Kidspace
at MASS MoCA

TEACHER CURRICULUM GUIDE
SPRING 2004

Featuring photographs by Carrie Baker and kinetic sculpture by
William R. Bergman, Pedro S. De Movellan, and Tim Prentice

Earth, Wind, and Desire: Wind Farm
March 4 – September 6, 2004

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INTRODUCTION

Earth, Wind, and Desire: Wind Farm

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EXHIBITION OVERVIEW

For the second part of the *Earth, Wind, and Desire* project, a sea of metallic, wood and feathered kinetic sculptures juxtaposed with large photos of wind turbines transforms the Kidspace gallery into an indoor "wind farm." The group exhibition features photographs by Carrie Baker, and kinetic sculptures by William R. Bergman, Pedro S. De Movellan, and Tim Prentice.

Carrie Baker of Montpelier, Vermont takes evocative photos of wind turbines from all over the country. Baker's photos of turbines set against cloudy skies and hilly landscapes are sometimes naturalistic, emphasizing the grace of the wind turbines. At other times they create the illusion that the turbines are looming creatures within strange, unknown worlds. *Wind Farm* features six colorful, large (18 x 24 inches and 4 x 6 feet) photographs of wind turbines found in Altamont, California.

William (Bill) R. Bergman of Albany, NY, has two pieces on view in *Wind Farm.* Both pieces involve the viewer in the mechanical process of creating wind through the use of hand cranks and other devices that help breath life into Bill's works. His works are multi-sensory; for example, a pleasant herbal scent is released from "Last Breath" and various creaking sounds can be heard as the sculpture's doors open and close.

Connecticut-based Tim Prentice is known for kinetic works of stainless steel and aluminum, as well as feathers and Lexin, a durable plastic resin. Though many of his pieces are made of human-made materials, much of his work recalls pollen, flower petals, and other natural materials floating in the wind.

Pedro S. De Movellan of East Chatham, New York, creates works in natural materials such as wood, as well as more industrial materials like rough-cast brass, aluminum, and stainless steel. When in motion his pieces recall the movement of the large wind turbines shown in Baker's photographs, bringing to light aesthetic parallels between turbines and kinetic sculpture.

Both Tim Prentice and Pedro S. De Movellan have created new works specifically for the Kidspace gallery. Tim's sculpture consists of a series of twenty-one identical light-weight metal wheels that use brightly colored feathers to create interconnecting gears. His piece hangs from the gallery ceiling and moves when air is emitted from the gallery's overhead vents. Pedro's wave-like sculpture covers the longest wall in the Kidspace gallery (50 feet) and is made of painted steel. Pedro has incorporated an electric air pump into his sculpture, which forces air to push the wave into a series of fragmented pieces.

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ABOUT THE ARTISTS

CARRIE BAKER

Artist Statement

As an artist, I am inspired by the interaction between people and nature; specifically, how we use nature to our own advantage. I use photography as a tool to isolate images in the world that I find especially telling. Photography is good for this purpose because it is at once very real and literal, but also planned and selective.

Through my photos of wind turbines, I strive to encourage viewers to look around and see how wind and the power we get from it affects them as well as how the turbines and other human-made objects affect nature. Wind turbines are evocative of this give and take relationship that exists between people and nature. They serve the needs of humanity by creating energy from wind; and their powerful physical presence impacts, perhaps even overwhelms, the landscape.

Biography

Montpelier, Vermont-based photographer Carrie Baker has a Bachelor of Fine Arts degree from Rhode Island School of Design (RISD). She has experience as

an artistic director for the Perlata Hacienda Historical Park in Oakland, California where she oversaw art and history programs for at-risk youth. Carrie also was a teaching assistant for RISD's photography and illustration courses for adults and high school students and an arts educator at RISD's art museum. Her work has been exhibited in alternative spaces in several group shows in the Bay Area.

WILLIAM R. BERGMAN

Artist Statement

Unforgettable moments that I have experienced are the visions that become my sculpture. These moments range from enlightenment to awe, from terror to sheer wonder.

"The Last Breath" is a culmination of years of thinking about the relationship between life and death. The struggle between these two realities is the subject of this piece. Momentum is built up as the flywheel rotates, which then carries the piece through its life cycle. The sculpture comes alive when air is quickly forced out of doors that are all too willing to close behind it. As air rushes out, so does the scent of thyme, a reminder of the smell of a cemetery lawn.

Biography

William R. Bergman, a sculptor from Albany, New York has a Master of Fine Arts degree in sculpture from Alfred University. He is a sculpture technician at the College of Saint Rose, Albany, New York. His work has been exhibited in group exhibition in such galleries as the Arts Center of the Capital Region, Troy, New York; Chesterwood, Stockbridge, Massachusetts; Tang Teaching Museum at Skidmore College, Saratoga Springs, New York; Albany International Airport Gallery, Albany, New York; University of Hawaii Art Department, Honolulu, Hawaii; and the Williams College Museum of Art, Williamstown, Massachusetts.

PEDRO S. DE MOVELLAN

Artist Statement

The size of the Kidspace gallery has allowed me to experiment with my creative process. "Levanter" is the largest piece I have made to date and like my other work it also uses air movement as a major part of its function. An electric air pump projects air onto this sculpture which causes its motion. This is a departure

from my previous work that has used air movement that already exists in nature or the display space. Color is brought into this new work to help emphasize its movement as well as the rest periods between movements.

Biography

Pedro S. De Movellan, a sculptor from East Chatham, N.Y., has a Bachelor of Fine Arts degree in sculpture from the University of Massachusetts at Amherst. His work is in private and corporate collections in the United States, as well as Switzerland, Germany, and Saudi Arabia. De Movellan's work has been exhibited in solo and group shows at the Herter Gallery, University of Massachusetts at Amherst, and the Grinnell College Art Gallery, Bucksbaum Center for the Arts. He is represented by the Maxwell Davidson Gallery, New York.

TIM PRENTICE

Artist Statement

In my current work, I am concentrating on movement rather than on the object. I take it as an article of faith that the air around us moves in ways that are organic, whimsical, and unpredictable. I therefore assume that if I were to hand over the design of the object to the wind, the work would take on these same qualities.

The engineer in me wants to minimize friction to make the air visible. The architect in me studies matters of scale and proportion. The sailor wants to test the strength and direction of the wind. The artist wants to understand its changing shape. Meanwhile, the child in me wants to play.

Biography

Tim Prentice, a sculptor from Cornwall, Connecticut, has a Master's degree in architecture from Yale University and co-founded the award-winning firm of Prentice and Chan in 1965. Ten years later, he established a studio in Cornwall Connecticut to design and fabricate kinetic sculpture. His corporate clients include American Express, Bank of America, Mobil, AT&T and Hewlett-Packard. In the last few years, he has completed installations in Japan, Korea, Northern Ireland, and Australia. His work has been exhibited in public venues such as the New York Public Library, New York.; Chesterwood, Stockbridge, Massachusetts; Jacob's Pillow, Lee, Massachusetts; Bradley Airport, Hartford, Connecticut; and

the Aldrich Museum, Ridgefield, Connecticut. He is represented by the Maxwell Davidson Gallery, New York.

WIND FARM PROGRAMS

TEACHER WORKSHOPS

We have found that by participating in teacher workshops, educators feel better prepared to incorporate the Kidspace curriculum into their busy schedules. There are three workshops planned for your school this spring, one of which will take place at Kidspace. At these workshops we will review how to make connections between art and other subject areas including science and English language arts. We will also try-out projects outlined in this curriculum. Please mark the workshop dates on your calendar (you can find the dates in Section 2 of this curriculum.)

KIDSPACE PROGRAMS

This curriculum provides you with classroom activities that you can do with your students before and after visits to Kidspace. It is broken down into two curriculums: one for Pre-K – 3rd grade and one for 4th – 8th grade. Activities can easily be adjusted to suit the needs and interests of your particular grade level. In certain cases, we offer different activities for the different grade levels.

Are You Already Doing Something Relating to Kidspace? We purposefully choose exhibition themes that easily relate to topics you are working on in school or that are included in the MA Learning Frameworks. This curriculum presents multi-disciplinary activities and a number of different approaches to studying wind. You might already have in your curriculum projects that can easily tie into themes addressed at Kidspace. For instance, are you planning a unit on poetry? Why not have your students write a descriptive poem about the wind? Or will you be doing do a study of technology? Why not do a historical examination of power sources, from candles and wood to oil, coal, and electricity? There are many other ways to connect Kidspace to your existing curriculum and we encourage you to plan this before the beginning of the Kidspace semester. We will have time to discuss this further at our workshop in March.

Each class will make two visits to Kidspace. During your first visit you will work with Kidspace staff, and during the second you will get to view the exhibition with one of the exhibiting artists. Students will explore the *Wind Farm*

exhibition and will create their own three-dimensional work of art during their first visit to the gallery. In addition, your class will have a short visit to the MASS MoCA galleries to view the Ann Hamilton installation "corpus," which, like the kinetic sculpture in Kidspace, involves movement. In MASS MoCA's largest gallery, "over five million sheets of onionskin paper drop gently from the rafters to the ground over the course of the installation. The rhythmic motion of paper falling creates a hypnotic environment, and the accumulation of paper over time is an evolving topography for the gallery visitor to walk through." (More time will be spent in the Ann Hamilton exhibition in fall 2004 during your Three-Museum Semester.)

