

UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF VERMONT

GREEN MOUNTAIN CHRYSLER- *
PLYMOUTH-DODGE, et al. *
*
THE ASSOCIATION OF *
INTERNATIONAL AUTOMOBILE *
MANUFACTURERS *
*
V *
*
GEORGE CROMBIE, Secretary *
of Vermont Agency of *
Natural Resources, et al. * Civil File No. 05-302 & 304

TRIAL BY COURT
Friday, May 4, 2007
Burlington, Vermont

WITNESSES:
Barrett Rock
John R. Christy

BEFORE:

THE HONORABLE WILLIAM K. SESSIONS III
Chief District Judge

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United States District Court
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1 FRIDAY, MAY 4, 2007

2 (The following was held in open court at 8:22 a.m.)

3 THE COURT: Okay, good morning.

4 COURTROOM DEPUTY: This is case number 5-302,
5 Green Mountain Chrysler-Plymouth-Dodge-Jeep, et al.
6 versus George Crombie, et al. Present in the courtroom
7 on behalf of the plaintiffs are attorneys Andrew Clubok,
8 Matthew Byrne, Stuart Drake, Stacey Bennett, Julie
9 Becker, Raymond Ludwiszewski, Deborah Bouffard and
10 Charlie Haake -- Charles Haake. Also present in
11 courtroom on behalf of defendants are attorneys Mark
12 Rielly, Benjamin Krass, Matthew Pawa, Kevin Leske, Scot
13 Kline, and James Tripp.

14 The matter before the Court is trial by court day
15 14.

16 THE COURT: All right. How are we proceeding?
17 Is Dr. Rock testifying first?

18 MR. RIELLY: Yes, your Honor.

19 THE COURT: It's Mr. Rielly?

20 MR. RIELLY: Yes.

21 THE COURT: Okay.

22 MR. RIELLY: May it please the Court: We'd
23 like to introduce Dr. Rock.

24 THE COURT: Okay.

25 BARRETT N. ROCK,

1 A I am. I am past director and current member of the
2 Complex Systems Research Center, and that is a part of
3 the Institute for the Study of Earth, Oceans and Space
4 at UNH.

5 Q Could you give me some sense of what those centers
6 of institutes do?

7 A The Complex Systems Research Center studies complex
8 systems, as you might guess, and climate would be an
9 example of a complex system. An ecosystem would be an
10 example of a complex system. The Institute for the
11 Study of Earth, Oceans and Space looks at it all. We
12 have a Space Science Center, Complex Systems Research
13 Center, Climate Change Research Center and an
14 Oceanographic Research Center.

15 Q Were you asked by defendants to offer an expert
16 opinion here today?

17 A I was.

18 Q And on what subjects?

19 A Essentially physiology: The response of forest,
20 vegetation, to changing climate conditions.

21 THE COURT: I'm sorry, what was that, Doctor,
22 again?

23 THE WITNESS: Pardon?

24 THE COURT: What was that last statement you
25 just made?

1 Hurt. Dr. Hurt.

2 Did you ever complain to your parents about being
3 named Barrett Rock from Barre, Vermont?

4 THE WITNESS: No. My mother loves the name
5 Barrett. She is the only one who calls me Barrett, and
6 I have gotten used to Barry from Barre.

7 MR. RIELLY: Did you ever consider geology?

8 THE WITNESS: I have a Master's degree in
9 geology, as a matter of fact, so --

10 A So, I graduated high school, in 1960. Went to the
11 University of Vermont, got a degree -- an undergraduate
12 degree, a Baccalaureate degree, in botany. Went to the
13 University of Maryland and received a Master's degree
14 and a Ph.D. in botany and, in particular, in the
15 comparative study of forest conditions.

16 Q Have you been published in a peer-reviewed journal
17 on these topics?

18 A Yes, I have.

19 Q And which journals have you been published?

20 A I have had papers in Science, American Journal of
21 Botany, Bioscience. I have also published some works in
22 Geology, and in Economic Geology. In the Journal of the
23 American Association of Petroleum Geologists.

24 Q Do you belong to any professional organizations?

25 A Yes, I do. American Geophysical Union, the AGU.

1 Botanical Society of America. Former member of the
2 American Association of Petroleum Geologists. And Union
3 of Concerned Scientists.

