

## HARNESSING THE W·I·N·D

In most parts of the world winds seem as inevitable as day following night. In fact, the diurnal cycle causes winds. Since sunlight falls unevenly across the earth and because land heats faster than the oceans, some air masses warm faster than others. As warm air rises, cooler air rushes in to replace it. Wind is therefore simply another form of solar energy - a form which we can harness to produce mechanical and electrical power.

Mankind has been utilizing windpower for over 2,000 years. The earliest windmills were developed independently in China and the Middle East, and were introduced to Europe during the twelfth-century crusades. The technology then traveled to the New World where it was instrumental in opening up the arid American West to grazing and agriculture. An estimated six million windmills supplied irrigation and drinking water in the West by the end of the nineteenth century. As America began to utilize more electricity in the early part of this century, wind power showed promise as a generating source, but the effects of cheap fossil fuels and hydropower rendered the then available wind technologies uneconomical, and cut short the embryonic development of wind-generated electricity.

The first Arab oil embargo prompted the United States to seriously reconsider windpower's potential as a commercially viable source of electricity. In 1973, the National Science Foundation sponsored a major project to explore the practicality of wind as an energy resource. This project was first undertaken by the National Aeronautics and Space Administration (NASA), but was subsequently assumed by the Department of Energy (DOE). It was DOE's objective to convert windpower into electricity on a practical and economically feasible scale. This project, together with the efforts of many private entrepreneurs, has helped windpower technologies to mature during the last decade. It now appears that windpower will be the first solar based energy system to make a significant contribution to commercial electrical production.

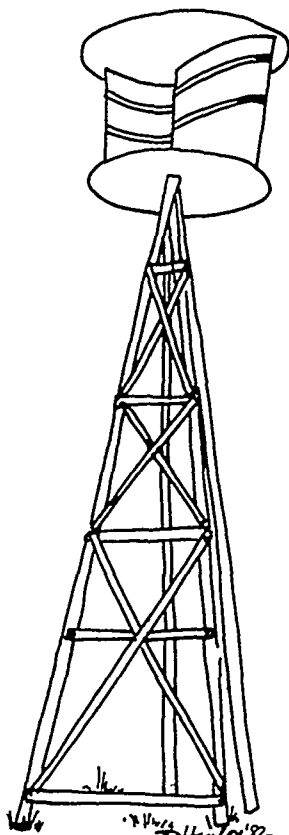
### From Wind to Electricity

Current windturbine designs are capable of capturing 40% of the wind energy passing through the area swept by their blades, compared with a capture efficiency of about 17% for the old farm windmill. This advance is even more significant than it seems since the laws of physics limit the capture efficiency of windturbines to a theoretical maximum of 60%.

A wind's speed is directly related to the power contained in it. The power in a wind is equal to the cube of the windspeed, multiplied by various constants. This means that a small increase in windspeed can result in a large increase in the power available for capture. For example, a 12 mph wind contains over 70% more power than a 10 mph wind ( $10 \times 10 \times 10 = 1000$ ;  $12 \times 12 \times 12 = 1728$ ). For turbine siting, both the average wind speed of the site and the distribution of typical windspeeds about this average are necessary data. As a general rule, wind speeds of at least 12 mph are needed for electrical generation to be economical. For mechanical water pumping, winds of 8 mph are sufficient.

Wind turbines follow two basic designs, vertical axis and horizontal axis systems. In a vertical axis system the blades look like an egg beater and act like sails, rotating about a central pole. The blades in a horizontal axis system resemble an aircraft propeller but perform the reverse function, the airflow causing them to rotate. Turbine generating capacities range from 1 kilowatt (kW) to 40 megawatts (MW); 1MW = 1,000kW, with 100kW set as the boundary between small and large turbines. To give these numbers some context, the electrical needs of a typical American home could be supplied by a 3 to 5kW turbine. A 1MW turbine could supply the needs of approximately 400 such homes.

Wind turbines do show economies of scale, but only to a certain point. The primary constraint on turbine size is blade-tip speed, since centrifugal forces can tear blade materials apart. The severe stresses on a blade (some longer than the wings of a 747 jet) combined with ever-changing weather conditions can cause cracks to develop, eventually causing a blade to either break apart or tear



A Savonius Rotor

away from the hub. Blade designers are testing materials such as fiberglass and wood laminates to eliminate this danger.

The size of the turbine must also be chosen to best suit its particular application. Small turbines are well suited for windy rural locations in need of power but far removed from any transmission lines. The generation of large amounts of power, such as for a utility, requires either several very large turbines or a "windfarm" composed of many smaller units. One problem with this approach is that each operating turbine creates airflow turbulence which lessens the capture efficiency of other nearby turbines. On windfarms turbines must be spaced at least 7 to 10 rotor diameters apart in order to let the airflow restabilize, enabling each turbine to perform at

maximum efficiency. This means that large windfarms will require expansive sites.