The artist residency program has been expanded this year with Massachusetts Cultural Council funding. Each class will have two visits with a Kidspace artist. Students in grade Pre-K to 3 will work with sculptor Bill Bergman. Grades 4 to 8 will work with photographer Carrie Baker. The first visit will take place at Kidspace and students will have the opportunity to ask the artist questions about his/her work and to discover first-hand how the artist created the pieces on view. At Kidspace they will also begin an art project to be completed in a second visit with the artist that will take place in your classroom.

In addition to classroom and Kidspace activities, specialists in the sciences have been invited to extend programs in your school. Students in grades 4 to 8 will visit the Searsburg Wind Farm in Vermont in special tours arranged by the Center for Ecological Technology. Students will be able to see wind turbines in action and will discover why they were placed on Searsburg Mountain. (See Section Three in this curriculum for an overview on wind energy, as well as articles on the Searsburg Wind Farm and the Hoosac Wind Project planned for Florida, MA.) This curriculum provides you with activities to do before and after your visit to the wind turbines. Funding for buses to Searsburg is provided from the Howard Hughes Medical Institute grant to Williams College.

Please note: This trip will be held rain or shine! (unless torrential rain occurs, in which case we will call you to reschedule.) Please make sure to have your students wear appropriate outdoor clothing, and to bring notebooks and pencils with them so they will be able to take notes and sketch.

PROGRAM GOALS

- Contemporary art can be used to sharpen student visual literacy skills which can be applied in many subject areas, including art-, English language arts and science.
- Interactions with artists and their artwork help students to more fully understand the artistic problem-solving processes.
- Curriculum materials and teacher workshops can motivate classroom educators to make multiple curriculum connections to the subject of the natural environment, and in particular, the wind.

LEARNER OUTCOMES

Through multiple activities focusing on contemporary art and wind energy, students will:

- discuss their understanding of how an artist's selection of material influences meaning in works of art;
- recognize natural materials as viable sources for art works;
- express key points connecting the way artists, scientists, and writers use the wind in their work;
- describe their concerns and/or admiration for the natural environment;
- illustrate their interpretations of wind in sculpture and in written and oral stories.

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YOUR FEEEDBACK AND SHARING WITH OTHERS

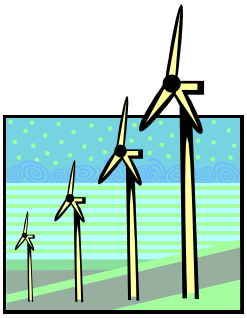
In June, we will have an evaluation workshop with all of the teachers in your school. We would like to know your thoughts on the curriculum and programs. We also ask that you share your comments on the exhibition. We will provide you with an evaluation form to complete at the workshop. Meanwhile, we would appreciate hearing your thoughts along the way. Drop us a note at lthompson@massmoca.org, or phone us at 413-664-4481 ext. 8131. **Your comments do make a difference.**

We hope that you will share your class projects with others in your school. Since each class in your school is involved with Kidspace, it would be interesting to see the different interpretations of the activities and the Kidspace experience. You might display your work throughout the school and meet with other classes to discuss the artists' work and Kidspace.

We would like to visit your school to document your students' work and to hear about the other projects that you develop on your own in conjunction with the *Wind Farm* exhibit. You may also send digital photographs, scanned work, or project ideas to the email address above.

We look forward to a successful collaboration!

Laura Thompson, Ed.D.	Barbara Robertson	Amanda Potter
Kidspace Assoc. Curator	Director	Kidspace Assistant



INTRODUCTION TO WIND ENERGY

WIND

From The Secondary Energy Infobook, The Need Project, Manassas, VA , 2002

What is Wind?

Wind is air in motion. It is caused by the uneven heating of the earth's surface by the sun. Since the earth's surface is made up of land, desert, water, and forest areas, the surface absorbs the sun's radiation differently.

During the day, air above the land heats quicker than air above water. The hot air over the land expands and rises, and the heavier, cooler air over a body of water rushes in to take its place, creating local winds. At night, the winds are reversed because air cools more rapidly over land than over water.

Similarly, the large atmospheric winds that circle the earth are created because land near the equator is heated more by the sun than land near the North and South Poles.

Today, people mainly use wind energy to produce electricity. Wind is called a renewable energy source because there will be wind as long as the sun shines.

History of Wind Energy

Through history people have harnessed the wind. Over 5,000 years ago, the ancient Egyptians used wind power to sail their ships on the Nile River.

Later, people built windmills to grind their grain. The earliest know windmills were in Persia (Iran). The early windmills looked like large paddle wheels.

Centuries later, the people in Holland improved the windmill. They gave it propeller-type blades made of fabric sails and made it so it could be turned to

face the wind. Windmills helped Holland become one of the world's most industrialized countries by the 17th century.

American colonists used windmills to grind wheat and corn, pump water, and cut wood.

Early in this century, people used small windmills to generate electricity in rural areas without electric service. When power lines began to transport electricity to rural areas in the 1930s, the electric windmills were used less and less.

Then, in the early 1970s, oil shortages created an environment more open to alternative energy sources, paving the way for the re-entry of the electric windmill to the American landscape to generate electricity.

Today's Wind Machines

Today's wind machines are very different from yesterday's windmill. Along with the changes in name have come changes in the use and technology of the windmill. While yesterday's machines were used primarily to convert the wind's kinetic energy into mechanical power to grind or pump, today's wind machines are used primarily to generate electricity.

Today's wind machines still use blades to collect the wind's kinetic energy, but the blades are made of fiberglass or other high-strength materials. Windmills work because they slow down the speed of the wind. The wind flows over the air-foil shaped blades causing lift, like the effect on airplane wings, causing them to turn. The blades are connected to a drive shaft that turns an electric generator to produce electricity.

Modern wind machines are still wrestling with the problem of what to do when the wind isn't blowing. Large turbines are connected to the utility power network—some other type of generator picks up the load when there is no wind. Small turbines are sometimes connected to diesel/electric generators or sometimes have a battery to store the extra energy they collect when the wind is blowing hard.

Wind Resources

Where is the best place to build a wind plant? There are many good sites for wind plants in the United States, including California, Alaska, Hawaii, the Great

Plains, and mountainous regions. Scientists say there is enough wind in 37 states to produce electricity. An average wind speed of 14 mph is needed to convert wind energy into electricity economically. The average wind speed in the U.S. is 10 mph. Because of the availability of consistent wind, some companies are considering installing wind machines offshore.

Scientists use an instrument called an anemometer to measure how fast the wind is blowing. An anemometer looks like a modern-style weather vane. It has three spokes with cups that spin on a revolving wheel when the wind blows. It is hooked up to a meter that tells the wind speed.

As a rule, wind speed increases with altitude and over open areas with no wind breaks. Good sites for wind plants are the tops of smooth, rounded hills, open plains or shorelines, and mountain gaps that produce wind funneling.

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ABOUT SEARSBURG WIND FARM

Wind Mountain: Perched on a ridge in the Green Mountains, these wind turbines generate power and attention, but little discontent
Cape Cod Times, May, 12, 2002
By JOHN LEANING, STAFF WRITER

SEARSBURG, Vt. - By the side of a dirt road halfway up a remote mountain, the headstones in the Crosier cemetery march in even rows over a grassy hilltop.

■An old cemetery lies at the base of the ridge near the Searsburg Wind Power Facility. The facility churns out enough power for 2,000 homes. (Staff photos by STEVE HEASLIP)

White marble headstones, with names and dates worn by the harsh northern climate, cast faint shadows in the weak spring sunshine, and the wind whispers through the still-bare tree branches in the surrounding hills.

Pure Vermont beauty. But with an interesting spin.

Beyond the cemetery, on top of the mountain, about 2,800 feet above sea level, are 11 giant windmills, each with three black blades turning slowly in the May breezes.

This is the Searsburg Wind Power Facility, owned by the Green Mountain Power Corp., a public, for-profit regulated utility in Vermont.

Completed in 1997, the $11 million facility was built with $4 million in grants from the federal Department of Energy and the Electric Power Research Institute, and the balance by Green Mountain Power.

With a capacity production of six megawatts, the Searsburg wind plant, located off Route 9 between Brattleboro and Bennington in southern Vermont, is one of the largest in the East, and provides electricity for approximately 2,000 Vermont homes each year.

■An unanticipated side effect of the Searsburg wind farm is its tourist draw. Officials of the southern Vermont town say they've had to build a parking lot for visitors.

The electricity goes into the grid that supplies power throughout New England, so locals don't directly benefit from the low-cost energy.

And although the turbines are incongruous with the pastoral Vermont setting, local residents asked about the wind farm, the unusual juxtaposition of modern technology with ancient mountains in a rural environment is old news.

"I work around here every day. They don't bother me," said Peter Janovsky, Searsburg's highway commissioner, during an interview last week. "There's no noise from them or nothing. And they're cheap. But we don't get any of the power."

It was the end of his lunch break. Tipping back in a chair in the town highway barn, one end of which doubles as the hamlet's town hall, with the smells of diesel and crankcase oil pervading the air, Janovsky said the windmills have proven to be a steady tourist attraction since they were built in 1997.

■Former Cape resident Barbara Bennert, on the deck of her Wilmington, Vermont home, can see the wind farm on a ridge about five miles away. She said the sight doesn't bother her. "I'm all for alternative energy," she said.

