



Uploaded to the VFC Website

▶▶▶ 2016 ◀◀◀

This Document has been provided to you courtesy of Veterans-For-Change!

Feel free to pass to any veteran who might be able to use this information!

For thousands more files like this and hundreds of links to useful information, and hundreds of "Frequently Asked Questions, please go to:

[Veterans-For-Change](#)

If Veterans don't help Veterans, who will?

Note:

VFC is not liable for source information in this document, it is merely provided as a courtesy to our members & subscribers.



Agent Orange Investigative Report Series, No. 8

Contract: VA-101-12-C-0006



195941

INVESTIGATIONS INTO SITES WHERE AGENT ORANGE EXPOSURE TO VIETNAM-ERA VETERANS HAS BEEN ALLEGED

Compensation Service

Department of Veterans Affairs

810 Vermont Ave., NW

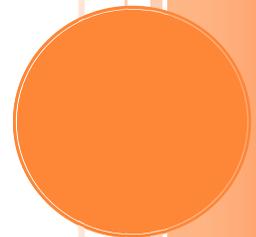
Washington, DC 20420

A. L. Young Consulting, Inc.

Alvin L. Young, PhD

Kristian L. Young, MA

May 2013





A. L. Young Consulting, Inc.

1810 Tranquility Road
Cheyenne, WY 82009-2903
307-638-6279
youngrisk@aol.com

June 3, 2013
Mr. Michael D. Pharr
Contract Officer's Representative
Compensation Service
Department of Veterans Affairs
810 Vermont Ave., NW
Washington, DC 20420

Dear Mr. Pharr,

Please find attached to this letter the Final Report: **Investigations into the Sites Where Agent Orange Exposure to Vietnam-era Veterans Has Been Alleged.** This report is the eighth of many reports that will be prepared in fulfillment of Contract VA-101-12-C-0006, *Development of an Archival Directory of Agent Orange Documents*. The goal of developing this directory is to search and identify the thousands of documents, reports, and correspondence located within our National Archives and Records Administration and other document repositories that relate to the use of "Tactical Herbicides" including Agent Orange, *outside of Vietnam*.

In the case of this report on sites where Agent Orange exposure to Vietnam-era has been alleged, Compensation Service has published two lists attributed to the Department of Defense of locations within the United States and outside of the United States where exposure was alleged other than Vietnam or the Korean DMZ where exposure was presumed. Both of these lists have not been adequately screened or validated and contain many errors of dates, chemicals, locations and the governmental agencies or institutions responsible for conducting the tests or military operations, thus causing significant confusion among Vietnam-era veterans reviewing the lists.

The Department needs to carefully update the sites based on this report, and most importantly, describe the protocol or criteria used for determining if a location/site was actually a site where the tactical herbicides used in Vietnam were documented as used OUTSIDE of Vietnam, with one or more of the items listed in proposed criteria identified in the report. As noted throughout the assessment section, many locations identified as appropriate for meeting the criteria have been selected to be the subjects of future investigative reports.

Sincerely,

Alvin L. Young, PhD
Professor of Environmental Toxicology
Colonel, USAF (Retired)

INVESTIGATIONS INTO SITES WHERE AGENT ORANGE EXPOSURE TO VIETNAM-ERA VETERANS HAS BEEN ALLEGED

EXECUTIVE SUMMARY

During the past few years, a tremendous increase in the number of claims for diseases allegedly caused by Agent Orange exposure has occurred. Many of these claims were filed by veterans of the Vietnam-era, **who did not serve in Vietnam or in the area adjacent to the Korean Demilitarized Zone** (locations where exposure is presumed). Many of these claims are for locations or sites **OUTSIDE** of Vietnam or the Korean DMZ. The veterans' claims have been that they were exposed to Agent Orange or the other tactical herbicides (e.g., Agent White and Agent Blue) while performing military duty in various locations. Indeed, it is now common to see stories in the media of non-Vietnam veterans describing their encounter with Agent Orange during the time period of the Vietnam War and having of one or more of the 15 recognized diseases allegedly associated with that exposure.

Two Appendices are attached to this Report. Appendix I is a list of Military Installations in the United States where veterans have alleged exposure to Agent Orange. Appendix II is a list provided by the Department of Veterans Affairs of locations both within the United States and outside of the United States other than Vietnam and the Korean DMZ where exposure was alleged. **Both of these lists have not been adequately validated and contain many errors of dates, chemicals, locations, and the governmental agencies or institutions responsible for conducting the tests or military operations.**

The purpose of this report is to provide an up-to-date documentation, i.e., providing a validated list of sites/locations, which in turn may assist the Veterans Benefit Administration in more appropriately responding to these claims. By examining the sites alleged to have been locations where Agent Orange was used, stored, or destroyed, a more accurate determination of where Vietnam-era veterans

may have been exposed will be available. Thus, each site must meet specific criteria for validating the presence of a tactical herbicide, e.g., Agent Orange.

To validate that a tactical herbicide, e.g., Agent Orange was shipped, used, stored, or buried at a site, and hence potential exposure could have occurred, one or more of the following criterion must be required:

1. Department of Defense form 173/2, Message Transmission of MILSTRIP (Military Standard Requisition and Issues Procedures) Transactions Form. The originator of this form was the Defense Logistic Agency and it was used in providing supply/logistics; all shipments of tactical herbicides to Southeast Asia and elsewhere were required to have DD form 173/2;
2. Department of Defense form 250/250a, Materiel Inspection and Receiving Report. This form identified the agency placing the order, name of the prime contractor, the manufacturer or warehouse shipped from, and the location shipped to. The form also identifies the stock and/or part number and description of the articles;
3. Department of the Army form 2496, Disposition Form. The form required a reference or office symbol, Subject box, and to, from, and date. The form was frequently used by the US Army for the Survey of Chemical Hazards, or for the identification and quantification of pesticides pending their disposal;
4. Any historical document(s) found in the National Archives, including correspondence, that describes the presence of Agent Orange or other tactical herbicide at a specific site;
5. Technical reports published by a government agency that describes the testing, evaluation, or disposal of a tactical herbicide at a specific location;
6. It must be a location/site where Vietnam-era military personnel were participants directly or indirectly in the activities involving Agent Orange or other tactical herbicide; and/or
7. A credible document maintained by the Vietnam-era veteran that can be authenticated.

An assessment of the sites identified in Appendix I and Appendix II suggested that the lists, descriptions, dates, locations and chemicals involved were not carefully screened before being posted on the Internet. Many of the locations and events occurred in the 1940s – 1950s. Two of the locations (North Dakota and Kansas) involved the testing of wheat stem rust. It was apparent that the 2006 Report prepared by the Department of Defense for the Department of Veterans Affairs was not reviewed or cited. The Department needs to carefully update the list of sites based on this report (and be supported by the 2006 Report) and most importantly, describe the protocol or criteria used for determining if a location/site was actually a site where the tactical herbicides used in Vietnam were documented as used OUTSIDE of Vietnam, with one or more of the items listed in the proposed

criteria. As noted throughout the assessment, many locations identified as appropriate to meeting the criteria have been selected to be the subject of future Investigative Reports.

