

**"Hope is the active engagement with  
uncertainty and the possibilities it holds"**

**—Rebecca Solnit**

# Thinking Like a Spruce









HOTSPOT  
BIG-I

ORDER HERE

OPEN

Peterbilt

SARGASM

Arctic Circle 60  
Coldfoot 120

HOTSPOT



**FARTHEST NORTH  
SPRUCE TREE**  
ON THE ALASKAN PIPELINE  
DO NOT CUT









Coldfoot 240  
Fairbanks 494

NEXT SERVICES  
240 MILES

James W. Dalton  
Highway

SPEED  
LIMIT  
50

SOUTH

DRIVE  
WITH  
LIGHTS

BUCKLE  
UP FOR  
SAFETY



## Framework for Ecological Monitoring on Lands of the Alaska National Wildlife Refuges and Their Partners



Open-File Report 2010–1300



White Spruce Seedling (*Picea glauca*) Discovered North of the Brooks Range along Alaska's Dalton Highway

WINNY K. ELSNER and JANET C. KRUGERSON<sup>1</sup>

Received 13 Mar 2008; accepted in revised form 13 Mar 2008

**ABSTRACT.** A white spruce seedling, *Picea glauca* (Mill.) B.S.P., was found at the southern edge of the Brooks Range in Alaska, more than 50 km north of the latitudinal tree line. The seedling, 19 cm tall and about nine years old, was growing at the side of the Dalton Highway in Prudhoe Bay. It most likely originated from a seed transported across the Brooks Range in a vehicle and has survived on the well-drained gravel road berm, where site conditions are more favorable for germination and survival than in the surrounding tundra. This spruce has survived for about a decade under current climatic conditions. Even with a warming climate, natural seed dispersal is severely hampered by the rugged topographic barrier of the Brooks Range. Considering the amount of white traffic on the Dalton Highway, however, it is likely that more pioneering spruce seedlings will travel along this corridor. Once over the Brooks Range, a spruce population may potentially develop and expand.

**Key words:** boreal forest, Brooks Range, forest-tundra, tree line, white spruce

**RÉSUMÉ.** Un plant d'épave blanche, *Picea glauca* (Mill.) B.S.P., a été trouvé du côté nord de la chaîne de Brooks en Alaska, plus de 50 kilomètres au nord de la limite forestière latitudinale. Le plant de 19 centimètres de hauteur a environ neuf ans et pousse au bord de l'autoroute de Dalton, vers la baie Prudhoe. Il est vraisemblablement le fruit d'une graine transportée par un véhicule à travers la chaîne de Brooks. Il a survécu sur la berge de la route de gravier bien drainée, où les conditions sont plus favorables à la germination et à la survie des graines que dans la toundra environnante. Cinq décennies et depuis une dizaine d'années dans les conditions climatiques actuelles. Malgré le réchauffement climatique, la dispersion naturelle des graines est généralement entravée par la barrière topographique accidentée de la chaîne de Brooks. Cependant, compte tenu de l'intensité de la circulation routière sur l'autoroute de Dalton, il est fort possible que d'autres plants d'épave puissent le long de ce corridor. Une fois de l'autre côté de la chaîne de Brooks, une population d'épaves pourrait se développer et prendre de l'expansion.

**Mots clés:** forêt boréale, chaîne de Brooks, toundra forestière, limite forestière, épave blanche

*Traduit pour la revue Arctic par Nicole Giguère.*

In the summer of 2008, a U.S. Fish and Wildlife Service field crew discovered a healthy 19 cm white spruce seedling, *Picea glauca* (Mill.) B.S.P., growing at the northern edge of the Brooks Range, more than 50 km north of latitudinal tree line. The nearest known cone-bearing trees are in white spruce woodlands along the Doyon River, on the south side of the continental divide. Demaree (1987) reported white spruce up to 500 years old at the tree line in that area, but the spruce had apparently not been able to migrate farther north during that 50-year period. The site where the seedling was found, north of 68°25'N latitude and at 850 m elevation, is separated from the Doyon River woodlands (at elevation above 900 m) by the 1413 m high Aigleau Pass, a rocky pass with discontinuous tundra vegetation. Means of dispersal of spruce across the Brooks Range are of interest to Arctic researchers because the climate of the north-central North Slope, where this spruce was found, has very likely been warm enough to support spruce for the past two decades (J. Jauze, pers. comm. 2008).