"I thought they were pretty interesting. They haven't bothered anybody," he said, noting that one Florida

resident who owned land on Route 8 below the wind farm worried that his property values would decline, so he sold out.

But a new house on Route 8, the dirt road leading to the substation and access road to the wind farm, was built looking right at the windmill, so at least for that homeowner, the view of these giant windmills turning gracefully on the hilltop was a plus, not a detraction.

One reason for the hilltop location is its remoteness, and relative distance from any homes. The nearest house is at least a half-mile away.

Before the wind farm, Janovsky said maybe 10 cars a day traveled Route 8 in the summer.

"Now there are 80 a day in the summer, I'll bet. They come from all over. That's why they built a parking lot there," he said.

■One of two turbine blades struck by lightning remains at the Searsburg wind plant and is a curiosity to visitors.

Told about the proposed 170 turbine wind farm for Nantucket Sound, with turbines more than twice the height of Searsburg's 198-foot-tall windmills, Janovsky chucked and said, "Well, you're a lot lower."

Told that some opponents of the Nantucket Sound wind farm worried it would hurt Cape Cod's tourist industry, the highway commissioner shook his head.

"It not gonna scare them any if they are anything like here," he said.

Last week, a bus tour of 35 Cape Codders arrived at the wind farm at for a tour organized by the Cape & Islands Self-Reliance Corp., which supports the Nantucket Sound project.

On top of the mountain, standing next two turbines that were shut down as a safety precaution during the tour, the group listened and watched as the other nine massive, towering machines whirled in the wind along a narrow dirt access road.

They made a swooshing sound as the blades turned 29 revolutions per minute, in the 20 mph breeze.

"I think these things are very promising," said Robert Bigalow, of Falmouth, a retired engineer in the energy field who is now Falmouth's representative to the Cape Light Compact.

"I went because I didn't know, and I wanted to see them. I thought they were absolutely beautiful. I thought I was at the ballet, to some degree," said Jane Coogan, of Mashpee. She supports the Nantucket Sound proposal, provided it passes the necessary environmental reviews.

She acknowledged the noise from the turbine blades was not something she would want to listen to 24 hours a day, but she also pointed out no one in Searsburg lived near enough to the turbines to hear anything. The same would be true out on the sound, she said.

Project yields information

The Searsburg project is the product of more than three decades of study by Green Mountain Power.

Yet the Searsburg facility is still a research facility, said Martha Staskus, who works with Vermont Environmental Research Associates, the consulting firm which planned and oversaw construction, and now manages the plant for Green Mountain Power.

The location presented unique challenges for the engineers. Just getting the large pieces of equipment up the mountain was a feat.

Because of the winter weather, the turbine's hydraulic systems had to be retrofitted with heaters after they froze up in the bitter cold.

To withstand the danger of ice buildup, the 66-foot-long rotor blades are made of black fiberglass. The black absorbs heat, even during the winter, enough to shed heavy sleeves of ice that would otherwise stop or even break the long, tapered blades.

Staskus said aside from weather problems, the plant has been in operation about 95 percent of the time when there is wind. Breezes need to be at least 10 mph for the turbines to start generating juice, but the wind dips below that speed only about 5 percent of the time.

Lightning strikes have proven problematic, however, with two different strikes since 1997 damaging turbine blades. The damaged blades are kept at the site, resting on wood blocks.

Satisfying state reviews

While it took 30 years to find the right site, it took another year or so to complete the environmental review and facility siting reviews required under Vermont law.

Issues such as wildlife habitat destruction, interference with wildlife movements, migratory, songbird and raptor concerns and visual impact dominated studies and meetings.

The site, on a 35-acre parcel, part of a 500-acre tract of private property, is surrounded by the Green Mountain National Forest.

The wind farm location is also in the middle of an area populated by black bears.

The bears are not endangered, but Vermont wildlife officials imposed strict limitations on human intrusion into the area, to minimize contact with the bears.

"Everything around here is a bear corridor," scoffed Janovsky, who has hunted deer and moose in the rugged countryside for 30 years.

Most game, he said, don't spend time on the ridge line, with or without the turbines. They go where the food is, several hundred feet lower.

And continuing studies show that the black bear comings and goings since the construction of the wind farm has increased.

Scientists speculate that may be due to clearing from the construction, which has allowed berry bushes to grow, providing a food source for bears.

Because of Vermont's stiff environmental laws protecting its scenic vistas, Green Mountain Power had to go through a tough review permitting process to get a "certificate of public good" to locate the wind farm on the ridgeline, with the turbines and blades rising about 160 feet above the tree line.

Green Mountain Power has a 99-year lease on the 35-acres, and pays taxes - $153,995 last year - on its utility equipment to Searsburg. The company also pays annual rent and a percentage of profits based on production to the landowner, who lives in New Hampshire. Green Mountain Power officials refused to divulge the amount of those payments to the landowner.

Support and reservations

In pre- and post-construction surveys of the project involving local year-round and seasonal residents, concerns about the visual aesthetic of the turbines were near the top of everyone's list.

Interestingly, in the post-construction survey, on a scale from one (very supportive) to five (very unsupportive) support for the project increased from about 2 to 1.5. And when asked if they would support doubling the number of turbines, the pre-construction response of 2.25 increased to about 1.8.

"I wish to hell they'd put up more, and cut out the nukes," Janovsky said.

Across the valley, on another ridge line, Barbara Bennert and her husband, Robert, live in a converted log cabin. Their view from the bedroom, kitchen and deck is straight at the turbines in the distance, about eight miles away.

"No, I have no reservations about the windmills. I'm of Dutch ancestry," said Barbara Bennert.

"I'm all for alternative energy, but I don't want to see it like California," she said, referring to massive wind farms, mostly in the desert or high mountain passes.

Bennert and her husband once lived in Harwich. Their son was a 1987 graduate of Harwich High School, and she remembers well the beaches on Nantucket Sound.

When told of the Nantucket Sound wind farm proposal, she said, "I'd probably have a lot of thoughts on that. I probably would not be in favor of it if there were that many, that close to Cape Cod. The Cape has enough problems as it is now," she said.

At Dot's Restaurant in Wilmington, the year-round hangout for locals, where blue plate specials fill you up for cheap, and the counter service is always friendly, waitress Shirley Sullivan perked her ears when she heard of the Nantucket Sound project.

"That sounds like a good idea," she said, adding that most people don't pay much attention anymore to the towers just down the road in Searsburg.

"Will there be a keeper of the windmills? That sounds like a good job to me," she said with a grin.

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ABOUT HOOSAC WIND PROJECT

Putting The Wind to Work: enXco Project Manager Describes Process Behind Hoosac Wind Project

Berkshire Eagle, Friday, February 06, 2004

By Bill Carey, Berkshire Eagle Staff

NORTH ADAMS -- There is more to creating a wind farm than the wind and a prayer, but the wind certainly is key.

"The economic viability of a potential wind project is most closely related to the wind speed at the site," explained Todd Presson, project manager of the planned, $40 million Hoosac Wind Project in the towns of Florida and Monroe.

While other factors were considered, it was the favorable wind environment of the Bakke Mountain and Crum Hill ridgelines in Florida and Monroe, respectively that led enXco Inc., the Palm Springs, Calif., wind-energy firm to settle on the Berkshires for the first of three wind farms the company is planning in New England.

With 20 turbines generating 30 mega-watts of electricity, Hoosac Wind will be the region's largest operational wind farm when it comes on line, possibly by the end of the year.

enXco is owned by SIIF Energies of France, a renewable energy company that is half-owned by the French electricity board EDF.

Among other factors that went into the local site selection, "we pursued private and town-owned lands because it was not clear whether state policy would accommodate wind power development on state-owned land," said Presson, who responded in writing and by telephone to a series of questions.

"We considered the site's proximity to existing transmission lines for interconnection to the utility grid," he said, and consulted with agencies that could identify whether rare species or priority habitat would be affected. "The combination of all of those factors led us to the site in Florida and Monroe."

Some two years after choosing the location, enXco has advanced to the sixth step of what it describes as a seven-step process to creating a wind farm. The firm has calculated the available wind with five temporary measurement towers, conducted environmental studies, developed a preliminary design and won

approval to use about 48 acres of public and privately owned land for the turbines, access roads and underground transmission lines.

In December, Gov. Mitt Romney signed legislation allowing Florida and Monroe to enter into long-term leases with enXco, expected to be 35 years in duration. That same month, the state's Executive Office of Environmental Affairs determined that the Hoosac Wind Project does not require an environmental impact report, which could have delayed the project by a year or more.

The last two steps are to secure the remaining, necessary permits and to build the wind farm.

As to the former, enXco has won approval of special permits needed from the Florida Select Board and Monroe Zoning Board of Appeals, but awaits the filing of those permits, Presson said. The project also still requires local building permits, a storm-water permit and an access permit from the state Highway Department.

Transportation of the turbines, which will be provided by GE Wind Energy of Tehachapi, Calif., is still to be determined. According to enXco, approximately eight tractor-trailers are needed to deliver each turbine, consisting of a 213-foot-high tower, the nacelle, or hub, and three rotor blades.

"We are still reviewing options, including rail and trucking, but have not yet selected the final route," Presson said. "A representative from GE Wind was on the site last week gathering data to help inform this decision, as they will likely be responsible for equipment delivery."

Its promise of clean, renewable energy notwithstanding, the Hoosac Wind Project is seen by some critics as blighting the landscape and causing untold damage to wildlife and the quality of life in the vicinity of the churning rotors. The project will have a high profile, with the 11 towers along Bakke Mountain clearly visible from downtown North Adams.