In October 2012, Compensation Service, Veterans Benefits Administration contracted for 23 Investigative Reports, i.e., **The Agent Orange Investigation Report Series**. In addition to the Reports, a supporting project was initiated on “**Development of an Archival Directory of Agent Orange Documents.**” Thus, every Investigative Report must be supported by archival information. This removes any bias as to whether a site received tactical herbicides and whether the site was used for tests and evaluations, actual spraying programs, or for storage or disposal. Most importantly, the time frame of the involvement of the tactical herbicide(s) must be during or immediately after the Vietnam War, and there must be some evidence (other than an associated disease) that the veteran actually came into contact with a tactical herbicide, rather than a commercial herbicide.

INTRODUCTION

The Veterans Benefits Administration (VBA) within the Department of Veterans Affairs has the responsibility for handling claims related to Agent Orange and other tactical herbicides. During the past few years, a tremendous increase in the number of claims for diseases allegedly caused by Agent Orange exposure has occurred. Many of these claims were filed by veterans of the Vietnam-era, **who did not serve in Vietnam or in areas adjacent to the Korean Demilitarized Zone** (locations where exposure is presumed). Many of these claims are for locations or sites **OUTSIDE** of Vietnam or the Korean DMZ. The veterans claim that they were exposed to Agent Orange or the other tactical herbicides (e.g., Agent White and Agent Blue) while performing military duty in various locations. Indeed, it is now common to see stories in the media of non-Vietnam veterans describing their encounter with Agent Orange during the time period of the Vietnam War and having one or more of the 15 recognized diseases allegedly associated with that exposure. These veterans were stationed at US Military Installations in the United States, Canada, Guam, Panama, Okinawa, the Philippines or other world-wide locations, and may have been involved in the direct application of herbicides, or observed herbicides or other pesticides being sprayed near their work or living environments, thereby concluding that an exposure to Agent Orange had occurred.

A search of Internet sites, media articles, and locations provided by the Department of Defense are listed in Appendix I for United States Military Installations where veterans have alleged exposure to Agent Orange. Appendix II is the list on the Internet as provided by the Department of Veterans Affairs of locations both within the United States and outside of the United States other than Vietnam and the Korean DMZ where exposure was alleged. **Both of these lists have not been adequately validated and contain many errors of dates, chemicals, locations, and the governmental agencies or institutions responsible for conducting the tests or military operations.**

The purpose of this report is to provide an up-to-date documentation by providing a validated list of sites/locations, which in turn may assist the VBA in responding to these claims. By examining the sites alleged to have been locations where Agent Orange was used, stored, or destroyed, a more accurate determination of where Vietnam-era veterans may have been exposed will be available. Thus, each site must meet specific criteria for validating the presence of a tactical herbicide, e.g., Agent Orange. The site must be where a Vietnam-era veteran was stationed or involved in temporary duty (as evidenced by their DD 214 or other documentation of duty assignment), and there must be some evidence (other than an associated disease) that the veteran actually came into contact with a tactical herbicide, rather than a commercial herbicide. The alleged exposure must also fit a specific time frame. Note that the tactical herbicides, Agents Purple, Pink and Green were deployed in Vietnam, November 1961 – March 1965 in limited quantities, all stocks depleted in-country. The tactical herbicides Agent Blue and Agent White were deployed from December 1965 – January 1972, again all stocks depleted in-country. The time frame from first deployment of Agent Orange to the final destruction of the surplus herbicides was March 1965 – August 1977. However, after April 1970, all use and spraying of Agent Orange was terminated and any exposure would have necessitated involvement in the storage, transportation, or destruction of the surplus herbicide [1].

OVERVIEW OF THE REPORT

Site assessments require access to the vast amounts of historical and scientific information on Agent Orange that have been collected by government agencies and now reside in the National Archives, or in other archival sources (see Search

Strategy). It requires an understanding of the Agent Orange Act of 1991 and how that act has been implemented by the Veterans Benefit Administration; specifically in granting a presumption of exposure for veterans who served in Vietnam and adjacent to the Korean DMZ, *but not to Vietnam-era veterans who did not see service in Vietnam or Korea*. The site assessment requires understanding what constitutes exposure to Agent Orange, and the differences between tactical and commercial herbicides. Finally, in order to make a decision as to whether the alleged site meets the conditions where Agent Orange exposure is plausible, site criteria have been developed.

BACKGROUND

The Vietnam War officially ended almost forty years ago but the controversy over the use and legacy of the herbicide known as Herbicide Orange, aka “Agent Orange”, lingers today. A large body of historical records and other data exist on the use of Agent Orange for vegetation control in Vietnam. Many of these primary historical records are now openly available, and they permit a comprehensive assessment of how the herbicide was developed, where it was tested, how it was purchased, how it was transported to Vietnam and elsewhere, how it was used, and how the surplus was eventually disposed. The historical records also document the vast amount of research that has been conducted on the dioxin contaminant discovered in the herbicide in 1969, and that resulted in the termination of the use of Agent Orange in Vietnam in April 1970 [2].

In 1991, Congress enacted Public Law 102-4, the “**Agent Orange Act of 1991.**” The 1991 law stated that, to establish service connection for herbicide exposure, a veteran who served in the Republic of Vietnam from 9 January 1962 to 7 May 1975 shall be presumed to have been exposed to herbicides containing dioxin unless there is clear evidence establishing the veteran was not so exposed [3]. However, the presumption is not automatic. The veteran must complete the Agent Orange Registry health examination [3]. This comprehensive health examination includes an exposure and medical history, laboratory tests and a physical examination. A VA health professional will discuss the results face-to-face with each veteran and also in a follow-up letter. The intent of the Agent Orange Registry health examination is to alert veterans to possible long-term health problems that may be associated to Agent Orange exposure during their military

service. The veterans must recognize that the Registry health examination is NOT a disability compensation examination, and it will not confirm exposure to Agent Orange, but rather information is based on veteran's recollection of service, not on their military records. If the veteran is interested in disability compensation, the veteran must then file a claim for disability compensation for Agent Orange – associated health problems, as established by the Veterans Benefits Administration [3].

DOD REPORTED AGENT ORANGE SITES

On 20 November 2000, The Honorable Lane Evans, Ranking Democratic Member, Committee on Veterans' Affairs, US House of Representatives sent a letter to the Under Secretary for Benefits, Veterans Benefits Administration, regarding benefits for veterans who may have been exposed to Agent Orange while serving in Korea. In response, a letter was sent on 13 March 2001 from the Under Secretary for Benefits to Congressman Evans acknowledging his concern that the Department of Veterans Affairs' (VA) promulgate regulations that would create a presumption of herbicide exposure for veterans who served in units near the Korean Demilitarized Zone (DMZ) when tactical herbicides were used on the DMZ in 1968. VA deferred action on whether a presumption was warranted pending records investigation by the Department of Defense, and by its own Military and Veterans Health Coordinating Board [4]. Simultaneously, the VA requested assistance from the Department of Defense's Directorate for Deployment Health Support in obtaining historical records to determine the extent of Herbicide Orange spraying outside of Vietnam and Korea [5].

