



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

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RULES AND REGULATIONS

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Call=A. Williamson  
(ARWI)

2-27-07

Chief, Rules Review and Directives Branch  
U.S. Nuclear Regulatory Commission  
Mail Stop T6-D59  
Washington, DC 20555-0001

RE: NUREG-1437, Supplement 29, draft  
PILGRIM NUCLEAR POWER FACILITY

Dear Chief,

Please be advised that I support and concur with the comments submitted by PILGRIM WATCH, dated February 5, 2007, regarding the above captioned matter on the re-licensing of the Pilgrim Nuclear Power Facility. I have the following additional concerns & comments along with some documentation as attachments hereto:

- 1- You have no safe or secure area to store the radioactive wastes generated by your nuclear power plants. As my AMISH neighbors have repeatedly stated at the local meetings near Three Mile Island for 28 years, "you built a house without an outhouse!" I do not need to elaborate on all the ways TERRORISTS can do harm - but it is easier than you'll ever admit & your test drills are phony & unrealistic.
- 2- Embrittlement concerns of your aging reactor vessels. It is only a matter of time!
- 3- With the June 1982 blow out of filters & subsequent radiation releases as an excellent example of "accidental radiation releases" at alarming levels & with horrific varieties of radionuclides - human health effects are inevitable & I would expect to find visible effects of

By: Mary Osborn (reassail)

2-27-07, page 2.

Chief, Rules Review & Directives Branch

NUREG-1437, Supplement 29, draft. Pilgrim Nuclear.

radiation damage to the flora & fauna of the surrounding areas of Pilgrim facility - such as that occurring for the past 28 years around Three Mile Island; see attachments **2 thru 7**.

Not only concern for flora & fauna - but for all edibles! Thus increasing the risks for cancers.

4- Deliberate mis-statements/mis-representations by the NRC and other industry affiliations:

The NRC has not learned the lessons of Three Mile Island accident - where NRC staff knew of leak rate problems for weeks prior to the accident, yet failed to shut down the reactor for repairs. The NRC continues with its obfuscations all over the country with similar, serious reactor plant problems (Davis-Besse, etc).

At Three Mile Island we are still waiting for former President Jimmy Carter to reveal what he has covered up: The President's Report, aka the Kemeny Commission Report, "...suppressed the most alarming aspects of that report." "...the report, if published in its entirety, would have destroyed the civilian nuclear power industry..." see attachments **1+8**.

Based on this statement alone - you the NRC, should not relicense Pilgrim. We, the people, do not trust the NRC to protect us. You lie & believe your own lies. You are destroying the industry because of profits before people. At Three Mile Island country we have the highest thyroid cancer rate in the country and the only cause is the Three Mile Island fallout of 1979. We received BOMB TEST FALLOUT EQUIVALENT doses at TMI and the U.S. Government - Ivory Purpose Knows it!

Submitted by: Mary Osborn (Orassiai) 4951 Highland St., Hbg, PA  
(717) 939-2890 17111

Toronto, Canada  
July 18, 1986

In May, 1983, my father-in-law, Admiral Hyman G. Rickover, told me that at the time of the Three Mile Island nuclear reactor accident, a full report was commissioned by President Jimmy Carter. He (my father-in-law) said that the report, if published in its entirety, would have destroyed the civilian nuclear power industry, because the accident at Three Mile Island was infinitely more dangerous than was ever made public. He told me that he had used his enormous personal influence with President Carter to persuade him to publish the report, only in a highly "diluted" form. The President himself had originally wished the full report to be made public.

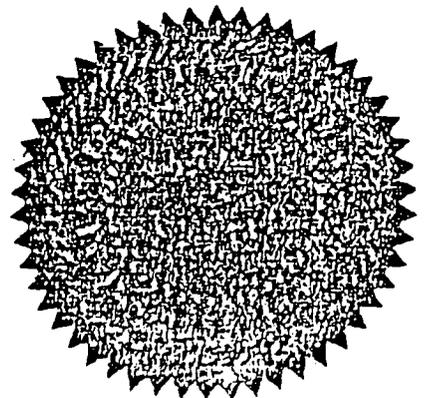
In November, 1985, my father-in-law told me that he had come to deeply regret his action in persuading President Carter to suppress the most alarming aspects of that report.

*Jane Rickover*  
Jane Rickover

JANE RICKOVER appeared before me and swore as to the truth of the above statement.

Dated at Toronto this 18th day of July A.D. 1986

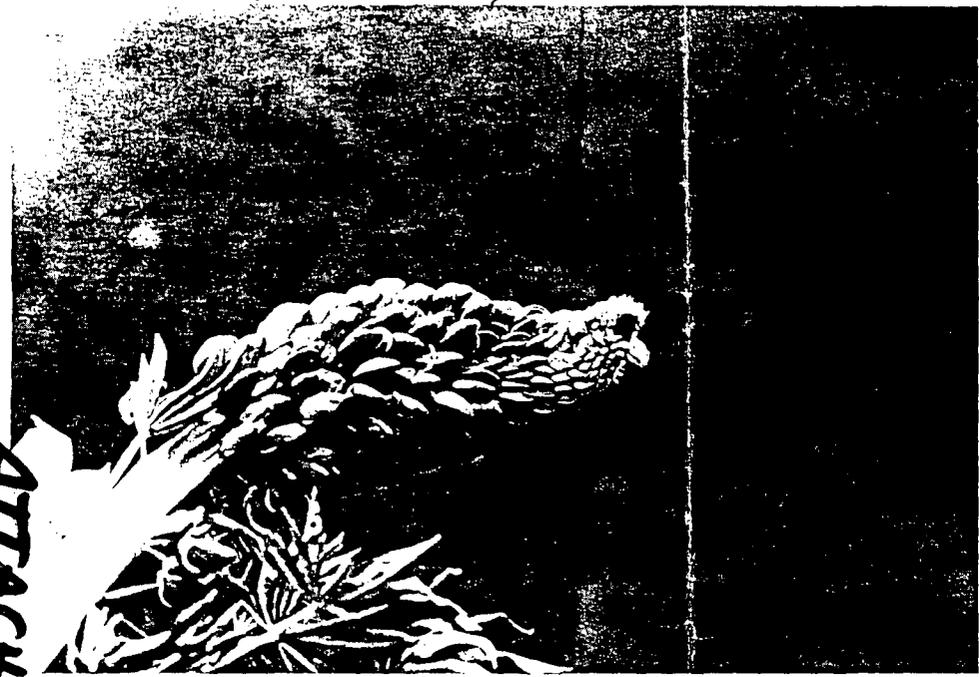
*William F. Lamson*  
William F. Lamson Q.C.  
Notary Public for the  
Province of Ontario



**ATTACHMENT I.**

The lupine told me, "Three Miles Island did it!"

ATTACHMENT



Mutation: Lupine = stem fasciation - double flower tip - distorted. Akase.

# Could you farm through fallout?

By ALEXANDRA KNOX

**S**uppose the Hanford Nuclear Reactor in Washington State suffers a meltdown, spewing 7% of its radioactive core into the atmosphere. Winds headed east across the U.S. would bury some of this country's prime farmland in fallout—the kind that sticks around for decades.

Not likely, you say? Maybe not. But the "Bulletin of the Atomic Scientists" at one time considered it possible enough to come up with this scenario:

"Truck farmers in central Idaho are told to plow under leafy vegetable crops such as spinach and lettuce [because radiation sticks to vegetation]; Minnesota dairy farmers are told to keep all their livestock in barns [to limit exposure and prevent grazing on contaminated forage]; in Madison, Wis., dairy sales fall 90% in response to rumors of radioactive iodine in milk . . ."

Depending on the time of year, precipitation patterns and soil types involved, South Dakota's sheep could turn up radioactive years later, having grazed on forage that has confused cesium-137 and strontium-90 with potassium and calcium. Wyoming's beef cattle, having accumulated cesium over hundreds of acres, could measure "well-done" on a Geiger counter. And in the Northeast, with its nutrient-poor, rock-bottomed lakes, certain fish might become the hottest food around.

Over the long-run, crops like corn and wheat would be in relatively good shape because their leaves—not the grain itself—would hold most of the radioactive particles.

Scientists picked the Hanford plant for good reason. It is the U.S.'s version of the Chernobyl Atomic Energy plant that melted down in Russia two years ago this month. The Hanford plant had been leaking for years. Last year, in light of safety problems spotlighted by the Chernobyl accident, the Hanford plant was shut down.

But nuclear plants around the world are aging, a fact that's not lost on people who deal in food—whether they raise it or trade it.

In mid-February, rumors of another nuclear accident in Russia sent domestic markets into a fury. Although the "nuclear" accident actually turned out to be a chemical spill, it's an example of how nuclear problems have become an everyday concern.

**Throughout Europe, farmers** are right now living—and farming—with a situation exactly like the one outlined above.

Although the Chernobyl reactor itself has since been incarcerated in concrete, the damage from it persists. Some of the fallout's effects in agricultural areas are just beginning to surface:

- Cesium-saturated grazing areas in Lapland continue to contaminate thousands of reindeer, at an estimated cost of \$182 million.
- In Sweden, radioactive milk, fish and wild mushrooms are still a problem.
- Northern England, Wales and Ireland report radioactive sheep. Radioactive meat from Denmark has appeared in Venezuelan ports. Turkey has "hot"

hazelnuts, and West German deer have set off Geiger counters.

The Chernobyl experience provides a better understanding of how farmland interacts with fallout. The accident has, in effect, offered scientists a real-world laboratory for combating radioactivity in our soils.

**In late-April 1986**, winds carried radioactive particles and gases thousands of miles from the Chernobyl Atomic Energy Plant. Rain and snow cleared the air but loaded vegetation and soils with iodine-131, cesium-134, cesium-137 and, to a lesser degree, strontium-90. The fallout forced the Soviets to remove and bury 650,000 cubic yards of contaminated soil—about 400 acres scraped one 1' deep.

Today, the 18-mile zone surrounding the plant in the agriculturally important Ukraine remains highly contaminated in parts, say the Soviets, although safe enough to allow the return of some of the 115,000 evacuees. Farming there is impossible.

But that's just a small part of the Chernobyl problem. Damage to crops, livestock and farmland ranges far from the site. Radioactivity from the accident is still playing havoc with farmers' livelihoods.

Take Lapland, for instance. A forested wilderness extending across northern Norway, Finland, Sweden, Lapland lies about 1,100 miles from Chernobyl. The lichen that carpet its forest floors are saturated with cesium-137, a radioisotope with a half-life of over 30 years

## Europe in Chernobyl's after glow

(that is, its radioactivity will be half as active in 30 years as today).

Reindeer herded and eaten by the Lapps graze on the lichen. Swedish authorities have detected up to 100 times more radioactive cesium in those reindeer than permissible. Tens of thousands of reindeer have had to be fed to mink instead of sold for human consumption. To lessen the economic blow, the Swedish government buys the contaminated meat at an estimated \$182 million.

The contamination elsewhere in Sweden is abating. Yet some farms are today producing radioactive milk; fish in Sweden's nutrient-poor, granite-bottomed lakes are showing higher and higher concentrations of radioactive cesium; and wild mushrooms—very popular in Sweden—remain off limits, says Ake Bruce, nutrition expert at Sweden's National Food Administration.

It takes several years for cesium to migrate from the environment to food and then to humans. In most cases, concentrations diminish. In others, radioactivity can increase. How long before it goes away? Sometimes very long.

In northern England, sheep from 635 farms suffer from radiation levels exceeding government safety limits, according to the Country Landowner's Association.

The problem is that the soil where these sheep graze has failed to trap the cesium. Two years ago, says Frances Livens, radiochemist at the Institute of Terrestrial Ecology in Britain, "We thought the cesium would lock up in the soil in three months. We're finding that the relatively acidic soils high in organic matter can't do that."

Livens speculates that it may take years before the cesium locks up in "peats and thin, nasty soils." Meanwhile, hundreds of thousands of sheep are banned from public sale. The affected farmers may have to wait three decades before they can sell their animals on the open market.