"Potential impacts to wildlife remain an important concern, as does the highly visible nature of wind turbines," the state's environmental secretary, Ellen Roy Herzfelder, wrote in her Dec. 26 determination excusing the project from an environmental impact report. She said it will be the "ongoing responsibility" of enXco to manage the project in a way that minimizes impacts, and to support its "fair share" of post-construction monitoring.

At the onset, enXco is trying to curb one visual impact -- the need to illuminate the turbine towers at night to warn off low-flying aircraft. Presson said the company has submitted applications to the Federal Aviation Administration and Massachusetts Aeronautics Commission with a proposed lighting configuration.

"Rather than lighting every turbine, we have proposed lighting seven of the 20 turbines," he said of the plan. "We expect to receive feedback on our application from FAA in the next several weeks, and a public comment period will follow."

Presson was asked to describe the noise produced by a working wind farm.

"The noise generated by multiple turbines is only slightly louder (about 3 decibels) than the noise generated by a single turbine," he said. "Standing 500 feet from the base of a 1.5-megawatt turbine (like those being used for the Hoosac Wind Project), the noise is about as loud as a typical clothes dryer. At 1,000 feet, noise levels are approximately 45 decibels -- roughly equivalent to the background noise level in a typical home, or a refrigerator at a distance of three feet."

The nearest residence to a turbine is about 1,800 feet away, and the maximum noise level there will be about 42 decibels under certain wind conditions, he said.

What is the payback to the host towns? Presson said the projected, total annual tax revenue from the project will be $300,000, to be divided by the number of turbines in each town, most of which lie in Florida. The towns also will share roughly $40,000 to $60,000 in annual royalty payments based on the amount of energy generated by turbines on town-owned property. Half of the turbines are on private property.

For its part, enXco already has won a $17 million commitment for the future purchase of energy from the Massachusetts Renewable Energy Trust.

Presson said the annual operating cost of the wind farm will be $400,000 to $500,000, including the salaries of two full-time operators. He initially offered a cost-per-kilowatt hour to describe the operating budget, but was reluctant to translate that directly into dollars because "it goes to the wind resource, just measuring the wind. Five measurement towers have been up for some time now."

Profitability, too, depends on the wind.

The operating surplus "is used to repay capital costs associated with constructing a modern wind plant, which are generally higher than 'traditional' power plants," Presson said. "The operating surplus in any given year is uncertain, of course, because the wind is variable, and returns to investors vary depending on financing structures."

The debt is expected to be repaid during the first 10 to 15 years, and a return on investment of 10 percent or better is typical over the life of the project, he said.

OVERVIEW

In the classroom and at Kidspace, students in Pre-K – 3rd grade will examine motion, particularly that caused by the wind. In the classroom they will examine images of movement found in nature and as illustrated in artwork. They will try making different motions themselves and will create anemometers to discover how to measure the movement of wind. At Kidspace, students will examine photography and kinetic sculpture to learn how artists use wind and air in their artwork. They will use the exhibition as inspiration for their own creations of windy sculptures—wind socks. And, back in the classroom, students will explore wind and movement in storybooks and poems, and will create two windy works of art.

An exciting addition to this semester's Kidspace program will be an additional trip to Kidspace with sculptor Bill Bergman as well as one session with him back in the classroom.

ACTIVITY SCHEDULE

Before Your Kidspace Visit: Introduction to Wind (March/April)

Moving Matters

1. Discussion/Movement: Introduction to Topic and to Kidspace Semester
2. Art: Preview Kidspace Exhibition
3. Science: Observing the Weather/Anemometers

During Kidspace Visit (March /April)

1. Guided Discussion
2. Art-Making Activity: Wind Sock

After Your Kidspace Visit: Windy Words and Devices (April/May)

Comes a Wind

1. Language Arts: Stories About the Wind
2. Language Arts: Poems (1^{st} – 3^{rd} grade)
3. Art: Collaging the Wind
4. Art/Science: Thaumatrope Motion Device

Artist Residency (May/June)

1. Preparing for Artist Residency

BEFORE YOUR KIDSPACE VISIT

Moving Matters

Pre-K – 3rd Grade

Objectives

- Through an introductory discussion of wind, students will discover that wind can be used as an energy source as well as the inspiration for artists and writers.
- By reviewing images that show the wind's effect on nature, art, and the built environment, students will be better prepared to talk about what they see during their field trips.
- By acting out motions, students will physically sense how things move in nature and through technology.
- For older students, by creating drawings about wind and motion, they will gain an understanding of how wind can be described by artists.
- In learning about wind turbines and by creating anemometers, students will connect scientific discoveries about wind to the art in *Wind Farm*.

1. Discussion: Introduction to Topic and to Kidspace Semester

To begin your Kidspace unit on wind and movement, ask your students to describe a windy day. Talk about what they might see and how things might move (i.e. a tree bends, papers fly around, the snow blows). For older students you might explain the scientific meaning of wind.

Have your students investigate how different objects move when the wind blows. First, drop a feather and have them describe the movement. Then have a student blow on the feather and see if the students' descriptions of its movement change. Repeat this activity using a ball, pencil or piece of chalk, sheet of paper, and a crumpled up piece of paper.

Explain to your students that this year's Kidspace program focuses on wind. Give your class an overview of the semester including classroom activities, two visits to Kidspace, and an artist residency with sculptor Bill Bergman.

2. Art: Preview Kidspace Exhibition

WHAT IS KINETIC: Now that your students are aware of wind and movement, talk about how artists use wind in their artwork. For older students, first, ask them to define the word *kinetic* and ask them if they can think of any examples of kinetic art. For younger students, move on to the "Describing Movement" activity.

KINETIC: of or relating to the motion of material

KINETIC ART: art (as sculpture or assemblage) having mechanical parts which can be set in motion

Examples of Kinetic Art and Objects:

- Mobiles (by Alexander Calder and George Rickey)
- Wind Chimes
- Pin Wheels
- Kites
- Wind Socks
- Wind Mills and Wind Turbines

DESCRIBING MOVEMENT AND SIZE: Explain that when they are visiting Kidspace, your students are going to see three artists' kinetic sculptures that rely on air and wind to make them move. They will also view photographs of wind turbines, another mechanism that utilizes wind. Show them either the overhead transparencies or CD with images of wind-related artwork, natural elements, and technology. (CD and overhead transparencies can be found in your school's main office.)

IMAGE LIST

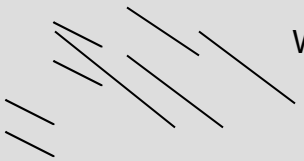
- Ocean wave
- Birds flying
- Tree bending to the wind
- Wind mills (Dutch and American)
- Vincent van Gogh, Dutch. *The Windmill at Montmartre*, also known as *Le Moulin de la Galette*, 1886, Oil on canvas, Newark (NJ), Private Collection
- Jacob van Ruisdael, Dutch. *The Windmill at Wijk bij Duurstede* c. 1670, Oil on canvas, Rijksmuseum, Amsterdam
- Katsushika Hokusai, Japanese. *Kanagawa-oki namimura* ("The Great Wave at Kamagawa"), from the series of *Fugaku sanju-rokkei* ("Thirty-six Views of Mt. Fuji"), 1823-29, Woodprint, The Metropolitan Museum of Art, New York City.
- Tim Prentice's *Turkey Feathers*. Stainless steel wire, turkey feathers. 2004.
- Carrie Baker's *Guards.* Photograph of Altamont Pass, CA wind turbines, 2002.

For each image, ask your students to **act out** the movement made by the object in it. For instance, when viewing a windmill, your students might rotate their arms to pretend to be the rotor blades. Also ask them to imagine the size of the object and to act out what they think it sounds like. Students can also imagine what it would be like if the object came to life. What would the object say to them? What would they do with the object? How would it feel to walk along side the object?

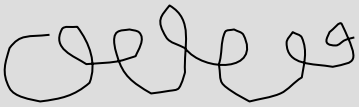
(Note: many wind turbines are up to 300 feet tall with the diameter of one rotor blade reaching more than 200 feet! So if one blade was placed inside Kidspace, it would take up more than half of the gallery floor.)

DRAWING MOVEMENT (1st – 3rd grade): After viewing the artwork, ask your students to draw lines on their paper that illustrate the movements they just acted out.

Examples:



Windy



Loopy

Ask your students to then use all of the descriptive lines they drew to create one abstract drawing in colored pencil and marker. Tell your students that thinness/thickness of lines as well as colors will add to their descriptive wind drawings.

3. Science: Introduction to Wind Turbines

INTRODUCTION: To begin this discussion, remind your students of Carrie Baker's photographs of wind turbines. Ask them to discuss how they think the wind turbines might work and how they might look in real life. There are many resources available to help you introduce wind power and wind turbines to your students.

CD-ROM: In your school main office, you will find "Windpower", a CD-ROM with information about wind power including a short history of wind energy sources such as windmills and wind turbines (by the Danish Wind Industry Association – windpower.org). It also has incredible graphics showing the inner-workings of wind turbines. Though made in Denmark (a leading country in the current wind power movement), the information is relevant in an investigation of American wind turbines. Have your students work in groups to study wind energy using the CD-ROM and follow-up with a group discussion. Or for younger students, turn off the sound and show them parts of the wind turbine video. Discuss the turbines' size and location.

