



Military-Veterans Advocacy, Inc.
Post Office Box 5235
Slidell, Louisiana 70469-5235
Telephone (985) 641-1855

Rob Maness
Colonel USAF (Retired)
Executive Director
email: rob@robmaness.com

Michael Yates
Chief of Staff
email: commander@bluewaternavy.org

John B. Wells
Commander USN (Retired)
Chairman of the Board
Director of Litigation
email: JohnLawEsq@msn.com

James A. Kuiken
Sgt. Major USMC (Retired)
Vice Chairman of the Board
Director of Legislation
email: contact@JamesKuiken.com

Michael Kvintus
Secretary
email: ermizmo1@yahoo.com

March 12, 2020

Hon, Robert L. Wilkie
Secretary of Veterans Affairs
810 Vermont Ave., NW
Washington, DC 20420

Re: Rulemaking Request for Herbicide Use in the Panama Canal Zone

Dear Mr. Secretary,

Pursuant to 5 USC § 553(e), request that you issue rules recognizing the presumption of Agent Orange exposure to veterans serving in the Panama Canal Zone from January 1, 1958 until December 31, 1999 or when the last US military personnel departed from their official duty in the Panama Canal Zone .

Per Dr. Wayne Dwernychuk, world-renown Agent Orange expert, in his letter in support of a Panama Canal Zone veteran who has been denied and now on appeal, the dioxin (TCDD) in soil can remain a toxic component of the environment for over 100 years (Paustenbach, *et al.* 1992).¹

The U.S. Census Bureau Commodities by Country show 2,4-D & 2,4,5-T shipped, stored and used in Panama from 1958 until at least December 1977². This item 2,4-D & 2,4,5-T produced and shipped from 1958-1964 was code named "Agent Purple" with a higher dioxin content (30-50 PPM TCDD), whereas shipments from 1965-1977 were to have a lower dioxin content closer to 0.5 code named "Agent Orange."

As outlined in the TM 5-629³, these pesticides/herbicides/insecticides were used routinely as needed on base. 2,4-D & 2,4,5-T was used to kill poison ivy, poison oak and sumac where troops were deployed. See page 34, 3-7. Silvex was used on golf courses, parade fields and gun ranges. See page 41,

¹ <https://adobe.ly/2SLBcOU>

²

<https://onedrive.live.com/?authkey=%21ABrYEHKAeHR8RdM&id=A3498740E4FC0118%213007&cid=A3498740E4FC0118>

³ U.S. DOD Herbicide Manual for Noncropland Weeds, 1970, Army TM 5-629, Navy NAVFAC MO-314, and Air Force, AFM 91-19

<https://specialcollections.nal.usda.gov/sites/specialcollections.nal.usda.gov/files/04821.pdf>

3-6. As well as many other persistent pesticides harmful to man as listed in this Tri-service manual to be used on every base as needed. Silvex also contains 2,4,5-T and the by-product Dioxin (TCDD).

Per Executive Order 11850 of April 8, 1975, herbicides were allowed under regulations applicable to their domestic use, for control of vegetation within U.S. bases.⁴

Any item listed in the Federal Stock Catalog was obtainable by anyone who needed it for vegetation management. As seen in the 1970-71 Federal stock Catalog, shown here⁵ Herbicide Orange was listed as an item procurable by any facility needing to control vegetation.

As confirmed in Pesticide Monitoring Special Study No. 44-0102-77, Environmental Sampling in the Panama Canal Zone, U.S. Army Environmental Hygiene Agency, Aberdeen Proving Ground, MD⁶, page 2, Table 1, shows a total of 406,466 gallons of pesticides used between the Atlantic (Ft Davis) and the Pacific side of the Isthmus (Corozol) as well as 71,386 gallons of Chlordane and 1,696 gallons of DDT used in the Canal Zone in just the year 1975. And as we see on the shipping records, all of these chemicals were shipped/stored/used in Panama for decades.

It is immaterial whether herbicides were classified as "tactical" or commercial." These designations represent a distinction without a difference as both contained 2,4-D & 2,4,5-T and the unintended by-product of 2,3,4,7,8-TCDD (Dioxin). See, GAO Report *Agent Orange, Actions Needed to Improve Accuracy and Communication of Information on Testing and Storage Locations*, GAO 19-24⁷ at page 11.

As testified by Lt. Charles Bartlett, Crops Division, U.S. Army Biological Laboratories, Fort Detrick, 200 barrels of Agent Orange were in fact shipped to the Panama Canal Zone in 1968 and it was routine.⁸

Whether the veteran's exposure came from Agent Orange or other tactical or commercial herbicides is of no moment. The name of the agent is not the determining factor. It is the chemical composition. If military personnel who served in the Panama Canal Zone were exposed to this chemical, and it appears that they were, any disease or disorder flowing from that chemical component should be service-connected pursuant to 38 USC § 1113 (b). The important thing is that they were exposed to herbicides with toxic components. That is enough to trigger coverage.

There is no question, scientific, or otherwise, that those US military personnel who served in the Panama Canal Zone were directly exposed to herbicides from January 1, 1958 – December 31, 1999. A presumption of exposure should be granted to all US military personnel who served in the Panama Canal Zone.

⁴ https://en.wikisource.org/wiki/Executive_Order_11850



⁵ 1970-71 FSC listing
orange.docx

⁶ https://apps.dtic.mil/dtic/tr/fulltext/u2/a034765.pdf?fbclid=IwAR3Lj4ucR-fjL8reoZa-kwGSRiIB_Vb3C6J5-5okPeUg2oSWIDzWeSljf8g

⁷ <https://www.gao.gov/products/gao-19-24>

⁸ <https://adobe.ly/2SJA9io>

Sincerely,

A handwritten signature in blue ink, appearing to read "John B. Wells", is written over the typed name and title.

John B. Wells
Commander, USN (Retired)
Chairman of the Board and Director
Of Litigation

Encl: Proposed Rule making
Dr. Wayne Dwernychuk curriculum-vitae

Proposed Change to 38 C.F.R. § 3.307

Add § 3.307(a)(6)(vi) to read as follows:

A veteran who, during active military, naval, or air service, served between January 1, 1958 and December 31, 1999, or when the last military personnel departed from their official duty in the Panama Canal Zone, individually or in a unit that, as determined by the Department of Defense, operated in or near the Panama Canal Zone, shall be presumed to have been exposed during such service to an herbicide agent, unless there is affirmative evidence to establish that the veteran was not exposed to any such agent during that service.