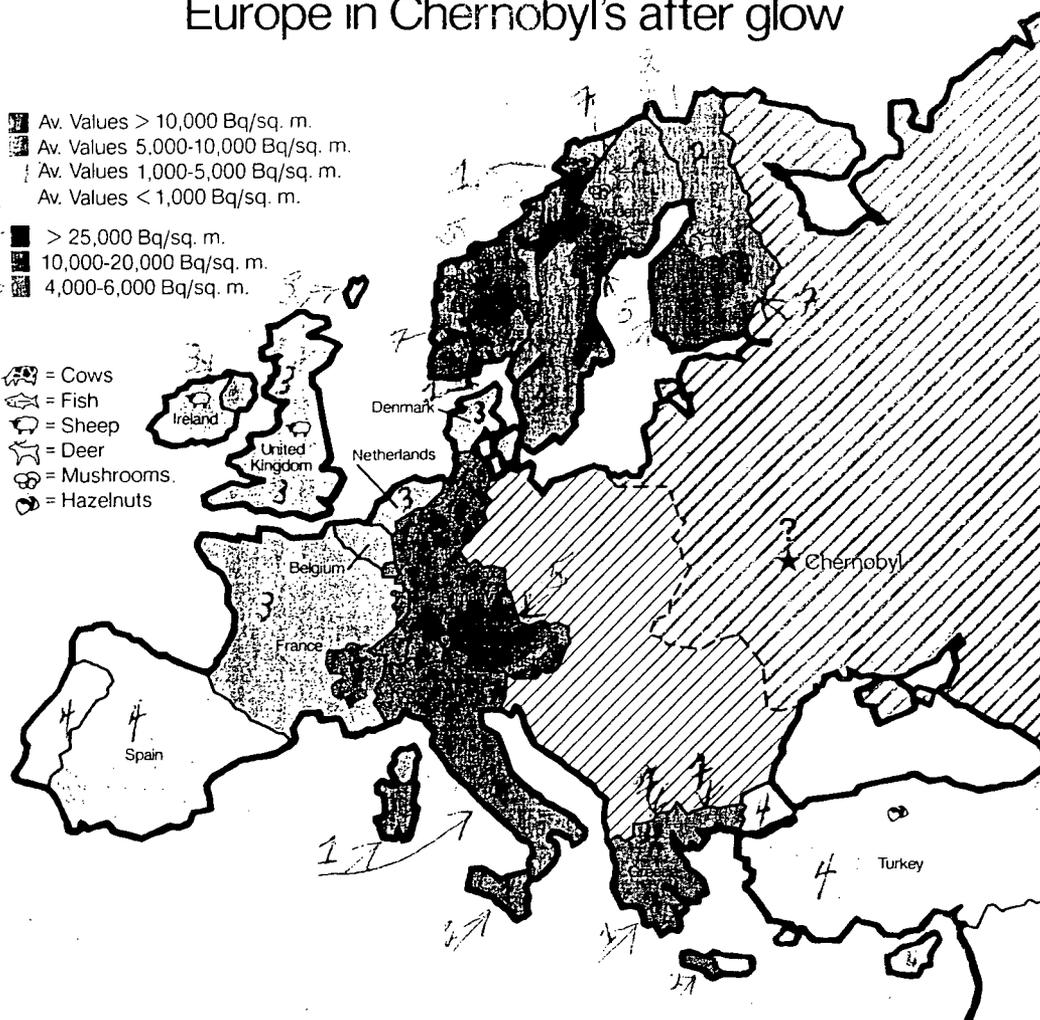
**Scientists have discovered** that, generally speaking, the stingiest soils under the nuclear cloud's path are those most likely to offer long-term harvests of cesium-137. That's because crops grown on poor soils will take whatever nutrients they can get. Plants on richer soils will usually choose standard elements before chemically similar radioactive ones.

Carl Rosen, soil scientist at the University of Minnesota, explains that cesium behaves like potassium in soil. In basic soils, cesium is trapped by clay particles. Likewise, say Swedish scientists, cultivated, fertilized soils rich in minerals bind cesium ions. But in poor

■ Av. Values > 10,000 Bq/sq. m.
   
 ■ Av. Values 5,000-10,000 Bq/sq. m.
   
 ■ Av. Values 1,000-5,000 Bq/sq. m.
   
 ■ Av. Values < 1,000 Bq/sq. m.

■ > 25,000 Bq/sq. m.
   
 ■ 10,000-20,000 Bq/sq. m.
   
 ■ 4,000-6,000 Bq/sq. m.

■ = Cows
   
 ■ = Fish
   
 ■ = Sheep
   
 ■ = Deer
   
 ■ = Mushrooms.
   
 ■ = Hazelnuts



SOURCE: NUCLEAR ENERGY AGENCY/OECD

**THIS MAP SHOWS THE AVERAGE** amount of cesium-137 and -134 in 1,000 becquerels per square meter, as measured on European soils from May 1986 to April 1987. Cesium concentrations are highlighted. Since the data were gathered, some of the cesium will have washed away or have been trapped in the soil. But plants and animals are still picking up the long-lived radioactive particles, even in some low fallout areas.

soils with little clay and minerals (tundra, sandy soils) or mostly organic matter (such as peats and tropical soils), cesium remains available to plants.

To limit the migration of cesium into the food supply, the USSR has had to deep plow, irrigate and lime hundreds of thousands of acres. Additional measures, says Harold Denton, a Nuclear Regulatory Commission (NRC) director, include treating highly contaminated areas with calcium to fix radionuclides in the soil. "Then the areas might be sown with crops such as lupines that absorb radionuclides. These crops would then be harvested and buried."

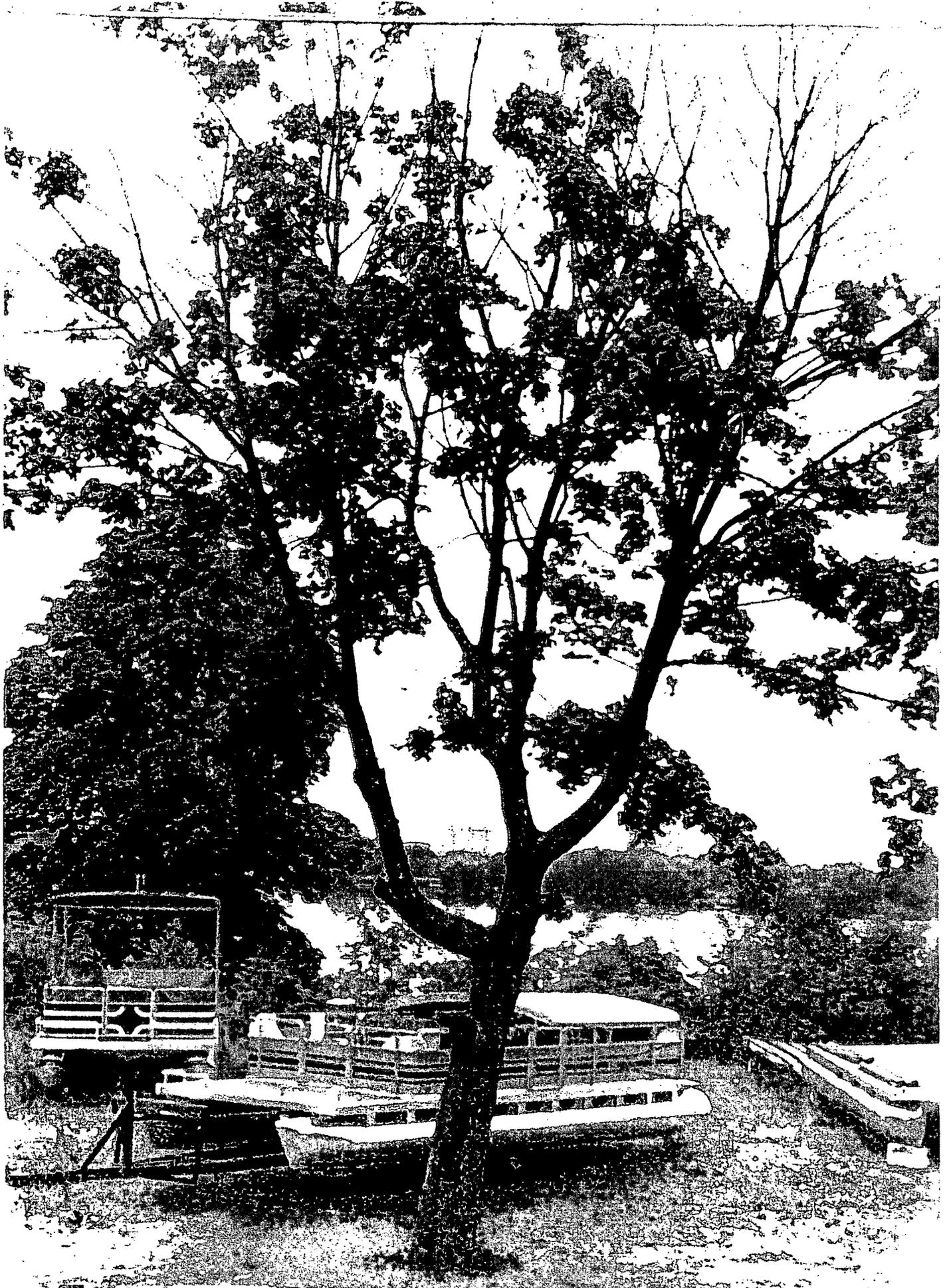
Generally, cesium-137 will reside near the soils' surface unless plowed under. Thus, shallow-rooted crops like potatoes or sugar beets are more likely to be long-term problems than deep-rooted ones like grains, says Gary Paulsen, Kansas State agronomist. He says contamination depends on the stage of growth and even variety; however, soy-

beans, requiring more potassium than grasses like rye, are likely to take more cesium up through their roots.

In the short-run, according to George Ham, Kansas State agronomist, rice would best resist the tissue-damaging beta particles emitted by radionuclides. Corn, sorghum, potatoes and sugar beets are moderately resistant. Wheat, oats and barley are very sensitive.

Processing removes much of the contamination. Potatoes lose radionuclides when made into starch; in milk they are filtered out during cheese-making. Other good crops are flax or cotton, because they aren't edible. "As it happens, rye, potatoes and flax are customary crops in the soils of the Chernobyl area," says Denton.

**Fighting fallout has proved** disruptive, costly, rarely practical and full of unknowns, say experts. Our best lab is Russia, but its experience, like its fallout, make take years to surface. ◀



ATTACHMENT 4. (6 pages)



*Trees dying -*

*all over central PA! to this day!!*



April 2006  
-- Evergreens --  
The trees Dr. James  
Gunckel said had  
radiation effects  
from TMI accident  
fallout...

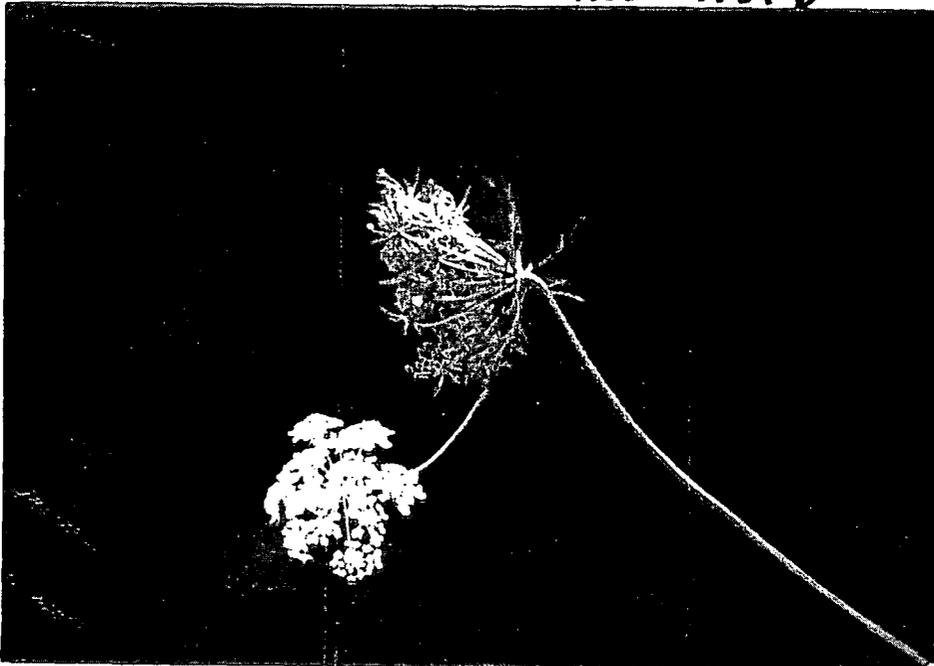
Magnolia w/ TMI  
in background. The  
seed pods grow mutated.