### Windpower in California

Three large windfarms are currently being developed in California, and many entrepreneurs are involved in smaller projects. U.S. Windpower is building a windfarm in the Altamont Pass area, about 50 miles east of San Francisco. This farm will consist of 100 turbines with a capacity of 50kW each, collectively producing 15 million kWh (kilowatt hours) a year. Later phases of the project will add 500 more turbines. Pacific Gas and Electric (PG&E) has signed a contract to purchase all the electricity produced by this windfarm.

Southern California Edison (SCE) has signed two contracts to purchase electricity from windfarms. One is with Wind Energy Conversion Systems for 5.5MW. This farm will consist of 55 turbines of 100kW each in the San Geronio Pass area near Palm Springs. This is considered the best wind resource area in the state. The other contract is with Zond Systems for 1.8MW. They plan to use small turbines with capacities of 25 to 50kW each, located in the Tehachapi Mountains north of Los Angeles. Within the next four years Zond Systems hopes to develop a windfarm with a capacity of 25 to 30MW.

In addition to these windfarms, SCE is currently working on draft contracts or letters of intent for 70MW of windpower. The utility is at various stages of negotiation for an additional 200MW of capacity. ("California Utilities Sign Up for Wind Energy," *Electrical World*, No. 196 (Feb. 1982), pp. 24-25.) The rate at which this power will be developed and go on line depends heavily on the success of the initial installations, and on the terms of the final contracts.

Further development of windpower and other alternative energy sources in California is currently stalled because of uncertainty about the terms of the final contracts between the utilities and the power producers. Section 210 of the Federal Public Utilities Regulatory Policies Act of 1978, (PURPA 16 U.S.C. §824a-3), requires state PUC's to conduct hearings with utilities and potential small power producers to set standard offer contracts. The California PUC issued a

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King Hall  
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Davis, California 95616

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## Harnessing the W·I·N·D

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decision in January, 1982, (#82-01-103, titled "Order Instituting Rulemaking #2" or OIR-2), requiring electric utilities to purchase wind and other alternative-source produced power, as well as generally setting out the price, terms and conditions utilities must conform to in making these purchases. OIR-2 also directs utilities to offer interested small power producers a variety of standard offer contracts, giving producers the opportunity to choose the contract best suited to their particular facility. Utilities must submit drafts of these contracts for PUC approval, and the current proceedings are to decide if these drafts do in fact comply with the terms and provisions of OIR-2.

The amount of liability insurance required is a critical issue for small power producers. Utilities realize that they represent a deep pocket for any wind-turbine related injury, and they have proposed that each producer carry as much as \$5 million in insurance. The power producers argue that the premiums for this much coverage would be prohibitively expensive for small operations, and that the utilities themselves are in a much better position to spread out and absorb the risk.

Utilities and investors are waiting to see how the price for turbine-produced power will be defined by regulatory agencies. Section 210 of PURPA states that the Federal Energy Regulatory Commission (FERC) is to prescribe rules governing the prices utilities must pay small power producers for electricity. These rules are to be implemented by the state PUC's. PURPA sets a ceiling by stating that the prices are to be determined by the incremental cost to the utility of alternative electric energy, and by what is "just and reasonable" to the final consumer. FERC has added some clarification to this standard by requiring utilities to pay the "avoided cost" of the power. This is defined as the cost to the purchasing utility of generating an equivalent amount of peak energy, or of purchasing an equivalent amount of peak energy from another utility. Subject to PUC approval, the utility can take into account such factors as the reliability and availability of the wind produced energy, as well as its own ability to avoid peak generating costs due to excess generating capacity of its own. (18 C.F.R. §292.304(e), 1981).

This gives the state PUC an opportunity to more accurately define avoided cost in a manner which will promote its objectives. The PUC can require utilities to include various production related costs in the avoided cost evaluation in order to increase the price paid to small power producers. The choice of cost evaluation methodology, either short term or long term, also influences the final price figure. The legislative history behind

PURPA shows an intent to use at least a medium-length term for evaluating avoided cost. The PUC must make sure its avoided cost figure is high enough to encourage small power production, yet low enough so that ratepayers do not face unnecessarily high utility rates. The price ultimately approved by the PUC will determine the profitability of wind power, especially for the small producers who could exploit much of this resource's potential.

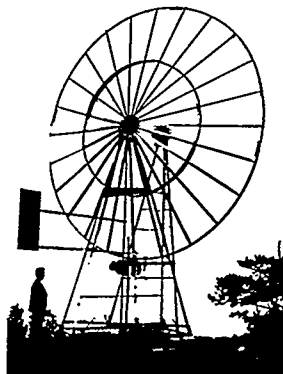
One more issue of particular importance to small, isolated wind-power producers is exactly what costs they will have to pay for line extensions and for interconnection with the utility's power grid. FERC regulations specify that the producer is to pay any interconnection costs assessed by the PUC on a nondiscriminatory basis. In addition, the PUC can determine the manner of payment, including reimbursement over a reasonable period of time. (18 C.F.R. §292.306, 1981). Some utilities, however, have proposed that producers also pay for any alterations which the utility must make to its existing grid in order to accommodate these producers. Because such interconnections and alterations can be very expensive, this could significantly chill the development of small wind generators and inhibit the progress of California's policy of encouraging wind power.

