

CLEAN AIR TODAY

Global Climate Change Issue

Summer 2007

Earth to You - page 4

California Takes Action - page 6

Archaeologist of Air - page 8



Welcome to Clean Air Today



Mike Villegas being interviewed by CNN about Ventura County's air quality in Port Hueneme, June 6, 2007.

by Mike Villegas,
Ventura County Air
Pollution Control Officer

This is our fifth issue of *Clean Air Today* and we have dedicated it to the reality of global climate change. I say reality because, based on the latest research we can find, our planet is undergoing dramatic climate

change. The Ventura County Air Pollution Control Board has asked the District to begin public outreach on this topic and this issue is the beginning of that effort. And speaking of global warming, we are working with the County of Ventura on the implementation of its Climate Change Action Plan.

I encourage you to read on in this supplement to learn more about global climate change and what we can do about it.

But what of the county's smog issues? I am happy to report that Ventura County continues to make progress on achieving our air quality goals. We had a record heat wave last summer and we experienced 17 days exceeding the federal 8-hour ozone (smog) standard. While this was an increase over summer 2005, we still have a significant reduction in days exceeding the standard when looking at the trend over the past 10 years. Air quality will always vary from year to year based on weather conditions. It is the longer term trends that are important. This summer our staff will present to our Board a plan to achieve the federal 8-hour ozone standard. It is the most critical project for us this year as it presents a roadmap to provide healthful air to everyone in Ventura County. Achieving the federal 8-hour ozone standard continues to be our agency's number one goal. And for those of you who would like information on our air monthly, you can now download our newsletter, *Skylines*, on our website at www.vcapcd.org.

I encourage you to read on in this supplement to learn more about global climate change and what we can do about it. And if you have any questions about air quality here, give us a call at 645-1400 or visit us on the web.

Getting a big message out of thin air



Barbara on location in Reyjavik, Iceland

by Barbara L. Page,
Public Information Manager

It's been a hectic year for public information at the air district. We are in post-production of our new IMAX-type film, *Air – the search for one clean breath* (see pg. 8). This project, funded primarily by a grant from the United States Environmental Protection Agency, took us on an international journey to capture the biography of air in a high definition format that has never been done before (we think) on this topic. From the rugged slopes of Iceland to a deserted steel

mill in the Utah Valley, from an encounter with 800,000 year old Antarctic ice cores, to a visit at a zero carbon community in London, we have tried to capture the story of air on film. It's a challenge. Last September we filmed three historical re-enactment scenes in one day! Thanks to Warner Brothers Studios for the donation of all our period costumes. We also appreciate the partnership with Iceland Air, the Port of Long Beach, Nordica Hotels, Media 360, and many others who gave in-kind contributions to this project. The film is scheduled for release this year.

At Cambridge University outside London, we also had the pleasure of interviewing Dr. Robert Mulvaney and you can read about his greenhouse gas research with ice cores here in *Clean Air Today*. If you would like additional copies of the publication, contact me at 645-1415.



Clean Air Today was distributed to over 102,000 county residents in 2006.

"The danger is that global warming may become self-sustaining, if it has not done so already. The melting of the Arctic and Antarctic ice caps reduces the fraction of solar energy reflected back into space, and so increases the temperature further. Climate change may kill off the Amazon and other rain forests, and so eliminate one of the main ways in

which carbon dioxide is removed from the atmosphere. The rise in sea temperature may trigger the release of large quantities of methane, trapped as hydrates on the ocean floor. Both these phenomena would increase the greenhouse effect, and so further global warming. We have to reverse global warming urgently, if we still can."

- Stephen Hawking, *Lucasian Professor of Mathematics, University of Cambridge, (and many feel the world's foremost theoretical physicist) in an interview with ABC News, August 2006*



