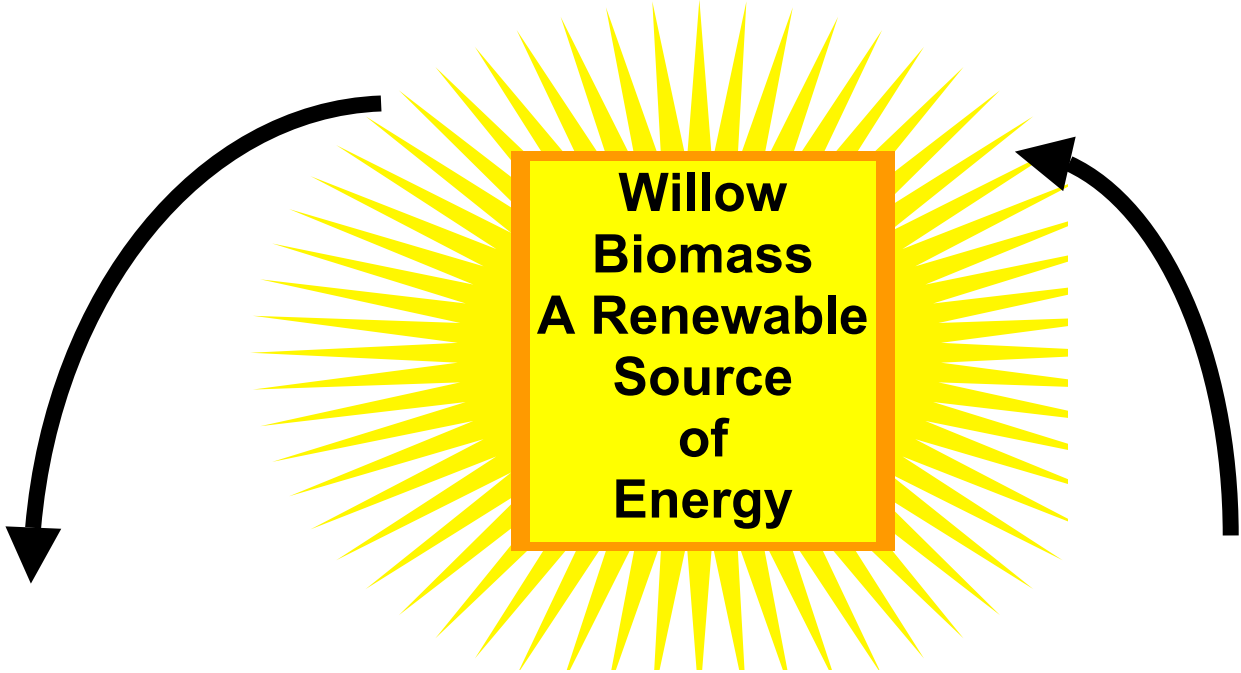


A Mini-Curriculum designed to meet New York State
Math Science and Technology Standards:
Emphasis is placed on the
Physical Setting Earth Science Core document.



Stored Solar Energy

+

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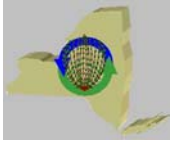
By: Nancy L.Volk



Introduction

Written and designed by Nancy

Acknowledgments



The following is a list of individuals who were instrumental in the completion of This document.

State University of New York College of Environmental Science and Forestry

Dr. Lawrence Abrahamson
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ESF in the High School Participants
Jason Mathers
(Union Of Concerned Scientists)
Terrika Lopez

Biographical Sketch Willow Biomass Modules Outline

Venn Diagram Lessons
Ultraviolet vs. Infrared Venn diagram

Global Warming Concepts
Greenhouse Effect
Synthesis of Learning

Terrarium Lab

The Benefits of Willow Biomass As an Alternative Energy Source

CO₂ Closure Lab

Density Lab
(3 Labs)

Climate Change
Climate Change in My City
(3 Activities)

Slideshow: ESF Tully Willow Project

Bibliography

Notes

Nancy Roberts Volk was born in Central New York. She received her educational training from Colgate University and State University of New York College at Oswego. She has fifteen years of classroom experience teaching math and science in New York State and West Africa.

Her experience with curriculum development includes the following: "Fossil Findings" a middle elementary curriculum designed for an energy center/ Regents Earth Science alternative testing program (students completed projects and made poster presentations)/ " People Connections" a



workshop created to support development workers in their communities/ a broad spiral science curricula for an elementary school,/ facilitating the development of a Native American Language program (preschool through adult)/ a Peace Theology curricula to be taught in Nigeria/ workplace training courses in pneumatics and hydraulics/ and the current set of modules on "Willow Biomass: An alternative energy source". Most of the curricula work was completed in a collaborative approach with many participants providing their expertise. Many minds make a more complete and comprehensive outcome.

Over the past four years, Nancy and her husband Tim, have been enjoying parenthood and learning more about the developmental stages of young children. These experiences have certainly added to their already high regard for classroom teachers, childcare providers, and other professionals who work with our children. It certainly does take a community to raise our leaders of tomorrow. "I selfishly want to be part of their tomorrow and so I am committed to being involved in our children's lives today. " ☆



