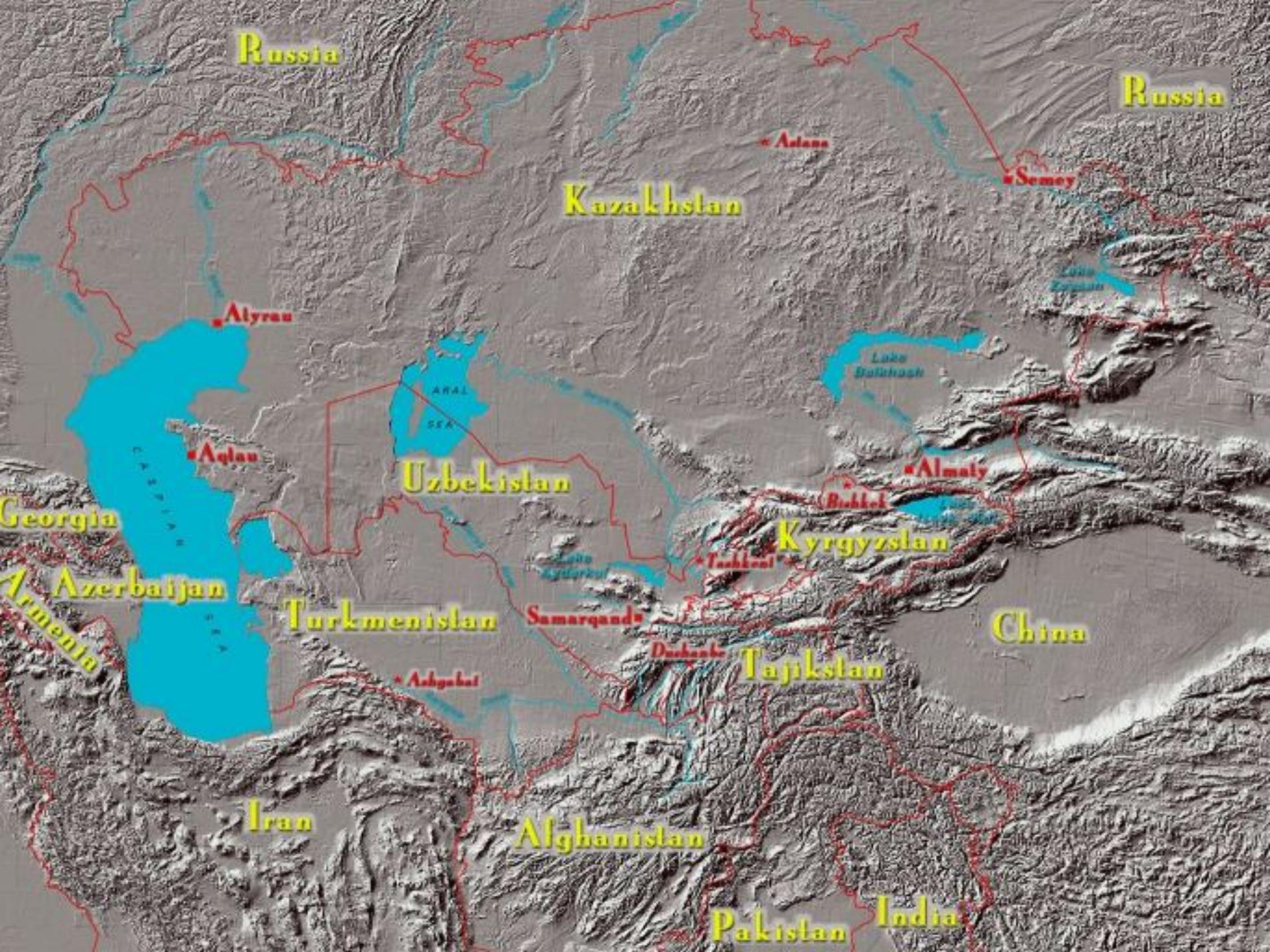
SAND 2001-0501P

*Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company
for the United States Department of Energy under contract DC-AC04-94AL85000*



