



## PART 1: Research

### Student Directions:

#### Your Assignment:

Your city council is researching the benefits of restoring a portion of the shoreline to its original salt marsh. You have the opportunity to speak at the next city council meeting. You will prepare your speech by watching videos, reading articles, and viewing an infographic to build your understanding of this topic. You will also be able to visit a coastal wetland, either live or virtually. Then you will answer several research questions and prepare what you will say at the next city council meeting.

#### Steps to complete:

To plan and compose your speech, you will do all the following:

1. Watch two videos.
2. Read two articles and study one infographic.
3. Answer three questions about the sources.
4. Investigate a coastal wetland.
5. Plan, compose and deliver your speech.

#### Directions for beginning:

Watch the videos, read the articles, and study the infographic. Take notes to help you answer the research questions and to help plan your speech. You can watch the video and read the sources as often as you like.

### Source Information

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**Video #1:** *Blue Carbon- A Story from the Snohomish Estuary* (5:47)  
[https://www.youtube.com/watch?v=Vzn5XO\\_GYL0&t=8s](https://www.youtube.com/watch?v=Vzn5XO_GYL0&t=8s)

**Video #2:** *Why Wetlands are Nature's Super Systems* (2:07)  
<https://www.youtube.com/watch?v=8Mm2tMlcEYE>

**Article #1:** *Blue Carbon and Wetlands* by Adelia Ritchie, Salish Magazine Autumn 2020. Adapted and reprinted from  
<https://salishmagazine.org/blue-carbon/>

**Article #2:** *Wetlands and Habitat Loss* by Elaine Mao - Reprinted with permission from Readworks.org. <https://www.readworks.org/article/Wetlands-and-Habitat-Loss/be342287-efca-48ee-a982-1a2b0eb5738e#!articleTab:content/>. Additional digital reading supports available online.

**Infographic #1:** *Coastal Blue Carbon*: Reprinted from  
<https://www.earthcorps.org/key-initiatives/blue-carbon/>



Task: **Blue Carbon & Wetlands (Grades 7-8)**



**NOTE TAKING TOOL**

	<i>What are the benefits of wetlands?</i>	<i>What is blue carbon?</i>	<i>How can wetlands mitigate or help people adapt to a changing climate?</i>
<b>Video #1:</b> <i>Blue Carbon- A Story from the Snohomish Estuary</i>			
<b>Video #2:</b> <i>Why Wetlands are Nature's Super Systems</i>			



**NOTE TAKING TOOL**

	<i>What are the benefits of wetlands?</i>	<i>What is blue carbon?</i>	<i>How can wetlands mitigate or help people adapt to a changing climate?</i>
<b>Article #1:</b> <i>Blue Carbon and Wetlands</i>			
<b>Article #2:</b> <i>Wetlands and Habitat Loss</i>			
<b>Infographic #1:</b> <i>Coastal Blue Carbon</i>			



**Article #1:** *Blue Carbon and Wetlands* by Adelia Ritchie, Salish Magazine Autumn 2020.

<https://salishmagazine.org/blue-carbon/>

A wetlands system isn't just another lovely place for a nature walk. Wetland ecosystems protect us from storms and floods. They provide important nursery grounds for fish and other sea life. Wetlands are among the most productive communities in the world, just like rain forests and coral reefs. A huge variety of microbes, plants, insects, amphibians, reptiles, birds, fish, and mammals) live in our local wetland ecosystems. And wetlands can even show the history of earthquakes and tidal waves in their sediments.

We also know that wetlands provide another important service, isolating and storing carbon from the atmosphere. Therefore, they are a very important piece of the solution to worldwide climate change.

"Blue carbon" is a term for carbon dioxide that is taken and held from the atmosphere by the world's ocean and coastal ecosystems. It is stored in the form of biomass and sediments. We now know that human activities give off carbon dioxide, which is a **greenhouse gas** when it enters the atmosphere. The good news is that our oceans and coastal wetlands provide a natural way of reducing the effect of these gases on our climate through *sequestration* (or capturing) of this carbon.

Sea grasses, mud flats, kelp, and tidal marshes along our coast capture and hold carbon, acting as a carbon sink. These coastal systems, though much smaller in size, sequester this carbon at a much faster rate than rain forests. And, can continue to do so for millions of years. Most of the carbon taken up by these wetlands is stored below ground where we can't see it, but it is still there locked safely away.

