

The Nuclear End to our Genetically Modified Beginnings: A historic retelling of the events which occurred at the Seneca Army Depot in the summer of 1983

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Cramped into vans too full with people, equipment, and supplies, they made their way down Route 96A. It was an unseasonably hot day in early May and the women of the Women's Encampment for Future Peace & Justice were just starting to congregate. They drove until they reached their site, then pulled off and collected into a large circle near the vans.

Looking around, the women admired their newly purchased 52 acre plot of farm land abutting the Seneca Army Depot.¹ Gathered here under pretenses that they were to peacefully protest the nuclear weapons and missiles certainly being stored in the depot, they had another job as well (Blume, 2001).



First group of researchers arriving at the Women's Encampment for Future Peace and Justice, pictured in May of 1983.

First and foremost, these women were scientists contracted by a private agrochemical research company to quietly run preliminary ecological studies on newly developed genetically modified crops. Looking around the circle of women dressed casually in shorts and tank tops one would maybe never know they were looking at a collection of ecologists, botanists, chemists, and scores of other research professionals gathered from all over the world for their expertise.

That was the point.

¹ The Seneca Army Depot was a 10,587 acre area of land located in Romulus, NY, a small upstate farming town. From 1941 until the mid 1990s, it was used as a high security, munitions storage and disposal facility for the US Army (Blume, 2001). The area was enclosed entirely by high fences and filled with herbivorous foraging animals including an infamous herd of white white-tailed deer.

They were to conduct their research using the Seneca Army Depot as their study site without the knowledge of the general public or US government. A daunting task for sure, but these women were celebrated professionals and not only that, but also capable, well-informed and passionate.

The research was multi-faceted and was the first of its kind. The genetically modified crops were fresh out of the lab-- they had only just engineered enough seeds to launch the study. The study was to test the first two genetically modified plants ever created: tumor-resistant tobacco plants and anti-frost strawberries capable of growing in more mild climates (Science News, 2012).



Two researchers beginning to setup shelter and basic infrastructure on their encampment. Within two weeks of arriving they had set up their encampment and experimental prep work was already well underway.

At any given time, the encampment was alive with activity. Days saw women staging public protests, cooking, and congregating for meeting about research efforts while nights saw researchers organizing into focused task forces.

Each night, teams quietly mobilized and would entered the depot through a small breach in the fence. Under silver moonlight, a large group could be seen tramping quietly around the soil with manual aerating equipment while another group spread loosely packed organic matter over the area in a joint effort to increase the drainage ability of the soil. Still other groups were charged with spreading nitrogen, phosphorous, and sulfur rich fertilizers while another troop of researchers dusted the newly tilled earth with dolomitic limestone.²

² Leading up to field work, extensive preliminary greenhouse research was conducted to determine ideal growing conditions for the two crops. Their findings suggested a very high level of importance placed on soil nutrient availability, fast soil drainage, and an optimal soil pH of 5.8-6 which was achieved through the use of dolomitic limestone (NC State Extensions, 2018). The Seneca Army Depot soils and conditions heavily deviated from greenhouse determined ideal conditions which



A researcher documents the landscape surrounding the Seneca Army Depot during early stages of the study.

Early summer saw commencement of the planting stage. Even just a glance at the archived research plans or field notes reveals that an extremely high emphasis was placed on what is referred to as “high propagule pressure” in scientific literature.³ Tens of thousands of seeds were sown over approximately 200 acres of land in variable densities throughout the depot, according to figure diagrams on record. Not just seeds, but thousands of healthy seedlings grown in the massive encampment greenhouses were also transported essentially overnight to the soils in the depot.

At the same time, another set of groups oversaw the systematic tracking and hunting of predatory animals to protect the various grazers within the depot limits such as rabbits, woodchucks, and deer. In order to have enough grazers to observe throughout the study and to reduce the confounding effects of predatory pressure from carnivorous animals on their results, they selectively reduced the populations of the predatory animals within the depot. This was done in accordance with population models created for the study which indicated that the carrying capacity of grazers once the GM crops had been established would be much higher than it was being currently maintained by the predatory animals in the depot. Much of their efforts surrounded the tracking of one bobcat spotted

ultimately resulted in researchers too heavily modifying and disturbing the landscape. While it is clear now that their actions had catastrophic effects, at the time, very little research had been conducted on the drastic ecological effects of nutrient, biological, or physical disturbances.

³ Propagule pressure is a concept which represents the overall introduction pressure of a species on a new area. It is determined by the number of individuals introduced, the number of introduction events, and the overall health of those individuals introduced. According to field note records, the Women’s Encampment researchers sought to create high propagule pressure in all ways possible; high seed and seedling numbers being planted every night for several consecutive weeks ensured high propagule number and high number of introduction events while propagule health was ensured through the genetic modifications already performed on the seeds with the express goal to increase health.

on the depot some months before and a particularly active pack of coyotes (Seneca White Deer Company, 2018).