CURRICULUM VITAE

DR. WAYNE DWERNYCHUK

B.Sc. [Hons.], M.Sc. [Zoology], Ph.D. [Biology]

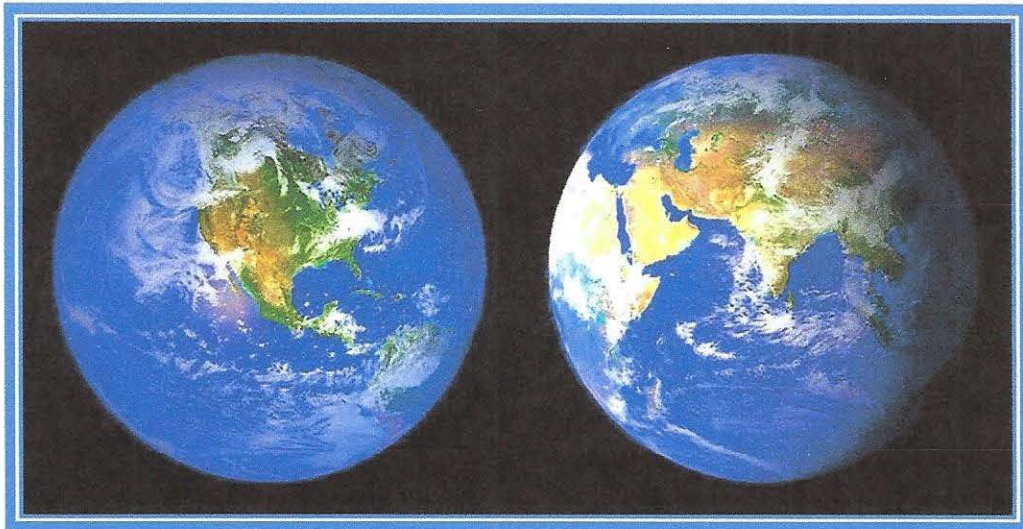
ENVIRONMENTAL SCIENTIST

AGENT ORANGE SPECIALIST

BRITISH COLUMBIA

CANADA

(Retired November 2006)



SUMMARY OF EXPERIENCE

Dr. Dwernychuk has designed, implemented, and authored numerous environmental assessments and monitoring studies for over 35 years. The impact of industrial developments (existing and proposed) on physical/chemical/biological components of ecological systems constitutes a major segment of his expertise. The integration of water quality/physical data with biological information has been a key approach in understanding temporal and spatial changes in biological communities as they may relate to potential sources of environmental perturbations.

Dr. Dwernychuk has functioned extensively in the capacity of Project Director/Advisor, Project Manager, and Principal Scientist responsible for all aspects of projects, including compliance to budgets and schedules, in conjunction with administrative/liaison duties associated with environmental investigations. Project planning, experimental design, data collection, analyses, and authorship of interpretive documents have been primary responsibilities.

Dr. Dwernychuk has been extensively involved in study design and the execution of environmental monitoring programs in Canada and abroad. The environmental assessment of chemical contaminants and physical disruptions on biological systems forms a substantial segment of his expertise. He served as Chief Scientist for Hatfield Consultants comprehensive studies in Viet Nam from 1994 through 2006 involving the impact of dioxins on the environment and humans. Dioxin was present in the Agent Orange herbicide mixture which was sprayed extensively over southern Viet Nam during the American/Viet Nam War. Mitigative strategies were developed to address chemical contamination in populated areas.

Dr. Dwernychuk was involved in Hatfield Consultants' investigation in Viet Nam focussing on landmines, unexploded ordnance, and chemical contamination, which was an integrated approach to landmine/unexploded ordnance clearance in areas also potentially contaminated with war chemicals (i.e., herbicides, explosives, etc.).

Dr. Dwernychuk also served as a Director/Senior Scientist for Hatfield Consultants' joint-venture companies in Indonesia (PT Hatfindo Prima) and Thailand (Pro-En Envirosiences Ltd.). He retired from his position of Senior Vice President and part owner of Hatfield Consultants Ltd. in November 2006; however he continues to serve as a senior scientific advisor to Hatfield Consultants on select projects.

POINT OF INTEREST

Early on in Dr. Dwernychuk's career, he, through his research on island-nesting waterfowl (1965 - 1967), documented peculiar behavioral patterns in the selection of nesting habitat. Nesting waterfowl on the islands were constructing their nests among gull colonies. On the islands, colonial gulls would provide protection to waterfowl nests/eggs by attacking other avian predators (e.g., crows, magpies). Gulls would

completely ignore the existence of waterfowl nests and eggs on the islands. Subsequent to hatching of waterfowl eggs, while females were leading their ducklings to water, waterfowl families would again be ignored by gulls as they 'waddled' through the gull colonies, with adult gulls making way for females and their ducklings. However, once the waterfowl family entered the water and were metres off shore, gulls would attack the family, and, in many cases, devour all the ducklings while mothers frantically tried to protect their little ones. An anthropogenic interpretation of these events states that these island-nesting waterfowl were 'trapped' into a false sense of security thought to be provided by colonial gulls in their provision of protection from other avian predators.

In 1972, Dwernychuk and his research advisor on his M.Sc. program (Dr. D. A. Boag) formulated and published the concept of the 'ecological trap'. Ecological traps are scenarios in which rapid environmental change and certain ecological factors lead organisms to prefer poor-quality habitats, which may result in detrimental consequences for the wildlife species in question.