Correspondence continued between the Department of Defense and the Department of Veterans Affairs with Congressman Evans over the next three years [6, 7]. In a letter to Secretary Rumsfeld on 7 May 2003, Congressman Evans requested information on 31 sites where tactical herbicides were allegedly tested, used, or stored [6]. In a letter to Congressman Evans on 23 September 2003, the Principal Assistant Deputy Under Secretary of Defense (Installation and Environment) addressed the issue of Guam and provided a 10-page summary of information (28 locations) obtained from a search of the records at the US Army's Center for Unit Records Research (CURR) on the use of Vietnam-era herbicides in other locations, i.e., sites [7]. This list had previously been shared with the VA, and

had and has been widely circulated on the Internet. Unfortunately, the list is incomplete, i.e., not all of the individual sites are included in the list, nor are some of the sites appropriately described. CURR's responsibility is to assist the VA in validating or not validating individual Vietnam-era veteran claims of Herbicide Orange used at the time and place claimed, especially for Vietnam and units stationed on the Korean DMZ; thus their records may not be complete for all locations.

To address this lack of details in the sites identified in 2003, the Department of Veterans Affairs in early 2006 requested that the Department of Defense provide: *“an official compilation of locations and dates outside of Vietnam, where the Department used, stored or buried/destroyed Agent Orange.”* As noted, the intent of this request was to obtain information that would be important in evaluating the merits of many veterans' disability claims. However, the request did not address the issue of **exposure to Vietnam-era veterans**, but rather only where Agent Orange could be documented as present at that specific location and time period. In December 2006, the Department of Defense released a report on **“The History of the US Department of Defense Programs for the Testing, Evaluation, and Storage of Tactical Herbicides”** [1].

That report discusses the history of the development of the tactical herbicides, how they differed from commercial herbicides, and where they were tested, evaluated, stored, and used (as an example, the case of Korea in 1968) **OUTSIDE** of Vietnam. Additionally, the report discusses the final disposition of Agent Orange after Vietnam. The report contains 32 leaflets identifying different locations or multiple locations involved in same projects (e.g., Leaflet 19 identifies 5 locations in Texas), or the multiple use of a specific location (e.g., Eglin Air Force Base, Florida). A total of 40 distinctly different locations are identified. For each leaflet, a description of the activity is given, an assessment was made of the activity and the individuals involved in the project, if identified, and sources of the information are documented. The report does not attempt to document the use of tactical herbicides in Cambodia, Laos, or Thailand, although the testing of tactical herbicides at the Pranburi Calibration Grid in Thailand is described [1].

In 25 January 2011, the VA published “Final Regulations” to aid veterans exposed to Agent Orange in Korea to access quality health care and benefits. The regulation

published in the *Federal Register* established a presumption of herbicide exposure for any veteran who served between 1 April 1968 and 31 August 1971, in a unit determined by VA and Department of Defense to have operated in an area in or near the Korean DMZ in which tactical herbicides were applied.

WHAT CONSTITUTES EXPOSURE TO AGENT ORANGE?

The issue of “meaningful exposure” to Agent Orange or to other tactical herbicides is a subject of debate in the scientific literature. Generally, discussion of exposure to Agent Orange begins in media articles describing the scenarios of where and when veterans believed they were exposed to Agent Orange and/or its associated dioxin and the diseases they believed were the result of that exposure. Presumably, these locations were sites where Agent Orange was used, tested, stored, or destroyed during or after the Vietnam War. Traditionally, Environmental Health Scientists use a conceptual model to assess if a meaningful exposure could have occurred and if their overall health could be affected:

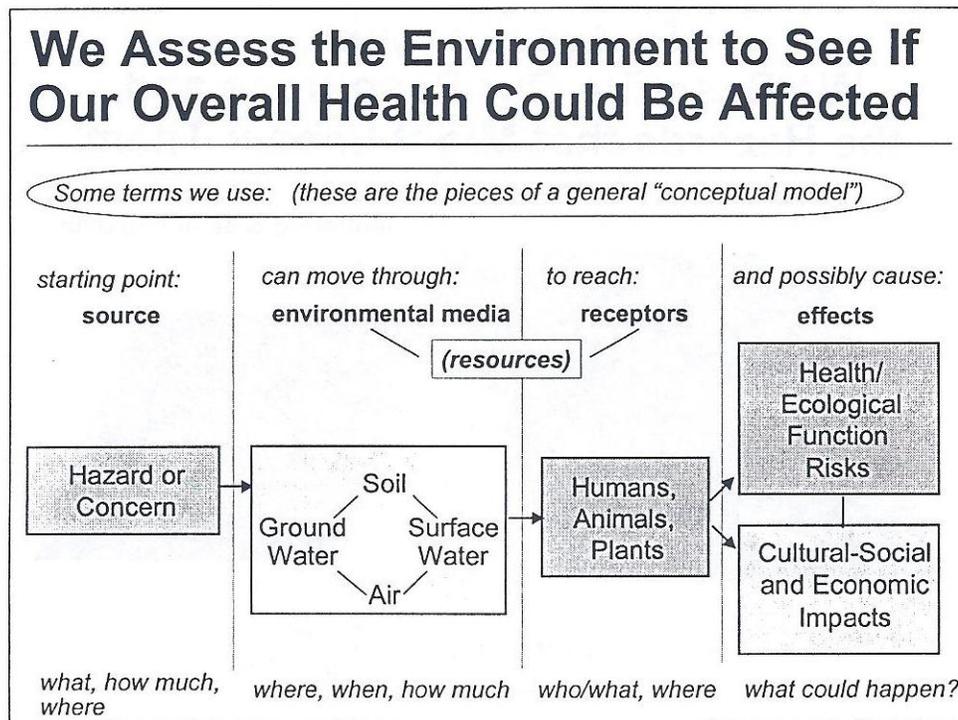


Figure courtesy of the Environmental Division, Argonne National Laboratory [8].

The current dilemma is the issue of length of time from the potential source of the exposure. For those individuals claiming they were allegedly exposed at locations where Agent Orange was being tested and evaluated, the time period would have been from 1962 through 1970 (40 to 50 years ago). For those individuals who claim exposure because they were stationed at the Naval Construction Battalion Center, Gulfport, Mississippi or Johnston Island, Central Pacific Ocean, the time period would have been from 1968 to 1977 (35 to 45 years ago). In each case, the veteran is being asked to recall the details of the potential exposure, this included the “**source**”, e.g., stacked 55-gallon drums or walked on brown vegetation; the “**pathway**”, e.g., sprayed herbicide for the Base Engineer or was present when a C-123 sprayed chemical over the base; and the “**receptor**”, e.g., the veteran.