All that's new under the sun

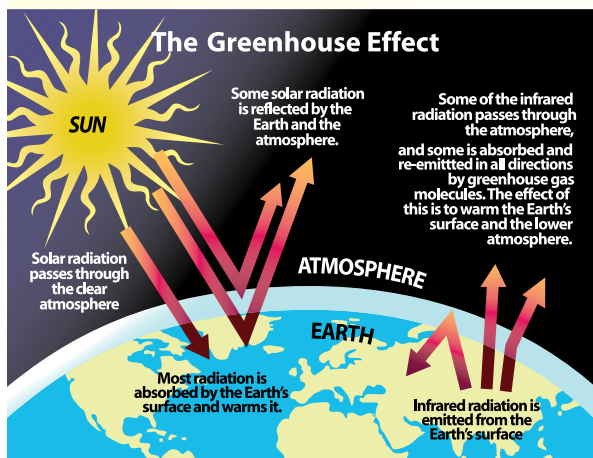
It seems everywhere we go lately, there's an article, a film, or a new discovery about global warming. Here in Ventura County, the Board of Supervisors and the Air Pollution Control Board have asked county agencies, and the Air District, to develop a plan to reduce greenhouse gas emissions. So – what exactly is this phenomena and what does it mean for us now and for our future?

What is global climate change?

Global climate change refers to changes in the Earth's weather patterns, including rising temperatures, due to an increase in heat-trapping or "greenhouse" gases in the atmosphere. Greenhouse gases include water vapor, carbon dioxide, methane, and nitrous oxide, among others.

The term climate change is often used interchangeably with the term global warming, but according to the National Academy of Sciences, "The phrase 'climate change' is growing in preferred use to 'global warming' because it helps convey that there are other changes in addition to rising temperatures."

What is the greenhouse effect?



The greenhouse effect is essential for life on Earth because it helps regulate temperature; it allows sunlight to heat the Earth and excess heat to radiate into outer space. Without a natural greenhouse effect, Earth would be extremely cold, around zero degrees Fahrenheit. So, the concern is not with the fact that the greenhouse effect exists but that a dramatic change is happening. Currently, increased amounts of heat-trapping gases

are reducing the amount of radiated heat escaping into outer space, thus altering the Earth's climate.

Who can we believe about global warming?

Most scientists agree that the physical consequences of climate change are real. The Intergovernmental Panel on Climate Change is a scientific group sponsored by the World Meteorological Organization and the United Nations Environment Programme, consisting of 600 scientists from 40 countries. In February 2007, it issued a report on global climate change stating that they are about 90 percent certain that people are the cause of global warming. The report asserts:

Global atmospheric concentrations of carbon dioxide, methane, and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed pre-industrial values. Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level. Changes in climate are now affecting physical and biological systems on every continent.

What is causing this condition?

The United States Environmental Protection Agency (EPA) says energy-related activities account for three-quarters of our human-generated greenhouse gas emis-

(sources: United States Environmental Protection Agency website; International Panel on Climate Change Report, February 2007; National Geographic Magazine, September 2004; Air Currents, BAAQMD, 2006; World Resources Institute, Climate Change 2005; Association of Environmental Professionals)

sions, largely in the form of carbon dioxide from burning fossil fuels. Sources include large stationary sources such as factories and power plants; transportation sources like cars, trucks, and airplanes; and industrial processes such as cement, steel, and aluminum production. Agriculture, other land use, and waste management are also sources of greenhouse gas emissions. Natural sources of greenhouse gas emissions include dead organic matter; respiration of plants, animals, and bacteria; evaporation from the ocean; and volcanic outgassing.

What are the effects?

Dr. James Hansen, head of the NASA Goddard Institute for Space Studies, began work in the 1970s on studies and computer simulations of the Earth's climate. He says the significant climate effects will only reveal themselves with time. But we do know temperature variations can cause increased damage from hurricanes, floods, fires, and infectious diseases. Some effects also include sea level rise, shrinking glaciers, changes in the range and distribution of plants and animals, trees blooming earlier, lengthening of growing seasons, ice on rivers and lakes freezing later and breaking up earlier, and thawing of permafrost.

Some dramatic examples of what has already happened:

- Eighty-seven percent of the 244 Antarctic glaciers have retreated.
- In June 2005, sea ice coverage was six percent below average.
- The first hurricane ever reported in the South Atlantic hit Brazil in 2004.
- The Atlantic conveyor belt is slowing — data suggests that the Atlantic overturning circulation is 30 percent slower than the period between 1957–2004.
- The 1990s were the hottest decade—not just of the last century, but of the last millennium.
- The famed snows of Kilimanjaro have melted more than 80 percent since 1912.
- 2006 was the hottest year on record in the United States.