### State Policy

The California Legislature has enacted several statutes designed to ease and encourage the development of wind energy resources within the state. They have grown out of the Legislature's findings and declared goal that:

"(a) Wind energy in California is abundant. The technology to convert wind to electricity is proven and the economies of electrical generation from wind are promising, and..."(b) Wind should be an important element of the state's energy supply mix since 10 percent of California's electricity needs could be supplied cost effectively by wind energy by the year 2000..." (Stats. 1978, c.1089, p. 3329).

In 1978, a state wind energy program was implemented to speed commercialization of wind energy systems through an evaluation of the state's wind resources and the testing of currently available wind turbines. (Cal. Pub. Res. Code §25611). The California Energy Commission has recently completed the resource study part of this program. In 1980, another program was enacted to develop wind and other solar energy resources for agricultural applications, the agricultural sector being one of the single largest consumers of energy in the state. (Cal. Pub. Res. Code



§25615). A significant portion of the energy currently consumed by agriculture could be effectively provided through utilization of wind and other alternative energy sources.

California has also provided funding and tax incentives to promote the use of wind and other solar energy resources. The California Alternative Energy Source Financing Authority Act of 1980 designates an authority to oversee and issue bonds for funding alternative energy projects. (Cal. Pub. Res. Code §§26000-26042.4). State income tax statutes, both personal and corporate, provide for special amortization rates for wind and other solar energy project expenses. (Cal. Rev. & Tax. Code §§17052.5, 23601, 17226, 24372). These statutes both outline the State's energy policy and make wind power more competitive with other more heavily subsidized energy sources such as nuclear power.

California's statutes are designed to promote wind power in the state as an essential element of a diversified energy resource base. Wind power is not an ideal energy source since it depends on the availability of sufficient winds; nor is it a source without adverse environmental impacts. As mentioned above, windfarms of any significant scale will require large amounts of land, and their development raises important land use questions. Placing turbines in valuable or scenic areas is sure to raise objections. In addition, turbines result in negative environmental impacts such as increased noise and interference with radio, TV and radar communications, but these impacts can be reduced or even eliminated.

Unlike other energy generating facilities, however, windfarms do permit multiple land uses. An excellent example of this is U.S. Windpower's Altamont Pass project. The windfarm is being built on a dairy ranch, but it should have no adverse impacts on the dairy operations. Although siting in populated areas could create conflicts with existing land uses, areas windy enough to be suitable as windfarm sites are generally not preferred for housing. Problems of noise and aesthetics can also be mitigated through proper siting considerations.

### The Future

The two major impediments to windpower's further development are uncertainty over contract terms between utilities and producers, and the lack of extensive operating data. The contract terms should be clarified somewhat by the end of 1982, giving necessary information to investors, developers, and utilities. Reliable operating data can only be collected with time and funding, but the investment risk posed by the limited amount of operating data presently available can be reduced through various tax credits and liberalized amortization methods, as well as through the subsidization provided for in the final definition of "avoided cost".

The rate at which windpower will be developed will depend to a large extent on government's interest in encouraging it. Many important issues of wind resource utilization need to be researched, but the necessary funding is not available. The economic viability of the technology will not be improved upon until the industry is able to move beyond the prototype stage and begin mass production. Large-scale production would both decrease unit costs and encourage investment by supplying proven operating data for various systems. The Reagan administration is firmly committed to subsidizing plutonium production for "national security" reasons, rather than promoting renewable energy resource development. In contrast, California has chosen to implement programs and tax incentives which encourage windpower.

Although windpower is an ancient idea, it has become a space-age technology capable of supplying a significant portion of our energy needs. Its "fuel" resource is renewed every day and is cost-free, but the technology must be effectively integrated into our present energy supply network and existing land uses. In the near future windpower can be a self-supporting industry, but for the present it needs some assistance to be competitive in the energy market. Although utilities and producers are uncertain about costs and revenues, both are very interested in starting production. What problems do exist are surmountable, and the future for windpower appears very bright indeed.

Editor's note: This is the first of two articles on windpower. A second article looking more closely at the Public Utilities Commission's regulatory strategies will appear in our next issue.

Jim Laughlin



## PEOPLE V The Chemical Feast

### Evidentiary Problems to Criminal Prosecution to Protect Worker Safety



Attorney General John Van de Kamp pledged during his campaign last Fall that he would lead the state's criminal justice division in the aggressive prosecution of environmental violations. In the future, the legal system will handle an increasing number of cases involving abuses of toxic substances. In Yolo County, the District Attorney's office has pioneered legal research on toxic substances legislation, and D.A. Richard Gilbert has experienced the problems involved in the investigation and prosecution of cases requiring special expertise in toxic materials, in their handling, and in their preservation and storage. This article is offered as a think-piece for environment-conscious prosecutors and attorneys.