For the site evaluations described in this report, the **source** is often questionable and the **pathway** for exposure is likewise questionable. What is not questionable is that the veterans have one or more of the diseases recognized by the Department of Veterans Affairs as being associated with exposure to Agent Orange. However, “exposure” does not equate to “dose”. The Institute of Medicine (IOM) did not establish a relationship of cause and effect, i.e., to establish that Agent Orange or its dioxin contaminant was responsible for diabetes in Vietnam veterans, nor did they address the “dose” required to cause any of the 15 presumptive diseases. Thus the Department of Veterans Affairs was given the task to define “exposure” without any consideration of “dose” for Vietnam or Korean veterans [3]. Exposure was presumed for all the soldiers that set foot on Vietnam soil or in a unit located at the Korean DMZ. *However, for non-Vietnam veterans, both the source and the pathway must be determined to provide sufficient evidence of exposure to Agent Orange* [3].

TACTICAL AND COMMERCIAL HERBICIDES

Much confusion has existed over the differences between commercial herbicides purchased by the individual agencies of the Department of Defense, and the tactical herbicides that were purchased by the Defense Supply Agency for use in Vietnam. In either case, the Department of Defense strictly controlled the use of all commercial and tactical herbicides used. This included any research, field evaluation, personnel certification, procurement, and application. Formulations of the phenoxy tactical herbicides, e.g., Orange, Purple, Pink and Green, contained only the active ingredients with no solvents, diluents, or surface active agents

(surfactants) added. The Army Chemical Corps specified the formulations of tactical herbicides. The tactical herbicide, Herbicide Orange was produced solely for the Department of Defense and was managed under the tight control of the US Army Chemical Corps and the United States Logistics Command. The Army Chemical Corps and Air Force Logistics Command kept extensive records on all movement and shipment of tactical herbicides, and those records were in the archives that were searched under this investigative series [1, 2].

The Department of Defense used commercial herbicides to control vegetation (along roads, fence lines, power lines, etc.). Internal Department of Defense guidance now and during the Vietnam Era allowed only the use of “commercially available - registered herbicides” on US military installations applied by “licensed applicators”. Licensed applicators could only apply commercial herbicides – they were not authorized to apply tactical herbicides. Commercially available herbicides had to meet USDA’s regulatory requirements (now the US Environmental Protection Agency, EPA), and had to be in compliance with the requirements of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) [1, 2].

Inside the Department of Defense, the Armed Forces Pest Control Board (AFPCB, now Armed Forces Pest Management Board, AFPMB) approved all commercial herbicides and other pesticides that were to be used on US military installations, including those in other countries. Indeed, the use of commercial herbicides on a US military installation outside the US also were required to meet the US Department of State’s Agency for International Development guidelines, ensuring both quality of product, its approved uses, and its distribution. Thus, commercial herbicides were required to meet AFPMB standards for safety (both human and environmental), stability, and efficacy. Certification was required of all applicators (military or civilian) and purchases were through the Installation’s Facility Engineer [1, 2].

CRITERIA FOR VALIDATING AN AGENT ORANGE SITE

To validate that a tactical herbicide, e.g., Agent Orange was shipped, used, stored, or buried at a site, and hence potential exposure could have occurred, one or more of the following criterions must be required:

1. Department of Defense form 173/2, Message Transmission of MILSTRIP (Military Standard Requisition and Issues Procedures) Transactions Form. The originator of this form was the Defense Logistic Agency and it was used in providing supply/logistics; all shipments of tactical herbicides to Southeast Asia and elsewhere were required to have DD form 173/2;
2. Department of Defense form 250/250a, Materiel Inspection and Receiving Report. This form identified the agency placing the order, name of the prime contractor, the manufacturer or warehouse shipped from, and the location shipped to. The form also identifies the stock and/or part number and description of the articles;
3. Department of the Army form 2496, Disposition Form. The form required a reference or office symbol, Subject box, and to, from, and date. The form was frequently used by the US Army for the Survey of Chemical Hazards, or for the identification and quantification of pesticides pending their disposal;
4. Any historical document(s) found in the National Archives, including correspondence, that describes the presence of Agent Orange or other tactical herbicide at a specific site;
5. Technical reports published by a government agency that describe the testing, evaluation, or disposal of a tactical herbicide at a specific location;
6. It must be a location/site where Vietnam-era military personnel were participants directly or indirectly in the activities involving Agent Orange or other tactical herbicide; and/or,
7. A credible document maintained by the Vietnam-era veteran that can be authenticated.

What is **not acceptable** for the validation of exposure to Agent Orange or other tactical herbicide are the following:

1. The presence of a disease or illness as identified by VA as associated with Agent Orange exposure;
2. An undocumented statement(s) by the Vietnam-era veteran or veterans;
3. Anonymous unverified Internet sources;
4. News media reports without supporting authenticated documentation; and/or
5. Allegations of presence or use by local residents without authenticated documentation.

SEARCH STRATEGY FOR HISTORICAL DOCUMENTS

In order to validate a location where Agent Orange or other tactical herbicides were developed, tested, field evaluated, transported or sprayed in tactical or equipment testing operations, or buried or destroyed, it was necessary to conduct a comprehensive search for the historical records. The following sources were searched:

- The Department of Army research on tactical herbicides was conducted primarily by the Army Chemical Corps' Plant Sciences Laboratory, Fort Detrick, Frederick, Maryland and its predecessors. A search was conducted of more than a thousand documents of the Army Chemical Corps at the National Archives in College Park, Maryland. In addition, the hundreds of boxes of Agent Orange records from the Air Force Staff Judge Advocate are currently being searched.
- The United States Armed Services Center for Unit Records Research (CURR), The Department of Army, Springfield, Virginia was contacted with the assistance of the Deployment Health Support Directorate, Deputy Under Secretary of Defense (Installations and Environment), Department of Defense, Washington, DC. CURR provided numerous leads on important documents;
- The Defense Technical Information Center (DTIC), Fort Belvoir, Virginia, is the "premier provider of DoD technical information." DTIC is the repository of the documents submitted by the military to its predecessor, the Defense Documentation Center (DDC). A DTIC search resulted in the identification and acquisition of numerous DDC documents;
- The Armed Forces Pest Management Board's Defense Pest Management Information Analysis Center, and Literature Retrieval System, Forest Glen Section, Walter Reed Army Medical Center, Washington, DC. The Literature Retrieval System is an online collection of scientific papers comprising more than 130,000 documents in searchable PDF format for research purposes only. The Literature Retrieval System was an excellent source of information;
- The Alvin L. Young Collection on Agent Orange, Specially Collections, The National Agricultural Library, Beltsville, Maryland is a collection of

more than 7,000 documents collected by Dr. Alvin L. Young from 1969 – 1987 on the issues associated with the use of herbicides in Vietnam and Southeast Asia. Many of the documents are technical reports of research conducted by the military on the use and disposal of tactical herbicides. Approximately 1,600 documents are retrieval in a searchable PDF format; and,

- The Office of Air Force History, Bolling Air Force Base, Washington DC, and the Office of History, Air Force Logistics Command, Wright-Patterson Air Force Base Ohio were additional sources for information on tactical herbicides, Operation RANCH HAND, Operation PACER IVY and Operation PACER HO.