Too darn hot in Glacier National Park



According to a June 2006 report from the National Park Service, change is in the air. The amazing mountains and valleys of Glacier National Park were sculpted by the action of glaciers over hundreds of years of advance and retreat. In 1850, an estimated 150 glaciers were in the park. Today, the number has dwindled to 27, many of which are remnants of what they once were. If the current rate of warming persists, the report

predicts the glaciers in the park will be completely gone by the year 2030. (June 2006 Resource Bulletin, Global Climate Change & Melting Glaciers, National Park Service, US Department of the Interior)

Sealing their future?

A 20-year study of Antarctic fur seal pups have found that the increased monthly average sea surface temperature, which they link to climate change, can explain the recent reductions in pups. Anomalies in the sea surface temperature have caused a reduction in available prey populations of krill (the base of the seal food chain).



Resulting undernourishment has, in turn, significantly reduced the breeding potential of Antarctic fur seal females. Thus, a 20-year trend of increased monthly average sea temperatures, driven by climate change, can explain the reductions in seal pups.

(World Resource Institute website March 2007, Climate Change 2005, Major new discoveries)

SAVING THE Earth...one carbon footprint at a time

Spotlight: Ventura, California



At a community meeting in October 2006, residents felt the city could set an example for other cities in the state, nation and beyond. They presented the following suggestions:

What can individuals do?

- Use a clothesline instead of the dryer.
- Drive a smaller, more fuel-efficient vehicle.
- Use cloth bags when shopping.
- Talk to your children about recycling & climate change.
- Reconfigure your home & office to make better use of natural light.
- When ready to purchase a new large-format TV, consider an LCD rather than a plasma screen.
- Ride a bike to work.

What can the city do?

- Clear road hazards for bicycle riders.
- Invest in wind, solar, and ocean-power technologies.
- Work with local grocery stores to sell more locally grown products.

TOP 10 things You can do to prevent Global Warming

- 10 Plant native, drought-resistant trees and shrubs around your home and outdoor air conditioning unit.
- 9 Use an electric or push mower instead of a gasoline-powered mower.
- 8 Replace your current home appliances with high-efficiency models.
- 7 Buy food and other products with reusable or recyclable packaging.
- 6 Replace incandescent light bulbs with compact fluorescent bulbs.
- 5 Install a solar heated system to provide hot water.
- 4 Recycle your home's waste newsprint, cardboard, glass, and metal.
- 3 Leave your car at home at times (walk, bike or take mass transit once or twice a week—even more if you can).
- 2 Insulate your home, clean your air conditioning filters, and install energy efficient shower heads.

And the number one thing you can do to prevent global warming is...

- 1 Purchase a fuel-efficient car (rated at 32 mpg or more) to replace your most frequently used automobile.

(source: Broward, Florida Environmental Protection Dept.)

Yes-
it's your very own Personal greenhouse gas calculator!



You can start assessing your own contribution to the problem, by using EPA's personal greenhouse gas emissions calculator to estimate your household's annual emissions. Once you

know about how much you emit, you use the tool to see how simple steps you take at home, at the office, on the road, and at school, can reduce your emissions. Visit www.epa.gov/climatechange/wycd.

The greening of Ventura County

Over ten years ago, long before global warming became a household word, Ventura County was retrofitting equipment, turning down the lights, and investing in green energy. However, in 2006, the Board of Supervisors made a formal request for the county to identify other key measures to further reduce greenhouse gas emissions through energy conservation and adoption of green building standards. Currently, the county has accomplished the following:

Green rooms. County facilities have reduced carbon emissions by 730 tons through lighting retrofits, and other high efficiency retrofits on motors and air conditioning units. The county has earned the US EPA's Energy Star Rating at eight of its major facilities.

Lighting the way. The Department of Airports has replaced all exterior lighting in parking areas and aircraft ramp areas with energy efficient systems at Camarillo and Oxnard. Internal lighting replacements have been completed in County owned buildings and commercial hangars resulting in savings of over 400,000 kilowatt-hours per year.

Eco-fleet. In 2002, the County purchased hybrid vehicles for its fleet. The objective was to develop a fuel-efficient fleet – cost effective and environmentally friendly. This resulted in 61 hybrid sedans; 14 hybrid sport utility vehicles; and 13 compressed natural gas vehicles. This represents 24.5 percent of the fleet. As a result, an estimated 20,000 gallons of fuel have been saved and 194 tons of CO₂ emissions reduced since the policy was implemented.