More on the ecological trap concept may be reviewed at:

https://en.wikipedia.org/wiki/Ecological_trap

A SAMPLING OF ARTICLES/COMMENTS

- http://www.hatfieldgroup.com/wp-content/uploads/VietNamHighlights/CHEMOSPHERE_1.pdf
- http://www.hatfieldgroup.com/wp-content/uploads/VietNamHighlights/Chemosphere_HotSpots.pdf
- <http://www.salem-news.com/articles/february022012/ao-controversy-wd.php>
- <http://www.thanhniennews.com/2010/pages/20120928-a-de-facto-admission-of-agent-orange-guilt.aspx>
- <https://www.japantimes.co.jp/community/2013/08/26/voices/denials-of-defoliant-at-former-u-s-base-site-in-okinawa-fly-in-the-face-of-science/#.XmUtdKhKhPY>
- <http://www.thanhniennews.com/pages/results.aspx?k=dwernychuk>
- **HATFIELD CONSULTANTS ON '60 MINUTES (CBS NETWORK):**
<https://youtu.be/gFLdfR7O9xc?t=18>

EDUCATION

- 1975 Doctor of Philosophy (Biology), University of Saskatchewan, Regina, Saskatchewan, Canada
- 1968 Master of Science (Zoology), University of Alberta, Edmonton, Alberta, Canada
- 1967 Bachelor of Science with Honours (Zoology), University of Alberta, Edmonton, Alberta, Canada

AWARDS AND SCHOLARSHIPS

- Queen Elizabeth Scholarship (2): 1964-65, 1965-66
- University of Alberta First Class Standing Prize (1): 1964-65
- National Research Council of Canada Scholarship (4): 1967-68, 1968-69, 1970-71, 1971-72
- Canadian Wildlife Service Scholarship (3): 1969-70, 1972-73, 1973-74
- University of Saskatchewan Graduate Scholarship (3): 1972-73, 1973-74, 1974-75

HONOURARY AWARD

Dr. Dwernychuk was nominated by the Vietnam Veterans of America and Associates of Vietnam Veterans of America, and on September 22, 2002, invested into *The Legion of Honor* of "The Chapel of Four Chaplains" (https://en.wikipedia.org/wiki/Four_Chaplains#Chapel_of_Four_Chaplains). This honor was bestowed for his work on Agent Orange, and for recognition of Hatfield Consultants' research in Vietnam on Agent Orange and the benefits accrued to Vietnam Veterans and their families as a result of these studies. Dr. Dwernychuk is only the fifth Canadian to be invested into the *Legion of Honor* since its inception in the late 1940's, and the first Canadian west of Ontario.

SPECIFIC CAREER EXPERIENCE

The following synopses are presented as a general overview of studies with which Dr. Dwernychuk has had direct involvement:

- Viet Nam/Agent Orange/Dioxin
- Initial Environmental Evaluation Studies
 - Mining
 - Pipeline Construction
 - Thermal Power Plant
 - Housing Development
 - Oil Exploration

- Environmental Impact Assessment of Industrial Operations/Discharges
 - Mining
 - Pulp and Paper/Forest Industry
 - Chemical Industry
- Other Investigations
 - Pulp and Paper/Forest Industry
 - Fisheries
 - Impact Assessments
- Aquaculture Related Studies

COUNTRY EXPERIENCE

- | | | | |
|-------------|-----------|-------------|-----------|
| • Argentina | • Sweden | • Turkey | • Vietnam |
| • Chile | • Finland | • Thailand | • Nigeria |
| • Italy | • Russia | • Indonesia | • Germany |

KEY PROJECT EXPERIENCE

Viet Nam/Agent Orange/Dioxin

- Vietnam Veteran Who Served on the USS RANGER Aircraft Carrier during the Vietnam War (Pro Bono) - The Board of Veterans' Appeals requested an opinion on the likelihood of this veteran being exposed to Dioxin contaminated mail bags, which were delivered to the carrier from a site near the Ranch Hand Agent Orange location at Da Nang airbase. 2020
- Military-Advocacy, Inc., United States (Pro Bono) - Dr. Dwernychuk provided a written scientific opinion regarding the exposure to Agent Orange of U.S. military personnel serving on Johnston Atoll where over 32,000 55 gallon barrels of Agent Orange were being stored after the Vietnam War. 2020
- Military-Advocacy, Inc., United States (Pro Bono) - Dr. Dwernychuk provided a written scientific opinion regarding the exposure to Agent Orange of U.S. military personnel serving on over 50 U.S. military installations in Thailand during the Vietnam War. Agent Orange was used for base perimeter spraying and also throughout the confines of each of these military installations. 2020
- The New York Times Magazine/Mr. George Black (Pro Bono) - The New York Times Magazine commissioned Mr. George Black, a journalist/author, to prepare an article on Agent Orange. Dr. Dwernychuk was contacted by Mr. Black to provide a face-to-face interview on the subject of Agent Orange in Vietnam. The interview was conducted in British Columbia. 2019

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- American Vietnam Veterans (Pro Bono) - Dr. Dwernychuk provided advice, information, and opinions on the exposure of individual American Vietnam Veterans to Agent Orange/Dioxin during their service in Vietnam. This includes family members of Vietnam Veterans. Most of his involvement was assistance/opinions to Veterans or their family members struggling to receive compensation from the U.S. Department of Veterans Affairs for dioxin exposure. He is pleased to report that some Veterans, who initially were rejected for compensation, did receive their due compensation once the judiciary in the U.S. considered his written opinions on their exposure during military service. 2005 - Ongoing
 - C-123 Air Crews (Pro Bono) - Dr. Dwernychuk provided advice, information, and opinions to specific members of the C-123 Agent Orange spray planes that were returned to America following their service during the Vietnam conflict. The aircrews associated with these planes were suspected to have been contaminated by residues of Agent Orange/Dioxin remaining inside these aircraft subsequent to their return to the U.S. mainland. Aircrews submitted requests for compensation from the U.S. Department of Veterans Affairs. Dr. Dwernychuk submitted an opinion on the exposure potential of C-123 air crews to Agent Orange/Dioxin during their use in the U.S. 2016/17
 - U.S. Blue Water Navy (Pro Bono) - Dr. Dwernychuk provided advice, information, and opinions to the Blue Water Navy addressing the exposure potential of Navy service men to Agent Orange/Dioxin while they were serving on Navy ships during the Vietnam conflict. Dr. Dwernychuk's opinions centred on Navy ships in close proximity to Vietnam's land mass, specifically Da Nang Harbour. His opinions were submitted to the U.S. Department of Veterans Affairs supporting exposure of service men during the conflict. 2016 - 2019
 - U.S. Veterans who served in Panama (Pro Bono) - Dr. Dwernychuk provided advice, information, and opinions to a Veteran who served in Panama. The Veteran had multiple health issues and suspected exposure to either Agent Orange/Dioxin or 2,4,5-T, one of the herbicides in Agent Orange which contained 'dioxin', per se. Dr. Dwernychuk provided a written opinion of exposure potential which was submitted to the U.S. Department of Veterans Affairs. 2017 - Ongoing
 - Various news outlets (Pro Bono) - Dr. Dwernychuk provided opinions/articles to news outlets addressing the potential for Agent Orange/Dioxin contamination in Okinawa. He also provided opinions/articles on the use of Scientology's Hubbard Method for the excretion of dioxin from the human body (this being impossible). He provided articles on the cleanup of dioxin contaminated lands in Vietnam. 2012 - 2016