Willow Biomass Modules Outline



Earth's Energy
Solar Source

Non-Renewable

Oil

natural gas

coal

Renewable

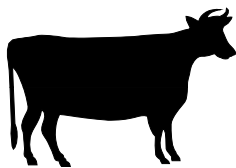
Hydro

Wind

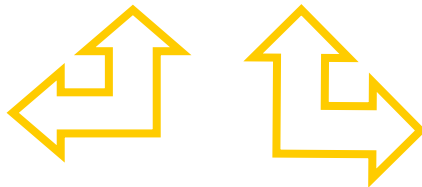
Geothermal

Bioenergy

Bioenergy or
Biomass



Animal wastes



Plant Sources



Biomass Plant Sources



Biopower

Feedstock sources

Woody crops

Willow, Poplar

Herbaceous crops

Switch grass

Agricultural residues

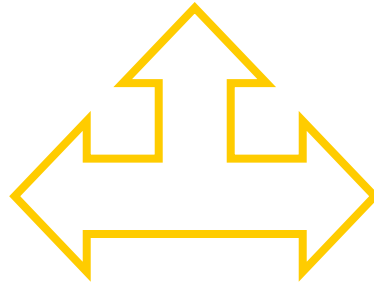
Corn Stover, rice straw,

wheat straw, or used vegetable oils

Wood waste

Sawdust, tree pruning,

paper trash, yard clippings



Biofuel

Bioethanol

Biodiesel

Biomethanol

Pyrolysis Oils

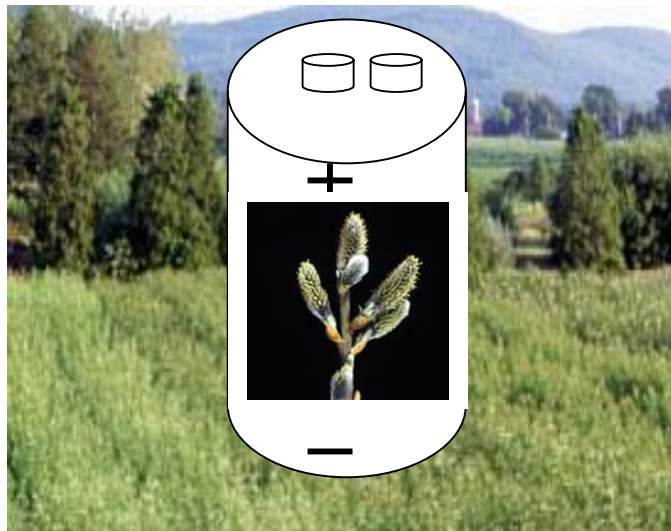
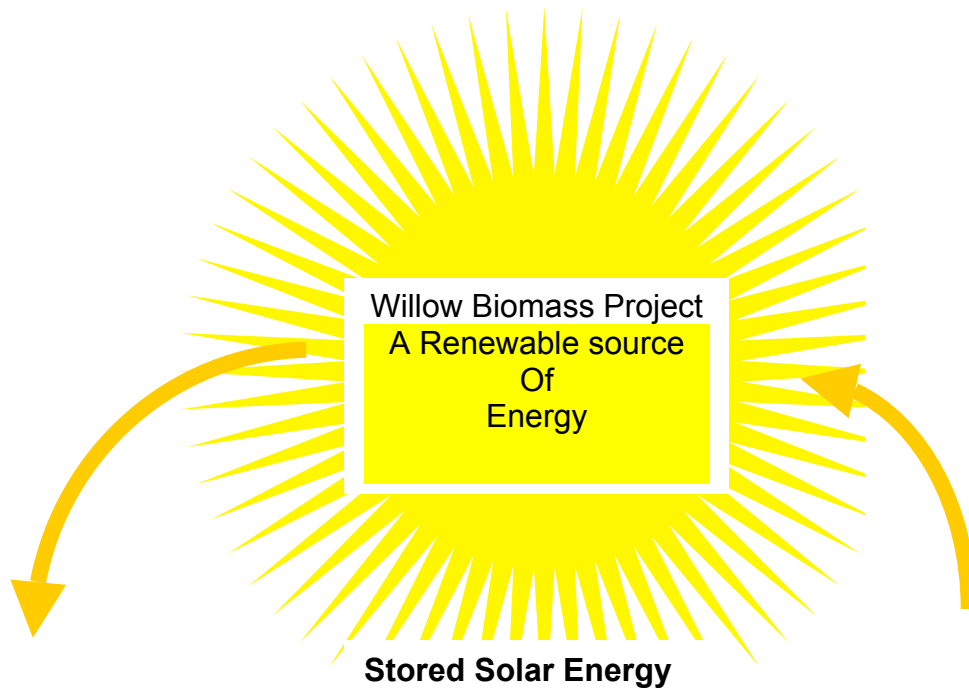
Biopower

Conversion Technique

Electric

Heat

Electric and Heat



General Information

Venn Diagram
Global Warming
Terrarium Lab

Willow Biomass Project

Slideshow
An Alternative Energy Source

Density

Labs
(3)

**Climate
Index**

Activities

Appendix I
Mapping the Willow Biomass Modules
to the New York State Learning Standards for Mathematics,
Science and Technology
Earth Science Core Curriculum

Standards	Venn Diagram	Greenhouse Effect Global Warming	Renewable Energy Sources	Terrarium lab Model for the Greenhouse Effect	Closed Loop Cycle
Standard 1 Analysis, Inquiry, and Design	*	*	*	*	*
Mathematical Analysis			*		*
Key Idea 1			*		*
Key Idea 2	*	*	*	*	*
Key Idea 3			*	*	*
Scientific Inquiry	*	*	*	*	*
Key Idea 1	*				*
Key Idea 2				*	*
Key Idea 3		*		*	*
Engineering Design	*	*	*	*	*
Standard 2 Information Systems		*	*		*
Key Idea 1		*	*		*
Key Idea 2					
Key Idea 3		*	*		
Standard 3 Mathematics	*	*		*	*
Key Idea 1	*	*		*	*
Key Idea 2					*
Key Idea 3					*
Key Idea 4					*
Key Idea 5				*	*
Key Idea 6				*	
Key Idea 7					*
Standard 4	Earth Science Core Area				
Key Idea 1		1.1 1.2e 1.2h	1.1 1.2e 1.2h		1.2e 1.2h
Key Idea 2	2.1a 2.1r	2.1a 2.1c, 2.1e 2.1h 2.1i 2.1r 2.2a 2.2b, 2.2c 2.2d	2.1a 2.1c, 2.1e, 2.1h, 2.1i, 2.1r 2.2a 2.2b, 2.2c, 2.2d	2.1e 2.1h 2.2a 2.2b	2.1e 2.1i 2.2a