ROSE 1987 - DOUBLE ↑ QUEEN ANNE'S  
LACE 1986 ↓



ROSE ↓ 1987 - NO REPRODUCTIVE PARTS



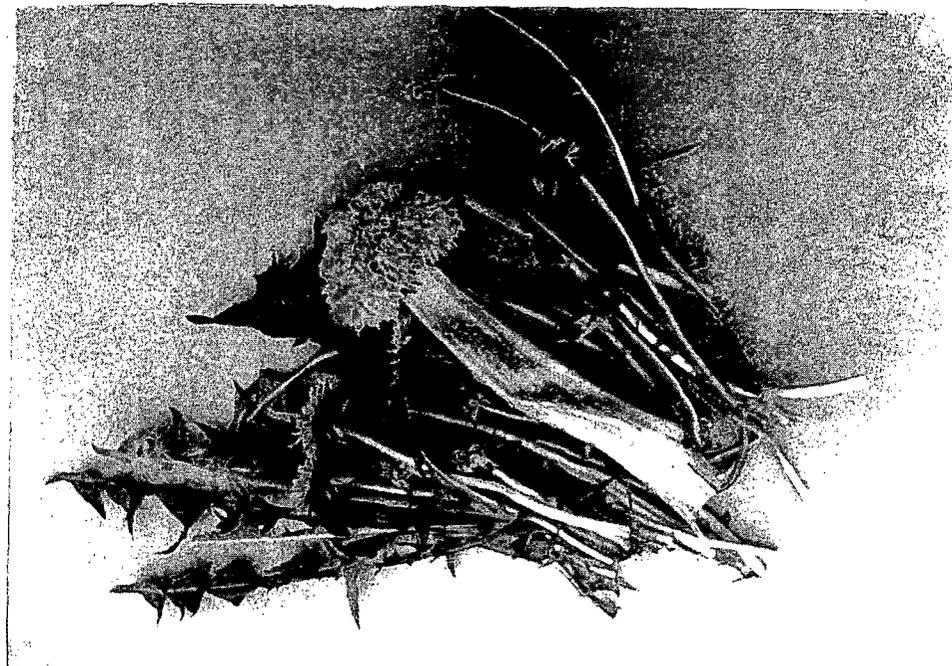


GLORIOSA DAISY 1989

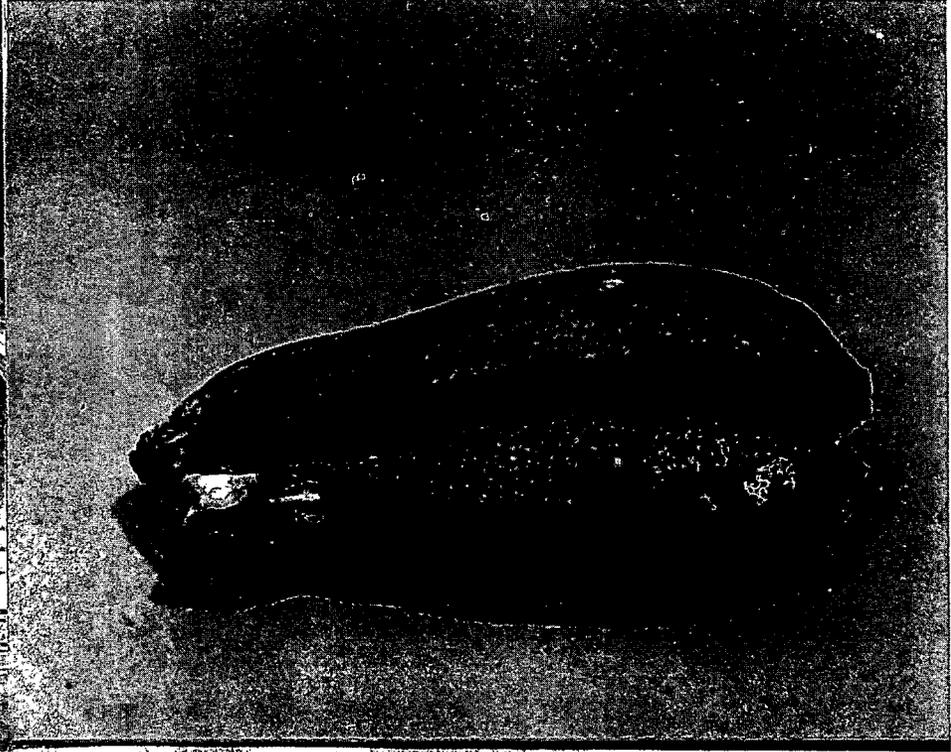


DANDELION 2002 ↑

1987 ↓



DOUBLE SQUASH



### Irradiated pine forest a surprise

KNOXVILLE, Tenn. (AP)—Researchers who exposed a pine forest to gamma rays 20 years ago in an experiment on the long-term effects of a nuclear explosion now are trying to find out why it took so long for the trees to grow again.

So far, only a few seedlings have sprung up in the South Carolina forest, Dr. Frank McCormick, a University of Tennessee ecology pro-

fessor, said. When researchers returned to the forest last spring for the first time in 15 years, they were "shocked because revegetation seems to have stopped after five years," he said.

McCormick headed the research team that exposed the forest and others to radiation in an attempt to discover one of the environmental effects of a nuclear blast.

The researchers designed a radiation machine and used it in 1964 to expose 40 acres on the grounds of Savannah River Plant, McCormick

said. Researchers monitored the forest for the first five years after it was exposed, and recovery seemed to be progressing normally, McCormick said.

The Hope Diamond, the largest of all blue diamonds, 44½ carats, is slightly lopsided. It is probably due to the bottom part of the teardrop shape being cut away so the original stolen jewel could not be identified. The setting is a circle of smaller white diamonds on a chain of diamonds.

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# A forest in S.C. fails to recover

## Pine trees exposed to radiation 20 years ago

By Patricia A. Paquette  
*Associated Press*

KNOXVILLE, Tenn. — A South Carolina forest exposed to radiation in an experiment 20 years ago has failed to replenish itself, and some surviving trees are not growing normally, according to a University of Tennessee ecologist.

Only a few seedlings have sprung up in the affected 40 acres on the grounds of the Savannah River Plant, said Frank McCormick, who headed the research team that irradiated the forest with gamma rays in 1964. He now teaches ecology at the University of Tennessee-Knoxville.

The few seedlings were not more than four years old, and researchers are not sure why the recovery was delayed, McCormick said.

When researchers returned to the forest last spring for the first time in 15 years, they were "shocked because

revegetation seems to have stopped" after the first five years following exposure.

Pine trees within about 25 yards of a radiation machine, invented for the experiment, were killed. Some browned and died before the eight-day exposure was completed, he said.

Farther away from the radiation source, some trees died after several years, some became sterile and some developed three or four trunks after buds on top of them were killed, McCormick said.

The amount of radiation emitted during the eight days was more than six times the amount that scientists estimate would kill a human, he said.

Researchers monitored the forest for the first five years after it was exposed, and recovery seemed to be progressing normally, McCormick said.

"Initial recovery was rapid and

predictable," he said. "Honeysuckle and trumpet vines began moving in. It was expected that pine seedlings would move in next to replenish the site. That didn't happen."

The weeds may have grown thicker because of the radiation and may have cut off light, so the seedlings couldn't grow, he said. Or the trees might not have been able to reproduce.

"Maybe there is more uncertainty about the ecological effects of radiation" than scientists thought 20 years ago, he said. "We need to reduce that uncertainty."

Other sites on federal land were tested in the mid-1960s, McCormick said. They include a mountain rain forest in Puerto Rico, a forest in Rhineland, Wis., and a forest at the Department of Energy's Oak Ridge National Laboratory, about 25 miles west of Knoxville.

ATTACHMENT 5.

## PHYSIOLOGICAL AND MORPHOLOGICAL RESPONSES OF *PINUS STROBUS* L. AND *PINUS SYLVESTRIS* L. SEEDLINGS SUBJECTED TO LOW-LEVEL CONTINUOUS GAMMA IRRADIATION AT A RADIOACTIVE WASTE DISPOSAL AREA

K. R. CHANDORKAR and G. M. CLARK

Departments of Botany and Zoology, University of Toronto, Toronto, Ontario, Canada, M5S 1A1

(Received 5 August 1985; accepted in revised form 19 November 1985)

CHANDORKAR K. R. and CLARK G. M. *Physiological and morphological responses of Pinus strobus L. and Pinus sylvestris L. seedlings subjected to low-level continuous gamma irradiation at a radioactive waste disposal area.* ENVIRONMENTAL AND EXPERIMENTAL BOTANY **26**, 259-270, 1986.—About 100 one-year old *Pinus strobus* and *Pinus sylvestris* seedlings were placed at the Welcome Residue Site (WRS), a radioactive waste disposal area located near Port Hope, Ontario, and thereafter continuously exposed to an average gamma dose rate of 10.15 mR/hr. An additional 100 seedlings were placed at a nearby control site where the background dose rate was about 0.03 mR/hr. Seedlings from both locations were sampled on three occasions for the analysis of various parameters. Data collected at the end of the growing season show that, although the low-level continuous irradiation treatment had not affected the chlorophyll content of the new needles of both species, it had suppressed their normal rates of apparent photosynthesis by about 16-19% and respiration rates by about 14-23%, and had reduced 80% ethanol soluble sugar content by about 14-25%. This treatment also suppressed stem elongation which led to considerable crowding of new needles and stimulated the outgrowth of lateral branches. These results suggest that both the morphological responses exhibited by the irradiated seedlings and the changes observed in the physico-chemical parameters of their needles were intermediated by the effect of continuous irradiation on the level of free auxin, IAA.

### INTRODUCTION

WELCOME Residue Site (WRS) is one of several radioactive waste disposal areas maintained by Eldorado Nuclear Ltd in the immediate vicinity of Port Hope, Ontario. This area was used between 1948 and 1953 as a depository for radioactive wastes resulting from the extraction of radium from uranium ores. The refining of radium was terminated towards the end of 1953 and, for the next two years, this area was mainly used to bury the dismantled parts and machinery of the radium laboratories. Presently it occupies a fenced-in area of about 30 hectares, of which the somewhat central, and also fenced, 5.1 hectares

constitute the main radioactive waste disposal area.

We first visited the WRS in the summer of 1976 to survey the types of vegetation growing within and around its perimeter and to ascertain the impact, if any, on the surrounding environment. During this visit we found that the site was mostly colonized by a variety of grasses, mosses and weedy dicot species (Fig. 5). Radiation exposure rates in different parts of the site varied considerably, ranging from as low as 0.3 mR/hr in areas with thick vegetative cover to as high as 100 mR/hr around a few barren spots. We also noticed a row of 10-year-old Scotch pine (*Pinus sylvestris* L.) trees growing along a drainage ditch

which flanks the southern border of the inner fence (Fig. 1). A closer examination of these trees indicated that, not only their normal growth and development was suppressed, but also that they exhibited a variety of anomalous growth responses such as witches' brooming, needle fusion and marked thickening of stems and needles (Figs 2 and 3). Other than these modifications, the trees did not exhibit nutritional deficiency or chemical toxicity symptoms as judged by the coloration of needles, in spite of the fact that the soil was known to be heavily contaminated with heavy metals such as arsenic, uranium and thorium. Gamma exposure rates in the vicinity of these trees ranged from about 0.3 to 1.2 mR/hr, which suggested that the total dose which they had accumulated in nine years at this site was approximately 25-100 R.

Symptomatic of radiation damage as these responses were, it was not clear at this time whether they were induced by (1) continuous low-level external gamma radiation, or (2) low-level internal alpha and beta irradiation from the absorption of alpha-emitting nuclides and their decay products, or (3) the combination of both.

Evidence that these responses may not have been caused by internal alpha and beta irradiation or by arsenic toxicity was provided by subsequent investigations. Using the technique of activation analysis, it was found that in aqueous extracts of several soil samples taken from the base of these trees the concentration of the alpha-emitting nuclides and arsenic was well below the level that is considered toxic to plants, and that the content of each of these elements in the stems, needles, cones and seeds of these trees was essentially comparable to similar tissues of trees growing at a nearby uncontaminated site. Although these analyses suggested that anomalous growth responses exhibited by these trees may have been induced by low-level continuous gamma irradiation, such a possibility appeared unlikely because reference to literature suggested that continuous gamma irradiation at such dose rates (i.e. 0.3-1.2 mR/hr) should have had little effect on the growth and development of these trees, even after several years of exposure.<sup>(19)</sup> It was therefore concluded that further assessment of the phenomenon was warranted and, hence, this study was initiated.