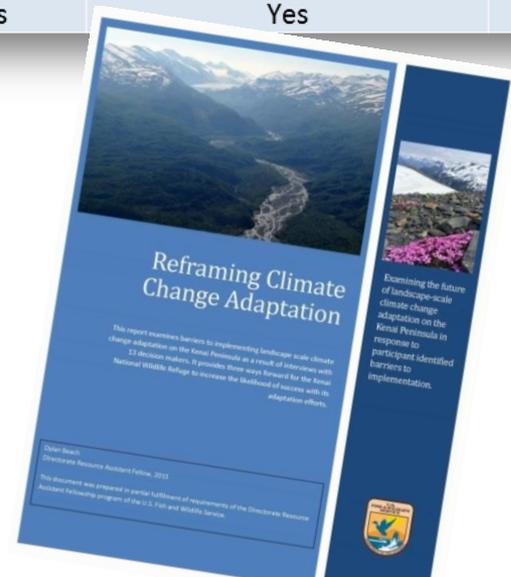
The seedling grew along the side of the Dalton Highway in Prudhoe Bay, on sparsely vegetated gravel road fill (Fig. 1). This human-made substrate is very different from the surrounding tundra, which is low shrub-sedge tussock tundra with a thick mat of poorly decomposed organic material. All the conditions for successful seedling establishment by white spruce, a mineral soil seedbed, well-drained soil, deep seasonal thaw, and little shading by surrounding plants (Zandbergen and Grogan 1999), are present at this site. Because of its good drainage and coarse texture, gravel typically has a summer seasonal thaw depth of 1.5 m, much greater than in the natural tundra. Soil on the nearby ripine right-of-way was 73% gravel, compared to 7% in the Aigleau Pass, a rocky pass with discontinuous tundra vegetation. A band of willows 60 cm tall along the road edge may collect wind-blown snow, providing protection from winter winds. Desiccation and mechanical injury from winter winds are major causes of tree mortality at the forest-tundra ecotone (Sivik,

<sup>1</sup> U.S. Fish and Wildlife Service, 101 12th Avenue, Fairbanks, Alaska 99709, USA  
Corresponding author: jans\_krugerson@fws.gov  
© The Arctic Institute of North America

“The authors welcome comments on whether to protect or pull this likely human-introduced seedling or leave its future to chance”

## Perceptions of Climate Change

Institution	Unit or Division	Climate change ranking	Does climate change exist?	Is climate change being accelerated by humans?	Do humans have a moral obligation to adapt?
USFS	Chugach National Forest	5	Yes	Yes	No
USFWS	Kenai National Wildlife Refuge	7.5	Yes	Yes	Yes
*NPS	Kenai Fjords National Park	-	Yes	Yes	Yes
*NPS	Kenai Fjords National Park	-	Yes	Yes	Yes
USFS	Chugach National Forest	8	Yes	Yes	Yes
NPS	Kenai Fjords National Park	7.5	Yes	Yes	-
USFWS	Kenai National Wildlife Refuge	9	Yes	Yes	Yes
Alaska DNR	Alaska State Parks	2.5	Yes	Yes	Yes
‡Alaska DNR	Mining, Land, and Water	-	-	-	-
CIRI	Land and Resources	2	Yes	-	Yes
KPB	Land Management Division	4	Yes	-	Yes
KPB	Mayor's Office	-	Yes	Yes	Yes
KPB	The Donald E. Gilman River Center	4	Yes	Yes	-





# The Mini Page

Betty Debnam, Founding Editor and Editor at Large



© 2011 Universal Uclick

from The Mini Page © 2011 Universal Uclick

## Humans Causing Fast Changes

# Earth in Sixth Major Extinction

As most kids probably know, dinosaurs came to a sudden end about 65 million years ago. Did you know that there have been four other super-big, or **mass**, extinctions of life on Earth?

