To Drill or Not to Drill?
An Examination of the Reliance and Risk

INTRODUCTION

This lesson seeks to impart scientific and historical knowledge surrounding the recent Gulf of Mexico oil spill in addition to other past spills. Moreover, students will examine how much oil was spilled into the Gulf and then perform an assessment activity involving specific details about the reliance and risk of oil extraction from the ocean. This lesson will also provide students with an opportunity to further explore the multifaceted debate surrounding oil drilling. Students will be evaluated on their ability to develop and demonstrate informed opinions on the various economic and environmental issues related to oceanic oil drilling.

LESSON OVERVIEW

Grade Level & Subject: Grades 11-12: Science, Social Studies

Length: 2-3 class periods

Objectives:
After completing this lesson, students will be able to:

- Demonstrate informed opinions on the various costs and benefits of oceanic oil drilling.
- Engage in a detailed discussion on the cause and scope of the Gulf oil spill.
- Comprehend the fact that everyday products are largely produced and transported via oil consumption, including transport across vast areas of the oceans.
- Better understand the conveniences and challenges that confront our society and its reliance on oil.

National Standards Addressed:[1]
This lesson addresses the following National Science Education Standards from the National Academies of Science:

- **Content Standard: NS.9-12.6 PERSONAL AND SOCIAL PERSPECTIVES**
  As a result of activities in grades 9-12, all students should develop an understanding of:
  - Natural resources
  - Environmental quality
  - Natural and human-induced hazards
  - Science and technology in local, national, and global challenges

[1] http://www.educationworld.com/standards.

- **Content Standard: NS.9-12.7 HISTORY AND NATURE OF SCIENCE**
  As a result of activities in grades 9-12, all students should develop understanding of:
  - Historical Perspectives

This lesson addresses the following National Geography Standards from The National Geographic Society:

- **Content Standard: NSS-G.D-12.5 ENVIRONMENT AND SOCIETY**
  - As a result of their activities in grades K-12, all students should
    - Understand how human actions modify the physical environment.
    - Understand the changes that occur in the meaning, use, distribution, and importance of resources.

This lesson addresses the following National Social Studies and History Standards from the National Council for the Social Studies:

- **Content Standard: NSS-C.9-12.5 ROLES OF THE CITIZEN**
  - How can citizens take part in civic life?
  - What are the responsibilities of citizens?

Materials Needed:

- Reproducible #1- Portioned Copy from Arctic National Wildlife Refuge's (ANWR) Products Made from Oil
- Reproducible #2-Test Your Oil Spill Knowledge
- Reproducible #3-Answer Key
- Reproducible #4-Portioned Copy from Arctic National Wildlife Refuge Report
- Reproducible #5-Portioned Copy from MSNBC-Would Drilling more Alaskan Oil Cut Prices?
- Reproducible #6-Portioned Copy from the *New York Times*-Shell's Alaska Oil Drilling Plan Draws New Scrutiny
- Reproducible #7-Portioned Copy from ANWR-Alaskans Strongly Support ANWR Development
- Reproducible #8-Portioned Copy from *USATODAY*-Time to Drill in Alaska
- Reproducible #9-Portioned Copy from ANWR-It's time to support ANWR drilling
- Reproducible #10-Portioned Copy from the National Wildlife Federation (NWF)-Compare the Exxon Valdez and BP Oil Spills
- Computer with internet access at school or at the students' homes in order to complete research during the debate segment

Assessment:

Students will be assessed through the following activities:

- Participation in warm-up and class discussion
- Exhibition of a successful group working dynamic
- Presentation of informed opinions on relevant subject matter during the class debate
- Quality and structure of informed letter written to Earth Day Network's Education Dept.

- Synthesis of opinions into an informed written response for final assignment

LESSON BACKGROUND

Relevant Vocabulary:

- **Antiseptic:** A substance that inhibits the growth and reproduction of disease-causing microorganisms.[2]
- **Enamel:** A vitreous, usually opaque, protective or decorative coating baked on metal, glass, or ceramic ware. A coating that dries to a hard glossy finish: nail enamel.[3]
- **Epoxy paint:** Two-part paint that hardens to a shine.[4]
- **Fan belt:** In a motor-vehicle engine, a belt that transmits motion from the driveshaft to the radiator fan and the generator or alternator. [5]
- **Glycerin:** A clear viscous liquid obtained by hydrolysis of fats and mixed oils and produced as a by-product in the manufacture of soap. It is used as an emollient in many skin preparations, as a laxative (particularly in the form of suppositories), and as a sweetening agent in the pharmaceutical industry.[6]
- **Oil filter:** A filter that removes impurities from the oil used to lubricate an internal-combustion engine Oil filters are included in many transportation vehicles today.[7]
- **Oil well:** A hole drilled or dug in the earth from which petroleum flows or is pumped. Also called an *oiler*.[8]
- **Percolator:** A coffeepot in which boiling water ascends through a central tube and filters back down through a basket of ground coffee beans.[9]
- **Petroleum jelly:** Used in preparing medicinal ointments and for lubrication. As a nearly colorless, highly refined liquid known as liquid petrolatum, liquid paraffin, or mineral oil, it is used as a lubricant, as a laxative, and as a base for nasal sprays.[10]

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[2] "Antiseptics - Definition of Antiseptics by the Free Online Dictionary, Thesaurus and Encyclopedia." *Dictionary, Encyclopedia and Thesaurus - The Free Dictionary*. Retrieved 26 January 2011 from http://www.thefreedictionary.com/antiseptics.

[3] "Enamel - Definition of Enamel by the Free Online Dictionary, Thesaurus and Encyclopedia." *Dictionary, Encyclopedia and Thesaurus - The Free Dictionary*. Retrieved 26 January 2011 from http://www.thefreedictionary.com/enamel.

[4] "Painting Terms and Definitions." *Painting, Exterior & Interior Painters - Free Price Quotes*. Retrieved 26 January 2011 from http://www.paintingkey.com/painting-terms.html.

[5] "Fan belt." The Oxford Pocket Dictionary of Current English. 2006. Retrieved 26 January 2011 from Encyclopedia.com:http://www.encyclopedia.com/doc/1O999-fanbelt.html.

[6] "Glycerin." A Dictionary of Nursing. 2008. *Encyclopedia.com*. Retrieved 26 January 2011 from http://www.encyclopedia.com/topic/glycerin.aspx.

[7] "Oil Filter - Definition of Oil Filter by the Free Online Dictionary, Thesaurus and Encyclopedia." *Dictionary, Encyclopedia and Thesaurus - The Free Dictionary*. Retrieved 26 January 2011 from http://www.thefreedictionary.com/oil%20filter.

[8] "Oil Well - Definition of Oil Well by the Free Online Dictionary, Thesaurus and Encyclopedia." *Dictionary, Encyclopedia and Thesaurus - The Free Dictionary*. Retrieved 26 January 2011 from http://www.thefreedictionary.com/Oil+well.

[9] "Percolator." *WordNet*. Princeton. Retrieved 26 January 2011 from http://wordnetweb.princeton.edu/perl/webwn?s=percolator.

[10] "Petrolatum." The Columbia Encyclopedia, Sixth Edition. 2008. *Encyclopedia.com*. Retrieved 26 January 2011 from http://www.encyclopedia.com/topic/petrolatum.aspx#1-1E1:petrolat-full.

Information:
After an explosion on April 20, 2010, the Deepwater Horizon oil rig, owned by Transocean and leased by BP, caught fire and sank into the Gulf of Mexico two days later on April 22, leading to one of the most highly publicized oil spill disasters in history. Eleven workers on the rig were killed. At that time, drilling was taking place over 5,000 feet below the water's surface. BP officials originally estimated that the Gulf spill would take two to four weeks to control; however, the well was not capped until five months after the explosion through the combined efforts of government and industry officials.

