Article: **State of Denial**

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State of Denial

by Tom Knudson

Intro

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From the Editor: Our choices make ripples around the world

How do decisions we make in California affect the environment in other parts of the world?

That simple question is the basis for this in-depth project.

And it is clear from months-long research, which took Bee staffers from the headwaters of the Amazon in Ecuador to the boreal forests in northern Canada to the seas off British Columbia, that the answer is just as simple. The impact of our public policy, business and individual decisions is profound.

The decision, for example, not to drill for oil off California's coastline has wide public support, for good reason. It allows California to preserve its wondrously scenic coastal beauty.

But the demand for gasoline continues to increase in the state - California drivers now use 38 million gallons a day. It has to come from somewhere. And so it does, increasingly from debt-ridden countries like Ecuador that have fewer environmental controls, leaving entire villages of indigenous people suffering severe consequences.

There are no simple solutions in a complex, industrialized nation like ours. Demands for goods and services will continue to grow. But are there ways as a nation, as a state, as a business or as individuals that we can lessen our global impacts?

To answer that question, it is fair to start with some introspection.

Newspapers are large consumers of newsprint, a wood product. Indeed, part of this project examines the impact of decisions to cut back on logging in California which, in turn, has had a profound impact on Canada's forests.

The Bee, for example, uses an average of 174 metric tons of newsprint a day, a significant percentage of which is made from recycled fiber. The Bee's parent company, the McClatchy Co., ranks second among California's largest newspaper companies in using partially recycled newsprint. According to the California Integrated Waste Management Board, 86 percent of the newsprint the company uses is at least 40 percent recycled fiber.

For this project, we tried to do better. We tried to find paper made partially with rice straw. In 1996, The Bee participated in an experiment to make newsprint using rice straw. The test went well, but the experiment didn't go any further because the cost to produce the paper was too high. There is no leftover rice-straw paper.

We also sought out a manufacturer of paper made with a hemp-like plant known as kenaf, but he said the newsprint project had been put on hold in the fall of 2000.

So the paper on which the newsprint version of this project appears was made last year by Blue Heron Paper Co. in Oregon City, Ore. The Blue Heron paper is 60 percent recycled, with the remainder coming from ground-up wood, mostly hemlock chips left over from lumber mills in the area. The paper, an upgraded stock, costs a little more and is brighter than our normal paper, the result of bleaching. Blue

Heron uses hydrogen peroxide, described by the company as environmentally friendly.

Still, as we researched Blue Heron, we found that its environmental record isn't faultless. We found it occasionally uses whole logs to make newsprint. And the company has had brushes with environmental regulators for discharging hot wastewater into the Willamette River, negatively affecting the salmon run.

The difficulty we encountered in trying to reduce our environmental impact for this project points out that there are few easy alternatives to the way we do things, even in a global economy, and many of those alternatives may be prohibitively expensive.

To jump-start our creativity about seeking alternatives, an Oakland think tank, Redefining Progress, has come up with one way for each of us to measure our impact on the world - our own ecological footprint.

It can be calculated in acres on the organization's Web site at www.myfootprint.org. The national average is 24 acres; mine is 34 acres, the product of my wife and me living in a 2,000-square-foot home, driving two cars, rarely using public transportation except to travel often by air, and frequently eating meat. According to the think tank, we would need 7.8 planets if everyone in the world lived as I do. This project has me thinking and changing, bit by bit. We hope you, too, find it provocative.

-- Rick Rodriguez, Executive Editor

Prologue: Shifting the pain

World's resources feed California's growing appetite

By Tom Knudson - Bee Staff Writer

Half a hemisphere separates the headwaters of the Amazon River and the frostbitten northern latitudes of Canada.

But the two landscapes have one thing in common.

You can see it along a muddy rain-forest road in Ecuador, in the silver glint of a pipeline snaking through the grass. North of Edmonton, Alberta, a different sight catches your eye: an old-growth forest of spruce, pine and aspen shredded by a dusty maze of logging roads.

That oil pipeline and those logging roads are linked, via quiet rivers of commerce, to the largest concentration of consumers in North America, to a culture that proudly protects its own coastline and forests from exploitation while using more gasoline, wood and paper than any other state in America: California.

With 34 million people and the world's fifth-largest economy, California has long consumed more than it produces. But today, its passion for protecting natural resources at home while importing them in record quantities from afar is backfiring on the world's environment.

It is exporting the pain of producing natural resources - polluted water, pipeline accidents, piecemeal forests and human conflicts - to the far corners of the planet, to places out of sight and out of mind. California is the state of denial.

"There is a disconnect going on," said William Libby, a professor emeritus of forestry at the University of California, Berkeley, who lectures and consults on forest issues around the globe. "We consume like mad. And we preserve like mad."

Since the days of John Muir - the California naturalist whose writings and ramblings helped kindle the conservation movement just over a century ago - concern for the environment has been a cornerstone of California life.

And seldom has conservation touched California so deeply as during the past 10 years. Since 1992, environmental rules have eliminated or sharply reduced logging on 10 million acres of national forest land in the state - an area 13 times larger than Yosemite National Park. In the Mojave and Great Basin deserts, 3.5 million acres were declared wilderness in 1994 - an expanse half again the size of Yellowstone National Park.

And while that conservation legacy will enrich Californians - and California ecosystems - for generations to come, its reach also extends far beyond the Golden State.

Libby was one of the first to notice, while on sabbatical in New Zealand in 1992. As the volume of wood cut from California forests dropped due to regulations to protect spotted owls, the demand for logs in

New Zealand soared - making loggers there happy.

"Prices were insane," Libby said. "The New Zealanders wanted me to get them a dead spotted owl so they could stuff it, put it in the lobby and genuflect to it."

He soon discovered logging was on the rise in other places, too, and has since published several articles that link preservation of California forests with species extinctions elsewhere.

"We Californians are really not very good conservationists - we're very good preservationists," he said. "Conservation means you use resources well and responsibly. Preservation means you are rich enough to set aside things you want and buy them from someone else."

A half-century ago, California was self-sufficient in wood. Today, the state imports 80 percent of what it uses. Follow some of that wood back to its source and you find yourself in the northern boreal forest, where Canada allows trees to be cut in ways not permitted in California.

On average, nine of every 10 acres logged in Canada are clear-cut - the contentious practice of leveling large patches of the forest. And more than two-thirds of Canadian logging takes place in stands that have never been nicked by a chain saw - virgin forests that in California would be regarded as sanctuaries.

"Many Americans believe Canada is this incredible wilderness, but it's not true," said Richard Thomas, an Edmonton consultant and author of a 1998 provincial study critical of logging practices in Alberta. "We are very much like a Third World country when it comes to our resources. We just let other countries have at it."

Six thousand miles south, a wave of development for another resource crucial to California - crude oil - is inflicting similarly serious wounds across Ecuador's Amazon. Rain forests that were home to kaleidoscopic displays of plant and animal life in the 1970s and '80s now are showcases of pollution and poverty.

Every day, an average of 235,000 barrels of oil is pumped from the region for export to world markets. The largest portion - 65,000 to 85,000 barrels a day - is shipped to refineries in Los Angeles and San Francisco.

The discovery of more reserves in the Amazon is setting off a new wave of controversy and threatening the cultural survival of semi-nomadic rain-forest tribes. Still, the country's new president, Lucio Gutiérrez, assured financiers in New York earlier this year that he supports more drilling because Ecuador is deeply in debt and needs foreign investment.

"The historical challenges for my government are very clear," Gutiérrez said at the time.

California's hunger for the planet's natural resources need not stir up trouble, if a system were in place to prevent it. You can find such a safeguard in the storm-tossed North Pacific, where Canadian fishermen, working under a federal plan that gives them an ownership stake in fish, are harvesting millions of pounds of rockfish every year for California without hurting the environment.

"Everybody is quite conscientious," said Jim Harris, a Canadian trawler. "We've got a fishery that is going to be here for the duration."

The clash of conservation and consumption in California may be large, but it is not unique in this country.

"We're the largest consuming nation basically of everything," said James Bowyer, a professor at the University of Minnesota who specializes in conservation policy and natural resource consumption. "Yet we find every reason in the world why we shouldn't mine steel, why we shouldn't drill for oil," Bowyer said. "It's ironic because we are transferring the impacts to someplace else. And then we are telling ourselves what we are doing is good for the environment.

"And not only are we transferring those impacts, we are magnifying them by turning to nations that don't have the stringent environmental controls that we do."

No government agency maps the global impact of California consumers. But a small Oakland think tank, Redefining Progress, has assembled estimates of the mountain of resources, from wood to fossil fuel, fresh water to seafood, consumed by 146 nations - and some California counties - a yardstick it calls an "ecological footprint."

The United States, a world leader in the conservation of natural resources, has a larger footprint (24 acres per person) than all nations except the United Arab Emirates (with 25 acres). Do the math and you find America's 291 million people draw upon a 7 billion-acre chunk of the planet - an area roughly three times the size of the United States.

An assessment for Marin County - the pricey, conservation-minded San Francisco suburb - found citizens there eat, drink, spend and drive their way through even more of the planet's natural wealth: 27 acres per person a year - the largest ecological footprint ever calculated.

The group's footprints have attracted attention from scientists and policy-makers around the world. And although some people criticize the methods as imprecise, none denies the basic premise.
"The idea is right," said Libby, the forestry professor.

Last year, Libby found some Californians are not eager to hear about the global consequences of conservation and consumption.

At a conference on Sierra Nevada forest management, held in Nevada City, Libby asked the 250 people attending how many of them lived in houses made of wood.

Almost everyone did. Then he asked how many had houses built with alternatives such as used tires and straw bales. Only two or three people responded.

A few moments later, Libby recalled, he asked, "How many people are comfortable with species going extinct somewhere else because we're not going to cut any wood on the Tahoe National Forest?'"