The authors, Dr. Charles Soderquist and D. Hankon, have worked extensively on the problems relating to the detection and prosecution of toxic regulation violations. Dr. Soderquist, an agricultural and environmental chemist, is Vice President of California Analytical Laboratories, Inc., in Sacramento. D. Hankon is a law student and a certified legal intern who has worked in the Yolo County District Attorney's office since June, 1981.

At about 6:00 a.m. on May 14, 1981, Santiago Ruiz Quezada reported for work at Chew Brothers Farms in Yolo County. His assignment? To assist in the tractor-application of Temik-15, a pesticide, to a field being prepared for sugar beets. Four hours later, the 29 year old Mexican farmworker lay lifeless on a hospital gurney after being crushed under the wheels of an articulating tractor.

Quezada's death posed a difficult law enforcement problem for several reasons. First, regulations concerning worker training and protective gear are confusing. Because of space restrictions, this article will not address overlapping jurisdictional issues and apparent conflicts between the California Department of Agriculture and the California Occupational Safety and Health Administration (Cal-OSHA). Suffice it to say that the confusion leaves employers as well as local agencies unsure of their rights, responsibilities and remedies. Second, investigations involving farmworker accidents require a certain frame of reference unfamiliar to most law enforcement personnel and forensic pathologists. Based upon the Quezada experience, Yolo County District Attorney Richard Gilbert believes that, "Investigations into accidents involving workers or others exposed to or near pesticides or other hazardous materials should be presumed to be linked to the hazardous material until proven otherwise." For the first time, police investigators are urged to make some preliminary assumptions.

Without such assumptions, valuable evidence may be improperly collected and its value as proof in a trial may be lost. This article explores events surrounding the Quezada case and proposes general recommendations for the collection of scientific evidence where pesticide involvement is suspected in a case involving possible criminal prosecution.

#### Background

Quezada began work that day by unloading bags of the granular chemical pesticide Temik-15 into the hoppers of the tractor. He was wearing gloves and coveralls as required by law, and supervisor Tom Anderson later made sure that Quezada was also wearing a respirator. Quezada burned the empty bags according to directions on the Union Carbide label. Witnesses say he was told before starting that the pesticide was harmful, that he should wear all of the protective equipment provided, that he should stay upwind of the smoke from the burning bags, and that he should wash his hands afterward. But the disposable coveralls issued to him were made of paper instead of the recommended Gore-tex, a doubly laminated plastic. He was wearing only flimsy bedroom slippers, and his gauntlet-type gloves had no band or strap around the wrists to prevent contamination by chemical dust. In addition, the respirator he was using was inappropriate for this particular use, and soap, water and towels appeared at the work-site only after the accident had occurred.

There were no witnesses to describe Quezada's behavior in the hour before the tragedy took place. Apparently, Quezada finished his task without mishap and spread out his lunch, preparing to eat as he watched the tractor. His lunch was set out near an irrigation pump; smudges and the partial print of a hand indicate that Quezada may

have tried to climb onto the tractor to alert the driver about the pump's proximity. Unable to get a firm foothold on the bumper in his slippers, Quezada may have fallen off the tractor. Or, after inhaling smoke from the burning bags, perhaps he became dizzy and fell in the path of the tractor. Perhaps he had absorbed so much of the toxic residue through his skin that his motor coordination was affected, and so he fell. It is still not known for sure whether Quezada was poisoned by an acute dose of Temik, a Category One "hot" insecticide.

On April 7, 1982, Richard Gilbert filed criminal charges in the Woodland Municipal Court against Chew Brothers Farms and Thomas Anderson, Quezada's foreman. The complaint alleged misdemeanor violations of California Labor Code §6423 and Agricultural Code §12996, for failure to provide adequate protective clothing or equipment and proper training in the safe use of a Category One pesticide. Such complaints are extremely rare.

On June 25, 1982, Chew Brothers Farms was fined \$2,100 and placed on probation for three years. After his guilty plea, Thomas Anderson was personally fined \$420 and placed on probation for two years. Chew Brothers Farms must now conduct annual pesticide safety training programs for all employees, and it is required to forward monthly training records to the Yolo County Department of Agriculture. Anderson is prohibited from supervising the application of any pesticide until he completes an approved course in pesticide worker safety.

In a report dated four months after the autopsy, Yolo County Coroner Dr. James Ransdell listed the causes of death as: (1) massive crushing chest injuries, and (2) acute toxic effect due to Temik (aldicarb). Dr. Ransdell postulated that Quezada was under the influence of the pesticide aldicarb (Temik's generic name) at the time of his death.