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- Ford Foundation - Dr. Dwernychuk served as supporting environmental scientist and advisor during a comprehensive investigation of dioxin residues in soils, sediments, foods, human blood and human breast milk collected on and in the vicinity of the Bien Hoa airbase, Viet Nam. 2010/2011
 - Renaissance Journalism Center, San Francisco State University - Dr. Dwernychuk presented overviews of Agent Orange and dioxin Hot Spots in Viet Nam. Fellows at the Center are travelling to Viet Nam to undertake a variety of journalistic projects in country addressing Agent Orange and its impacts. May 2010
 - Ford Foundation - Dr. Dwernychuk served as supporting environmental scientist and advisor during a comprehensive investigation of dioxin residues in soils, sediments, foods, human blood and human breast milk collected on and in the vicinity of the Da Nang airbase, Viet Nam. 2006 to 2009
 - Ford Foundation - Dr. Dwernychuk served as principle scientist on a study of dioxin residues at seven former US military bases in southern Viet Nam. 2004 to 2006
 - Agent Orange Research and Policy Briefing, Washington, D.C. - Dr. Dwernychuk was invited to present the Hatfield Agent Orange studies and comment on the most recent research on defoliant use during the Viet Nam war. The session was opened by Congressman Lane Evans. Those in attendance included the US State Department, NGOs, academics, The Viet Nam Veterans of America and embassy representatives from Viet Nam and Lao PDR. The panel meeting was sponsored by the Fund for Reconciliation and Development (New York), Oxfam America and the American Friends Service Committee. July 8, 2003
 - Dr. Dwernychuk has presented the Hatfield Agent Orange investigations at numerous venues during 2000-2003:
 - Vietnam Veterans of America Leadership Convention, Buffalo, New York
 - Vietnam Veterans of America Convention, Pennsylvania Chapter, Pennsylvania State University, University Park, PA
 - Health Canada, Ottawa, Ontario
 - Canadian International Development Agency, Ottawa, Ontario
 - University of British Columbia, Vancouver, British Columbia
 - Langara College, Vancouver, British Columbia
 - Capilano College, North Vancouver, British Columbia
 - British Columbia Institute of Technology, Vancouver Campus, Vancouver, British Columbia

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- Canadian Department of Indian Affairs and Northern Development, Ottawa, Ontario
 - Conference on the Long-Term Environmental Consequences of the Viet Nam War, Stockholm, Sweden
 - Government of New Zealand, Ministry of Health - Retained by the Ministry of Health to critique a study plan investigating dioxin contamination in humans, resulting from potential exposure to materials associated with historical chemical manufacturing (New Plymouth, New Zealand). 2002
 - Nominated by The Vietnam Veterans of America and Associates of The Vietnam Veterans of America for investiture in "The Legion of Honor" (https://en.wikipedia.org/wiki/Four_Chaplains#Chapel_of_Four_Chaplains) of "The Chapel of Four Chaplains" for work on Agent Orange and for recognition of the benefits that Hatfield's work on Agent Orange has had to Viet Nam veterans and their families. Dr. Dwernychuk is only the fifth Canadian to be vested into the Legion of Honor, and the first Canadian west of the Ontario US Coastguard Base, Cape May, New Jersey. September 2002
 - International Conference on the Ecological and Health Effects of the Viet Nam War - Invited to present the Hatfield Agent Orange studies in Viet Nam at the conference at Yale University, New Haven, Connecticut. September 13-15, 2002
 - Rockefeller University, New York - Invited to present the Hatfield Agent Orange studies at a seminar session which focussed on Agent Orange investigations in Viet Nam and Lao PDR. September 2002
 - Vietnam-United States Scientific Conference on Human Health and Environmental Effects of Agent Orange/Dioxin - Invited to present the Hatfield Agent Orange studies in Viet Nam at the international conference in Ha Noi. March 3-6, 2002
 - Development of Methodologies and Technology for Supporting Clearance of Landmines and Unexploded Ordnance (UXO) in Viet Nam - Senior Scientist. This work included using satellite remote sensing, topographic maps and military archive information to create Geographic Information System (GIS) products to efficiently provide landmine/UXO clearing personnel with historic and present day site information relevant to planning and carrying out their programs. The project also included the development of landmine/UXO clearing protocols in chemically contaminated soils and for rehabilitating cleared sites. 2001 to 2002
 - International Conference on the Long-Term Environmental Consequences of the Viet Nam War (Stockholm, July 26-28, 2002) - Served on the conference

Steering Committee, and the sub committee on “Ecosystems” for the Stockholm conference (<http://www.nnn.se/vietnam/enviro.htm>). 2000 to 2002

- **United States National Institute of Environmental Health Sciences (NIEHS)** - Served as a member of an *Ad Hoc* Panel charged with developing strategies for investigating the environmental/human health consequences of herbicide use during the Viet Nam War. Discussions preceded the signing of a collaborative agreement between the US and Viet Nam to initiate in-country investigations. 2000 to 2001
- **Royal Danish Embassy, Ha Noi, Viet Nam** - Senior Scientist. Investigations on dioxin contamination of soils near a former US military fire base in Quang Tri province, Viet Nam. 1999 to 2000
- **Environmental Impacts and Mitigation Strategies, Addressing the Use of Agent Orange Herbicide During the Viet Nam War, Aluoi Valley, Viet Nam** - Senior Scientist. Studies involved field investigations, laboratory analyses and preparation of two reports (October 1998 and April 2000) focussing on soils, food, human blood and breast milk. Recommendations were prepared in order to assist local authorities in reducing contaminant exposure and intake. Studies extended from 1994 to 2000. Studies were funded by various Canadian government agencies. 1994 to 2000
- **Hatfield general photos from Vietnam related to our research:**

1 ... Copy the URL link into your browser or click on the link:

<https://www.dropbox.com/sh/6wfn8cdnuj2n57r/AADhowfFRk0-WyV45XFqkooXa?dl=0>

2 ... At the top of the page see **cutlines**; click on **cutlines**:

A LISTING OF EACH PHOTO IS PRESENTED WITH A PREFEX TO THE NUMBER NAMING THE PHOTOGRAPHER, WITH A BRIEF DESCRIPTION OF THE PHOTO. AT THE VERY TOP OF THIS PAGE IS A LISTING OF THE PHOTOGRAPHER.