At that point, Libby said, "Somebody in the audience shouted: 'We don't like your question.' "

Chapter One: Staining the Amazon

The tropics suffer to satisfy state's thirst for oil

By Tom Knudson - Bee Staff Writer

SUCUMBÍOS PROVINCE, ECUADOR

At midday, the fresh spill of crude oil sparkles like obsidian.

Creeping across the floor of the Amazon rain forest, it covers jade-colored plants and lime-green grasses in a thick petroleum paste. Imprisoned on its surface, insects struggle for freedom, then sink slowly into an oily tomb.

A few feet away, on a dirt road stained with oil, Luz Soto points to a festering sore on her arm. "It's from the pollution," said the 40-year-old mother of six.

Journey to the South American nation of Ecuador and you find pollution and misery on a scale that never would be tolerated in California, a state that guards its own majestic coastline from oil development and is home to some of the toughest environmental laws on Earth.

Follow that oil as it leaves Ecuador and you find that between 20 and 40 million barrels a year flow to California, which consumes more gasoline - 38 million gallons a day - than Florida and New York combined.

Yet the link between petroleum consumption in California and environmental damage and human suffering abroad is not well known, in part because such harm happens thousands of miles away, out of view of consumers, policy-makers and many environmental groups.
It also is masked by the generic nature of crude oil, which leaves no fingerprint at the pump, no clue to the landscapes where it is coaxed from beneath the earth, loaded onto tankers and shipped to the United States.

But there's no hiding what oil development is doing to Ecuador. Its signature includes not only pollution, disease, poverty, deforestation and diminishing wildlife but something darker: the decimation of indigenous rain forest cultures.

"The discovery of oil brings the promise of great riches," said Terry Lynn Karl, a senior fellow at Stanford University's Institute for International Studies who wrote "The Paradox of Plenty: Oil Booms and PetroStates."

"But the reality is it is very closely linked to environmental degradation, the spread of conflict and a wide range of economic problems."

In Ecuador, the hardest-hit area is a riot of vegetation and swift-moving streams east of the Andes: the Ecuadorean Amazon. Flanked by Colombia to the north and Peru to the south and east, Ecuador's Amazon is surprisingly rich in petroleum. It also is part of a forest ecosystem second in size only to the

boreal forest, which circles the globe across Canada, Alaska, Russia and Scandinavia.

Unlike the austere boreal, South America's fabled tropical Amazon forest abounds in biological diversity. And few parts are as lively as Ecuador's portion, home to an estimated 8,000 to 12,000 species of plants - or up to 5 percent of all plant species on Earth - and an impressive complement of wildlife, from pink fresh.water dolphins to transparent "glass frogs" to the largest raptor on Earth, the harpy eagle.

But since 1972, when the first oil well was tapped, petroleum has siphoned off much of its glory. Tracts of forest that teemed with monkeys, macaws and semi-nomadic tribes now are tattered by roads, rigs and colonist settlements. Tea-colored streams that shimmered with silvery fish now float petroleum scum.

With the recent discovery of additional oil reserves in still-untouched parts of Ecuador's Amazon, many Ecuadoreans fear for the future.

"If the oil companies come in, they will be finishing off with us, and nature as well," said Sabino Gualinga, an indigenous healer who has lived all his 82 years in a remote Amazon village now targeted for oil development.

More than a dozen oil companies from around the world - including the United States and Canada - operate in Ecuador. The largest is Ecuador's own national petroleum company: Petroecuador.

Ivan Narvaez, Petroecuador's chief of environmental protection, said that although Ecuador is taking steps to clean up its petroleum-fouled rain forest, the scope of the problem is too much for the debt-strapped country to handle.

"We do as much as we can," he said, "but it is always too little."

Near refineries and oil fields in the Amazon, even the rain reeks of petroleum. "It smells similar to the exhaust from a car," said Serbio Escobar, who farms near the Colombian border. His wife, Margarita Campoverde de Escobar, added: "Sometimes, when we collect rainwater in pots, the water is black."

Wherever oil goes, trouble seems to follow.

Inside a pipeline that snakes westward up the eastern slope of the Andes, through green canyons tinseled with waterfalls and veiled in clouds, crude oil is pumped into the cross hairs of danger. Here, landslides attack it, rip it out of its steel cocoon and send it gushing in toxic black waves down mountain streams.

On the other side of the Andes, the mayhem continues.

"We sleep in terror here," said Lucia Castillo, whose brother was burned to death when a pipeline break sent waves of fire through the coastal community of Esmeraldas in 1998. As flames roared down oil-soaked streets, devouring cars and homes, frantic parents put their children in wooden canoes and pushed them into the Esmeraldas River.

Then they watched in horror as fire engulfed the river - and the children.

"They say petroleum is the excrement of the devil," said Byron Borja, a customs agent who lost two family members in the disaster. "In part that's right, because it's the cause of so many of the world's problems."

Ecuador's environmental rules not well enforced

California's complicity in Ecuador's pain is relatively new. Just a decade ago, all but 6 percent of the state's oil came from its own reserves - mostly in Kern County - and from Alaska. Last year, 31 percent came from other countries.

That's because existing oil fields in California and Alaska slowly are running out of crude. And proposals to drill for more in the Arctic National Wildlife Refuge, and off the California coast, so far have been sidelined by environmental opposition.

California's intake of foreign crude reached a record 196 million barrels in 2002. More than a third came from deserts in Saudi Arabia and Iraq - through the United Nations sanctioned "oil-for-food" program.

But the third largest source - at 14 percent - was tropical Ecuador, which contributed 27 million barrels. The recent war in Iraq is certain to increase demand for Ecuador's oil.

Yet the ground rules for oil drilling vary widely. In California, the oil industry must comply with environmental regulations that John Martini, head of the California Independent Petroleum Association, called "the most stringent in the U.S."

Oil companies face an array of environmental laws in Ecuador, too, under the jurisdiction of the Ministry of Energy and Mines, the Ministry of the Environment, and Petroecuador. But those laws are not well enforced, according to Judith Kimerling, associate law professor at the City University of New York and author of "Amazon Crude," a book about Ecuadorean oil development.

"Despite a growing trend toward increasingly detailed paper regulations, the government has still not implemented meaningful environmental regulation in the oil field," Kimerling said.

Larry Meriage, spokesman for Los Angeles-based Occidental Petroleum Corp., a major company in Ecuador, said Kimerling is "completely off-base."

In Ecuador, Meriage said, "We jump through hoops for developments which are really very carefully manicured and carved out." Oil companies are held to a higher standard of accountability in Ecuador than other businesses, he said.

The Golden State needs that oil because it is home to more vehicles - 27.7 million - than any other state. When industrial and other uses are considered, Texas consumes more petroleum overall. But California leads the nation in gasoline consumption, burning up 15 billion gallons a year. Its freeways are showcases of consumption. In California, one in eight motorists drives a gas-guzzling sport-utility vehicle.

"When I visit an oil-exporting country with the kind of degradation and poverty that you see in Ecuador, I can't help but think, 'Oh, my God - all of this to fuel someone's SUV,' " said Karl, the Stanford fellow.

Filling up his Toyota Tacoma recently at a Beacon station in suburban Roseville, Rob Beazizo - a registered nurse - wasn't thinking about Ecuador at all. But when told about the pollution, he was concerned.

"It kind of gives you pause," he said. "Americans are pretty oblivious to what happens outside the U.S. It's out of sight, out of mind."

Overshadowed by larger reserves in conflict-torn parts of the world, such as Venezuela and the Persian Gulf, Ecuador's 30-year history of petroleum development has drawn scant attention in the world's press.

In recent years, the situation in Ecuador has grown tense too, and the causes are complex:

• Since 1972, oil companies have extracted 3 billion barrels of oil from Ecuador. Yet little of that wealth is reinvested in the Amazon, in part because the nation is so deeply in debt. In many places, potable water, electricity and medical care simply do not exist.

"Petroleum has not brought a bonanza of benefits; it has not brought happiness. It has brought misfortune," said Carlos Castillo, a petroleum engineer and vice mayor of Esmeraldas, whose wife died in the fiery pipeline break.

• Studies point to a link between oil extraction and skin rashes, miscarriages, even cancer. "The level of petroleum in the rivers, on which local residents depend, is 200 to 300 times higher than the limits set for human consumption," said Miguel San Sebastian, an Ecuadorean physician and co-author of the most recent study of petroleum's impact on the health of Ecuador's people.

• Oil spills and other ecological calamities are routine. The 300-mile trans-Ecuadorean pipeline has suffered more than 60 major ruptures since 1972, spilling 614,000 barrels of oil - more than two Exxon Valdez tankers' worth. By contrast, the 800-mile trans-Alaskan pipeline, which came on line in 1977 and carries more than twice as much oil, has spilled just 85,000 barrels.

• As new parts of the Amazon are opened to oil development, the cultural survival of the continent's last indigenous hunter-gatherer cultures is in doubt.

"This is a repeat of what happened in the U.S. in the 19th century," said Karen Marrero, an Ecuadorean woman who is helping Quichua natives fight oil development around the village of Sarayacu.

"Just as you had a gold rush, there is a rush for oil here. But this one is coming with more velocity. There's no time for people to adapt to it."

Accessible only by small plane, canoe or foot, Sarayacu clings to the reddish-brown banks of a jungle river. One Sunday last year, nearly the entire village of 300 turned out to greet two strangers from a distant land: California.

One man carried a spear. A woman with raven hair and a painted face nursed a baby. Children scampered everywhere. A man in a monkey headdress strummed a guitar. Lunch was smoked monkey soup, served on a table piled high with fruit and meat, including the monkey's grinning skull.

"This is our life," said one young man, César Santi, pointing to the rain forest. "This is our Earth."

Ecuador's government, which owns all sub-surface mineral rights in the nation, has granted permission to an Argentine company to develop petroleum resources in the pristine area around Sarayacu. But first the company must secure Quichua approval. And the Quichua refuse.