LOCATION/SITE ASSESSMENTS

Appendix I identified 30 US military installations where Agent Orange was allegedly developed, tested, sprayed, or stored. When applying the criteria to these sites, it was found that appropriate and authenticated documents were available for the following military installations:

Aberdeen Proving Grounds, MD: Field tests of tactical herbicides 1965 – 1966
Dugway Proving Ground, UT: Loading and testing of aerial spray equipment, 1964
Fort Chaffee, AR: Field Tests of tactical herbicides, 1967
Fort Detrick, MD: Tests in greenhouse & small plots; disposal of Orange and White in 1972
Fort Drum, NY: Field tests of Purple, 1959
Fort Gordon, GA: Field tests of tactical herbicides, 1967
Fort Meade, MD: Field tests of tactical herbicides, 1963 – 1964
Fort Ritchie, MD: Field tests of tactical herbicides, 1963 – 1964
Fort Smith, AR: Field tests of tactical herbicides, 1967
Naval Construction Battalion Center, MS: Storage of surplus Agent Orange, 1968 – 1977
Eglin AFB, FL: Loading and testing of aerial spray equipment, 1962 -1971
Hill AFB, UT: Soil biodegradation tests at the AFLC Test Range Complex, 1972
Kelly AFB, TX: Storage of Pink and Blue, 1969 – 1974

All of the above military installations were locations where Vietnam-era veterans were stationed, where tactical herbicides were developed, tested, evaluated, or stored, and where technical reports and other supporting documentation were found in the archives and other sources. The circumstances involved for the various tests or military operations are critical to understanding the potential for

Vietnam-era veterans to be exposed to the tactical herbicide. **Accordingly, a detailed report will be prepared on each of the above 13 military installations.**

Appendix II is the current list maintained by the Department of Veterans Affairs. As noted, the Appendix is divided into sites outside of the United States and sites within the United States. For the portion of the list for outside the United States, the list is incomplete and does not include the Philippines, Panama, Guam, or Okinawa, all locations identified by Vietnam-era veterans as locations where they were allegedly exposed to tactical herbicides. Detailed Investigative Reports have been prepared for Okinawa and Canal Zone/Panama for the Veterans Benefits Administration (BVA) confirming that there was no Agent Orange or other tactical herbicides transported to, sprayed, or buried at either location [9, 10]. Detailed Investigative Reports will be prepared on Guam and the Philippines.

A Department of Defense Report was prepared on Korea in 2011, **Historical Review of the 1968 Project to Spray Tactical Herbicides on the Korean DMZ** [11]. That report noted that only limited quantities of Agent Orange (350 drums) and Agent Blue (610 drums) were sprayed on the DMZ, and then only in 1968 and in dilute form. The applications of the two tactical herbicides involved ground applications (versus aerial applications) involving 3,345 soldiers of the First Republic of Korea Army. With the exception of a US Chemical Corps Officer assigned as an observer, no US military were involved in the 3-month operation. The report also confirmed that no Agent Orange was sent, sprayed, or buried elsewhere in South Korea except for the tactical operation on the DMZ in 1968 [11].

Appendix II lists Cambodia, Laos, and Thailand. Detailed Investigative Reports will be prepared on each of these locations. A detailed Investigative Report was prepared on Base Gagetown, Canada in April 2013, **Investigations into the Allegations of Exposure at Base Gagetown, New Brunswick, Canada** [12]. That report noted that 180 gallons of tactical herbicides were applied on a total of 405 acres in 1966 and 1967, and the likelihood of US troops training at Base Gagetown beginning in 1971 and being exposed to Agent Orange or its associated dioxin was negligible.

Appendix II lists India. The operation in India was conducted in World War II as part of the US Defense Department's interest in potential crop destruction efforts, and should not have been on the VA list as it did not involve tactical herbicides or Vietnam-era veterans. Agent Orange was not formulated as a tactical herbicide until 1963. Prior to that time period, many locations evaluated commercially available phenoxy herbicide formulations in support of proposed vegetation control programs potentially to be used in military operations in WW II or the Korean Conflict.

The information on the VA list concerning Puerto Rico is not properly documented. All of the tests conducted at the seven sites in Puerto Rico (Mayaguez, Maricao, Guajataca, Guanica, Toro Negro, El Verde, and Jimenez) were conducted between 1963 and 1967 and included the tactical herbicides Purple, Orange, White, and Blue. All of the tests and evaluations were conducted by scientists of the USDA's Agricultural Research Service (ARS) [13]. Vietnam-era veterans were not involved in any of the tests in Puerto Rico. Appendix II does list the field tests in Puerto Rico in 1967 and 1968 by The Dow Chemical Company, however these tests did not involve tactical herbicides and the purposes were to evaluate pellet formulations for control of range plant species. There were no Vietnam-era veterans involved.

Appendix II did list Operation PACER HO, the Department of Air Force project for the incineration at sea of the surplus Agent Orange remaining after the termination of the Vietnam War. Transfer operations of the herbicide to the incineration vessel, the *M/T Vulcanus* began at the Naval Construction Battalion Center (NCBC), Gulfport, MS in May 1977 and continued at Johnston Island in the Central Pacific Ocean through August 1977 [14]. Both the operations at NCBC and Johnston Island involved Vietnam-era veterans, although at Johnston Island, civilian personnel were also involved.

The last section of Appendix II reviews the information available on projects to test, dispose of, or store tactical herbicides in the United States. Information and reports noted on Arizona, California, Indiana, Kansas, Kentucky, Montana, North Dakota, Rhode Island, and Washington **do not meet the criteria** for the testing, storing or disposal of tactical herbicides during the Vietnam era, nor did they involve Vietnam-era veterans. Many of these projects were conducted in the 1940s

and 1950s. Many were conducted by the Agricultural Research Service or the Forest Service, e.g., Brawley, California and Globe, Arizona, respectively.