It soon became clear to the researchers that their efforts to facilitate the establishment and spread of the GM crops were too effective. It had been only weeks since they first stepped foot on depot soil, but the tobacco already lay as a heavy green blanket over almost all the available grazing land creeping ever closer to the fenced edge while the strawberry bushes stood in dense thickets with their branches bowing heavily under the weight of their fruits.



Photograph of the extremely dense ground cover of tobacco plants observed only several weeks after planting.

In response, the researchers quickly lessened their planting and facilitating efforts and switched entirely to observation. It also soon became clear that along with rapid expansion of the range of their GM plants came a massive hike in deer population. The carrying capacity of the area was so greatly increased that deer numbers reach nearly 50 deer per square mile according to recovered field note estimates.

Around this time, aggressive instances of competition between the deer, especially males, were being recorded at an alarming rate and many reports of fence damage were made and explained by observations of deer ramming into the fence edge. Fence integrity was also compromised heavily by increased burrowing activity caused by the growing rabbit population. Such high levels of aggression in white-tailed deer had never been observed and many researchers voiced a fear that the behavioral changes may have been caused by the genetically modified crops.

Scrambling, researchers rapidly switched efforts again, now towards controlling and limiting the spread of the GM plants and herbivorous animals. Fence repairs were being made constantly, but separately by both the researchers and the oblivious members of the US army. Records also indicate that there was much discussion of the use of herbicides to contain the introduced crops, but ultimately, they were never implemented. There was

perhaps hope that the growing foraging population would soon create a great enough demand to halt the spread of the plants, but it seems that balance was never met.



Some of the modified fence structures added to keep deer and rabbits from damaging the fence or exiting the base.

The changes to the biological and physical systems of the depot persisted and worsened for a multitude of interconnected reasons according to most scientific historians. Considering the extremely high levels of disturbance caused by the researchers and the subsequent results, many cite this study as strong evidence for the disturbance hypothesis and the associated fluctuating resource hypothesis.⁴ The aerating and fertilization of the soil paired with strong changes to population numbers at multiple trophic levels certainly greatly changed the natural systems in place within the depot fence.

Tilling, tree clearing, and aerating of the soil coupled with a week of particularly heavy rain in early summer caused massive amounts of erosion further disturbing the area. This most likely allowed the new crops to more quickly establish because native trees, grass, and clover were cleared, leaving open space and available resources to the new plants. Not only this, but the soil acidity modifications made for the study inhibited the growth of native species in the depot like Crimson Clover which prefers different soil acidity than what researchers imposed to benefit the desired crops.⁵

The new environment created by the study not only disadvantaged native plants, but it also seemed to benefit the GM crops. The rapid growth of tobacco plants observed

⁴ Both of these hypotheses support the idea that disturbances and directional changes in the environment may create conditions that disfavor native species. Disturbances may create fluctuations in resource supplies or conditions which also may disproportionately favor newly introduced species as is suggested by the outcomes documented during the depot study.

⁵ Originally, the newly added genetically modified plants benefitted from the nitrogen fixing properties of the clover species growing in the depot, but eventually they all disappeared due to heavy grazing and competition with the GM plants (Texas A&M Agrilife Extension, 2018).

that year has only recently been explained by research on the strong allelopathic properties of tobacco which prevent the growth of other plants.⁶ Furthermore, the high propagule pressure which was kept at the beginning of the study was maintained by deer, birds, etc. excreting and dispersing seeds, especially the strawberries.

It had been just a few days since the researchers had begun implementing a hastily made emergency action critical control plan when one of the nuclear holding igloos contained within the high security Q area of the depot became structurally compromised and a massive amount of nuclear material was dumped into the soil and surrounding area.

Of course evacuation of human personnel on the depot, Women's Encampment, and surrounding area was immediate. Death of all living organisms within a 10 miles or so came soon after. Research on the crops reportedly proceeded quietly elsewhere.

The area is now a designated Superfund Site and after being left completely untouched for nearly 35 years is in the beginning stages of remedial action by the EPA (United States Environmental Protection Agency, 2018).

⁶ Allelopathy is a phenomenon where one plant produces one or more biochemicals that influence the growth, survival or reproductive success of other plants. Tobacco is rich in allelochemicals including isoprenoids, alkaloids, cinnamoylputrescines, flavonoids and anthocyanins (Farooq et al., 2014). Nicotine, an alkaloid, is one of the most important allelochemicals present in tobacco which inhibits the growth of most other plants.

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