The Board will continue to develop policies regarding climate change, including green building standards and alternative fuel use. For further information contact Norma Camacho at norma.camacho@ventura.org.

Here's an internet clean car resource from the California Air Resources Board. The website www.driveclean.ca.gov is your guide to discovering all the advantages clean vehicles offer. You'll find information on advances of today as well as a glimpse at future technologies. Take a look and see why these vehicles are raising pulses, helping people breathe easier and reducing greenhouse gas emissions. Also for tips on how to save energy and money, along with some cool rebates, visit www.flexyourpower.org.

What the feds are saying

The US Environmental Protection Agency has a lot to say about what we can do to reduce greenhouse gas emissions.

AT HOME



Look for ENERGY STAR labeled products. When buying new products, such as appliances for your home, get the features and performance you want and help reduce greenhouse gas emissions and air pollution. Look for ENERGY STAR-qualified products in more than 50 product categories, including lighting, home electronics, heating and cooling equipment, and appliances. The typical household spends more than \$1,900 a year on energy bills. With ENERGY STAR, you can save up to 30 percent or about \$600 a year.

ON THE ROAD



Many factors affect the fuel economy of your car. To improve fuel economy and reduce greenhouse gas emissions, go easy on the brakes and gas pedal, avoid hard

accelerations, reduce time spent idling and unload unnecessary items in your trunk to reduce weight. If you have a removable roof rack and you are not using it, take it off to improve your fuel economy by as much as five percent. Use overdrive and cruise control on your car if you have these features.

AT SCHOOL



Explore the Climate Change Kids Site, <http://epa.gov/climate-change/kids/index.html> and watch climate animations that bring to life the science

and impacts of climate change. The site also provides games that help students, their parents and their teachers learn about both the science of climate change and what actions they can take to reduce greenhouse gas emissions.

For more EPA tips, visit www.epa.gov/climatechange/wycd.

Everybody talks about the weather but nobody does anything about it. - Mark Twain



EARTH TO YOU:

Do Something – Even A Little Thing - Now!

- **Use the "off" switch.** Turn off lights when you leave a room. It's also a good idea to turn off the water when you are not using it.
- **Cut out vampire power.** This is the electricity your home electronics suck out of the power grid when you're not using them. When you turn off some home electronics, they don't actually go all the way off—they continue using energy to power features like clock displays, remote controls, and battery rechargers. So unplug your television, DVD player, stereo, and microwave oven when you're not using them. This can reduce emissions and take a smaller bite out of your wallet.
- **Use less heat & air conditioning.** Turn down the heat while you're sleeping at night or away during the day, and always keep temperatures moderate. Setting your thermostat just 2 degrees lower in winter and higher in summer could save about 2,000 pounds of carbon dioxide each year.
- **Plant trees.** In other words, start digging. Trees absorb carbon dioxide and give off oxygen. They are an integral part of the natural atmospheric exchange cycle here on Earth, but there are too few of them to fully counter the increases in carbon dioxide. A single tree will absorb about one ton of carbon dioxide during its lifetime.
- **Travel green.** Check out "Green Hotels Association" member hotels when you travel. These hotels implement water and energy-saving measures and reduce solid waste. The GHA encourages all lodging accommodations to get guests and clients involved. Hotels can offer towel and sheet-changing options, guestroom recycling baskets and reduced food-related waste. Choose green hotels by calling or faxing "Green Hotels Association" for a list of members. Or, visit GHA's internet site, www.greenhotels.com.



And for businesses, the California Climate Action Registry

The Registry was established by California statute as non-profit voluntary registry for greenhouse gas emissions to help companies and organizations within the state establish GHG baselines. When future state, federal, or international regulations are implemented, companies can get credit for early emission reductions. Participants can demonstrate environmental leadership and gain a competitive advantage by monitoring emissions and reducing waste. Registry participants include businesses, non-profit organizations, municipalities, state agencies, and other entities.

Visit www.climateregistry.org.

A Carbon Footprint is a measure of the impact human activities have on the environment in terms of the amount of greenhouse gases produced, measured in units of carbon dioxide.

Source: www.carbonfootprint.com

CALIFORNIA takes action

“We simply must do everything we can in our power to slow down global warming before it is too late.” -Governor Arnold Schwarzenegger

by Don Price

As Californians, our superb weather and beautiful natural resources make us particularly aware of the consequences of pollution. It is this awareness that lead our legislature to adopt the California Global Warming Solutions Act of 2006.