YOU MAY USE ANY PHOTO YOU WISH WITHOUT SEEKING PERMISSION BEFOREHAND. HOWEVER, PLEASE GIVE CREDIT TO THE PHOTOGRAPHER.

- **Hatfield 2000 report photos from A Loui (A Shau, named so during the war) Valley, Vietnam:**

https://www.hatfieldgroup.com/wp-content/uploads/AgentOrangeReports/CIDA849/CIDA849_Agent_Orange_V1_Report_Plates.pdf

Initial Environmental Evaluation Studies

The following studies involved collection, analysis and interpretation of physical/chemical/biological data associated with aquatic systems located near proposed developments; these facilities had the potential for environmental disruptions due to physical and/or chemical factors related to construction/operation of the development.

Mining

- **Lakefield Research** (a division of Falconbridge Limited), Lakefield, Ontario – Data analysis and synthesis focusing on benthic macroinvertebrate communities in Meadow and Fairless Creeks. 1992
- **Strathcona Mineral Services Limited** (Midway Project) – Project Manager; Principal Aquatic Scientist; Author. 1990
- **Corona Corporation** (Mt. Milligan Project) – Aquatic Scientist; Contributing Author. 1990
- **Minnova Inc.** (Samatsum Mountain Project) – Principal Aquatic Scientist; Contributing Author. 1988
- **Esso Minerals** – Principal Aquatic Scientist. 1988
- **Skyline Explorations Limited** – Contributing Author. 1987
- **Mascot Gold Mines Limited** (Hedley, British Columbia) – Project Manager; Principal Aquatic Scientist; Author. 1985
- **Utah Mines (Carbon Creek)** – Project Manager; Principal Aquatic Scientist; Contributing Author. 1982
- **Cadillac Explorations Limited** (Northwest Territories rivers and streams) – Project Manager; Principal Aquatic Scientist; Author. 1980 to 1982
- **Pan Ocean Oil Ltd.** (Yukon rivers and streams) – Principal Aquatic Scientist; Contributing Author. 1979
- **Erickson Gold Mines** (Yukon rivers and streams) – Principal Aquatic Scientist; Contributing Author. 1978
- **DuPont of Canada Explorations Limited** (Northern British Columbia streams) – Project Manager; Principal Aquatic Scientist; Author. 1976
- **Texas Gulf Inc.** (Northern British Columbia streams) – Project Manager; Principal Aquatic Scientist; Author. 1975

Pipeline Construction

- **Foothills Pipeline Ltd.** (Yukon rivers and streams) – Field Scientist. 1979

Thermal Power Plant

- **British Columbia Hydro** (Hat Creek) – Project Manager; Principal Aquatic Scientist; Contributing Author. 1980 to 1981

Housing Development

- Daon Development Corporation (Vancouver, British Columbia) – Principal Aquatic Scientist; Contributing Author. 1975

Oil Exploration

- Panarctic Oils Limited (near the High Arctic islands) – Field Scientist. 1975

Environmental Impact Assessment of Industrial Operations/Discharges

The following studies involved assessment of industries on aquatic environments (i.e., physical, chemical and biological), where physical/chemical issues related to the development may have impacted local environments. Dr. Dwernychuk served as Project Manager, Principal Aquatic Scientist and Author for all the following studies:

Mining

- Noranda (Bell Mine), Granisle, British Columbia. 1991
- Expert witness re: impact of a supernatant spill into Babine Lake, British Columbia
- Noranda (Bell Mine), Granisle, British Columbia. 1988 to 1989
- Skyline Explorations Limited, Vancouver, British Columbia. 1988 to 1989
- Corona Corporation Ltd. (formally Mascot Gold Mines Ltd.), Vancouver, British Columbia. (Two studies). 1986 to 1987
- DuPont of Canada Explorations Limited, Vancouver, British Columbia. 1982
- Highland Valley Copper, Logan Lake, British Columbia. 1975 to 2002

Pulp and Paper/Forest Industry

- MacMillan Bloedel Limited, Powell River, British Columbia. 1988 to 1989
- Quesnel River Pulp Company, Quesnel, British Columbia. (Approximately 5 studies). 1982 to 1987
- Celgar Pulp Company, Castlegar, British Columbia. (Approximately 4 studies). 1980 to 1988
- Expert witness on Environmental Appeal Board Hearings (effluent impacts on the river receiving environment)
- Skeena Cellulose Inc., Prince Rupert, British Columbia. (Approximately 11 studies). 1979 to 1989
- Manitoba Forestry Resources Limited, The Pas, Manitoba. 1979 to 1980
- Crestbrook Pulp and Paper Ltd., Skookumchuk, British Columbia. 1979
- Canadian Forest Products Ltd., Port Mellon, British Columbia. 1978
- Proctor and Gamble of Canada Limited, Grande Prairie, Alberta. 1977 and 1980
- Cariboo Pulp and Paper Company, Quesnel, British Columbia. (approximately 12 studies). 1975 to 1987

- **Prince George Pulp and Paper Limited**, Prince George, British Columbia. (Approximately 12 studies). 1975 to 1987
- **Northwood Pulp and Timber Limited**, Prince George, British Columbia. (Approximately 12 studies). 1975 to 1987
- **Intercontinental Pulp Company Limited**, Prince George, British Columbia. (Approximately 12 studies). 1975 to 1987
- **Pacifica Papers**, Powell River, British Columbia. 1998 and 1999
- Expert witness on Environmental Appeal Board Hearings (impacts of recovery and power boiler emissions on the marine environment).