WEB SITE: Another option is to visit the website of ZILKHA, one of America's largest wind turbine manufacturers at **www.zilkha.com.** They have a site for educators with a succinct overview of wind energy. It also has additional activities you might choose to complete with your students.

ARTICLES AND BOOKS: A third option is to review the section in this curriculum on how wind turbines work. You can also have your students conduct research in their library for books and articles on wind energy or read some of the recommended books in this curriculum (see RESOURCES).

CREATE ANEMOMETERS: Following your research into wind power, ask your students to create an anemometer—a simple device to measure the force or speed of wind. These instruments measure wind patterns at different sites for over a year before wind turbines are installed. This is to ensure that there is adequate wind to be generated into electricity by the turbines. Anemometers are also mounted onto turbines to constantly check the wind speed and to send signals to a computer that adjusts the pitch of the blades.

Kinetic artists are also concerned with wind speed and direction, as their pieces often rely on the wind to make them move. For example, when planning his piece for Kidspace, Tim Prentice walked through the gallery with his hand close to the airshaft. He was determining at what points the air was released, how far the air spread, and how much air pressure existed. As a result, he chose to use feathers in his artwork, a material which does not require a significant amount of air pressure to move. He also chose to locate his piece on the ceiling, the location where most of the "wind" exists.

Have your students use their anemometers to measure wind speed over a two-week period. Chart daily measurements and note any significant changes. (For an example, see the chart at end of this section.)

How to make an Anemometer:

See directions from the Southeast Regional Climate Center at the end of this section.

DURING YOUR KIDSPACE VISIT
Pre-K – 3rd Grade

A series of questions will be used to help guide the students in their exploration of the exhibition *Wind Farm*. They will be asked to respond to these questions using the artwork as a source of both information and inspiration. Each question builds upon another so that students can create stories about wind based on the artwork. For instance, they might be asked the following questions when standing in front of one work of art:

- What do you think is going on in this sculpture/photo?
- How would you imagine this sculpture works?
- Could you imagine this sculpture, or photo of a wind turbine, coming to life? What would happen?
- Have you ever seen something similar to this piece in real life?
- How do you think the artist made this? Why do you think he/she chose to use these materials?
- What are the different parts of this sculpture?
- How does this piece relate to the last piece we looked at?

These guided discussions serve two purposes: to build students' visual literacy skills and to increase their knowledge of the various ways in which artists represent the wind and use wind in their artwork. Visual literacy skills include thinking critically about what one sees, forming opinions and interpretations about artwork, and expressing in words these observations and opinions.

Following the guided discussions, students will have the opportunity to reflect on the artists' art-making processes. We will talk about what the artists needed to do in order to create their works of art. Then students will create their own moving work of art-- a wind sock.

At the conclusion of this first visit to Kidspace, students will have a quick visit to MASS MoCA's largest gallery to view Ann Hamilton's "corpus." This piece ties in nicely to the *Wind Farm* exhibition as it, too, is kinetic. Sheets of onionskin paper drop from the ceiling and gracefully glide down to the floor. They will spend more time in the exhibition in the fall during the Three-Museum Semester.

AFTER YOUR KIDSPACE VISIT

Comes A Wind
Pre-K – 3rd Grade

Objectives

- Students will further explore wind and movement in storybooks and poems to understand how writers handle the topic of wind.
- Through creating their own poems, older students will understand how to use words to creatively describe their world.
- Through creating windy collages and thaumatrope motion devices, students will further see that there are many artistic techniques and materials that can be used to show motion and wind.

1. Language Arts: Stories About Wind

Continue your study of movement and wind by looking at how writers have approached this topic. There are some terrific picture books that you can read aloud to your younger students, or have your older students read. In the back of this curriculum you will find book recommendations. Or use a book that you have in the classroom or that you are planning to read as part of your language arts activities. While reading the book, stop periodically to discuss how the author's interests are similar to those of the artists in Kidspace. Also, if using a picture book, show the students how the illustrator portrays wind. Discuss materials used by the illustrator, and figure out if the drawings go along well with the text.

A favorite book of Kidspace staff that is appropriate for Pre-K – 3rd grade students is *Comes a Wind* by Linda Arms White. This book has wonderful illustrations and a fun story told by two brothers who compete in telling the tallest tale of a windy day.

2. Language Arts: Poems About Wind (1st – 3rd grade)

As a follow-up to your study on windy writers, ask your students to write their own windy poetry. First, read a windy poem aloud. A good resource is *Make Things Fly: Poems About the Wind* edited by Dorothy M. Kennedy (Margaret K. McElderry Books, 1999). On the next page is a poem by A.A. Milne that is included in the book.

Wind on the Hill

By A.A. Milne

No one can tell me,
Nobody knows,
Where the wind comes from,
Where the wind goes.

It's flying from somewhere
As fast as it can,
I couldn't keep up with it,
Not if I ran.

But if I stopped holding
The string of my kite,
It would blow with the wind
For a day and a night.

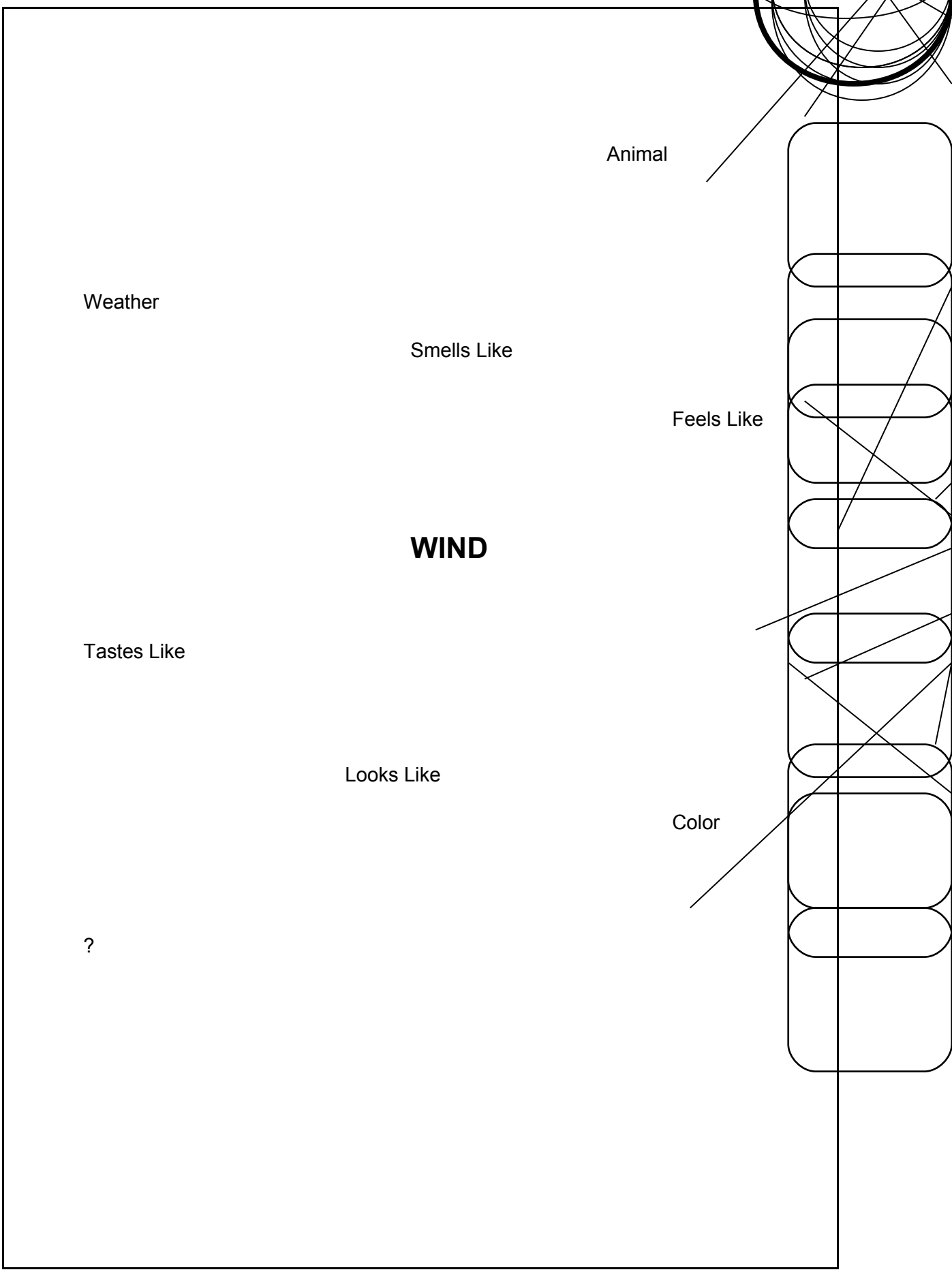
And then when I found it,
Wherever it blew,
I should know that the wind
Had been going there too.

So then I could tell them
Where the wind goes. . .
But where the wind comes from
Nobody knows.

Now have your students brainstorm words about wind using the chart on the next page. They should fill in at least five circles with nouns and adjectives to describe wind. For instance, for "animals", they might put a "seagull" since birds enjoy flying in the wind. Or for "tastes like", they might put "salt" if they have been to the beach on a windy day. Their words need only make sense to themselves! Once they have completed the chart, have them use at least six of their words in a poem about wind.