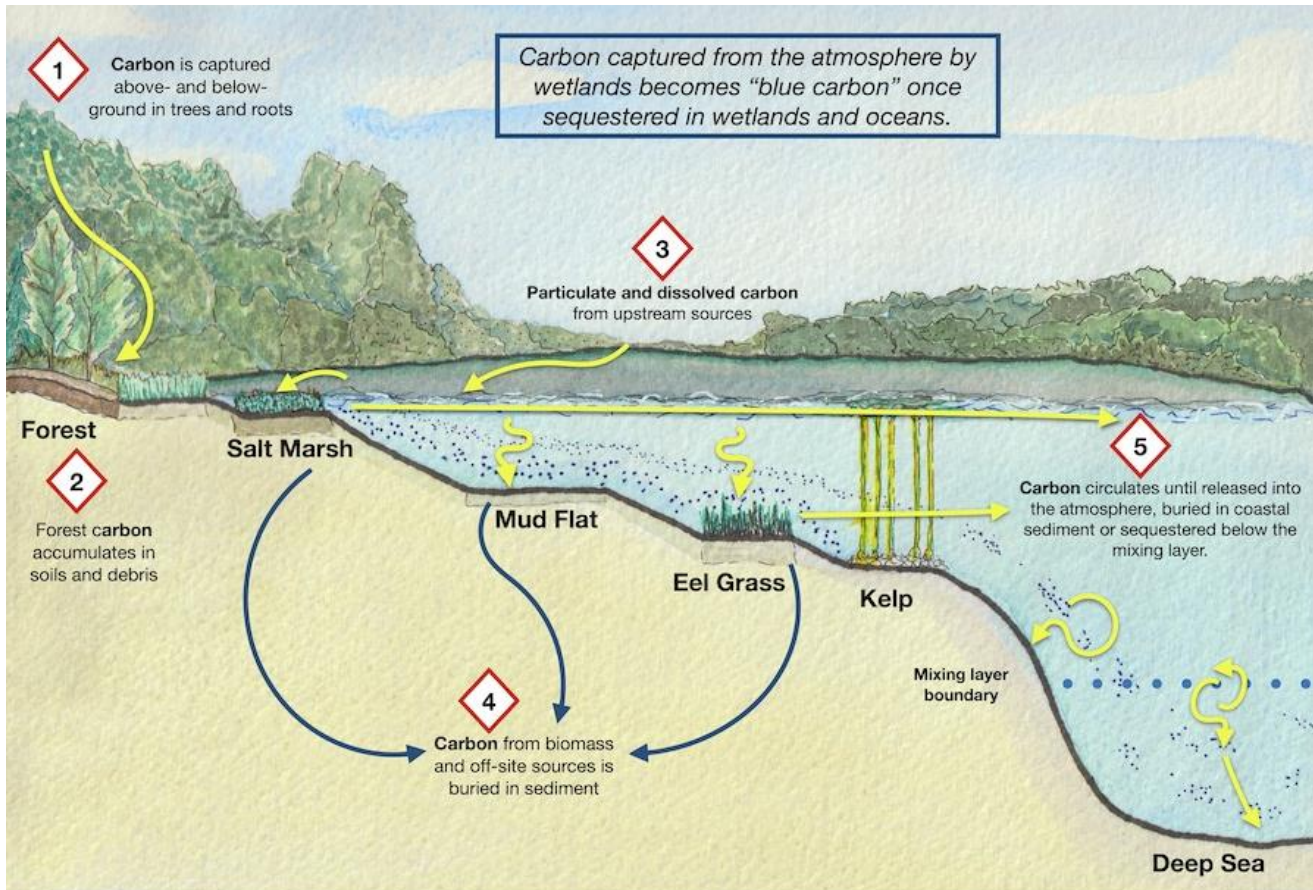
#### **What is a "greenhouse gas"?**

Our atmosphere contains so-called "greenhouse" gases - carbon dioxide, methane (natural gas), nitrous oxide and ozone. Each acts just like the glass walls of a land-based greenhouse. It lets light and heat in, but it traps and holds the heat. Without any greenhouse gases, it would be freezing on our planet! With just the right amount of greenhouse gases, we are in the "Goldilocks zone" where life has evolved for millions of years. However, when too much carbon dioxide is allowed to escape into the atmosphere, the planet warms, ice caps melt, plant and animal life begins to suffer, and eventually, if left unchecked, life on Earth would be in very big trouble.



Task:

# Blue Carbon & Wetlands (Grades 7-8)



Let's talk about the basics of carbon capture.