4 Q What work and research have you done that bears
5 upon the issue of climate change in the northeast?

6 A In particular, looking at the impact of climate,
7 both physical climate -- that would be temperature,
8 precipitation, relative humidity -- and then also
9 chemical climate, which would be air quality, acid rain,
10 on forest health.

11 I have done that work extensively throughout New
12 England and essentially the eastern part of the United
13 States. And I have also done extensive work in that
14 area in central Europe. Czech Republic primarily, but
15 Poland, former Eastern Germany, Siberia.

16 Q Are you familiar with the U.S. Global Change
17 Research Project?

18 A Yes.

19 Q Have you been involved in that at all?

20 A I was. The peer-reviewed journal or the
21 peer-reviewed articles that we are going to be
22 discussing this morning appeared in the New England
23 Regional Assessment, which was one of 16 regional
24 studies conducted as part of the national assessment,
25 which was under the direction of the United States

1 Climate Change Research Program.

2 Q I'd like to refer you to two documents in front of
3 you which have been premarked as Defendants' Exhibits
4 2298 and 2297.

5 A Um-um. These would be the NERA documents, the New
6 England Regional Assessment documents.

7 Q Can you explain why there's two?

8 A The document that is referred to as the New England
9 Regional Overview was generated first. It was published
10 in August of 2001. And it was designed for public use
11 and study, and so it doesn't look too much like science.
12 It was really designed to be more readily understandable
13 to the general public.

14 The second document, which is this, is referred to
15 as the New England Regional Foundation. This is the
16 science basis for the overview document, and this was
17 published in December of 2001.

18 Q Did you rely on these documents in preparing your
19 opinions?

20 A Yes, I did.

21 Q Was the NERA report peer reviewed?

22 A Yes, it was. Very -- very extensively peer
23 reviewed. There is a -- an appendix in each of these
24 documents that indicate the number of research
25 scientists as well as stakeholders -- members of the

1 general public -- that were involved in reviewing both
2 documents. Well over 100 total reviewers for each of
3 the documents; approximately 50 research scientists,
4 looking at the science in both documents, and then 60
5 stakeholders were involved in looking at the relevance
6 and the ability to communicate to the general public the
7 information.

8 Q What was your role and responsibility in preparing
9 these reports?

10 A I was the -- essentially editor, editor-in-chief,
11 and lead author for the document.

12 Q Has any of your research focused particularly on
13 the climate impacts in the state of Vermont?

14 A Yes, it has.

15 Q Can you explain that for us?

16 A One of my first research efforts was on Camel's
17 Hump, and studying the impact of physical climate and
18 chemical climate on red spruce health. You may know
19 that Camel's Hump became rather well-known for studies
20 in so-called acid rain effects. That would have been in
21 the 1980s. And my work there began in 1986 -- actually
22 in 1984; and then we published a major article on our
23 findings in 1986.

24 Q Are there different elements of the -- what we call
25 the climate that you look at?

1 A Yes. Yeah. The physical climate and chemical
2 climate are intimately connected. And we find that air
3 quality becomes more of a problem when we are looking at
4 warmer climates, high terms, dry conditions.

5 THE COURT: Do you have an objection?

6 MR. BYRNE: Your Honor, until we get -- if we
7 start getting into his opinions, it might be proper
8 first to qualify him as an expert when he starts to
9 discuss the various opinions, but while I am up, I think
10 I should just say my sort of standing objections.

11 We wanted to renew our objection based on Daubert,
12 703, and foundational objection based on certain
13 modeling. But just as a matter of procedure, we ought
14 to know whether he is qualified before he starts giving
15 the substance of his opinions.

16 THE COURT: All right. Go ahead.

17 BY MR. RIELLY:

18 Q You just heard reference to modeling. Dr. Rock,
19 are you a climate modeler?

20 A I am not.

21 MR. RIELLY: Well, at this point I would like
22 to move then Dr. Rock be admitted as an expert in tree
23 physiology, forest health and the climate impacts on the
24 northeast.