Most scientists believe we are in the middle of a sixth mass extinction. But this time, the extinction isn't being caused by an asteroid or volcanoes. Its causes can be traced to us.

To find out more about this event, The Mini Page talked with Michael Brett-Surman from the Smithsonian National Museum of Natural History.

### What is a mass extinction?

When a **species**, or type of life, becomes **extinct**, it means there are no more members of that species alive.

Extinctions are normal. Usually, there is a steady rate of extinctions during every million years. Life-forms naturally appear and disappear over time.

In a **mass extinction**, at least one-fourth of all plants and animals on the planet might be wiped out very quickly, much faster than normal. Huge numbers of species die, and no new species appear in that time.

Scientists are seeing this happen now on Earth.



The most famous mass extinction was at the end of the Cretaceous Period, when six out of seven of all dinosaur groups were wiped out, along with half of all life. There is evidence that a giant asteroid hit the Earth then.

### Climate change

Each time there has been a mass extinction, it was because something caused the climate to change. Many types of life could not **adapt**, or change, quickly enough, and they died.

During the current mass extinction, humans will be able to adapt, but our crops and animals might not. Life as we know it will keep changing.

### The ages of Earth

Each time there is a mass extinction, a new age begins on Earth. As older species die out, other species suddenly have no competition. They begin to fill in the Earth's habitats.

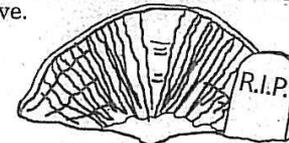
Over millions of years, newer types of life develop. Diversity increases again. The makeup of the planet changes yet again.

Let's explore Earth's earlier mass extinctions.

### End of the Ordovician

The Ordovician (or-doh-VIH-shun) Period ended about 445 million years ago. Most life lived in the oceans at this time. Experts believe more than 50 percent of life was wiped out at the end of this age.

One reason for the extinctions might have been a drop in sea level. Huge glaciers might have formed, locking up much of the planet's water. This would have caused sea levels to drop. Life in shallower waters might not have been able to adapt quickly enough to survive.