The Legislature and Governor Schwarzenegger have established a first-in-the-world program to achieve real, quantifiable, and cost-effective reductions in greenhouse gas (GHG) emissions, which have increased dramatically over the last 60 years. GHG emissions are primarily carbon dioxide but also include methane, nitrous oxide, and the chemicals used in refrigeration and air conditioning systems. Our success in decreasing these emissions will determine how global warming will impact our planet over the next 60 years and beyond. The Act puts the California Air Resources Board (ARB) in charge. ARB will determine the current level of GHG emissions and the level that existed in 1990. The 1990 data will be used to set a GHG emission

cap for the year 2020. By then, GHG emissions must be lower than the 1990 level.

Greenhouse gas emissions come from a variety of sources, including motor vehicles, power plants, agricultural activities, and air conditioning systems. ARB will develop emission reporting rules for significant sources of greenhouse gases. This information will improve its GHG emission research. It will also help ARB develop regulations to reduce GHG emissions in a technologically feasible and cost-effective way. The Legislature instructed ARB to be as flexible as possible with these regulations, which may include GHG trading mechanisms and alternative compliance scenarios.

The tasks are complicated and difficult to achieve in the short timeframe. While ARB will get assistance from a number of subcommittees, they will also need input from the public and private sectors to make the process work. Before taking any action, ARB must evaluate the impact on our economy,

environment, and public health. It must also take into account regulatory fairness, electricity reliability, environmental laws, and impacts on low-income communities. Accomplishing these tasks will take a monumental effort from all involved.

Is technology available to meet the deadline? According to ARB spokesperson Richard Varenchik, “Yes and no. Some of today’s existing technology will certainly be helpful, but we also anticipate that, as time goes on, new technology will be developed that will also help in meeting the 1990 goal.”

By reducing GHG emissions to 1990 levels, California is making a huge contribution to the global effort to prevent runaway global warming. Let’s hope our example will lead to similar laws in many other states and countries.

{Mr. Price is an engineer with the Ventura County APCD and is currently monitoring climate change issues for the District.}

Global solutions

Other countries are entering the global climate change wilderness with some exceptional programs.

Great Britain – students on the front line

Secondary schools in Great Britain will soon start mandatory classes in Climate Control. The plans will ensure that, for the first time, issues such as climate change and global warming are at the heart of the school timetable. Pupils will also be taught to understand their responsibilities as consumers – and learn to examine their individual carbon footprints, and what they can contribute in the fight to preserve the planet’s resources.

France – relying on nuclear energy

Carbon dioxide emissions in France are significantly less than most industrialized countries because nearly 80 percent of the electricity there comes from nuclear power, rather than fossil fuels. A timetable for French industry and car emissions to adhere to the Kyoto guidelines became law as part of the national climate plan in 2005. France insists that it will do all it can to hit these targets but some admit it will be difficult and environmental groups in France say the country has no chance.

Germany – no can do

The German government provides strong incentives that encourage alternative energy sources. Northeast Germany is one of the world’s most densely wind-farmed regions. Some strategies include a devotion to recycling; a ban on canned drinks; and a legendary rubbish sorting system. Axel Friedrich of the German Environmental Protection Agency advises that small things really add up. One idea he promotes: purchase thinner tires for your car; they’re safer and produce less emissions.

Spain – catch up if they can

Spain is striving to catch up on green matters. Government campaigns urge people to save water, recycle rubbish, and use public transportation. But the biggest polluters,

heavy industry, are slow to adapt and Spain’s Environment Ministry admits laws to cut industrial emissions have been delayed. Amid a construction boom, the government has stopped some projects on environmental grounds and seeks to protect nature reserves.

Australia – saving energy down under

In a world first, Australia is phasing out inefficient light bulbs and replacing them with those curly, environmentally-friendly compact florescent ones. Last February, the government announced the phase out will reduce greenhouse gas emissions by four million tons per year. Lighting currently represents around 12 percent of greenhouse gas emissions from households, and around 25 percent from the commercial sector. Australia is aiming for full enforcement of new lighting standards legislation by 2009 to 2010.

Japan – at the top?

