

00:00
we are so good afternoon and welcome to
00:05
our third signs of the seasons webinar
00:07
in our series this year through these
00:09
webinar presentations we've explored
00:12
rockweed looms and now historical data
00:14
in May we're pleased to have Caitlin
00:17
with us to share her exciting work with
00:18
us and signs and seasons is now in its
00:22
seventh season and we've had a great
00:25
season thus far I wanted to share a
00:27
little bit of new new information about
00:29
us we've just completed our 2017 signs
00:34
of the season survey which we've been
00:35
doing every year since 2011 and had 91
00:38
observers participate in this at the
00:41
record so it's really helpful getting
00:46
this information so we can work towards
00:48
improving our program these webinars in
00:51
fact or result of observers asking for
00:54
more information on our indicator
00:56
species and phenology stories so let's
00:59
get started I'd like to introduce
01:01
Caitlin McDonough Kinsey an ecologist

01:04
and Alpine zone enthusiast she studies
01:07
plant ecology above treeline in New
01:10
England with an emphasis on
01:11
understanding changes in plants
01:13
communities over multiple time scales
01:15
from the recent and through Anthropocene
01:18
to the last 15,000 years
01:20
Caitlin studied environmental science
01:23
and public policy as an undergraduate at
01:25
Harvard and ecological planning as a
01:29
master student at the University of
01:31
Vermont her master's project partnered
01:33
with the Appalachian Mountain Club to
01:35
study Alpine plant phenology through the
01:37
citizen science project Mountain watch
01:39
so that's another partner of ours too
01:42
her PhD in biology at Boston University
01:47
explores patterns of species loss and
01:49
spring phenology in new england's plant
01:54
communities and she conducted fieldwork
01:56
at Acadia National Park she defended her
02:00
PhD in May 2017 and will be began a
02:04
postdoc at David as a David a Smith

02:07
conservation biology fellow at the
02:09
University of Maine or notice fall and
02:10
as a postdoc she'll be studying paleo
02:12
eCollege
02:13
name looking at changes in plant
02:16
communities above tree line through
02:18
pollen captured in lake sediments in
02:20
Acadia National Park in Baxter State
02:22
Park we're really happy that she's
02:24
remaining in Maine and excited for her
02:26
talk today so I'm going to turn over the
02:30
presentation to Caitlin and that just
02:37
takes a few seconds thank you for being
02:42
with us today
02:43
Caitlin really appreciate it thank you
02:46
so much for that lovely introduction can
02:48
you see the screen now yes
02:50
great thanks so I'm excited to share my
02:55
research with everyone about uncovering
02:57
the past through Maine historic
03:00
phenology and when I talk about that um
03:03
hold on I'm just going to come out for a
03:06
second so I can move GoToMeeting and see

03:09
um my full screen a little bit better
03:12
there we go
03:13
all right slides look good for everyone
03:15
um so I am really excited to talk about
03:22
my dissertation research and as a frog
03:25
that I defended in May and this
03:28
presentation this webinar is a little
03:29
bit like the vh1 behind the music
03:32
version of that defense talk where I get
03:34
to dig into the more human stories
03:37
behind the data that I worked with so
03:40
I'm really excited to share this with
03:41
you because my PhD would not have been
03:44
possible at all without an amateur
03:46
college botanist who was working on no
03:48
desert island in the 1880s or a
03:51
schoolteacher who grew up in Concord
03:53
Massachusetts in the 1840s and 50s and
03:56
summered on Mount Desert Island in the
03:58
1880s and 1890s or a mid 20th century
04:02
hunting guide who lived way up in
04:04
Aroostook County and we basically don't
04:08
know anything about him except for what

04:09
he left behind in daily journal and then
04:13
there's Henry David Thoreau and a lot of
04:15
ecologists and Natural Science folk like
04:20
to point back to Henry David Thoreau as
04:22
an influence on their research and on
04:23
their enthusiasm about nature
04:26
but Thoreau had a slightly more direct
04:29
influence on my dissertation I worked in
04:32
the Premack lab at Boston University and
04:34
the Premack lab has been using Henry
04:37
David Thoreau's journals as a dataset
04:40
for the past um 10 plus years and in
04:45
addition to that that influenced the
04:47
schoolteacher who grew up in Concord
04:49
Massachusetts actually learned to
04:50
boughten eyes with Henry David Thoreau
04:52
as her mentor and he went on to mentor
04:55
the amateur college botanist who
04:57
collected all of this data on that
04:59
desert island so Henry David Thoreau
05:01
really had a outsized influence on this
05:04
dissertation um and I think it's only
05:09
fitting that he was such a fan of Maine

05:10
from Massachusetts and I also grew up in
05:13
Massachusetts and have become a huge fan
05:15
of Maine and finally um there's another
05:18
person or fictional person involved in
05:21
influencing my dissertation and that's
05:23
Samantha Parkington
05:24
and she is an American Girl doll so for
05:27
those of you not familiar with the
05:29
American Girl doll series this is a
05:32
group of very beautifully made dolls
05:35
that in the early 1990s were super
05:39
popular I think they're still pretty
05:40
popular but each doll came from a
05:42
different historic time period and there
05:45
was a series of books that went along
05:46
with them so my grandmother gave me
05:48
Samantha Parkington who grew up in
05:51
Victorian New York and so she's about 10
05:54
years old in 1904 when her books take
05:56
place and so Samantha's grappling with
06:00
things like industrialization and
06:02
women's suffrage movement and she has a
06:05
very wealthy grandmother who takes her

06:07
summering to a location called cranny
06:09
point which could really be anywhere on
06:11
the Maine coast and in her sixth book
06:14
Samantha faded saves the day Samantha is
06:17
at cleany point and she's got this cute
06:19
little sailor dress but she also has
06:21
these really beautiful accessories
06:23
including a wicker backpack with a
06:26
little butterfly net it's a little tiny
06:28
fake butterflies there's a watercolor
06:31
sketch book and really teeny tiny little
06:33
watercolor and watercolor brush so you
06:35
can actually paint inside of in a little
06:38
pint pillow that Samantha had so
06:39
own with pine needles from piney point
06:42
and my favorite little accessory that
06:44
she had was this little tiny plant press
06:47
it was about the size of a post-it note
06:49
pack and you could actually use it to
06:52
press a little tiny plant so I would do
06:54
this I would go out into my yard and
06:56
take little violets and cut them so it's
06:58
just the top of the flower petals and

07:01
put it into the plant press and press
07:03
plants with the Samantha Parkington
07:05
plant press and so Samantha provided for
07:08
me this weird outlet of combining
07:10
history and ecology and kind of
07:13
understanding how botanist went through
07:16
the world before I really had an
07:18
understanding of what botany was and so
07:21
when I think back on the late 19th
07:23
century and early 20th century and the
07:25
folks who are doing some of the
07:27
botanical work that I now depend on I
07:31
always have this image of the context of
07:33
Samantha Parkington and my tiny plant
07:36
press and so I keep Samantha there as my
07:40
childhood reminder I actually did grow
07:43
up to be what I was pretending to be
07:45
when I was about 10 years old
07:47
um and so to just orient ourselves to
07:50
what we're going to talk about today
07:52
I have Concord Massachusetts on and
07:55
that's a pretty big star for the lab
07:57
that I work in at Boston University we