The following figures illustrate the oil's prevalence after the initial explosion and during the recovery period: 17% was captured through purposeful containment systems initiated by BP and the federal government, 8% was burned or skimmed, 25% evaporated or dissolved on its own, 16% dispersed naturally, 8% was dispersed using chemicals, and 26% is still at sea or on shore. BP, under pressure from the U.S. government, agreed to an initial $20 billion compensation fund for victims of the spill; this fund is managed by Kenneth Feinberg, the lawyer and mediator who administered the 9/11 victims' fund. BP also put $100 million towards a foundation that supports unemployed oil rig workers who lost their jobs due to the moratorium the government placed on new deep-water drilling projects after the spill. However, the full consequences of the spill are impossible to determine. As a result, the Deepwater Horizon explosion and subsequent oil spill were unfortunate and undesired incidents for all parties involved. [11, 12, 13]

In any educational setting, natural or manmade disasters are difficult subjects to teach to any age-level. Thus, we recommend the following primer from the National Wildlife Federation on how to teach about this particular incident: "How to Talk with Kids about the Gulf Oil Spill."[14]

Resources:

- "Gulf Coast Oil Disaster: By the Numbers." *CNN.com - Breaking News, U.S., World, Weather, Entertainment & Video News*. Retrieved 26 January 2011 from http://www.cnn.com/SPECIALS/2010/gulf.coast.oil.spill/interactive/numbers.interactive/index.html.
- Kuo, Vivian. "Oil Spill Coordinator: Gulf Cleanup to Continue into Winter - CNN.com."*CNN.com - Breaking News, U.S., World, Weather, Entertainment & Video News.*

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[11] Aigner, Erin. "Map and Estimates of the Oil Spill in the Gulf of Mexico - Interactive Map - NYTimes.com." *The New York Times - Breaking News, World News & Multimedia*. Retrieved 25 January 2011 from http://www.nytimes.com/interactive/2010/05/01/us/20100501-oil-spill-tracker.html.
[12] Hall, Mimi. "Apologetic BP Pledges $20B Compensation Fund - USATODAY.com." *News, Travel, Weather, Entertainment, Sports, Technology, U.S. & World - USATODAY.com*. Retrieved 09 February 2011 from http://www.usatoday.com/news/washington/2010-06-16-obama-bp-oil_N.htm.
[13] "Kenneth Feinberg." *The New York Times*. Retrieved 9 February 2011 from http://topics.nytimes.com/topics/reference/timestopics/people/f/kenneth_r_feinberg/index.html.
[14] "How to Talk with Kids About the Gulf Oil Spill - National Wildlife Federation." *Home - National Wildlife Federation*. Retrieved 02 February 2011 from http://www.nwf.org/Kids/Ranger-Rick/Parents-and-Educators/How-To-Talk-With-Kids-Gulf-Oil-Spill.aspx.

Retrieved 26 January 2011 from http://www.cnn.com/2010/US/10/13/gulf.oil.cleanup/index.html.

- "1979's Ixtoc Oil Well Blowout in Gulf of Mexico Has Startling Parallels to Current Disaster | NOLA.com." *New Orleans, LA Local News, Breaking News, Sports & Weather - NOLA.com*. Retrieved 26 January 2011 from http://www.nola.com/news/gulf-oil-spill/index.ssf/2010/07/1979s_ixtoc_oil_well_blowout_i.html.
- "The Gulf Coast Oil Spill: How Does It Compare to Exxon Valdez? | The Rundown News Blog | PBS NewsHour | PBS." *PBS: Public Broadcasting Service*. Retrieved 26 January 2011 from http://www.pbs.org/newshour/rundown/2010/05/could-the-gulf-coast-oil-spill-eclipse-exxon-valdez.html.
- Kershner, Isabel, and Mark Landler. "Gulf Found to Recover From War's Oil Spill - New York Times." *The New York Times - Breaking News, World News & Multimedia*. Retrieved 26 January 2011 from http://www.nytimes.com/1993/03/18/world/gulf-found-to-recover-from-war-s-oil-spill.html.
- "War in the Gulf; U.S. Says Iraq Pumps Kuwaiti Oil into Gulf; Vast Damage Feared from Growing Slick - New York Times." *The New York Times - Breaking News, World News & Multimedia*. Retrieved 26 January 2011 from http://www.nytimes.com/1991/01/26/world/war-gulf-us-says-iraq-pumps-kuwaiti-oil-into-gulf-vast-damage-feared-growing.html?scp=27&sq=oil spills iraq&st=nyt.
- "BP Oil Spill Nears Record As Largest In Gulf History." *Breaking News and Opinion on The Huffington Post*. Retrieved 26 January 2011 from http://www.huffingtonpost.com/2010/07/01/bp-oil-spill-nears-record_n_631955.html.
- Achenbach, Joel, and David A. Fahrenthold. "Oil Spill Dumped 4.9 Million Barrels into Gulf of Mexico, Latest Measure Shows." *Washington Post - Politics, National, World & D.C. Area News and Headlines - Washingtonpost.com*. Retrieved 26 January 2011 from http://www.washingtonpost.com/wp-dyn/content/article/2010/08/02/AR2010080204695.html.

LESSON STEPS

Warm-up: *Exactly how much oil was spilled in the 2010 Deepwater Horizon spill?*

1. Tell the class that the recent oil spill in the Gulf of Mexico was articulated by many to be one of the worst environmental disasters in history. Ask them if they can estimate how much oil was spilled in the recent disaster. *Some estimate that 184 million gallons were spilled;*[15] *others posit that 4.9 million barrels were spilled, equal to 205.8 million gallons.*[16, 17]

2. Ask students the following question: Is it possible for you to fathom 184 million gallons of oil? Let's put such a number in perspective. Think of 184 million jugs of milk standing side by side; this would cover 1.36 square miles. Or, think of 279 Olympic-sized swimming pools 6 feet 7 inches deep – and if placed in a line end-to-end – would cover a distance of 8.6 miles. [18, 19]

3. Tell the students that The Gulf of Mexico contains 660 quadrillion gallons of water – that's the number 660 with 15 zeros after it. Write this number on the board. Then write the number 184,000,000 on the board and ask the following question: Is the amount of oil spilled significant compared to the amount of water in the Gulf of Mexico? Ask students to use the information provided to calculate a percentage-based answer. *If The Gulf of Mexico was the Dallas Cowboy's football stadium, the oil spill would fill a 24 ounce beverage in the total space of the stadium. The oil spilled is a mere .000000002788% (184,000,000 divided by 660 quadrillion, then multiplied by 100 to obtain a percentage) of the Gulf's 660 quadrillion gallons of water; however, oil typically spreads to affect a greater volume of water during a spill.*[20]

4. Have the class estimate the following: The world's proven oil reserves are about 1.36 trillion barrels; hence, write the number 136 with ten zeros after it on the board. Then write the number 4,900,000 on the board. Now, ponder the following: if one asserts that approximately 4.9 million barrels spilled into the Gulf (the number 49 with five zeros after it), is this amount significant compared to the world's proven oil reserves? Again, calculating a percentage is useful. *The world's proven oil reserves are about 1.36 trillion barrels, which makes the*

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[15] "News Headlines." *CNBC Mobile Home*. Retrieved 25 January 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=2.
[16] Aigner, Erin. "Map and Estimates of the Oil Spill in the Gulf of Mexico - Interactive Map - NYTimes.com." *The New York Times - Breaking News, World News & Multimedia*. Retrieved 25 January 2011 from http://www.nytimes.com/interactive/2010/05/01/us/20100501-oil-spill-tracker.html.
[17] "Oil to Gasoline." *NEWTON/ANL Home Page*. Retrieved 25 January 2011 from http://www.newton.dep.anl.gov/askasci/eng99/eng99288.htm.
[18] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=2.
[19] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=3.
[20] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=9.

2010 spill account for merely .00036% of the world's remaining proven oil (4,900,000 divided by 1.36 trillion then multiplied by 100).[21]

5. Ask students the following: if approximately 272.7692 gallons of oil are required to provide the annual energy needs for the average, oil-powered U.S. home, how many U.S. homes could be powered for a year using the energy equivalency of the oil spilled in the disaster, assuming that 184 million gallons were leaked? *If one uses the estimate of 184 million gallons, the oil spilled would have been sufficient to provide power for 674,563 U.S. homes for an entire year (184,000,000 divided by 272.7692).*[22]

Activity One: *How Much Do We Really Rely on Oil?*

1. Ask students if it would be possible to conduct class without using any oil based products and assess the answers. Inquire what materials would need to be eliminated in order to do so. *Pens, binders, notebooks, desks and even clothes are all oil based, making it near impossible to conduct class.*

2. Tell the class that you would like to attempt to not use any oil based products for the rest of class. Explain to them that they will have to take notes. When they inevitably pull out pens, pencils and paper inform them that these products are all made using oil and so they cannot use them. Ask students to stand up because their desks and chairs are also made with oil. In fact, almost everything in the classroom and the classroom itself is produced with oil. If weather and timing permit, take your students outside. If you cannot go outside, ask students to sit on the floor and explain that only if class were held outside and were conducted orally without any writing, hand outs, calculators, lockers, binders or any other materials used everyday could class be conducted without oil based products. Make it clear to them that their daily lives are inextricably linked to oil. (Whether the class is outdoors or not, resume normal class procedure after acknowledging that the lesson could not continue without oil based products. Class can be continued outside if feasible)

3. Hand out **Reproducible #1 – Portioned Copy from ANWR's Products Made from Oil**. Have the students circle the items that they or their family members use on a regular basis, underline the products they feel would be extremely difficult to live without, and put a star next to the items without which many people wouldn't survive.