Pathologists consulted by the district attorney, however, disagreed. Dr. Peter Kurtz, Medical Coordinator for Worker Health and Safety at the California Department of Food and Agriculture, was among them. He pointed out that a severe crushing injury sufficient to cause death had been sustained. He conceded that residues of aldicarb and its metabolites or descendant molecules were present in Quezada's body when he died, but he argued that proof that the farmworker was under the influence of the most toxic, parent molecules of the chemical --which alone could result in motor impairment-- was not determinable from the samples collected.

It was in fact the way in which the original samples from the scene were collected and processed which made it almost impossible to come to firm conclusions about the role of Temik in Quezada's death. Completely ignoring hundreds of pounds of pesticide all around him, the initial investigator on the scene saw only a man crushed by a tractor. As a result, pesticide poisoning was not considered until almost two weeks after the death. Thus, the first samples collected were too small to be parsed out for the number of tests necessary to determine what foreign chemicals might have been present. Body tissues were irrigated before specimens were taken, and for a period of ten days after the autopsy, fluid and tissue samples were not frozen, but merely refrigerated. Thus, by metabolism and oxidation, the pesticide continued to deteriorate rapidly. Checked too late, this bio-degradation rendered the accuracy of subsequent toxicological analysis questionable. How many of the highly toxic parent molecules were present at the time of death, relative to less toxic components? It became impossible to tell.

No specimens of the pesticide were taken from various areas at the site. Quezada's effects were bundled into brown paper bags and tagged, but since they were not frozen the pesticide residues continued to dissipate. Similarly, no data was collected from other workers. Thus, we do not know whether the dose he received was acute or sub-acute. As a result, the prosecutor lacked the necessary evidence to prove beyond a reasonable doubt that the failure to provide adequate training or protective gear proximately caused Quezada's death. This ruled out any possibility of filing manslaughter charges in the case.

#### Pesticide Poisoning and Criminal Investigation

Forensic scientists, criminal investigators, and allied legal specialists confront a unique set of problems when litigating acute or sub-acute pesticide poisoning cases. While pathologists and coroners are generally familiar with techniques necessary to develop legally accept-



## FORESTRY LEGISLATIVE UPDATES

### •H. R. 6542

H. R. 6542, a bill which would ban the operation of mineral leasing laws on specific areas within the National Wilderness Preservation System (NWPS), was passed by the House 340-58 on August 12, 1982. This bill would prevent the issuance of oil, gas and mineral leases on millions of acres in the NWPS that will be unprotected when the 1964 Wilderness Act expires in 1983.

When the Wilderness Act does expire, virtually all National Forest areas within the wilderness system will be subject to speculation and resource development. Secretary of the Interior James Watt has already announced his intention to begin processing oil, gas and mineral lease applications for 1984. As a result of loudly protesting public and environmental constituencies, however, Watt has placed a moratorium on the issuance of mineral leases in wilderness areas until the end of the 97th Congress.

H.R. 6542 would ban more than mineral leasing. An amendment to allow limited surface seismic explorations was finally defeated when opponents concluded that while the sound of gunshots was acceptable in the wilderness areas, seismic explosions were not. Wilderness areas could be opened up in case of urgent national need by Presidential request, but the bill requires Congress to approve such a request, rather than having to veto a Presidential directive.

H.R. 6542 does not create any new wilderness areas or address RARE II issues such as release of

non-wilderness lands. These topics are likely to be discussed in Senate hearings. The Senate version of H. R. 6542 is currently in the Senate Energy and Natural Resources subcommittee on Public Lands and Public Water, to which it was referred in August, 1982. It is likely to be amended before it is approved by the Senate.

### •S. 2085/H. R. 6913

Members of the Oregon delegations in the House and Senate have introduced legislative aid for federal timber purchasers in the Northwest. Two bills that are nearly identical, S. 2085 (introduced by Mark Hatfield D-OR) and H.R. 6913 (introduced by Oregon Democrats James Weaver and Les Aucoin), are aimed at releasing federal timber purchasers from contract obligations by terminating, extending or rolling back prices on existing contracts. The purchasers are currently under contract to pay more for government timber than they can sell the timber for.

Assistant Secretary of Agriculture John Crowell, a former timber industry executive from Portland, Oregon, astonished the bill's sponsors when he told them the Reagan Administration opposes any relief to the timber purchasers. Conversely, about half a dozen conservation groups have come out in favor of the bills as a means to get the contracted timber lands back on the market and forestall new sales in areas that are still roadless.

At stake is an estimated 15 billion board feet of timber on federal lands that cannot be economically harvested at this time.

The Southern Forest Products Association agreed to support a legislative proposal for partial contract relief. The proposal would allow Northwest federal timber purchasers to terminate 40% of the volume they are holding under contract, with the stipulation that only 4 billion board feet can be offered for sale per year by the Forest Service in Oregon and Washington. This is to prevent a flow of timber falling back on the market from drawing down prices nation-wide. Included in the proposal is a provision that would allow the transfer of purchase credits (from sale expenses such as roads) to other National Forest Sales.