25 THE COURT: Okay?

1 MR. BYRNE: With the understanding that he is
2 not a modeler, we have no objection.

3 THE COURT: All right. So qualified.

4 BY MR. RIELLY:

5 Q Dr. Rock, were you asked to prepare an opinion
6 today on the historic temperature trends in the
7 northeast?

8 A I was.

9 Q Are you prepared to give that opinion?

10 A I am.

11 Q What is that opinion?

12 A We have seen a -- a trend in warming temperatures
13 over the last 100 years; actually, from 1895 through to
14 the present. And that warming has affected the region,
15 but it has also impacted the state of Vermont. The
16 overall warming for the region, as studied in the New
17 England Regional Assessment, was seven tenths of a
18 degree Fahrenheit over that 100-plus year period. In
19 the state of Vermont, 1.6 degrees Fahrenheit for that
20 same time frame.

21 Q And can you explain the basis for your analysis,
22 how you got to those conclusions?

23 A We used the National Climate Data Center historic
24 climate network data points. And for the NERA report,
25 we looked at approximately 350 such monitoring sites

1 across the region.

2 I would just call everyone's attention to the fact
3 that -- looking at the cover of the document, New York
4 State is included in the New England region. So when we
5 say New England regional, I am referring to both New
6 York State plus the six New England states.

7 Q Have you prepared any graphics that illustrate this
8 point for the Court?

9 A I have. A graphic that we are showing --

10 Q Could you just identify --

11 A This one? It says spatial variation of annual
12 temperature trend, 1899 through 2000. This comes
13 from --

14 Q I'm sorry to interrupt. Is that the same you see
15 on the screen there?

16 A That is correct.

17 Q Okay. Could you just explain what this graphic
18 illustrates?

19 A This graphic represents, again, the region -- in
20 this case, New Jersey has been added to New York, in
21 addition to the six regional states of the New England
22 states.

23 Q Did anyone ask permission --

24 (Interruption by the reporter.)

25 THE COURT: Did anyone ask permission of New

1 Jersey to be included within New England as a part of
2 the study, is exactly what the question was.

3 A With respect to the region, notice that in this
4 particular analysis, we see an overall increase, a
5 regional increase, of 1.8 degrees Fahrenheit. And I had
6 mentioned before that the NERA analysis done in 2001
7 showed a seven tenths of a degree Fahrenheit warming.
8 This is a study that is an update of the NERA report and
9 was published in 2005. And we see a difference in the
10 temperatures because of the climate stations that were
11 used.

12 In the New England Regional Assessment, we used all
13 350 climate stations within -- within the region.

14 In this case, we used only 56 stations, and those
15 were stations that had continuous climate records for
16 the period in question, in this case 1899 through 2000.
17 Many of the 350 stations had discontinuous, or
18 incomplete records, and we felt that it might be more
19 reasonable to use 56 stations that had the continuous
20 record. So that's what we see in this graphic.

21 Notice that the size of the dots and the --
22 essentially the color of the dots indicate the degree of
23 warming for a specific monitoring stations. And you can
24 see that within Vermont, there are a total of six
25 monitoring sites. We see that, of those six, five have

1 warmed from essentially two to three degrees Fahrenheit,
2 so the findings here just amplify our findings in the
3 New England Regional Assessment that Vermont is warming
4 more -- to a greater extent than is the regional
5 assessment.

6 Q Do you hold that conclusion to a reasonable degree
7 of scientific certainty?

8 A Yes, I do.

9 Q Dr. Rock, were you also asked to prepare an opinion
10 regarding the effect of the warming climate on fall
11 foliage?

12 A I was.

13 Q Are you prepared to give that opinion, sir?

14 A I am.

15 Q And what is that opinion?

16 A The fall foliage in Vermont, for which we are --
17 are famous -- it's one of our icons -- is based on the
18 sugar maple and the color changes that occur in the
19 fall. And those color changes -- getting into a little
20 bit of botanical science here -- result from a
21 shortening day length, and also from cooler
22 temperatures. And the climate change that is projected
23 for the future, if that were to occur, we would have
24 very muted color displays, and if the kind of
25 projections that are made by the climate models were to

1 occur, we would in fact lose our sugar maples. The
2 trees would not be able to tolerate a -- a warmer
3 climate than we are currently seeing.