4. As a class, discuss the students' answers and allow them to briefly debate their findings.

Activity Two: *Quiz-Examining misconceptions about the Gulf Oil Spill.*

1. Baseline Assessment: Ask the students what they heard in the news about the Gulf oil spill and capture some of the main themes on the board. *Answers will vary.*

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[21] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=10.
[22]"News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=7.

2. Divide students into groups of four and hand out a copy of **Reproducible #2 – Test Your Oil Spill Knowledge** to each group.

3. Allow time for the groups to take the quiz together.

4. Hand out **Reproducible #3 – Answer Key** to each group.

5. Ask students to identify which of the items previously written on the board were either perceived as contradictory, misleading, confusing or simply new pieces of information. Ask them to add clarifications or any new items they found most interesting and important for the public to know after taking the quiz.

Activity Three: *Research, Roles and Debate*

1. Have the class posit the following hypothetical: Federal government officials need to make a decision about whether they should proceed with an oceanic oil drilling project in the near future. There are conveniences and consequences when it comes to oil use, and this activity seeks to explore this interplay.

2. Hand out **Reproducibles #4 – 9.** Tell the class that these documents explore a possible drilling project in Alaska's Arctic National Wildlife Refuge and will help them better understand the various positions often depicted in such debates. These documents will help portray the hypothetical scenario and lay the groundwork for the various perspectives that students will represent in the activity.

3. Assign an equal number of students to each of the following roles: oil company executive, national environmentalist, local environmentalist, Indigenous Alaskan civilian, fisherman employed by the oil company, fisherman not employed by the oil company, federal government official, tourist, marine biologist, tourism industry worker.

4. Tell the students that they will be involved in a debate where they will assume the perspective of the person they were assigned and will argue the pros and cons of oil drilling in the hypothetical example. Students should reflect upon the same issues encompassed in the debate over whether or not to drill in Alaska. If the role they play is under the opinion that no drilling should take place, they should be prepared with alternative methods for energy production. Other students should be prepared to defend drilling as long as it is undertaken as cheaply and efficiently as possible. The final claim that some students will defend is that drilling should take place, but with certain precautions in place.

5. Remind the students that they will have to provide complete and reasonable arguments for their positions. For example, if students are assigned the role of environmentalist, they should not simply say there should no longer be oil drilling, since energy still must come from somewhere. In this case, factors such as reliance on oil, the impact on the job industry and alternative energy sources should be addressed. Students must convince the public of their positions and why others would benefit as well.

6. Allow students assigned to the same position time to briefly meet to promote collaboration and discuss various arguments. Make it clear that it is possible for members of the same group to have different perspectives on the situation; each student will have to support his or her own ideas in the end.

7. Allow students extra time for research either at home as homework or additional time in the classroom.

8. With the teacher as a moderator, stage a classroom debate in which every student must participate. This is not a two sided debate; the desks should be arranged in a circle to facilitate communication among the group.

9. During the debate, allow each person to present his or her role and approach to the issue. Foster a group discussion in terms of the debate. As a deliverable for the assignment, tell the students that they must develop and provide a collective compromise to the federal officials in Alaska. Assign one person to write the multiple ideas and opinions generated on the board. Acknowledge that it may not be possible for students to establish a collective agreement. In this case, explore various compromises and/or prepare two messages to deliver to the federal officials with varying opinions.

Wrap Up: *Synthesis of Opinion(s)*

1. Ask students to share their personal reflections and opinions about the hypothetical drilling example. Compare and contrast the findings.

2. As an additional activity, have each student compose a letter to Earth Day Network's Education Department (contact information below) detailing the approach he or she thinks should be taken towards oceanic oil drilling. Selected letters will appear on our website (www.earthday.org/education) based upon their comprehensiveness, clarity of thought and the argument's eloquence.

3. Collect the letters and grade them based on each student's ability to synthesize a coherent, comprehensive argument.

4. President Obama is quoted as saying that the Gulf of Mexico oil spill was "the worst environmental disaster America has ever faced."[23] Allow the students to write a brief, take-home essay response for homework on whether or not they agree with this statement. Use information obtained from the debate to inform one's argument.

Extension 1: Comparing the BP Spill to Spills of the Past

1. Have the students think about what they know about past oil spills. Can they name a previous oil spill? If so, how many and why did they occur? *The students will most likely say that they don't have very much detailed knowledge of past spills since many were not alive when they occurred.*

[23] "Remarks by the President to the Nation on the BP Oil Spill." *The White House*. Retrieved 08 February 2011 from http://www.whitehouse.gov/the-press-office/remarks-president-nation-bp-oil-spill.

However, they may have some knowledge of the Exxon Valdez spill since it was the most recent one of popular reference in American culture before Deepwater Horizon.

2. Ask how much oil they believe that the 1989 Exxon Valdez spill dumped into Prince William Sound in Alaska after striking Bligh Reef.[24] *It leaked 10.8 million gallons, or 5.9% of the quantity in the Deepwater Horizon incident.*[25]

3. Ask students why they think the spill in Alaska was such a widely discussed and publicized subject at the time, even though it was such a small quantity compared to the recent Gulf oil spill. *A spill is a spill, and the 10.8 million gallons of oil that were dumped into Alaska's natural environment was a large amount. This spill also took place in a part of Alaska that was previously perceived as remote, pristine and unpolluted. Thus, this factor made the consequences all the more complicated and difficult.*[26]

4. Challenge the students by inquiring how the BP spill compared to the one in Kuwait during the Gulf War. *The BP spill was 61% to 76% as large as the intentional leaking of between 239.4and 300 million gallons into the Persian Gulf by Iraqi military forces in Kuwait.* [27, 28]

5. What was the Gulf of Mexico's worst spill before the 2010 incident? *Ixtoc 1 in 1979-1980 when 140.3 million gallons were leaked into the Bay of Campeche of the coast of Mexico. This was about 76% as large as the BP spill.* [29]

6. Have students review **Reproducible #10 – Portioned Copy from NWF's Compare the Exxon Valdez and BP Oil Spills.** Ask them to hypothesize the future effects of the Gulf oil spill considering the ramifications from the Exxon Valdez spill (noting the quantity difference and depth of water difference between the two spills).

Extension 2: Cooking With and Without Oil – A Hands on Experience!

1. To start this activity, make sure you have the proper space, supervision and permission necessary to prepare the food, along with accessibility to locally grown produce. As preparation the teacher will need to find a recipe for fruit salad using local and non-local ingredients. Additionally, the teacher will need to provide the necessary food items in the recipe to perform the activity.

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[24] "Exxon Valdez Oil Spill: Ten Years Later." *Arctic Circle*. Web. 09 Feb. 2011. http://arcticcircle.uconn.edu/SEEJ/Alaska/miller2.htm.
[25] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=5.
[26] ibid
[27] Oil Spills." *The New York Times*. Updated 6 August 2010. Retrieved 25 January 2011 from http://topics.nytimes.com/top/reference/timestopics/subjects/o/oil_spills/index.html?scp=3&sq=gulf%20compared%20to%20exxon%20valdez&st=cse.
[28] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=5.
[29] ibid

2. Ask students what typical meal they can cook without using any oil. Ask them to give an example of a meal that doesn't rely on oil and one that does. Ask them which is easier to conceptualize and why. *Food grown at home and eaten raw is the only food that doesn't rely on oil for anything aside from possibly the fertilizer needed to grow it. Fertilizers, pesticides and herbicides are all often made with oil as a main ingredient. Be sure that students understand that imported food – even local food – relies on oil for production and/or transportation.*

3. Now that they know how necessary oil is for nearly all meals, ask students if any of them have eaten a meal that doesn't rely on any oil for preparation or transportation. *This should spur a small discussion; some students may live on farms or have been to farms where vegetables, fruits, and dairy products are produced which they have consumed on premises. Additionally, many of them may have gardens or have eaten items from gardens.* Remind students that most fertilizers rely on oil and that the feed for many animals is also derived from oil, so it is often a necessity without realizing it.

4. Ask students how far locally grown food travels. What distance does food travel if it is not locally grown? *150 miles[30] for locally grown and 1,500 miles[31] for other food.*

5. Divide the class into two groups (or 4 if the class is large). If there are two groups, have one group follow a recipe to make a simple fruit salad using only local produce, while the other group assembles the ingredients for a recipe using only imported produce (produce that commonly relies on greater amounts of oil in order to be available in one's area).

6. If there are four groups, have two prepare each recipe. Do not tell the students which group has the local ingredients and which has the imported. Be sure that students do not taste during the preparation!

7. Place each prepared item at the front of the classroom, and have the students sample each dish and vote on which they think tastes better, and separately, which dish appears more appetizing -"Dish A" or "Dish B."