Standards	Venn Diagram	Greenhouse Effect Global Warming	Renewable Energy Sources	Terrarium lab Model for the Greenhouse Effect	Closed Loop Cycle
Key Idea 3					
Standard 5 Technology	*	*	*		
Key Idea 1	*	*			
Key Idea 2					
Key Idea 3			*		
Key Idea 4					
Key Idea 5			*		
Key Idea 6					
Key Idea 7					
Standard 6 Interconnectedness: Common themes	*	*	*	*	*
Key Idea 1	*	*	*	*	*
Key Idea 2		*	*	*	*
Key Idea 3					
Key Idea 4		*	*	*	*
Key Idea 5			*	*	
Key Idea 6					
Standard 7 Interdisciplinary Problem Solving	*	*			*
Key Idea 1		*			*
Key Idea 2	*	*			*
Skills and Strategies for Interdisciplinary Problem Solving	*	*	*	*	*
Working Effectively	*	*	*	*	*
Gathering and Processing Information	*	*	*	*	
Generating and Analyzing Ideas	*	*	*		*
Common Themes	*		*		*
Realizing Ideas	*	*	*		*
Presenting Results	*			*	*

Appendix IB
Mapping the Willow Biomass Modules
To the New York State Learning Standards for Mathematics,
Science and Technology
Earth Science Core Curriculum

Standards	Density Labs	Synthesis of major Concepts	Climate Change In My City Activity 1,2, & 3	Extended Activity Climate Change In My City
Standard 1 Analysis, inquiry, and Design	*		*	*
Mathematical Analysis	*		*	*
Key Idea 1	*			
Key Idea 2	*		*	*
Key Idea 3	*		*	*
Scientific Inquiry	*		*	*
Key Idea 1			*	*
Key Idea 2	*		*	*
Key Idea 3	*		*	*
Engineering Design		*		
Standard 2 Information Systems			*	*
Key Idea 1			*	*
Key Idea 2			*	*
Key Idea 3				*
Standard 3 Mathematics	*		*	*
Key Idea 1	*		*	*
Key Idea 2	*			
Key Idea 3	*			
Key Idea 4				*
Key Idea 5	*		*	*
Key Idea 6				*
Key Idea 7	*			*
Standard 4	Earth Science Core Area			
Key Idea 1		1.1 1.2e 1.2h	1.2g	1.2g
Key Idea 2		2.1a 2.1c, 2.1e 2.1h 2.1i 2.1r 2.2a 2.2b 2.2c 2.2d	2.1a 2.1c 2.1d 2.1g 2.1i 2.1y 2.2a 2.2b 2.2c 2.2d	2.1a 2.1c 2.1d 2.1g 2.1i 2.1y 2.2a 2.2b 2.2c 2.2d
Key Idea 3				

Standards	Density Labs	Synthesis of major Concepts	Climate Change In My City Activity 1,2, & 3 Revised: contact Jason Mathers www.climatehotmap.org	Climate Change: Extended Activity
Standard 5 Technology		*	*	*
Key Idea 1				
Key Idea 2				
Key Idea 3			*	*
Key Idea 4				
Key Idea 5				
Key Idea 6				
Key Idea 7		*		*
Standard 6 Interconnectedness: Common themes	*		*	*
Key Idea 1				
Key Idea 2	*		*	*
Key Idea 3	*			
Key Idea 4	*		*	*
Key Idea 5	*		*	*
Key Idea 6				
Standard 7 Interdisciplinary Problem Solving	*	*	*	*
Key Idea 1		*		
Key Idea 2	*	*	*	*
Skills and Strategies for Interdisciplinary Problem Solving	*	*	*	*
Working Effectively	*	*	*	*
Gathering and Processing Information	*	*	*	*
Generating and Analyzing Ideas	*	*	*	*
Common Themes		*		
Realizing Ideas		*		*
Presenting Results	*	*	*	*

Bibliography

Abrahamson L. P., D.J. Robison, T.A. Volk, E.H. White, E.F. Neuhauser, W.H. Benjamin and J.M. Peterson. Sustainability and environmental issues associated with willow bioenergy development in New York (U.S.A.). *Biomass and Bioenergy* 15(1):17-22

Abrahamson L.P., T.A. Volk, R.F. Kopp, E.H. White, and J.L. Ballard. 2002. *Willow Biomass Producer's Handbook*. State University of New York College of Environmental Science and Forestry, Syracuse, NY. Available at <http://www.esf.edu/willow>. (Verified April 12, 2002).

Alter, Lisa. Yale-New Haven Teachers Institute. Global Warming-Background Information. Available from <http://www.cis.yale.edu/ynhti/curriculum/units/1993/5/93.05.02.x.html>. (Verified April 12, 2002).

American Bioenergy Association. Global Warming. Biomass: Clean Energy For America's Future: General Fact Sheet.. Available at www.biomass.org/fact_sheet_1.htm. (Verified April 12, 2002).

Anonamous 1991. TAPPI Press, Fibrous Materials and Pulp Testing T1-T270. TAPPI Test Methods 1991: Volume one pg.2-4.

British BioGen. Bioenergy 21st century fuel: power from the land. Available at <http://www.britishbiogen.co.uk>. (Verified April 12, 2002).

