

Reaction to Chemical Pollution Along the Awapiko: A Case Study of Increasing Ecological Awareness

Robert J. Gregory

Department of Psychology, Massey University, Palmerston North, New Zealand
Fax: 64 06 3505673 E-Mail: R.J.Gregory@massey.ac.nz

KEY WORDS Chemical Pollution. Ecological Rehabilitation. Prevention.

ABSTRACT Awareness of chemical pollution in the environment begins with personal experiences, grows with access to information and questions, and results in activism designed to prevent further abuse and to rehabilitate our human environments. Those concerned with chemical pollution need to provide leadership in teaching others, in building support in communities, and in promoting more ecologically appropriate ways to live. The Awapiko Stream Valley (pseudonym) represents a case study where chemical pollution presents problems for the people and environment. The people of the valley became concerned and have been trying to change the social and political system to regain an ecologically sound environment.

INTRODUCTION

Awareness of chemical pollution problems comes only gradually to people neither trained nor experienced in chemistry, environmental and public health, or toxicity. Perhaps awareness arrives even more slowly when advertisements and media claim that you have left behind the polluted Northern Hemisphere when you go to live in unpolluted, clean and green New Zealand.

But, one begins learning by noting small planes and occasional helicopters buzzing over the green farmlands - spraying fertilizers and agricultural chemicals in wide swaths. If the wind is blowing in the right direction, you get a taste or smell of whatever chemical is being distributed. If the wind abates, you won't gain a direct experience, at least not sufficient to detect. Still, at some point, you may wonder "just how clean are vegetables, milk, lamb, or other farm products?" What are the standards or levels tolerated or likely to "get by?" Slowly one becomes aware that "export quality" is of a far higher standard than are food products for "local consumption." Local products are rarely tested for pesticides or other residue problems.

PERSONAL INCIDENTS: THE PROCESS OF BECOMING AWARE

One time we drove through the countryside to spend a week on holiday. As we followed friends, I still vividly recall the big blue tractor on a block of orchard land located to the left. The tractor was creating a big cloud, which the wind caught and pushed right into our path. Thinking that it was dust, I was not alarmed, but by the time we were entering the cloud, I realized it was a chemical spray. I had a flash vision of the tractor driver, hooded and cloaked in protective gear. I rolled up my windows and made sure that my family had all windows up. We drove through - a brief whiteout - and eventually arrived at our destination. My colleague, who drove ahead of us said he did not have time to get his windows up. There was nothing he could do. His family breathed in the fumes and dust and chemical spray particles. I noted the time, exact location, and identifying features of the scene, and upon return later, wrote a letter to the powers that be asking about the chemicals used. They promised to investigate, but nothing ever came of it. Their eventual letter said they could not identify the site!

I recall also when I heard from two different individuals that methyl bromide, an extremely strong substance, was used to sterilize soil in the Awapiko Valley, not far from the bore and source of drinking water. Methyl bromide is a poison which is why it is used to fumigate soil. It creates havoc with the environment, and is implicated in destruction of the ozone layer with effects more powerful than CFCs. Let loose in a water system, methyl bromide could be deadly. I checked information at the library and then, acting on the best interests of the public, called the Health Department, stating that methyl bromide was being used, that it could be adverse to public

health, and could they please check. They said they did - replying that "there was no danger." I am not so sure, for bromide can remain in the ground, and the ground water, virtually forever!

I remember also reading about a committee in charge of water rights in a trout stream downstream of the Awapiko giving permission to a factory to dump "small amounts of chrome" as used in wool processing. Knowing that chrome would never disappear, I wondered what information these people had, what their expectations of the future were, and why they so freely gave "permission." It bothered me that this information was reported in the newspaper - were they not even sophisticated enough to cover up their guilt by hiding the facts! I certainly felt guilty that I did not try to intervene myself, right then and there.

In any case, along with others, I read the daily newspapers and remained alert to the problems of chemical pollution. There was no difficulty in finding items of interest. One report appeared about results of a blood test among orchard workers which demonstrated "safer spraying habits". Some of those who "changed" their habits were reported as having their blood level concentrations of chemicals come back to acceptable or even normal levels. The check carried out by a Health Development Unit programme, was for absorption of organo-phosphate pesticides. Another example concerned interest by the agricultural chemical companies in investigating the methods used by a homeopath. It seemed that the homeopath made the mistakes of claiming "that tens of thousands of New Zealanders were suffering from pesticide poisoning". Of course, the Agricultural Chemical Manufacturers Association said that such claimed links were "unproven."