8. Discuss the results. Which dish did the class like better? Why do the students believe this is the case?

9. A modified version of this activity can be done by simply purchasing one item – an apple, a cucumber, a carrot, etc. that's locally grown and another of the same item that's imported and have the students vote on their opinions.

10. Ask students how fuel efficient they believe a new light truck that may be used to transport produce would be. *15-20 miles per gallon.*[32]

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[30] Hsing, Crystal. "Deciding between Organic or Locally Grown Food, UCLA Sustainability." *UCLA Sustainability.* Retrieved 08 Feb. 2011 from http://www.sustain.ucla.edu/article.asp?parentid=7686.
[31] "Is Local Food Better? | Worldwatch Institute." *Worldwatch Institute | Vision for a Sustainable World.* Retrieved 08 February 2011 from http://www.worldwatch.org/node/6064.

11. Ask students how many gallons of gas would be used to transport one truckload of food locally, at 150 miles, versus typically, at 1500 miles. *75-100 gallons of gas would be used to transport one truckload of typical produce, and 7.5-10 gallons would be used to transport one truckload of local produce. Divide 1500 by the miles per gallon to get the number of gallons for typical and 150 by the miles per gallon to get the number of gallons for local. That is 15.75 to 21 gallons of oil for the transportation of one truckload of local produce and 157.5 to 210 gallons of oil for the same amount of typical produce to be transported.*[33]

12. Ask students how much oil is used on average to transport typical as opposed to local produce. *10 times as much (typical gallons divided by local gallons).*

13. Explain to students that this analysis suggests that local transportation by these means uses 110 to 147 pounds of oil, or the weight of approximately one 150 pound adult, and typical transportation uses 1,102.5 to 1,470 pounds, or the weight of approximately ten people. That number of people is how much the fuel alone weighs in the transportation of one truckload of produce. The truck itself weighs 8,500 pounds on average.[34]

CONCLUSION

Students demonstrated more informed perspectives on the details of the Gulf oil spill and oceanic oil drilling in general. Moreover, they comprehended the various economic and environmental viewpoints present in the current debate on oil drilling. Lastly, students understood the multifarious nature of our society's dependence on oil and its positive and negative effects on the ocean.

LESSON PLAN CREDITS

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[32] "Transportation Sector Key Indicators and Delivered Energy Consumption." *Energy Information Administration.* Retrieved 02 February 2011 from http://www.eia.doe.gov/oiaf/servicerpt/table9.pdf.
[33] "Gasoline FAQs - Energy Information Administration." *U.S. Energy Information Administration - EIA - Independent Statistics and Analysis.* Retrieved 02 February 2011 from http://www.eia.doe.gov/ask/gasoline_faqs.asp#gallons_per_barrel.
[34] "EIA - Analysis of Corporate Average Fuel Economy (CAFE) Standards for Light Trucks - Introduction." *U.S. Energy Information Administration - EIA - Independent Statistics and Analysis.* Retrieved 08 February 2011 from http://www.eia.doe.gov/oiaf/servicerpt/cafe/introduction.html.

Portioned Copy from ANWR's Products Made From Oil[35]

Directions: Circle the items that you and your family use on a regular basis. Underline the products that you think would be extremely difficult to live without. Star the items that many people would not survive without.

Clothing Ink	Model cars	Hair coloring	Beach umbrellas	Shaving cream
Heart Valves	Floor wax	Toilet seats	Ballpoint pens	Footballs
Crayons	Sports car bodies	Denture adhesive	Boats	Paint brushes
Parachutes	Tires	Loudspeakers	Nail polish	Balloons
Telephones	Dishwashing liquids	Movie film	Golf bags	Fan belts
Enamel	Unbreakable dishes	Fishing boots	Caulking	Umbrellas
Transparent tape	Toothbrushes	Candles	Tape recorders	Nylon rope
Antiseptics	Toothpaste	Water pipes	Curtains	Ice buckets
Vacuum bottles	Combs	Car enamel	Vitamin capsules	Fertilizers
Deodorant	Tents	Shower curtains	Dashboards	Perfumes
Pantyhose	Hair curlers	Credit cards	Putty	Shoe polish
Rubbing Alcohol	Lipstick	Aspirin	Percolators	preservatives
Carpets	Ice cube trays	Golf balls	Skis	Faucet washers
Epoxy paint	Electric blankets	Detergents	Insecticides	Food
Oil filters	Tennis rackets	Sunglasses	Fishing lures	Cameras
Upholstery	Drinking cups	Glue	Solvents	Anesthetics
Hearing Aids	House paint	Fishing rods	Insect repellent	Hand lotion
Car sound insulation	Roller-skate wheels	Linoleum	Antihistamines	Shampoo
Cassettes	Guitar strings	Soft contact lenses	Cortisone	Salad bowl
Motorcycle helmets	Ammonia	Paint Rollers	Dyes	Rubber cement
Pillows	Eyeglasses	Luggage	LP records	
Shower doors	Ice chests	Antifreeze	Bandages	
Shoes	Life jackets	Refrigerants	Dentures	
Refrigerator linings	TV cabinets	Typewriter ribbons	Mops	
Electrical tape	Car battery cases	Cold cream	Artificial turf	
Safety glass	Roofing	Glycerin	Artificial Limbs	
Awnings	Trash bags	Plywood adhesive	Petroleum jelly	

[35] "ANWR Feature - Products Made From Oil." *Arctic Power - Arctic National Wildlife Refuge - Home.* Retrieved 25 January 2011 from http://www.anwr.org/features/oiluses.htm.

Test Your Oil Spill Knowledge

1. What was the cause of the oil spill? When did it happen and in what month did the US government declare the well "dead?"

2. How many days did oil spill into the Gulf of Mexico?
   A. 46 B. 126 C. 86 D. 16

3. Was this the largest oil spill in history?

4. How many people were killed in the Deepwater Horizon accident?

5. How much money did BP supply to the fund designated to cover emergency payments to people and businesses to cover losses incurred by the spill?
   A. $500 million B. $20 billion C. $5 billion D. $40 billion

6. How much of the oil was sequestered in BP's containment actions?
   A. 6% B. 17% C. 36% D. 54%

7. How much of the remaining oil was depleted through evaporation, burning, skimming, or dispersion?
   A. 1/3 B. 1/4 C. 2/3 D. over 1/2

8. As an estimate, how much oil remains at sea or on-shore?
   A. 26% B. 30% C. 35% D. 41%

9. What other substance was leaking?
   A. natural gas B. water C. acid D. salt

10. How many birds, sea turtles and dolphins were found dead or severely sick in the first six months after the spill?

11. Name three wildlife species that will be impacted by the spill and how they will be impacted. Also, name one specific human population that will be affected and how.

12. What happened to the remaining oil in the Gulf?

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Test Your Oil Spill Knowledge – Answer Key

1. What was the cause of the oil spill? When did it happen and in what month did the US government declare the well "dead?"
   It was caused by an explosion on the drilling rig Deepwater Horizon on April 20, 2010 and was declared "dead" on September of 2010, five months after the initial explosion.[36]

2. How many days did oil spill into the Gulf of Mexico?
   A. 46 B. 126 C. 86 D. 16

3. Was this the largest oil spill in history?
   While it was the largest accidental spill, the purposeful opening of valves on pipelines and tankers by Iraqi military forces in Kuwait during the first Gulf War in 1991 released between 239and 300 million gallons of oil, much more than the Gulf spill.[37, 38]

4. How many people were killed in the Deepwater Horizon accident?
   11 men died in the BP explosion.[39]

5. How much money did BP supply to the fund designated to cover emergency payments to people and businesses to cover losses incurred by the spill?
   A. $500 million B. $20 billion[40] C. $5 billion D. $40 billion

6. How much of the oil was sequestered in BP's containment actions?
   A. 6% B. 17%[41] C. 36% D. 54%

7. How much of the remaining oil was depleted through evaporation, burning, skimming, or dispersion?
   A. 1/3 B. 1/4 C. 2/3 D. over 1/2[42]

