



OFFICE OF PUBLIC HEALTH AND ENVIRONMENTAL HAZARDS

Agent Orange: Herbicide Tests and Storage in the U.S.

Agent Orange and other herbicides used in Vietnam were tested or stored elsewhere, including many military bases in the United States. Below is information from the Department of Defense (DoD) on projects to test, dispose of, or store herbicides **in the U.S.** For projects outside the U.S., go to [Herbicide Tests and Storage Outside the U.S.](#)

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Arizona

Location: Pinal Mountains near Globe, AZ

Dates: 1965, 1966, 1968, and 1969

Project Description: In 1965, the USFS began a land improvement program in the Pinal Mountains. The program called for spraying an area of chaparral with herbicides to accomplish the objectives of multiple land use.

Agents: 2,4-D isooctyl-ester, 2,4,5-t isooctyl-ester, silvex, propyleneglycolbutylether ester, 2,4,5-T butyl ester, 2,4,5-T 2-e-h e

DoD Involvement: No

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Arkansas

Location: Fort Chaffee, AR

Dates: 5/16/1967 - 5/18/1967, 7/22/1967 - 7/23/1967, 8/23/1967 - 8/24/1967

Project Description: During the period of 12/1966 - 10/1967, a comprehensive short-term evaluation was conducted by personnel from Fort Derrick's Plant Science Lab in coordination with contract research on formulations by chemical industry and field tests by USDA and U of HI.

Agents: Basic, in-house, improved desiccants and Orange, Blue

DoD Involvement: Yes

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California

Location: Brawley, CA

Dates: 1950-51

Project Description: The purpose was to determine means of accomplishing defoliation of tropical forest vegetation by application of a chemical agent. Here, irrigation water studies were done with the agent. H.F. Arle worked here.

Agents: 2,4-D

DoD Involvement: Undetermined

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Florida

Location: Orlando, FL; Cocoa, FL

Dates: 1944

Project Description: Tests were conducted in 1944 by the Army in Orlando and Cocoa areas of Florida to determine the value of ammonium thiocyanate and chloride as marking and defoliation agents. They were conducted initially at ground level and later from aircraft.

Agents: Ammonium thiocyanate and zinc chloride

DoD Involvement: Yes

Location: Near Lake George, FL

Dates: Spring 1944

Project Description: The purpose was to determine means of accomplishing defoliation of tropical forest vegetation by application of a chemical agent. Spraying here.

Agents: Zinc chloride

DoD Involvement: Yes

Location: Orlando, FL at Army Grove Air Force's Tactical Center

Dates: 3/14/1944, 4/12/1944

Project Description: The purpose was to determine means of accomplishing defoliation of tropical forest vegetation by application of a chemical agent.

Agents: Ammonium thiocyanate, zinc chloride, sodium nitrate, sodium arsenate, sodium fluoride

DoD Involvement: Yes

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Location: Marathon, FL
Dates: 3/21/1944 - 3/23/1944

Project Description: The purpose was to determine means of accomplishing defoliation of tropical forest vegetation by application of a chemical agent. Spraying was done here.

Agents: Zinc chloride, ammonium sulphamate, ammonium thiocyanate

DoD Involvement: Yes

Location: Bushnell Army Air Field, FL

Dates: 2/1945

Project Description: Small plot experiments were commenced to test the effectiveness of LN agents. Various trials were done under contract with the USDA, aided by personnel at Camp Detrick. Here, it was aerial spray experiments on potted plants.

Agents: LN *phenoxy

DoD Involvement: Yes

Location: Bushnell Army Air Field, FL

Dates: 2/1945 - 4/1945

Project Description: Trials, performed by C.W.S. personnel from Camp Detrick, MD, tested the practicability of severely injuring or destroying crop plants sprayed from smoke tanks mounted on tactical aircraft.

Agents: 2,4-D and its ammonium salt

DoD Involvement: Yes

Location: Avon Air Force Base, FL

Dates: 2/1951 - 4/1951

Project Description: Trials were conducted at Avon Air Force Base, FL by Chemical Corps with personnel of the Air Force and Navy to determine the practical effectiveness of spraying pure anticrop agents from at low volume from aircraft. C-47 and Navy XBT2D-1 aircraft with various nozzles were used.