British BioGen, Friends of the Earth, ESSU, and Environmental Resolve Short Rotation Coppice for Energy Production. Available at www.britishbiogen.co.uk/gpg/srcpgg/srcpggfront.htm. (Verified April 12, 2002).

Calendar Creator Plus gold Edition for Windows Softkey, "C" 1995 SoftKey International Inc. One Athenaeum Street Cambridge, MA 02142 USAyt.

Dickson, R.E., K.F. Lewin, J.G. Isebrands, M.D. Coleman, W.E. Heilman, D.E. Riemenschneider, J. Sober, G.E. Host, D.R. Zak, G.R. Hendrey, K.S. Pregitzer, D.F. Karnosky. 1992. Forest Atmosphere Carbon Transfer and Storage (FACTS-II) The Aspen Free-air CO₂ and O₃ Enrichment (FACE) Project: An Overview, United States Department Of Agriculture. General Technical Report NC-214 8pp.

Davies, T. 2000. An Introduction to Global Warming. *EPA Journal* 16: 2-3.

Epstein, P.R. 2000. Is Global Warming Harmful To Health? *Scientific American*. P.1- 2 available at <http://www.sciam.com/2000/0800issue/0800epstein.html> (verified April 18, 2002).

Environmental Protection Agency. Global Warming. Available at <http://www.epa.gov/globalwarming>. (Verified April 12, 2002).

Fleming, J.R. 1998. *Historical Perspectives on Climate Change*, Oxford University Press, Oxford, 194 ppavailable at earthobservatory.nasa.gov/giants/Arrhenius.)

Heinrichs, J.F., L.E. Lassen. 1970. Improved technique for determining the volume of irregularly shaped wood blocks. *Forest Production Journal* 20(4): 24.

International Energy Agency. 1998. *Benign Energy? The Environmental Implications of Renewables*. Available at <http://www.iea.org/pubs/studies/files/benign/index.htm>. (Verified April 2, 2002)

Klass, D.L. *An Introduction To Biomass Energy A Renewable Resource*. Biomass Energy Research Association. Entech International, Inc. Barrington, Illinois 60010-2422, USA. Available at <http://www.bera1.org/about.html>. (Verified April 12, 2002).

Mann, M., and P. Spath. 2000. A summary of Life Cycle Assessment Studies Conducted On Biomass, Coal, and Natural Gas Systems. National Renewable Energy Laboratory (NREL). Midwest Research Institute (MRI) Golden, Co. 6pp.

Mathers, J. 2000. Climate Change In My City. Pg 4-8. Union Of Concerned Scientists. Available at www.ucsusa.org. (Verified March 12, 2002).

National Renewable Energy Laboratory. Biomass: Nature's Renewable Storehouse of Solar Energy and Chemical Resources. Available at http://www.nrel.gov/research/industrial_tech/biomass.html. (Verified April 18, 2002).

Panettone, L. What Is Biomass? Why Use biomass as an energy source? Available at <http://starfire.ne.uiuc.edu/~ne201/1996/panetton/index.html>. (Verified April 12, 2002).

The Scottish Agricultural College. Energy From Willow. Available at www.sac.ac.uk/envsci/External/WillowPower.htm. (Verified April 12, 2002).

Smith, D.M. 1954. Maximum Moisture Content Method For Determining Specific Gravity of Small Wood samples. Analysis and Testing. United States Department of Agriculture Forest Service Forest Products Laboratory Madison, Wisconsin.

Spath, P. and M. Mann. Life Cycle Assessment of a Biomass Gasification Combined-Cycle System. December 1997. National Renewable Energy Laboratory (NREL). Midwest Research Institute (MRI) U.S. Government Contract No. DE-AC36-83CH10093. ppp 2-3.

Stamm, A.J. 1929. Density of Wood Substance, Absorption By Wood, And Permeability of Wood. Journal of Physical Chem. Vol. 33, pp. 398-414.

UCAR Office for Interdisciplinary Earth Studies. (1991, Fall). "EarthQuest" author. Excellent reference on the stratospheric ozone problem.

Union of Concerned Scientists: Citizens and Scientists for Environmental Solutions. Global Warming: Early Warning Signs (set of 10 articles) Available at www.ucsusa.org or www.climatehotmap.org. (verified April 12, 2002).

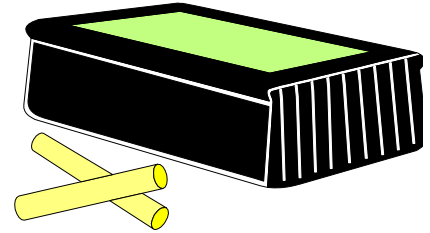
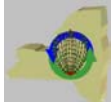
The United States Department of Energy National Biofuels Program. What are Biofuels? Available at http://www.ott.doe.gov/biofuels/what_are.html. (Verified April 18, 2002).

The University of the State of New York: Revised March 1996. The State Education Department. Learning Standards For Mathematics, Science, and Technology.

The University of the State of New York: The State Education Department. Physical Setting/Earth Science Core Curriculum. 2001. Available at <http://www.nysed.gov>. (Verified April 12, 2002).

Volk, T.A., L.P. Abrahamson, E.H. White, R.F. Kopp and C.A. Nowak. 1999. Producing short-rotation willow crops in the Northeastern United States. Proceedings of the Second Short-Rotation Woody Crops Operations Working Group Conference. Portland, OR, August 24-28, 1998. p. 7-16.

Williams D.R. Planet Fact Sheet. Available from <http://nssdc.gsfc.nasa.gov/planetary/planetfact.html> (Verified April 18, 2002).