Aral Sea Straddles Kazakhstan and Uzbekistan





Russia

Russia

Kazakhstan

Astana

Semey

Alytau

Uzbekistan

ARAL SEA

Lake Balkhash

Aqlan

Georgia

Kyrgyzstan

Almaty

Bishkek

Azerbaijan

Turkmenistan

Tashkent

Samarkand

China

Armenia

Tajikistan

Dushanbe

Iran

Afghanistan

Pakistan

India

Ashgabat

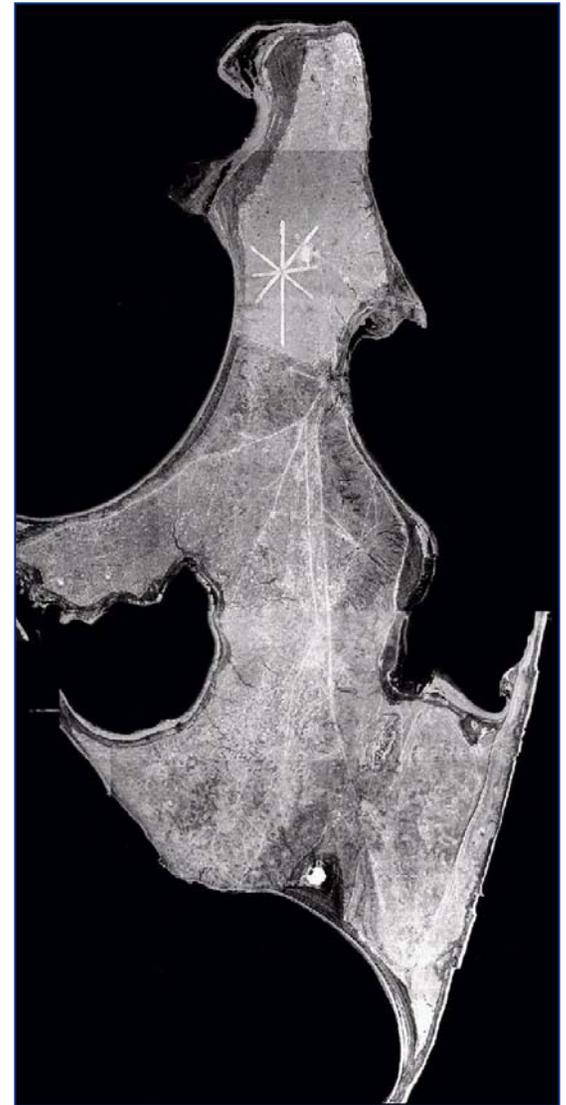
- **Aral Sea region and Renaissance/Rebirth Island attractive to Soviet biowarfare system because:**

- **2300 miles south of Moscow**
- **Geographically isolated & sparsely populated**
- **Thin vegetation & sandy soil**
- **Arid climate & high summer temperatures**



Aerial photo of the Aral Sea (1985)

- According to press and open sources, Voz Island was a biological weapons testing ground
 - Used temporarily in 1936; became permanent facility in 1952; operations ended in 1992
 - Housing in the north; test site in the south; prevailing winds blow from north to south
 - Teams spent months there at a time to study the effectiveness of recently developed biological weapons
 - Suspected that many different agents tested: anthrax, tularemia, brucellosis, plague, typhus, Q fever, botulinum toxin and Venezuelan equine encephalitis
 - Trials suspected to have been conducted on a wide variety of animals



Satellite image of Voz Island (1970)

- **Intentional acquisition of pathogenic material from island**
 - Suspected that, before discontinuing their operations, Soviets buried bleach-soaked anthrax and plague on the island
 - According to press and open sources, small amounts of anthrax, an extremely robust organism, may still be viable deep beneath the soil's surface
- **Natural spread of pathogens that were tested on the island**
 - According to press and open sources, it is possible that rodents, birds and other wildlife have become infected with anthrax or plague
 - If true, infected animals could soon spread the bacteria to the mainland, placing humans at risk



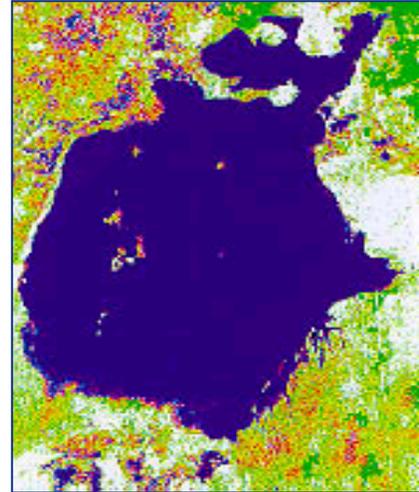
Aral Sea no longer provides natural security for Voz Island