Another item in the same newspaper told the story of a young man in hospital. The mother claimed that orchard workers were indiscriminately spraying when children were biking to school on roads next to orchards, and she believed her son to have been severely affected by chemical poisoning. But such claims were not unusual, at least in my reading over the past few years. How many instances have been not reported would be an even more intriguing question!

A More Active Interest

One day, while working in the back-yard garden, I heard the sound of the neighbour's tractor, systematically going back and forth. Slowly, ever so slowly, it came to me that something was going on beyond the pine tree shelter belts - the orchard owner or one of his workers was up to something. Behind the chicken coop, I spied a person going by with a sprayer attached - and as I turned to flee, I yelled out "What are you spraying?" He replied as I was busy running towards the house, "Paraquat!"

I persuaded my daughter to come into the house too, even though she was not convinced. I told my wife, "Our neighbour is out spraying Paraquat, and people and kids are only ten or twenty feet away in their backyards! Can you imagine?"

After worrying for several days, I wrote to the powers that be asking about what substances were being sprayed, and what my rights were, and sent the letter off to the Department of Health. While waiting for a reply, I watched for additional information. And I compared notes with neighbours. The man next door lost several small citrus trees, about the same time our backyard grapefruit tree died. "Why", we asked each other?

Getting into the Facts

The Medical Officer of Health wrote that the department investigated my questions, including an unproductive visit in October and a more useful visit in December to the orchard in question. The report totalled 4 pages, plus the accompanying letter and an abstract from another report. To me, the tone of the report and letter were set by the inclusion of a statement to the effect that "the fact that paraquat as a herbicide would never be sprayed in an orchard indicated no cause for undue alarm."

Nevertheless, it is instructive to note that the Ministry of Agriculture and Fisheries "spray programmes are used for all orchard fruit." These include fungicides: Bordeaux, Topsin, and Ronilin, with the possibility that Bravo may be substituted for Bordeaux in the coming next season. Insecticides include Bordeaux, Agrimycin, Systhane, Pallinal, Captan, and Lorsban, along with plans for using azinphos methyl and potentially

Carbaryl in the future. Paraquat, the herbicide, was reported to be held in a large container, but the container appeared to be very old. Further, it was claimed that Paraquat would only be applied by hand wand, and never sprayed. This directly contravened what I had seen and what Mr. Orchard (pseudonym) or his worker told me. I also remembered strips of dead grass under the fruit trees - could that have been the effect of directed spray of Paraquat?

The fungicides and herbicides were said to be sprayed during the days, as required, and only during still wind conditions (still wind conditions are extremely rare in this region). Further, insecticides were sprayed at night "because of wind conditions and to avoid potential spray problems to neighbours and his own family." Yet some of the statements in the report were contradictory as "Whenever possible he avoids spraying when neighbours are likely to be outdoors." Backyard barbecues in the evening, children playing in the early morning and late afternoon, and people gardening or working on lawns every day certainly would make it impossible to spray, so it seemed to me. I could not be sure as to what "whenever possible" really meant.

The failure of the person who wrote the report to even consider the possibility that organic orchards are possible was clearly evident with the statement that "It is not practical to run a commercial orchard without the aid of pesticides and there must always be some risk associated with the use of chemicals of this nature." The writer also glosses over the goodwill and wisdom of the orchard owner:

I believe Mr. Orchard is fully aware of the potential dangers of the chemicals being used and is taking adequate precautions in their use . . . His spraying procedures appear to have considerable thought for the safety of the neighbouring properties . . . I believe Mr. Orchard is very aware of the potential dangers to health and public alarm with the use of pesticides . . .

One of the fundamental problems was touched on, although with a revealing error:

This type of public concern can in many instances be avoided by careful thought at the initial town planning stages. This is a typical (sic) example of problems caused

when residential areas are allowed to be built on the periphery of horticulture blocks.

Of course, the horticultural block was given permission to be built adjacent to the residential block some 20 years after the residential area was established. But the writer transposed who did what and when, quite naturally, when his or her orientation is considered.