Agents: Butyl 2,4 D

DoD Involvement: Yes

Location: Englin Air Force Base, FL

Dates: 11/1952 - 12/1952

Project Description: Two trials: Chemical Corps- concerned with basic fundamental work, using 2,4-D, Air Force-concerned with evaluating prototype large capacity spray system for aircraft installation using 2,4,5-T, primarily. Used 3 atomizing nozzles: Bete Fog Nozzles, Whirljet Spray Nozzles, and Fogjet 1.5F50.

Agents: 2,4-D, 2,4,5-T: 143 and 974, respectively

DoD Involvement: Yes

Location: Avon Park Air Force Base, FL

Dates: Spring 1954

Project Description: Series of tests were conducted at Avon Park AFB during the spring of 1954 to study the behavior of chemical anticrop aerial sprays when released from high-speed jet aircraft. The Navy F3D jet fighter was used with Aero 14A Airborne Spray Tanks to disperse the anticrop agents.

Agents: Butyl 2,4-D, butyl 2,4,5-T, Isopropyl 2,4-D

DoD Involvement: Yes

Location: Jacksonville, FL

Dates: 7/18/1962 - 7/21/1962

Project Description: The HIDAL was used successfully on an H-34 helicopter to spray herbicidal materials. Therefore, it had not been calibrated previously. Spray tests were performed to do so. This was done under order by OSD/ARPA.

Agents: Purple, Fuel Oil, Mix

DoD Involvement: Yes

Location: Eglin AFB, FL, C-52A test area

Dates: 1962-70

Project Description: CPT John Hunter discussed vegetation changes and ecological studies of the 2 square mile test area which had been sprayed with herbicides over the period 1962-70.

Agents: Orange (1962-68), Purple (1962-68), White (1967-70), Blue (1968-70)

DoD Involvement: Yes

Location: Apalachicola National Forest near Sophoppy, FL

Dates: 5/3/1967 - 5/8/1967

Project Description: During the period of 12/1966 - 10/1967, a comprehensive short-term evaluation was conducted by personnel from Fort Detrick's Plant Science Lab in coordination with contract research on formulations by chemical industry and field tests by USDA and U of HI.

Agents: Basic desiccants and Orange/Blue

DoD Involvement: Yes

Location: Eglin AFB, FL

Dates: 6/11/1968-9/12/1968

Project Description: A spread factor study was performed by the Army to correlate the spherical drop sizes of both Orange and Stull Bifluid defoliant. It involved development of new techniques to determine spread factors over an extended range of drop sizes. A spinning cup drop generator was used.

Agents: Orange, Bifluid #1, Bifluid#2, Stull Bifluid

DoD Involvement: Yes

Location: 2 areas in FL, 2 areas in GA, and 1 in TN

Dates: 1968

Project Description: In 1968, emphasis was given to soil applied herbicides for grass control. Applications were made by a jeep-mounted sprayer on small plots or by helicopter on larger plots.

Agents: Bromacil, Tandex, monuron, diuron, and fenuron

DoD Involvement: Undetermined

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Georgia

Location: Georgia and Tennessee

Dates: 1964

Project Description: In 1964, helicopter spray tests were conducted on transmission line rights-of-way by the Georgia Power Company and Tennessee Valley Authority in collaboration with Fort Detrick to evaluate effectiveness of several commercially available herbicides.

Agents: Diquat and Tordon 101, various

DoD Involvement: Yes

Location: Fort Gordon, GA

Dates: 7/15/1967 - 7/17/1967

Project Description: During the period of 12/1966 - 10/1967, a comprehensive short-term evaluation was conducted by personnel from Fort Detrick's Plant Science Lab in coordination with contract research on formulations by chemical industry and field tests by USDA and U of HI.

Agents: In-house desiccants mixtures and formulations, Orange and Blue

DoD Involvement: Yes

Location: 2 areas in GA, 2 areas in FL, and 1 in TN

Dates: 1968

Project Description: In 1968, emphasis was given to soil applied herbicides for grass control. Applications were made by a jeep-mounted sprayer on small plots or by helicopter on larger plots.

Agents: Bromacil, Tandex, monuron, diuron, and fenuron

DoD Involvement: Undetermined

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Hawaii

Location: Hilo, HI

Dates: 12/1966

Project Description: Field tests of defoliant were designed to evaluate such variables as rates, volume of application, season, and vegetation. Data from aerial application tests at several CONUS and OCONUS locations are provided in tables. There were Fort Detrick personnel there.