While this study was well under way, in the summer of 1981 Eldorado Nuclear Ltd initiated work to retop the WRS with uncontaminated soil in order to reduce further deterioration through wind and water erosion. When this work was completed towards the end of 1982, the background dose rate over most of the area was reduced to about 2-2.5 mR/hr and that in the vicinity of the border trees to about 0.03-0.05 mR/hr. Since then, most of the *Pinus sylvestris* trees have been growing at a much faster rate than that which they exhibited before 1981 (Fig. 4), indicating that continuous external gamma irradiation with an average dose rate as low as 1 mR/hr could have suppressed the growth and development of these trees.

## METHODS

### *Plant material*

One-year-old *Pinus strobus* L. (white pine) and *P. sylvestris* L. (Scotch pine) seedlings were obtained from the Ontario Ministry of Natural Resources Nursery in Orono, Ontario. About 250-300 seedlings of each species were lifted from their seed-beds before budbreak and brought to the Department of Botany, University of Toronto, along with a sufficient amount of their seed-bed soil. From these lots about 100 seedlings of each species were selected for uniformity in height and these were transplanted into styrofoam cups using the Orono nursery soil. They were then fertilized with 'heavy' phosphate nutrient solution (N:P:K-10:50:10, Plant Products Co. Ltd, Bramalea, Ontario) and transferred to two adjacent cold frames in an outdoor lot where they were maintained for 10-15 days under diffused light and watered as required. Seedlings of *P. strobus* and *P. sylvestris* were transplanted and transported to the WRS at Port Hope, Ontario on 16 May 1978 and 8 May 1979, respectively.

### *Experimental arrangement and dosimetry*

Of the total number of seedlings of each species taken to Port Hope, half was transferred to a wooden platform (height 30.5 cm, width 40.7 cm and length 244 cm) which was placed near the eastern inner fence of the WRS (Figs 5 and 6). The remaining were transferred to a similar



FIGS 1-4. Photographs of *P. sylvestris* trees growing at the Welcome Residue Site. Fig. 1. A row of 11-year-old *P. sylvestris* trees growing along the southern edge of the inner fence of WRS. Taken 1978. Fig. 2. Branch showing a witches' broom type of growth resulting from suppression of main-shoot extension and outgrowth of lateral buds. Fig. 3. Branch showing thickened stem, abnormal (fused and thickened) needles and reduced stem elongation. Fig. 4. Tree showing marked changes in growth pattern after WRS was covered with uncontaminated soil in 1981, lowering the dose rate to 0.03 to 0.05 mR/hr. Arrow marks height at which 1981 growth began.

6-5-81

PERSONAL EXPERIENCES  
&  
OBSERVATIONS OF  
PLANT GROWTH ABNORMALITIES  
IN  
NORTH WEST QUADRANT  
OF  
THREE MILE ISLAND

Mary Osborn  
1/14/85  
(revised & corrected 2/85)

*(21 pages follow)*

**ATTACHMENT 7.**

PERSONAL EXPERIENCES & OBSERVATIONS OF

PLANT GROWTH ABNORMALITIES IN NORTH WEST QUADRANT OF THREE MILE ISLAND

Since the spring of '79, I have observed, collected and photographed abnormal growth of flora in the areas around Three Mile Island. Regardless, or in spite of the arguments of how much radiation did or didn't get out, if chemicals were released, or even a combination of both - these are my findings and experiences since the early days of the TMI accident.

First I will restate some of my experiences (I will not get into the reports of farm animals & pets, birds, insects or bumble bees dying or disappearing following the accident). I live in the northwest quadrant of TMI, in Swatara Township, approximately 6½ miles away from the plant, Between Harrisburg and Three Mile Island (near the Host Inn, see: NUREG 0600, figure II-3-6).

On Wednesday, 3/28/79 at six o'clock in the morning, my husband and I were outdoors. We had a clean metallic taste at that time. (Our taste was not coppery or rusty or like burning galvanized steel as others have reported) My son and I were outdoors from 7:45 am to 10:00 am; later that day we both had sunburn effects on our hands and faces.

Thursday, 3/29/79, we drove to the west shore, to Ashcombe Vegetable Farm near Grantham, to just get-away for a while. During that drive I had tearing and burning of my eyes. It was so bright, it hurt to see. I did not connect the skin and eye burns to the accident, although we joked about the metallic taste sometime later as being vaporized metal from the accident.

Friday, 3/30/79 (or black Friday as we call it now) after hearing sirens, church bells and the radio news of uncontrolled radiation releases from Three Mile Island, we evacuated.

The next week, on Tuesday evening, my husband and I returned home for winter clothing, medicine and teddy bears. During our brief two hour trip home I encountered an "unusual event" - the problem I observed was the accelerated growth of my umbrella plant (genus cyperus). New growth, fresh green in color, had appeared - more than a 3" x 5" card within 5 days! (Friday to Tuesday)

We evacuated for eight days. Sometime later (I don't remember how many days), while giving my two year old a bath, I noticed a "small wad" of hair in the tub. His hair had thinned, you could see his scalp. (I think all of us in my family had some amount of hair loss and have met women from Middletown saying the same happened to them.)

That spring, one pinkish tulip had a petal growing 2" down on the stem. In the spring of 1980 that tulip "branched", it had two tulips on one stem. This has not occurred since that time. *did have branching 1992 + 2000*

In May of 1979, my daughter picked a bunch of wild field daisies, with two grossly deformed flowers among them. I also found three dandelions in my back yard that appeared to be similarly deformed. I have found many of these every year since 1979. (My neighbor who lived here over 25 years had never

mary stamos osborn

observed this before. I have lived here since 1969 and had never observed this either, anywhere).

In the fall of '79, my children picked up leaves from the front yard, to do crayon "rubblings". The leaves would not fit under a sheet of 8½" x 11" paper. One leaf would not fit where two or three used to.

I have also found abnormalities on the west shore, in the areas of the Aamodt Health Study. The plants were found easily by observing shapes or colors that weren't normal.

In May of '84, Marjorie Aamodt and I took some of the specimens collected to a botanist, Dr. James Gunckel. He is the "world authority on modifications of plant growth and development induced by ionizing radiations". (See his affidavit attached, from the Aamodt Health Survey.) At that time Dr. Gunckel gave us two reprints of his research and mentioned clues as to what additional effects or symptoms to look for: thickening of leaves, leathery leaves, unusual dwarfing, multiple leaf axils (stimulations), reversion (vegetative-floral growth back and forth), etc.

To date, I have found plant abnormalities in these areas around TMI: Londonderry Township, Derry Township, Lower Swatara Township, Fairview Township, Harrisburg, Newberry Township, Swatara Township and Upper Allen Township. The plants I've found are: daisies, dandelions, chrysanthemums, pyrethrum, sunflower, forsythia, marigolds, crown vetch, maple leaves, redbud leaves, rose leaves, queen anne's lace, corn tassels, some common weeds and a few others. Also, very unusual growth patterns on two pine trees and dandelion leaves 31" long. (see list and sketches attached)

I cannot say "all" abnormalities found were caused by radiation or chemicals from the Three Mile Island accident, but I believe the fallout from the accident has caused most of the effects I've seen.

..The fact that abnormalities are being found 5 years after the accident raises serious questions.....

Is there something in the soil now that is causing these effects? Is the plant releasing enough from clean-up or Unit 1 testing to cause this now? Has the Chinese Bomb Fallout and weapons testing combined with years of continuous radiation releases from TMI done irreversable harm to our environment? To our babies, children or families? To our animals, plants, water, air and earth? What Environmental Impact Statement ?

A key point to make is the finding that these abnormalities, modifications, or mutations occurred in the same areas where people have reported having the metallic taste, skins burns, and other accident related symptoms. We have found people, animal and plant effects in the same areas where symptoms were reported at the time of the Three Mile Island nuclear accident. They have been discounted by some "experts" but not all. The fact is there is still no other explanation to these terrible effects. Everything I've found seems to tie into the accident and the more one learns the more this seems to be true.

GLOSSARY

ADVENTITIOUS BUDS: Buds formed where it shouldn't be, from tissues that shouldn't form a bud.

AXIL: Angle between leaf or leafstalk and the stem that carries it. Any new growth or flower bud that arises from an axil is called axillary.

BLIND SHOOT: Where normal tip of shoot that would normally have leaves or flower, but it doesn't; it just forms a long shoot tip without leaves or flowers.

BUD: A condensed shoot, often protected by overlapping scales. A growth bud contains embryo leaves. A flower bud contains embryo flowers or flower clusters.

CHLOROSIS: A condition in which leaves become unnaturally pallid, whitish or yellow. Usually due to lack of essential minerals.

DIFURCATION: Branching into two.

FASCIATION: Multiple stems from multiple buds.

MARGIN: The edge or boundary of any plant organ - most often applied to the border area of a leaf. (margin deformity see Redbud leaves.)

MORPHOGENETIC ABNORMALITIES: Form abnormalities.

VACUOLATION: Formation of a largely water filled cell.

Abnormalities have been observed in the following areas around Three Mile Island since the spring of 1979:

LOCATION CODE\* (see following page)

DT DERRY TOWNSHIP	LST LOWER SWATARA TOWNSHIP
E ETTERS	M MECHANICSBURG
FT FAIRVIEW TOWNSHIP	NT NEWBERRY TOWNSHIP
H HARRISBURG	O OBERLIN
L LISBURN	ST SWATARA TOWNSHIP
LT LONDONDERRY TOWNSHIP	UAT UPPER ALLEN TOWNSHIP

note-

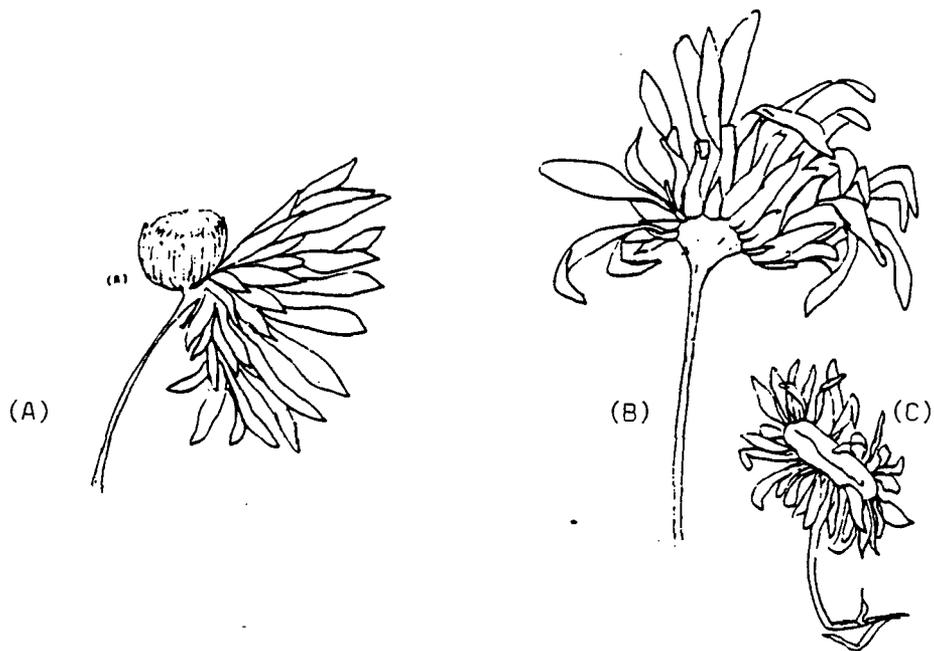
There have been other reports of strange or unusual plant growth in the TMI area since the accident. Abnormalities are not limited to locations mentioned here. My observations are up to the period of January 1985 and have been found as far as 15 miles from Three Mile Island. In many instances the findings seem to follow the "plume" pathways as evidenced by the reports of exposure at time of the accident by human dosimeters.

Abnormalities/mutations occur in nature, it is the frequency of these occurrences that merits attention and concern.

