# Arctic Region Becomes Major Carbon Emitter

## Description

Expansive regions within one of Earth's most significant carbon sinks are now emitting carbon dioxide ($CO_2$) rather than sequestering it. Recent research conducted by an international team, spearheaded by scientists from the Woodwell Climate Research Center in Massachusetts, reveals that over a third of the Arctic-Boreal Zone (ABZ)—comprising tundra, forests, and wetlands encircling the Arctic Circle—has transitioned to a net carbon source.

This alarming shift is also evident in certain areas of the Amazon Rainforest. While the ABZ continues to be classified as a carbon sink overall, a historic role it has played for millennia, the escalating global temperatures threaten to destabilize crucial ecosystems, underscoring the necessity of rigorous monitoring to assess their condition.

“Although our findings indicate that many northern ecosystems still function as sinks for carbon dioxide, regions that are sources of emissions, coupled with the prevalence of wildfires, are significantly undermining the net carbon uptake and reversing trends established over long periods,” explains ecologist Anna Virkkala from Woodwell Climate.



Arctic-Boreal Region
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Diverse regions of the Arctic-Boreal area function variably as carbon sinks and sources. (Greg Fiske/Woodwell Climate Research Center)

A key component of this dynamic is wildfire activity; the researchers found that wildfires are not only growing more frequent but also increasingly impactful in the ABZ. While wildfires are considered, it becomes evident that 40 percent of the ABZ emitted more $CO_2$ than it absorbed from 2001 to 2020, in contrast to 34 percent when excluding wildfire impacts.

The data, derived from meticulous compilation from 200 carbon monitoring stations within the ABC Flux network, underpin the findings. Seasonal variations are notable; during summer, the ABZ’s carbon sink capabilities peak due to enhanced vegetation and photosynthesis, whereas winter temperatures, which are atypically warm, expose more soil and organic matter, leading to increased $CO_2$ release.

“This variability is not unexpected as the Arctic encompasses vast areas with diverse climatic conditions and ecosystems,” remarks ecologist Sue Natali from Woodwell Climate. “We now possess the means to meticulously track and map carbon processes, providing insights into ground-level phenomena.”

Research conducted between 1990 and 2020 indicates a general strengthening of the ABZ’s role as a carbon sink, yet persistent hotspots, particularly in tundra ecosystems, show a contrary trend, a finding corroborated by previous studies. Nearly half of the planet's soil-stored carbon is believed to reside in this region.

To comprehensively understand the ongoing transformations on our planet, it is imperative to monitor how various components of the ABZ function throughout the year and how a warming, rejuvenated Arctic may contribute to shifts in global atmospheric conditions.

“Collaborative efforts of this magnitude are essential for grasping the implications of altered seasonal dynamics and disturbance patterns, which may have repercussions at both regional and global scales,” states ecologist Marguerite Mauritz from the University of Texas-El Paso. The findings have been published in *Nature Climate Change*.

## Vocabulary List:

1. **Sequestering** /sɪˈkwɛstərɪŋ/ (verb): To isolate or hide away often in reference to carbon being stored.
2. **Emitting** /ɪˈmɪtɪŋ/ (verb): To release or give off particularly referring to gases like carbon dioxide.
3. **Ecosystems** /ˈiːkoʊˌsɪstəmz/ (noun): Communities of living organisms and their physical environment interacting as a system.
4. **Destabilize** /ˌdiːˈsteɪbəlˌaɪz/ (verb): To make an environment or system unstable or to disrupt its equilibrium.
5. **Variability** /ˌvɛrɪəˈbɪlɪti/ (noun): The quality of being subject to change or variation.
6. **Monitoring** /ˈmɒnɪtərɪŋ/ (noun): The act of observing and checking the progress or quality of something over time.



## Comprehension Questions

### Multiple Choice

1. What is the main focus of the recent research conducted by an international team led by scientists from the Woodwell Climate Research Center?

Option: Emission of carbon dioxide in expansive regions
Option: Impact of wildfires on Arctic-Boreal Zone
Option: Carbon sequestration in the Amazon Rainforest
Option: Role of tundra in global carbon sink

2. Which region of the Earth is identified as transitioning to a net carbon source by the recent research findings?

Option: Arctic-Boreal Zone
Option: Amazon Rainforest
Option: Antarctic Peninsula

Option: Sahara Desert

3. What percentage of the Arctic-Boreal Zone emitted more CO2 than it absorbed from 2001 to 2020, including wildfire impacts?

Option: 34%
Option: 40%
Option: 50%
Option: 25%

4. According to ecologist Anna Virkkala, what factor is significantly undermining the net carbon uptake in certain regions?

Option: Global temperature stabilization
Option: Prevalence of wildfires
Option: Enhanced vegetation
Option: Decreased carbon emissions

5. Which season witnesses the peak carbon sink capabilities in the Arctic-Boreal Zone due to enhanced vegetation and photosynthesis?

Option: Spring
Option: Summer
Option: Autumn
Option: Winter



6. What key component of the dynamic in the Arctic-Boreal Zone is responsible for emitting more CO2 and impacting the carbon sink capabilities?