S. 2085 has been reported out of the Senate Judiciary Committee and is currently in the House.

### •S. 2783

Colorado Senator William Armstrong has introduced a bill to establish eight new wilderness areas and expand one National Forest area in Colorado. The bill, S. 2783, would add 425,000 acres to the 2.6 million acres currently designated as wilderness areas in Colorado.

Proposals in the bill include the addition of 205,003 acres of wilderness area in Dinosaur National Monument; 238,585 acres in Rocky Mountain National Park; 14,779 acres in Colorado National Monument, and 8,000 acres in the White River National Forest (24 of the existing 28 Colorado Wilderness areas are in National Forest lands).

S. 2783 is currently pending in the Senate Energy and Natural Resources subcommittee on Public Lands and Public Water. Hearings are scheduled for the end of November 1982.

### •H. R. 6011

Alabama may acquire new National Forest Wilderness areas also. H.R. 6011, which was passed by the House in early August, would

add about 38,000 acres of National Forest Wilderness areas within the Bankhead and Talledega National Forests, and would increase the size of the Sipsy Wilderness to about 42,000 acres.

H.R. 6011 however contains "soft-release" language that would exempt 18,000 acres of RARE II lands from further wilderness consideration during the first generation of forest management plans. The companion bill of H. R. 6011, S. 2799, is currently in the Senate Energy and Natural Resources subcommittee on Public Lands and Public Water to which it was referred in September, 1982. Hearings are scheduled for the end of November.

### Volcanic Monument on Mt. St. Helens

President Reagan signed into law on August 27, 1982, a bill creating the Mt. St. Helens National Volcanic Monument. The bill establishes a 110,000-acre monument within the Gifford Pinchot National Forest in southwestern Washington, to be administered by the U.S. Forest Service.

The Forest Service had recommended only 84,000 acres for the Monument because the proposed 115,000 acres covered areas with salvageable timber. It argued that anything larger than 84,000 acres would cost millions of dollars in lost revenue from timber that could not be salvaged from within an established preserve. Administration officials had opposed anything larger than the Forest Service proposal mainly on the basis of the cost of acquiring private lands.

Laurie Davis



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able data for classic poisoning cases (e.g., cyanide, arsenic, barbiturate and narcotic drugs, etc.), pesticide cases are unusual and far more difficult to diagnose or confirm.

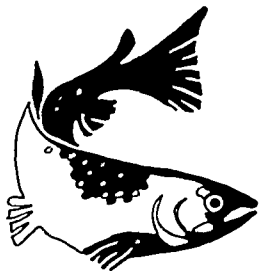
The following recommendations assume that the investigator has reason to suspect the involvement of toxic chemicals. We will also assume that the exposure has been unintentional.

### Sampling

Under the best of conditions, the investigator should collect and maintain evidence (i.e., samples) of the broadest possible scope. Whenever an investigator is called to an agricultural operation where a farmworker has died, acute pesticide exposure should be considered an obvious possibility.

The investigator should immediately obtain the following samples: (1) clothing of the victim; (2) respirator worn by the victim (if present); (3) any pesticide containers (drums or sacks) at the site; (4) a sample from the tank of the ground spray rig, mixer or aircraft, if present; (5) samples of soil or crops both near the body of the victim and away from it (as a "control" sample). Each of these sample should be stored and preserved as described later.

These samples are relevant to explain the cause of death as follows: (1) The presence or absence



of pesticide in the victim's clothing will indicate exposure either from a spill during loading or exposure during the actual application. (2) The presence or absence of the pesticide in the charcoal trap of the victim's respirator will indicate exposure. (3) Empty pesticide containers at the site will establish the potential toxic agent. Partially filled containers will allow lab analysis to verify that the container correctly states the contents. (4) A sample from the rig or spray tank will establish what pesticide(s) was actually being applied. (5) Samples of soil and vegetation near the victim's body may show, upon lab analysis, what pesticide(s) had been applied.

Lab analyses of the five sample types listed above will be com-

pared to lab analyses of the victim's body fluids and organs after an autopsy. This comparison is the whole point of the investigation. Good communication between the field investigator who suspects pesticide poisoning and the coroner (or hospital staff) is essential. The medical staff should be reminded when a pesticide is involved to collect blood, urine and stomach contents; lung, liver, and kidney tissues; and fat samples. If any of the five field samples are positive for one kind of pesticide which is also positively revealed in body fluids or organs, a good case for pesticide exposure can probably be made.

These guidelines on sample preservation should be followed when possible. All samples should be chilled (if liquid) or frozen (if solid) immediately upon collection, and they should be kept in that state during transport and during storage at the lab. In any case, samples should be refrigerated or frozen (liquid and solid) and held out of the light (to avoid photo-decomposition) as soon as is practical.