Agents: Orange

DoD Involvement: Yes

Location: State Forest area, 3500 ft.elevation on slope of Mauna Loa, near Hilo, HI

Dates: 12/2/1966, 12/4/1966, 1/12/1967

Project Description: The purpose of this project was to evaluate iso-octyl ester of picloram (TORDON) in mixtures with ORANGE, as a candidate defoliant agent, using ORANGE as standard. There were personnel from Fort Detrick there.

Agents: Orange, M-3140, TORDON ester, 2,4-D ester, 2,4,5-T ester

DoD Involvement: Undetermined

Location: Kauai, HI

Dates: 1967

Project Description: Field tests of defoliant were designed to evaluate such variables as rates, volume of application, season, and vegetation. Data from aerial application tests at several CONUS and OCONUS locations are provided in tables.

Agents: Orange

DoD Involvement: Yes

Location: Kauai Branch Station near Kapaa, Kawai, HI

Dates: 6/1967, 10/1967, 12/1967, 2/1968

Project Description: During the period of 12/1966 - 10/1967, a comprehensive short-term evaluation was conducted by personnel from Fort Detrick's Plant Science Lab in coordination with contract research on formulations by chemical industry and field tests by USDA and U of HI.

Agents: Blue, diquat, paraquat, Orange, PCP, Picloram, White, HCA, 2,4,5T, Endothall

DoD Involvement: Yes

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Indiana

Location: Vigo Plant CWS, Terre Haute, IN

Dates: 5/1945 - 9/1945

Project Description: Small plot experiments were commenced to test the effectiveness of LN agents. Various trials were done under contract with the USDA, aided by personnel at Camp Detrick. Here, it was aerial trials spraying field grown plants.

Agents: LN *phenoxy

DoD Involvement: Yes

Location: Jefferson Proving Grounds, Madison, IN

Dates: Summer 1945

Project Description: Small plot experiments were commenced to test the effectiveness of LN agents. Various trials were done under contract with the USDA, aided by personnel at Camp Detrick. Here, it was dropping trials.

Agents: LN *phenoxy

DoD Involvement: Yes

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Kansas

Location: Hays, KS; Langdon, ND

Dates: 1960

Project Description: Two studies on the stem rust of wheat were conducted during 1960 to obtain data on the establishment, development, and destructiveness of artificially induced stem rust epiphytotics.

Agents: Stem rust of wheat

DoD Involvement: Undetermined

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Kentucky

Location: Fort Knox, KY

Dates: 1945

Project Description: In 1945, a special project known as Sphinx was conducted jointly by CWS and the ARML to investigate the use of chemical agents for increasing the flammability of vegetation prior to flame attack.

Agents: Various

DoD Involvement: Yes

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Maryland

Location: Camp Detrick, MD - Fields A, B, and C

Dates: 1946-47

Project Description: The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays or to the soil in the solid form to be taken up by the roots.

Agents: 2,4,5-T, 2,4,5-T triethanolamine, tributylphosphate, ethyl 2,4-D, butyl 2,4,5-Triet 2,4-D

DoD Involvement: Yes

Location: Camp Detrick, MD - Fields C, D, and E

Dates: 1948

Project Description: The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays or to the soil in the solid form to be taken up by the roots.

Agents: 2,4,5-T, isopropyl phenol carbamate, LN-2426, 2,4-D

DoD Involvement: Yes

Location: Camp Detrick, MD - Fields C, D, and E

Dates: 1949

Project Description: The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays or to the soil in the solid form to be taken up by the roots.

Experiments were done by Ennis, DeRose, Newman, Williamson, DeRigo, and Thomas.

Agents: Triethelyne. 2,4,5-T, carbamates

DoD Involvement: Yes

Location: Camp Detrick, MD - Fields A, B, D, and E

Dates: 1950

Project Description: The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays or to the soil in the solid form to be taken up by the roots.

Experiments were done by Ennis, DeRose, Acker, Newman, Williamson, and Zimmerly.