8. As an estimate, how much oil remains at sea or on-shore?

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[36] "Gulf of Mexico Oil Spill (2010)." *The New York Times*. Updated 11 January 2011. Retrieved 25 January 2011. from http://topics.nytimes.com/top/reference/timestopics/subjects/o/oil_spills/gulf_of_mexico_2010/index.html?scp=1-spot&sq=bp%20oil%20spill&st=cse.
[37] "News Headlines." *CNBC Mobile Home*. Retrieved 09 February 2011 from http://www.cnbc.com/id/38294088/What_Does_184_Million_Gallons_of_Oil_Look_Like?slide=5.
[38] Oil Spills." *The New York Times*. Updated 6 August 2010. Retrieved 25 January 2011 from http://topics.nytimes.com/top/reference/timestopics/subjects/o/oil_spills/index.html?scp=3&sq=gulf%20compared%20to%20exxon%20valdez&st=cse.
[39] ibid
[40] "Gulf of Mexico Oil Spill (2010)." *The New York Times*. Updated 11 January 2011. Retrieved 25 January 2011. from http://topics.nytimes.com/top/reference/timestopics/subjects/o/oil_spills/gulf_of_mexico_2010/index.html?scp=1-spot&sq=bp%20oil%20spill&st=cse
[41] Aigner, Erin. "Map and Estimates of the Oil Spill in the Gulf of Mexico - Interactive Map - NYTimes.com." *The New York Times - Breaking News, World News & Multimedia*. Retrieved 25 January 2011 from http://www.nytimes.com/interactive/2010/05/01/us/20100501-oil-spill-tracker.html.
[42] ibid

A. 26%[43] B. 30% C. 35% D. 41%

9. What other substance was leaking?
   A. natural gas[44] B. water C. acid D. salt

10. How many birds, sea turtles and dolphins were found dead or severely sick in the first six months after the spill?
    over 8,000[45]

11. Name three wildlife species that will be impacted by the spill and how they will be impacted. Also, name one specific human population that will be affected and how.
    There will be significant impacts on birds, sea turtles, and coral, among other wildlife, along with fisherman. The coating of birds' feathers with oil causes buoyancy and the ability for them to regulate their body temperature to decrease, and oil ingestion causes ulcers along with internal bleeding. Sea turtles are also coated in oil, and deep sea corals die. Commercial fisheries are a huge part of the Gulf State economies, and fishing was shut down in the area from May to August. State parks were also closed.[46]

12. What happened to the remaining oil in the Gulf?
    Much of it has sunk to the Gulf floor, and there is still some in various coastal areas.[47]

[43] ibid
[44] ibid
[45] "How Does the BP Oil Spill Impact Wildlife and Habitat? - National Wildlife Federation." *Home - National Wildlife Federation*. Retrieved 25 January 2011 from http://www.nwf.org/Oil-Spill/Effects-on-Wildlife.aspx.
[46] ibid
[47] ibid

Portioned Copy from Arctic National Wildlife Refuge Report [48]

The Unique Conservation Values of the Arctic Refuge

The Arctic National Wildlife Refuge is the largest unit in the National Wildlife Refuge System. The Refuge is America's finest example of an intact, naturally functioning community of arctic/subarctic ecosystems. Such a broad spectrum of diverse habitats occurring within a single protected unit is unparalleled in North America, and perhaps in the entire circumpolar north.

The Arctic Refuge is the only area on Alaska's North Slope where petroleum development is specifically prohibited by Congress. The rest of the region is available for oil and gas development through administrative decisions by the Secretary of the Interior on NPR-A and the Beaufort Sea, or by the Commissioner of the Alaska Department of Natural Resources on State lands and waters.

The 1002 Area is critically important to the ecological integrity of the whole Arctic Refuge, providing essential habitats for numerous internationally important species such as the Porcupine Caribou herd and polar bears. The compactness and proximity of a number of arctic and subarctic ecological zones in the Arctic Refuge provides for greater plant and animal diversity than in any other similar sized land area on Alaska's North Slope.

The Refuge is also an important part of a larger international network of protected arctic and subarctic areas. In Canada's Yukon Territory, the government and First Nations people protected the coastal tundra and adjacent mountains by establishing Ivvavik and Vuntut National Parks, where oil exploration and production are not allowed.

Potential Impacts of Oil and Gas Development on Refuge Resources

Newer technologies that are applied today in Alaska's expanding North Slope oil fields include directional drilling that allows for multiple well heads on smaller drill pads; the re-injection of drilling wastes into the ground, which replaces surface reserve pits; better delineation of oil reserves using 3-dimensional seismic surveys, which has reduced the number of dry holes; and use of temporary ice pads and ice roads for conducting exploratory drilling and construction in the winter. As the oil fields expand east and west, additional oil reserves are consequently being tapped from smaller satellite fields that rely on the existing infrastructure at Prudhoe Bay and Kuparuk.

Although technological advances in oil and gas exploration and development have reduced some of the harmful environmental effects associated with those activities, oil and gas development remains an intrusive industrial process. The physical "footprint" of the existing North Slope oil facilities and roads covers about 10,000 acres, but the current industrial complex extends across an 800 square mile region, nearly 100 miles from east to west. It continues to grow as new oil fields are developed.

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[48] "Arctic Refuge: Oil and Gas Issues." *Arctic National Wildlife Refuge*. Retrieved 26 January 2011 from http://arctic.fws.gov/issues1.htm.

The 100-mile wide 1002 Area is located more than 30 miles from the end of the nearest pipeline and more than 50 miles from the nearest gravel road and oil support facilities. According to the U.S. Geological Survey, possible oil reserves may be located in many small accumulations in complex geological formations, rather than in one giant field as was discovered at Prudhoe Bay. Consequently, development in the 1002 Area could likely require a large number of small production sites spread across the Refuge landscape, connected by an infrastructure of roads, pipelines, power plants, processing facilities, loading docks, dormitories, airstrips, gravel pits, utility lines and landfills.

A substantial amount of water is needed for oil drilling, development, and construction of ice roads. Water needed for oil development ranges from eight to 15 million gallons over a 5-month period, according to the Bureau of Land Management. If water is not available to build ice roads, gravel is generally used. Water resources are limited in the 1002 Area. In winter, only about nine million gallons of liquid water may be available in the entire 1002 Area, which is enough to freeze into and maintain only 10 miles of ice roads. Therefore, full development may likely require a network of permanent gravel pads and roads.

Cumulative biological consequences of oil field development that may be expected in the Arctic Refuge include:

- blocking, deflecting or disturbing wildlife
- loss of subsistence hunting opportunities
- increased predation by arctic fox, gulls and ravens on nesting birds due to introduction of garbage as a consistent food source
- alteration of natural drainage patterns, causing changes in vegetation
- deposition of alkaline dust on tundra along roads, altering vegetation over a much larger area than the actual width of the road
- local pollutant haze and acid rain from nitrogen oxides, methane and particulate matter emissions
- contamination of soil and water from fuel and oil spills

Impacts of Winter Exploration

While the exploration of oil typically occurs during the winter months when caribou and birds are absent from the 1002 Area, there are several arctic-adapted species that remain in the area during winter which would likely be affected, most notably muskoxen and polar bears, but also wolverine, arctic fox, and arctic grayling. Winter exploration could also impact the sensitive arctic tundra vegetation.

Muskoxen:

About 250 muskoxen live year-round in the 1002 area of the Arctic Refuge. They use smaller areas in winter when snow limits available habitat. In order to survive cold weather and poor forage conditions, muskoxen reduce their activity and movements in winter to conserve energy. Muskoxen give birth four to six weeks before summer forage is available. Therefore, females must maintain body fat throughout the winter to successfully rear a calf. Calf production and animal survival is

influenced by environmental conditions such as snow depth and the length of the snow season. In recent years, the number of muskox calves produced in the 1002 Area has declined.

Muskoxen respond to predators and other disturbances by moving into a defensive group from which they protect themselves with sharp horns. If groups are disturbed enough, they will run. This can result in the deaths of young calves that are left behind. Muskoxen in the 1002 Area are most frequently found along or adjacent to large rivers flowing across the coastal plain.

During petroleum exploration and development, large rivers are regularly used for gravel and water removal as well as transportation corridors. Concerns associated with oil field activities along river corridors include:

- displacement of muskoxen from preferred winter habitat
- increased energy needs related to disturbance and displacement
- decreased body condition of females
- increased incidents of predation
- decreased calf production and animal survival

Polar Bear:

Female polar bears that are going to give birth to cubs build dens in the winter. These females den on either ocean ice or on land, and those that den on land choose sites along shoreline bluffs or along steep creek banks where snow drifts early in the winter. The Arctic Refuge's coastal tundra provides the most important land denning habitat for the Beaufort Sea polar bear population.

According to studies of radio-collared polar bears of the Beaufort Sea population between 1981 and 2000, 53 dens were located on the mainland coast of Alaska and Canada. Of these 53 dens, 22 (42%) were within the Arctic Refuge's 1002 Area.

Current seismic exploration methods require numerous vehicles to move in a grid pattern across the tundra. Maternal polar bears with newborn cubs can be prematurely displaced from their winter dens by the noise, vibrations and human disturbance associated with oil exploration activities. This displacement may result in potentially fatal human-bear conflicts, and may expose the cubs to increased mortality due to harsh winter conditions for which they are not yet prepared.