"I worry for my daughters," said Sarayacu resident Ester Malaver, walking barefoot down a muddy jungle trail. "Here, everything is healthy and natural. If the petroleum company comes, the land will be poisoned.

"I will fight against the oil incursion until my last days; until I die."

In Ecuador, indigenous leaders say oil companies sometimes use unsavory practices to attempt to win community support.

"There are a lot of small bits of money placed here and there," said Randy Borman, territories and economic director for the Cofan people, an Amazon tribe hit hard by oil development. "They create a lot of false expectations."

The son of American missionaries, Borman has gone native. He is married to a Cofan and is the leader of Zabálo, a Cofan village in a remote part the Amazon. In 1998, The Field Museum in Chicago awarded Borman its Parker/Gentry award for his efforts to protect Cofan territory.

Borman recalled one incident he said took place when an oil exploration company showed up at the remote Cofan village of Bermejo in 1999.

"First of all, they brought in several series of gifts: a whole lot of rice, a couple of pigs and several cases of whiskey," he said. "Next they had a big party and they offered villagers helicopter flights. And then they said, 'Let's negotiate.'"

Such anger toward oil exploration is growing across Ecuador. A new $1.1 billion pipeline, now under construction and funded by companies from Canada, Spain, Argentina, Italy and the United States - including Occidental Petroleum - is behind much of it.

The Oleoducto de Crudos Pesados (OCP) pipeline, expected to double the flow of oil to foreign markets, follows the old trans-Ecuadorean pipeline as it rises out of the Amazon. But in the Andes, it strikes a more northerly course and slices through one of the last pristine cloud forests in South America.

Lost in a thick blanket of fog, the Mindo-Nambillo Reserve has been rocked by environmental protests. During one last year, activists shadowed by military and pipeline police climbed to a ridge about 90 miles northwest of Ecuador's capital, Quito.

Security forces halted the group and ordered the protesters downhill. Instead they charged uphill, through a thick green wall. The police followed.

Protesters and police gained the ridge, which looms over a landscape that is home to 400 species of birds and a thriving ecotourism industry. Downhill, the brown gash of a pipeline road was plainly visible. The roar of earth-moving equipment sounded like distant thunder.

One of the protesters - Juan Pablo Barragán - sat wearily on a log and shook his head.

"This kind of destruction would never be permitted in the United States," said Barragán, a Quito businessman. "The government would not allow it."

Later that night, Barragán and seven others were jostled from their sleep by police, marched down the mountain at gunpoint and jailed in Quito.

"That's how it is in Ecuador," Barragán said when contacted later. "If you stand up for a cause, you expect to be imprisoned."

Last July, Julia "Butterfly" Hill - the famous environmental activist who spent two years living in a giant California redwood tree - trekked to the same ridge for another protest. During a later protest in Quito, she too was arrested, then deported.

Ecuador's president at the time, Gustavo Noboa, showed no sympathy for Hill or her cause. After her arrest, he told the media: "The little gringos have been arrested, including the old cockatoo who climbs trees." In 2001, Noboa told The Economist magazine that cloud forest demonstrations were limited to "four bird-watchers and a couple of mayors."

Other clashes have been more severe. In February 2002, the Inter Press Service news agency reported

that at least 300 people were wounded in conflicts with the Ecuadorean military during 10 days of violent demonstrations in the Amazon region over the new OCP pipeline, expected to be finished this year.

"Oil companies operate here without responsibility," said Natalia Arias, former president of Acción Ecológica, a Quito environmental group. "The people and environment of Ecuador have suffered greatly."

Occidental's spokesman, Meriage, said the pipeline won't hurt the cloud forest because "a tremendous amount of care and effort has been taken." That care, he added, substantially increased the project's cost.

Meriage blamed the uproar on "the radicalization" of environmental protest in Ecuador by U.S. and European groups.

"Not everybody who wraps themselves in the mantle of environmental protection can be accepted at face value," he said. "These groups in many cases are unaccountable to anyone. They can say whatever they want."

Government shares blame for pollution

The heart of Ecuador's oil country lies south of the Colombian border in the steamy jungles of Sucumbíos province. This is where Texaco first perforated the Amazon 36 years ago, launching an oil boom that continues today.

In the 1970s, the province was a daunting, largely untrammeled wilderness. Today, it is still daunting but for different reasons. Around the oil boomtown of Lago Agrio - a grimy muddle of shacks, brothels, bars and cheap motels 12 miles from the Colombia border - violence is epidemic.

The border is a no man's land, where Colombia guerrillas routinely cross into Ecuador for reconnaissance, rest and supplies. In the past year, more than 100 people have been killed in guerrilla-related violence in Lago Agrio, population 24,000, according to local authorities. In October 2000, 10 foreign oil workers - half of them Americans - were kidnapped by guerrillas in the surrounding jungle. One of the Americans was later murdered.

Roads are rutted and ruinous, morphing into sluices during downpours. The U.S. Embassy's advice to Americans who might want to visit the region is direct: don't.

Yet it's not the violence, poverty or bad roads that most capture your attention here. It's the pollution - and the stories about it.

Stop by a small convenience store in the town of Dureno and ask the manager, Jacinto Jumbo, her opinion of the oil industry.

"This is what happens," she says, pulling down her blouse to reveal a red welt on her left breast. "When you take a bath in the river, it creates boils on your skin, like this."

Not far away, a woman stands ankle-deep in a creek, stubbornly trying to scrub her clothes clean on a board. It's a washday gamble because pools of thin, purplish oil skim along the creek's surface.

"They are always spilling oil around here," says the woman, who identifies herself only as Marta. "We have to drink this water, too. Of course, it is bad. But what choice do we have? We live here."

A few hundred yards west, across a road and up a hill, lies the pollution's source: Campo Libertador - literally "Liberator Field" - a major Ecuadorean oil field.

Campo Libertador is a sprawl of wells, pipes and tanks operated by Petro.ecuador, the national oil company. But locals say there is nothing liberating about it.

"There are many sicknesses here," said Dora Solano, a 45-year-old Ecuadorean woman who lives in the area. "There is no control. The oil companies just throw their chemicals and garbage into the water."

Inside the oil field, a large, unlined pit shines black with waste oil floating on a toxic soup of drilling wastes and "production water" - liquid pumped out of the ground with petroleum that contains heavy metals such as arsenic, lead and mercury.

A Petroecuador subcontractor pointed to a tube piercing the side of one oil-filled pit.

"Look at that pipe," he said. "It takes the waste crude and chemicals and spills them into a swamp, and from there they go into the river.

"And that is why, when people go to the river to take a bath, they get a rash," said the man, who said giving his name would cost him his job. "In the river, sometimes you can see chemicals swirling, like smoke. Fish just don't exist around here anymore."

In Quito, Narvaez - Petroecuador's environmental chief - acknowledged his company is partly responsible for the pollution. But he blamed others, too, including his own government for failing to adequately invest in pollution control and cleanup.

Pacing back and forth, Narvaez grew exasperated. "The sickness of the people, the poverty of the people, the contamination of the rivers, the loss of biodiversity - this is all the product of 30 years of oil drilling," he said. "You can't solve that in just one year, not even two or three."

Another problem is Ecuador's $14 billion foreign debt. The sale of oil brings Ecuador more than $2 billion a year, but Narvaez said there's little left over for the environment because of the country's enormous debt payments, which account for more than a third of its $5.6 billion budget.

Narvaez also blamed Texaco, which made the first major discovery of oil in the region in 1967 and formed a business consortium with Petroecuador. When Texaco pulled out of Ecuador in 1990, Narvaez said, it left a "disaster."

For its part, Texaco - now ChevronTexaco - maintains it acted properly. "I'm not going to dispute that conditions in the region are difficult," said Chris Gidez, a spokesman for ChevronTexaco. "But it's hard to isolate one (factor) as a cause of some or all of the problems."

For instance, he cited the miles of oil service roads that pierce large parts of Ecuador's Amazon, opening it to colonization.

"You have to understand this is a region in which there had been a border dispute with Peru," Gidez said. "The government of Ecuador encouraged colonization in order to lay claim to the region and forced the consortium to build more roads than it needed."

Gidez also defended the unlined wastewater pits, saying that during the 1970s and '80s, the approach was a generally accepted practice in the region.

After Texaco left Ecuador, Gidez said it agreed to pay the government of Ecuador $40 million to clean up 250 sites identified in environmental audits.

Ask Borman, the Cofan director, about Texaco's payment and he says it "really didn't have much effect. We tried to get a piece of it for cleaning up a series of wells that contaminate rivers that go through the Cofan reserve. And the guy at Petroecuador said there is only 800 barrels of (toxic) production water per day going in from wells in that area. We were way low on the priority list."

Oil companies operate differently in foreign countries than in the United States, according to Roger Herrera, a retired exploration geologist for British Petroleum.

"What tends to happen is they use the cheapest technology they can get away with," he said. "In a way, it is sort of shameful."

But Herrera, who worked for 30 years in such places as Kuwait, Libya and Colombia, said it's not just oil companies that are at fault.

"Often, they are forced or coerced by foreign governments into using primitive pollution-control technologies," he said. "I know that sounds startling. And it doesn't take all the guilt from the companies. But it is a fact that they are discouraged from using more costly technologies because it would take a little bit off the bottom line of the host countries."

Since Texaco left, Ecuador has adopted more rigorous environmental laws. Even critics say some private firms are using modern pollution-control measures, such as injecting oil drilling waste and production water deep into the earth.

"Some things are changing," wrote Judith Kimerling, the law professor, in a recent article in the Columbia Journal of Environmental Law. But enforcement of environmental laws remains weak and is "hindered by the absence of political will (and) a lack of resources.

"The jury is still out on whether oil companies can extract oil and gas from a fragile rainforest environment without serious injury. The track record to date suggests they cannot."

Last year, Ecuador's then-minister of Energy and Mines, Pablo Teran, failed to respond to a written request for an interview presented in person at his Quito office. Nor did he respond to subsequent e-mails. Alfredo Bariga, a sub-secretary in the Ministry of the Environment, agreed to an interview but failed to show up for it.