Chemical Industry

- **Ocelot Ammonia Company**, Kitimat, British Columbia. 1989
- **FMC of Canada Ltd.**, Squamish, British Columbia. 1975 to 1990

Other Investigations

Pulp and Paper/Forest Industry

- **International Finance Corporation (World Bank Group)**, Washington, DC – Expert Panel member reviewing the environmental impacts of two bleached Kraft pulpmill developments in Uruguay. 2006
- **Project Director/Senior Aquatic Scientist** for pre-design and design phases of the Environmental Effects Monitoring program for each industrial complex related to the federal *Fisheries Act* (Cycle One: 1993-1996; Cycle Two: 1997-2000; Cycle Three: 2001-2004). Studies are required in the vicinity of all pulp and paper mills in Canada to assess environmental effects of wastewater discharges.
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Crofton Pulp and Paper, Crofton, British Columbia
 - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Elk Falls Pulp and Paper, Campbell River, British Columbia
 - NorskeCanada, Port Alberni, British Columbia
 - NorskeCanada (formerly MacMillan Bloedel Limited), Powell River Division, Powell River, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Port Alice Operation), Port Alice, British Columbia

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- Canadian Forest Products Ltd., (formerly Northwood Pulp and Timber Limited), Prince George, British Columbia
 - Cariboo Pulp and Paper Company, Quesnel, British Columbia
 - Quesnel River Pulp Company, Quesnel, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia
 - Tembec Industries Inc. (formerly Crestbrook Forest Industries Ltd.), Cranbrook, British Columbia
 - Celgar Pulp Company Castlegar, British Columbia
 - Fiberco Pulp Inc., Taylor, British Columbia
 - Scott Paper Limited, New Westminster, British Columbia
 - Weyerhaeuser Canada Ltd., Kamloops, British Columbia
 - **Sandwell Inc., Vancouver, British Columbia** – Senior Aquatic Scientist on an Environmental Impact Statement regarding a greenfield pulpmill in Sabah, Malaysia. 1999
 - **Project Manager and Principal Aquatic Scientist** for implementation of dioxin/furan trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. 1996 to Present
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia
 - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Crofton Pulp and Paper, Crofton, British Columbia
 - Norske Skog Canada Limited (formerly Fletcher Challenge Canada), Elk Falls Pulp and Paper, Campbell River, British Columbia
 - Pacifica Papers Inc. (formerly MacMillan Bloedel Limited, Powell River Division), Powell River, British Columbia
 - **NLK Consultants Inc., Vancouver, British Columbia** – Project Manager, Principal Aquatic Scientist for a study involving a potential pulpmill in Central Kalimantan, Indonesia. 1994
 - **Project Manager and Principal Aquatic Scientist** for implementation of dioxin/furan trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. 1993, 1994 and 1995
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia

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- Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
 - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
 - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
 - MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia
 - **Institute of Ecological Toxicology, Baikalsk, Irkutsk Region, Russia** – Invited to attend a symposium on "Environmental Chemistry and Toxicology of Chlorinated Organic Pollutants". 1990
 - **Western Pulp Inc., Western Pulp Limited Partnership (Port Alice Operation), Port Alice, British Columbia** – Environmental overview of Neurotsos Inlet, related to pulpmill effluent discharges. 1992
 - **Sandwell Inc., Vancouver, British Columbia** – Project Manager/Senior Environmental Scientist for an independent evaluation of an initial environmental assessment report (bleached Kraft pulpmill in Sumatra, Indonesia) submitted by an environmental consultant to Sandwell Inc. Dr. Dwernychuk was retained by CIDA through Sandwell to provide a critique on the document following a site visit and discussions with other project professionals. 1992
 - **Project Manager and Principal Aquatic Scientist** for implementation of dioxin/furan trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. 1992
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia
 - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
 - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
 - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
 - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
 - MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia
 - Campbell River Mills Ltd., Campbell River, British Columbia
 - **External Affairs and International Trade Canada** – Invited to attend and participated in a Pulp and Paper Trade Mission to Indonesia. Presentation of

qualifications/experience, mill visits, and formal functions in Jakarta, Bali, and Surabaya. 1992

- **Weyerhaeuser Canada Ltd., Kamloops, British Columbia** – Data analysis and synthesis focusing on benthic macroinvertebrate communities of the Thompson River. 1991 to Present
- **H.A. Simons Limited, Vancouver, British Columbia** – Senior Aquatic Scientist on an Environmental Impact Assessment Study of a proposed pulp mill in East Kalimantan, Indonesia (PT Kiani Kertas, Jakarta, Indonesia). 1991 to 1994
- **Canadian Pulp and Paper Association** – Advisor to the industry on the design and implementation of the proposed federal regulations focusing on Environmental Effects Monitoring. 1991 to 1992
- **H.A. Simons Limited, Vancouver, British Columbia** – Initial Environmental Evaluation of a proposed greenfield pulp mill in East Kalimantan (PT Kiani Kertas, Jakarta, Indonesia). 1991
- **Project Manager and Principal Aquatic Scientist** for implementation of dioxin/furan trend monitoring studies in sediments and biological tissues collected from marine environments associated with each industrial complex. 1991
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia
 - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
 - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
 - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
 - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
 - MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia
 - Raven Lumber, Campbell River, British Columbia
- **Project Manager and Principal Aquatic Scientist** for dioxin/furan studies in biological tissues collected from remote regions along the British Columbia coast. 1991
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia

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- Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
 - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
 - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
 - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
 - MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Port Alberni, British Columbia
 - **International Conference: Environmental Fate and Effects for Bleached Pulpmill Effluents; Stockholm, Sweden** – Co-authored a paper titled *Monitoring Environmental Effects of the Pulp and Paper Industry: A Regulatory Approach*. November 1991
 - **Project Manager and Principal Environmental Scientist** for baseline organochlorine contamination studies in the Fraser and Thompson Rivers (effluents, drinking water, sediments, biological tissues). 1990 to 1991
 - Northwood Pulp and Timber Limited, Prince George, British Columbia
 - Prince George Pulp and Paper Limited, Prince George, British Columbia
 - Intercontinental Pulp Company Limited, Prince George, British Columbia
 - Cariboo Pulp and Paper Company, Quesnel, British Columbia
 - Weyerhaeuser Canada Ltd., Kamloops, British Columbia
 - **British Columbia Ministry of Environment, Victoria, British Columbia** – Project Manager and Principal Environmental Scientist for dioxin/furan sample collections: Lower Mainland/ Vancouver Island/Skeena/Interior Regions (pulp and paper/forest industry sites in addition to PCB storage sites, oil refineries, sewage sludge, municipal waste, biomedical waste). 1990 to 1991
 - **Project Manager and Principal Environmental Scientist** for development and implementation of comprehensive effects monitoring of pulpmill effluents on the marine receiving environment of Howe Sound (effluents, receiving waters, bottom sediments, subtidal benthic macroinvertebrate communities, contaminant loading in biological tissues, etc.). 1990 to 1991
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc./Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - **Skeena Cellulose Inc., Prince Rupert, British Columbia** – Project Manager and Principal Environmental Scientist for development and implementation of comprehensive effects monitoring of pulpmill effluents on the marine receiving environment near Skeena Cellulose (effluents, receiving waters, bottom sediments, subtidal and intertidal benthic macroinvertebrate communities, macroalgae, contaminant loading in biological tissues, etc.). 1990 to 1991

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- **Crestbrook Forest Industries Ltd., Cranbrook, British Columbia** – Project Manager and Principal Environmental Scientist for baseline organochlorine contamination studies in the Kootenay River (effluents, drinking water, receiving waters, sediments, biological tissues). 1990 to 1991
 - **Project Manager and Principal Environmental Scientist** for environmental studies addressing organochlorines in the forest industry and their concentration in receiving waters, effluents, sediments and biological tissues (i.e., groundfish, crab, prawns, clams, oysters) collected from marine receiving environments associated with the forest industry operations. 1990
 - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
 - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
 - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
 - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia
 - Raven Lumber, Campbell River, British Columbia
 - **MacMillan Bloedel Limited, Alberni Pulp and Paper Division, Alberni, British Columbia** – Project Manager and Principal Environmental Scientist for environmental studies addressing organochlorines in pulp and paper discharges at Port Alberni (effluents, receiving waters, sediments and biological tissues). 1990
 - **United Nations Economic Commission for Europe – Task Force on the Environment, Baikalsk (Lake Baikal), USSR** – Presented studies on the effects of pulpmill effluents on receiving waters in British Columbia, Canada. Participated in Workshop and Task Force activities regarding a United Nations document on environmental impacts and prediction. 1990
 - **Orenda Forest Products Ltd., West Vancouver, British Columbia** – Project Manager and Principal Aquatic Scientist for environmental activities/assessments related to the proposed pulpmill near Stewart, British Columbia, subsequently relocated near Terrace, British Columbia. 1990
 - **Project Manager and Principal Environmental Scientist** for supplementary sampling and chemical analyses (organochlorines) on biological tissues collected from additional sites near each pulp and paper operation. 1990
 - Fletcher Challenge Canada, Crofton Pulp and Paper, Crofton, British Columbia
 - Fletcher Challenge Canada, Elk Falls Pulp and Paper, Campbell River, British Columbia
 - MacMillan Bloedel Limited, Harmac Division, Nanaimo, British Columbia
 - MacMillan Bloedel Limited, Powell River Division, Powell River, British Columbia

- **Project Manager and Principal Environmental Scientist** for environmental studies in the Fraser River system addressing organochlorines in pulp and paper effluents (Western Canada pilot study related to the proposed federal environmental monitoring guidelines for Canadian pulp and paper mills). These studies focus on the chemical characterization of mill effluents, receiving river water and river bottom sediments, bioassays on raw effluents and dilution of ambient river water, benthic macroinvertebrate communities and fish tissue analyses involving enzyme activation tests and contaminant loads. 1989 to 1990
 - Northwood Pulp and Timber Limited, Prince George, British Columbia
 - Prince George Pulp and Paper Limited, Prince George, British Columbia
 - Intercontinental Pulp Company Limited, Prince George, British Columbia
 - Quesnel River Pulp Company, Quesnel, British Columbia
 - Cariboo Pulp and Paper Company, Quesnel, British Columbia
 - Environment Canada
 - British Columbia Ministry of Environment
- **Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia** – Project Manager and Principal Environmental Scientist for water quality studies and dioxin/furan studies on crab tissues collected from Howe Sound. 1989 to 1990
- **Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia** – Project Manager and Principal Environmental Scientist for dioxin/furan studies on dredge material collected near the Western Pulp operation. An assessment of bottom materials for ocean dumping approval by Environment Canada. 1989 and 1990
- **Project Manager and Principal Environmental Scientist** for environmental studies addressing organochlorines in pulp and paper effluents (i.e., guaiacols, extractable organic halides, dioxins, furans) and their concentration in sediments and biological tissues (i.e., groundfish, crab, prawns, mussels) collected from marine receiving environments associated with pulp and paper operations. 1988 to 1989
 - Howe Sound Pulp and Paper Limited, Port Mellon, British Columbia
 - Western Pulp Inc., Western Pulp Limited Partnership (Squamish Operation), Squamish, British Columbia
 - Skeena Cellulose Inc., Prince Rupert, British Columbia
- **H.A. Simons Ltd., Vancouver, British Columbia** – Principal Environmental Scientist and Author for environmental impact assessment of a proposed bleached kraft pulpmill on Rio Uruguay, Argentina. On-site investigations were undertaken in Argentina and Uruguay. 1988 to 1989