Vegetation:

Seismic exploration involves sending sound waves into the ground, recording how the sound reflects back, and interpreting the results to construct an image of subsurface geology to determine if oil may be present. A seismic exploration program on Alaska's North Slope is typically a large operation with many people and vehicles driving across the tundra in a grid pattern. Although such exploration is conducted only in winter, snow cover on the 1002 Area is often shallow and uneven, providing little protection for sensitive tundra vegetation and soils. The impact from seismic vehicles and lines depends on the type of vegetation, texture and ice content of the soil, the surface shape, snow depth, and type of vehicle.

Two-dimensional (2-D) exploration was authorized by Congress in the 1002 Area in the winters of 1984 and 1985. Monitoring of more than 100 permanent plots along the 1,400 miles of seismic lines has documented that while many areas recovered, some trails had still not recovered by 1999. Some of the trails have become troughs visible from the air. Others show changes in the amount and types of tundra plants. In some areas, permafrost (permanently frozen soil) melted and the trails are wetter than they were previously.

Seismic exploration is conducted every winter on the North Slope of Alaska, west of the Refuge. New vehicle tracks and older ones in various stages of recovery are visible on the tundra in the summer. Today, 3-dimensional (3-D) seismic surveys, as conducted west of the Refuge boundary, require a much more dense grid of lines to collect all the data necessary for creating 3-D images of oil reserves. While the 1984-85 2-D trails on the Arctic Refuge were 4 miles apart, 3-D trails would be one half mile or less apart. The impact to vegetation and soils on the Refuge would likely be much greater from 3-D seismic surveys than from the 2-D seismic surveys conducted in the 1980s.

Impacts of Year-Round Oil Field Development

If winter exploration activities, including seismic surveys and drilling, find economical amounts of oil, then full-scale construction and development of oil fields might occur to produce oil and gas on a year-round basis. In addition to affecting muskoxen, polar bears and other arctic-adapted resident species, oil and gas production would likely also impact caribou and birds that migrate to the 1002 Area during the brief summer period for calving and nesting.

Caribou:

In late spring, just as the snow recedes and the tundra plants turn green, the Porcupine Caribou herd, numbering 129,000, migrates from south of the Brooks Range in the Arctic Refuge and Canada to give birth to their young on the arctic coastal tundra.

The caribou's preferred food during calving season is higher in nutrition, more digestible, and more available within the 1002 Area than in surrounding areas. To successfully reproduce, female caribou must be able to move freely throughout the 1002 Area to find adequate food resources to build up their fat reserves and milk. This allows them to produce healthy calves. Cows with newborn calves are particularly sensitive, and commonly move as much as 1.5 miles away from human disturbance. This has been well-documented in the vicinity of existing North Slope oil fields.

The Arctic Refuge's coastal tundra has been the birthing ground for the majority of Porcupine Caribou cows in all but three of the last 18 years. In those 3 years (1987, 1988 and 2000), snow remained on the tundra longer than usual, forcing the caribou to have their calves in areas farther east or inland. Calf survival was poorer in those years due to lower food nutrition and higher levels of predation.

Caribou populations naturally fluctuate in response to weather and forage conditions, and all the arctic caribou herds in North America increased under favorable conditions in the 1980s. There are fundamental differences between the calving areas of the Central Arctic and the Porcupine herds. In

the case of the Central Arctic herd, there is a greater amount of alternative calving area available for displaced cows to move to because the mountains are much farther from the ocean. The 1002 Area is only one-fifth the size of the area used by the Central Arctic caribou herd, but six times as many caribou use the 1002 Area. In the Arctic Refuge, where the mountains are close to the coast, few alternative areas would be available for displaced cows. If the 1002 Area was developed, the associated pipelines, roads, and structures would potentially impact the Porcupine Caribou herd by:

- reducing the amount and quality of preferred forage available during and after calving,
- restricting access to important coastal insect-relief habitats,
- exposing the herd to higher predation, and
- altering an ancient migratory pattern, the effects of which we can not predict.

A reduction in annual calf survival of as little as 5% would be sufficient to cause a decline in the Porcupine caribou population.

Birds:

135 species of birds are known to use the 1002 Area, including numerous shorebirds, waterfowl, loons, songbirds, and raptors. One notable example is snow geese. Large numbers of snow geese, varying from 15,000 to more than 300,000 birds, feed on the Arctic Refuge coastal tundra for three to four weeks each fall, on their way from nesting grounds on Banks Island in Canada to wintering grounds primarily in California's Central Valley. They feed on cottongrass and other plants to build up fat reserves in preparation for their journey south, eating as much as a third of their body weight every day. The rich vegetation of the coastal tundra enables them to increase fat reserves by 400% in only two to three weeks.

Snow geese feed on small patches of vegetation that are widely distributed across the Refuge's coastal tundra, so a large area is necessary to meet their needs. They are extremely sensitive to disturbance, often flying away from their feeding sites when human activities occur several miles distant.

Portioned Copy from MSNBC-Would Drilling more Alaskan Oil Cut Prices?[49]

The week's vote in the House to approve drilling for oil in the Arctic National Wildlife Refuge has several readers — including Kelly in Georgia — wondering if there's enough extra oil up there to make a difference.

How much oil is in Alaska and is it worth it?
-- Kelly J.,Statesboro, Ga.

Whenever you're talking about estimates of how much oil is in the ground, the only honest answer is: God only knows.

Oil geologists have gotten pretty good at making estimates. Even then, these analyses are hedged by including the probability that the expected amount of oil will ultimately be extracted. And even with the latest 3-D seismic data analysis (4-D, if you track underground changes over time), estimating reserves still involves plenty of guesswork.

The total volume of recoverable crude oil in the so-called coastal plain of ANWR, the last major untapped field left in Alaska (that we know of), comes to about 10.4 billion barrels, according to the Energy Department's analysis, which is based on data from the U.S. Geologic Survey.

That estimate predicts a 95-percent certainty that only 5.7 billion barrels are recoverable and a 5 percent chance there might be as much as 16 billion barrels. (These estimates cover both the oil believed to be reachable by land, as well as an offshore area within the 3-mile limit. So far, no one is proposing offshore drilling.)

So let's go with the 10.4-billion-barrel estimate. The Energy Dept. figures that, from the day final approval is granted, it would take seven to 12 years to begin producing oil. That means ANWR oil would come on stream in 2013 and peak at about 876,000 barrels per day in 2024.

How much impact will that have on oil prices? Here's where people on both sides of the ANWR debate start to play a little mischief with the numbers.

The U.S. currently uses about 21 million barrels of oil a day, about 6 million of which is produced domestically. But that domestic production is declining as older fields dry up. So adding ANWR oil won't bring an increase in U.S. oil production, it will barely make up for the lost production from declining fields. Nor will it make up for the increased demand of another 1.5 million barrels a day by 2013 — unless we figure out a way to conserve a lot more oil.
On the other hand, 10 billion barrels is a lot of crude. Drilling proponents say it amounts to something like 20 years worth of imports from Saudi Arabia. (While that sounds pretty good, it overlooks the fact that only about 10 percent of U.S. oil imports come from Saudi Arabia.) If all 10

[49] Schoen, John W. "Would Drilling More Alaskan Oil Cut Prices? - Business - Answer Desk - Msnbc.com." *Breaking News, Weather, Business, Health, Entertainment, Sports, Politics, Travel, Science, Technology, Local, US & World News - Msnbc.com.* Retrieved 26 January 2011 from http://www.msnbc.msn.com/id/12993250/ns/business-answer_desk/.

billion barrels were recovered, at 1 million barrels a day, production would last for 27 years. But that's not likely.

In any case, drilling in ANWR isn't likely to make much of a dent on the cost of crude. With global demand of some 85 million barrels a day — and rising — even an extra 1 million barrels a day wouldn't be enough to have a significant long-term impact on prices. Assuming global demand continues to grow by 2 percent a year, a million barrels a day will represent about 1 percent of overall demand by 2013.

So is it worth it? For oil companies, it would almost certainly be profitable to produce some of the oil under ANWR. And although those companies have developed ways to reduce environmental impact, production would almost certainly have some long-term impact on local wildlife and fishing. That's why ANWR was off limits to drilling in the first place. Still, it's reasonable to think that, in theory, some balance could be struck.

But there's no way drilling for oil in ANWR is going to head off the oil crunch of the next decade.

Portioned Copy from The New York Times-Shell's Alaska Oil Drilling Plan Draws New Scrutiny[50]

ANCHORAGE — An ambitious plan to drill for oil off the northwest coast of Alaska has been moving ahead despite the spill in the Gulf of Mexico, but the project is now facing new questions from federal regulators.

Led by Shell Oil, the project has not been formally halted and could still begin exploratory drilling as early as this summer in the Beaufort and Chukchi Seas.

In a letter late Thursday, the director of the United States Minerals Management Service asked the president of Shell, Marvin E. Odum, to provide more information about safety precautions for the project while the agency, part of the Interior Department, conducts an "expanded review" of permit applications "based on the Deepwater Horizon disaster."