Agents: 2464, butyl 2,4-D, 974, butyl 2,4,5-T, q:q 143 and 974

DoD Involvement: Yes

Location: Camp Detrick, MD - Field F

Dates: 1950-51

Project Description: The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays or to the soil in the solid form to be taken up by the roots.

Experiments were done by Acker, DeRose, McLane, Newman, Williamson, Baker, Dean, Johnson, Taylor, Walker, and Zimmerly.

Agents: 2464, carbamate, butyl 2,4-D, 143 and 974 (orange?), 2,4,5-T, 2,4-D, Orange

DoD Involvement: Yes

Location: Area B, Camp Detrick, MD

Dates: Spring/Summer 1953

Project Description: Personnel at Camp Detrick tested the feasibility of using an experimental spray tower for applying a mixture of chemical anticrop agents to broad-leaf crops.

Agents: 3:1 mixture 2, 4-D and 2, 4, 5-T

DoD Involvement: Yes

Location: Fort Detrick, MD; Fort Ritchie, MD

Dates: 1956-57

Project Description: In 1956 And 1957, defoliation and desiccation were carried out at Fort Detrick and Fort Ritchie, Maryland by the Chemical Corps and Biological Warfare Research. These were bench tests.

Agents: Various, 577 compounds

DoD Involvement: Yes

Location: Fort Detrick, MD

Dates: 8/1961 - 6/1963

Project Description: From 8/1961 to 6/1963, compounds were spray-tested in the greenhouse to evaluate them as effective defoliant, desiccants, and herbicides.

Agents: 1410 compounds

DoD Involvement: Yes

Location: Fort Ritchie, MD

Dates: 1963

Project Description: Various studies were done to explore the effectiveness of different herbicides. They were all field trials. These studies were done by personnel from the US Army Biological Laboratories.

Agents: Tordon, 2,4-D, Orange, diquat, endothal, and combinations of each with Tordon

DoD Involvement: Yes

Location: Fort Meade, MD

Dates: 1963

Project Description: Various studies were done to explore the effectiveness of different herbicides. They were all field trials. These studies were done by personnel from the US Army Biological Laboratories.

Agents: Cacodylic acid, Dowco 173, butyediol

DoD Involvement: Yes

Location: Poole's Island, Aberdeen Proving Ground, MD

Dates: 7/14/1969 -

Project Description: During the week of 7/14/1969, personnel from Naval Applied Science Laboratory in conjunction with personnel from Limited War Laboratory conducted a defoliation test along the shoreline.

Agents: Orange, Orange plus foam, Orange plus foam Orange, Foam

DoD Involvement: Yes

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Mississippi

Location: Near Wayside, MS, Wilcox Road, Greenville, MS

Dates: 9/19/1967

Project Description: In 1967, the Dow Chemical Company was awarded a DoD research contract. The objective was to prepare as pellets mixtures of various herbicides and to test them on varying vegetation situations for the control of a range of plant species.

Agents: Picloram, bromacil, pyriclor, and terbacil, Orange, cacodylic acid

DoD Involvement: Undetermined

Location: Fulcher Ranch, Greenville, MS

Dates: 4/15/1968

Project Description: In 1967, the Dow Chemical Company was awarded a DoD research contract. The objective was to prepare as pellets mixtures of various herbicides and to test them on varying vegetation situations for the control of a range of plant species.

Agents: Picloram and bromicil

DoD Involvement: Undetermined

Location: Gulfport, MS

Dates: 1968-70

Project Description: While discussing the mandatory disposal of Orange, it was mentioned that 15,161 drums were being stored at Gulfport, Mississippi.

Agents: Orange

DoD Involvement: Yes

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Montana

Location: Galatin Valley near Bozeman, MT

Dates: 7/3/1953, 7/6/1953, 7/14/1953

Project Description: A preliminary series of field evaluations of chemical agents for attacking wheat using a miniature spraying system mounted on light aircraft were performed by USDA.

Agents: 4- fluorophenoxy-acetic acid and 2 of its esters, 3:1 butyl 2,4-D and butyl 2,4,5-T

DoD Involvement: No

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New York

Location: Fort Drum, NY

Dates: 1959

Project Description: The Commanding General, 1st US Army, requested that Fort Detrick assist with defoliation efforts at Fort Drum. Thirteen drums were sprayed there on 4 square miles from a helicopter spray device.