Referring to the illustration above, the entire process begins in upland forests and other upstream sources. The plants grab carbon from the atmosphere during photosynthesis, and carbon in the water upstream flows downstream.



All those dead leaves, needles, and branches that you walk on during your forest walks are in the process of becoming deep ocean sediments! As trees, shrubs, and animals die, the carbon compounds in their leaves and bodies decompose and return to the earth. There, the rains wash them downhill to rivers and streams, stopping in wetlands along the way.



Eventually, this "recycled" carbon reaches marshes and estuaries, becoming food for other creatures. Over time, this carbon-containing biomass reaches the deep blue sea, where it is held safely away for a very long time.

Consider for a moment how this would be different if the trees in the upland forest had burned instead of living out their natural lives. Instead of being used and reused and stored safely away at the bottom of the sea, the carbon in those trees would have gone directly into the atmosphere. That would add to the greenhouse effect and continue to overheat our planet!





**Article #2:** *Wetlands and Habitat Loss* - Reprinted with permission from Readworks.org.  
<https://www.readworks.org/article/Wetlands-and-Habitat-Loss/be342287-efca-48ee-a982-1a2b0eb5738e#!articleTab:content/>. Additional digital reading supports available online.

## Wetlands and Habitat Loss



What image comes to mind when you think of a swamp? How about a marsh or a bog? Chances are you had a similar image in your mind for all of these. That's because these are, in fact, very similar environments. In everyday use, it is common to use these terms interchangeably, and while there are minute differences among the three land areas, they all belong to the same general category: wetlands.

A wetland is an area of land that is filled or covered with water for at least part of the year. Wetlands are neither completely dry nor completely underwater. They are known as “**transition** zones” because they are the link between water and land, and they have a unique combination of the characteristics of both. The special characteristics of these “**transition** zones” enable them to support plant and animal life not found anywhere else. A common nickname for wetlands is “nurseries of life.”

Chances are, however, when you envisioned a swamp (or a marsh or a bog), you conjured up an image of a rather unpleasant place: creepy and shadowy, muddy, overrun with snakes and insects. Would it ever occur to you that this could be the kind of place we would want to save and **preserve**? Probably not.

Wetlands have historically been regarded as wastelands and centers of disease and insect infestation, and humans have sought to avoid or eliminate them when possible. Since the 18th



**Task: Blue Carbon & Wetlands (Grades 7-8)**



century, more than half of the original wetlands in the United States have been degraded or destroyed. In the 19th century, there was a massive push to drain the wetlands, which harbored malaria-bearing mosquitoes, after a series of yellow fever epidemics. Since then, further destruction has occurred as a result of human activities, such as agriculture, industrialization, and development. Wetlands have been drained and converted to farmland, filled in to provide more opportunities for residential and industrial development, or used as dumping grounds for waste. Other human activities, such as pollution, while not directly targeted at eliminating wetlands, have also played a role in the process.

However, in recent decades, attitudes about wetlands have changed. People have begun to realize that wetlands are valuable and productive ecosystems that fulfill an essential function for both humans and wildlife. Due to their unique characteristics, wetlands can support a wide diversity of plants, mammals, reptiles, birds, and fish. They also control floodwaters and protect us from storms and hurricanes. Wetlands also improve water quality by filtering, cleaning and storing water. Lastly, many people rely on wetlands for their livelihood, as they are important centers for hunting, fishing and recreation.

The state of Louisiana, in the United States, relies heavily on wetlands, and is one of the regions of the country that has been most adversely affected by wetlands destruction. Southern Louisiana has some of the most extensive wetlands in the United States, containing approximately 40 percent of the country's total wetlands area. This is because Louisiana is located at the drainage gateway where the Mississippi River meets the Gulf of Mexico. Much of the region's economy and culture is built around the wetlands. However, Louisiana's wetlands are quickly disappearing. Although the state has only 40 percent of the country's wetlands, it also bears 80 percent of the country's wetland losses. Every 38 minutes, the equivalent of a football field is lost. This has serious implications for the region's wildlife and economy, as well as the ability of the region to withstand natural disasters.

The Louisiana wetlands are home to a variety of animals, including alligators, snakes, turtles, coyotes, muskrats, armadillos, pelicans and egrets, among others. The wetlands are a crucial resource for many endangered species. In fact, more than one-third of the United States' threatened and endangered species live only in wetlands, and more than one-half use the wetlands at some point in their lives for breeding, nesting or raising their young. Many species of migratory birds depend on the wetlands and would go extinct if the wetlands were destroyed.