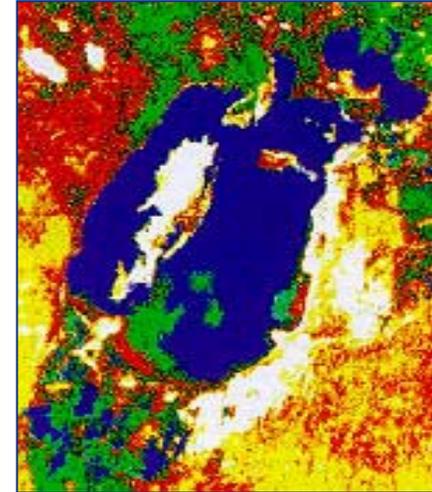
Animals and insects are potential disease hosts and vectors

Aral Sea as an Ecological Disaster

- To build a Central Asian cotton bowl, Soviet state planners ordered the diversion of the Aral's river sources into concrete irrigation canals
- Once the world's fourth-largest inland body of water, it has been shrinking since the 1960s
 - Receded 70 miles in 40 years
 - Inflows 10% of 1960 inflows
 - Sea level dropped 13 m
 - Surface area decreased by 50%
 - Volume decreased by 60%
 - Salinity increased by 300%
 - Groundwater tables declined by 200%
 - 85% of the wetlands gone
 - Severe losses in biodiversity
- Island has expanded from 200km² in 1960 to 2000km²; land bridge predicted by 2010



1977



1995



November 1999

Aral Sea as a Public Health Calamity

- Clouds of toxic dust, salts and agricultural chemicals billow across the region every year
- Rivers silted over and drinking water contaminated with high concentrations of pesticides, herbicides, fertilizers and biological contaminants
- Increasing rates of incidence of
 - Esophageal cancers (15 times higher than FSU average)
 - Typhoid, paratyphoid, viral hepatitis, dysentery; kidney, liver and immunological diseases
 - Tuberculosis (250 cases per 100,000 - highest rate in Europe and FSU)
 - Infant mortality (10 times higher than U.S., 4 times higher than FSU average)
 - Birth defects; nervous system and mental disorders; shortened life spans
- Public health: “the worst of all developing countries” (Elhance 1997)



- **Herbicides, pesticides, and salts in exposed sea bed poisoned farmlands over hundreds of thousands of square kilometers**
- **Once thriving fishing industry has virtually disappeared**
 - **48,000 tons/year fishing industry employing 60,000 dropped to zero**
- **Annual economic damage estimated at \$500-600 million for agriculture and \$60-90 million for fisheries**
- **270,000 refugees in first half of 1990s**



Agricultural opportunities crippled by environmental conditions



Former coastal fishing village and marooned fishing vessels in Kyzylorda Oblast, Kazakhstan



- Is there any connection between the region's widespread health problems and the island?
- Has any non-endemic infectious material spread beyond the island? What animals are infected? What human populations are at risk?
- What role does the environment play in influencing disease spread in this region?
- Are there systems that can rapidly identify disease outbreaks, allowing for containment in a timely fashion?
- Can environmental data help predict natural outbreaks of endemic disease?
- Is it necessary to decontaminate the island? Can that be accomplished without further contaminating the island and the region?

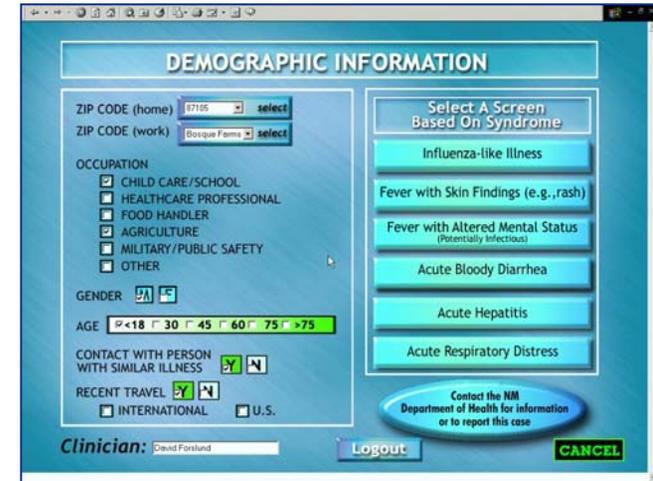


Boys drawing untreated water in Khiva



Amu Darya, 200 km above its mouth at the Aral Sea

- Need for Multidisciplinary Approach
- If necessary, address source and proliferation concern
 - Decontaminate biological agents without causing additional environmental damage
- Determine other sources of disease and disease spread
 - Monitor human health
 - Monitor animal health
 - Monitor the environment
 - Collect, integrate and analyze data
 - ◆ to establish background presence of infectious and zoonotic diseases
 - ◆ to determine if disease has spread beyond the island into the region
 - ◆ to ensure rapid identification and even predictions of novel disease outbreaks
 - ◆ to develop achievable and sustainable remediation strategies
 - ◆ to promote regional collaboration and regional solutions