Occidental's Meriage said like it or not, oil development is going to happen in the Amazon. "The question is: Do you want it done by somebody who does a responsible job or an irresponsible job?" he said. "Would you rather have Oxy do it or Petroecuador?"

Major oil spills - such as the Exxon Valdez accident that hemorrhaged 260,000 barrels of crude into the Prince William Sound in Alaska in 1989 - capture world attention. Lesser spills go unnoticed but inflict real pain as well.

With a wave of his hand, Benigno Martínez motions toward a jungle thicket. "You want to see the bones?" he said. "Follow me."

Martínez, 58, who farms near the Colombian border in Sucumbíos province, said that in recent years seven of his horses have died after drinking water fouled by oil waste. Tromping into the forest, he finds the spot where the carcass of his favorite horse - Condorito - rots slowly in the shade.

"Pobre Condorito," Martínez said, poking at the animal's rib cage with a machete. "First, his stomach bloated. Then he began throwing up. ... It took him a month to die.

"I am just a poor farmer. When I went to ask for compensation, they made jokes about me."

A stocky man with short salt-and-pepper hair, Martínez shuffles out to a clearing. His flannel shirt is stained with mud. A crucifix hangs around his neck. His home is 200 miles over the Andes from Ecuador's capital, Quito. But, he said, "Next Sunday, at Mass, we are going to talk about taking a walk to Quito to talk to the government about the pollution."

In Ecuador, less pollution would likely mean better health. Since the 1980s, studies have pointed to links between petroleum contamination and chronic diseases in humans there.

One report, by a team of Harvard physicians working with the Center for Economic and Social Rights - a New York-based human rights group - made these observations in 1994: "Residents of the (Amazon) are exposed to levels of oil-related contaminants significantly exceeding internationally recognized safety limits ... Such levels of exposure suggest increased risk of more serious health consequences."

ChevronTexaco's Gidez disputed those findings, saying the report is not scientifically valid. "It has never been held up for peer review, as any credible medical study would be," he said.

A more recent study, completed by two Ecuadorean doctors in May 2002, found that Amazon residents living near oil facilities were more likely to contract stomach, liver, skin and other cancers than people elsewhere in the country.

Ecuador's attorney general, José Ramón Jiménez-Carbo, spoke publicly about health concerns last year, vowing to back Ecuadorean plaintiffs in a U.S. lawsuit against Texaco seeking $120 million in damages and injuries. That suit, however, was dismissed in August by a federal appeals court in New York, which ruled the matter should be resolved in Ecuador.

Back in Ecuador's Amazon, it seems every neighborhood has its tale of ailments. In Sucumbíos province, Silvio Calderón's common-law wife, Luz Soto, sipped water from a spring in their jungle garden, downhill from an unlined toxic waste pit at a Petroecuador oil facility, Estación Guanta.

"When it rains, the pit fills up and the waste comes right through here," said Calderón, machete in hand, indicating the clearing where the couple grow rice, corn, yucca, beans and plantains - or try to. Like others in the area, they say pollution is withering their crops.

After drinking the water, Luz Soto "immediately fell ill with diarrhea and fever. Her skin turned yellow," Calderón said. "She almost died. She still feels very sick today."

At the one-room wooden shack where they raise five children, their son, Jorge, stood in the doorway, pale. He, too, is sick.

"He is 8 years old but looks like he is 4," Calderón said. "We took him to a hospital in Quito and lab tests showed he had lumps in his stomach. I'm sure it is contamination. ... We can't go on like this."

Animals suffer, too. In 2000, Johnny Alman, manager of the Amazon Jungle Resort Village in Sucumbíos pprovince, was guiding some scientists on a tour near the Cuyabeno Wildlife Reserve when they spotted a dark object flopping and shaking on the side of a road.

It was an agouti, a large jungle rodent, "so completely covered with oil it couldn't walk," Alman said. "He was making a howling noise.

"A little while later, we came across a smaller rodent, completely drenched with oil. Even its eyes were coated. It was almost dead.

"We were shocked," Alman said. "The idea was to see animals alive and running through the rain forest, not animals covered with oil."

Five years after inferno, town is still traumatized

In the port of Esmeraldas - where ocean tankers are loaded with oil bound for California - petroleum took a violent turn in 1998.

"That fire came roaring down the river like a dragon," said Zoila Valverde, a 45-year-old laundrywoman.

She is speaking of the night when two major pipelines broke during a landslide, sending oil and gas cascading down streets and into rivers.

Someone notified Petroecuador. But it was too late. Around 10 p.m., a spark from perhaps an automobile or a backyard barbecue - no one is sure what - set off an inferno. "I gathered up my children and we ran," Valverde said. "There was one little girl in the neighborhood who lost her way. We never saw her again."

At 3 a.m., Byron Borja - the Ecuadorean customs agent - rushed to the hospital to find his sister-in-law's two teenage daughters badly burned, but conscious. They pleaded for water. "It was horrible," Borja recalled. "The odor of burned flesh was everywhere."

Borja stepped away to speak to his sister-in-law, who was out of town, on the phone.

Frantic, she screamed into the phone: "Byron, tell me the truth! Tell me the truth!"

"I am going to tell you the truth," Borja replied. "Be prepared for the worst."

One of the daughters died a short while later. The other died a month later at a burn unit in a hospital in the United States.

They were among the 12 confirmed dead. Six more were never found.

When Valverde returned to her home, "It was in ashes," she said. "I took my children into my arms and started to cry.

"Then, it began to rain a black rain. It made dark oily spots in our clothes. Two weeks later, we all got rashes. Our hair was falling out."

Five years later, the town remains traumatized.

"We are afraid," said Maritza Quiñonez, who lives in a small cabin near where the pipeline broke. "I am worried that the next time it might finish the world."

The enormous black and red ocean tankers that gather in the Pacific at Petroecuador's export terminal near Esmeraldas hauled 86.5 million barrels of Amazon oil to world markets in 2000. The largest portion, 43 percent, was shipped to California, according to U.S. and Ecuadorean records.

Few oil benefits, though, seep back to the Amazon. Last year, the sale of crude oil brought Ecuador about $2 billion. Yet only 3 percent of Ecuador's national budget is routed to its jungle provinces, according to the Inter Press Service news agency, even though those provinces make up 50 percent of its land area. Some of Ecuador's poorest communities are in the shadow of the oil fields.

"Oil is the Midas myth," said Terry Lynn Karl, the former director of Stanford's Center for Latin American Studies. "It creates the expectation that you will be rich. But the end result is you have more poverty, more inequality and more conflict."

Karl said she sees the pattern around the world. Oil, she said, concentrates political and economic power, and "when power is so concentrated, it is extremely difficult for the benefits of petroleum to trickle down."

"Nada! Nada!" exclaims Margarita Campoverde de Escobar. "Nothing! Nothing! That's what petroleum brings to this area."

She lives with her husband in a one-room wood shack in an agricultural cooperative near Dureno, in SucumbÍos province. Her neighbor is an oil field and she once washed clothes for an oil company, but that work has disappeared. The couple earn $60 to $80 a month selling coffee and bananas - barely enough to support three children and a granddaughter.

They have no electricity, phone, running water or car. They are separated from the nearest pharmacy by

a six-mile walk and a 20-mile bus ride - and their granddaughter is sick.

"Petroleum only puts money in the pockets of the rich," said Campoverde de Escobar. "The oil industry has forgotten us."

Chapter Two: Scarring the Boreal

Swaths of forest taken for lumber, paper

By Tom Knudson - Bee Staff Writer

Ten years after the historic battle to protect spotted owls and old-growth forests, California's woods are quiet, almost churchlike.

The chain saws and logging trucks that once shattered the symphony of birdsong and muted the music of mountain streams have disappeared from many places - stilled by environmental lawsuits, public opinion and increasingly strict regulations about timber harvesting.

Since 1990, 62 lumber mills in California have closed. The volume of timber cut from national forests has dropped 80 percent. At no time in state history have California forest ecosystems enjoyed such sweeping protection.

Yet there is a trapdoor to this turnabout, one that opens a passageway to more environmental trauma: The logging never really stopped; it just moved to Canada.

In throttling the harvest of wood from its own back yard, while continuing to devour forest products, California is not merely turning to America's largest trading partner, Canada, to fill the gap.

It is buying wood from a nation where up to 90 percent is harvested through clear-cutting - the controversial mowing down of entire stands of forest - and where two-thirds of the cutting occurs in old-growth stands. And it is buying wood from a country where logging is moving more deeply into one of the planet's most important ecosystems: the boreal forest.

Circling the globe like a jade and emerald crown, the boreal, named for Boreas, the Greek god of the north wind, is home to a mythic array of wildlife, including timber wolves, woodland caribou and - in Russia - Siberian tigers. It also plays a critical role in regulating the Earth's climate, helping protect it from global warming.

But in Canada's boreal zone, which sweeps across the country in a wide arc from Newfoundland to the Yukon, logging is proceeding so rapidly that some scientists fear the forest's vital ecological functions may be in danger. Already, some species of wildlife are in decline and native cultures, for whom the boreal is both pantry and medicine chest, are struggling to maintain their way of life.

"This is a classic example of not taking a holistic view," said Richard Thomas, an environmental consultant in Edmonton, Alberta.

"You do the cosmetic stuff at home," Thomas said. "You minimize your ecological footprint in your own back yard. And here in Canada, you get away with murder. It's out of sight and out of mind."

California's hunger for Canadian forest products is part of a larger national appetite. In 2001, a record 18.5 billion board feet of Canadian softwood lumber was imported to the United States - enough two-by-fours, plywood, doorjambs, siding and other products to build a city the size of San Diego.