4 Q Is there a graphic that would illustrate that point
5 to the Court?

6 A Yes, there is.

7 This comes from the NERA document. It's this one.

8 Q Is that the same one you see on the screen?

9 A It is.

10 Q Can you explain what that illustrates, please?

11 A Um-hum. This particular document comes from a
12 series of Forest Service studies that were begun about
13 1995. This is from a study that was published in 2000.
14 And it is illustrating the current conditions, the
15 current FIA diagram that is shown. FIA stands for
16 forest inventory analysis.

17 This is a detailed study that the Forest Service
18 has conducted, and you can see that the region is
19 dominated by a red color, and that red color represents
20 maple, beech and birch. So this isn't telling anything
21 we don't already know. We know that maple is a dominant
22 species across the region.

23 In the New England Regional Assessment, we used two
24 climate models: One called the Hadley climate model and
25 the other called the Canadian climate model. And as you

1 can see in this diagram, the Hadley climate scenario
2 projected over the next 100 years, by the year 2100, a
3 warming of approximately six degrees Fahrenheit. And
4 the Canadian model, which is represented by the CCC
5 scenario, projected a 10 degree warming.

6 And under both of those scenarios, we see that
7 there are no maples in the New England region. The
8 warming would be such that the sugar maple would not
9 tolerate those warmer conditions, six degrees or 10
10 degrees Fahrenheit increase. These would be annual
11 average increases. And that that would mean we would
12 simply lose our sugar maples.

13 Q And the time frame for these -- for the
14 Canadian/Hadley models for that warming of 10 and six
15 degrees, respectively, is what?

16 A This is assuming a warming of that extent in the
17 next 100 years, or by 2100, and I know a fair amount has
18 been discussed about climate impacts, the warming, and
19 the migration of tree species, but in order for the
20 maples to migrate out of the area, and then be replaced
21 by the green color there, which would be an oak,
22 hickory, more southern type of forest cover, that would
23 assume hundreds of years, or perhaps a thousand years or
24 more.

25 So, a 100 year warming of this sort, we would see

1 the death of the sugar maples and then a gradual
2 replacement by other tree species. But 100 years is too
3 short a time for species to effectively migrate -- tree
4 species to effectively migrate.

5 Q So based on your understanding of trees and forests
6 and their health, what would you anticipate forests to
7 look like under these two scenarios?

8 A We would probably see a number of weed species that
9 have come in. These would be things like birch. There
10 would also be perhaps black locust. It's unclear what
11 would actually happen, but we wouldn't see a -- an
12 organized replacement of the maples by the southern
13 species in a 100 year time frame.

14 Q Is it customary for scientists looking at -- such
15 as yourself, to use global warming impacts as -- I'm
16 sorry, to use climate models, outputs, as their inputs
17 when they are examining climate?

18 A These scenarios are projections. They're generated
19 by others. And we do use those to take into account
20 what the impact on foliar would be 100 years from now.

21 Q Can you explain how you use those?

22 A Again, I am not a modeler so I don't generate the
23 products myself. I rely on others. And I also rely on
24 my knowledge of tree physiology in terms of how sugar
25 maples are adjusted to the current climate conditions,

1 and what those changes would have to be under the
2 climate scenarios provided.

3 And we can simply look at Camel's Hump as an
4 example. The lower elevations of Camel's Hump are
5 dominated by the species that we see in the current
6 condition, the birch and the maple. As you go higher on
7 Camel's Hump, you run into the spruce-fir zone, and
8 that's not because the spruce-fir zone necessarily like
9 the higher elevations. It's that the maples don't. And
10 so as a result, we have this zonation of forest
11 conditions on our mountains, that we see today.

12 Q Could you put the warming that's predicted under
13 these scenarios in context for us geographically?

14 A One of the points we made in both of the New
15 England Regional Assessment documents was that the
16 Hadley model projects some warming of six degrees
17 Fahrenheit. We see that on this graphic. And the
18 Canadian model projects a warming of 10 degrees.

19 To put that into context, we took the 30-year
20 average temperature for Boston, as a typical New England
21 city, and that was the 30-year average temperature from
22 1961 through 1990, and we then added six degrees to
23 that. And when you do that, the resulting temperature
24 is the 30-year average temperature for Richmond,
25 Virginia. And if you add 10 degrees to that, you get

1 the 30-year average temperature for Atlanta, Georgia.