07:59
do a lot of work in Concord and I'll
08:01
continue to come back to Concord as a
08:03
point of comparison with Mount Desert
08:05
Island Maine where I've been working in
08:08
Acadia National Park and also for Oxbow
08:11
Maine where I have the hunting guides
08:13
journal way up in Aroostook County and
08:16
so you can see the spans a pretty large
08:18
area in New England you do and we'll be
08:23
talking about plant communities across
08:25
all of New England and northern New
08:27
England especially and so I know this is
08:31
a signs of the seasons group and
08:33
everyone is probably pretty familiar
08:35
with phenology but I wanted to put out a
08:37
technical definition on when we talk
08:39
about phenology we're talking about the
08:41
timing of seasonal biological events as
08:43
a planet ecologist I'm often thinking
08:46
about plant phenology and I'm
08:48
specifically interested in spring plant
08:51
phenology so I look at
08:53
leaf out timing and the timing of

08:55

flowering and um looking back over the

09:00

last 130 years this shows how the

09:04

climate globally has changed since some

09:08

of these early naturalists were

09:09

collecting and recording and noting

09:12

phenology and thinking about the context

09:16

of when all of these observations were

09:18

taken we can see that the northeastern

09:20

United States has become a much warmer

09:23

area compared to the 20th century

09:25

average over that last century in a

09:29

couple decades and so when we think of

09:32

plant phenology as providing some of the

09:35

these indicators of how the climate has

09:37

changed and we can think of things like

09:40

the length of the growing season and so

09:42

when we compare the length of the

09:44

growing season in Maine today to

09:46

Samantha Parkington time to the time of

09:49

the hunting guide in northern Maine or

09:51

to the time of the schoolteacher in

09:53

Mount Desert Island we can see that the

09:56

growing season is almost two weeks

09:58
longer than it used to be and that's a
10:00
really simple metric that's kind of easy
10:03
to wrap your head around but ecologists
10:05
have been studying the ecological
10:06
impacts of climate change for a couple
10:09
decades now and this has a huge range of
10:12
possibilities so climate change can
10:15
impact the behavior of organisms so in
10:17
this example the purple spiders have
10:20
actually shifted down into the territory
10:22
of the pink spiders as the top layer of
10:25
the grass canopy warms up and that
10:27
provides a lot more pressure on the
10:30
grasshoppers at the base of the grasses
10:32
but actually provides kind of a haven at
10:34
the top of the grasses climate change
10:38
has impacted the distribution of
10:40
organisms and ecosystems in Vermont
10:42
there's been a lot of work looking at
10:45
the ecotone or the boundary between
10:48
northern hardwood species and high
10:50
elevation boreal forests so the northern
10:52
hardwood species like maples and beech

10:55
trees have actually shifted up in
10:57
elevation and are found at higher
10:59
elevations than they were 80 years ago
11:02
so areas that used to be strictly
11:04
loosened for now
11:06
more hardwoods climate change is also
11:08
impacting the abundance of organisms in
11:10
the High Arctic cape and his colleagues
11:13
have noticed a shrub affectation of the
11:17
landscape so areas that used to be very
11:19
herbaceous have a lot more woody shrubs
11:21
and they've expanded their abundance and
11:25
finally phenology phenology is a great
11:28
marker of the ecological impacts of
11:31
climate change and I love this example
11:32
from Japan where they've been tracking
11:35
the fruiting chronology of cherry trees
11:37
across an elevation gradient and at the
11:40
lowest elevation the cherries ripen
11:42
earlier in the season in the Bears Ethos
11:44
cherries and then they start moving
11:46
upslope to follow the ripening cherries
11:48
so as they move upslope they're also

11:51
helping to spread some seeds by
11:54
depositing the Caesar in their feces at
11:57
higher elevations so when we think about
11:59
how plants and animals will have to
12:01
track climate change as perhaps
12:04
migrating upslope the Bears are actually
12:07
providing a way for the cherries to do
12:09
that so that the low elevation cherry
12:11
populations on will be able to move up
12:15
to the mid elevation which will soon
12:17
feel like a low elevation site because
12:19
the Bears have already moved the seeds
12:21
for them so that's a great example of
12:24
phenology across different levels in the
12:29
ecosystem between animals and plants um
12:33
but not all of the phenological research
12:37
that's done shows this great harmony
12:39
between animals and plants or different
12:41
trophic levels and so Linda makes wrote
12:44
really beautifully that there are two
12:46
calendars now the seasonal timing
12:48
evolved within living things and the
12:50
seasons cooked up by us and I think when

12:53
we study phenology as an indicator of
12:55
climate change we have to keep in mind
12:58
that we need both of those calendars we
13:00
need to know what's happening now but we
13:02
also need that past calendar to provide
13:05
context we need some historical data to
13:07
understand how things have changed and
13:09
what the shift has really been and
13:14
luckily lots of natural historians have
13:17
collected or recorded
13:19
data without any idea about the
13:22
committee impacts of climate change and
13:24
so henry david thoreau is a perfect
13:26
example where in the 1850s he was
13:29
constantly recording the first flower
13:31
the first would be felled migratory bird
13:33
arrivals and spring in his diaries and
13:36
we in the Premack lab now read those
13:39
Diaries as a fair data set so we're able
13:42
to look at how the phenology has changed
13:46
since the rose time in concord
13:48
massachusetts and so this figure comes
13:51
out of the lab um this is a paper that

13:54
dr. Premack worked on with some other
13:56
graduates and on the x-axis there's a
13:58
mean spring temperature from cooler
14:00
years to warmer years and the y-axis is
14:04
the mean first flowering date from
14:06
mid-april through mid-may and if there's
14:10
a really clear pattern where in the
14:12
warmer spring the first flowering date
14:15
is earlier and that's especially true in
14:17
2012 and 2010 we're extremely early
14:20
years so when we go back to the Rose
14:23
Concord and monitor the same plants that
14:25
Thoreau was watching we can see how with
14:28
warming temperatures the spring has
14:30
shifted and there's a really nice
14:32
correlation between the two and we can
14:34
actually describe quantitatively that
14:36
for each degree Celsius of warming the
14:38
mean for flowering date is advancing by
14:41
3.2 days so it's negative because that
14:44
shift is happening earlier and in this
14:47
case each of those data points
14:48
represents 32 common plant species in a

14:52
single year so that that one data point
14:56
for 2010 is all of the plants in 2010
15:00
their mean for flowering date and while
15:02
that's great for a community-wide number
15:04
it's important to remember there's a lot
15:06
of species level variation and
15:08
phenological responses so in this figure
15:10
which is also from another grass roots
15:12
in our lab the x-axis has a whole list
15:15
of different plant species there's trees
15:17
and shrubs in vines and you don't need
15:20
to worry about decoding what each of the
15:24
abbreviations mean which is that each of
15:26
those is a different species and the
15:29
y-axis is the thermal units to leaf out
15:31
in the field which is just a
15:33
jargony way of saying how hot before the
15:36
leaf out occurs in the spring and you
15:38
can see that each species has a
15:40
different requirement or a different
15:42
heat level before it leaves out in this
15:44
pattern of species level variation plays
15:46
out in studies across the globe looking

15:49
at least out of flowering or migratory
15:51
bird arrivals some birds are more
15:53
sensitive to warm spring temperatures
15:55
some flowers are more sensitive to warm
15:58
spring temperatures and we see that over
16:00
and over again and that species level
16:01
variation is important ecologically
16:03
because it leads to lots of different
16:06
effects throughout the ecosystem from
16:08
trophic interactions where a hummingbird
16:12
might depend on a certain flower's nectar
16:14
and so if that flower is blooming
16:16
earlier and earlier and the hummingbird
16:18
is arriving later in later in the spring
16:20
there's a risk that they might
16:22
eventually miss each other to mutualisms
16:26
like plant-pollinator interactions so
16:28
the timing of when pollinators are in
16:31
flight versus the timing of when these
16:33
species are in bloom you can also think
16:35
about leaf-out and carbon uptake so when
16:38
leaves first come out as plants will
16:41
start photosynthesizing and pulling