Lots of Canadian paper was shipped south, too: 26.8 billion pounds, to be precise. That is roughly equal to the weight of every man, woman and child in America. Most arrived in two forms: newsprint (13.2 billion pounds) and printing and writing paper (9.4 billion pounds).

Track that wood and paper back to Canada and you are in for a jolt.

A sheet of Canadian siding from a Roseville Home Depot, for example, will lead you to Lesser Slave Lake in Alberta, where the forest is so shredded by cutting that only thin wisps of trees remain - old-growth confetti.

"The boreal is under attack," said Dave Donahue, a gray-bearded trapper who lives nearby with his wife and oldest son. "This is not progress. This is mass destruction."

Deeply religious, the 59-year-old Donahue moved to Alberta in 1972 after watching his native New Brunswick forests fall to logging.

Last spring, as outrage welled up inside him, Donahue wrote an essay titled "Americans Wake Up," hoping it might appear in the pages of an environmental newsletter in the United States. It never did. "Americans are not even vaguely aware of what is happening here in Canada," he wrote. "Every tree that is of any value is cut by means of clear-cut logging and any tree that is of no use … is knocked down and left to rot. The lungs of Mother Earth are being RIPPED out. ... Wild animals are being destroyed at a fantastic rate."

Not long ago, some siding made from the boreal forest Donahue calls home was being nail-gunned to the roof of a new home in Highland Park, a Roseville subdivision. A sign out front read: "Building America's Neighborhoods - Sold."

"This is hard to believe," said carpenter Ruben Centeno when shown photos of the Alberta clear-cuts. "They should find some other way to make this stuff."

Pick up a newspaper at any Northern California convenience store and you find roots that reach deep into majestic stands of old-growth forest in northeast British Columbia. Trees in that Rocky Mountain region feed a mill owned by the world's largest newsprint maker - Abitibi Consolidated Ltd. - which sells paper to several U.S. dailies, including The Bee.

From its Mackenzie, British Columbia, mill, Abitibi harvests pine, spruce and balsam across a vast wilderness that not only is home to some of the continent's most impressive species of wildlife, including grizzly bears, but also is inhabited by the indigenous Kaska Dena people, many of whom still survive by hunting wild game.

Although conflicts between indigenous people and timber and paper companies are common in Canada, Abitibi and the Kaska Dena are working together to develop environmentally sensitive kinds of logging. Abitibi has even helped the Kaska Dena form their own logging company.

When asked why, Abitibi forester Wayne Lewis said, "They live here. We respect that. They should be a part of the process."

Dave Porter, chairman of the Kaska Dena council, praised the company's efforts but added: "There is still a long way to go."

A barrel-chested man with curly black hair, bushy beard and wire-rimmed glasses, Porter folded his arms as he spoke of desperate living conditions around the Kaska Dena community of Fort Ware.

"The road to the outside world is one of the worst excuses for a road anywhere," he said. "We're hooked up to diesel generators with a history of blackouts and shutdowns - in the winter.

"How many millions of dollars are taken out in profits and how much is put back into indigenous communities?" he said. "A pittance."

Speaking broadly, Porter said U.S. consumers "have an inherent responsibility to ask questions" about forest products from Canada.

"This is not just about the environment. It's about people. Aboriginal people and their cultures (in Canada) are as endangered as endangered species. And that should be known."

Fifteen hundred miles east, Steve Fobister - a former grand chief of the Ojibwa nation - kicks the dust in a gaping clear-cut in Ontario. Trees there also supply an Abitibi mill vital to U.S. newspapers, including the Minneapolis Star-Tribune - owned by The Bee's parent company, The McClatchy Co.

Staring at a moonscape of stumps and bare ground stretching for more than 10 square miles, Fobister said: "This is selfish. This is devastation."

Nearby, someone has spray-painted the word "PROPAGANDA" across a timber company sign about reforestation.

That someone, Fobister said, is him.

"You can't even hear a bird in a clear-cut. You can't even find an insect," he said. "Everything is dead." But in Montreal, Abitibi spokesman Marc Osborne defended the company's logging. "We adhere to sustainability," he said.

Rich in forest resources, Canada has been cutting trees for years. But as demand for wood has jumped worldwide, the nation has stepped up its level of cutting: from 1.6 million acres in 1970 to 2.5 million acres in 2001.

In recent years, that increase has ignited a trade dispute with the United States, which now assesses a stiff 27 percent duty on Canadian lumber imports to this country. The environmental side of Canadian

logging, which is largely overseen by its provinces, has drawn less attention.

A spokesman for the Ontario Ministry of Natural Resources, which leases provincial land to timber companies, said Canadian-style logging actually is healthy because it mimics the natural rejuvenating force of forest fire.

"A clear-cut is not the end of the forest," said ministry forest policy officer Joe Churcher. "It's the beginning."

Many in the industry say concerns about cutting are overblown.

"We're certainly not running out of trees," said Ed Greenberg, spokesman for the Alberta Forest Products Association, a trade group. "We're as concerned about the environment as anybody."

U.S. regulations meant opportunity in Canada

To environmentalists in the United States, the spotted owl in the 1990s became a symbol of the vanishing of old-growth forest and - through the U.S. Endangered Species Act - a legal tool to halt and slow timber cutting. To many Canadians, though, it was a business opportunity.

As the harvest of wood from federal forests in California, Oregon and Washington plunged 4.8 billion board feet during the 1990s, Canadian imports to the United States shot up 6.2 billion board feet.

"You can put a fence around a particular forest. But you can't put a fence around all the forests in the world," said Roger Sedjo, a senior fellow at Resources for the Future, a Washington, D.C., think tank.

At the same time, wood consumption in the United States catapulted to a record high: 68.3 billion board feet in 1999. Per capita wood consumption in the United States is 2.5 times higher than in other developed nations - and 3.4 times the world average. Americans also use more paper than anyone else in the world - about 718 pounds per person per year.

Wood consumption figures for states aren't available, but experts say California, partly because of its size and growth, devours the biggest share of lumber - an estimated 10 billion board feet a year. That is nearly 15 percent of the national total, the equivalent of 70 two-by-fours for every person in the state. About a fifth comes from Canada, up from 6 percent in the 1980s.

The numbers make some Canadians uneasy. "If we brought everybody in the world up to California's standard of living, we would need four or five Earths," said Thomas, the Alberta environmental consultant.

The international impact of the United States' forest conservation is hardly ever covered by the mainstream press, but it is starting to surface elsewhere.

"Reducing domestic production (of wood) with no corresponding change in consumption simply requires other parts of the globe to supply the resources," said a 2002 article in Harvard Forest, a Harvard University publication. "Consequently, well-intentioned environmental activism may generate unanticipated environmental degradation. ... A new effort is needed to expose this illusion of preservation."

Boreal forest losing its shroud of obscurity

Controversy is no stranger to Canada's forests. Until recently, however, outcry has focused on the rich rain forests of British Columbia, the nation's largest timber producer.

As more of those coastal forests are set aside for conservation, the battleground is moving inland, to the boreal forest.

The first thing you notice about the boreal is its size. Thirteen times larger than California, Canada's boreal is the world's largest contiguous wooded wilderness and part of the planet's largest ecosystem. Yet it is a landscape few know well.

Punished by long, cold winters, Canada's boreal can't compete with the dazzling diversity of species that endear environmentalists to the tropics. Its spindly stands of spruce, pine, larch and aspen are no match for the coastal redwoods that crane necks and inspire awe on the California coast.

Yet the boreal has its own magic. In the brief, frantic summers, its silvery panorama of lakes, ponds and puddles quivers with 40 percent of North America's nesting waterfowl. Its thick canopy is home to more than 1 billion nesting migratory warblers. Endangered whooping cranes raise their chicks there.

Much of the year, though, the boreal is barren and brooding - haunted by the howling of wolves and the restless rasping of wind across snow and ice.

Its greatest gift may be climatologic. Like all forests, the boreal helps the planet breathe, filtering out and storing more carbon - the primary spark for global warming - than any other forest on earth.

As threats to Canada's boreal grow, its obscurity is lifting. Last June, National Geographic devoted a story to the region. And environmentalists have launched a campaign to scale back logging and set aside large tracts of the boreal as wilderness, arguing the health of the planet is at stake.

"If you care about wild forests, if you care about migratory songbirds, waterfowl and combating climate change, then you need to care about Canada's boreal forest," said Stewart Elgie, executive director of the Canadian Boreal Trust, an Ottawa environmental group.

Canada's timber companies say such concerns are exaggerated and that the environmentalists - having succeeded in the rain forest - are merely revving up another money-making, alarmist campaign.

"You've got to justify your existence somewhere," said Rick Alguire, woodlands manager at Tolko Industries Ltd., which makes siding and sheathing in High Prairie, Alberta. "The boreal is the next big target. We are a target. Every mill in Canada is a target."

Target or not, some companies are moving away from large, industrial clear-cuts to a quiltlike "mosaic" of smaller cuts that more closely resemble the natural progression of fire.

"Are there impacts? Of, course there are. We've never denied that," said Kirk Andries, director of external affairs at Alberta-Pacific Forest Industries, Al-Pac, which harvests trees for pulp - ground wood fiber - the primary building block for paper products.

But, he said, Al-Pac - which is the largest timber company in Alberta and 70 percent owned by Mitsubishi - has invested in "a staggering amount of science" to make sure those impacts are kept to a minimum and the boreal remains healthy.

Elgie, the environmentalist, agreed Al-Pac is doing a good job. But, he added, "On the whole, most wood and paper coming from Canada's boreal is not being cut with adequate environmental protection."

Investigators feel a 'sense of urgency'

There is one thing environmentalists and loggers agree on: Opening the boreal to logging, oil and gas drilling, mining and other activities at the same time is not ideal.

Al-Pac is a good example. Under a long-term "forest management agreement" with Alberta's government, it is entitled to log trees across a nearly 15 million-acre swath of the boreal. Much of that land also is leased to oil and gas companies. One area may hold as much oil - in deposits called tar or oil sands - as Saudi Arabia, and is being feverishly tapped. (Most of Canada's oil and gas ends up in the United States too.)