2 And I know that Dr. Christy is from the south, and
3 by no means do I want to denigrate the forests of the
4 south. I do some work there myself. But, Vermont isn't
5 Richmond. It's not Atlanta. And so, these kinds of
6 warmings -- we know that they don't have maple trees
7 outside of Atlanta, Georgia. If they do, they are red
8 maples and not sugar maples. And so Vermont would
9 change in very fundamental ways if either of these
10 projections would prove to be correct.

11 Q When are we likely to begin seeing changes in the
12 forest cover in Vermont, or the New England region?

13 A Well, based on our work, we are seeing changes
14 already. The color changes have become more muted.
15 There is a -- an intense orange color to the typical
16 Vermont foliar display that we haven't seen in the last
17 few years. And I believe this is the beginning of the
18 impact of the warming.

19 Warmer falls. One of the triggers for a sharp,
20 intense color display is the occurrence of a frost in
21 September. That causes the decline of chlorophyll to be
22 more rapid. And there are pigments that are accessory
23 pigments in the photosynthetic process that assist
24 chlorophyll in trapping light energy, and those pigments
25 are called carotenes and xanthophylls, and these tend to

1 be orange and yellow, and when the chlorophyll degrades,
2 then the orange and yellow colors come through, and that
3 first frost in September then will lead to a -- an
4 intense color display, along about Columbus Day, first
5 couple of weekends in October.

6 And recently, we have not seen frosts in Vermont in
7 September. The typical timing of frost is getting so
8 that it's more typical of October.

9 THE COURT: Can I just interrupt for a second.

10 I am interested in the process of determining
11 whether there has been a rise in average temperatures,
12 because obviously there's some variation year to year.

13 To be able to track the rise in temperature, do you
14 take a certain number of years at the beginning and
15 average them, and then compare them to a certain number
16 of years later on? Or is there some other process by
17 which you conclude that there is an increase in the
18 average temperature?

19 THE WITNESS: We develop a number of different
20 comparisons. In the case of the study that looked at
21 the change in temperature between 1895 and 1999, we
22 developed what is called a trend line, and we look at
23 the initial point of that trend line and what that trend
24 line temperature represented in 1895, and then look at
25 the current -- the other end of the trend line, if you

1 will.

2 THE COURT: Okay. Well, how do you determine
3 what the trend line is, let's say, in 1895, other than
4 taking the average temperature on that particular year,
5 which may be higher or lower than the average
6 temperature over a period of 10 years?

7 THE WITNESS: We actually average over a
8 10-year time frame to try to eliminate some of that
9 weather variation. And I would also have to tell you, I
10 am not a statistician, so, I -- I am not as well versed
11 in the actual methodologies some of the witnesses --

12 THE COURT: But NERA adopted this particular
13 approach.

14 THE WITNESS: Yes.

15 THE COURT: Do you know if NERA adopted an
16 approach which actually showed a trend line --

17 THE WITNESS: Yes.

18 THE COURT: -- as opposed to just a bald
19 comparison of 1895 to 1999?

20 THE WITNESS: No, we developed trend lines for
21 each of these studies.

22 THE COURT: And are there trend lines which
23 reflect the amount of change in temperature over the
24 past 30 years, as opposed to -- in other words, does the
25 trend line -- we have heard testimony that the

1 significant impact in global climate change,
2 theoretically, has happened over the last 30 years. Or
3 that's the most frequent. The most dramatic. And is
4 there a trend line which is consistent or inconsistent
5 with that observation?

6 THE WITNESS: No, no. The most aggressive
7 warming that we have seen appears to have occurred since
8 1970. So that would be that last 30- or 35-year period.

9 THE COURT: Is there something in the NERA
10 report which actually sets out that trend line showing
11 the increased temperature, or is that your general
12 assessment?

13 THE WITNESS: We did not do that in the NERA
14 report. The Markham and Wake 2005 publication does
15 that. In fact, to a certain extent, the publication of
16 the Markham and Wake 2005 paper was in response to the
17 fact that we were seeing this aggressive warming, and
18 that had not been identified in the NERA report; the
19 another aggressive warming in the last 30 years.

