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# 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.](#)

[Alaska](#) | [Arizona](#) | [California](#) | [Florida](#) | [Georgia](#) | [Hawaii](#) | [Indiana](#) | [Kansas](#) | [Kentucky](#) | [Maryland](#) | [Mississippi](#) | [Montana](#) | [New York](#) | [North Dakota](#) | [Pennsylvania](#) | [Rhode Island](#) | [Tennessee](#) | [Texas](#) | [Utah](#) | [Washington](#) | [Wisconsin](#)

## Alaska

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**Location:** Fort Chaffee, AK

**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

## Arizona

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**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

## California

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**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

## Florida

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**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

**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

## Georgia

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**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

## Hawaii

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**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

## Indiana

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**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

## Kansas

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**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

## Kentucky

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**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

## Maryland

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**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 defoliants, 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, endotal, 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

## Mississippi

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**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

## Montana

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**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

## New York

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**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

## North Dakota

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**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

## Pennsylvania

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**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

## Rhode Island

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**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

## Tennessee

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**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

## Texas

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**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

## Utah

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**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

## Washington

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**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

## Wisconsin

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**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

## *What If I Was Exposed to an Herbicide Outside Vietnam?*

Herbicides were used by the U.S. military to defoliate military facilities in the U.S. and in other countries as far back as the 1950s. This document contains information from the Department of Defense (DoD) on projects to test, dispose of, or store herbicides in the U.S. Even if you did not serve in Vietnam, you can still apply for service-connected benefits if you were exposed to an herbicide while in the military which you believe caused your disease or injury. If you have a disease which is on the list of diseases which VA recognizes as being associated with Agent Orange, the VA requires:

1. a medical diagnosis of a disease which VA recognizes as being associated with Agent Orange (listed below),
2. competent evidence of exposure to a chemical contained in one of the herbicides used in Vietnam (2,4-D; 2,4,5-T and its contaminant TCDD; cacodylic acid; or picloram), and
3. competent medical evidence that the disease began within the deadline for that disease (if any).

If you have a disease which is not on the list of diseases which VA recognizes as being associated with Agent Orange, VA requires:

1. competent medical evidence of a current disability;
2. competent evidence of exposure to an herbicide during military service; and