"I'm comfortable with our own activities," said Al-Pac's Andries. "But when you start layering stuff - energy, agriculture, forestry - on the landscape, you wonder, 'Gee, maybe this needs a little more thought.'"

There also are concerns about accountability. Across the boreal, government environmental monitoring often is limited and sometimes left to industry. Even federal inventories showing that forests are growing faster than they are being logged rely in part on industry data.

Charles Caccia, who served as environment minister under Canadian Prime Minister Pierre Trudeau in the 1980s, said the reports cannot be trusted.

"There is no established manner to verify the data," said Caccia, now a member of Parliament. "In the absence of a reliable inventory, we do not know - and cannot claim - that we are on a sustainable path."

Starting in 1996, a Canadian Senate subcommittee spent 2 1/2 years examining boreal conflicts. It staged a dozen hearings and field trips and heard testimony from about 175 witnesses. Its report is a stark account of over-cutting and mismanagement.

"There is ample evidence to show that current forest management practices are destroying our legacy, that we are cutting too many trees over too large an area," the subcommittee reported.

And it added a warning: "There is a sense of urgency that, at least in some parts of the boreal forest, time is running out for saving some vital functions, such as wildlife habitat, watershed protection and carbon sinks."

One place the subcommittee stopped was Winnipeg, Manitoba, not far from a part of the boreal forest Randall Bird knows well: his "trap line" - 10 square miles near his native Ojibwa village of Hollow Water.

Bird, now in his 50s, has worked the area since he was a boy - laying out traps each fall, checking them by snowshoe and snowmobile, sleeping wrapped in fur blankets in remote cabins. Most years, he would harvest a pile of pelts - from beaver to lynx, weasel to wolf - now worth $10,000 to $15,000 Canadian ($6,500 to $9,750 U.S.).

Then, in the late 1990s, the Pine Falls Paper Co. began clear-cutting in the area.

Walking through a recent cut, Bird was quiet. A few patches of aspen remained, but large stands of black spruce and jack pine, from which newsprint is made, had been leveled. It looked like a bomb had exploded.

"Everything's gone," he said.

Bird inherited the trap line from his father, who inherited it from his father. He had long planned to pass it on to his sons. But now Bird says it won't be worth it.

"You won't get anything now. Fishers, martens - those animals like trees. They have no place to go now because it's all open," he said.

Last summer, Bird joined his fellow tribal elders inside a large tepee. They sat in a circle and smoked a sacred pipe as Garry Raven, a traditional healer, prayed for help.

The logging industry "has killed off our rabbits, our porcupine, our otter and lynx," Raven told the Creator. "Most of the forest roads are blocked off. There are big gates on them so you can't get in."

Pine Falls Paper has since been sold to another company, Tembec, which plans more logging on lands where Ojibwa trap and gather herbs. But Tembec official Bob Yatkowsky said the cutting can be done without hurting the land and that he is proceeding cautiously.

"You don't want to end up with standoffs and roadblocks," he said.

Others have less patience. Asked about Ojibwa concerns, John Bulmer - a former superintendent who leads mill tours - said, "That's all fine and dandy. But what are we going to live on in the meantime? We can't live on nuts and berries. We can't turn the clock back."

Winding his way through a maze of stairwells and industrial machinery, Bulmer vigorously defended Tembec logging. "It's a system that works," he said. "We plant trees. We cut trees. And we keep a lot of people employed."

Tembec's newsprint is not just made from trees. A lot of recycled newspaper is mixed in, too. Over the years, the amount of newspaper born again as newsprint has grown dramatically. But newspaper companies generally prefer to publish on newsprint with some virgin wood fiber because the paper is whiter and photographs reproduce better.

Environmentalists say that leaves plenty of room for damage. And while most U.S. newspapers, The Bee included, routinely write about forest conservation and editorialize on its behalf, seldom if ever do they examine the environmental price of newsprint.

"The amazing lack of coverage is no coincidence," said Todd Paglia, campaign coordinator at Forest Ethics, a San Francisco environmental group. "When their own bottom line is on the line, newspapers tend to shy away from coverage that would reveal their complicity."

Bruce Meissner, who manages The Bee's press room, said four of the company's five largest newsprint suppliers make paper with 40 percent or more recycled content. "At times, they go 60, 70, 80," he said.

Only one supplier makes newsprint 100 percent from virgin old-growth trees: Abitibi in Mackenzie, British Columbia, which supplies about 6 percent of the 55,000 to 65,000 metric tons The Bee consumes annually. The paper is actually made from chunks of wood left over from cutting logs into two-by-fours and other dimensional lumber.

But even with 100 percent old-growth fiber, the Mackenzie paper has problems. "It tends to tear easily," Meissner said. "If I had my druthers, I wouldn't use any."

Why, then, does The Bee use it? The company, Meissner said, prefers a mix of manufacturers to ensure a steady supply of newsprint and to get a good price.

The subject of newsprint was on the mind of U.S. Forest Service chief Dale Bosworth when he addressed the Newspaper Association of America, which represents the nation's newspaper publishers.

A transcript of Bosworth's October 2001 speech, released by the Forest Service, contains the following passage:

"Newsprint comes from wood and wood comes from forests. Just to produce the Washington Post takes the equivalent of three or four square miles of clear-cut forest per year. Multiply that by all the newspapers and magazines in the nation and you get some idea of the demands on our natural resources just to produce newsprint."

Tom Croteau, a senior vice president for the association, said Bosworth's statement was misleading.

"It suggests that all newspapers and magazines are printed on paper that has been manufactured from forests that were clear-cut," Croteau said. "And that's not true."

Building supplies for U.S. deprive beavers of theirs

North of Edmonton, near Lesser Slave Lake, trees are falling not for newsprint but for "oriented strand board."

Sold in 4-by-8-foot panels and used widely for roof sheathing and siding, oriented strand board, known as OSB, is a relatively recent boreal forest innovation. And industry officials say it's environmentally friendly, as well, because it is made from fast-growing aspen, not century-old pine and spruce.

Last summer, sheets of Canadian OSB were sailing out of the Stanford Ranch Home Depot in Roseville at a rate of about 2,500 per week. Stacked 15 feet high, each panel was stamped: Tolko, Made in Canada, High Prairie, AB.

The price: $5.99, about $4 cheaper than plywood.

"This was a special buy for us," said Home Depot lumber and building department manager Kathleen Johnson. "And we are passing the savings on to our customers."

Back in the boreal forest near High Prairie, trapper Dave Donahue said those savings are savaging nature.

Slowing his pickup, he pointed to a clear-cut where he said a logging crew working for Tolko had leveled a stand of aspen, from which OSB is made.

But it wasn't the clear-cut he was pointing at. It was an igloo-shaped mound of sticks near a bog.

"You see that beaver den?" Donahue said. "After they logged it, those beavers died out. Beavers need aspen to live."

Donahue said that in the winter, when a lot of logging takes place, heavy equipment sometimes crashes through snarls of debris where bears are hibernating and nursing their cubs. When that happens, the cubs freeze to death and the mother starves.

"It happens with all the denning animals," he said. "The logging companies know this is going on."

Tolko's Rick Alguire said he knows of no such thing.

First, he said that although Tolko logged the area in 1998, the cuts Donahue pointed out may not have been Tolko's - because other companies work there, too.

About beaver, Alguire said: "I can tell you honestly we do not encroach within their food supply. We just legally cannot do it."

About bears, he said that in two decades of logging he has seen bears disturbed only twice - once by oil and gas crews and once by Tolko. On both occasions he said the animals "crawled back into their dens, safe."

Logging for OSB is very forest-friendly, Alguire said. "There are areas coming back like a green carpet," he said. "It's beautiful. The moose populations are just booming."

A March 1998 report by Alberta's provincial government found something different: a landscape shredded by logging and also crisscrossed by 45,000 miles of oil and gas pipelines and 88,000 miles of access roads. Alberta's boreal is experiencing "a massive increase in industrial activity - timber, hydrocarbon and mineral extraction - unprecedented in scale," it said.

Consultant Richard Thomas, who wrote the report, said such fragmentation is happening across Canada - and beyond.

"These problems are international in scope," he said. "The boreal is much more important to the global community left standing than exploited, simply because of its carbon storage.

"Messing around with the boreal the way we are, it's eventually going to affect everybody on the planet."

Chapter Three: Harvesting the Sea

Quotas work to protect Canada's catch

By Tom Knudson - Bee Staff Writer

Once they turned to the sea for sustenance. Today, many fishermen on California's coast turn to wives and girlfriends instead.

"Steady job and benefits, that's the marrying kind," said Troy Vought, a commercial trawler in Eureka. "If you ask most fishermen, 'How are you still fishing?' they tell you, 'It's because my wife has a good job.'"

Six hundred miles up the coast, in a restaurant on Vancouver Island, Canadian trawler Brian Mose leans back and smiles.

Life is good. Unlike Vought, Mose faces no snarl of federal rules that threaten his career. His deckhands earn up to $150,000 Canadian ($104,000 U.S.) a year. And three-quarters of their catch is shipped south to the most voracious seafood market on the West Coast: California.

"I would never try to sell to 34 million people in Canada; it's logistically impossible," Mose said. "The beauty of it is Californians are all jammed into the I-5 corridor. California is just as sweet as it comes."

Ever since gold-seekers swarmed to California in the 19th century, the state has been known as a mother lode of economic opportunity.

But on its central and north coast, efforts to protect seven species of Pacific rockfish - commonly known as red snapper - with federal fishing limits and bans put into place beginning in the 1990s, are reversing that historic trend by exporting opportunity to Canada - and sowing joblessness and despair at home.

Like many commodities, Canada's rockfish don't leave a well-defined trail in the marketplace. Once sold to processing plants, they are shipped by truck and plane to seafood wholesalers who in turn deal them to restaurants and supermarkets from Vancouver to San Diego. No agency - U.S. or Canadian - logs the final destination.