16:43
carbon dioxide out of the atmosphere and
16:45
that has huge implications for our
16:47
carbon budget or how much of a carbon
16:49
sink a forest might be and then finally
16:52
there are implications for competition
16:54
so in our lab we found that non-native
16:57
species like invasive Japanese Barbary
16:59
we found much earlier than the native
17:02
tree species and they're they're much
17:03
more responsive to what form spring
17:05
temperatures which might allow them to
17:08
out-compete some native plants because
17:10
they're able to start their growing
17:12
season very early and perhaps even shade
17:14
out their competitors and so all of
17:18
these ecological impacts are important
17:21
for conservation and my dissertation
17:23
research at Acadia National Park was a
17:26
part of the climate change vulnerability
17:28
assessment and we know from other
17:30
studies that plants that don't shift the
17:33
timing of their phenology so plants that
17:35
don't flower earlier in warmer years or

17:38
don't leaf out earlier in warmer years
17:40
those plants are more likely to
17:42
disappear or decline in abundance and so
17:44
there's some kind of relationship
17:46
between the fitness
17:46
and the phenological sensitivity and
17:50
scientists are still working on that I'm
17:52
still doing some studies on that um but
17:55
we know that that connection exists so
17:57
we can use the phenological sensitivity
17:59
as a metric and we can identify some
18:02
plant species that are less sensitive
18:04
and perhaps those need more monitoring
18:07
or they need more habitat restoration or
18:10
they might need more help in terms of
18:12
assisted migration
18:13
so using phenology as a way to
18:15
understand which parts of a plant
18:17
community might be most vulnerable and
18:19
so that's where my my research really
18:22
jumps off from and I'll start
18:24
introducing you to some of my
18:26
collaborators so this is a photo from

18:29
the 1880s and this is a group of Harvard
18:33
undergraduates who had decided to come
18:36
up to Mount Desert Island to do some
18:39
research on their summer vacation and
18:41
Samuel Eliot and Charles Eliot who are
18:43
in the middle um were the sons of the
18:47
current president of Harvard and they
18:49
hosted a gathering in the spring of 1880
18:51
for their friends they invited their
18:53
friends over to the dorm room and they
18:55
sat around and thought to themselves why
18:57
not select some particular region and
18:59
put in the summer studying its
19:01
geological formations its flora and
19:03
fauna its birds and fishes its trees and
19:06
shrubs there would be a happy
19:08
combination of work and play cien lands
19:10
tripping failing and reading and so they
19:13
did that they named themselves the
19:15
Champlain Society and they sailed from
19:17
Boston up to Mount Desert Island and
19:19
they set up camp this is one of their
19:21
tents at the campsite and spent their

19:24
summer exploring and they divided at
19:27
their society up so that one person
19:29
would be the geologist and he would
19:31
study all of the rocks and another
19:33
person would be as the ornithologist and
19:34
he would study all of the birds on the
19:36
island and one person Edward Rand would
19:40
be the botanist
19:40
and he would study all of the plants on
19:42
the island and they returned for many
19:45
summers to do this so here's Edward Rand
19:47
as a slightly older gentleman I'm in the
19:51
second photo he's in the back somewhere
19:53
um in the tent working on plants so
19:56
Edward Rand was among the most serious
19:59
and Stu
20:00
of the Champlain Society members and
20:03
while the ornithologist and the
20:05
geologist went off to the hotels in Bar
20:09
Harbor a Southwest Harbor and socialized
20:11
and perhaps got some girlfriends Edward
20:14
Rand remained very dedicated to his
20:16
mechanical mission and he completed 14

20:19
years of field work so he returned to
20:21
Mount Desert Island throughout his
20:23
undergraduate career he went to Harvard
20:25
Law School and he kept coming back to
20:28
Mount Desert Island while he was a law
20:29
student and then while he was a lawyer
20:31
in Boston and his 14 years of field work
20:34
were really impressive and in fact the
20:38
second picture that has to me and my
20:40
daughter in it on is in an exhibit that
20:42
the Mount Desert Island Historical
20:43
Society put on last summer where they
20:46
created the the tent of the campsite and
20:49
did a beautiful exhibit that honored the
20:53
Champlain Society and the work they had
20:54
done in looking at the science of the
20:57
island and as I said Edward Rand was a
21:00
he was a lawyer he was not a trained
21:02
botanist and below he took college
21:04
classes but he was not a professional
21:06
botanist at all and yet he produced a
21:09
huge amount of historical records that
21:11
are just amazing so he collected a lot

21:13
of her very assessments he used the same
21:15
kinds of plant presses that my Samantha
21:17
Parkington Dahl had on and the Champlain
21:20
Society kept a daily camp log so we know
21:23
exactly what kinds of work he was doing
21:25
where he was going
21:27
what mountains he was climbing his
21:29
thoughts on collecting plants as well as
21:32
some of the fun antics that the
21:34
Champlain Society got into together and
21:36
he really did reach out to the community
21:39
beyond this airplane society to try to
21:42
get other people involved in his mission
21:45
to catalog the plants on the island so
21:47
the older gentleman in the picture who's
21:49
actually making another pressed plant is
21:51
I'm John Redfield who was a retired
21:54
businessman and botanist from
21:57
Philadelphia who lived up on the island
21:58
and then the woman who looked very stern
22:01
um is a nice foyer down she was the
22:04
schoolteacher from Concord who came up
22:06
to the island Imogene her husband built

22:08
a house in southwest Harbor that still
22:10
standing and Annie third downs
22:13
and gentleman Redfield collaborated with
22:15
with Edward brand and mentored him they
22:17
were both much older than him um and
22:20
they helped put together this catalogue
22:23
um until there are various specimens are
22:26
still at the Harvard herb area and they
22:29
provided a lot of help on the floor of
22:32
Mount Desert Island Maine which is this
22:34
flora that Edward R and eventually
22:36
published in 1894 fourteen years after
22:38
he had begun his work as a member of the
22:41
Champlain Society and we can use his
22:45
historic data to look at florist
22:48
exchange so every single species in that
22:51
flora of Mount Desert Island from 1894
22:53
has a small description of its abundance
22:56
on the island and very fortuitously for
22:59
me I started my work as a PhD student
23:02
right after the publication of the
23:04
plants of Acadia National Park in which
23:07
Glen middle Helzer and his co-authors

23:09
had basically surveyed all of Acadia
23:11
National Park in the same manner that
23:13
Edward Rand had a century before them
23:16
and so Glenn Middle Hauser's book I'm
23:20
categorized each plant as being common
23:23
occasional uncommon or rare and we
23:26
worked with him to limit our or restrict
23:29
our analysis just the plants on Mount
23:31
Desert Island so to cover the same
23:33
geographic area that Edward Rand had
23:35
been working on and then I went through
23:37
all of Edward Rand's lovely Victorian
23:39
flowery
23:41
descriptions of abundance and put them
23:44
into one of the four categories that was
23:47
used by Glenn Middle Hauser's we could
23:48
see how each species had changed over
23:51
time and our results look like this so
23:55
for our six change on Mount Desert
23:57
Island from 1894 to 2010 the historic
24:01
flora had 730 species the current flora
24:05
is eight hundred and twenty-nine species
24:07
and 205 of those are new arrivals