**So let's revisit  
conserving biodiversity...**

**perhaps reframing our challenge  
in a climate changing world as  
minimizing species extinction**



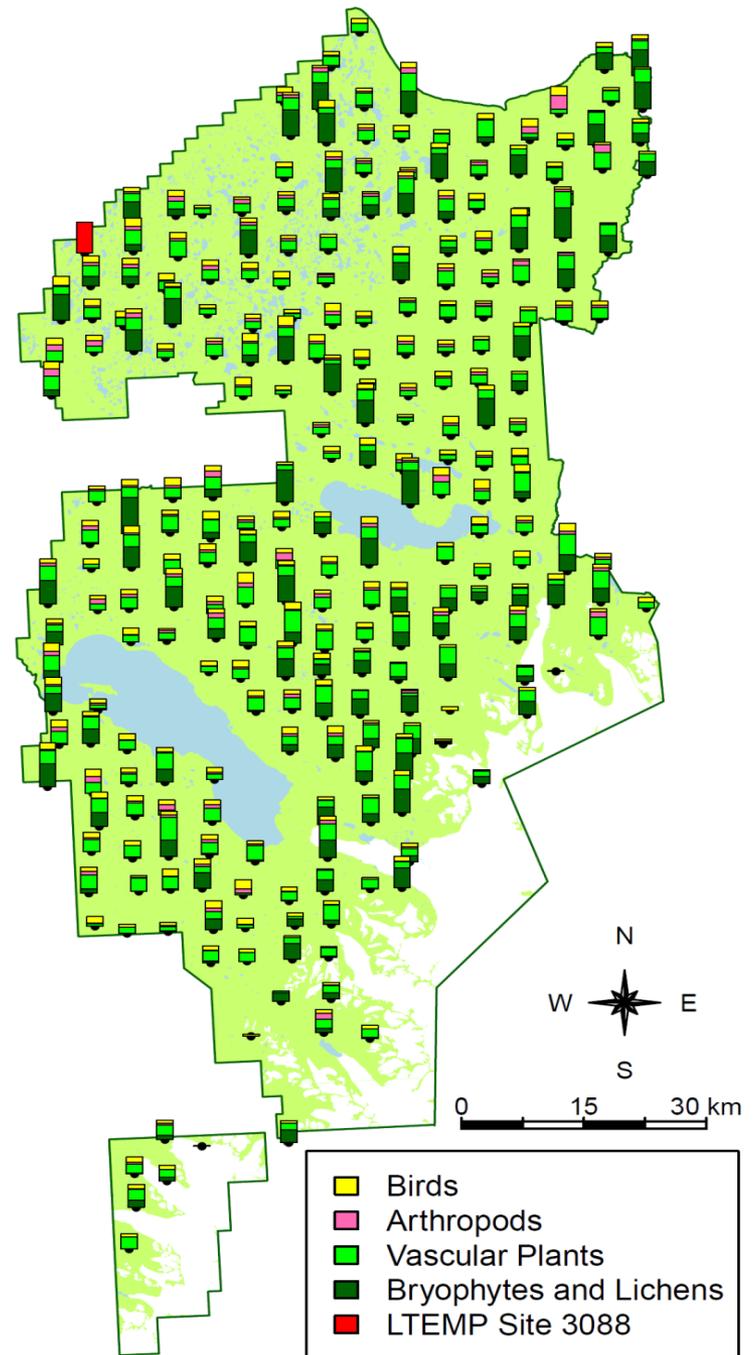
**“The last word in ignorance is the man who says of an animal or plant, ‘What good is it?’ If the land mechanism as a whole is good, then every part is good, whether we understand it or not. If the biota, in the course of aeons, has built something we like but do not understand, then who but a fool would discard seemingly useless parts?”**

**“To keep every cog and wheel is the first precaution of intelligent tinkering”**

**—Aldo Leopold**

# ~1,100 species!

80 birds  
228 arthropods  
4 snails  
307 vascular plants  
298 lichens  
123 mosses  
22 ferns and allies  
30 liverworts



# Perhaps its time to replace “management” with “stewardship”

the conducting, supervising, or managing of something;  
especially: the careful and responsible management of something  
entrusted to one's care <stewardship of natural resources>

— Merriam-Webster

“We have become, by the power of a glorious evolutionary accident called intelligence, the stewards of life's continuity on earth. We did not ask for this role, but we cannot abjure it. We may not be suited to it, but here we are.”

— Stephen Jay Gould



## 22 FW 1, Creation, Authority, and Functions

The USFWS has three basic objectives:

- (1) to assist in the development and application of an environmental **stewardship ethic** for our society, based on ecological principles, scientific knowledge of fish and wildlife, and a **sense of moral responsibility**;**
- (2) to guide the conservation, development, and management of the Nation's fish and wildlife resources; and
- (3) to administer a national program to provide the public opportunities to understand, appreciate, and wisely use fish and wildlife resources.

# Take home messages

- ✓ Go on a bike ride
- ✓ Check your values
  - “what we know influences what we see”
- ✓ Go big (Anthropocene)
- ✓ Remember your humility (biodiversity)
- ✓ Invest in your staff (NGS)
- ✓ Go deep (stewardship and moral responsibility)



# CLIMATE SUMMIT

WHAT IF IT'S  
A BIG HOAX AND  
WE CREATE A BETTER  
WORLD FOR NOTHING?

- ENERGY INDEPENDENCE
- PRESERVE RAINFORESTS
- SUSTAINABILITY
- GREEN JOBS
- LIVABLE CITIES
- RENEWABLES
- CLEAN WATER, AIR
- HEALTHY CHILDREN
- ETC. ETC.