But trawlers and processors in Canada say about 75 percent of British Columbia's commercial catch is snapped up by consumers in California.

And that has some British Columbia environmentalists worried.

A decade ago, hunger for North Atlantic cod - its fillets white and flaky like rockfish - helped propel one of the most dramatic episodes of overfishing ever off the coasts of Newfoundland and New England. Some fear the same kind of market forces could one day deplete British Columbia's rockfish.

"When California started scaling back, I said: 'Holy smokes! What kind of pressure is this going to put on our species?'" said Terry Glavin, marine conservation adviser and rockfish specialist for the Sierra Club of British Columbia.

So far, the answer has been: none at all.

Therein lies a contrarian tale suggesting California's passion for conserving resources at home while consuming them from elsewhere need not export environmental pain, as it has done in Ecuador's Amazon and Canada's boreal forest.

The key is having a system to prevent such damage.

In British Columbia, that system is a federal management plan that is turning commercial fishermen into conservationists by giving them an ownership stake in the fish of the sea.

With legal title to an average of 610,000 pounds of rockfish a year, trawlers no longer race to sea in a competitive dash for fish. They work at their own pace, dragging their nets when prices are good. Most fish less - and catch less - but earn more.

Like property owners, they now take a keen interest in the value of their asset, including its resale value. The more productive rockfish stocks are, the more valuable a trawler's ownership stake - or quota - in them becomes. Lately, some trawlers have retired from the fleet and sold their quota to other fishermen

for about $1.90 a pound, becoming millionaires.

While not flawless, Canada's 6-year-old quota system has made trawling less wasteful.

When British Columbia trawlers happen to catch more than their quota, they are not forced to shovel the excess overboard dead, as U.S. fishermen must do. Instead, the Canadian system allows them to keep their catch - and profit from it, without hurting the environment.

Perhaps most importantly, Canada's system puts a federal "observer" on every boat, allowing its Department of Fisheries and Oceans to eliminate the guesswork that has long plagued fisheries management and to respond more quickly to changing ocean conditions. It is just such a failure to react to changing conditions that precipitated the rockfish crisis in California.

"The quota system has proven so successful you can't ignore it," said Bruce Turris, executive manager of the Canadian Groundfish Research and Conservation Society, which represents the trawl fleet.

"Clearly, there are public policy issues about the allocation of quasi-proprietary rights to a public resource. But there is no question quotas have their place in enhanced resource management."

U.S. fishery officials agree. "It's a system I would love to have," said Hans Radtke, chairman of the Portland-based Pacific Fishery Management Council, the federal entity that oversees commercial fishing on the West Coast.

Until October, though, the Pacific council, like regional councils around the country, was forbidden by Congress from developing quota systems, in part because of conflict about how to divvy up fish stocks.

With that ban now lifted, "We'll move ahead," Radtke said. "But it's going to be a long, drawn-out political process. And the industry has to get behind it. Otherwise, it won't work."

Many trawlers are enthusiastic. "I wish we had that system here," said Peter Leipzig, head of the Eureka-based Fishermen's Marketing Association, which represents the 273-boat West Coast trawl fleet.

Instead, the fleet has faced a maze of federal limits and closures so riddled with uncertainty it has forced fishermen and fish processors out of business and contributed to divorce, drug abuse and domestic violence, according to skippers and their wives.

"There is so much worry about money," said Mary Young, a Crescent City social worker married to a trawl captain. "I talk to the wives of crew members and half the time they're splitting up. You see a lot more problems in the family."

By their very nature, rockfish are not an easy species to know.

For starters, there aren't just a few kinds. There are dozens, an undersea galaxy of 70 to 80 species that school and swarm along the continental shelf from Baja California to Alaska.

Rockfish don't splash up rivers like salmon. They don't slash through the surface like tuna. They hunker down at crushing and sunless depths of 400 to 2,500 feet, where many details about their lives remain unfathomed by science.

They are ambassadors of the unusual.

With bulging eyes, bucket-like mouths and a forest of quills on their spines, rockfish seem to spring from a Dr. Seuss children's story:

There were purple rockfish, lemon rockfish
and other strange types;
Some had thin yellow lips, some wore
speckles and stripes!

Even their names are colorful. There are chilipeppers and chuckleheads, harlequins and honeycombs, widows and idiots, vermilions and chameleons, warthogs and watermelons.

But their comic front masks a complex nature. As scientists recently discovered, rockfish are like humans in some ways. They grow slowly, take years to mature and reproduce only occasionally. The rockfish on your plate may be older than you. Some live to be 70 or more. A few make it past 100.

With quotas, trawlers can ride market tides

Two days before Thanksgiving, 30 miles off the west coast of Vancouver Island, a large trawling net

swollen with fish hangs from a hoist over the Miss Tatum's aft deck.

A crew member pulls a cord and a waterfall of rockfish cascades onto the boat. Most are widows and yellowtails, but there is a smattering of red-stripe, silver-gray and canary rockfish, even an occasional strawberry-red bocaccio.

With tails flapping and mouths and gills slowly opening and closing, the catch sloshes across the deck, forming snowdrifts of snapper. The crew wades in, shoveling the fish into a hold, amid a whirling cloud of gulls.

The Miss Tatum was at sea because its skipper, Clayton Odberg, saw a market opportunity in the millions of Californians he hoped would soon tire of Thanksgiving turkey and turn to fish. And he had enough quota to give it a try.

About 8 a.m., with his net 490 feet deep in the Pacific, Odberg's radio crackled with the voice of Dave Ernst, a local seafood processor in touch with fish wholesalers in San Francisco and Los Angeles. California buyers were hungry for snapper - but the market was not sizzling.

"Clayton, the price isn't as good as what we were hoping for."

"I know that," Odberg said. "I was going to stop at 60,000."

"It would be better if you stopped at 50, even better at 40."

Later, Odberg raised the net. It held close to 40,000 pounds of rockfish, enough to bring a good price - 75 cents a pound (52 cents U.S.) - but not too much to drive the market down.

For Odberg and the rest of Canada's trawlers, quotas have turned fishermen into entrepreneurs.

"We each have our pull of fish now," trawler captain Mose said. "That's all we have. We want to make the very most of them.

"Take canary rockfish. My quota is 50,000 pounds for the year. I can catch that in one tow, or two - or 10. I can bring it in at 40 cents a pound or 75 cents a pound."

The ability to ride rising market tides means many Canadian trawlers now make more while working less.

"I used to fish 12 months a year. Sometimes I would even leave on Boxing Day," just after Christmas, said skipper Norman Sigmund. "Now I fish four months and make more money."

The news is not all upbeat. Some skippers say the government gave too much quota to some boats and too little to others. "There was not a lot of fairness," said skipper Jim Harris. "Some guys wound up out of business who had been pioneers in the industry."

The approach also has made boats so costly - a no-frills trawler with "quota" has jumped in value from $400,000 to $3 million in Canadian currency - that some fear for the fleet's future. "Who's going to come into this business if they have to pay $5 million for an operation that will only generate a million a year?" Sigmund asked.

"How are we supposed to transfer this equity to the next generation? Larger entities will gobble up the quota because they can afford to."

Several Vancouver Island trawlers are now millionaires. Many drive new trucks and SUVs. One has a condo in Palm Beach, Fla. Another sold his quota for $5 million Canadian ($3.45 million U.S.). Some have reinvested heavily, buying more efficient boats, safer gear and technology to cut the catch of undesired fish.

But the biggest sea change may be in attitude.

"It has changed the tone of discussion," said Rick Stanley, a biologist with Canada's Department of Fisheries and Oceans. "Fishermen take a more long-term interest because they own a share of the farm."

When Mose first saw his quota, he cried.

"I thought I was finished," he said. "Why would I like something that was going to reduce the amount of my take?"

And today?

"My revenues are higher than they've ever been," Mose said.

"But what is most interesting to me is when I'm out trawling and I see a school of fish, I'm thinking, 'I know your parents. They did me well. Now do me well. Be productive.'"

West Coast fleet's cost in wasted fish is high

Like many improvements, Canada's quota system began with failure. Every three months, at the government's order, trawlers charged to sea, hoping to catch their "trip limit" before another boat got to it first. The competition was so fierce trawlers called it "Olympic" fishing.

"It created a boom-and-bust cycle," said Murray Chatwin, a buyer at Ocean Fisheries Ltd., a major Canadian processor. "It wasn't working for anybody. The boats weren't making money; we weren't making money."

When trawlers caught more than their limit, they threw the excess overboard, dead. With so many nets in the water, they also caught more than the entire fleet's three-month quota in just a few days. Unable to regulate the catch, Canada shut the fishery down in September 1995.

"It was binge fishing," Mose said. "Looking back, there was not one thing good about it. Production was high; quality was low. All you could predict was, 'Look out, here it comes.'

"I watched it evolve to the point where there just wasn't enough fish for the fleet anymore."

A similar cloud now hangs over the West Coast trawl fleet. From Seattle to San Diego, the Pacific Fishery Management Council also uses limits to harness trawlers. Here, though, the limits cap what trawlers can catch over a 60-day period, instead of on every trip.

But with some rockfish populations in decline, pressure from environmental groups on the rise and a 1996 federal law on the books requiring that "overfished" stocks be rebuilt, the fishery management council has steadily whittled those limits lower.

The result: a desperate, impoverished fleet and a whole lot of wasted fish.

"You are forced to catch what you can while you can because of the uncertainty of not being able to fish tomorrow," said Vought, the Eureka trawler.

Last year, while making a tow for lingcod near Eureka, Vought's crew caught something unexpected: 2,500 pounds of canary rockfish, a delicious, valuable species known to live to be at least 84 years old. Trouble is, Vought was already near his two-month limit for canaries.

To avoid a federal fine, the crew shoveled 2,000 pounds of canary rockfish back into the sea. Not one survived, because rockfish's air bladders burst in the rapid pressure change of their forced journey to the surface.