Fort Chaffee, AR; Eglin AFB, FL; Fort Gordon, GA; Fort Detrick, MD; Fort Ritchie, MD; Fort Meade, MD, Aberdeen Proving Ground, MD, Naval Construction Battalion Center, MS; Fort Drum, NY; and Hill AFB, UT are all military installations where Vietnam-era veterans were stationed, where tactical herbicides were developed, tested, evaluated, or stored, and where technical reports and other supporting documentation were found in the archives and other sources. The circumstances involved in the various tests or military operations are critical to understanding the potential for Vietnam-era veterans to be exposed to the tactical herbicide. **Accordingly, as noted in discussion of Appendix I, a detailed report will be prepared on each of these military installations.**

Appendix II describes 9 locations in Florida, but only Eglin AFB, 1962 -1971, and Apalachicola National Forest, Sopchoppy meet the criteria of being sites where tactical herbicides developed for Vietnam were actually involved in spray operations. The research conducted at the Apalachicola National Forest did not involve Vietnam-era veterans [1]. Thus only the testing of aerial spray equipment that occurred on Test Area C-52A, Eglin Reservation, and the loading of the UC-123B aircraft at Hardstand 7 at Eglin AFB meets the criteria. Documents found within the National Archives at College Park, MD included DD Forms 173/2 and 250/250a, plus more than 20 technical reports [15]. The test operation at Jacksonville, FL in 1962 was actually carried out at Test Area C-52 of the Eglin Reservation. Test Area C-52A received significant quantities of Purple, Orange, White, and Blue that were used to evaluate the effectiveness and compatibility of the aerial spray equipment that was subsequently used in Vietnam [15]. An Investigative Report will be prepared on Eglin AFB, FL.

The spray tests conducted by Fort Detrick scientists in 1964 -1965 at the Georgia Power Company rights-of-way and at the Tennessee Valley Authority did not involve Vietnam-era veterans. Similarly, all of the tests in Hawaii were conducted between 1 May 1967 and 30 June 1968. These tests were conducted by the Department of Agronomy and Soils of the University of Hawaii with oversight provided by scientists from the Plant Science Laboratory, Fort Detrick, MD [1]. All of the tests were conducted on the Island of Kauai at either the Kauai Branch

Station of the Hawaii Agricultural Experiment Station at Kapaa, or on lands belonging to the Hawaii Department of Land and Natural Resources [1]. There were no Vietnam-era veterans involved in any of the experiments or in follow-up observations.

Appendix II lists eleven sites/locations within the state of Maryland where herbicide projects were conducted. Seven of these projects were conducted between 1946 and 1957 and did not include any of the tactical herbicides. Investigative Reports will be prepared, as previously noted, on Fort Detrick, Fort Ritchie, Fort Meade, and the Aberdeen Proving Ground.

Although three locations are identified in Texas, neither Kelly AFB at San Antonio nor the five locations (Llano, Refugio, Victoria, Carlos, and Livingston) that were treated with tactical herbicides by the Agricultural Research Service from March 1963 to June 1967 were listed [13]. The Texas field tests conducted by the Agricultural Research Service were supported by the Texas Agricultural Experiment Station [13]. The tests identified at Beaumont were in 1944 or in the early 1950s. The tests conducted in Weslaco, Texas were under the direction and support of the Ansul Chemical Company. Thus, ONLY Kelly AFB in San Antonio meets the criteria established for determination of where Agent Orange and other tactical herbicides were tested, sprayed, or stored. All other locations in Texas did not involve military personnel, namely, Vietnam-era veterans, but rather scientists belonging to USDA/ARS or the Texas Agricultural Experiment Station (Texas A&M University).

Finally, the greenhouse and small field tests conducted in 1967 – 1969 by Ansul Chemical Company at their facility in Marinette, Wisconsin did not involve military personnel, i.e., Vietnam-era veterans.

SUMMARY OF SITE ASSESSMENTS

An assessment of the sites identified in Appendix I and Appendix II suggested that the lists, descriptions, dates, locations and chemicals involved were not carefully screened before being posted on the Internet. Many of the locations and events occurred in the 1940s – 1950s. Two of the locations (North Dakota and Kansas) involved the testing of wheat stem rust. It was apparent that the 2006 Report prepared by the Department of Defense for the Veterans Administration was not

reviewed or cited [1]. The Department needs to carefully update the list of sites based on this report (and be supported by the 2006 Report) and most importantly, describe the protocol or criteria used for determining if a location/site was actually a site where the tactical herbicides used in Vietnam were documented as used OUTSIDE of Vietnam, with one or more of the items listed in the proposed criteria. As noted throughout the assessment, many locations identified as appropriate to meeting the criteria will be the subject of future Investigative Reports.

In October 2012, Compensation Service, Veterans Benefits Administration contracted for 23 Investigative Reports, i.e., **The Agent Orange Investigation Report Series**. In addition to the Reports, a supporting project was initiated on “**Development of an Archival Directory of Agent Orange Documents.**” Thus, every Investigative Report must be supported by archival information. This removes any bias as to whether a site received tactical herbicides and whether the site was used for tests and evaluations, actual spraying programs, or for storage or disposal. Most importantly, the time frame of the involvement of the tactical herbicide (s) must be during or immediately after the Vietnam War, and there must be some evidence (other than an associated disease) that the veteran actually came into contact with a tactical herbicide, rather than a commercial herbicide. The Investigative Reports are intended to provide the VBA and the veteran with factual information and circumstances that may have influenced the exposure to the tactical herbicide OUTSIDE of Vietnam or the Korean DMZ, both sites that do not require the veteran to prove exposure.

REFERENCES

1. Young AL (2006): The History of the US Department of Defense Programs for the Testing, Evaluation, and Storage of Tactical Herbicides. Prepared for the Office of the Under Secretary of Defense (I&E) (Available from the Armed Forces Pest Management Board Literature Retrieval System, Accession No. 182581)
2. Young AL (2008): FINAL REPORT: Agent Orange: A History of Its Use, Disposition, and Environmental Fate. Prepared for the Office of the Under Secretary of Defense (I&E) (Available from the Armed Forces Pest Management Board Literature Retrieval System, Accession No. 188312)
3. Brown MA (2011): Science versus Policy in Establishing Equitable Agent Orange Disability Compensation. *Military Medicine* 176: 35-40, July Supplement