Teacher Information

Lesson Title: Climate Change

Lesson Description: The students will learn how to use the climate database on the Internet. This database has climate information from all over the world. The lesson guides students through comparisons of climate conditions for one area over the course of several years. It also encourages students to investigate other locations around the world and compare the climate changes to their own area. The lesson provides support materials for the instructor to teach the necessary skills to the students ahead of time so that they can be successful once they are using the climate database.

Learning Outcomes:

The students will be able to:

- Explain the climate data base graphs
- Explain how the climate database works
- Locate two different places in the world and compare their climates for the same time periods
- Compare and contrast graphs for several different locations
- Explain what has been occurring within the climate index for their city over the last few years

Materials:

Lab worksheets
Overheads for the instructors use
3 different colored overhead markers

Activity 3:

LCD projector and computer connected to the Internet
Screen
Or
Computer lab for all the students (internet access)

Method: Follow the directions provided on the lab sheets

Time Requirements:

45 minutes per activity

MST standards: See the overview chart

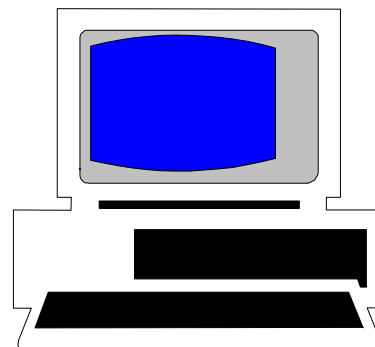
Assessment: Every student will complete activity sheets and submit them for the instructor's assessment



Climate Change Student Activity #1

Name _____ Date _____
 Partner(s) _____

Introduction: In this activity you will be using your own knowledge of weather patterns, your classmate's knowledge and a climate index found on the Internet to help analyze climate change in _____.
 (Location)



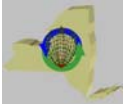
Pre Internet discussion:

1) What stands out in your mind regarding the weather for your location last year? (Ex. A colder than normal winter, a dryer than usual spring, etc.)

2) In the chart below, list your thoughts about the year. Record in "your thoughts" column, cooler, warmer, normal or unsure, according to your ideas.

Season (State-By-State)	Your Thoughts	Classes Thoughts	Actual, Factual Occurrence Using the climate index
Winter			
Spring			
Summer			
Fall			

2B) Choose a person to record the classes' results for each of the seasons above. Everyone should record these findings on their own worksheets.

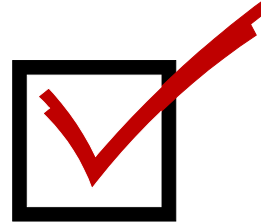


3) Make some observations regarding the results of the two columns. (Did everyone think the same way?)

Student Activity #2

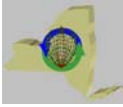
Data Collection:

Directions: You will be using the Internet to acquire the data regarding average temperatures for different seasons for your State and Country. Make sure you have an access or user number (check with your instructor) before you begin.



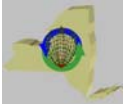
Directions:

- _____ 1) type in the website <http://lwf.ncdc.noaa.gov/oa/climate/climateresources.html> on the address bar and type in enter. You are now in the “Climate Index”. This is a system that collects data regarding the weather from locations all over the world and keeps the data on file. It also calculates the average temperatures, according to the years listed. Take some time to explore the climate index.
- _____ 2) Click on the link for “Climate of 2001”. Scrolling through this page you will find links to monthly or seasonal reports.
- _____ 3) Click on the Jan-Feb 2001 in Historical Perspective”. This provides information for the country.
- _____ 4) Click on “Regional/Statewide Analyses” for a state-by-state analysis.
- _____ 5) Now explore each of the seasons from last year and determine if they were colder than normal, warmer than normal or average. Find this information by using the state-by-state analysis. Record your findings in the chart under question 2 on the first page. This information should complete that chart.
- _____ 6) Complete the following table using your newly developed skills with the climate index and your partner(s) assistance. (You may want to divide up the task and assign each person a job and then compile your data as a group)



Time Period June-August 2001	Temp. Average = A Cooler = C Warmer = W	Basis for Average or normal (Years)	Precipitation > = Greater < = Less A = average	Basis for Average or normal Condition (Years)
Regional				
Northeast				
South				
West				
National				
Global				

Conclusions: Based on the completed chart above make three conclusions regarding the data.



Extended Activity: Climate Change in My City

Name _____ Date _____

Partners _____
(teams of 3-5)

Task: Using the following websites

<http://www.ncdc.noaa.gov/ol/climate/climateresearch.html>.,

<http://lwf.ncdc.noaa.gov/oa/climate/climateresources.html>

the library and other resources, complete the following data worksheet with your partners and then make a 2-5 minute presentation in the form of a News Report or a Travel Promotional to present to another group of students. Note the rubric-scoring sheet that will be used to judge your presentation before you begin the process.

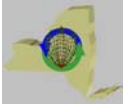
Data Work:

1) Region of the United States or country that you are investigating?

2) What are the areas yearly temperature ranges?

3) Describe the seasons, temperature, precipitation, wind patterns, etc.

4) List the latitude and longitudes for the area selected.

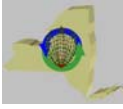


5) Notable factors effecting climate such as proximity to large bodies of water, mountain ranges, arid locations, wind patterns etc.

6) Warming or cooling trends for last year compared to the average. Use the technique from the earlier worksheet.

7) Other interesting climate, geological, astronomical factors regarding the area.

Please add more information on your own paper and feel free to add pictures, diagrams, graphs etc.