When I perused several library books and various reports, I found my answer about paraquat and citrus. Citrus trees are particularly susceptible to paraquat poisoning. I found a lot more information too, about the deadly effects of many pesticides, insecticides, and herbicides.

In January I wrote to the Occupational Health and Safety Official of the Department of Labour in response to a radio presentation the week before:

I listened to a programme that described how you would be checking on farmers use of chemicals . . . I would like to express some thoughts to you about the experiences I have had here in the Awapiko valley. I have lived here for over six years now, and am building a home on my block - so I have long term interests and involvement here. The stretch I am particularly concerned about is the land and stream that runs . . . across the Awapiko . . . of course, the entire catchment area as well as downstream. This stream or river is a trout spawning area, so is extremely important to the local fishery. The sheep farmer nearby uses 245-T to control Gorse, the prickly shrub, each year. He purchased an extra stock when 245-T was going out of style - to be sure of having enough . . . in the future. . . Further upstream, a horticulturalist uses methyl bromide to fumigate his soil . . . Further downstream, the orchard is small, but with a diversity of fruit crops, Mr. Orchard (name changed) sprays with a variety of chemicals - including Paraquat - and houses are adjacent.

Residents do not have any warning as to when he might spray, no knowledge of what chemicals are being used, no awareness of the dosages they might receive, and no understanding of prevention or treatment for effects. My neighbours and I have lost

citrus trees in our backyards - an apparent effect of Paraquat poisoning from what I have read about Paraquat. Some residents have noted teary eyes the morning after spraying is carried out. I certainly wish there were advance warning, and an indication as to what is being sprayed.

I am concerned about the effects of these and other chemicals on residents, on the crops that are being produced and marketed, and on the stream and its trout and other creatures. As a resident in the area, I wonder what my rights are, and what I can do as a responsible person to protect myself, my family, and my neighbourhood from toxic poisons and dangerous misuse of chemicals.

Stating that I would appreciate any ideas or information, I sent copies to several people I felt might share my interest, and waited.

In a reply, the officer recited the responsibilities of the Occupational Safety and Health Service, maintaining that

our focus is very specifically directed towards the safety and the health of persons employed on farms, rather than on the broader implications of chemical usage for the owners of neighbouring properties, or on environmental effects generally.

However he went on with an even more interesting statement:

it is difficult to isolate the issues that we are concerned with from the broader matters that you address in your letter and at a local level, I am considering at the moment the possibility of putting together some sort of seminar driven promotional campaign later in the year targeted at farmers at which I hope to provide information on alternatives to some of the chemicals that are currently in use, as well as dealing with all aspects of safety in the application of chemicals and their mixing and storage. . . .

Perhaps the dominant theme that is coming through from our Inspection programme, is that many chemical users in the agricultural sector are simply not sufficiently aware of how toxic some of the materials they are handling are, and are not sufficiently rigorous in observing safety precautions when

using the materials. There is also evidence that some greater efforts should be made to pursue alternative less toxic materials, as substitutes for some of those that are still being used. These are all matters that I would like to pursue with agricultural organisations in co-operation with other agencies, but clearly resources and other priorities will need to be taken into account.

Still More Information

After reviewing the readily available statistics and tight organization available in developed countries, Jeyaratnam (1986) noted a "paucity of data" about chemicals and their effect on health, a lack of scientific knowledge, interest and evidence, the dumping of banned pesticides and other chemicals, a failure to control use and abuse by authorities and the governments, a lack of appropriate clothing and prevention devices, a failure to train users, license sellers, and maintain equipment, and so on in the third world (my underlines). He claimed

In conclusion I wish to confirm that all evidence points to the existence of an acute and usually large problem covering the health hazards due to pesticides in the countries of the developing world . . .

An article in the *Wanganui Peoples' Access Magazine* (1985) by Peter Horsley stated that the Pesticides Act 1979 and the Pesticides Regulations 1983 control use of sprays and the drifting of sprays. If someone's property is affected, redress can be gained under criminal proceedings, which requires the person affected to prove in court that the herbicide was applied in a "reckless" manner and that damage resulted. This is an extremely difficult case to prove in a court of law. A civil claim for damages is possible under the law of negligence, the law of nuisance, or a development from the law of nuisance - the *Rylands versus Fletcher* doctrine (when a "dangerous thing" escapes from one property to another). Horsley states that a "high standard of proof" is required by the courts, generally including clearly defined economic loss.