The Top Runner Program, initiated in 1999, sets fuel efficiency standards for vehicles, and energy conservation standards for appliances (like TVs, copiers, gas & oil water heaters, and even rice cookers!) above the levels of best-performing vehicles/appliances currently sold in the market. The program is promoted with energy-saving labeling to provide consumers information on the product’s energy efficient performance.

(sources: The Independent 10/26/06; California Air Resources Board International Symposium on Near-Term Solutions for Climate Change Mitigation in California; Australian Greenhouse Office; CoolAqua.com; CBS News)

Dear Clean Air Today –

How can one explain the effects of global warming and its potential dangers without scaring our children?

-Concerned parent, Santa Paula

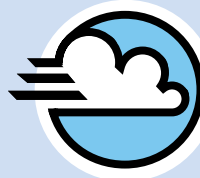
Dear Concerned –

Good question. Nationally renown University of Wisconsin environmental educator Elaine Andrews has this advice:

Many things about our world are scary or sad; still, parents want their children to become knowledgeable and responsible citizens. It's important to introduce your child to the world's dilemmas while keeping the child's focus on the "work" of being a child: learning how to play and be curious; how to love and how to help others; and how to be respectful of themselves and other living things. Helping children develop qualities that will support them through a lifetime of difficulties may not sound like an "environmental" answer, but flexibility and resilience are part of environmental solutions. Try these ideas:

- Encourage curiosity about how plants, animals and people stay alive. Where does a plant or animal get its water? Where does it sleep at night? What happens if these conditions change?
- Talk about connections and what might happen if the connection is broken. Can a polar bear live in a warm place? Can it still catch food? What happens when the polar bear is no longer camouflaged by ice and snow?
- Help solve a problem. The percentage of carbon dioxide in the atmosphere appears to be increasing. One source is fuel combustion. Younger children can help set up a shopping list so the family can reduce the number of trips to the supermarket. Older children can be encouraged to think up questions, then read or talk with adults to learn about solutions. Where do the gases in the air come from? How much carbon dioxide do plants really need? What happens to people or plants if there is extra carbon dioxide?

Contact Us



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Control District**

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Ventura County Air Pollution Control Board

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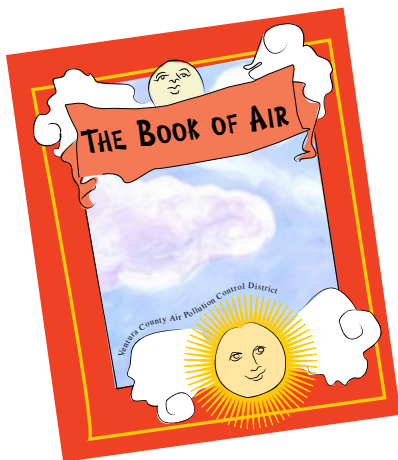
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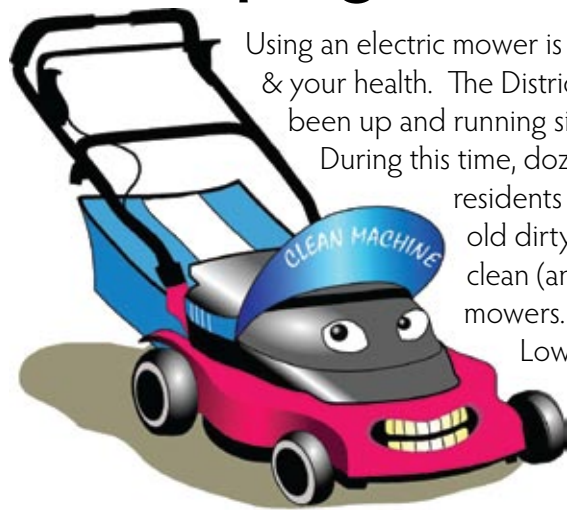
The Book of Air was the recipient of the 2006 1st Place Blue Pencil Award of Excellence for written communication from the National Association of Government Communicators.



The publication was written by Public Information Manager Barbara L. Page and designed by Elena Trevino Design of Ventura.

For a copy, call 645-1415.

Lawn mower trade-in program



Using an electric mower is good for our air & your health. The District's program has been up and running since October 2006.

During this time, dozens of county residents have traded their old dirty gas mowers for new clean (and quiet) electric mowers. Working with Lowe's in Simi Valley and Ventura, it's

possible to save up to 50 percent of the retail price of a new mower. We are now also offering a trade-in program for commercial leaf blowers. For information on either of these programs, visit our website, or contact Stan Cowen at 645-1408.