24:09
there's been a net loss of native
24:12
species and an increasing proportion of
24:14
non-native 106 species that were
24:19
recorded by Edward R and are now locally
24:21
extirpated so they're no longer on the
24:22
island and that's just under 16 percent
24:26
of the entire historic flora
24:28
another 34.4% of the historic flora has
24:31
declined in abundance all habitat
24:35
categories across the island have lost
24:37
species evenly so that's when we look at
24:39
things by if they grew in woods or
24:41
grasslands on the coast mountains
24:43
wetlands or roadsides and disturbed
24:48
places with all lost species and three
24:52
genus or three families on the lilies
24:54
the mints and the orchids have
24:56
experienced very high species loss and
24:59
so to put that in context I look at
25:02
other places in New England where there
25:04
had been a published floristic exchange
25:06
study so this figure just shows what
25:09
kind of historic data is available

25:11
across these studies in New England and
25:14
you can see very clearly that now Desert
25:17
Island is the farthest north of these
25:20
studies and the only one in Maine so
25:22
that's right there is just an important
25:25
piece of context but then on top of that
25:27
we've also access different historic
25:30
data that have been used so for three of
25:32
them on Three Mile Island in New
25:35
Hampshire the Harvard forest Mountain
25:37
Western Massachusetts and Middlesex
25:39
fells just north of north of Boston
25:41
those are all based on published
25:43
florists just like the 1894 flora that
25:46
Edward Rand published on the purple
25:49
docks which included my desert island
25:51
our places where we have a published
25:54
flora and or barium records so we have
25:56
the floor itself but we can also go into
25:58
the herbarium and see the flowers that
26:00
were prepped by the folks who are
26:02
actually doing that original survey so
26:05
we can collaborate or we can say that

26:08
their identifications were correct we
26:10
can see where things have changed names
26:11
over the past century or so or if
26:14
scientists have decided that a
26:15
subspecies is actually a species now we
26:17
can actually trace that on the herbarium
26:19
specimens themselves so it's like
26:22
another on another quality control for
26:26
for assessing how well that historic
26:28
flora was most catalogued and in
26:31
addition to the herbarium specimens on
26:33
Mount Desert Island we also have those
26:34
camp logs so we know exactly what the
26:37
fieldwork was like and how am I
26:39
effort they put into it and where Edward
26:41
ran rent went so we have this additional
26:44
level of information about this dark
26:46
floor for two of the historic floors
26:49
including the Holyoke range just north
26:53
of Springfield um in Worcester County um
26:57
we see that they just have our barium
26:59
specimens and so that can be problematic
27:01
because in for example in the Mount

27:04
Holyoke range um they were just looking
27:06
at any or various specimens that have
27:08
been collected during a historic time
27:09
period so there were multiple people
27:11
collecting and they had different goals
27:13
and no one had this kind of central idea
27:15
of I'm going to go out and catalog every
27:18
species that's here and in fact there
27:20
can be a lot of biases in these historic
27:22
herbarium collections um people often
27:25
try to collect the prettiest things or
27:27
the flashiest or most rare things
27:29
there's often a bias towards places that
27:31
are very accessible like along a
27:33
roadside or very inaccessible like on
27:36
top of the mountains because there's
27:37
more glory involved in that but it's the
27:39
kind of mid-range relatively medium
27:44
difficulty places to get to or
27:46
relatively not showy flowers can be
27:48
underrepresented and so there can be
27:51
some problems with using simple or
27:54
varium records as a historic source um

27:57

let's see

27:58

Broadmoor Brook and Concord have

27:59

unpublished florists so um and if the

28:02

manuscript for the 1894 flora never made

28:05

it out into the world and there can be

28:07

some problems with those for example

28:10

they don't get feedback from the broader

28:11

community after the 1894 flora for Mount

28:15

Desert Island was published Edward Rand

28:17

received lots of letters and accolades

28:19

and I actually went into the archives at

28:21

Harvard and read all of his

28:22

correspondence and it was actually a

28:24

really exciting experience to see how

28:27

positively his work was received by the

28:31

very new professional botanical

28:34

societies around the country because

28:37

again he was not a professional botanist

28:39

so it was really nice to see these

28:41

professional botanists writing lovely

28:43

letters to him and he also continued his

28:45

field work after he published on his

28:47

book and then would continually update

28:50
so he would publish in the New England
28:52
botanical clubs journal updates
28:55
throughout the 19-teens and 1920s of
28:57
species that he had found or other
28:59
people had alerted him to do that had
29:01
been missing from the original flora so
29:03
he had this very completest idea to it
29:06
which is missing an unpublished flora
29:09
and then our last example from Needham
29:11
had an unpublished flora and in
29:13
herbarium so we can kind of collaborate
29:15
or collaborate between the two of those
29:17
again just to put into context that no
29:21
desert island is a really unique
29:22
historic flora where we have so much
29:25
information about who was doing the
29:27
research what they actually saw
29:29
all of your various specimens and then
29:31
that published flora and when we look at
29:34
the rates of species loss across these
29:37
Flora's exchange studies in New England
29:39
we can see a huge range from under 10%
29:43
of the flora of the historic flora

29:45
disappearing from the landscape to over
29:47
40% and what I find interesting in this
29:50
example is that no desert island is not
29:53
the the least a species loss or the
29:59
place where the species are most
30:00
protected I would say so now desert
30:02
island has been a national park for 100
30:04
years
30:05
um but despite this protection from
30:09
development pressures it's still losing
30:12
species similar to places like Harvard
30:14
forests in Worcester County from
30:16
Worcester County does have some very
30:18
rural areas but it's also a highly
30:21
developed area and in each of these
30:22
individual studies the authors are often
30:24
citing that development pressures are
30:27
probably driving species loss but when
30:30
we look at it as a regional trend it's
30:33
clear that places that have different
30:34
levels of conservation from state parks
30:37
like the Mount Holyoke Range to
30:39
conservation easements like Middlesex

30:41
fells to national parks like Acadia
30:43
National Park they're all experiencing
30:46
species loss and these same families the
30:48
orchids the lives in the midst are
30:50
losing species across the range um so it
30:53
shows that there might be a more
30:54
regional trend or even global trend in
30:57
terms of climate change that's driving
30:59
some of these patterns of species loss
31:01
so from that very big regional picture I
31:04
wanted to zoom in
31:06
on a species level look and so as I
31:10
talked about before our lab has done a
31:11
lot of work in Concord Massachusetts so
31:14
on top there's a picture of my advisor
31:16
and a bill arresting the science
31:19
director at Acadia National Park with
31:21
Henry David Thoreau statue at Walden
31:24
Pond
31:24
I wanted to recreate that photo myself
31:26
but nobody made a statue of Edward Rand
31:28
or nobody has yet there is however a
31:31
little plaque to him on a rock in Acadia

31:33
National Park so that's me and Edward
31:35
ransom rock and we're Richard and Abe
31:40
looked at changes in the floor of saros
31:42
Concord to look at changes excuse me
31:47
implants a bum abundance since the 1850s
31:51
in Concord I noticed that the row and
31:54
the rose Concord and Edward Rance Mount
31:57
Desert Island had a lot of species in
31:59
common in fact there are 304 species
32:02
that are in both locations so if we just
32:04
zoomed in on those 304 species I
32:08
expected that abundance change in
32:10
Concord would help us predict change on
32:12
Mount Desert Island so in my hypothesis
32:15
I have this expected idea that for all
32:18
the species that are declining and
32:20
abundance and Concord most of those
32:22
would also be declining in abundance on
32:24
Mount Desert Island in that first green
32:26
bar or in that middle category if they
32:29
were experiencing no change in abundance
32:32
and Concord over the last century or so
32:34
they also wouldn't have changed in