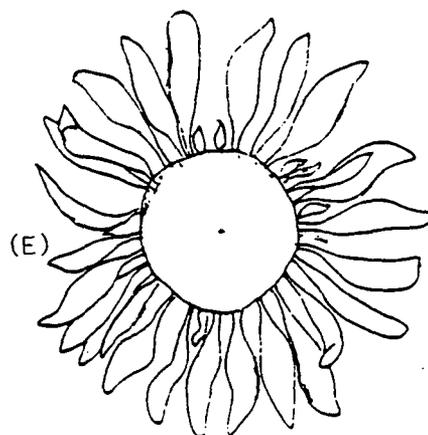
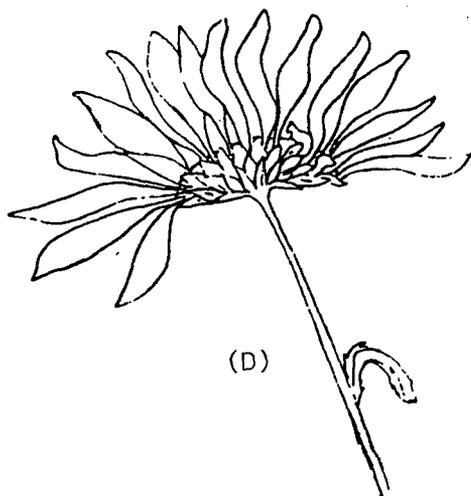
OBSERVATIONS

<u>TYPE OF PLANT</u>	<u>LOCATION*</u>	<u>ABNORMALITY OBSERVED</u>
CHRYSANTHEMUMS	UAT	MULTIPLE BUDS.
CORN	DT, E	SEX REVERSAL.
CORNFLOWER	ST	WHITE, SHOULD BE BLUE (CHLOROSIS?).
CROWN VETCH	ST	CHLOROSIS (FRENCH VANILLA COLOR).
DAISY	E, ST	STEM FASCIATION, <del>MULTIPLE BUDS</del> , AXILLARY FLOWER HEAD.
DANDELION	E,ST,O,H,M	DEFORMED FLOWER HEADS, MULTIPLE BLOOMS.
DANDELION LEAVES	FT	HUGE, 31" LONG.
FORSYTHIA	E, LST	MULTIPLE BUDS.
MAPLE LEAVES	E,L,ST,LST	MARGIN ABNORMALITY, THICK & LEATHERY, PUCKERED, CHLOROSIS, SOME DWARFED, SOME HUGE.
MAPLE TREE	ST, FT	BLIND SHOOTS, EXCESS SEEDS (WOULD NOT SPROUT).
MAPLE TREES	LST, ST, FT	DEAD AREAS ABOUT 15' IN DIAMETER AS IF "PLUME" WENT THRU.
MARIGOLDS	FT	STUNTED, STEM FASCIATION, NO FLOWER PETALS, ALL FLORETS, LEATHERY LEAVES.
ONION/GARLIC WEED	ST, LST	REVERSION.
PINE TREES	E, ST	UNUSUAL GROWTH PATTERN FOR PINE CONES, UNUSUAL MASSIVE GROWTH.
PYRETHRUM	ST	STEM FASCIATION, THICK LEATHERY LEAVES.
QUEEN ANNE'S LACE	ST, LT	PINKISH FLOWERS, WOODY STEM.
REDBUD LEAVES	ST	MARGIN ABNORMALITIES.
ROSE	LST	WHITE ROSE ON ALL YELLOW BUSH.
ROSE LEAVES	LST, ST	LEAF FUSION, STUNTING, CHLOROSIS, AXILLARY BUDS FORMED.
SPIDERWORT	NT,ST	EXTRA PETALS & STAMENS.
SUNFLOWER	E, L, ST	STEM FASCIATION, AXILLARY BUDS.
YELLOW BUSH TYPE WEED	ST	WRONG COLOR (CHLOROSIS?).

\*see previous page for location code



- (A) AXILLARY FLOWER HEAD
- (B) STEM FASCIATION
- (C) DEFORMED INFLORESCENCE, TOP VIEW
- (D) NORMAL SIDE VIEW
- (E) NORMAL TOP VIEW



(Shape and form characteristics are similar in dandelion, sunflower, chrysanthemum and daisy)

