

Forests are also at risk from genetic engineering. Both the paper and the lumber industry are interested in genetically engineering trees to make them grow faster or to alter their characteristics. There's been considerable research on low lignin trees which would reduce pulping costs. Implicit in such plans is domestication of trees which will accelerate replacement of complex forest environments with tree plantations. While this may provide pulp and lumber more efficiently, the ecology of tree plantations is impoverished and this will translate into species loss. Genetically engineered trees may also become invasive species in their own right, and their corporate-hacked, patented genetic code may spread to related species and varieties, altering nature forever. The loss of all natural forest ecosystems is a likely result.

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To learn more about Sierra Club's positions on genetic engineering, log on to www.sierraclub.org/biotech

We'd like to hear from you and to work with you in the future to resist the spread of hacked, corporate-patented genetic code in our fields, in our forests, and in all out-of-doors environments!

Our campaign to Oppose Monsanto's GE Wheat! is also on our web pages – see www.sierraclub.org/biotech/amberwaves to add your name to a petition.

Information on our Kraft campaign is available at www.sierraclub.org/biotech/kraft.asp
You can order postcards from Jim (address below)

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Genetic Engineering



From Sierra Club's view – and we're an environmental organization so it's an environmental view – there's more than just food and farming to the issue of transgenic agriculture and the commercial propagation of transgenic organisms out of doors. Here are 5 important "F's" to keep in mind:

- **Food** and the impacts of transgenic agriculture
- **Pharming** (big pharma making drugs out in the fields)
- **Fish** (fast growth salmon could threaten native varieties)
- **Forests** (can we protect forests from hacked genetic code)
- **Phytoremediation** (trees and bacteria that sequester arsenic, etc.)

Food and Farming involve how we feed ourselves and what we do to our societies and to the natural world as we do it. Genetic engineering is only a part of this, but an increasingly important part. The U.S. has led the world into the patenting of life forms which means that seed companies can expropriate a portion of what used to be the shared genetic commons by patenting old genes when they put them in new locations. This is a new sort of enclosure of the commons in which intellectual property rather than land is being taken. The companies who are involved talk about the benefits to humanity but they want to reap a portion of the benefits for their bottom lines while accepting no liability

for health and environmental consequences.

When industrial agriculture puts RoundUp resistance into crops in order to sell more RoundUp or puts pesticides into plants so that they make their own, it creates problems which are little different from those of any other form of industrial pollution. We need to keep track of the pollutants and fight increased health and environmental burdens.

Pharming involves transgenic organisms engineered to produce pharmaceuticals. Of course plants are good at doing this without help – aspirin and opium are examples of pharmaceutical products produced by plants – but making cancer-fighting drugs in goat’s milk or corn plants brings a whole new set of problems. Here it’s not only the drug which can escape the factory but the genes, and the health consequences of this particular type of fouling our own nest may be profound. Putting pharmaceutical factories out of doors and letting them run on sunshine and water is very attractive from a cost point of view, but making powerful drugs in open fields with little regulation and inadequate confinement is a danger which needs to be recognized more widely.

Fish have already been engineered for more rapid growth and an application to allow commercialization is under review. Containment or sterility is unlikely to be perfect and once commercialized they’ll likely be widely introduced. The Starlink fiasco has shown us that voluntary regulations will be ineffective. Experts have pointed to many different ways in which these fast-growth salmon could threaten native salmon and trout species.

Carp (already an invasive species in the U.S.) and many other fish which are extensively farmed are also being genetically engineered.

Phytoremediation is the use of plants to clean up pollution, and we often hear that genetically engineered bacteria or plants will do wonders in this department. But this technology, like any other, must be judged on its merits, not on good intentions. For instance, if trees pull arsenic from the soil they may scatter it when leaves drop in autumn. Other toxins may be aerosolized from leaf pores. If the engineered genetic code which permits survival in polluted environments provides a Darwinian advantage to the organisms they may propagate in natural settings with unknown ecological and health consequences.