32:36
abundance on Mount Desert Island
32:38
so that was my hypothesis and I analyzed
32:41
us their abundance change in both
32:44
locations for all 300 species and found
32:48
no correlation between well it had
32:50
happened in Concord and what we had seen
32:52
on no other island so my hypothesis was
32:54
completely wrong at the species level a
32:57
species can be declining in abundance
32:59
and Concord and that same species could
33:01
have increased in abundance on Mount
33:02
Desert Island or vice versa
33:04
um so when we look at these floor stick
33:09
change patterns um we have this
33:12
community-wide species loss that's
33:14
similar to regional trends across New
33:16
England but at the species level for
33:18
sick Tanjung Concord is
33:20
predictive of floristic change i'm not
33:21
desert island so it's really pointing to
33:24
the fact that you need local data to
33:26
make a local decision for management
33:28
especially if you're in a place like

33:31
Mount Desert Island or in Maine where
33:32
there aren't a lot of local examples
33:36
yeah alright so let's move up to
33:40
Aroostook County and talk about
33:41
Quackenbush um LS Quackenbush was a
33:45
hunting guide in the 1940s and 50s who
33:47
lived up in Oxbow Maine just south of
33:50
Presque Isle um we have no photograph of
33:54
him in fact we know almost nothing about
33:55
him besides what's in his journal which
33:58
includes daily records of temperature
34:01
and observations of things like nature
34:05
on BC he saw a fox he has observations
34:09
of migratory bird arrivals first flour
34:11
firstly fat in the spring and um this
34:16
dataset is has a really interesting
34:18
backstory um so the turrets is this
34:22
cottage or mansion that was built on in
34:25
Bar Harbor on Mount Desert Island in the
34:26
1890s so in fact this photograph is from
34:28
the same era when Edward Rand had just
34:31
published the floor of Mount Desert
34:33
Island and Samantha Parkington was about

34:35
to go up to Piney Point um and the
34:39
turrets is now part of college of the
34:41
Atlantic and a few years ago they were
34:43
doing renovations on this beautiful
34:45
historic building and during the
34:47
renovations they had to empty out the
34:49
attics of the turrets and during that
34:53
process they found this box which was
34:56
just the stacks and stacks of the
34:58
journals from LS Quackenbush and the
35:01
back story was that sometime after
35:03
Quackenbush died and his last journal
35:05
entries are from 1959 so supposedly
35:07
sometime in the 60s um cracking bush his
35:10
family donated the journals to Acadia
35:12
National Park they recognized that he
35:14
had a lot of information about the
35:16
natural history of Oslo and they thought
35:18
the National Park Service would be the
35:20
ones who could appreciate that and so
35:22
around this time College of the Atlantic
35:25
started and Acadia gave the journals to
35:28
a professor College the of the Atlantic

35:30
who must have put them in the attic and
35:32
forgotten about
35:33
until the turrets renovation so when the
35:36
turrets were renovated in the summer of
35:38
2013 those journals came back to the
35:41
park service and we digitized and
35:44
scanned every page of those journals and
35:46
they're actually now available online
35:49
anybody can go look them up and the
35:52
Quackenbush journals are about 5,000
35:55
pages but one of the amazing things
35:58
about Quackenbush was that at the end of
36:00
his life probably when he was no longer
36:02
taking daily walks he actually sat down
36:05
and indexed everything in his distally
36:08
journals so he has an index of birds and
36:11
that's the bird folder where he lists by
36:13
species every observation that he had of
36:16
a bird or he goes through by year and
36:18
then goes so for the spring of 1946 this
36:22
plant leaf down on this day this plant
36:24
leaf out on this day and so these
36:26
incredible indices provide just a really

36:28
wonderful data source and he was so
36:32
pharoah
36:32
so here's the first page of history will
36:35
kind of blown up and while his
36:37
handwriting is not great it's much
36:39
better than the rose and so he writes a
36:40
little bit about the climate he talks
36:42
about how February was feeling very
36:44
spring-like he heard a Phoebe and then
36:46
he goes back and annotated that it might
36:48
actually have been a chickadee and this
36:50
data set is just really wonderful to
36:52
work with so we tried to find as much as
36:56
we could about Quackenbush and this is a
36:59
photo from Oxbow I went up there with
37:01
Richard Premack my advisor in the Hat we
37:04
worked with Jason Johnson who has the
37:06
binoculars he's a professor at U Maine
37:08
Presque Isle and we actually found
37:10
Quackenbush his house and barn that's
37:12
the barn behind us and we tried to
37:15
retrace his path walking through town to
37:18
the post office and look at the plants

37:21
that he was probably observing about
37:23
some of the trees that may have been the
37:25
same exact tree people it was looking at
37:27
in the 40s and 50s and we tried to take
37:30
that data set and create the same types
37:34
of figures that we had done in Concord
37:35
Massachusetts so in this figure the
37:37
x-axis is the mean April temperatures
37:40
from cooler April's to warmer April and
37:43
then the y-axis is the date from early
37:46
May three
37:46
mid June and the blue shows leaf out so
37:52
that's each data point there is ten
37:54
species on the ten common tree species
37:58
that he was consistently recording each
38:00
spring from 1940 through 1955 and the
38:04
gray is flower species so these are the
38:06
15 common wildflower species that he was
38:09
consistently recording from 1945 through
38:12
1957 when we can see the same trend that
38:15
we saw in Concord where in warmer
38:18
Springs there's earlier aise leaf out
38:20
and earlier flowering and so we can

38:23
quantify that shift for beef out it's
38:25
2.5 days for each degree Celsius and
38:28
it's advancing just like in Concord and
38:30
for wild flowers it's advancing 2.3 days
38:33
for each degree Celsius and again it's
38:37
the same direction that we saw in
38:38
Concord but a little bit less in
38:41
magnitude
38:42
so Concord was advancing wild flowers by
38:44
3.2 days per degree Celsius Quackenbush
38:49
also had this really incredible data set
38:51
of migratory bird arrivals and he
38:53
specifically had on nine species that he
38:56
was recording over the course of 17
38:58
years and incredibly we were able to
39:02
match this record with the ornithologist
39:04
Bill Sheehan who has been recording
39:07
migratory bird arrivals for the same
39:09
nine species over a 17-year period from
39:12
the 1990s through the mm I think 2011
39:15
was the last year we used and so we were
39:19
able to compare these two time periods
39:21
and what we found was that the birds

39:23
were arriving earlier in the present
39:26
time period than they had during
39:28
Quackenbush his time but they were
39:30
correlated with spring temperatures so
39:33
it may not be a spring temperature in
39:35
Maine that's driving this earlier
39:38
migratory bird arrival but perhaps
39:40
something happening in their
39:42
overwintering habitat that's cueing them
39:46
to come up earlier at the same time I do
39:49
want to point out that Quackenbush was
39:51
pretty much just in Oxbow Maine walking
39:54
around the same area whereas she and
39:56
drags all over Reece accounting which is
39:58
a very large County
40:00
looking for first arrival so Shion might
40:02
be finding earlier arrivals because he
40:05
hasn't a broader geographic scope and so
40:08
we have to consider that the differences
40:09
in methodologies that might be driving
40:11
this but it's still an important dataset
40:15
to look at because um migratory bird
40:18
arrivals have been studied in Maine but