The five types of field samples discussed should be collected in these containers: (1) clothing in a plastic bag, tightly sealed; (2) a respirator in a plastic bag, also tightly sealed; (3) If not too large, pesticide containers should also be sealed in plastic bags. Since any containers may contain pure pesticides, they must be kept separate from other samples at all times to avoid cross-contamination. (4) Tank samples should be stored in plastic bottles or jars, again, separate from other samples. One or two grams is sufficient. (5) Soil or crop samples should be stored in glass jars or plastic bags. Generally, 100 grams (1/4 pound) is enough.

The investigator must use extreme caution to avoid cross-contaminating these samples -- analyzed for traces of pesticides in parts per million-- with samples that contain pure or percent solutions of pesticides. Furthermore, the investigator must avoid inhalation of or direct contact with any materials that may contain pesticide residues.

Samples from the victim's body should be stored as follows: (1) Blood, at least two separate 10 ml samples in glass tubes with rubber stoppers, stored either under refrigeration or carefully frozen. (2) Urine, at least two separate 50 ml samples in glass tubes or bottles, stored under refrigeration. (3) Tissues and organs via autopsy, about 10 grams each, wrapped in aluminum foil, placed in plastic bags, and frozen. Typical tissue specimens include fat, liver and lung.

### Laboratory Analysis

Crime labs are poorly equipped to handle pesticide poisoning cases. Whatever the sample type, the determination of the presence of pesticides almost always involves the use of gas chromatog-

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## LETTER FROM THE EDITOR

THIS ISSUE is the first one this year and is also the first in our new format. As I mentioned in the last issue, we have gone to this new format for financial reasons. We do think that it is attractive, however, and we would like to hear from you on what you think of it.

A LOT HAS happened since our last issue came out. The November elections were a mixed bag for California environmentalists, but it appears that as far as the State Legislature is concerned, environmentalists have solidified their position. I am hoping that in our next issue we will have an in-depth analysis of this change. Another election related topic is of course the defeat of several environmentally motivated propositions. The how's and why's of these defeats will also be the subject of an upcoming article. In fact, there is a wide range of articles being prepared for the *Environms* issues scheduled to come out during the next semester. The topics include solar-access legislation in California, the impacts of the new provisions in Reclamation law, an analysis of the Pyramid Lake water controversy, articles on the upcoming revisions in the Clean Air Act, and an article on how environmentalists should feel about an expected federal move to allow the export of Alaskan oil, something California environmentalists fought hard against in the early 1970's. I think that our upcoming issues will be informative and interesting.



AS IS TO BE EXPECTED, the first issue of the year has had the usual problems involved in coordinating a group of busy law students and combining their individual efforts into those of a working team, particularly given the problem of moving to a new and unfamiliar format at the same time. This year I have tried to make *Environms* more of a team effort than it has been in the past, for I am convinced that that is the only way to continue building a better and longer-lasting publication of this type. While it has made this issue more difficult to complete, this approach should result in a better and more streamlined production process starting with our next issue, scheduled to come out in late February. At this point we are planning to put out three issues next semester, and the articles already being written for those issues constitute a good start in this direction.

THE CURRENT ISSUE, however, is not an exception to *Environms* usual approach of providing interesting and valuable information to our readers. A number of interesting issues are covered, including an overview of the status of windpower in California, and an article on the problems associated with the enforcement of handling and training regulations for toxic chemicals. The windpower article in this issue will be followed by a more detailed analysis in our next issue of the direction of PUC regulations in this area, written by an analyst for the PUC.

REGULAR READERS of *Environms* will notice that D. Hanlon's article on pesticide regulation enforcement is somewhat out of the ordinary for *Environms*. I feel that the subject area it covers will become more and more important in the future and that many of our readers will be interested in the criminal law aspects of environmental regulation enforcement. Local research is at the forefront of this field, since Davis is right in the middle of the agricultural region where these problems occur. In this issue we have also included an update of a series of bills that are pending in Congress which may significantly affect the state's forest resources, as well as a summary of the activities of the Environmental Law Society's political branch last year.

I HOPE YOU ENJOY this and future issues of *Environms*.

*Laura H. Kosloff*

Laura Kosloff

## The Environmental Law Society

### POLICY DIVISION

Those of you who enjoy reading *ENVIRONS* might also be interested in other activities of the Environmental Law Society (ELS). Much of our time is devoted to law school, but when we're not hitting the books we still get a chance to engage in some practical political activity.

The ELS Policy Division engages in various research and lobbying efforts. Last year, for example, we did some research for Californians Against Waste (CAW). They had been setting up tables in shopping centers in order to gather enough signatures to qualify the bottle-bill (Proposition 11) for the ballot. However, some of the shopping malls began to prohibit signature-gathering on mall property.

Most of the case law on public rights of access is new. The leading case, *Robins v. Pruneyard Shopping Center*, 23 C.3d 899, was decided only three years ago in 1979. The court held in *Pruneyard* that the right of access is subject to "reasonable time, place and manner restrictions" which the shopping center owners may establish. CAW needed to know what conditions the court had found to be "reasonable" in cases decided after *Pruneyard*, to help them decide whether they had sufficient grounds on which to seek an injunction against the owners' denial of access to CAW signature gatherers.