"We request that Shell provide detailed information with respect to additional safety procedures that the company is proposing to undertake in light of the Deepwater Horizon disaster," wrote S. Elizabeth Birnbaum, the director of the Minerals Management Service.

Ms. Birnbaum asked Shell to provide the information by May 18.

In a separate statement, the Interior Department said a decision on the Alaska project and others would not be made until after the White House reviews a report on offshore drilling safety that the department is to file by May 28. Projects in California and Virginia have already been delayed.

A spokesman for Shell said the company would comply with the administration's request and try to "find new barriers and contingencies we can add to our existing plan." The spokesman, Curtis Smith, said the company still hoped to be able to drill this summer. Sue Libenson, who was executive director of the Alaska Center for the Environment during the Exxon Valdez oil spill in 1989, and has been part of a coordinated push to stop the Shell project, expressed concerned that Shell would still be able to drill this summer.

"Suspending Arctic offshore drilling is the first real test if this administration is going to be serious about taking a step back and learning something," Ms. Libenson wrote in an e-mail message.

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[50] Yardley, William. "Shell's Alaska Oil Drilling Plan Draws New Scrutiny." *The New York Times*. Web. 26 Jan. 2011. http://www.nytimes.com/2010/05/08/us/08alaska.html.

Since the gulf spill, dozens of environmental groups and several native Alaskan groups that have opposed the project for years have stepped up their efforts, writing to Interior Secretary Ken Salazar and arguing against the project in federal appeals court this week in a long-scheduled hearing. The prospect of a disastrous spill in the forbidding Arctic has been at the core of their argument.

The sites in the Beaufort and Chukchi would be dozens of miles offshore in seas that experience some of roughest storms and waves in North America. Groups opposed to the project have cited the region's constant winter darkness, ice and sheer remoteness. Native villages on the coast also worry about effects on the whale populations they hunt.

Shell fought back this week, saying that the opponents were deliberately misrepresenting the risks of the project to exploit public outrage over the gulf spill.

"Clearly no one wants to see oil in an ice environment," Pete Slaiby, vice president for Shell Alaska, said in an interview before the government raised new questions about the project. "But to suggest that it's an unworkable situation or game over is just not correct."

Shell has planned to begin exploratory drilling this summer using a ship-based drill that could begin making its way from the Philippines this month. It would be the first exploratory drilling in the area in many years. Actual oil production might not begin for another decade.

Shell and supporters of the project say it will have strict safeguards and pose fewer challenges than deep-water drilling in the gulf. Mr. Slaiby said that the sea floor was less than 150 feet deep in most of the Alaska projects, compared with 5,000 for the Deepwater Horizon, and that the shallower wells would be under less pressure.

Mr. Slaiby said a 300-foot response ship outfitted with spill-fighting tools, including booms, skimmers and dispersants, would be stationed within a one-hour trip of the drill rig. Smaller boats would also be on constant call.

The Minerals Management Service has said that nearly 27 billion barrels of oil could be produced off the Alaska coast, potentially one of the largest remaining sources of oil in the nation. Mr. Slaiby said Shell would not rush to develop the site.

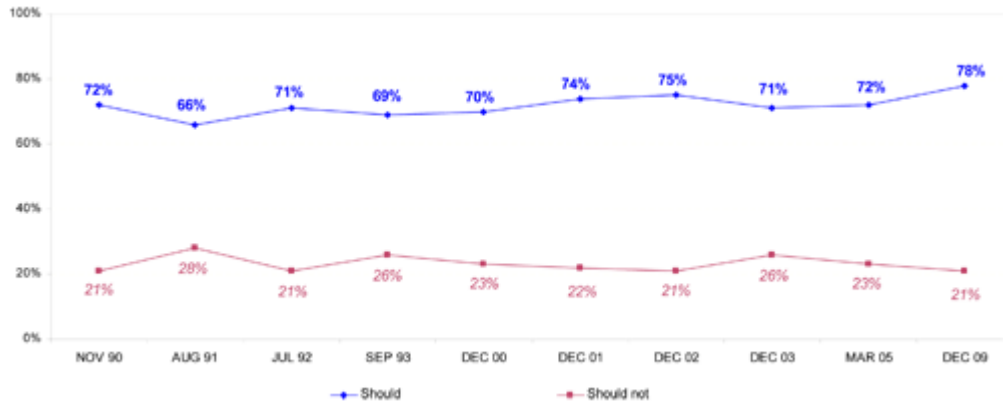
"We are patient capitalists," he said. "This is a company that's willing to take bets on energy. We like what we see out there."

Portioned Copy from ANWR-Alaskans Strongly Support ANWR Development[51]

Over 78% percent of Alaskans support exploration and production on the Coastal Plain of ANWR. Polling conducted in December 2009 by the Dittman Research Corporation shows that a vast majority of Alaskans support opening ANWR to oil and gas exploration.

Dittman's poll questioning Alaskans on various topics of interest has been conducted regularly over the years and includes the basic question,
"The Arctic National Wildlife Refuge, usually referred to as ANWR, is located on the northern edge of Alaska between Prudhoe Bay and the Canadian border. What is your opinion, do you feel oil and gas exploration should or should not be allowed in that area?"

In December 2009 the response was 78% in favor of exploration and 21% opposed. The results over the past 10 years indicate a very steady response with only minor fluctuation.



Further polls nationally have shown that once basics facts about ANWR exploration are explained to respondents, such as the fact that the only area under consideration for development is the 10-02 Area of ANWR and of this legislation limits the footprint size to 2000 acres, that nearly half of those who originally answered "opposed" change their minds. The results for Alaskans are very clear and have been for decades. That Alaskans understand exploration can be done properly and with care for the environment. Furthermore the issue in Alaska is fairly non-partisan with Democrats and Republicans supporting the issue equally. Nearly every year the Alaska State Legislature passes a resolution supporting ANWR exploration. The votes have always been nearly unanimous with only 1 or 2 legislators dissenting.
Nationally polling companies have addressed the question of ANWR only occasionally and

[51] "Arctic Power - Arctic National Wildlife Refuge - Alaskans Strongly Support ANWR Development." *Arctic Power - Arctic National Wildlife Refuge - Home*. Retrieved 26 January 2011 from http://www.anwr.org/People/Alaskans-Support-Development.php.

with mixed results often depending on the price of gasoline at the time. PEW organization completed US public opinion polls in 2008 that showed a small majority, 50%, support ANWR exploration. The issue in Congress as well as with the general American public seems very prone to partisanship with Democrats against development by a 2 to 1 margin over Republicans. This penchant for partisanship often throws logic to the weigh side on the issue skewing votes in "blind" support of a general party trend versus an actual understanding of the debate. For Alaskan politicians and representatives this causes great issue trying to move the ANWR issue during national elections.

Portioned Copy USATODAY- Time to Drill in Alaska[52]

The nation's painful but fleeting experience with $3 a gallon gasoline this summer demonstrated the need to both increase the supply of oil and curb demand for it.

The disruptions from Hurricanes Katrina and Rita also showed how domestic oil production is dangerously concentrated in the Gulf of Mexico region.

Drilling in Alaska's Arctic National Wildlife Refuge (ANWR), the largest untapped oil pool in the country is no panacea for the nation's energy problems. But it's a necessary step to augment long-term supply, one that can make the nation less vulnerable to the whims of nature and oil-producing countries.

The Senate is expected to vote as early as today on an amendment — tacked on to a $453 billion military spending bill by Sen. Ted Stevens, R-Alaska — that would allow drilling in ANWR. Ideally, after more than 20 years of debate, drilling in that refuge should rise or fall on its own merits. But, as the old saying goes, laws and sausage are two things you don't want to watch being made.

Despite the unfortunate choice of legislative vehicles, there are good reasons the Senate should vote to permit ANWR drilling, as the House of Representatives did Monday:

• ANWR has at least 6 billion and maybe 16 billion barrels of recoverable oil, U.S. Geological Survey says. It could provide 1 million barrels a day for 30 years, or about 5% of daily consumption. It wouldn't reduce gas prices next week or next year, but it would help ease the nation's long-term energy crunch.

• It could be done without wrecking the environment. Opponents claim drilling would ruin the pristine beauty of the refuge. But the experience with oil development at nearby Prudhoe Bay is encouraging. The caribou herd has flourished there, and newer technology means the environmental impact of drilling can be minimized.

Only 2,000 acres of the 19 million-acre ANWR refuge would be subject to drilling, in an area so remote that few Americans not associated with the oil industry will ever see it.