40:20
in those studies Aroostook County has
40:23
been explicitly excluded this is because
40:26
historically there hasn't been enough
40:27
data from northern means to include
40:30
Aroostook County so a number of papers
40:32
that have come out from Wilson's lab at
40:35
Colby have looked at historical
40:37
observations of migratory bird arrivals
40:39
and they've never been able to include a
40:42
rustic County in that and Quackenbush
40:44
this dataset allows us to take a look at
40:46
this underrepresented county in the
40:49
climate change literature so again this
40:52
hunting guys journal contains really
40:53
valuable climate change change data and
40:56
the placement Oxbow are responding to
40:58
variability and spring temperatures but
41:00
the shift in days per degree Celsius is
41:03
smaller than in Concord Massachusetts
41:04
and our migratory birds are arriving
41:07
earlier than in the past
41:08
but these differences might be an
41:09
artifact of the methodology all right so

41:13
just to wrap up I wanted to talk a
41:16
little bit about what I've been doing in
41:18
Acadia National Park
41:19
I had such wonderful mentors and
41:21
collaborators historically from Agra
41:23
Grandin and Annie Thoreau down and LS
41:26
Quackenbush and they've all inspired me
41:28
to hopefully be a better field biologist
41:30
and take much better notes during my
41:32
time doing dissertation research at
41:35
Acadia so I just want to remind everyone
41:38
of this figure where we have suros
41:41
Concord and each of those data points
41:44
represents 32 species from a single year
41:47
when you think about making a figure
41:49
here like this it actually takes a lot
41:51
of time and so this is all the data that
41:54
we did to that figure on the x-axis of
41:56
year and on the y-axis this mean first
41:59
flowering date so this covers a lot of
42:01
years and a lot of different observers
42:04
from sirot through my adviser Richard
42:07
Premack and when I started my

42:09
dissertation I just didn't think I had
42:12
you know 25 years to get that root that
42:15
phenology data for my own work and since
42:18
Edward Rand and the Champlain society
42:21
were summering in Acadia National Park
42:23
Aaron mount on Mount Desert Island
42:25
before it was a national park they
42:27
weren't there for the spring phenology
42:29
event so they weren't recording these
42:30
out and flowering however Mount Desert
42:35
Island has this beautiful coppa
42:37
graphical variability and so anybody
42:40
who's been hiking in Maine knows that if
42:42
you start at the trailhead in shorts and
42:44
a t-shirt by the time you get to the
42:46
summit you've added a couple layers like
42:48
a long-sleeve t-shirt or fleece or a hat
42:50
because the microclimate at the summit
42:52
is different from the microclimate at
42:54
the base of the mountain so I used that
42:56
to my advantage so I could collect a lot
42:58
of data in a single year and I was
43:00
looking at Cadillac Mountain kind of

43:02
take mountain in Sargent Mountains I'm
43:04
not desert island and I took each of
43:07
those mountains and divided them into
43:09
different zones and looked at leaf out
43:12
and flowering data across different
43:15
zones and across the north and the south
43:16
aspect of each peak so I've had seven
43:20
elevation zones on each of these three
43:22
mountains and I monitored them twice a
43:24
week in April May and June in flow over
43:27
four years during my PhD and I was
43:30
looking at 30 species but I'm going to
43:32
present some some data from the nine
43:33
most common species so species like
43:36
lowbush blueberry you can find across
43:38
the entire elevation gradient but some
43:41
species are much more restricted so I
43:43
was doing this analysis on the most
43:45
common species because we have the most
43:47
data from them um so spring temperatures
43:50
across the these microclimates turned
43:53
out to be a little bit more complex than
43:54
we thought we assumed the summits would

43:57
be the coldest spots and that was mostly
44:00
true and so I'm showing data here from
44:01
Cadillac in 2016 this is the March and
44:04
April temperatures um but the the other
44:09
cold spot on the mountain on the
44:11
mountain we're not necessarily where you
44:12
would expect in fact the lowest
44:14
elevation site on the south aspect of
44:17
Cadillac is pretty chilly and that's
44:19
because for the first mile or so of that
44:21
Cadillac Southbridge trail you're in a
44:24
dense
44:25
conifer forest so it's pretty cool
44:28
underneath that canopy and then the
44:31
northern aspect at the lowest elevation
44:34
and even at a pretty high elevation site
44:36
3 on cadillac is very open and rocky and
44:39
receives a lot more sunlight than those
44:41
closed canopy down below on the south
44:43
side so led to some interesting
44:46
discoveries about where the hot spots on
44:48
the mountains are and we try to recreate
44:51
that figure from Saros time or from the

44:54
Rose Concord and so on the y-axis again
44:57
we have the date of leaf out from
44:59
mid-april through mid-june and the
45:02
x-axis is mean spring temperature from
45:04
cooler springs to warmer spring each
45:07
color in this graphic is a different
45:09
species and each data point represents
45:13
the date of leaf out for that species in
45:18
a microclimate and the microclimate
45:20
matches up with the main spring
45:21
temperature so each mountain is
45:23
represented multiple times each
45:26
elevation zone also since I was there
45:28
for 3 on 3 years with temperature data
45:31
and for six out of the nine common
45:34
species we had a significant
45:36
relationship between main spring
45:38
temperature and data we got and the six
45:40
species are the one shown at the top so
45:42
huckleberry sheets plural Canada may
45:45
flower 3 to 6 while lowbush blueberry
45:47
and wild raisin on and when we looked at
45:52
species that we had observed in Concord

45:55

Massachusetts and on Mount Desert Island

45:57

for leaf out we found this pattern where

45:59

across the board they're all advancing

46:02

except for chokeberry which is not

46:05

significant they're all advancing their

46:07

leaf out on in response to warmer

46:09

springs but the magnitude of that

46:11

advance is not as strong on no desert

46:14

island very similar to what we found in

46:16

Oxbow with crack and bushes data and

46:19

this is true not just for leaf out but

46:21

also for flowering we see the same

46:22

pattern and um I set this this project

46:28

up on on hiking trail so I my transects

46:31

actually followed the north and the

46:32

south for a hiking trail Cadillac on the

46:35

same for Pema tick and Sergeant because

46:36

I love doing this research

46:38

but I knew that at some point I would

46:40

graduate and I thought that it would be

46:43

important for Acadia National Park to

46:45

continue this type of work and that if

46:47

we had a fun project on hiking trails we

46:50
could recruit to this and scientists to
46:52
continue this work so one of the last
46:55
things I did as a PhD student was to
46:57
analyze different subsets of my data to
47:00
kind of provide recommendations to the
47:03
Park Service for different monitoring
47:04
strategies so I looked at lowbush
47:06
blueberry data the most common plant
47:08
that we had and then I looked at what
47:10
would happen if I only had data from
47:12
Cadillac would I still be able to see
47:14
the same patterns but I have enough
47:16
statistical power to make decisions and
47:19
what if I had data from the other two
47:21
mountains but not Cadillac so I tried
47:23
different combinations of bridges to see
47:25
if we should encourage this and
47:26
scientist to hike a specific mountain or
47:29
if we needed all three mountains and it
47:32
turns out Cadillac on its own does a
47:33
pretty good job of providing solid
47:37
information about the phenology of these
47:39
plants and then I looked at well do you