Or you can focus your poetry exploration on a particular type, such as in the style of the one above. Explain that this is a quatrain poem—lines 2 and 4 must rhyme. Lines 1 and 3 may or may not rhyme. Rhyming lines should have the same number of syllables. After your students come up with words using the

chart below, have them figure out rhyming words, and then put the words together to form a quatrain poem.


Animal
Weather
Smells Like
Feels Like
WIND
Tastes Like
Looks Like
Color
?

3. Art: Collaging the Wind

Materials

- White paper (8 x 11)
- 3 or 4 pieces of colored construction paper
- Glue

The following activity can be done after your visit to Kidspace or before your artist residency with sculptor Bill Bergman. Give each student a piece of white paper and 3 or 4 smaller pieces of colored construction paper and glue. Tell them that the objective of this activity is to represent a windy day using only torn paper (no scissors, please). Have them first discuss different things that happen on a windy day and describe what it might look like (i.e., trees bending over, waves crashing, paper rolling around). Next, have them tear paper into shapes and scrunch them into different textures. Glue the paper to the larger piece of white paper to create a paper collage of a windy day.

4. Art/Science: Thaumatrope Motion Device

(Taken from www.cmp.ucr.edu and www.osv.org/kids/crafts7.htm)

The history of animation and movie making begins with a simple device called the thaumatrope. This optical toy was in wide circulation by 1826 and it may have been known much earlier than that. The thaumatrope is the most basic of motion toys. It consists of a disc that is attached to two pieces of string. When twirled, the images on the sides of the disc are perceived together as a single image.

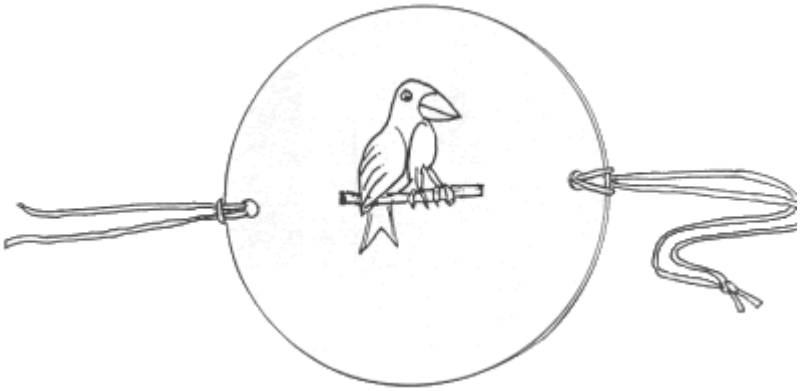
Like all animation devices, the thaumatrope works on the principle of persistence of vision. (The eye's ability to retain an image for a fraction of a second after the object is gone). In this case, the eye continues to see the two images on either side of the thaumatrope for a split second after each has appeared. As the thaumatrope spins, the series of quick flashes is perceived as one continuous image.

Materials

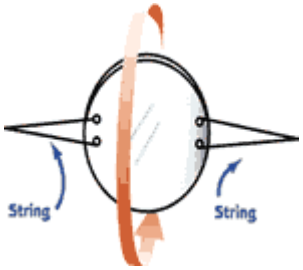
- Heavy stock paper or cardboard
- Heavy string or yarn
- Scissors
- Paper hole punch
- Crayons or markers

Begin by having your students cut a 10" circle or rectangle from the paper (for younger kids, you might do this for them ahead of time.) On one side of the paper, ask them to draw a lighting bolt and to outline it with a dark color such as black. On the other side, they should draw and color a sky. After they have finished drawing,

they should lightly draw a guideline through the center of the circle on one side. Punch a hole in the cardboard about 1/4-inch in from both sides on the line. (This is where you'll attach the strings.)



Next, tie the ends of about two feet of string together in a knot. Thread the other end through the hole in one side of your thaumatrope and loop it back through' itself. Do the same thing with more string on the other side.



To make it work, hold the strings about three or four inches from the cardboard and twist them between your fingers to cause the disc to spin. Look at the disc. When the speed is right and the spinning is steady the lightening bolt will be superimposed onto the sky.

THE PARALLEL WINDS
4th – 8th Grade Activities

OVERVIEW

In the classroom and at Kidspace, 4th – 8th grade students will examine many facets of the wind: wind as an energy source, as an inspiration for artists and as the subject of writers. Students will research wind turbines as a renewable energy source, one that has been and will probably be increasingly utilized in the Berkshire region. Students will use their discoveries about the science of wind power in their own art and writing activities. They will examine photography and kinetic sculpture to learn how artists use wind and air movement in their artwork. And as a final project, students will explore wind as a metaphor found in common phrases and songs.

Two exciting aspects of this semester's Kidspace program will be a visit to the Searsburg Wind Farm in Searsburg, Vermont, with the Center for Ecological Technologies, where students will get a first-hand look at how wind turbines work. Also, students will have an additional trip to Kidspace with photographer Carrie Baker as well as increased time with her back in the classrooms.

ACTIVITY SCHEDULE

Before Your Kidspace Visit: Introduction to Wind (March/April)

Which Way the Wind Blows

4. Discussion: Introduction to Topic and to Kidspace Semester
5. Art: Preview Kidspace Exhibition
6. Science: Introduction to Wind Turbines / Preparing for Searsburg

During Kidspace Visit (March /April)

3. Guided Discussion
4. Art-Making Activity: Mobiles

After Your Kidspace Visit: Metaphors (April/May)

The Answer Is Blowin' In the Wind

5. Music/Language Arts: Blowin' In the Wind (6^{th} – 8^{th} grade)

6. Language Arts: Growing Up Is Like a Windy Day Poetry (6^{th} – 8^{th} grade)
7. Language Arts: Windy Poetry (4^{th} – 5^{th} grade)
8. Language Arts: Searsburg Post-Visit/Editorials

Artist Residency (May/June)

2. Preparing for Artist Residency

BEFORE YOUR KIDSPACE VISIT

Which Way the Wind Blows
4^{th} – 8^{th} Grade

Objectives

- Through an introductory discussion on wind, students will discover that wind can be used as an energy source as well as the inspiration for artists and writers.
- By reviewing images that show the wind's effect on nature, art, and the built environment, students will be better prepared to talk about what they see during their field trips.
- By creating drawings about wind and motion, students will gain an understanding of how wind can be described by artists.
- In learning about wind turbines and by creating anemometers, students will connect scientific discoveries about wind to art and will be prepared for their visit to the Searsburg Wind Farm.

1. Discussion: Introduction to Topic and to Kidspace Semester

To begin your Kidspace unit, ask your students to define wind in as many ways as possible (see segment from dictionary below). Make sure to talk about both its

WIND: Moving air, especially a natural and perceptible movement of air parallel to or along the ground. **b.** A movement of air generated artificially, as by bellows or a fan. **2a.** The direction from which a movement of air comes: *The wind is north-northwest.* **b.** A movement of air coming from one of the four cardinal points of the compass: *the four winds.* **3.** Moving air carrying sound, an odor, or a scent. **4a.** Breath, especially normal or adequate breathing; respiration: *had the wind knocked out of them.* **b.** Gas produced in the stomach or intestines during digestion; flatulence. **5.** *Music* **a.** The brass and woodwinds sections of a band or orchestra. Often used in the plural. **b.** Wind instruments or their players considered as a group. Often used in the plural. **c.** Woodwinds. Often used in the plural. **6a.** Something that disrupts or destroys: *the winds of war.* **b.** A tendency; a trend: *the winds of change.* **7.** Information, especially of something concealed; intimation: *Trouble will ensue if wind of this scandal gets out.* **8a.** Speech or writing empty of meaning; verbiage: *His remarks on the subject are nothing but wind.* **b.** Vain self-importance; pomposity: *an expert who was full of wind even before becoming famous.*

The American Heritage® Dictionary of the English Language: Fourth Edition. 2000

literal/scientific definitions, as well as its poetic/metaphoric usages. (Define metaphors, if you haven't covered this yet. A metaphor is "a figure of speech in which a word or phrase literally denoting one kind of object or idea is used in place of another to suggest a likeness or analogy between them as in *drowning in money*".) Explain to your students that this year's Kidspace program focuses on wind. Give your class an overview of the semester including classroom activities, two visits to Kidspace, an artist residency with Carrie Baker, and a visit to the Searsburg Wind Farm.

2. Art: Preview Kidspace Exhibition

WHAT IS KINETIC: Now that your students are aware of wind and the different ways in which the word can be defined, talk about how artists use wind in their artwork. First, ask your students to define the word *kinetic* and ask them if they can think of any examples of kinetic art.

KINETIC: of or relating to the motion of material bodies

KINETIC ART: art (as sculpture or assemblage) having mechanical parts which can be set in motion

Examples of Kinetic Art and Objects:

- Mobiles (by Alexander Calder and George Rickey)
- Wind Chimes
- Pin Wheels
- Kites
- Wind Socks
- Wind Mills and Wind Turbines

DESCRIBING MOVEMENT AND SIZE: Explain that when they are visiting Kidspace, your students are going to see three artists' kinetic sculptures that rely on air and wind to make them move. They will also view photographs of wind turbines, another mechanism that utilizes wind. Show them either the overhead transparencies or CD with images of wind-related artwork, natural elements, and technology. (CD and overhead transparencies can be found in your school's main office).