4. Thompson J (2001): Letter from Veterans Benefits Administration to the Honorable Lane Evans, 13 March 2001, RE: Veterans exposed to Agent Orange
5. Mather SH (2001): Letter from Chief Public Health and Environmental Hazards Officer to Executive Director, Military and Veterans Health Coordinating Board, 22 March 2001, RE: Request assistance in obtaining Information from the Department of Defense about the potential exposure to members of the military outside Vietnam
6. Lave, E (2003): Letter from Congressman Lane Evans to Secretary of Defense Rumsfeld, 7 May 2003, RE: Requesting Review of Guam "Public Health Assessment" and details on 30 other locations alleged to be sites where tactical herbicides were used, tested, or stored
7. Grone PW (2003): Letter from the Principal Assistant Deputy Under Secretary of Defense (Installations and Environment) to Congressman Lane Evans, 23 September 2003, RE: No records on Guam; Summary of 28 locations on the use of Vietnam-era herbicides, per request
8. MacDonell M (1999): Risk/Impact Technical Report for the Hanford Groundwater/Vadose Zone Integration Project. Prepared for the US DOE-Center for Risk Excellence by Environmental Assessments Division, Argonne National Laboratory, Argonne, IL, Technical Report DOE/CH/CRE-7-1999
9. Young AL, Young KL (2012): Investigations into the Allegations of Agent Orange on Okinawa. Agent Orange Investigative Report Series, No.1, October 2012. Prepared for Compensation Service, Department of Veterans Affairs, Washington DC
10. Young AL, Young KL (2012): Investigations into the Allegations of Agent Orange in the Canal Zone and Panama. Agent Orange Investigative Series, No. 3, December 2012. Prepared for Compensation Service, Department of Veterans Affairs, Washington DC
11. Young AL, Young KL (2011): Historical Review of the 1968 Project to Spray Tactical Herbicides on the Korean DMZ. A Report prepared under contract with the Oak Ridge Institute for Science and Education for the Eighth United States Army, Republic of South Korea, 30 November 2011 (Available from the Armed Forces Pest Management Board Literature Retrieval System, Accession No. 192313)
12. Young AL, Young KL (2013): Investigations into the Allegations of Exposure at Base Gagetown, New Brunswick, Canada. Agent Orange Investigative Report Series, No. 7, April 2013. Prepared for Compensation Service, Department of Veterans Affairs, Washington DC
13. Tschirley, FH (1968): Research Report ...Response of Tropical and Subtropical Woody Plants to Chemical Treatments. Agricultural Research Service, US Department of Agriculture, Technical Report CR-13-67, February 1968. Prepared under ARPA Order No. 424, Advanced Research Projects Agency, US Department of Defense (Available from the Army Forces Pest Management Board Literature Retrieval System, Accession No. 142280)

14. Miller RA, Shafts PA, Stieritz SF, Termena BJ (1980): Disposal of Herbicide Orange, 1971-1979. Office of History, Air Force Logistics Command, Wright-Patterson AFB, OH (Available from the Armed Forces Pest Management Board Literature Retrieval System, Accession No. 188336)
15. Young AL, Newton M (2004): Long Overlooked Historical Information on Agent Orange and TCDD Following Massive Applications of 2,4,5-T-Containing Herbicides, Eglin Air Force Base, Florida. Environ Sci Pollut Res 11 (4): 209-221 (Available from the Armed Forces Pest Management Board Literature Retrieval System, Accession No. 180535)

BRIEF BIOGRAPHY OF THE AUTHORS

For more than 40 years, Dr. Alvin L. Young has been involved in issues surrounding the use of Herbicide Orange and other tactical herbicides in Vietnam. He completed his PhD in Herbicide Physiology and Environmental Toxicology at Kansas State University in 1968. In his 21 years with the USAF (obtaining the rank of Colonel), he was involved with the testing and evaluation of the equipment used in Operation RANCH HAND, Vietnam, and with the environmental and human health studies with the USAF School of Aerospace Medicine and the Department of Veterans Affairs. He served as a Science Advisor on environmental issues including Agent Orange with the President's Office of Science and Technology Policy. He was the Director of the Department of Energy's Center for Risk Excellence. He was a Visiting Professor at the University of Oklahoma, 2001-2007, and has served as the Senior Consultant on Herbicide Orange for the Office of the Deputy Under Secretary of Defense (Installations and Environment). He has more than 300 publications in the scientific literature, including five books on issues related to Herbicide Orange and/or dioxins and furans. From 2000 to 2012, He was the Editor of the international journal *Environmental Science and Pollution Research*.

For the past ten years, Kristian L. Young has been the Principal Researcher for A.L. Young Consulting. He received his Bachelor of Arts in Political Science from DePaul University, Chicago (Magna Cum Laude, Phi Kappa Phi, and Pi Sigma Alpha). He received the Master of Arts in International Relations in 2010 through Webster University's Global Program having studied in Europe and China. He has provided support to the company in areas of public policy, technical issues, archival research, and the coordination of national and international projects.

APPENDIX I

LIST NOT VALIDATED (See the Text of the Report)

INTERNET SOURCES FOR AGENT ORANGE SITES

<http://www.agentorangequiltotears.com/AOLINKS.htm>

<http://www.agentorangelegacy.com/were-you-exposed/href=>

<http://www.ffrd.org/USSites.htm>

http://www.gmasw.com/ao_out.htm

http://www.publichealth.va.gov/exposures/agentorange/outside_vietnam.asp

http://www.vietnamresearch.com/agento/dod_1.html

TITLE: *US Military Bases alleged to be contaminated by tactical herbicides:**

US Army Posts & Proving Grounds In the United States

Aberdeen Proving Ground, MD
Bushnell Army Air Field, FL
Corpus Christi Army Depot, AZ
Dugway Proving Grounds, UT
Jefferson Proving Grounds, IN
Fort A.P. Hill, VA
Fort Chaffee, AR
Fort Detrick, MD
Fort Drum, NY
Fort Gordon, GA
Fort Jackson, SC
Fort Knox, KY
Fort Meade, MD
Fort McClellan, AL
Fort Pike, LA
Fort Ritchie, MD
Fort Smith, AR

US Navy and Marine Corps Stations in the United States

Moffett Field, NAS, CA

Naval Construction and Battalion Center, MS
Whidbey Island NAS, WA

US Air Force Bases in the United States

Avon AFB, FL
Eglin AFB, FL
Griffiss AFB, NY
Hickam AFB, HI
Hill AFB, UT
Kelly AFB, TX
Otis AG Base, MA
Robins AFB, GA
Tinker AFB, OK
Wright-Patterson AFB, OH

*There was significant confusion at some of these Internet sites as to whether the contamination at US Military Installations was from tactical herbicides, commercial herbicides, other pesticides, or whether it involved phenolic residues or even trichloroethylene (TCE).

APPENDIX II

LIST NOT VALIDATED (See the text of the Report)

Department Veterans Affairs Listing of Locations/Sites

Agent Orange and other herbicides used in Vietnam were tested or stored elsewhere, including in countries outside of the US. Below is information from the Department of Defense on projects to test, dispose of, or store herbicides **outside the US**.

Cambodia

Location: Southeastern part of Kompong Cham Province and Dar and Prek Clong plantations, Cambodia

Dates: 6/1969

Project Description: In 6/1969, the U.S. government received notice of charge by Cambodian government that major defoliation damage to the Cambodian rubber plantation near the RVN border had occurred as a result of U.S. defoliation activity. This was confirmed by a team of experts.

Agents: Orange

DoD Involvement: Yes

Canada

Location: Base Gagetown near Fredericton, New Brunswick, Canada

Dates: 6/20/1967 - 6/24/1967

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 University of Hawaii.

Agents: Basic desiccants and Orange, Blue, various

DoD Involvement: Yes

India

Location: Kumbla, South India

Dates: 1945-1946

Project Description: The main objective of the experiments was to determine the feasibility of accomplishing severe injury or destruction of tropical food crops by the application of growth-inhibiting (LN*) compounds in static trials. Field plantings were treated with various agents at different rates in different forms.

Agents: LN compounds *phenoxy

DoD Involvement: Yes

Korea

Location: Korea, third Brigade, 2nd Division area

Dates: 7/23/1968 - 7/24/1968

Project Description: In 1968, chemicals were sent from the Plant Sciences Lab, Ft Detrick, MD, to the Republic of Korea for the purpose of testing their effectiveness in the control of vegetation.