**Task: Blue Carbon & Wetlands (Grades 7-8)**



The wetlands are also essential to the state’s fishing industry, providing a habitat for fish, shrimp, oysters and crabs. As of 2013, Louisiana’s commercial fishing industry is responsible for 25 percent of all seafood produced in the United States, with the highest production of shrimp, oysters and freshwater fish in the nation. Approximately one in every 70 jobs in the state is related to the fishing industry. The destruction of the wetlands would have disastrous consequences for the economy of the area and the livelihoods of many of Louisiana’s residents.

In addition to endangering the wildlife and economic prosperity of an area, the loss of wetlands also puts humans at risk. Wetlands serve as a natural **buffer** zone against storms and hurricanes, slowing down the storms and reducing their force before they move inland. However, as the wetlands disappear, some cities are becoming more exposed.

The city of New Orleans, Louisiana, has already suffered the consequences of this gradual depletion of wetland **buffer** zones. In 2005, Hurricane Katrina, one of the deadliest and most destructive hurricanes in the entire history of the United States, hit the Gulf Coast. There were more than 1,800 casualties, with the greatest number of them concentrated in New Orleans. Eighty percent of the city was flooded, and there were more than 700 dead. Many blamed the destruction of New Orleans on the failure of the levees, which are manmade barriers that prevent water from flooding into a city. However, scientists and researchers believe that the hurricane would have done far less damage to the city if the surrounding wetlands had been intact. Since the storm, there has been a greater national focus on **preserving** and restoring the wetlands on the Gulf Coast. **Preserving** our wetlands and maintaining a **buffer** zone against storms will only become more crucial in the future, as climate change may increase both the frequency and the severity of extreme weather events such as hurricanes.

In recent decades, since the importance of wetlands became apparent, there has been a push toward better education and regulation. The U.S. Environmental Protection Agency (E.P.A.) has declared the month of May to be American Wetlands Month, which is dedicated to celebrating the ways in which wetlands enrich our lives and the environment.

Regulation has also been an important tool in the fight against wetlands loss. Since 1998, the United States has maintained a “no net loss” wetlands policy. This means that the total area of wetlands in the country must either remain constant or increase. If wetlands are destroyed for agriculture, development, or any other reason, the effect must be balanced out by restoring or reclaiming wetlands elsewhere. The policy has had a dramatic effect in slowing the rate of wetlands loss.





**Infographic #1: Coastal Blue Carbon.**

Reprinted from <https://www.earthcorps.org/key-initiatives/blue-carbon/>

# COASTAL BLUE CARBON

An investment in wetland restoration supports many important benefits, including *carbon capture*, improved water quality, critical marine habitat, and increased resiliency through storm and flood protection.

**Healthy coastal wetlands BUILD UP SOIL** by taking up carbon and storing it in plants and in the ground.

**BLUE CARBON** is the ability of tidal wetland and sea grass habitats to capture and store CO<sub>2</sub> and other greenhouse gases from the atmosphere.

**Coastal wetlands...**

- Globally store **84-233M TONS** of carbon every year
- Bury carbon in the ground at rates **10x GREATER** than forests
- Capture carbon at rates **2-4x GREATER** than forests on a per area basis

**The U.S. is losing coastal wetlands faster than we are restoring them.**

- The U.S. lost **80,000 ACRES** of coastal wetlands per year between 2004 and 2009
- Losing **2.5 ACRES** of coastal wetlands releases the same amount of carbon as
- Losing **25-100 ACRES** of native forest

**If the entire Snohomish Estuary in Puget Sound, WA is restored...**

- 8.9M TONS** of CO<sub>2</sub> will be captured over the next 100 years
- offsetting **900M** gallons of gas
- or **1.7M** cars for a year
- or Power for **860,000** homes for a year

**BLUECARBON.US**

Wetland restoration offers a place-based approach to addressing rising atmospheric carbon levels while also providing many benefits for fish, wildlife and the local community.



**Research Questions for Part 1**

Use your remaining time to answer the questions below. Your answers to these questions will be scored. Also, they will help you think about the sources you have read and viewed, which will help you prepare for your speech. You may refer to the sources and notes when it would be helpful. Answer the questions in the spaces provided below them using information from the sources.