Option: Deforestation
Option: Wildfire activity
Option: Industrial pollution
Option: Soil erosion

**True-False**

7. Rigorous monitoring to assess the condition of ecosystems is deemed unnecessary by researchers.

8. The ABZ continues to function solely as a carbon sink without any transition to becoming a carbon source.

9. Nearly half of the planet’s soil-stored carbon is believed to be found in the tundra ecosystems of the Arctic-Boreal Zone.

10. Summer temperatures in the ABZ lead to increased CO2 release due to decreased vegetation.

11. Wildfires are considered factors exacerbating the emission of CO2 in the ABZ.

12. The recent research findings suggest a general weakening of the ABZ's role as a carbon sink.

**Gap-Fill**

16. Nearly _____ percent of the ABZ emitted more CO2 than it absorbed from 2001 to 2020, when excluding wildfire impacts, as stated in the research conducted by an international team.

17. The data derived from meticulous compilation from _____ carbon monitoring stations within the ABC Flux network underpin the research findings on the ABZ as a carbon sink.



## Answer

**Multiple Choice:** 1. Emission of carbon dioxide in expansive regions 2. Arctic-Boreal Zone 3. 40% 4. Prevalence of wildfires 5. Summer 6. Wildfire activity
**True-False:** 7. False 8. False 9. True 10. False 11. True 12. False
**Gap-Fill:** 16. 34 17. 200

## Vocabulary quizzes

**Multiple Choice ( Select the Correct answer for each question. )**

1. Which word means to explain something clearly?

Option: Anomaly
Option: Elucidated
Option: Resurgence
Option: Vulnerability

2. Which word refers to isolating or hiding something?

Option: Ecosystem
Option: Sequestering
Option: Formulation
Option: Hydration

3. Which word describes something that is important or meaningful?

Option: Insights
Option: Significant
Option: Destabilize
Option: Syndrome

4. Which word represents the ability to change or vary?

Option: Resurgence
Option: Variability
Option: Monitoring
Option: Energizing

5. Which word means to release or give off something?

Option: Complications
Option: Emitting
Option: Sustainable
Option: Radiance



6. Which word denotes taking action against something harmful?

Option: Alleviation
Option: Vulnerability
Option: Resurgence
Option: Combating

7. Which word means to refill or renew something?

Option: Ecosystem
Option: Resurgence
Option: Replenish
Option: Overgrazing

8. Which word describes the act of making something unstable?

Option: Syndrome
Option: Destabilize
Option: Monitoring
Option: Vulnerability

9. Which word refers to observing or checking something over time?

Option: Radiance

Option: Monitoring
Option: Sustainable
Option: Electrolytes

10. Which word relates to maintaining something for the long term?

Option: Insufficient
Option: Ecosystems
Option: Sustainable
Option: Hydration

**Gap-Fill ( Fill in the blanks with the correct word from the vocabulary list. )**

11. Her smile was so bright; it lit up the room with _____.

12. The doctor diagnosed the patient with a rare _____ that required specialized treatment.

13. The children huddled together aware of their _____ in the storm.

14. The researcher gained valuable _____ into the behavior of the endangered species.

15. The fields suffered from _____ by livestock leading to soil erosion.

16. The marine _____ was rich with diverse marine life.

17. The surgery was successful but there were unexpected _____ during recovery.

18. Adequate _____ is essential for maintaining good health especially in hot weather.

19. The community showed remarkable _____ in rebuilding after the natural disaster.

20. The team worked on a new drug _____ to combat the infectious disease.

**Matching Sentences ( Match each definition to the correct word from the vocabulary list. )**

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| 21. The sudden drop in temperature was considered an in the weather pattern. |
| 22. The region is known for its rich soil due to the area being active. |
| 23. Her generous donation brought much-needed to the struggling community. |

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| 24. The water supply was to meet the needs of the growing population. |
| 25. The political unrest threatened to the fragile peace in the region. |
| 26. There has been a noticeable in interest for traditional crafts in recent years. |
| 27. The lively music had an effect on the crowd lifting their spirits. |
| 28. Sports drinks contain to help replenish nutrients lost during exercise. |
| 29. The outbreak of a new prompted health officials to take immediate action. |
| 30. The rainforest a vast array of plant and animal species. |

## Answer

**Multiple Choice:** 1. Elucidated 2. Sequestering 3. Significant 4. Variability 5. Emitting 6. Combating 7. Replenish 8. Destabilize 9. Monitoring 10. Sustainable
**Gap-Fill:** 11. Radiance 12. Syndrome 13. Vulnerability 14. Insights 15. Overgrazing 16. Ecosystem 17. Complications 18. Hydration 19. Resilience 20. Formulation
**Matching sentence:** 1. Anomaly 2. Volcanically 3. Alleviation 4. Insufficient 5. Destabilize 6. Resurgence 7. Energizing 8. Electrolytes 9. Disease 10. Sustains



### CATEGORY

1. Sci/Tech - LEVEL5

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