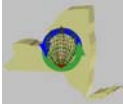


RUBRIC (scoring for the extended activity: Climate Change in My City)

Teacher Guidelines:

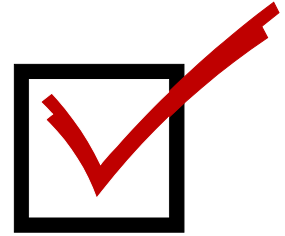
- 1) Each student team of 3-5 people should complete their own factual worksheet to turn in to the instructor. They should be asked to keep all worksheets in their notebooks when they are returned. The data collection for the fact sheets can be completed by the team but each individual in the team should write out their own worksheet.
- 2) Each team should make a list of the tasks each person in the team will complete. The instructor will check the list and make modifications if needed so so that individual strengths are highlighted and equality of work is demonstrated. This will be completed at the beginning of the project.
- 3) Before the presentations are made, the instructor should complete a check for accuracy of the information on the student's factual worksheets.
- 4) Practice a mock presentation with the class and lead a mock class scoring session so that the students are familiar with the scoring process before they are asked to score other students.
- 5) Each group will contain two teams for the presentations; the presenters and the observers. While one team is making their presentation, the observers should check off the rubric and score them. After the presentation, each scorer should sign their sheets and tally the total score. Everyone's scoring sheets should be collected, secured together and turned into the instructor or placed in the provided folder. The instructor should act as facilitator, clarifier during this process but not critique the presentations. The teams will switch and the roles of observer and assessors will also switch.
- 6) The instructor should average the scoring sheets for each team presentation and use this as their assessment grade for the activity.

Note* Using the team assessment approach cuts down on the time needed to evaluate student work, increases student involvement and interest and teaches high order skills such as evaluating/assessing.

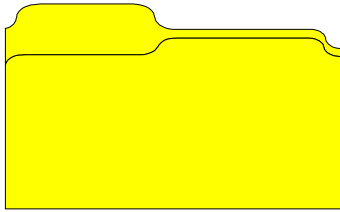


**Student Scoring Sheet
For The Extended Activity:
Climate Change in My City**

Team Name making the presentation:



Name of individual scoring the presentation:



Each student is responsible for making an assessment of the presenting group. After the presentation, each scorer should sign their sheets and tally the score. Everyone's scoring sheets should be collected, secured together and turned into the instructor or placed in the provided folder.

10-point assessment

3pts 1) **Pre presentation work:**

_____ *Student's data worksheets are all completed and accurate

_____ *A bibliography of resources is provided (three different sources needed one of which should be the use of the computer).

***(The instructor should preview the student's data sheets prior to the presentation to check for accuracy.)**

2pts 2) **Group presentation:**

_____ *Fits within the 2-5 time minute period

_____ *Information was clear and concise

_____ *The material was understandable to peer group

2pts 3) **Data Presentation:**

_____ *A clear presentation of the data is made using a chart, graph, poster, or visual aide



3pts 4) **Team building:**

_____ *Student task list shows all members participated

_____ *A clear use of all team members' skills and talents was demonstrated in the task assignment list

_____ * Everyone on the team participated and was involved in the presentation

_____ **Total points**

Willow Biomass Module

www.esf.edu/willow

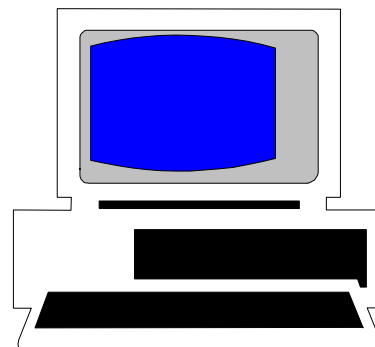
Contact person: Dr. Larry Abrahamson



Climate Change Student Activity #1

Name _____ Date _____
 Partner(s) _____

Introduction: In this activity you will be using your own knowledge of weather patterns, your classmate's knowledge and a climate index found on the Internet to help analyze climate change in _____.
 (Location)



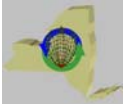
Pre Internet discussion:

1) What stands out in your mind regarding the weather for your location last year? (Ex. A colder than normal winter, a dryer than usual spring, etc.)

2) In the chart below, list your thoughts about the year. Record in "your thoughts" column, cooler, warmer, normal or unsure, according to your ideas.

Season (State-By-State)	Your Thoughts	Classes Thoughts	Actual, Factual Occurrence Using the climate index
Winter			
Spring			
Summer			
Fall			

2B) Choose a person to record the classes' results for each of the seasons above. Everyone should record these findings on their own worksheets.

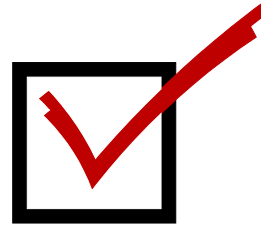


3) Make some observations regarding the results of the two columns. (Did everyone think the same way?)

Student Activity #2

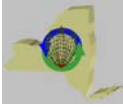
Data Collection:

Directions: You will be using the Internet to acquire the data regarding average temperatures for different seasons for your State and Country. Make sure you have an access or user number (check with your instructor) before you begin.



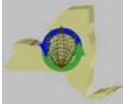
Directions:

- _____ 1) type in the website <http://lwf.ncdc.noaa.gov/oa/climate/climateresources.html> on the address bar and type in enter. You are now in the “Climate Index”. This is a system that collects data regarding the weather from locations all over the world and keeps the data on file. It also calculates the average temperatures, according to the years listed. Take some time to explore the climate index.
- _____ 2) Click on the link for “Climate of 2001”. Scrolling through this page you will find links to monthly or seasonal reports.
- _____ 3) Click on the Jan-Feb 2001 in Historical Perspective”. This provides information for the country.
- _____ 4) Click on “Regional/Statewide Analyses” for a state-by-state analysis.
- _____ 5) Now explore each of the seasons from last year and determine if they were colder than normal, warmer than normal or average. Find this information by using the state-by-state analysis. Record your findings in the chart under question 2 on the first page. This information should complete that chart.
- _____ 6) Complete the following table using your newly developed skills with the climate index and your partner(s) assistance. (You may want to divide up the task and assign each person a job and then compile your data as a group)



Time Period June-August 2001	Temp. Average = A Cooler = C Warmer = W	Basis for Average or normal (Years)	Precipitation > = Greater < = Less A = average	Basis for Average or normal Condition (Years)
Regional				
Northeast				
South				
West				
National				
Global				

Conclusions: Based on the completed chart above make three conclusions regarding the data.