47:42
need to hi folks the North rates and the
47:44
Southbridge or could you just send
47:46
hikers up the South Ridge Trail and it
47:49
turned out the South Bridge is a really
47:50
good trail to capture lots of variation
47:52
in microclimate in phenology and I
47:55
looked at just low elevations and just
47:57
high elevations so sorry and I looked at
48:00
what would happen if I reduce the number
48:03
of years that I had data on and reducing
48:05
yours is a terrible idea we need to
48:06
continue and add years and so I ended up
48:10
with these recommendations to include
48:12
focusing on Cadillac southern aspects
48:14
and more years for monitoring strategies
48:16
with system scientists but we found in
48:19
general that this leaf out and flower
48:21
phenology is responsive to temperature
48:23
across environmental gradients and as an
48:25
oxbow the shifts in days per degree
48:27
Celsius is smaller than in Concord
48:29
Massachusetts so to jump back to the
48:32
broad conclusions from this dissertation

48:33
we have a changing flora on no desert
48:36
island with lots of new non-natives
48:39
these floristic change patterns at the
48:41
species level are different from in
48:44
southern New England specifically
48:45
Concord records from the hunting guide
48:48
as Quackenbush in Oxbow in the 1950s and
48:51
ridge transects
48:52
me on Mount Desert Island in the 2010
48:55
demonstrate advancing plant phenology in
48:57
response to spring temperatures and main
48:59
but these phenological responses match
49:02
the direction but not the magnitude
49:03
recorded in southern New England and one
49:07
of the great things about working on
49:08
this dissertation in partnership with
49:10
Acadia was providing these applications
49:13
at the end on so we can say that we have
49:15
on this great example of the utility of
49:18
historical records we can highlight
49:21
northern Maine research on climate
49:23
change or north northern Maine as a
49:25
region in research and climate change we

49:28
can provide a lot of local data from the
49:30
historic data from Edward Rand and from
49:32
my own Ridge work for local management
49:34
decisions and we can support the climate
49:36
change vulnerability assessments that
49:38
Acadia is been working on and hopefully
49:40
we can initiate this citizen science
49:42
project monitoring on hiking trails so
49:45
hopefully this will be coming soon to
49:47
signs of the seasons as I continue to
49:50
work with Acadia to get this together so
49:52
I just like to thank all of the funders
49:55
that have supported this research in my
49:57
lab especially Abe Miller rushing at
49:59
Acadia National Park for mentoring this
50:01
research and thank you so much the signs
50:03
of the students for inviting me to speak
50:05
with you all so with that I'll take any
50:08
questions that was awesome Caitlin yeah
50:13
just much better than I even dreamed so
50:17
your research is so important to design
50:20
the seasons and as many examples and and
50:24
teacher collaboration I had a question I

50:28
don't see I just I see a couple of oh I
50:30
do see some questions so well I'll ask
50:33
my first uh so um were you looking at
50:37
fall plant phenology at all and the
50:40
reason I ask is because you know we are
50:44
of our different seasons of fall and
50:48
winter are the most warming for me I
50:51
mean very very very significantly more
50:53
than spring and summer yeah so I I
50:58
personally haven't but in our lab Amanda
51:01
gallon at who is about to finish up
51:03
right now wrote a really wonderful paper
51:06
on
51:07
as the neglected season and she has been
51:10
working with scoot I'm putting together
51:14
the the methodology to do Studies on the
51:17
timing of fruiting in non-native plants
51:20
and native plants and how that's related
51:22
to the timing of fall migration servers
51:25
leaving the area so they've been working
51:28
with bird banding stations and
51:29
collecting data on when different plant
51:33
species are on producing berries when

51:35
those berries are ripening and then
51:37
looking at the bird poop basically in
51:41
bird banding stations to see what feeds
51:43
are in bird poop at different times
51:46
different times of the fall I'm trying
51:48
to connect the dots through what's
51:50
happening with autumn phenology so it's
51:53
an exciting area of research that I
51:54
haven't done very much on but I have
51:56
helped Amanda pick up arts and bird poop
51:59
and it's been a cool project that's
52:01
great yeah I have that paper I should
52:03
put that on our website it's a great
52:06
paper um so here's a question for you
52:09
and I realize that we're over time but
52:11
we started really late so if people
52:13
would need to leave go ahead but hang in
52:16
there if you have questions type them
52:18
into the chat box if there are any
52:21
unanswered questions Caitlin said she's
52:23
happy to answer those and we can post
52:25
those on our website along with the
52:27
recording of this so here's another

52:30
question what would you say is the most
52:32
significant climate and/or phenology
52:33
change that your research has uncovered
52:36
and why is it's so significant so I
52:40
think it's pretty interesting that what
52:44
I found in Maine has been to match the
52:46
direction of what we found in Concord
52:48
Massachusetts but not the magnitude and
52:51
it's interesting because we're not sure
52:55
why um and so one case might be that
52:59
Concord Massachusetts it's right outside
53:01
Boston there's an urban heat island
53:03
effect and so warming not just from
53:05
climate change but also from being so
53:07
close to a city and so Concord might
53:09
have just experienced a lot more warming
53:11
um but um we also might just have this
53:18
artifact where Concord we have so much
53:20
data from
53:20
Rowe and Hosmer who was a botanist in
53:23
the 19th early 1900 and in Acadia and
53:27
even in aqsa were kind of just stuck in
53:29
the 20th or 21st century and so we don't

53:32
have that whole range of differences and
53:35
so it might be a methodology thing it
53:37
might be there's actually differences in
53:40
how different populations are adapting
53:42
to differences in spring temperatures
53:45
and I think it's probably very
53:49
significant in terms of understanding
53:50
what's happening across a region where
53:54
as I said in Concord Massachusetts
53:56
there's 300 plant species that are also
53:58
in Acadia National Arts the plant
54:00
communities are very similar but they're
54:02
responding in different ways so trying
54:05
to understand what's happening at that
54:06
local level
54:07
um it's maybe not a significant finding
54:11
yet it's more of a like huh that's
54:13
really interesting we should look at
54:14
that in a lot more depth and I didn't
54:16
expect it I really thought that I would
54:19
get up to Acadia National Park and there
54:21
would be somebody like Thoreau who had
54:23
that historic data and I just like type

54:25
it into an Excel spreadsheet and be like
54:27
no like it's the same card so that's
54:32
good information
54:32
um the other question I had is of of
54:37
course you know that's a really special
54:42
ecological habitat in Mount Desert
54:47
Island and so we you know a lot of our
54:50
volunteers are working in their
54:52
backyards and community places and don't
54:56
have that maybe those species but we've
54:59
been we're definitely going to be adding
55:01
some species because there are signs of
55:03
seasons observers that are out there
55:05
looking at different species than the 19
55:07
that are on our list and one of them is
55:09
that we're thinking of it that you have
55:11
on yours is lowbush blueberries so do
55:17
you think of that as a good addition as
55:20
an indicator species of you know how
55:21
things are changing I do and I thought
55:24
one thing I didn't show you guys I did
55:27
an experiment on cadillac mountain with
55:31
transplanting lowbush blueberry from

55:33
different elevations
55:34
so I had a summit population of lowbush
55:36
blueberry that I moved to mid and low
55:38
elevations and vice versa because we're
55:41
really interested in species that can
55:43
occur along these whole gradients so you
55:45
can find lowbush blueberry pretty much
55:47
everywhere in the park um and we've
55:50
noticed anecdotally that the globish
55:52
blueberry on the summit is flowering and
55:54
leaving out later than the lowbush
55:56
blueberry at lower elevations and that
55:58
makes sense the summit is colder so I
56:01
might just be responding to that local
56:04
microclimate but if there's some kind of
56:07
local adaptation also going on where
56:10
maybe the summit is more prone to late
56:12
frost or the summit warms up differently
56:16
than the low elevations we want to know
56:20
if those populations have evolved to
56:22
have some kind of different adaptation
56:24
than the same species at a different
56:27
elevation or in a different microclimate