Agents: Hyvar XWS, tandex, Urox B, Urox Oil concentrate (liquids) bromacil, tandex, Urox 22 (solids)

DoD Involvement: Yes

Location: Korea, 2nd and 4th Brigades, 2nd Division area

Dates: 8/1968

Project Description: In 1968, chemicals were sent from the Plant Sciences Lab, Ft Detrick, MD, to the Republic of Korea for the purpose of testing their effectiveness in the control of vegetation.

Agents: Hyvar XWS, tandex, Urox B, Urox Oil concentrate (liquids) bromacil, tandex, Urox 22 (solids)

DoD Involvement: Yes

Location: Korea, third Brigade, 2nd Division area

Dates: 10/3/1968

Project Description: In 1968, chemicals were sent from the Plant Sciences Lab, Ft Detrick, MD, to the Republic of Korea for the purpose of testing their effectiveness in the control of vegetation.

Agents: Hyvar XWS, tandex, Urox B, Urox Oil concentrate (liquids) bromacil, tandex, Urox 22 (solids)

DoD Involvement: Yes

Laos

Location: Laos

Dates: 12/1965 - 1967

Project Description: In December 1965, herbicide operations were begun in Laos, with sorties being flown from Tan Son Nhut and Da Nang. The purpose was the exposure of foot trails, dirt roads and other LOCs that crossed into SVN. This network led from NVN, through the eastern panhandle, to Cambodian border.

Agents: Orange

DoD Involvement: Yes

Puerto Rico

Location: Las Mesas and La Jagua experimental areas at Mayaguez, Puerto Rico

Dates: 2/1956 - 6/1956

Project Description: During February to June, 9 chemicals were evaluated in PR on 16 genera

tropical woody plants. The chemicals were applied in highly concentrated solutions with a microsprayer to the leaves.

Agents: 2,4,5-T, 2,4-D, pentachlorophenol, ammate, weedazol, endothal Harvestaid, Butyne - 1,4-diol

DoD Involvement: Yes

Location: Guanica and Joyuda, Puerto Rico

Dates: 6/1956 - 9/1956

Project Description: 9 chemicals were evaluated on 16 genera of tropical woody between June and September. The chemicals were sprayed to duplicate small branches, using a microsprayer.

Agents: 2,4,5-T, potassium cyanate, amiendo, F-2, 6-Ca-4, Y-F Tree and Brush Kiler, ACP M-118, ShedA-Leaf

DoD Involvement: Yes

Location: Las Mesas and La Jagua, Mayaguez, Joyuda at Cabo Rojo, and Guanica Insular Forest at Guanica, Puerto Rico

Dates: 9/1956-12/1956

Project Description: 16 compounds with defoliating properties were evaluated using 28 different tropical woody plants, each representing a separate genus. The chemicals were applied to duplicate small branches with a microsprayer and to single larger branches or whole trees with a 2-gallon knapsack sprayer.

Agents: 6-Ca-4, Liojn Oil, 2,4,5-T, B-1613, B-1638, Ammate, V-C1-186, endothal, shed-a-leaf, M-118, Y-F, esteron 2,4-D, F3, F4, F5, F6

DoD Involvement: Yes

Location: Las Mesas and La Jagua, Mayaguez, Guanica Beach, Puerto Rico

Dates: 1/1957 - 3/1957

Project Description: 7 compounds were evaluated on 29 different woody plants to determine their effectiveness as defoliant, desiccants, and as killing agents. They were applied with a microsprayer to the upper leaf surfaces of duplicate small branches.

Agents: V-C 3-105, V-C 1-21, V-C 1-443, F-7, TBP, Phillips 713, V-C 3-173

DoD Involvement: Yes

Location: Las Mesas and La Jagua, Mayaguez, Guanica Beach, Puerto Rico

Dates: 4/1957 - 6/1957

Project Description: 7 compounds were sprayed on 25 different plants in order to evaluate their effectiveness as defoliant, desiccants, and killing agents. The compounds were applied with a microsprayer to the upper and lower leaf surfaces of duplicate small branches.

Agents: B-1676, B-1638, NP 1098, SD 1369, Ammate, Shed-a-leaf

DoD Involvement: Yes

Location: Las Mesas and La Jagua, Mayaguez, Puerto Rico

Dates: 7/1957 - 12/1957

Project Description: 8 different spray formulations were applied to 16 different tropical trees and shrubs in order to evaluate their effectiveness as defoliant, desiccants, and killing agents.

Agents: MgClO₃, Golden Harvest Defoliant, Dow-M562, F-8, F9, F-10, F-11, F-12
DoD Involvement: Yes

Location: Loquillo, Puerto Rico

Dates: 4/1966, 10/1966

Project Description: Field tests of defoliants 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: Las Marias, Puerto Rico

Dates: 2/1967 - 12/1967

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: Various, including Orange

DoD Involvement: Yes

Location: Near Rio Grande, on the northeast coast of Puerto Rico

Dates: 8/23/1967, 10/18/1967, 12/21/1967-12/26/1967

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

DoD Involvement: Undetermined

Location: Las Mesas Cerros, Mayaguez, Puerto Rico

Dates: 5/24/1968, 5/26/1968, 5/27/1968

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, bromacil, pyriclor

DoD Involvement: Undetermined

At Sea

Location: At Sea

Dates: Summer 1977

Project Description: In 1977, the USAF incinerated 2.22 million gallons of Herbicide Orange at sea in an operation entitled PACER HO. Extensive industrial hygiene sampling efforts supporting the transfer operations at Gulfport, MS and Johnston Island indicated all exposures were inconsequential (2-3 orders of magnitude below the TLVs for 2,4-D and 2,4,5-T).

Agents: Orange

DoD Involvement: Yes (Gulfport, MS); No (Johnston Island)

Thailand

Location: Replacement Training Center of the Royal Thai Army near Pranburi, Thailand

Dates: 1964 and 1965

Project Description: An extensive series of tests were conducted by Fort Detrick during 1964 and 1965 in collaboration with the Military Research and Development Center of Thailand. The objective was to perform onsite evaluation of phytotoxic chemicals on vegetation in SE Asia.

Agents: Orange, Purple

DoD Involvement: Yes

Location: Thailand

Dates: 1964-65

Project Description: Sponsored by ARPA; ARPA Order 423, Between the mentioned dates, there was a large-scale test program to determine effectiveness of mentioned agents in defoliation of upland forest or jungle vegetation representative of SEA.

Agents: Purple, Orange, Others

DoD Involvement: Yes

Location: Thailand

Dates: 1964-65

Project Description: Field tests of defoliants 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, Blue

DoD Involvement: Yes

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 US**.

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

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

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

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

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

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

Location: Hilo, HI

Dates: 12/1966

Project Description: Field tests of defoliant agents 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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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