Extended Activity: Climate Change in My City

Name _____ Date _____

Partners _____
(teams of 3-5)

Task: Using the following websites

<http://www.ncdc.noaa.gov/ol/climate/climateresearch.html>.,

<http://lwf.ncdc.noaa.gov/oa/climate/climateresources.html>

the library and other resources, complete the following data worksheet with your partners and then make a 2-5 minute presentation in the form of a News Report or a Travel Promotional to present to another group of students. Note the rubric-scoring sheet that will be used to judge your presentation before you begin the process.

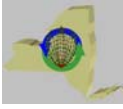
Data Work:

1) Region of the United States or country that you are investigating?

2) What are the areas yearly temperature ranges?

3) Describe the seasons, temperature, precipitation, wind patterns, etc.

4) List the latitude and longitudes for the area selected.

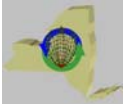


5) Notable factors effecting climate such as proximity to large bodies of water, mountain ranges, arid locations, wind patterns etc.

6) Warming or cooling trends for last year compared to the average. Use the technique from the earlier worksheet.

7) Other interesting climate, geological, astronomical factors regarding the area.

Please add more information on your own paper and feel free to add pictures, diagrams, graphs etc.

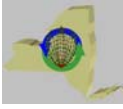


RUBRIC (scoring for the extended activity: Climate Change in My City)

Teacher Guidelines:

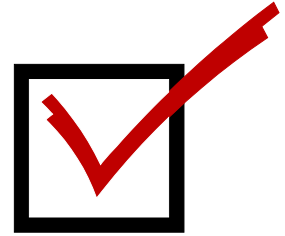
- 1) Each student team of 3-5 people should complete their own factual worksheet to turn in to the instructor. They should be asked to keep all worksheets in their notebooks when they are returned. The data collection for the fact sheets can be completed by the team but each individual in the team should write out their own worksheet.
- 2) Each team should make a list of the tasks each person in the team will complete. The instructor will check the list and make modifications if needed so so that individual strengths are highlighted and equality of work is demonstrated. This will be completed at the beginning of the project.
- 3) Before the presentations are made, the instructor should complete a check for accuracy of the information on the student's factual worksheets.
- 4) Practice a mock presentation with the class and lead a mock class scoring session so that the students are familiar with the scoring process before they are asked to score other students.
- 5) Each group will contain two teams for the presentations; the presenters and the observers. While one team is making their presentation, the observers should check off the rubric and score them. After the presentation, each scorer should sign their sheets and tally the total score. Everyone's scoring sheets should be collected, secured together and turned into the instructor or placed in the provided folder. The instructor should act as facilitator, clarifier during this process but not critique the presentations. The teams will switch and the roles of observer and assessors will also switch.
- 6) The instructor should average the scoring sheets for each team presentation and use this as their assessment grade for the activity.

Note* Using the team assessment approach cuts down on the time needed to evaluate student work, increases student involvement and interest and teaches high order skills such as evaluating/assessing.

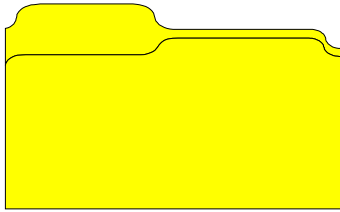


**Student Scoring Sheet
For The Extended Activity:
Climate Change in My City**

Team Name making the presentation:



Name of individual scoring the presentation:



Each student is responsible for making an assessment of the presenting group. After the presentation, each scorer should sign their sheets and tally the score. Everyone's scoring sheets should be collected, secured together and turned into the instructor or placed in the provided folder.

10-point assessment

3pts 1) **Pre presentation work:**

_____ *Student's data worksheets are all completed and accurate

_____ *A bibliography of resources is provided (three different sources needed one of which should be the use of the computer).

***(The instructor should preview the student's data sheets prior to the presentation to check for accuracy.)**

2pts 2) **Group presentation:**

_____ *Fits within the 2-5 time minute period

_____ *Information was clear and concise

_____ *The material was understandable to peer group

2pts 3) **Data Presentation:**

_____ *A clear presentation of the data is made using a chart, graph, poster, or visual aide



3pts 4) **Team building:**

_____ *Student task list shows all members participated

_____ *A clear use of all team members' skills and talents was demonstrated in the task assignment list

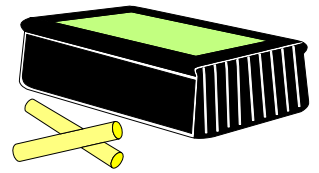
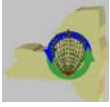
_____ * Everyone on the team participated and was involved in the presentation

_____ **Total points**

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Climate Change In My City Activity # 3

Teacher Information: This activity uses NASA's Goddard Institute for Space Science "Common Sense Climate Index". It will be necessary to understand how this climate index works and how to make use of the website. The following steps will help you be prepared to make the lesson a success.

_____ 1) Read the pages provided that explains how the Climate Index works. "CSCI: Discussion of Climate Index" and CSCI: Climate Indicators in the Climate Index.