In a submission to the Secretary of the Pesticides Board of the Ministry of Agriculture and Fisheries (1985) Horsley and Ritchie offer an alternative procedure because of the unsatisfactory

nature of then current regulations, that is, "the current imbalance that is weighted in favour of the spraying fraternity." Their plan would be based on the nuisance and *Rylands v Fletcher* principles and a proven cause and effect relationship.

Most sadly, the law however, has obvious limitations when it comes to promoting positive alternatives to the use of damaging sprays. Public knowledge and acceptance of integrated pest control using biological methods, organic and biodynamic practices is scant to say the least (Horsley, 1985).

The Search for Environmental Rehabilitation

"Freedom is just another word, when there's nothing left to lose" sang Janis Joplin in the 1960's. And now, near the end of the 1990's, rehabilitation is just another word when the damage has been done. Prevention is no longer an option, for indeed, damage has resulted from the indiscriminate use of chemicals to control pests and weeds. Further, the political, social, and economic structures built up by the advocates of chemical controls are such that they will persist, and continue to impede the development of alternatives. Improvements have been made in recent times, with the advent of Integrated Pest Management, outlawing some of the more dangerous chemicals, and education of applicators.

Still, prevention of damage to the human population and the environment in this situation has for the most part failed. The awareness and activism of a few individuals has little impact until a readiness occurs in larger populations to do something. Gaining that readiness is the task before us, as a first step towards environmental rehabilitation. The activists who are leaders must work to educate the larger community as a first priority.

An exemplary submission by the National Council of Women (approximately 1985) spells out some of the possibilities for a better New Zealand in terms of pesticides. They called at that time for:

- 1) creating greater public awareness about types and quantities of pesticides used on particular products
- 2) labelling of produce to indicate which

pesticides are present on which foods

- 3) establishing a "low residue" standard
- 4) linking results of monitoring to labelling of produce
- 5) giving prior notification of intent to spray pesticides
- 6) stopping aerial spraying
- 7) linking prior notification and compensation
- 8) making criminal conviction possible
- 9) increasing public participation.

Now, some years later, much more is needed. Debates continue about environmental resource bills, newspapers continue to report incidents of poisoning, and the Health Department recently reported that nearly 10 per cent of domestic vegetables are over the limit with traces of chemicals, some forbidden. What are we to do?

CONCLUDING THOUGHTS

The "system" established by the Health Department, local body members, and other government officials is comprised of people of good intent who are apparently naive or unaware. The people involved, that is, the authorities who make decisions and enforce regulations, are unable to gather facts because of limits of time, energy, and finances, are unable to analyze the data they do have on the basis of the best short and long term interests of public health and scientific evidence, and most unfortunately, are unable to act because of vested interests, political and economic powers and influences, and similar matters. The complexity, the quantities, the lack of access, and the disorganization of clear information, and the speed required for prompt action limit responses. Lethargy in the system is inherent. The principles and vision represented by ecological concepts and thinking are lacking.

When a human population is subjected to a chemistry experiment without consent, accurate knowledge, adequate information, or rights, then there is little hope of either a clean environment or long-term environmental rehabilitation. Public education, awareness, and advocacy is a first and necessary step towards stopping the current practices. Then and only then will cleaning and eventually rehabilitating the environment take place.

Environmental Rehabilitation

Given chemical pollution in the Awapiko Stream Valley, and neighbourhood efforts to oppose degradation of the environment, what have we learned about environmental protection and rehabilitation?

We have needs for a philosophical, moral, spiritual and ethical foundation on which to base practical efforts.

One of the obvious conclusions is that the experiences of "outsiders" who have personally experienced environmental destruction in their own lives, can offer local people useful information on which to base action. If this can happen prior to enormous or continuing destruction, it may be able to block or prevent. Unfortunately, such short-cut ways to reverse the tide are not necessarily listened to. The voice of personal experience appears, however, to be essential to generate spirited civic action.

Some other conclusions are drawn below about development, change, and future directions.

According to the World Health Organization, rehabilitation is the combined and coordinated use of medical, psychological, social, educational and vocational measures for training or retraining an individual to the highest possible level of functional ability. The concept of rehabilitation often includes at least some interest in changing the system (particularly the social surround of the individual with a disability) and changing the environment - physically and socially - so that people with differences can fit in easily and comfortably with the mainstream of society. An ultimate goal is empowerment of individuals with disabilities, so that society becomes sufficiently tolerant of individuals who happen to be different to design work and life spaces in ways that are harmonious for all human beings.