56:29
um and that's important for
56:31
understanding how species will respond
56:33
to climate change across much less
56:36
compressed gradients so if you're
56:37
looking at lowbush blueberry from
56:39
Massachusetts up to Maine those are a
56:41
similar kind of difference in micro
56:44
climates on the lowbush blueberry do you
56:47
think of it as being very common but
56:48
trying to understand what's happening to
56:50
it in different locations I think is
56:51
really important and it's also just a
56:54
delicious study species yeah well thank
56:58
you that's great so there are a couple
57:00
of questions here
57:01
how is air pollution looked at in your
57:03
study um we didn't directly measure air
57:08
pollution but I think that could be um
57:10
an interesting thing to compare between
57:13
Concord Massachusetts and amount desert
57:15
island for sure and it's definitely
57:17
something that we could try to come up
57:20
with a metric for when we're comparing

57:21
all of the floristic changed at base
57:24
across New England one of the things
57:26
that was really interesting when I was
57:28
reading all of those floristic change
57:30
studies was that they the eventually
57:33
seem to be pretty aware of each other
57:35
like they would cite each other as they
57:37
came out but it was often just so
57:39
locally focused on well here's this one
57:42
place and here's what it looked like in
57:43
1800 or 1899 and
57:46
here's what it looked like when we
57:47
resurveyed it in 2005 and like there's a
57:50
new parking lot so maybe that's what
57:51
happened and so it was very focused on
57:53
what was happening at the local level
57:54
but looking at something like air
57:57
pollution gradients across New England
57:58
might be a really interesting way to
58:01
bring in that regional trend I was
58:03
trying to think of it in terms of
58:05
conservation statuses or um how urban to
58:09
rural the gradient was but I think air

58:10
pollution could be another interesting
58:12
factor there definitely that's a great
58:14
idea
58:15
okay so here's another question could
58:18
the cooling effect of the ocean be
58:20
influencing the smaller temperature
58:21
changes in Maine
58:22
compared with Massachusetts absolutely
58:25
I'm Concord as inland and so on it
58:29
doesn't have that maritime effect that's
58:31
not as tempered by being on the coast
58:35
and that might be one thing that that
58:37
kind of buffers climate change for
58:39
Acadia National Park and all of coastal
58:42
Maine so it could end up having coastal
58:45
Maine being kind of this refuge on in
58:47
the future as the climate changes more
58:50
dramatically inland yeah a huge
58:53
difference is there so another question
58:55
is what do you think is driving the
58:57
dramatic loss of historically present
58:59
species and the addition of new not
59:03
invasive species so I wish that we had

59:08
kind of a middle or 1920s ish um
59:12
flora form a desert island because I
59:15
think the creation of the auto road and
59:17
the bridge on to melchester Island
59:20
probably had a pretty large impact
59:22
around the time that Edward Rand and the
59:24
Champlain Society we're studying the
59:26
island it was becoming a summering place
59:30
but it wasn't attracting just the hordes
59:32
of people that would eventually come up
59:34
um it was still a pretty rustic location
59:38
um and so I imagine that increasing auto
59:43
traveling and increasing just the number
59:45
of people probably brought in a lot of
59:47
those new non-native species but it also
59:50
probably just led to habitat destruction
59:54
or inadvertently people over picking
59:58
things like fur
59:59
and so there's probably like that first
60:04
jump of Mount Desert Island becomes very
60:07
popular and there's more cars and so we
60:09
have um an increase in non-natives and a
60:11
drop in natives but then I do think that

60:13
the most recent climate change is
60:16
probably driving some of that species
60:19
loss and when we look at places where
60:21
there are multiple surveys of the whole
60:25
flora there's a really significant
60:28
drop-off especially in declines in
60:30
abundance and in local extirpation in
60:33
the most recent resurface so places like
60:36
Concord Massachusetts they have this
60:38
they have the the thorough data they
60:41
have Alfred Hosmer in the early 20th
60:43
century and then another botanist ray
60:46
Angelo has been working in Concord and
60:48
he published the flora I think in the
60:50
night around 1970 and then when Abe and
60:54
Richard went in and did their work it
60:57
around 2007-2008
60:58
there's a really significant drop-off
61:01
from the 1970s to 2007-2008 and it just
61:04
it wasn't as dramatic in the previous
61:07
time period so there's something
61:09
happening recently on and there's been a
61:13
lot of papers that have tried to rule

61:15
out things like white-tailed deer try to
61:17
look at specific events um like a
61:22
habitat destruction and our work in
61:25
Acadia we try to look at habitat law or
61:28
look at species loss across different
61:31
habitats to try to identify if a
61:33
specific habitat for example grasslands
61:36
which are becoming much more wooded
61:38
especially since it's a national park
61:41
and no one is out there actively farming
61:43
or cutting grass but every habitat
61:47
category is living species which
61:48
indicates there's something more region
61:51
why or more global happening and it's
61:53
really hard to find like the direct
61:55
evidence or The Smoking Gun of like
61:57
climate change impacted that plant
62:00
species for sure yeah well I don't see
62:05
any other questions but um if any do
62:08
come up after the fact then
62:10
put up something about ox though um oh
62:13
did I see something similar in Oxbow we
62:16
actually don't know very much about the

62:18
abundance of plants in aqsa so it's hard
62:21
to to determine how the plant abundance
62:24
has changed in Oxbow
62:26
and we just have our data from the 40s
62:29
and 50s on there we fattened flowering
62:31
times and we've actually been working
62:33
with Jason Johnson and his colleagues
62:35
that you made Presque Isle and they've
62:36
been monitoring the same species both in
62:40
Presque Isle and in Oxbow so we have
62:42
some updates on how those species have
62:45
responded to recent years but
62:47
unfortunately we started this project
62:48
after 2012 so we're missing that really
62:52
great outlier year of the extremely warm
62:55
spring but hopefully we'll have
62:59
something to talk about with ox out
63:00
pretty soon and we're hoping to publish
63:02
that paper this fall great looking
63:05
forward to that
63:06
actually I had a quick question were
63:09
there no cites in common front with
63:11
Chien and Quackenbush as far as the the

63:15
bird phenology go no it was mostly just
63:20
that she is so Oxford kind of in the
63:23
middle of nowhere so Sheehan hadn't been
63:25
out there I think so they're talking
63:27
about it um but just that he was
63:30
traveling so widely across the county
63:32
that he was just covering a much larger
63:34
geographic range route it would be
63:36
slightly more comparable if he had just
63:38
been like in Presque Isle and hanging
63:40
out around Presque Isle itself but he
63:42
used to travel across the county which
63:45
is very common for birders I totally
63:47
understand wanted to see this you can
63:50
right okay any other questions before we
63:54
close this out well I can't thank you
64:00
enough Caitlin for your presentation and
64:03
great answers to our questions and
64:07
increasing our knowledge on this this is
64:09
wonderful and look forward to you know
64:11
your other work in that paper and in
64:14
working together great thank you so much
64:17
it's been really wonderful working with

64:19

friends with seasons and and it's

64:22

awesome it to be able to talk about my

64:24

work

64:24

and as I said before I had a good time

64:27

doing my defense or as much of a good

64:30

time as you can

64:30

defending your PhD but it's really nice

64:32

to get to talk about the human side of

64:34

the research a little bit more well it's

64:37

very very interesting and I think that

64:39

getting some comments about that as well

64:42

so that's we really appreciate it

64:44

thanks so much lots of the plugs thank

64:49

you all for participating