"In order to sell $800 worth of fish, we actually threw away $1,100 worth," Vought said. "In what world does that make sense?"

When Canadian trawler Sigmund found himself in a similar predicament not long ago, not one fish was wasted. He had hauled in 35,000 pounds of silver-gray rockfish, 20,000 of which was over his legal quota.

Sigmund called another trawler who had not yet caught his annual quota of silver-grays, and traded for 20,000 additional pounds of quota. "I turned my by-catch into catch," Sigmund said. "That's what the quota system is all about."

California trawlers say being forced to conserve rockfish by wasting them is crazy. Crescent City trawler Richard Young once walked onto the deck of his boat while his crew was heaving fish overboard. "They told me, 'This is nuts,'" Young said. He responded sarcastically: "No, it's not. It's conservation."

"There's no way you can feel good about it," Young said. "That fish is food. It could be feeding hungry people."

John DeVore, groundfish coordinator for the Pacific management council, said the 60-day limits were put into place for an economic reason: to keep a steady flow of fish coming to the dock. Seafood processors wanted a system in which they had a year-round business, he said.

But he acknowledged the biological cost in wasted fish is high. "It doesn't make sense from any perspective," DeVore said. "It's distasteful for everyone. It's one of those things we want to get away from."

Unable to gauge how many fish were being wasted, and faced with a continued decline in rockfish, the federal fisheries council last year took an unprecedented step. It declared a huge swath of the continental shelf, from Canada to Mexico, off-limits to trawling.

Since then, a deep economic gloom has settled over California's North Coast. The value of Young's trawler, the City of Eureka, has fallen from $400,000 to $150,000. "I'm not convinced we can sell it for anything," said his wife, Mary.

Like many fishing families, the Youngs, who are in their 50s, have always counted on the future sale of that boat to fund their retirement. "I try not to think about it, because right now the only retirement we have is my Social Security," Mary Young said.

"We sit here and struggle at night and say, 'What are we going to do?'" she said.

As catches have shriveled, so have paychecks. A decade ago, Richard Young paid crew members $35,000 to $40,000 a year. Now they make less than half that. Times are so lean that some deckhands have even stopped paying federal income taxes.

Statewide, roughly 200 people still earn a living as deckhands on trawl boats. Despite the downturn in rockfish, Young keeps his crew employed most of the year, in part by turning to other species, including crab and shrimp. During slow times, they repair gear.

Many have found other work. "One guy is a prison guard. Another is a truck driver," Young said. "Twenty years ago, people were begging us for jobs. Now it's hard to find a crewman."

In Eureka, Vought has his own way of dealing with that problem. He swings by the local unemployment office where, he said, he finds an unusual class of workers.

"We are literally pulling drug addicts off the street to take them fishing." But Vought said it's not as bad as it sounds. "A lot of times, they are cleaned up by the time you get them. There's no help. The perception is that fishing is over with."

It's more dangerous, too, because trawlers are under financial pressure and can't afford to maintain boats.

A recent U.S. Coast Guard report attributed accidents and loss of boats in Northern California partly to desperate financial straits. In Crescent City, at least two trawlers have sunk in the past decade due to fatigue and financial stress, local fishermen said.

"More boats get lost," Vought said. "You have more accidents."

Warmer water doomed generations of rockfish

The West Coast's rockfish disaster began in the 1970s when the federal government, after pushing foreign trawlers out of coastal waters by extending the 200-mile territorial limit, handed out boatloads of financial incentives to jump-start a domestic trawl fleet.

The fleet grew rapidly and the fishing was fantastic. Most people assumed rockfish were prolific breeders, like sole and halibut.

Rockfish productivity "was not an issue," said Peter Leipzig, head of the trawlers association and a former member of the Pacific fisheries council. "The national policy was full utilization of the resource."

The first hint that something was awry came in the late 1980s, when scientists noticed that most rockfish in trawl nets were adults. There was a drought of youngsters.

They now understand that in the mid-'70s, a period of generally cold water, rockfish thrived, giving birth to millions of squiggling larvae that survived to become healthy adults.

But in the 1980s, a time of warmer water, including one of the century's worst El Niño patterns, new generations of rockfish were born and then mysteriously perished.

The 1990s brought a surge of even warmer water - and more reproductive failure. But figuring that out took time. Meanwhile, the trawl fleet continued catching adult rockfish in the prime of their reproductive lives.

Veteran rockfish scientist Alec MacCall likens it to continually dipping into the principal in a savings account. Sooner or later, you deplete the account.

"It wasn't until the late '90s that we started realizing there was a serious problem," said MacCall, who

works for the National Marine Fisheries Service. "By then, a lot of damage had been done."

The management council did not act swiftly enough to avert disaster, MacCall said, in part because of the usual pressure from politicians, fishermen and fish processors. But he also blames another group for the disaster: scientists, himself included.

"We blew it by not looking hard enough and soon enough at what was going on," he said.

There is plenty of blame to go around, according to Leipzig. "We all regret what happened," he said. "But we can't attack it because we were all part of it."

Today, seven species of rockfish have been hurt the most: bocaccio, canary, cowcod, dark-blotched, yelloweye, widow and Pacific Ocean perch. And because they have been fished to such low levels, and reproduce so sporadically, scientists say it will be years, decades, even more than a century before they recover.

Three species - dark-blotched, widow and Pacific Ocean perch - are expected to rebound the quickest: between 2011 and 2047.

Depending on ocean conditions and fishing practices, yelloweye and canary rockfish could take 24 to 73 years to bounce back. Biological recovery - a return to just 40 percent of their original abundance - could take 96 years for cowcod and more than a century for bocaccio.

Managing rockfish is a task that calls for detailed monitoring of fish populations, commercial catch, by-catch and ocean conditions.

Perhaps the best way to keep track of such matters is by placing a federal observer on every trawler. And that is just what the Canadian quota system does.

On board the Miss Tatum, that observer was Guy Boxall, a bushy-haired young man in a ragged flannel shirt who watched everything that came up and jotted it down: yellowtails (48 percent), widows (46 percent), a sprinkling of red-stripes, silver-grays and bocaccio - even two stray salmon.

At first, Canadian trawlers were skeptical. After all, the cost of the program - about $350 Canadian a day ($240 U.S.) - is paid by fishermen. And observers, who work for a private company, report everything they see to the government.

"There's a significant cost to this program," Mose said. "It's privacy, the thing we hold dearest."

Most now are sold on the concept, finding that they can easily afford it and that observer information serves as an early-warning system about the health of rockfish stocks. Government fishery managers like the program because it provides a precise accounting of the catch. U.S. fishery managers are envious.

Told about the Canadian program, John DeVore, the federal U.S. rockfish manager, said: "They've got 100 percent observer coverage? That's great. That's really ideal. Then you see everything. You could really manage by-catch a lot better doing that."

The Pacific council took a step in that direction in 2001, placing observers on 20 percent of trawl trips. "Clearly, if we had the resources, we would like to see 100 percent coverage," DeVore said.

Recently, observer data helped the Canadian fleet respond to a potential rockfish disaster. "We were watching silver-grays just get older - there were no young ones," Mose said. Last year, the fisheries and oceans department cut the silver-gray quota.

Leipzig said quick action often is difficult in the United States because the current system requires extensive public notice and involvement. A simple stock assessment to estimate rockfish abundance takes two years to work its way through the system. "By the time you use the information, it's out of date by at least two years," he said. "How does that advance conservation?"

Canada's system has its critics, too.

Terry Glavin, the Sierra Club adviser, said that even with observers, there is not enough information to guarantee the long-term health of rockfish stocks. "We don't know about interspecies relationships," he said. "We don't know anything about what influences the productivity of the various species."

He's also skeptical of the close relationship between the fishing industry and its government overseers. "Decisions are made ... in closed meetings by nameless mandarins and industry lobbyists who reckon that the less the rest of us know about this stuff, the better," Glavin wrote in a newspaper column published in Canada last year.

But what haunts him most is that an overfishing disaster like the one that decimated cod stocks on the east coast of Canada and in New England in the 1980s and early 1990s could happen to British Columbia.

The genesis of that catastrophe is eerily similar to what spawned California's rockfish crisis: a prolonged spell of intense fishing, seasoned by industry pressure and scientific uncertainty.

"My country destroyed the largest and oldest fishery in the history of the human experience: North Atlantic cod," Glavin said.

But Bruce Turris, the British Columbia trawl fleet representative, said past is not prologue. Federal groundfish managers "are much more cautious and conservative now," he said.

A snapshot of the British Columbia rockfish catch shows no wild upswings in rockfish landings - despite rapidly declining catches and cutbacks in California, Oregon and Washington. British Columbia rockfish landings have actually dipped 9 percent, from 53.8 million pounds in 1996 to 48.9 million pounds in 2001.

Many West Coast trawlers have argued for a quota system and other reforms, including a buy-back program to reduce the number of boats in the fleet - a measure recently approved by Congress.

"Quotas, if done properly, could be the salvation of this fishery," said Richard Young, the Crescent City trawler.

Unless that happens, they will have to continue to deal with the fallout of the current system.

For Young, that means spending time and money diversifying into crab and shrimp fishing.

For Troy Vought, it means getting out of trawling. Last year, he started Aquascape, a business building water gardens and ponds.

And it means changes in the marketplace.

To see one example, drop by Mr. Fish Seafood, a popular retail fish market on Highway 101 in Eureka.

A sign near the door says, "Save a Cow, Eat a Fish." Inside, there are colorful fish-shaped Christmas ornaments, T-shirts ($10 each) that say "Fish Happens!" and another sign: "Catch Your Limit Here."

One recent weekend, there was rockfish for sale too - labeled as snapper, for $5.99 a pound. Asked where it came from, owner Mark McCullough ducked into the back and fished out the smelly brown box in which it was shipped.

Stamped on one side were three words: Product of Canada.