- 1. Question 1.** Describe three ways wetlands benefit people? Be sure to name your sources. (*Claim 4, Target 2*)

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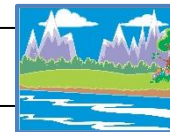
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Task: **Blue Carbon & Wetlands (Grades 7-8)**



2. **Question 2.** Which source is best for learning about blue carbon? Consider both videos, articles, and the infographic. Explain your answer using evidence from the sources. (*Claim 4, Target 3*)

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**Task: Blue Carbon & Wetlands (Grades 7-8)**



3. **Question 3.** Explain wetlands abilities to mitigate or allow people to adapt to a changing climate. Use information from the readings and video in your answer. Be sure to cite your sources. (*Claim 4, Target 4*)

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Task: **Blue Carbon & Wetlands (Grades 7-8)**

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## **PART 2: Field Investigation**

Arrange for students to visit a coastal wetland. If possible, invite career professionals related to the wetlands, such as wetlands specialists, shoreline planners, etc.

If not possible to visit a wetland, have students take a virtual tour. For example, Great Lakes Now Virtual Field Trip <https://www.youtube.com/watch?v=tX-OvA22MAI>

### **Post-visit Questions for Discussion:**

1. What observations supported the information from the video and articles?
2. What additional information did you gain from visiting a real coastal wetland?
3. What pictures did you decide to take and why?
4. What do you think are the most important benefits of the wetlands you visited?





Task: **Blue Carbon & Wetlands (Grades 7-8)**



**Student Directions:** Record observations. Take pictures that you might use to support your presentation to the city council.

Characteristic	My Observations
<b>Land and Water</b>	
<b>Plants</b>	
<b>Animals</b>	
<b>Human Use and Impact</b>	



### **PART 3: SPEECH**

#### **Student Directions:**

You will now have time to compose and deliver your speech. While you may use your notes and refer to your sources, you must work on your own. You may use your notes from the sources and your data from the field experience. You may also refer to the sources. Read your assignment and the information about how your speech will be scored, then begin your work.

#### **Your Assignment:**

Your city council is researching the benefits of restoring a portion of the shoreline to its original salt marsh. You have the opportunity to speak at the next city council meeting. You will prepare your speech by watching videos, reading articles, and viewing an infographic to build your understanding of this topic. You will also be able to visit a coastal wetland, either live or virtually. Then you will answer several research questions and prepare what you will say at the next city council meeting.

#### **How your speech will be scored:**

*Your speech will be scored on the following criteria:*

- 1. Focus-** How well your speech clearly introduces and communicates your ideas.
- 2. Organization-** How well the ideas flow from the opening to the conclusion and how well you stay on topic throughout the speech.
- 3. Elaboration of Evidence-** How well you use sources, facts, pictures, and details as evidence.
- 4. Language and Vocabulary-** How well you effectively express ideas using precise language that is appropriate for your audience and purpose.
- 5. Presentation-** How well your speech is presented, including eye contact, pronunciation, and awareness of audience and the use of visual/graphics/audio enhancements appropriate to your message.

#### **Now begin work on your speech.**

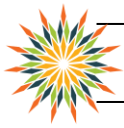
Manage your time carefully so that you can:

1. Review your notes and data
2. Plan your speech using evidence to support your ideas
3. Write your speech
4. Edit and revise your speech



**SPEECH PLANNING TOOL**

<b>Speech Components</b>
Introduction: Capture the audience's attention.
How do wetlands benefit people?
How do wetlands benefit the environment?
How can wetlands mitigate climate change?
Closing:



**SCORING VERSION**

<b>4 – Point Speech Rubric (Grades 3-11)</b>				
<b>Score</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>
<b>Focus</b>	The speech is consistently and purposefully focused: <ul style="list-style-type: none"> <li>controlling idea, opinion, or claim is clearly stated and strongly maintained</li> <li>controlling idea, opinion or claim is introduced and communicated clearly within the context</li> </ul>	The speech is adequately and generally focused: <ul style="list-style-type: none"> <li>controlling idea, opinion, or claim is clear and for the most part maintained though some loosely related material may be present</li> <li>some context for the controlling idea, opinion, or claim</li> </ul>	The speech is somewhat unclear and unfocused: <ul style="list-style-type: none"> <li>controlling idea, opinion, or claim is for the most part maintained though there may be a minor drift</li> <li>controlling idea, opinion, or claim may be lacking an appropriate context</li> </ul>	The speech is unclear and unfocused: <ul style="list-style-type: none"> <li>controlling idea, opinion, or claim may have a major drift</li> <li>controlling idea, opinion, or claim may be confusing or ambiguous</li> </ul>
<b>Organization</b>	The speech has a clear and effective organizational structure helping create unity and completeness: <ul style="list-style-type: none"> <li>employs a strong opening and logical progression of ideas</li> <li>effective introduction and conclusion for audience and purpose</li> </ul>	The speech has an evident organizational structure and a sense of completeness, though some ideas may be loosely connected: <ul style="list-style-type: none"> <li>adequate use of transitional strategies with some variety</li> <li>ideas progress from beginning to end</li> <li>introduction and conclusion are adequate</li> <li>adequate, if slightly inconsistent, connection among ideas</li> </ul>	The speech has an inconsistent organizational structure: <ul style="list-style-type: none"> <li>inconsistent use of transitional strategies with little variety</li> <li>ideas progress unevenly from beginning to end</li> <li>introduction and conclusion, if present, any be weak</li> <li>weak connection among ideas</li> </ul>	The speech has little or no discernible organizational structure: <ul style="list-style-type: none"> <li>few or no transitional strategies are evident</li> <li>frequent extraneous ideas may intrude</li> </ul>
<b>Elaboration of Evidence</b>	The speech provided thorough and convincing support/evidence for the writer’s controlling idea, opinion, or claim that includes the effective use of sources, facts, and details: <ul style="list-style-type: none"> <li>use of evidence from sources is smoothly integrated</li> </ul>	The speech provides adequate support/evidence for the writer’s controlling idea, opinion, or claim that includes the use of sources, facts, and details: <ul style="list-style-type: none"> <li>some evidence from sources is smoothly integrated though may be general or imprecise</li> </ul>	The response provides uneven, cursory support/evidence for the writer’s controlling idea, opinion, or claim that includes partial or superficial use of sources, facts, and details: <ul style="list-style-type: none"> <li>evidence from sources is weakly integrated</li> </ul>	The speech provides minimal support/evidence for the writer’s controlling idea, opinion, or claim that includes little or no use of sources, facts, or details: <ul style="list-style-type: none"> <li>use of evidence from the source material is minimal, absent, in error, or irrelevant</li> </ul>
<b>Language and Vocabulary</b>	The speech clearly and effectively expresses ideas: <ul style="list-style-type: none"> <li>use of precise language (including academic and domain-specific language)</li> <li>consistent use of syntax and discourse appropriate to the audience and purpose</li> </ul>	The speech adequately expresses ideas employing a mix of precise with more general language: <ul style="list-style-type: none"> <li>use of use of academic and domain-specific language is adequate</li> <li>use of syntax and discourse generally appropriate to the audience and purpose</li> </ul>	The speech inconsistently expresses ideas employing simplistic language: <ul style="list-style-type: none"> <li>use of domain-specific insufficient use of academic and domain-specific language</li> <li>use of syntax and discourse may at times be inappropriate to the audience and purpose</li> </ul>	The speech expresses vague ideas, lacks clarity, or is confusing: <ul style="list-style-type: none"> <li>uses limited language or domain-specific vocabulary</li> <li>rudimentary use of syntax and discourse inappropriate for the audience and purpose</li> </ul>
<b>Presentation</b>	The speech is clearly and smoothly presented: <ul style="list-style-type: none"> <li>use of effective eye contact and volume with clear pronunciation</li> <li>understandable pace adapted to the audience</li> <li>consistently aware of audience’s engagement</li> <li>use of strong visual/ graphics/ audio enhancement, when appropriate, to effectively clarify message.</li> </ul>	The speech is adequately presented with minor flaws: <ul style="list-style-type: none"> <li>appropriate use of eye contact volume, and pronunciation</li> <li>generally understandable pace adapted to the audience</li> <li>sufficiently aware of audience’s engagement</li> <li>sufficient use of visual/graphics/audio enhancements, when appropriate, to clarify message</li> </ul>	The speech is unevenly presented with evident flaws: <ul style="list-style-type: none"> <li>inconsistent use of eye contact, volume, and pronunciation</li> <li>pace partially adapted to the audience</li> <li>partially aware of audience’s engagement</li> <li>sufficient use of visual/graphics/ audio enhancement, when appropriate, to clarify message</li> </ul>	The speech is presented with serious flaws that obscure meaning: <ul style="list-style-type: none"> <li>infrequent eye contact, and inappropriate volume and pronunciation</li> <li>pace not adapted to the audience</li> <li>little or no sense of audience’s engagement</li> </ul>

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