A few weeks after we presented CAW with our memorandum they challenged their exclusion from a shopping center, utilizing the material we had provided.

The court agreed with CAW's argument that the shopping center's restrictions were not "reasonable" and granted an injunction against the center, requiring it to set up reasonable right of access rules. The case allowed CAW to continue its signature-gathering efforts to qualify the bottle-bill for the ballot. The case also has implications for future initiative campaigns which might otherwise be stalled in their grassroots efforts.

*Pruneyard* was one of our most satisfying research projects, but was by no means our only one. We also did a comparative study of Public Utility Commissions (P.U.C.'s) around the country for the Sierra Club. The Club's goal is to reform California's P.U.C. and they have been considering various statutory alternatives. That legislation is still being drafted, but is scheduled to be submitted to the state legislature sometime in 1983.

The Policy Division is always open to research requests. A

number of environmentally-conscious law students are eager to use their skills on something other than a casebook. Please keep in mind that due to time constraints, specific legal questions are easier for us to handle than general research questions. We have some members with specific areas of expertise such as toxic wastes and the Clean Air Act, but we are not limited to those areas.

The Policy Division is involved in more than just research. We have done letter-writing and lobbying on a number of Congressional bills. H.R. 5252 (the Dingell-Luken-Broyhill bill) threatened to drastically weaken the Clean Air Act. We voiced our opposition to H.R. 5252, lobbying legislators in Washington to resist it. The bill never got out of committee and died with the adjournment of the 97th Congress.

Back here in Sacramento, we lobbied the Assembly Committee on Transportation on S.B. 33, a bill to require annual inspections of auto smog devices in those air basins that request it (like Los Angeles). It also set a limit of \$50-\$100 on any repairs that would need to be done as a result of the inspection. This limit was intended to prevent the pollution standards from placing too heavy a burden on the poor, who tend to have older cars which pollute more. The Legislature passed the measure, although it changed the annual inspections to biennial ones. The bill has since been signed into law.

This fall, elections dominated the scene. Propositions 11 (bottle-bill), 12 (nuclear freeze), and 13 (water resources) made this election year a significant one for environmentalists, and ELS members were heavily involved with all aspects of these campaigns. Some of us also attended a National Audubon Society seminar on citizen-action held in San Jose in October to help us prepare for a new round of lobbying.

We cannot be as ever-present as a group like the Sierra Club, and we are sometimes reminded of that by the pile of reading assignments that seems to always await us. Still, we like to think that we make a valuable contribution toward preserving our environment and keeping other informed about it. Thank you for your support by reading *ENVIRONS*.

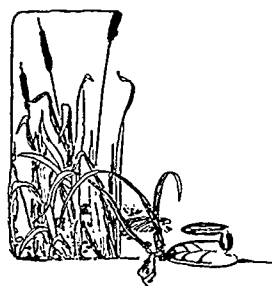
Elliot Block



## PEOPLE V The Chemical Feast

(continued from page 5)

raphy with specific, selective detector systems, high performance liquid chromatography, and, increasingly, gas chromatography-mass spectrometry (GC/MS). Analytical support from an independent lab is usually cost-effective and often absolutely necessary due to limitations of in-house staff and facilities. However, data generated by an independent lab, if used in court, must be able to withstand legal scrutiny. The lab



must be able to demonstrate adequate chain-of-custody, quality assurance data (verified precision and accuracy of the techniques employed), and provide expert testimony. The criminologist and pathologist who seek outside analytical support must be sure that these criteria are met. Advice and consultation may be obtained from the Department of Food and Agriculture, the Department of Health Services, or the University of California Cooperative Extension.

### Conclusion

The frequency of criminal and civil cases involving toxic chemicals is likely to increase as we learn more about the effects of such chemicals. In investigating such



cases, however, the chain of evidence can only be as strong as its weakest link. An investigator involved in a pesticide exposure case must be generally aware of laboratory requirements as well as legal requirements. The improper collection of evidence, however understandable in terms of the unique nature of the event, may

result in a critical failure of proof. We need new training for police officers and investigators to increase awareness about the possible involvement of toxic substances. We need better communication between field investigators and medical personnel, and between medical examiners and lab experts. Finally, we need updated testing of toxic substances and their potential harmful effects; and if such testing continues to be done primarily by manufacturers, as seems likely, we need stringent enforcement of testing procedures.

Any prosecution for pesticide exposure will require extensive inter-agency cooperation. Prosecutors should be alert to potential pitfalls in the earliest stages of the investigation. Consultation with qualified pesticide experts is usually mandatory for all but the best criminal laboratories and will yield, in the long run, successful and cost-effective prosecutions.

D. Hanlon  
Dr. Charles Soderquist



## enVIRONS

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