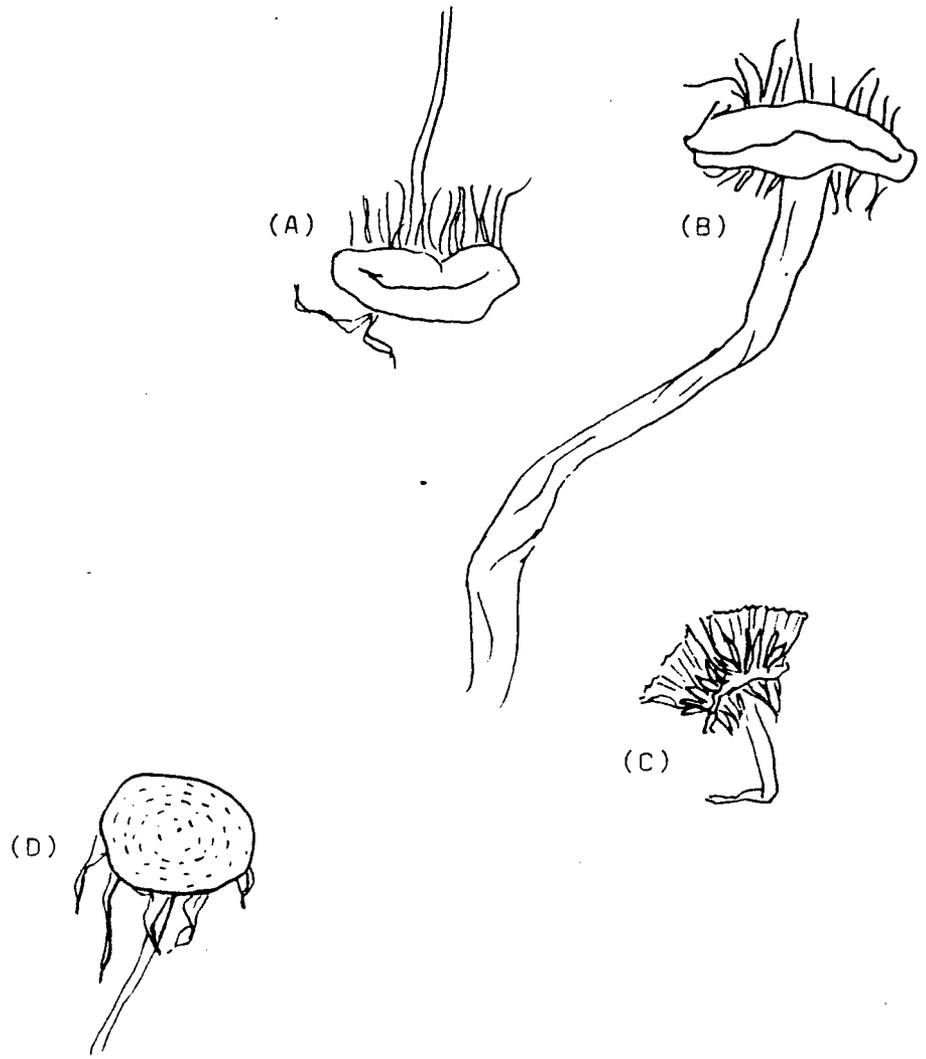
5/84

Swatara Twp, Eppers

area-

FIELD DAISIES

A,B,C, CLOSE TO ACTUAL SIZE  
D, ENLARGED



A, B, 5/82 OBERLIN  
C, 7/82 HARRISBURG  
D, 8/84 SWATARA TWP.  
AREA

(A)(B) DEFORMED FLOWER HEAD  
(C) DOUBLE BLOOM  
(D) NO DEFORMITY  
DANDELION

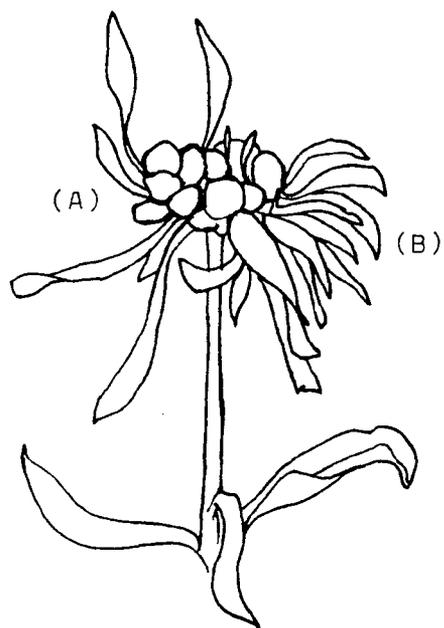
CLOSE TO ACTUAL SIZE



9/84  
SWATARA TWP.  
AREA

NO DEFORMITY  
CHRYSANTHEMUM

CLOSE TO ACTUAL SIZE



9/21/84

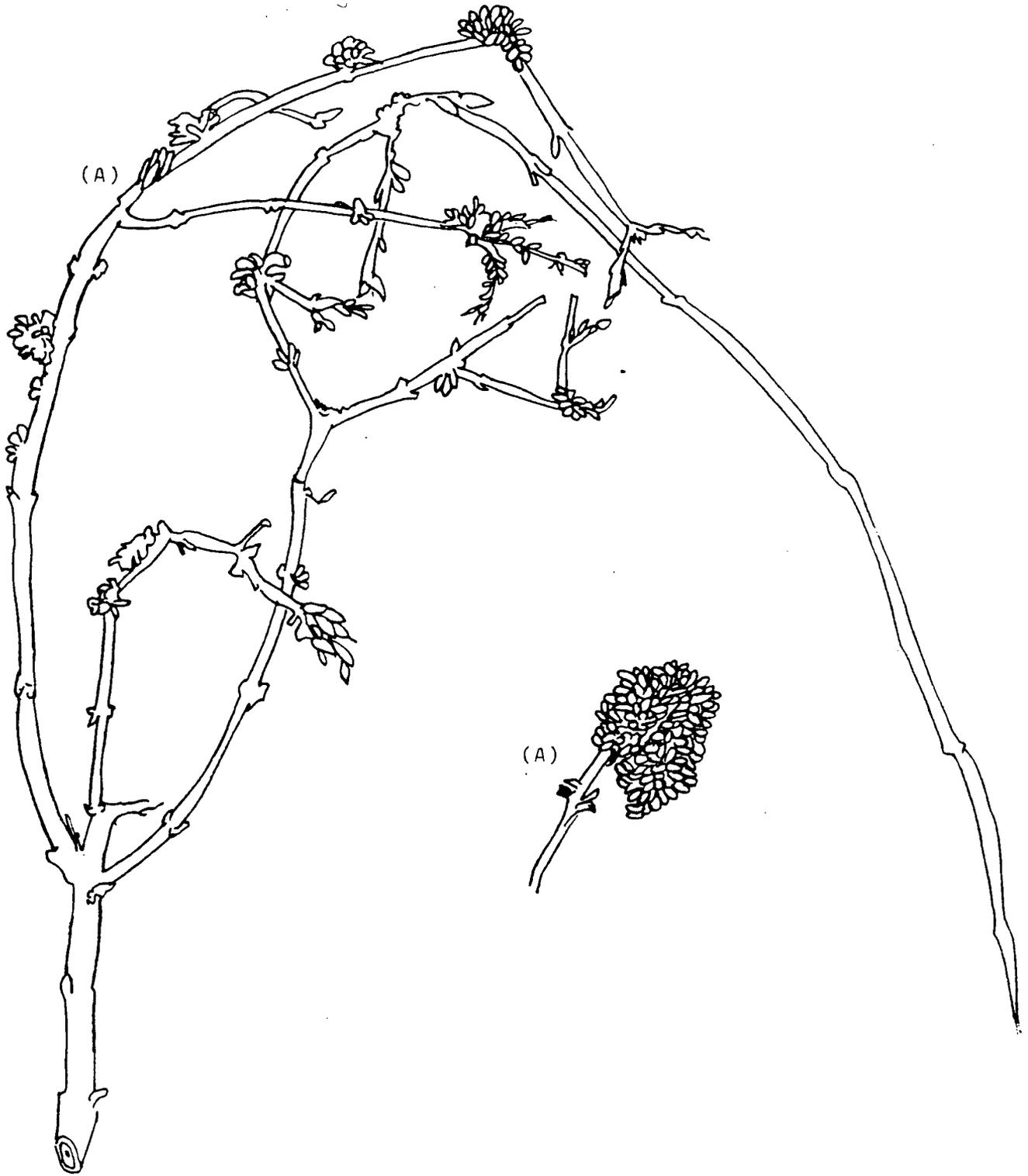
about 14 miles n/w  
AREA

(A) MULTIPLE BUDS

(B) PETALS

CHRYSANTHEMUM

CLOSE TO ACTUAL SIZE

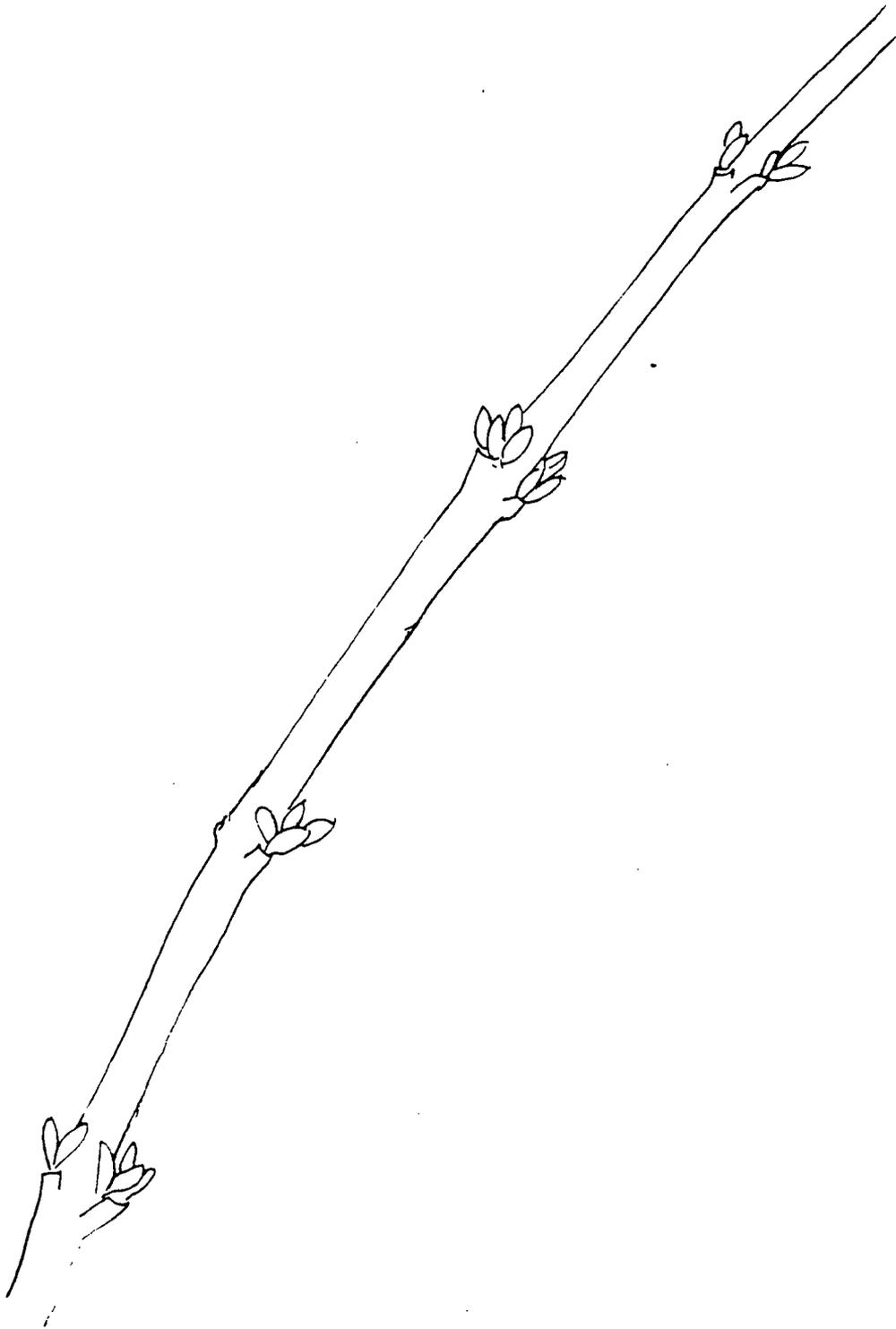


4/83  
ETTERS  
AREA

(A) MULTIPLE BUDS

FORSYTHIA

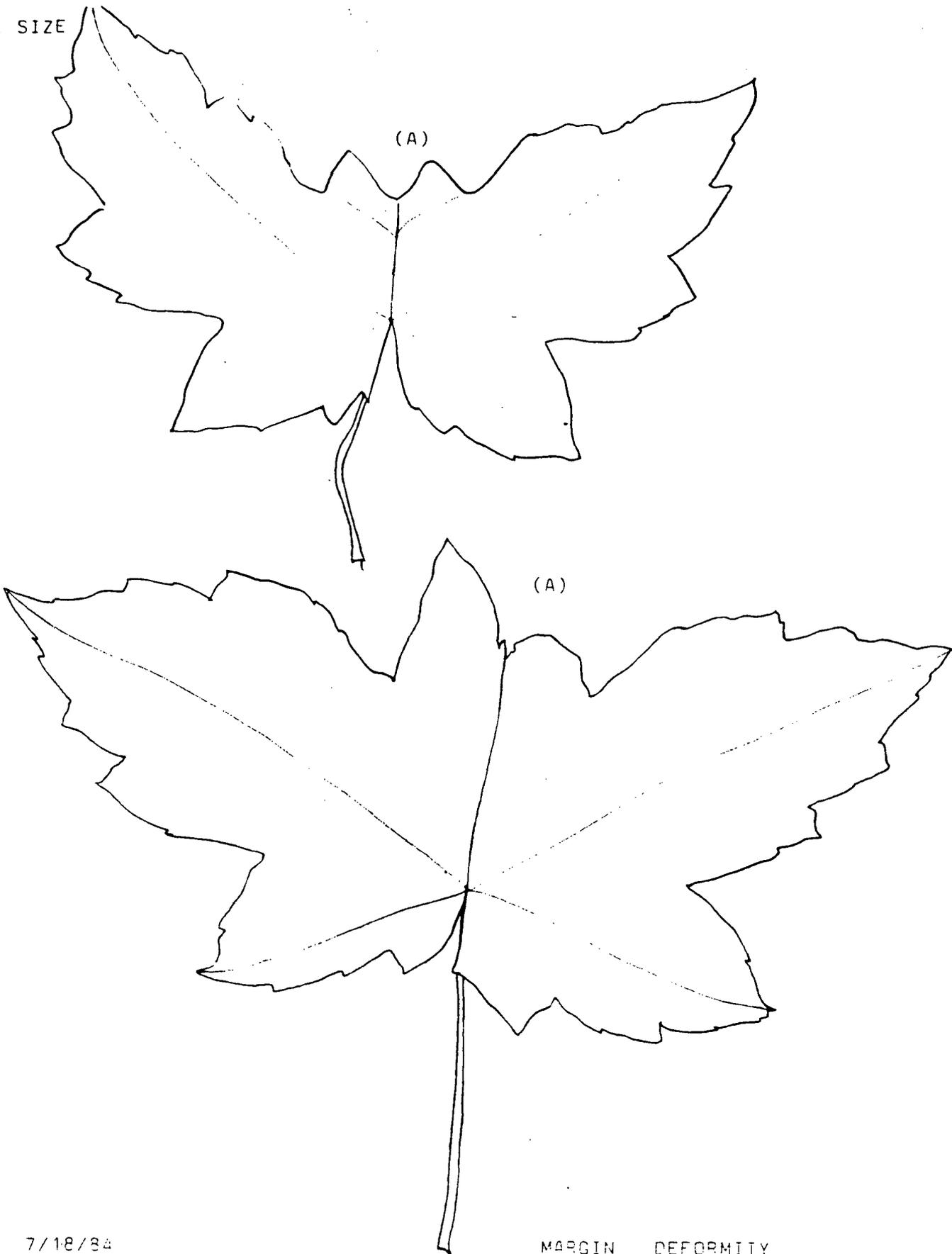
CLOSE TO ACTUAL SIZE



1/2/85  
SWATARA LOWER SWATARA LINE  
AREA

NORMAL TWIG  
FORSYTHIA

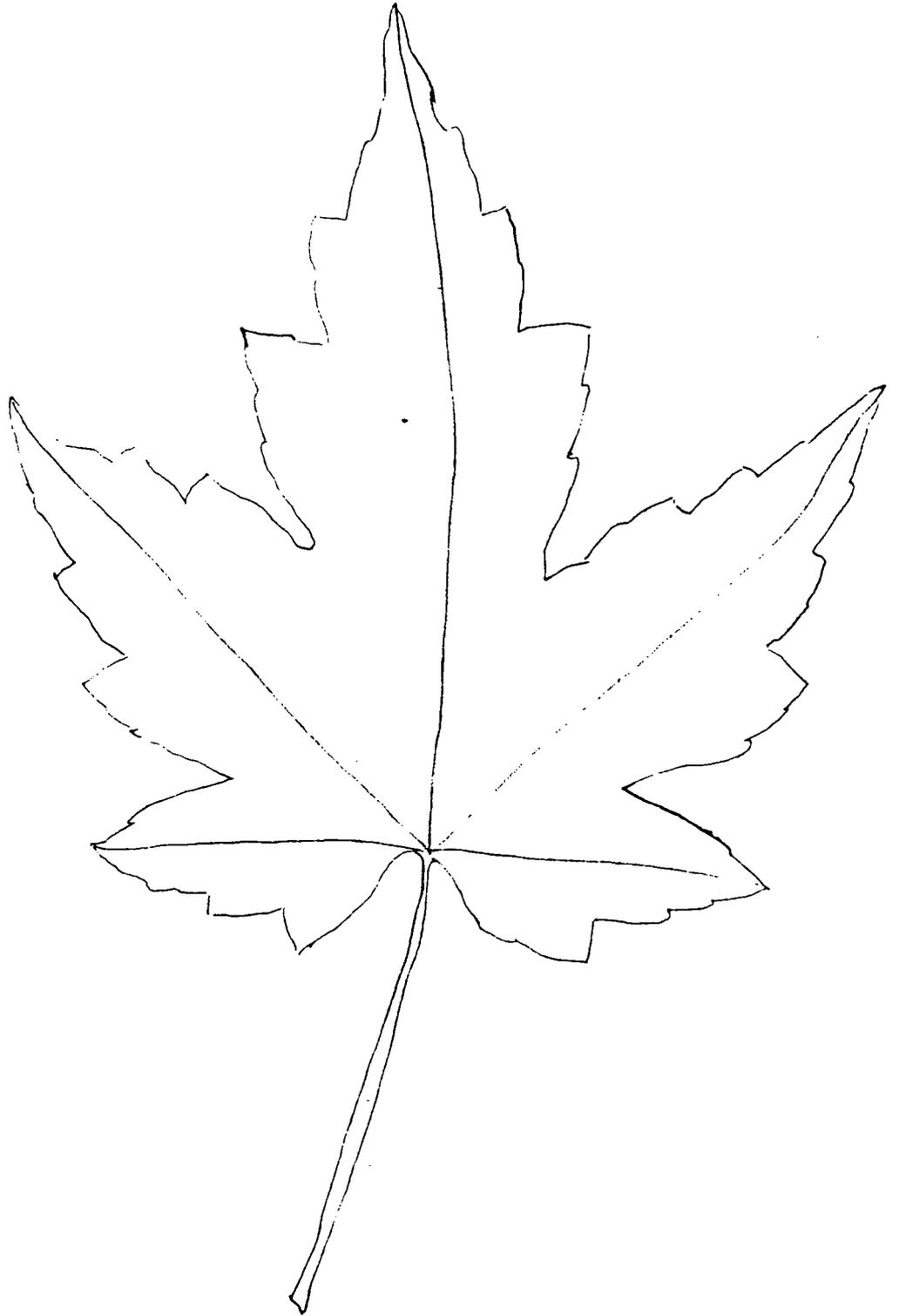
ACTUAL SIZE



7/18/84  
SWATARA TWP.  
AREA

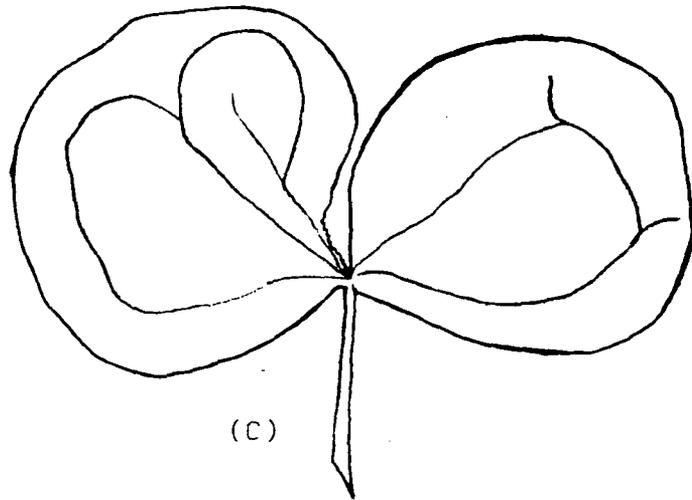
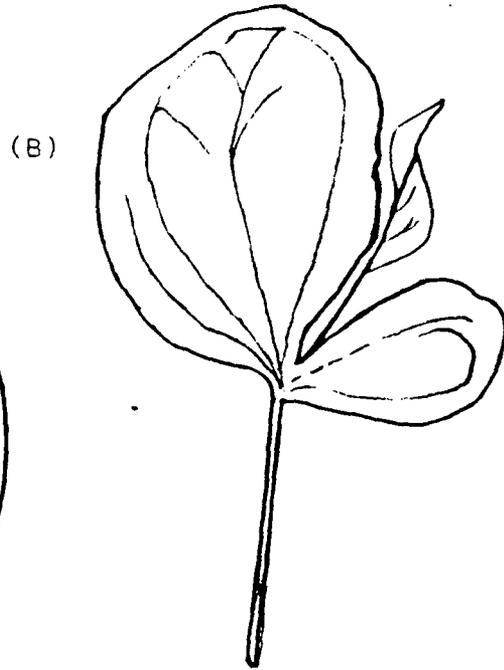
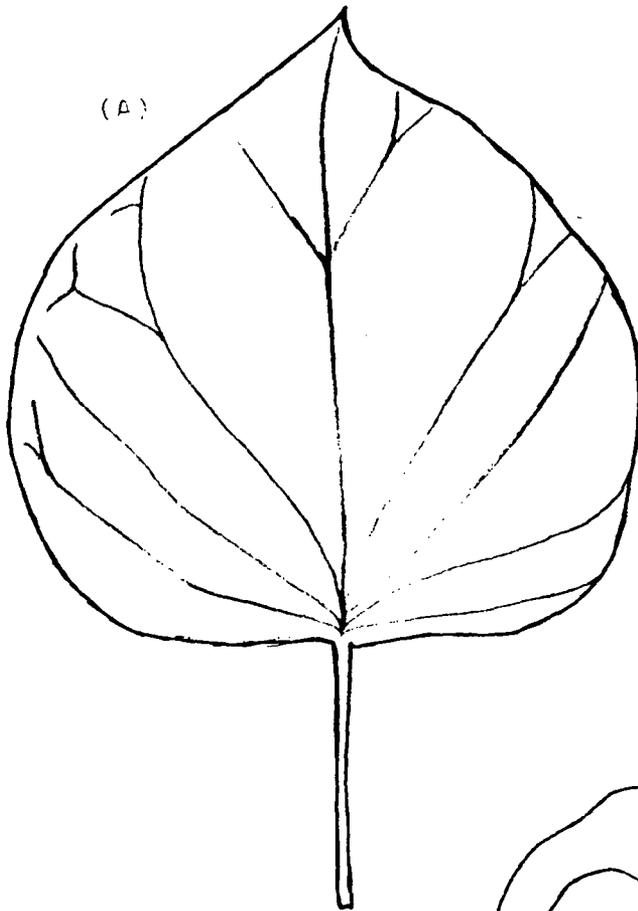
MARGIN DEFORMITY  
(A) CENTER LOBE NOT DEVELOPED  
MAPLE LEAF

ACTUAL SIZE



10/84  
SWATARA TWP.  
AREA

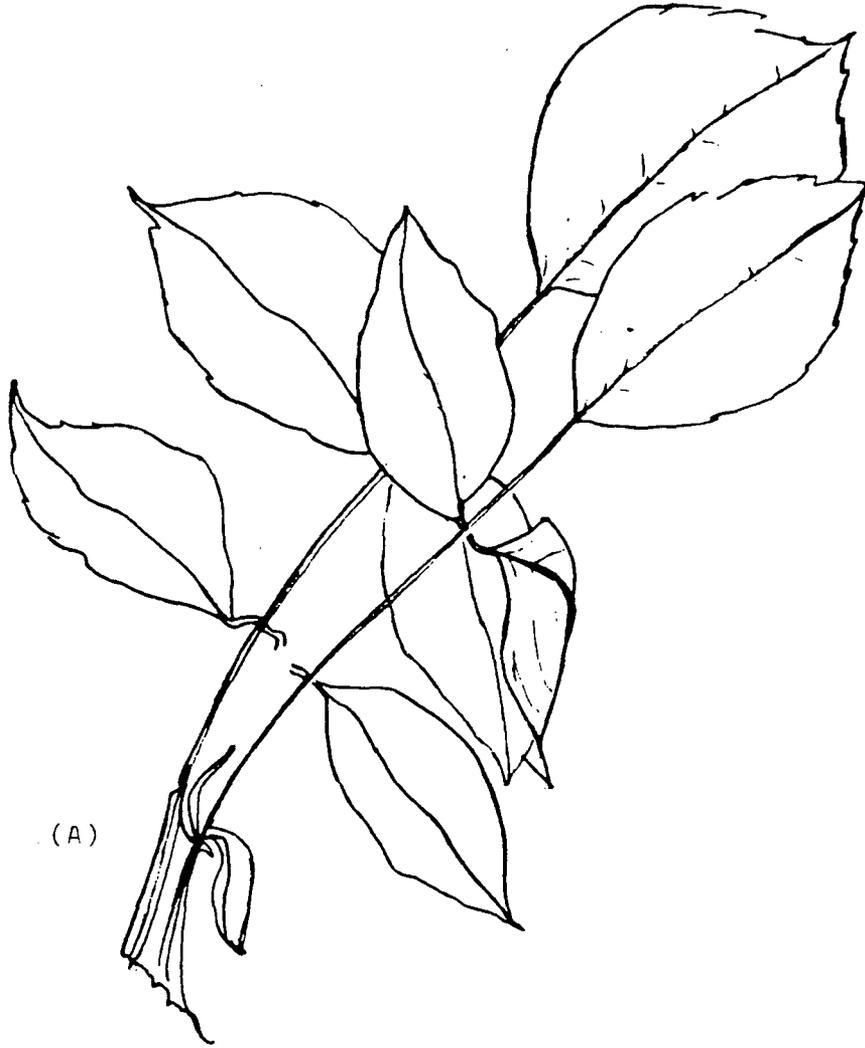
NO DEFORMITY  
MAPLE LEAF



7/84  
SWATARA TWP.  
AREA

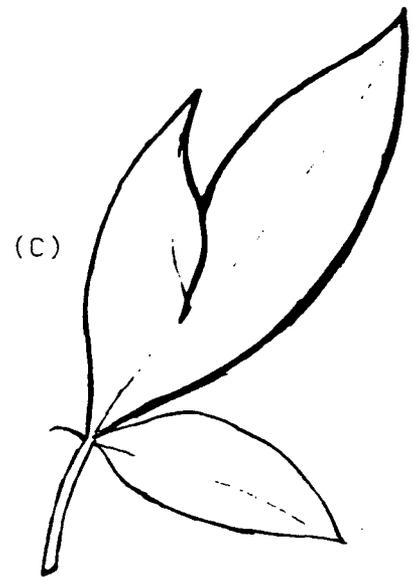
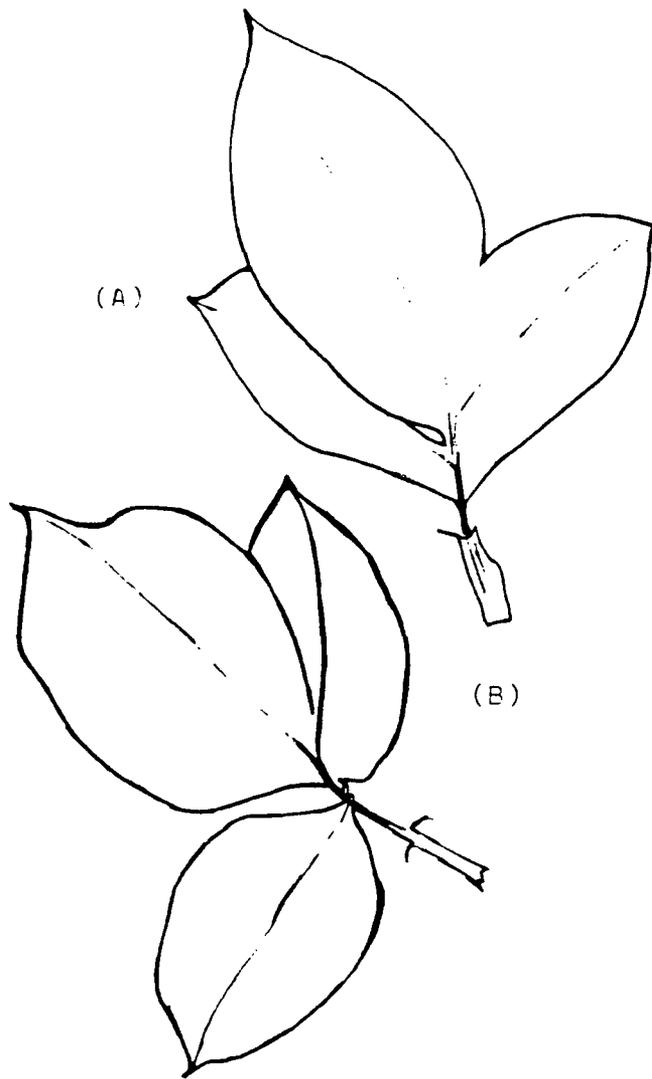
(A) NO DEFORMITIES  
(B)(C) MARGIN DEFORMITIES  
REDBUD LEAVES

ACTUAL SIZE



7/84  
SWATARA TWP.  
AREA

(DECAPPED? & THEN)  
AXILLARY BUDS DEVELOPED  
BLAZE ROSE BUSH



6/84  
A, B, LOWER SWATARA  
C, SWATARA TWP.

FUSED LEAVES  
ROSE BUSH



SEX REVERSAL (MALE TASSEL  
PRODUCING FEMALE CORN)

TASSEL OF CORN

9/84, 8/82

ETTERS, HERSHEY R.D.

AREA

REVERSION

WILD GARLIC/ONION WEED

9/82

SWATARA, LOWER SWATARA

AREA

## The Scribbler

# Boy George Corn

### Another Agricultural Oddity of the Season

We have reported on a few of the weird plants that issued from this most abundant of growing seasons, and we now have the 1984 garden winner. The envelope, please, Mellors.