Ask your students to come up with four or five words that describe the motion in each image. (Create a list of these words either on the blackboard or on paper.) Have them consider how these objects might move and what role their make-up (size, texture, weight) plays in the way they move. Also, ask your students to

imagine the size of the sculptures and photographs in Kidspace, as well as how big the actual wind turbines might be in real life (Note: many wind turbines are up to 300 feet tall with the diameter of one rotor blade reaching more than 200 feet!) You might compare the turbines' height to other tall built structures to further emphasize their scale.

IMAGE LIST

- Ocean wave
- Birds flying
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- Wind mills (Dutch and American)
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- Tim Prentice's *Turkey Feathers*. Stainless steel wire, turkey feathers. 2004.
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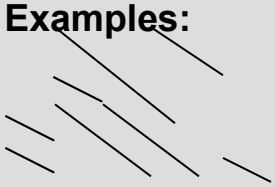
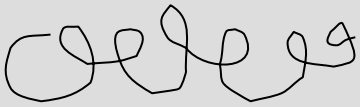
DRAWING MOVEMENT: After viewing the artwork, ask your students to draw lines on their paper that illustrate each word.

Examples:



Windy



Loopy

Ask your students to then use all of the descriptive lines they drew to create one abstract drawing in colored pencil and/or marker. Tell your students that

thinness/thickness of lines as well as colors can add to their descriptive wind drawings.

3. Science: Introduction to Wind Turbines

INTRODUCTION: To begin this discussion, remind your students of Carrie Baker's photographs of wind turbines. Ask them to discuss how they think the wind turbines might work. (Let your students know that they will have the opportunity to visit the Searsburg Wind Farm in Searsburg, Vermont to see first-hand how the turbines move and sound, and how they fit into their environment.) There are many resources available to help you introduce wind power and wind turbines to your students.

CD-ROM: In your school main office, you will find "Windpower", a CD-ROM with information about wind power including a short history of wind energy sources such as windmills and wind turbines (by the Danish Wind Industry Association – windpower.org). It also has incredible graphics showing the inner-workings of wind turbines. Though made in Denmark (a leading country in the current wind power movement), the information is relevant in an investigation of American wind turbines. Have your students work in groups to study wind energy using the CD-ROM and follow-up with a group discussion.

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Kinetic artists are also concerned with wind speed and direction, as their pieces often rely on the wind to make them move. For example, when planning his piece for Kidspace, Tim Prentice walked through the gallery with his hand close to the airshaft. He was determining at what points the air was released, how far the air spread, and how much air pressure existed. As a result, he chose to use feathers in his artwork, a material which does not require a significant amount of air pressure to move. He also chose to locate his piece on the ceiling, the location where most of the "wind" exists.

Have your students use their anemometers to measure wind speed over a two-week period. Chart daily measurements and note any significant changes. (For an example, see chart at the end of this section.)

How to make an Anemometer:

See directions from the Southeast Regional Climate Center at the end of this section.

PREPARING FOR YOUR VISIT TO SEARSBURG: Before your students visit the Searsburg Wind Farm, work together to create a list of the things they anticipate seeing and discovering during their trip. Use the list below (provided by the Center for Ecological Technology) to further your discussion.

1. Wind: Look for signs of wind in the environment/surroundings...for example, branches all growing on one side of the tree, indicating the direction of the prevailing winds.
2. Turbine blades: Observe carefully the three different movements of the wind turbines' blades...rotation, pitch and yaw (you may need to ask the tour guide what these terms mean)
3. Measurement equipment: Look on top of the wind turbines for instruments measuring wind speed and direction...and look inside the turbines to see the control panel.
4. Revegetation: Look for signs that trees are growing in places where they had once been cleared.
5. Aesthetics: Notice the size of the turbines, and how much space is between them. Also listen for the sounds of the wind and other sounds in the environment (birds, cars, people).

6. Emotive: Consider feelings that arise about the placement and look of the wind turbines. Think about their appeal as sculptural objects in the environment as well as innovative forms of technology.

Ask your students to bring their lists with them to Searsburg, along with notebooks in which to write or sketch.

DURING YOUR KIDSPACE VISIT
4th – 8th Grade

A series of questions will be used to help guide the students in their exploration of the exhibition *Wind Farm*. They will be asked to respond to these questions using the artwork as a source of both information and inspiration. Each question builds upon another so that students can create stories about wind based on the artwork. For instance, they might be asked the following questions when standing in front of one work of art:

- What do you think is going on in this sculpture/photo?
- How would you imagine this sculpture works?
- Could you imagine this sculpture or photo of a wind turbine coming to life? What would happen?
- Have you ever seen something similar to this piece in real life?
- How do you think the artist made this? Why do you think he/she chose to use these materials?
- What are the different parts of this sculpture?
- How does this piece relate to the last piece we looked at?

These guided discussions serve two purposes: to build students' visual literacy skills and to increase their knowledge of the various ways in which artists represent the wind and use wind in their artwork. Visual literacy skills include thinking critically about what one sees, forming opinions and interpretations about artwork, and expressing in words these observations and opinions.

Following the guided discussions, students will have the opportunity to reflect on the artists' art-making processes. We will talk about what the artists needed to do in order to create their works of art. Then students will create their own moving work of art.

At the conclusion of this first visit to Kidspace, students will have a quick visit to MASS MoCA's largest gallery to view Ann Hamilton's "corpus." This piece ties in nicely to the *Wind Farm* exhibition as it, too, is kinetic. Sheets of onionskin drop from the ceiling and gracefully glide down to the floor. They will spend more time in the exhibition in the fall during the Three-Museum Semester.

AFTER YOUR KIDSPACE VISIT

The Answer is Blowin' In The Wind

4th – 8th Grade

Objectives

- Students will further explore wind metaphors found in common phrases and in music to better understand how they are included in many creative works.
- Through creating their own metaphoric poems, students will understand how to use words to creatively describe their world.
- Students will understand how to effectively present an argument in a letter.

Introduction

Remind students about what they saw at Kidspace. Ask them to discuss what they learned about wind and about the Kidspace artists' approach to the subject. Ask if anyone can define "metaphors" and if anything they saw at Kidspace was a metaphor for something else (for instance, William Bergman's "Last Breath" uses wind to symbolically represent life leaving one's body at death).

1. Music/Language Arts: Blowin' In the Wind (6th – 8th grade)

Artists, poets, writers, and philosophers throughout time have used wind as a metaphor. Review the following phrases with your students and determine the meaning of wind in each.

- We'll be in trouble if wind of this scandal gets out.
- Three sheets to the wind.
- An ill wind is upon us.
- She had the wind knocked out of her.
- Run like the wind.
- His remarks on the subject are nothing but wind.
- If the wind doesn't blow, the grass doesn't stir (Chinese proverb)
- The strongest wind cannot stagger a spirit; it is a spirit's breath. (Henry David Thoreau).
- You never know which way the wind will blow.
- Throw caution to the wind.
- That remark took the wind out of his sails.

Next, listen to "Blowin' In the Wind" by Bob Dylan (A CD copy is in your school main office). Make photocopies of the words on the next page in this curriculum so your students can read along while they listen to the song. Ask your students to discuss the meaning of the song and the reasons why Dylan might have chosen to use wind as a metaphor for the world around us. (This song is about lessons people have yet to learn although they keep repeating the same mistakes. Dylan wrote this song in response to the Vietnam War.) Talk about how the tone of the music adds to the mood Dylan is creating with his lyrics.

Blowin’ In the Wind by Bob Dylan 1967

How many roads must a man walk down, before they call him a man
How many seas must a white dove sail, before she sleeps in the sand
How many times must the cannonballs fly, before they are forever banned
The answer, my friend, is blowing in the wind
The answer is blowing in the wind

How many years must a mountain exist, before it is washed to the sea
How many years can some people exist, before they're allowed to be free
How many times can a man turn his head, and pretend that he just doesn't see
The answer, my friend, is blowing in the wind
The answer is blowing in the wind

How many times must a man look up, before he can see the sky
How many years must one man have, before he can hear people cry
How many deaths will it take till he knows, that too many people have died
The answer, my friend, is blowing in the wind
The answer is blowing in the wind

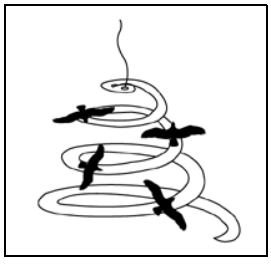
2. Language Arts: Growing Up is Like a Windy Day (6th – 8th grade)

For the following activity ask your students to demonstrate that growing up is like a windy day. First make two columns on a piece of paper. On the left side, list the characteristics and events of "growing up." After writing ten examples, fill in the right column with words that describe windy days.

GROWING UP	WINDY DAY
1. Brothers	Flying garbage
2. Homework	Whirling paper
3.	
4.	
5.	
6.	
7.	
8.	
9	

Write a metaphoric line of poetry replacing the growing up characteristics with the windy day descriptions. For example: "My flying garbage came racing through the house looking for my mother." Or, "I told my teachers that my whirling paper eaten by my dog."

Working in small groups of three or four, have your students put their lines together to form a short poem. Ask them to write their poem on a 12" spiral that they will cut out from oak tag or other stiff paper you have on hand. Add images to the edges of the spiral. Tie a string to the top and watch the words twirl away!



3. LANGUAGE ARTS: WINDY POETRY (4th – 5th grade)

As a follow-up to your study on wind, ask your students to write their own windy poetry. First, read a windy poem aloud. A good resource is *Make Things Fly: Poems About the Wind* edited by Dorothy M. Kennedy (Margaret K. McElderry Books, 1999). Below is a poem found in the book by A.A. Milne.