The screenshot shows a web-based interface for a syndromic surveillance system. The main heading is "DEMOGRAPHIC INFORMATION". It includes several input fields: "ZIP CODE (home)" with a dropdown menu showing "97105" and a "select" button; "ZIP CODE (work)" with a dropdown menu showing "Borrego Farms" and a "select" button; "OCCUPATION" with a list of checkboxes including "CHILD CARE/SCHOOL", "HEALTHCARE PROFESSIONAL", "FOOD HANDLER", "AGRICULTURE", "MILITARY/PUBLIC SAFETY", and "OTHER"; "GENDER" with radio buttons for "M" and "F"; "AGE" with a range selector showing "18-30" selected; "CONTACT WITH PERSON WITH SIMILAR ILLNESS" with radio buttons for "Y" and "N"; and "RECENT TRAVEL" with radio buttons for "INTERNATIONAL" and "U.S.". On the right side, there is a section titled "Select A Screen Based On Syndrome" with buttons for "Influenza-like Illness", "Fever with Skin Findings (e.g., rash)", "Fever with Altered Mental Status (Potentially Infectious)", "Acute Bloody Diarrhea", "Acute Hepatitis", and "Acute Respiratory Distress". At the bottom right, there is a button that says "Contact the NM Department of Health for information or to report this case" and another "CANCEL" button. At the bottom left, there is a "Clinician:" field with the name "David Forslund" and a "Logout" button.

Syndromic Surveillance System



Environmental Monitoring Station



Decontamination Foam

- Ken Alibek, *Biohazard: The Chilling True Story of the Largest Covert Biological Program in the World - Told From Inside by the Man who Ran it*, New York: Random House, 1999.
- “Aral Sea Basin Program Water and Environmental Management Project,” World Bank Project Report, TMGE8326, New York, 1997, <http://www.worldbank.org/>.
- Gulbarshyn Bozheyeva, Yerlan Kunakbayev and Dastan Yeleukenov, “Former Soviet Biological Weapons Facilities in Kazakhstan: Past, Present, and Future,” Center for Nonproliferation Studies, Occasional Paper #1, June 1999, <http://cns.miis.edu/pubs/opapers/op1/op1.htm>.
- CNN.com, “Anthrax ‘time bomb’ ticking in Aral Sea, researchers say,” June, 22, 1999, <http://www.cnn.com/WORLD/asiapcf/9906/21/anthrax.island/>.
- Arun P. Elhance, “Conflict and cooperation over water in the Aral Sea basin,” *Studies in Conflict and Terrorism*, vol. 20, 1997.
- Federation of American Scientists, “Vozrozhdeniye Island - Renaissance/Rebirth Island,” <http://www.fas.org/nuke/guide/russia/facility/cbw/vozrozhdenly.htm>.
- N.F. Glazovskiy, “Ideas on an escape from the ‘Aral Crisis’,” *Soviet Geography*, February 1991.
- Dana Lewis, NBC News, “Legacy of Soviet germ war lives on: An exclusive look at the now-abandoned island where Soviet scientists tested deadly germs,” October 20, 2000, <http://www.fas.org/nuke/guide/russia/facility/cbw/314844.htm>.
- P. Micklin, “Desiccation of the Aral Sea: A Water Management Disaster in the Soviet Union,” *Science*, vol. 241, 1988.
- Judith Miller, “Poison Island: a special report; At Bleak Asian Site, Killer Germs Survive,” *New York Times*, June 2, 1999.
- Anthony Rimmington, “From Military to Industrial Complex? The Conversion of Biological Weapons Facilities in the Russian Federation,” *Contemporary Security Policy*, April 1996.
- “The State of the World’s Refugees: A Humanitarian Agenda,” UNHCR Report, Geneva, 1997, <http://www.unhcr.ch/>.