And the winner is: sexually confused corn. This has been a ripe year for what ordinarily is a rare abnormality: tassels producing their own ears.

Lou Gable, a deputy game warden of Columbia R2, spotted some of this strange corn on a Mountville-area farm not long ago. He informed Penn State extension agent Arnold Lueck. Lueck has since heard about several other outbreaks.

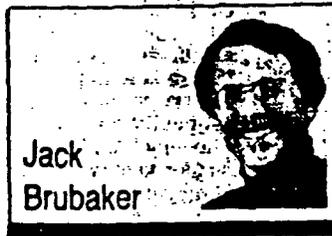
A brief explanation for city slickers: Corn is bisexual. The tassel is the male organ. The ear is the female organ. The tassel sheds pollen on the ear, and the ear makes baby kernels.

That's what happens under normal circumstances. Abnormally, on rare occasions, male tassels change sex and produce their own miniature ears with kernels — as if they didn't need the regular ears at all.

Nobody knows precisely why this happens, Lueck says. All is speculation, especially this year when the abnormality is relatively widespread.

"The affected plants likely experienced some kind of environmental shock," he notes, "as extreme cold or a virus infection. Such conditions have been known to produce sex changes in corn plants."

The corn Gable spotted, and which is pictured here, is field corn. Lueck says he has also seen the aberration in sweet corn. (The Scribbler once spied a mirage with one white, sequined glove dancing in his bowl of corn flakes, but we're not going to develop that theme.)



Corn tassels that gave birth to their own ears

Lanc 10/84



55 LB. mushroom

### Record find?

Erma and Donald Croce of Hershey hope their find will mushroom into a record breaker. The couple pulled the 55-pound specimen from a stump in a field along Route 322 just east of Hershey yesterday. They plan to have the mushroom — which they claim is edible — weighed and measured at Lebanon Valley College before submitting statistics for possible inclusion in the Guinness Book of World Records.

Below are excerpts from the booklets Dr. Gunckel gave us. This explains why even knowledgeable people have difficulty in accepting the fact that radiation damage occurred in the plants around TMI.