Wind on the Hill by A.A. Milne

No one can tell me,
Nobody knows,
Where the wind comes from,
Where the wind goes.

It's flying from somewhere
As fast as it can,
I couldn't keep up with it,
Not if I ran.

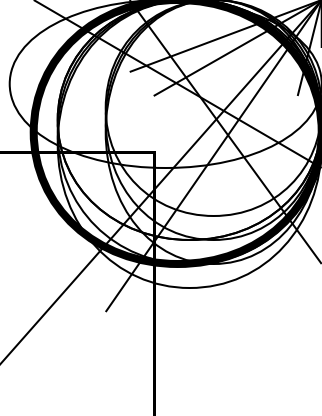
But if I stopped holding
The string of my kite,
It would blow with the wind
For a day and a night.

And then when I found it.
Wherever it blew,
I should know that the wind
Had been going there too.

So then I could tell them
Where the wind goes. . .
But where the wind comes from
Nobody knows.

Now have your students brainstorm words about wind using the chart below. They should fill in at least five circles with nouns and adjectives to describe wind. For instance, for "animals", they might put a "seagull" since birds enjoy flying in the wind. Or for "tastes like", they might put "salt" if they have been to the beach on a windy day. Their words need only make sense to themselves! Once they have completed the chart, have them use at least six of their words in a poem about wind.

Or you can focus your poetry exploration on a particular type, such as in the style of the one above. Explain that this is a quatrain poem—lines 2 and 4 must rhyme. Lines 1 and 3 may or may not rhyme. Rhyming lines should have the same number of syllables. After your students come up with words using the chart below, have them figure out rhyming words, and then put the words together to form a quatrain poem.



Animal

Weather

Smells Like

Feels Like

WIND

Tastes Like

Looks Like

Color

?

4. SEARSBURG FOLLOW-UP (4th – 8th grade)

EDITORIALS: When a new technology is presented to the public, there is always a bit of controversy. Certainly this is true in the case of wind turbines. Some people do not want these large mechanisms near their homes or distracting their views of nature. Other people are supportive of the wind turbines and view them as not only good for the environment but also as beautiful sculptures that enhance the landscape.

Whether you are "for" or "against" wind energy technologies, this is a good opportunity to discuss how to present an effective argument. Review some letters to the editor and newspaper editorials about the Hoosic Wind Project for Florida, MA, written by adults and students from the local area. Have your students discuss which arguments are compelling and why.

Now that your students have had first-hand experience viewing wind turbines and studying them in the classroom and at Kidspace, ask them to write their own letters to the editor. Have them make-up creative headlines, similar to the following ones from the articles found at the end of this section: "Wind Power Is So Much Hot Air," "Caution to the Wind," "Blowing in the Wind," and "Students Weigh In on Florida Windmills." You can put their letters together in a school newspaper format.

WIND FARM RESOURCES

BOOKS

Alexander Calder by Jacob Baal-Teshuva. Taschen, 1998. A non-fiction book with great pictures of Calder's mobiles.

Catch the Wind by Landt Dennis. Four Winds Press, 1976.
Nice photos of windmills and discussion on wind power.

Comes a Wind by Linda Arms White. Dorling Kindersley Publishing, Inc., 2000.
Storybook about two boys who compete in telling one windy tale after another.

Gilberto and the Wind by Marie Hall Ets. Puffin Books, 1963. Storybook about a young boy on a windy day.

Katje The Windmill Cat by Gretchen Woelfle. Candlewick Press, 2001. Storybook about a cat who is forced to live in a windmill.

Make Things Fly: Poems About the Wind edited by Dorothy Kennedy. Margaret K. McElderry Books, 1998. Poems by Stevenson, Sandburg, Milne, and more.

The Wind Blew by Pat Hutchins. Aladdin Paperbacks, 1974. Storybook about a windy day.

The Wind's Garden by Bethany Roberts. Henry Hot and Co., 2001. Storybook about a girl's garden compared to one designed by nature.

When the Wind Bears Go Dancing by Phoebe Stone. Little, Brown and Co, 1997. Storybook about a child who cavorts in the stormy night with the Wind Bears.

Wind: Causes and Effects by Philip Steele. Franklin Watts, 1991. Non-fiction book for children on wind.

Wind and People by Nikki Bundey. Carolrhoda Books, Inc., 2001. A non-fiction book about wind in science and culture.

Wind Energy by Graham Rickard. Gareth Stevens Children's Books, 1990. Non-fiction book for children on wind power.

Wind Power by Mike Cross. Gloucester Press. Non-fiction book for children on wind power.

Wind Power by Norman F. Smith. Coward, McCann & Geoghegan, Inc., 1981. Non-fiction book with fun illustrations describing why the wind blows and hot it can be harnessed through windmills.

WEB SITES

Center for Ecological Technology, Pittsfield, MA
http://cetonline.org

Hoosac Wind Power News
http://www.hoosacwind.com/qa.html

Berlin Wind Project

http://www.berlinwind.org

U.S. Department of Energy – Energy Efficiency and Renewable Energy
http://www.eere.energy.gov/RE/wind.html

National Energy Education Development Project (NEED)
What is Wind for primary and secondary schools
http://www.need.org/needpdf/WINDPrimary.pdf
http://www.need.org/needpdf/WINDSecondary.pdf

Alexander Calder Foundation
http://www.calder.org/

Curriculum on wind by teachers in Maine
http://www.umeedu.maine.edu:16080/coehd/wind/

Wind Power (Danish Organization)
http://www.windpower.org/

California Energy Commission (website on wind power)
http://www.energyquest.ca.gov/story/chapter16.html

Zilkha Renewable Energy (nice overview and activities for students)
http://www.zilkha.com/forteacherskidsconsumers.asp

WIND FARM LEARNING STANDARDS

Pre-K –2

Earth Science 2. Understand that air is a mixture of gases that is all around us and that wind is moving air

Earth Science 3. Describe the weather changes from day to day and over the seasons (how windy is it, which direction wind is blowing)

Physical Science 3: Describe the various ways that objects can move, such as in a straight line, zigzag, back-and-forth, fast, and slow.

Physical Science 4: Demonstrate that the way to change the motion of an object is to apply a force (observe objects as the move and make predictions as to what direction they will move and how far).

Technology 2.1: Identify tools and simple machines used for a specific purpose.

Observation, work with simple measuring devices

Grades 3 – 5

Earth Science 6: Explain how air temperature, moisture, wind speed and direction, and precipitation make up the weather in a particular place and time. (Use instruments to measure such as thermometer, barometer, rain gauge, wind gauge, hygrometer, and anemometer.)

Earth Science 8: Describe how global patterns such as the jet stream and water currents influence local weather in measurable terms such as temperature, wind direction and speed, and precipitation.

Physical Sciences 4: Identify the basic forms of energy and recognize that energy is the ability to cause motion or create change.

Physical Sciences 5: Give examples of how energy can be transferred from one form to another.

Technology 1.1: Identify materials used to accomplish a design task based on a specific property.

Technology 2.1: Identify a problem that reflects the need for shelter, storage, or convenience.

Technology 2.4: Compare natural systems with mechanical systems that are designed to serve similar purposes, e.g. a bird's wings as compared to an airplane's wings.

Identify basic forms of energy (light, sound, heat, electrical, magnetic)

Grades 6 – 8

Earth Science 4: Explain the relationship among the energy provided by the sun, the global patterns of atmospheric movement, and the temperature differences among water, land, and atmosphere. (Note the relationship between global wind patterns and ocean current patterns.

Physical Science 11: Explain and give examples of how the motion of an object can be described by its position, direction of motion, and speed.

Physical Science 13: Differentiate between potential and kinetic energy.

Technology 1.1: Given a design task, identify appropriate materials based on specific properties and characteristics (E.g., weight, strength, hardness, flexibility).

Technology 2.1: Identify and explain the steps of the engineering design process, i.e. identify the need or problem, research the problem, develop possible solutions, select the best possible solutions, construct a prototype, test and evaluate, communicate the solution(s), and redesign.

Discuss wind as an energy force and compare to other natural energies.

Differentiate between potential and kinetic energy

WIND FARM THEMES AND EXTENSIONS

SUGGESTED THEMES

- Invention / Technology
- Wind, Air
- Natural Elements
- Weather
- Global wind patterns
- Energies
- Movement (as art form and as found in nature)
- Materials
- Photography
- Sculpture
- Habitats

EXTENSIONS

≈ Use "Wind" as a metaphor in a short story or write poem about wind
≈ Create pinwheels and mobiles
≈ Research the history of wind as an energy source—Egyptian boats, Persian and Dutch windmills
≈ Design a weather vane and an anemometer
≈ Define wind energy and its relationship to other energy sources (scientific, cultural)
≈ Investigate how artists used wind in their work or as inspiration for their work (sculptors, photographers, poets, writers, dancers, musicians)
≈ Research how we use wind today as a form of technology and how it compares to other energy sources
≈ Research current issues in wind energy project proposed for the local community
≈ Read myths that use wind as symbolic device
≈ Create bottle tornados, kites, wind musical instruments, and wind chimes
≈ Research other environmentally friendly technologies
≈ Explore motion and create flip books
≈ Draw a landscape and determine where to place wind turbines
≈ Investigate a weather map in your local newspaper

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