_____ 2) Note: On the maps and graphs the color blue consistently means cooler and yellow or red means warmer. The dark black line on the graphs represents the five year mean climate index.

_____ 3) Explore the website www.giss.nasa.gov/data/update/csci/ . Type in the website. Click on "World and U.S. Maps. Scroll to the bottom of the page for the U. S. map and click on the city of interest. Once the list of cities in this area appears click again on the city of your interest. This should bring up a map with the climate index and seasonal temperature curves for this city station. Try a variety of worldwide locations.

_____ 4) There are six colored overheads provided for you to use with your class to help them understand the graphs before they work on the website. Familiarize yourself with these overheads.

Preparing the students to use the Climate Index website:

The purpose of this mini lesson is to help the students understand what they will see on the website. They will also learn how to read and make observations regarding the graphs and maps.



1) Use the overhead of Syracuse, NY:

Identify what the axes are labeled

Explain the red, blue and black lines on the graph to the students.

Summarize the meaning of the climate index.

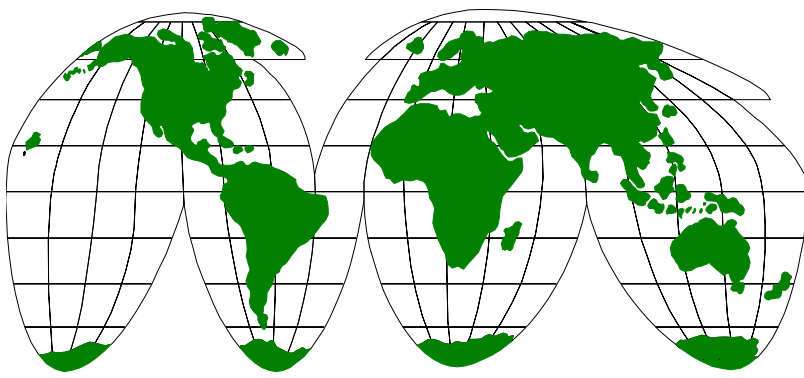
Ask the students to:

A) Describe the climate index trends for Syracuse

B) Explain what is the most recent climate trend?

C) Determine when one of the warmest ten-year periods occurred?

D) (Other questions)



3) Place the overhead of **New York Central Park** on the projector. Break the class up into teams and have them answer the following questions and be ready to share their responses with the class.

- A) What ten-year period seemed to be the coolest?
- B) What ten-year period seems to be the warmest?
- C) What is the most recent trend?
- D) Do you find the five year average (black line) or the bars easier to read, why?

Lead a class discussion regarding the student's responses

4) Change the overhead to **Watertown, NY**:

- A) Make at least three observations regarding the graph.
- B) Compare this overhead with the one from Syracuse NY. (Provide black and white photocopies of the Syracuse graph). Make at least two observations about how these graphs are the same or different. (You could choose to have students draw a Venn diagram for this question)

Class discussion to review the questions

5) Place the overhead of **Atlantic City** on the projector.

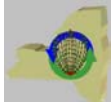
- A) Ask the students to compare and contrast this graph with that of Syracuse using the Venn diagram method. Note* the time reference for Atlantic City is from 1950-2000 vs. Syracuse NY which is 1910-2000, make sure that the students notice this point.

- B) Make at least three comparisons.

6) Place the overhead "**Climate index 1961-1970 and the four world maps** on the projector for the class to view. Have each student respond to the following questions.

- A) What major color shifts occur on the world map from 1961-1990?
- B) What do the color shifts indicate in terms of temperatures?
- C) Are there any areas of the world that appear to be cooling? If so where?
- D) What appears to be the global trend for the climate Index?

The students should now be ready to complete the lab activity using the website.



Climate Change in My City
Activity #3
Student Worksheet

Name _____ Date _____

Partner's Name _____

You will be determining the climate trends for your own city or nearest reference city for the years provided. You will be asked to make observations regarding the graphs similar to the exercise conducted by your instructor. Please read the directions and then complete the tasks assigned. Have fun exploring the world.

Directions:

_____ 1) type in the website www.giss.nasa.gov/data/update/csci on the address bar and type in enter. You are now at NASA's Goddard Institute for Space Science's web site that contains the Common Sense Index for U.S and world cities.

_____ 2) Scroll to the bottom of the page for the U.S. map. Click on the city on the map closest to you. A list of cities will appear in list form. Click on the name of the city you would like to investigate (choose your own or the nearest city).

_____ 3) Two graphs should appear. One that shows the annual and 5 year mean climate index and the other graph that shows temperature for different seasons throughout the year. These should look like the graphs presented on the overheads by your instructor in the classroom.

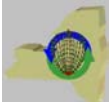
_____ 4) Answer the following questions before exploring this site.

A) During what years was a warming trend apparent? _____

B) During what years was a cooling trend apparent? _____

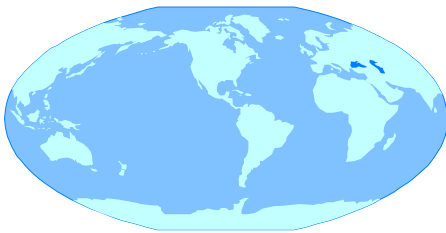
C) What is a major trend for the graphs? _____

D) Other observations about the graphs?



E) Compare this graph with that of the U.S.
 (www.giss.nasa.gov/data/update/csci/bargraphs/)
 How are they the same? How are they different?

F) Choose another City anywhere in the world. What location did you choose?



Answer the following questions for this location:

2A) During what years was a warming trend apparent? _____

2B) During what years was a cooling trend apparent? _____

2C) What is a major trend for the graphs?

2D) Other observations about the graphs?

Compare this location with your own city. What is the same and what is different? (Use your own paper to summarize the similarities and differences)