Agents: Orange

DoD Involvement: Yes

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North Dakota

Location: Langdon, ND; Hays, KS

Dates: 1960

Project Description: Two studies on the stem rust of wheat were conducted during 1960 to obtain data on the establishment, development, and destructiveness of artificially induced stem rust epiphytotics.

Agents: Stem rust of wheat

DoD Involvement: Undetermined

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Pennsylvania

Location: Stone Valley Experimental Forest in Huntington County and near State College in Centre County, PA

Dates: 3/1969 - 10/1970

Project Description: Soil- applied herbicides were studied by the U of Pa with Ft Detrick for 18 months for their effectiveness, rapidity of action, and duration of response in native stands of central PA grasses, broadleaf weeds and woody plants. These herbicides were spread or sprayed.

Agents: Bromacil, diuron, tandex, fenuron, picloram

DoD Involvement: Undetermined

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Rhode Island

Location: Kingston, RI

Dates: 7/26/1949, 1950-51

Project Description: The experiments were directed mainly towards the investigation of plant inhibitors applied as sprays or to the soil in the solid form to be taken up by the roots.

Experiments were carried out under supervision of T.E. Odland if RI State College. H.T. DeRigo was also there.

Agents: Trieth.2,4,5-T, butyl 2,4,5-T,974

DoD Involvement: Yes

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Tennessee

Location: Tennessee and Georgia

Dates: 1964

Project Description: In 1964, helicopter spray tests were conducted on transmission line rights-of-way by the Georgia Power Company and Tennessee Valley Authority in collaboration with Fort Detrick to evaluate effectiveness of several commercially available herbicides.

Agents: Diquat and Tordon 101, various

DoD Involvement: Yes

Location: 1 in TN, 2 areas in FL, 2 areas in GA

Dates: 1968

Project Description: In 1968, emphasis was given to soil applied herbicides for grass control. Applications were made by a jeep-mounted sprayer on small plots or by helicopter on larger plots.

Agents: Bromacil, Tandex, monuron, diuron, and fenuron

DoD Involvement: Undetermined

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Texas

Location: Beaumont, TX

Dates: 6/1944

Project Description: Small plot experiments were commenced to test the effectiveness of LN agents. Various trials were done under contract with the USDA, aided by personnel at Camp Detrick. Here, they were testing on rice crops.

Agents: LN *phenoxy

DoD Involvement: No

Location: Beaumont, TX

Dates: 1950-51

Project Description: The purpose was to determine means of accomplishing defoliation of tropical forest vegetation by application of a chemical agent. Here, irrigation water studies were

done with the agent. Coghill, Hasse, and Yeatner worked here.

Agents: 2,4-D

DoD Involvement: Undetermined

Location: Weslaco, TX

Dates: 5/1967 - 1/1969

Project Description: 71 new arsenic compounds were tested in primary screening against 6 plant species in greenhouse tests. Then, 5 of the most active compounds were tested in field trials against Red Maple and compared to formulations of cacodylic acid and a 50:50 blend of orange and sodium cacodylate. The Ansul Co. for DoD.

Agents: Arsenic compounds, Orange, cacodylic acid, sodium cacodylate

DoD Involvement: Yes

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Utah

Location: Granite Peak, UT

Dates: Summer 1945

Project Description: Small plot experiments were commenced to test the effectiveness of LN agents. Various trials were done under contract with the USDA, aided by personnel at Camp Detrick. Here, it was dropping trials.

Agents: LN *phenoxy

DoD Involvement: Yes

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Washington

Location: Prosser, WA

Dates: 1950-51

Project Description: The purpose was to determine means of accomplishing defoliation of tropical forest vegetation by application of a chemical agent. Here, irrigation water studies were done with the agent. V.F. Burns worked here.

Agents: 2,4-D

DoD Involvement: Undetermined

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Wisconsin

Location: Marinette, WI

Dates: 5/1967 - 1/1969

Project Description: 71 new arsenic compounds were tested in primary screening against 6 plant species in greenhouse tests. Then, 5 of the most active compounds were tested in field trials against Red Maple and compared to formulations of cacodylic acid and a 50:50 blend of orange and sodium cacodylate. The Ansul Co. for DoD.

Agents: Arsenic compounds, Orange, cacodylic acid, sodium cacodylate

DoD Involvement: Yes

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