Though it began with individuals with disabilities, rehabilitation, as a philosophy, process, practice, or policy, can, should, and must also concern the earth, the system of agriculture, and the lifestyles of people (Gregory, 1998). Rehabilitation professionals and workers have developed excellent strategies for working with individuals with impairments and disabilities. Generally, they do not dominate, but work in partner-

ship, enabling the person with disabilities to gain or regain a meaningful role. Now, it is essential to look at the context of people with disability and of people generally to incorporate into the model of rehabilitation both the larger society and the environment itself. In this way, rehabilitation workers can begin to help provide leadership in finding solutions to the problems of today.

Rehabilitation began with an ethical consideration created when military veterans returned to civilian society after major wars. Injured while in service to their country, the ex-soldiers were shown gratitude and honour, by being "re-adjusted" to society with adequate resources and service to assure a rightful place. They were not given charity, benefits and welfare as much as they were rehabilitated through "investments" of time, energy, training, resources, and treatment.

In rehabilitation work, the original ethical and moral concerns have provided an ethics about the value of human life. From this ethical concern have come principles or beliefs that life should be preserved, and that if someone has an impairment or disability, then society has obligations to assist. From principles derive practices, such as for example, a plan is formulated following determination of eligibility for services and feasibility of intervention.

A variety of responses to bridge gaps between societies and environments are emerging given the environmental crises, such as deep ecology by Arne Naess (1989) and Bill Devall (1985), organic farming and prevention by Robert Rodale, sustainable agriculture (Clive A. Edwards, 1990), Permaculture (Mollison, 1988), systems and ecology (Odum, 1983), the Green political movement (Porritt, 1984; Hutton, 1987), Greenpeace (Brown and May, 1989), and many others.

Those who realise that the lives of many people and the capabilities of the planet in the future have already been dramatically affected in negative ways by this world/cultural strategy are likely to become increasingly militant unless and perhaps until, positive changes occur. And of course, there may well appear end points - where vast numbers of people die because of previously caused environmental damage. Some would say that these points are being reached,

witness the spread of AIDS, starvation, and effects of storms.

Our planet has been dramatically modified in directions by human interventions, just as individual human beings have been disabled by trauma from automobile accidents, disease processes, and "ageing". Western society and its system of agriculture as presently constituted continues with monocrops, chemical warfare on insects and weeds, unwise use of scarce natural resources, and ever-increasing industrialization and high technology. Similarly, individuals are surviving but with differences and difficulties brought on by dangerous environments, by accidents, by genetic birth defects, by disease, and by the ageing process.

Given this line of argument, the Awapiko Valley situation is typical of an environment that has been and is being interfered with by mankind in a frequently destructive and non-harmful way. Therefore, rehabilitation efforts are justified, needed, and indeed, essential. The spirit of the gad-fly, or "the stirrer," may trigger neighbourhood awareness, and eventually social support for interventions which block negative practices.

The efforts to prevent unwise use of chemicals can be seen in the light of this thinking. If a working definition of rehabilitation is "to live again," then environmental rehabilitation can be defined as "to maintain an environment fit to live in." A wide variety of specific approaches as cited above could be useful. The on-going downgrading of the environment demands a similarly on-going response to stop what is taking place, to redress the balance in favour of the environment, and to create awareness of future potentials rather than immediate profits.

It is an opportune time for a convergence of interest to be recognised, that rehabilitation professionals and workers join with environmental designers, benevolent developers, and their many allied followers to help re-create an environment where all can flourish. The goals are sufficiently similar that people in each movement can benefit by examining and thinking through the philosophy, literature, research, and practices of the others. In the case of the Awapiko Stream Valley, the process has begun. The Awapiko Valley story is but a microcosm of the larger fight that is taking

