Environmental crimes

Modern methods of forensic detection make it easier than ever before to track down criminals who trade in endangered species, or who pollute and destroy the natural environment. But the international nature of many of these crimes, the vested interests involved, and lack of political conviction mean prosecutions are rare.

TOXIC TUBS ▲
The "fill and forget" attitude of polluters means toxicologists must identify the contents of rusting, leaking drums in huge and dangerous dumps.

International agreements and national laws help to protect the environment and endangered species, but pressures to flout them are enormous. Huge sums of money are at stake, and poverty, complacency, and cultural differences make law enforcement difficult. Within both developed and developing nations, greed and corruption can all too easily override concerns for the environment. Governments may also face dilemmas if, for example, environmental protection means closing a polluting chemical plant and losing jobs. If resolving these issues is complex, then at least environmental crime detection is relatively straightforward.

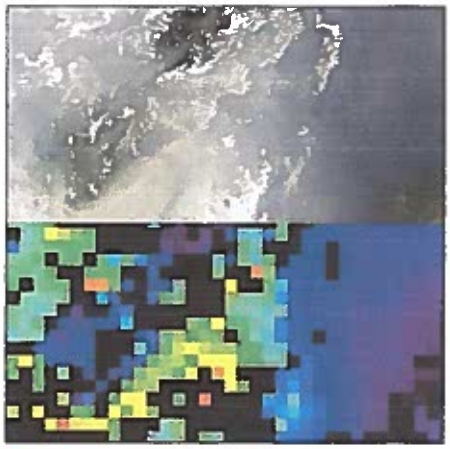
Pollution control

Analytical techniques can now detect tiny quantities of pollution in water, soil, and air. For example, analysts can spot river pollution diluted a billion times—the equivalent of half a teaspoonful in an Olympic-size swimming pool.

Pollution detection and control typically combine remote sensing with automated and manual testing. In water, for example, tests can measure oxygen depletion, as well as levels of nutrients, organic and inorganic chemicals, and other pollutants.

Unfortunately, detecting pollution is only half the challenge. To stop it, the source must be traced, which can be much more difficult. Sampling progressively farther upstream leads eco-detectives to the source of industrial pollution. Other pollutants, however, are more elusive. When it comes to fertilizer or pesticide runoff from fields, the pollutant enters streams and rivers at many points, so proving responsibility may be difficult.

POLLUTING PIPES ▼
Many diagnostic techniques are used to analyze discharges from suspect pipes. Gas chromatography, for example, detects tiny amounts of pesticides.



"HAZE" OVER SUMATRA ▲
NASA's Terra satellite instruments measure numbers of airborne smoke particles. High values can indicate locations of illegal forest fires set to clear farmland.

DNA pawprints

DNA analysis is widely used to stop the trade in endangered species. Many animals and birds are in danger of extinction because of the use of their body parts in traditional East Asian remedies, and the demand from collectors. Identifying live animals is not that difficult, but dried or frozen tissue is a tougher challenge. Morphology—studying the shape and structure of bone, fur, beak, and feather—can indicate species. Serology also helps, by using methods similar to the precipitin test for human blood (see p. 59). But as the price of DNA analysis continues to fall, this quick method of positive identification is becoming increasingly favored.

For example, scientists from Hawaii took a portable laboratory to Japan to analyze DNA from samples of restaurant whale meat. Comparing the results with a DNA database revealed that Japanese diners were eating protected species, including North Pacific humpback and North Atlantic fin whales. Similar methods have traced caviar from illegally fished sturgeon, and tiger parts en route to traditional Oriental herbalists.

Who does it?

Though governments like to favor environmental conservation, proper funding for the detection and prevention of wildlife crime is rare. Many countries have integrated wildlife forensics into their intelligence and policing services, but only the US has a dedicated unit—the National Fish and Wildlife Forensics Laboratory in Ashland, Oregon.

Lack of resources means environmental crime detection is often left to voluntary agencies and pressure groups. Brazil, for example, has a government agency to stop illegal logging, but each inspector polices an area of forest the size of Switzerland. Logging companies use bribes and death threats to stop them from working. In collaboration with the agency, Greenpeace took a ship equipped with aircraft and launches up the Amazon to areas where logging was forbidden. They tagged felled trees with a colorless paint that glowed in UV, and hid electronic tracking devices in log rafts. These undercover methods traced logs to Great Britain and France, and the campaign led to multi-million-dollar fines on loggers in Brazil.

◀ FEATHERED CONTRABAND
X-ray inspection of luggage can detect rare birds packed in tubes. The illegal wildlife trade is worth $10–20 billion annually—only drug and arms trafficking are more lucrative.

RHINO PROBLEM ▶
Infrared spectroscopy can identify as little as 1% rhino horn in traditional impotence "cures," but the technology is too costly for the countries that need it most.

LAB ANALYSIS

The successful prosecution of poachers and smugglers of endangered wildlife usually depends on the positive identification of their prey or contraband. Specialists in birds, mammals, and reptiles can usually use morphology (form and structure) to pin down the specimen to species level—provided they have access to a whole, well-preserved carcass. Incomplete or decayed specimens may limit the identification to the family or genus level. Use of DNA profiles to identify seized wildlife specimens is possible only if the laboratory has access to genetic material known to come from an animal of the same species as the one submitted for testing.