Remember to "clean cut" your lawn this summer.



Air

– the search for one clean breath

Walt Disney once said, “It’s kind of fun to do the impossible.” The District is finding that out as post-production begins on its IMAX-type film, *Air—the search for one clean breath*. The film, originally funded by a grant from the United States Environmental Protection Agency and produced by the Ventura County Air Pollution Control District, is scheduled for release this fall. And if all goes according to plan, this much-anticipated large format high definition film will present the biography of air to hundreds of thousands of viewers.



Filming geothermal power plant at Nesjavellir, Iceland

So why is a medium size air district doing such a huge project? According to public information manager Barbara L. Page, “We just wanted to present

air in a way that had never been done before! We wanted to tell the story of a misunderstood, brooding and ever-evolving character. And the IMAX screen can give breath to the story of how we breathe. So, the District wrote the grant and competed for the funding. To our great delight, we received the money and the project began. That was back in 2004, and we have been working on the film ever since.”

The film is an exciting blend of spectacular scenery, dynamic animated sequences, and historical re-creations. It will provide viewers with the story of air – its personality, lifestyle changes, and struggle for identity and endurance. It will also highlight what various countries, organizations, and just plain folks are doing to clean the air. And teachers nationwide can receive a DVD and an information guide to the film. Finally, it is the hope of the

producers that the film will inspire viewers with the message that they have the power to affect the air quality in their communities.

According to APCO Mike Villegas, “This film will be a valuable contribution to information on air quality nationwide. By telling the story of air, we are also telling of its importance as a natural resource to be valued and protected. As the beginning of the film states, we breathe about 20,000 times a day. With six billion people on this planet, that’s a lot of air. And all that air needs to be protected.”

Air – the search for one clean breath, featuring

- The BedZED zero carbon community of South London
- Iceland’s Professor Hydrogen
- A deserted steel mill in the Utah Valley
- Survivors of the Donora Smog Disaster
- 800,000 year old Antarctic ice cores
- Historical recreations of classic air pioneers
- An environmental justice grass roots center in East Los Angeles
- A Harvard air laboratory, up close and personal
- A surprise celebrity narrator & a cast of hundreds

Core values



Dr. Robert Mulvaney is an international ice core expert. At the British Antarctic Survey Core Program at Cambridge University, he investigates the relationship between the evolution of Antarctic ice and the changing global environment over hundreds of thousands of years.

“I am really an archeologist of air. But my artifacts are not the mummies or urns you can see in the British Museum. They are the gases trapped in bubbles in ancient ice cores. Without them, we would have never known the past weather and air conditions; they are the only record of past atmosphere we have.”

Drilling ice cores is a slow process. They go down 8 to 10 feet each time, eventually reaching 2 miles in the ice. And this is in frigid conditions at several locations in Antarctica. Then, the cores are shipped back to Cambridge for analysis. “When the melted ice releases bubbles, we can measure the gases,” says Mulvaney.

So what has he found trapped in the ice? “History for one thing. You can see nuclear weapons testing from the 60s, the 1986 Chernobyl disaster, and volcanic eruptions from centuries ago. If it happened in the air, it’s preserved for us in the ice.”

Mulvaney says the ice shows air pollution as relatively recent phenomena, but lead pollution during the times of the Romans is evident. “They used lead in wine vessels and it shows up.” But it’s not just history for history’s sake. There is frightening evidence in these ice cores that the atmosphere of this planet is changing drastically. We have proof here that air is significantly more polluted now than at any other time in our history. And greenhouse gases are going crazy. We have doubled carbon dioxide (CO₂) emissions in the past 20 years alone. This could mean impacts on agriculture in some areas. Sea level could also rise. This would have sweeping consequences. The natural level for CO₂ is 200 parts per million (ppm). Normal levels for us could be around 290

ppm. But today, measurements are showing 380ppm of CO₂. Recent greenhouse gas concentrations are way out of the natural realm. The last 250 years have gone wild.” You can visit the British Antarctic research program, at www.antarctica.ac.uk.

Ice cores from Antarctica show that throughout the last eight glacial cycles, climate and the chemical composition of the atmosphere have been tightly linked.

– British Antarctic Survey