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- **Principal Environmental Scientist and Author** conducted visits to Sweden, Finland and West Germany to obtain environmental perspectives regarding chlorinated organics in pulpmill effluents. Government and industry agencies were interviewed (regulatory and research groups) to assess conditions in the Baltic Sea and Bay of Bothnia. 1988
 - MacMillan Bloedel Limited, Vancouver, British Columbia
 - Fletcher Challenge Canada, Vancouver, British Columbia
 - Western Pulp Inc., Vancouver, British Columbia
 - Cariboo Pulp and Paper Company, Vancouver, British Columbia
 - **Northwood Pulp and Timber Limited, Prince George, British Columbia** – Project Manager, Principal Aquatic Scientist and Author for thermal profiling of the Fraser River near the effluent diffuser related to expansion of the mill facility. 1988
 - **Skeena Cellulose Inc., Prince Rupert, British Columbia** – Project Manager, Principal Aquatic Scientist and Author for environmental impact studies and assessment of pulpmill effluent on water quality, subtidal and intertidal benthic invertebrates, intertidal macroalgae, sediments and fish utilization. 1987 to 1988
 - **Crestbrook Pulp and Paper Ltd., Skookumchuk, British Columbia** – Principal Aquatic Scientist for studies examining the psychophysical impacts of pulpmill effluent colour (Kootenay River) on human observers randomly selected from Cranbrook, British Columbia. 1977
 - **Turkish State Organization for the Pulp and Paper Industry, Ismit, Turkey** – Principal Aquatic Scientist and Author for biological and water quality studies of Karamik Lake, Turkey, prior to receipt of effluents from a proposed pulpmill complex. 1976

Fisheries

- **Estudios Technicos Ltda., Bogota, Colombia** – Project Manager, Principal Aquatic Scientist and Author for study reviews focusing on hydroelectric reservoir clearance of forested areas and associated impacts on water quality and fish production. 1984
- **Ladner Downs, Barristers and Solicitors, Vancouver, British Columbia**
- **Campney and Murphy, Barristers and Solicitors, Vancouver, British Columbia**
- Expert advisor to defense counsel for clients charged with the discharge of deleterious substances into fish-bearing waters. 1981
- **Department of Fisheries and Oceans, Vancouver, British Columbia** – Authored a report on the effects of the proposed Kemano II project on chinook salmon resources of the Nechako River. 1975

Impact Assessments

- **Peigan Nation, Brocket, Alberta** – Principal Aquatic Scientist and Author on Assessment of the effects of the proposed Oldman River Dam on fisheries resources, water quality, benthic communities and associated parameters of the Oldman River situated within the Peigan Reserve boundary. 1986
- **Dene Nation, Yellowknife, Northwest Territories** – Principal Aquatic Scientist and Author for preparation of a training manual for winter and summer environmental monitoring addressing hydrocarbon, mining and road developments in the north. Workshops and seminar sessions were held in Northwest Territories communities with local Dene people. 1985
- **Dene Nation, Yellowknife, Northwest Territories** – Project Manager and Principal Aquatic Scientist for participation in the development and implementation of a major fisheries program in the Mackenzie River addressing potential contaminants in fish tissues. 1985
- **N.D. Lea Associates, Vancouver, British Columbia** – Principal Aquatic Scientist and Contributing Author on Aquatic studies on the impact of the Annacis Bridge freeway alignment. 1982
- **British Columbia Hydro, Vancouver, British Columbia** – Project Manager, Principal Aquatic Scientist and Contributing Author on pre-construction monitoring of fisheries and invertebrate fauna in Hat Creek and the Bonaparte River related to the Hat Creek power project. 1981
- **Public Works Canada, Vancouver, British Columbia** – Principal Aquatic Scientist and Author on studies assessing the impact of improvements to the Fraser River shipping channel on benthic fauna. 1981
- **Department of Supply and Services (Canada)** – Principal Aquatic Scientist and Author on studies reviewing the impact of linear facilities in northern ecosystems on aquatic habitats. 1979
- **Twinriver Timber Limited, Terrace, British Columbia** – Project Manager, Principal Aquatic Scientist and Author on studies addressing the use of a logging canal by spawning salmonids. Examined sediment structure as a factor in limiting use of gravels for spawning. 1977

Aquaculture Related Studies

- **Aquastar Services Limited and Farmers, Bangkok, Thailand** – Hatfield Consultants conducted extensive field studies and an Environmental Impact Assessment (EIA) of a large shrimp farming development in Ranot area of southern Thailand. The project supported 400 ha of shrimp ponds with plans to expand to 10,000 ha. The work involved assessment of land, freshwater and marine resources in the area, an evaluation of impacts of the project on these resources and the formation of a mitigation plan. An oceanographic computer

model was developed by the study team for the west coast of the Gulf of Thailand to assist in the process.

- Dr. Dwernychuk was responsible for design and supervision of water quality and macroinvertebrate surveys and interpretation of impacts on these preceding resources. He also directed design of the mitigation plan. 1990 to 1992
- Canadian International Development Agency (CIDA), Ottawa, Ontario, Canada – Contributing Aquatic Scientist for environmental review/assessment of aquaculture facilities (hatchery and marine grow-out sites) – Hong Kong, Thailand, Singapore and Indonesia. 1989 to 1990
- Moore-Clarke Co. Inc., Vancouver, British Columbia, Canada – Aquatic Scientist for site selection studies for hatchery and marine grow-out facilities in Chile (aerial and ground reconnaissance programs). 1988
- Patagonia Salmon, S.A., Buenos Aires, Argentina – Aquatic Scientist for pre-feasibility investigations regarding development of salmon farming operations and joint ventures in Argentina. 1988
- Aqua Terra Technologies Limited, Victoria, British Columbia, Canada – Contributing Aquatic Scientist and Author for feasibility studies on a land-based salmon farm in British Columbia. 1987
- Salt Spring Aquafarms Ltd., Salt Spring Island, British Columbia, Canada – Principal Aquatic Scientist for Training programs for salmon farm personnel regarding water quality control, experimentation and data analyses. 1987
- Salt Spring Aquafarms Ltd., Salt Spring Island, British Columbia, Canada – Principal Aquatic Scientist for design of *in situ* monitoring programs for a salmon farm in British Columbia. 1987
- Hatfield International S.A., Puerto Montt, Chile – Contributing Aquatic Scientist advising personnel in Chile. Activities involved water quality, administrative issues and general pollution control at joint venture salmon hatchery and marine grow-out sites. 1986 to 1988
- Subsecretaria de Pesca, Fisheries Department, Santiago, Chile – Executive Director for preliminary on-site field activities related to transplanting salmon to Chilean coastal waters. 1982
- Electrowatt Consulting Engineers and Planners, Zurich, Switzerland – Project Manager, Principal Aquatic Scientist and Author for studies on the fisheries potential of a hydroelectric reservoir for increasing fish as a Native food resource in remote areas of Nigeria. On-site activities in Nigeria were supplemented with literature reviews at Food and Agricultural Organization libraries in Rome, Italy. 1982