or will take place throughout the world if we are to have a future

REFERENCES

- Agricultural Chemicals Board: *A Guide to Agricultural Chemicals*, Volume 2, Government Printer, Wellington, New Zealand (1980).
- Brown, M. and May, J.: *The Greenpeace Story*, Dorling Kindersley, London (1989).
- Cornes, P.: *The Future of Work for People with Disabilities: A View from Great Britain*, World Rehabilitation Fund, New York (1984).
- DeVall, B. and Sessions, G.: *Deep Ecology*, G. M. Smith Salt Lake City, Utah (1985).
- Dickinson, P.: Personal Communication (1991).
- Edwards, C. A., et. al. (Eds.): *Sustainable Agricultural Systems*, Soil and Water Conservation Society, Ankeny, Iowa (1990).
- Gregory, R. J. An introduction to ecological rehabilitation, *J. Hum. Ecol.*, 9: 233-237 (1998).
- Horsley, P.: Spray drifts and the law: Who cares?, *Wanganui Peoples' Access Magazine*, Issue 3 (1985).
- Horsley, P. and Ritchie, I.: Submission to the Secretary, Pesticides Board, Ministry of Agriculture and Fisheries, photocopied statement (1985).
- Hutton, D. (Ed.): *Green Politics in Australia*, Angus and Robertson, North Ryde (1987).
- Jeyaratnam, J.: Health problems of pesticide usage in the third world, *Journal of Occupational Health and Safety in Australia and New Zealand*, 2(6): 448-455 (1986).
- Kairanga County District Scheme, Review No. 1, (1982).
- Lindegger, M.: Personal Communication and Permaculture Design Workshop, Wanganui, NZ (1989).
- Lowenfeld, B.: Some Thoughts on Rehabilitation and Psychology, In G. Leviton (Ed.): *The Relationship Between Rehabilitation and Psychology: Conference Held at Institute of Human Development*, Clark University (June 11-13, 1959) Washington, D.C.: U.S. Department of Health, Education and Welfare, pp. 5-6 (1959).
- Mollison, B.: *Permaculture: A Designer's Manual*, Tagari Press, Tasmania, Australia (1988).
- Naess, A. with Rothenberg, D. (Eds.): *Ecology, Community and Lifestyle: Outline of an Ecosophy*, Cambridge University Press, Cambridge (1989).
- National Council of Women: Submission to the Minister for the Environment: Working Group on Pesticides, photocopy (1985).
- New Zealand Agrichemical Manual*, 2nd edition No. 2, Agpress Novasearch, Palmerston North (1987).
- Odum, H. T.: *Systems Ecology: An Introduction*, John Wiley and Sons, New York (1983).
- Palmerston North City Council, *Proposed Palmerston North City District Scheme - Kairanga Section*, (1991).
- Permaculture Educators Link: *Newsletter*, (New Zealand) (1989).
- Porritt, J.: *Seeing Green: The Politics of Ecology Explained*, Basil Blackwell, London (1984).
- Pyle, E. and Gough, J. D.: *Environmental Risk Assessment for New Zealand*, Information Paper No. 29.

- Centre for Resource Management, Lincoln University, Christchurch (1991).
- Saunders, J.: Couple live in fear of spray drift on their land, *Evening Standard Newspaper*, 23 November 1990 (1990).
- Stubbins, J.: *The Clinical Attitude in Rehabilitation: A Cross-cultural View*, World Rehabilitation Fund, New York (1982).
- Stubbins, J.: The Interdisciplinary Status of Rehabilitation Psychology, Photocopied paper (1983).
- Stubbins, J. and Albee, G. W.: Ideologies of Clinical and Ecological Models, *Rehabilitation Literature*, 45 (11-12): 349-353 (1984).
- Sussman, M. B.: *Sociology and Rehabilitation*, American Sociological Association (1966).
- Vettorazzi, G.: *International Regulatory Aspects for Pesticide Chemicals*, Volume I, Toxicity Profiles, CRC Press, Boca Raton, FL (no date).
- Watterson, A.: *Pesticide Users' Health and Safety Handbook: An International Guide*, Gower Technical, London (1988).
- Walker, M. L.: *Beyond Bureaucracy: Mary Elizabeth Switzer and Rehabilitation*, University Press of America, Lanham, MD (1985).
- Worthing, C. R.: *The Pesticide Manual: A World Compendium*, 8th Edition, British Crop Protection Council Thornton Heath, United Kingdom (1987).

NOTE

An early and preliminary version of this article appeared in a working paper in the Development Studies Department at Massey University. The title of the working paper was Environmental Rehabilitation: Development and Change along the Awapiko Stream Valley (1993) and the author was Robert J. Gregory.