Most of the radiation effects described are quantitatively rather than qualitatively different from those known to occur in unirradiated plants. (273)

You have nothing that is not known in nature - you seem to be speeding up the frequency of these events. (279)

Most, if not all, radiation induce effects are teratological responses observed in nature, but the frequency of such events is markedly accelerated. (373)

A large variety of leaf anomalies has been noted in irradiated plants. In any given species, one or more of the following changes may appear; dwarfing, thickening, roughened or uneven texture, puckering of blade, curling of leaf margins, distorted venation, fusions, cup-shaped or tubular leaves, color changes, and premature abscission. (272)

Irradiated flowering plants may show: increased height, thickening & fasciation of floral stalks, delayed and/or reduced flowering, premature or increased flowering, color changes and somatic changes, or high degree of sterility and modification in form and number of floral parts. (597)

Fasciation of stems, while not uncommon in unirradiated plants occurs so frequently in irradiated plants that it may be considered a typical radiation effect. (375)

It should be emphasized that the results for one species should not be extrapolated to another, as the responses of different species or even different forms or varieties within a species may vary. (595) An example was given-if you have an apple orchard with many different kinds of apple trees, and they were all exposed to equal doses of radiation, some trees could be injured while other trees are unaffected.

Dr. Gunckel and Dr. Sparrow wrote in 1961, "it is obvious that the naturally occurring ionizing radiations were producing their biological effects since time immemorial, and that the cumulative effects of these radiations might conceivably be of considerable evolutionary significance. The recent concern over small increases in background radiation due to radioactive fallout reflects the opinion of many biologists that an increase in the background level of radiation, if continued over long periods of time, may produce significant biological effects, mainly genetic."

Publications of James E. Gunckel

IV. The Effects of Ionizing Radiation on Plants: Morphological Effects, The Quarterly Review of Biology, Vol 32, No. 1, March 1957

Modifications of Plant Growth and Development Induced by Ionizing Radiations, Encyclopedia of Plant Physiology, Vol XV/2, 1965

Aberrant Growth in Plants Induced by Ionizing Radiation, with Arnold H. Sparrow, Abnormal and Pathological Plant Growth, Brookhaven Symposia in Biology No. 6 (1954)

Ionizing Radiations: Biochemical, Physiological and Morphological Aspects of their Effects on Plants, with A. H. Sparrow, Encyclopedia of Plant Physiology, Vol XVI, 1961

note: I met Dr. Gunckel on 5/5/84 at his home in N. J. 3 items he mentioned at that time were: • "all studies ever done on levels below 35 R is exactly 2 studies." (plant studies)  
• "The real danger is the food chain."  
• the "Body can't get rid of heavy metal - gathers in fatty tissues in animals."  
(the above is from some of my notes of that visit.)

ASD

The Bulletin  
of the Torrey Botanical Club

Editor-in-Chief: James E. Gunckel

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Bridgewater, NJ 08807  
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May 11, 1984

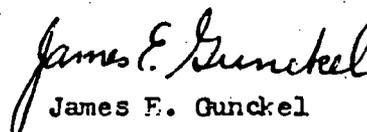
AFFIDAVIT 9

I have carefully examined a few specimens of common plants collected shortly after the accident at TMI and compared them with specimens collected more recently. The current abnormalities are probably carried forward by induced chromosomal aberrations. There were a number of anomalies entirely comparable to those induced by ionizing radiation -- stem fasciations, growth stimulation, induction of extra vegetative buds and stem tumors.

Most of the stem abnormalities described in the literature, and in my own experience, are induced by relatively high doses of X or gamma rays extending over a period of usually 2-3 months. Notable exceptions, however, are similar responses to beta ray exposure from radioisotopes ( $P^{32}$ ,  $Zn^{65}$ ,  $Ca^{45}$ ) and for only 24 hours. In other words, it would have been possible for the types of plant abnormalities observed to have been induced by radioactive fallout on March 29, 1979.

In discussing the general biological effects of irradiation, some clarification may be helpful. In plants, the dose rate (e.g., mr/hr) is much more important than total dose (e.g., mr/yr) in inducing abnormalities. Further, the "quality factor" for gamma and beta radiation is not the same as generally assumed. In fact, I have incontrovertible experimental results to show that beta rays are at least a quality factor of two in plants.

I am the world authority on modifications of plant growth and development induced by ionizing radiations, having researched this area for 34 years at the Brookhaven National Laboratory and at Rutgers University. The three review papers appended attest to my expertise.

  
James E. Gunckel

3/29/79 = 3 Rem Release

# State's TMI study clouded by survey method doubts

By Frank Lynch  
Sunday Patriot-News

The state's recently released study of health effects of the 1979 Three Mile Island accident may have been flawed by expanding the survey areas beyond the prescribed five- and 10-mile zones.

According to 1980 census figures, the state Department of Health included 28,610 people who live farther than five miles from the Londonderry Twp. plant in the population listed for those who live within five miles.

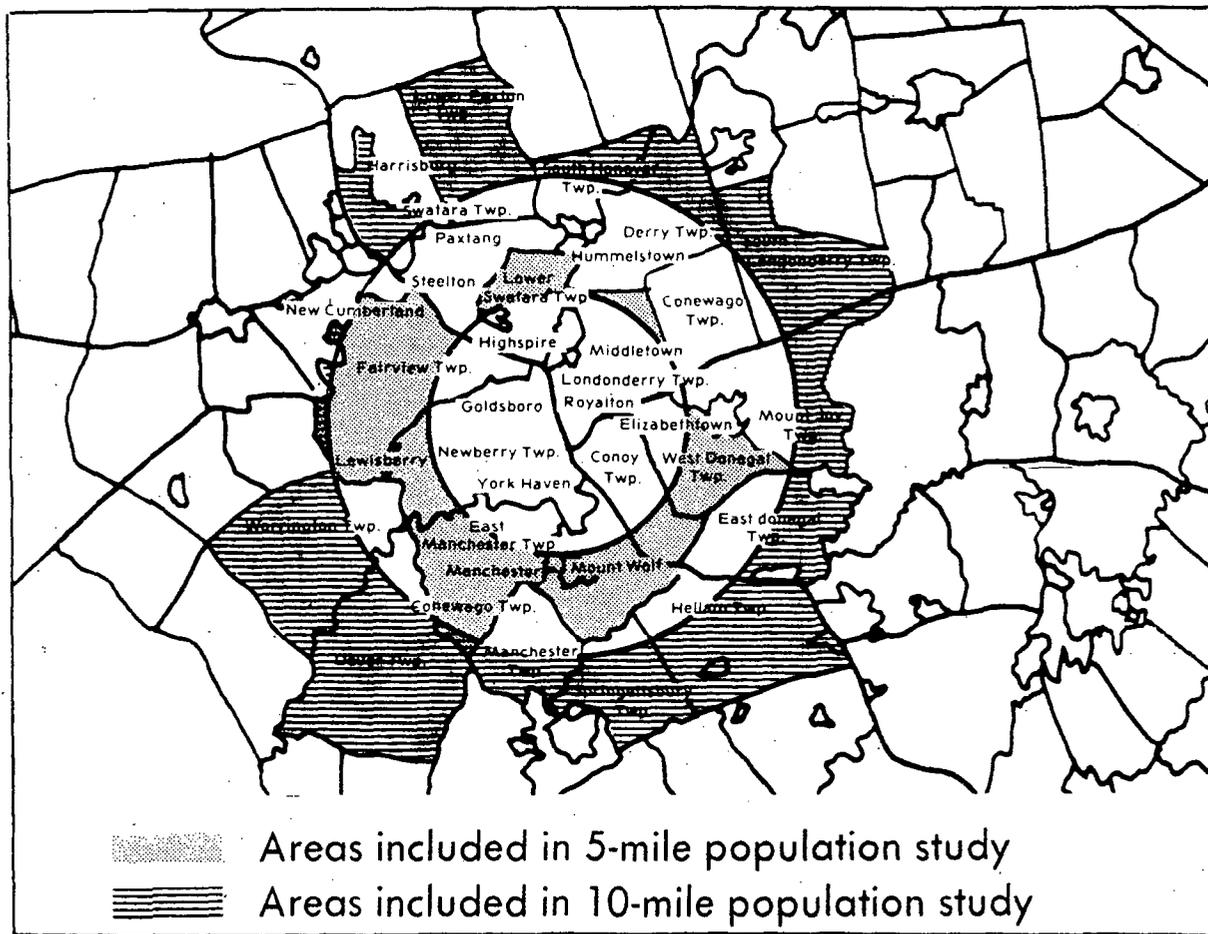
Another 122,000 people who live farther than 10 miles from the plant were included in the population of those living "within" 10 miles.

**THE RESULT**, according to epidemiologists and statisticians contacted by the Sunday Patriot-News, is that if there actually were adverse health effects such as increased cancer cases among those living close to the plant, the figures would be diluted by expanding the base population.

"It seems like a strange thing to do," said Dr. Robert A. Hultquist, Pennsylvania State University professor of statistics. "I think you would substantially dilute [assumed cancer rates] to get even a few miles away."

Dr. George Hutchison, Harvard professor of epidemiology, concurred.

"Let's suppose there is an ex-



cess cancer rate [in the five-mile zone], and not excess rate beyond the five-mile zone," he said. "The larger population would dilute the overall cancer rate."

THE STUDY, released a month

ago, concluded that no adverse health effects had been found so far in people who live around TMI, site of the nation's worst commercial nuclear accident on March 28, 1979.

Comparing census figures with

the totals listed by the Health Department, 44 percent of the population figured in the five-mile statistics live outside that zone, while 42 percent of those said to be

See STATE'S — Page A10

Sunday Patriot-News  
 ATTACHMENT 8. END.  
 HARRISBURG, PA., OCTOBER 6, 1985

# State's TMI study clouded

From Page A1

"within" the 10-mile zone actually live farther away.

For example, all of Lower Paxton Twp.'s 34,830 residents were included in the 10-mile figures, although only 2,000 of them live in the sliver of the township inside the 10-mile radius. Some Lower Paxton Twp. residents live as far as 16 miles from the plant.

Health Department officials defend the way they gathered their data. They say the data were not diluted by the excess population included, and that the study could not have been conducted had they attempted to stay close to the imaginary 5- and 10-mile zones.

"IT WOULD be a tremendous job, almost humanly impossible" to conduct such a study, said Edward Digon, principal author of the report and chief of the department's special studies section, division of epidemiology research.

Digon said the report should have noted that some of the people included in the study live outside the zones. Such a notation had been included in an early draft that he wrote, but was deleted during the editing process. Leaving the explanation out, he said, was an "error."

But Digon stressed that there was not an increase in cancer. He said the four communities entirely

within the five-mile zone had about the same number of cancer deaths as would have been expected.

Health Department spokesman Bill Lindeberg said, "We think we have a pretty solid report, and we stand on it."

**TMI'S UNIT 2** reactor overheated and released some radioactivity into the environment in March 1979. Government experts and scientists have said not enough radiation escaped to trigger any significant health problems.

But doubts have persisted over the last six years.

Norman and Marjorie Aamott, formerly of Chester County, and now of Lake Placid, N.Y., conducted a study last year that concluded the number of local people dying from cancer increased sevenfold since the accident. *on 3 streets.*

Meanwhile, the Columbia (N.Y.) University Department of Epidemiology is conducting a two-year, \$420,000 study of pregnancy outcomes and cancer rates since the accident.

And the Health Department will continue to monitor cancer cases in the area for future studies.

**THE MOST** recent study was made to find out what, if any, health effects were suffered by residents living certain distances from the plant. Five- and 10-mile zones were selected for comparison purposes.

Digon noted that death certificates and cancer incidence information from the state's Cancer Registry are available according to "minor civil division" — or by township and borough.

Since the minor civil divisions do not align with the five- and 10-mile circles, officials included all of a division in the study even if only part of it is within the described zone. *neither do twps.*

Digon said it was decided to use the divisions — even though their use inflates the population numbers — because it will be easier to conduct follow-up studies.

"YOU COULD do it [try to divide the divisions to stay close to the zone circles]. But you can't do that for too many years because the reference books [needed to keep track of residents] would fill up a room," he said.

Therefore, he said future comparison studies also will include those living outside the zones.

Harvard's Hutchison said that to do a study expeditiously, "there is a good argument for using townships and boroughs rather than using areas defining a circle around Three Mile Island."

But he said that that study method should have been described in the report. "If there is not any footnote [explaining that some areas are actually not within the described zones], then you have a problem."

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## Anti-nuclear protests spread

PARIS (AP) — About 3,000 people, chanting to the strains of accordion music, marched through Paris on Monday to protest France's resumption of nuclear test blasts in the South Pacific.

Several hundred anti-nuclear protesters also demonstrated Monday in Orleans in central France, Rennes in the west, and Poitiers and Agen in the southwest.

The protests were small by French standards, involving far fewer people than the typical union, student or other anti-government demonstration. But they were still one of the largest shows of opposition yet in France to nuclear testing.

9-12-95 Mitchell Lane

AND-PADOH already had a 5 mile population base study