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[52] "USATODAY.com - Time to Drill in Alaska." *News, Travel, Weather, Entertainment, Sports, Technology, U.S. & World - USATODAY.com*. 20 Dec. 2005. Retrieved 26 January 2011 from http://www.usatoday.com/news/opinion/editorials/2005-12-20-our-view_x.htm.

• Drilling would have economic benefits. It could create 250,000 to 735,000 jobs nationwide, supporters say. Energy companies would pay as much as $10 billion for the rights to drill in ANWR, to be evenly split between Alaska and the federal government, according to the Congressional Budget Office.

Drilling in ANWR is no substitute for smart conservation policies, including gasoline taxes high enough to dampen demand. The nation also needs to promote alternative fuels and more energy-efficient vehicles, homes and offices.

Even so, the world's thirst for oil is outstripping the industry's ability to produce it. That imbalance has driven up energy prices and can't be fixed through conservation alone. Allowing ANWR drilling would show that the nation is finally getting serious about acting in its best interest by tapping a rich energy source and curbing its dependence on Middle Eastern dictatorships.

Now that gasoline is again closer to $2 a gallon than $3, a sense of complacency is returning. That's predictable but regrettable. Extracting more oil from Alaska in an environmentally sensitive fashion is important insurance against future energy shocks.

Portioned Copy from ANWR-It's time to support ANWR drilling[53]

America's anti-oil policies are hurting jobs, prosperity and the poor.

Political policy writer Paul Driessen of the Congress of Racial Equality and Center for the Defense of Free Enterprise writes very directly on the merits of ANWR and the nonsensical arguments of environmentalists and obstructionists in Congress against it.

Read Paul Driessen's piece below.

The budget reconciliation bill recently passed by the US Senate would finally open the Arctic National Wildlife Refuge (ANWR) to drilling. Environmentalists are "outraged," while most Democrats in the House of Representatives plan to go against their constituents' best interests by voting against drilling.

Sadly, that's to be expected. What's amazing is that a number of House Republicans are likewise saying they intend to vote to lock up ANWR'S vast energy resources. They're supposed to understand market forces and energy economics – at least better than their colleagues across the aisle. And yet they are planning to cast "nay" votes precisely when global demand for petroleum is soaring, energy prices are reaching all-time highs, and winter heating bills will make it increasingly difficult for poor people to heat and eat.

That any responsible member of Congress could vote against this energy development legislation underscores the ideological blinders worn by drilling opponents, the vast misinformation that still dictates discussions about this issue, and the refusal of elected officials even to acknowledge the cumulative effects of "environmental protection" rules enacted over many decades – much less do anything about them.

Many votes against drilling will come from California, Northeastern and Midwestern legislators who have made a career of railing against high energy prices, "obscene" oil company profits, unemployment and balance of trade deficits – while simultaneously doing everything possible to constrict supplies, increase demand and drive up prices. For instance, air quality rules – coupled with a virtual prohibition on building new nuclear plants – mean that most new electrical generating plants are gas-fired. So demand for natural gas continues to climb, while domestic supplies continue to decrease.

But these same legislators have consistently opposed natural gas (and oil) development in Alaska, off the East Coast, off the Florida coast, along the Pacific Coast, in the Great Lakes, throughout the western states, and in any other areas where petroleum might actually be found.

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[53] Power, Arctic. "Anwr.org – It's Time to Support ANWR Drilling." *Arctic Power - Arctic National Wildlife Refuge - Home.* Retrieved 02 February 2011 from http://www.anwr.org/archives/itas_time_to_support_anwr_drilling.php.

They apparently believe it's OK to drill in other countries, even in sensitive areas in other countries. It's likewise appropriate to buy crude from oil-rich dictators (especially when offered at a discount by Venezuelan despots), send American jobs and dollars overseas, reduce US royalty and tax revenues, imperil industries that depend on petroleum, and blanket habitats with "ecologically friendly" wind turbines and solar panels. However, drilling in the USA, even for natural gas, is strictly verboten.

This is truly political theater of the absurd.

ANWR, government geologists say, could hold up to 16 billion barrels of recoverable oil. That's 30 years' of imports from Saudi Arabia. Turned into gasoline, it would power California's entire vehicle fleet for some 50 years. The area's natural gas could fuel Florida, New Hampshire, New York, Pennsylvania and Wisconsin generating plants for a decade or more.

At $50 a barrel, ANWR crude would eliminate the need to import $800 billion worth of foreign oil, create up to 700,000 American jobs, and generate hundreds of billions in royalties and taxes.

Bringing this oil online would have another vital benefit. As Prudhoe Bay and nearby oil reserves decline, a point will be reached where there isn't enough to keep the Trans-Alaska Pipeline running at capacity. That would mean enormous quantities of otherwise recoverable oil will be left in the ground, instead of fueling our economy. New supplies from ANWR would ensure that our oil lifeline remains open.

But all that is irrelevant, insist environmental purists in and out of Congress. Energy development would "irreparably destroy" the refuge, they assert. Caribou droppings.

ANWR covers 19 million acres, an area equivalent to South Carolina. Of this, only 2,000 acres – scattered in small parcels across the "coastal plain" – would actually be disturbed by drilling and development, thanks to modern directional drilling technologies. That's 0.01% of the refuge, one-twentieth of Washington, DC – or 20 of the buildings Boeing uses to manufacture 747 jets!

The potentially oil-rich area is flat, treeless tundra – 3,500 miles from DC and 50 miles from the beautiful mountains seen in all the deliberately misleading anti-drilling photos. During eight months of winter, when drilling would take place, virtually no wildlife are present. Only oil field workers are crazy enough to remain outdoors when temperatures drop to minus 40 F, the tundra turns rock solid, and that chaw of tobacco they spit out freezes before it hits the ground.

However, these unforgiving conditions mean drilling can be done with ice airstrips, roads and platforms. In the spring, they'll all melt, leaving only puddles and little holes. The caribou will return – just as they have for years at the nearby Prudhoe Bay and Alpine oil fields – and do just what they always have: eat, hang out and make babies. In fact, Prudhoe's caribou herd has increased from 6,000 head in 1978 to 32,000 today. Other Arctic wildlife will also return, along with the Alaska state bird, Mosquito giganteus (which locals claim can carry off rabbits and small dogs).

Vast oil and gas potential, in a distant, mostly desolate area. Unprecedented global demand for petroleum. Soaring energy prices that hurt productivity, prosperity and the poor. Modern technological marvels that enable us to find and develop petroleum resources with no significant environmental impacts. Jobs, revenues and reduced dependence on foreign sources. Ensuring that we can recover all the oil we've already discovered along Alaska's North Slope.

The benefits are many and obvious. The negatives few. Finding and producing ANWR's oil ought to be a slam-dunk. The fact that so many congressmen (and senators) can't bring themselves to support drilling there – or anywhere else in or off our 50 states – ought to make every American question the analytical skills of the people they've sent to Washington.

Every thoughtful taxpayer and voter ought to tell their representatives: These oil and gas resources are vital to our future. It's time to end the obstruction and political posturing. It's time to drill in ANWR.

Paul Driessen is senior policy advisor for the Congress of Racial Equality and Center for the Defense of Free Enterprise.

Portioned Copy from NWF - Compare the Exxon Valdez and BP Oil Spills[54]

	BP Oil Spill	Exxon Valdez Oil Spill
Source of Oil	Deepwater Horizon oil platform - broken well pipe	Exxon Valdez oil tanker
Date Spill Began	April 20, 2010	March 24, 1989
Total Estimated Oil Spilled	An estimated 172 million gallons	10.8 million gallons
Key Wildlife Species Affected	Brown pelican, reddish egret, royal tern, snowy plover, sperm whale, bluefin tuna, sea turtle.	Salmon, sea otters, seals and sea birds.
How Many Wildlife Died?	TBD.	100,000-250,000 seabirds**;** 2,800 sea otters**;** 12 river otters**;** 300 harbor seals**;** 247 bald eagles**;** 22 orcas**;** billions of salmon and herring eggs
Long Term Effects	TBD	**Still not completely recovered after 20 years:** • Barrows Goldeneyes • Black Oystercatchers • Harlequin Ducks • Killer Whales • Sea Otters • Clams • Mussels • Sediments • Intertidal Communities **Still not Recovering after 20 years:** • Pacific Herring • Pigeon Guillemots **Human Services Still Impaired:** • Commercial Fishing • Recreation • Tourism • Subsistence
Cause of Spill	Oil well explosion	The tanker struck a reef
Leak Location	5,000 feet below the surface	Mostly on the surface

[54] "Compare the Exxon Valdez and BP Oil Spills - National Wildlife Federation." *Home - National Wildlife Federation.* Retrieved 26 January 2011 from http://www.nwf.org/Oil-Spill/Effects-On-Wildlife/Compare-Exxon-Valdez-and-BP-Oil-Spills.aspx.

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