20 THE COURT: So there's a separate study?

21 THE WITNESS: Yes.

22 THE COURT: Markham --

23 THE WITNESS: Markham and Wake.

24 THE COURT: Which actually shows the trend
25 line in the increasing temperatures?

1 THE WITNESS: Over the last 30 years, yes.

2 MR. RIELLY: Your Honor, I have that study
3 here.

4 THE COURT: Oh. Okay.

5 BY MR. RIELLY:

6 Q Dr. Rock, if you could point us -- this has been
7 previously marked as Defendants' Exhibit 2303.

8 THE COURT: I'm sorry, I didn't mean to
9 predict where you were going.

10 Q Dr. Rock, could you point us -- is there an
11 illustration in the Wake study that would demonstrate
12 that to the Court, the point we were discussing?

13 A The illustration, which does not include the trend
14 line, but it's figure three? One.

15 Of the things that I should have mentioned from
16 the NERA report was that we identified a more dramatic
17 warming during the winter months than during the overall
18 annual temperature, and that would be true for the
19 entire region as well as the individual states.

20 And figure three on page two -- excuse me, figure
21 three on page three shows the annual winter temperature
22 for the northeast. Describes this. And it is then
23 stated that over the past -- in this case, from
24 essentially 1899 to the year 2000, the wintertime
25 temperature has increased by 2.8 degrees Fahrenheit for

1 the region, and goes on to state that even more striking
2 is the 4.4 degree Fahrenheit increase in winter
3 temperatures over the last 30 years, 1970 through the
4 year 2000. And that is shown in figure three.

5 Q If I can go back to your fall foliage testimony.
6 How certain are you, based on your experience as a tree
7 physiologist, that the impacts you describe on fall
8 foliage will occur with the warming that's predicted?

9 A I am very certain of that.

10 Q Were you asked today to prepare an opinion
11 regarding the impacts of warming on skiing conditions?

12 A Yes, I was.

13 Q And have you prepared that opinion?

14 A Yes, I have.

15 Q And what is that?

16 A That is that with warming, we will see shorter
17 winters and warmer winters, and it will have definite
18 impact on the amount of snow. We see that already.
19 That impact is occurring now.

20 Q Is there a graphic that would illustrate that for
21 the Court?

22 A Yes, there is. This is from the NERA report. It's
23 entitled Average Snowfall for Maine, New Hampshire and
24 Vermont.

25 Q Is that the same one that I put up on the screen?

1 A Yes, it is.

2 Q Can you explain to the Court what this graph
3 represents?

4 A This particular graphic represents the time frame
5 from 1953 through to 1993 for those three states, Maine,
6 New Hampshire and Vermont. And we see an overall 13
7 inch decrease over that period of time, which represents
8 approximately 15 percent decrease in average snowfall
9 for that period of time.

10 Q Did the NERA report also examine snow cover?

11 A Yes, it did.

12 Q Is there a graph that would help illustrate that?

13 A Um-hum. This one, which is entitled Maine, New
14 Hampshire, Vermont Annual Snowfall -- or, excuse me,
15 Annual Snow-On-Ground.

16 Q Is that the same graph that's on the screen?

17 A It is.

18 Q Can you explain what that represents, please?

19 A And, your Honor, in this case, the trend lines are
20 shown on both of these graphics.

21 Along the vertical axis is something called Julian
22 date, and that doesn't mean anything to any one other
23 than a scientist using that designation, and so I have
24 inserted the actual calendar dates of April 22nd, for
25 the beginning point, which was 1953, and then April

1 14th, in 1998.

2 And so what this is telling us is that the snow is
3 on the ground for shorter periods of time; decrease of
4 about seven and a half days, approximately, a week.

5 Q Your opinions regarding snowfall snow on the
6 ground, do you hold those to a reasonable scientific
7 certainty?

8 A Yes, I do.

9 Q Dr. Rock, were you also asked to prepare an opinion
10 regarding the impacts of warming temperatures on maple
11 sugar production?

12 A Yes, I was.

13 Q What is that opinion?

14 A The maple sugar industry will essentially be a
15 thing of the past if the kinds of warming that are
16 projected by the models were to occur, and we are seeing
17 an impact already. And that is an impact that has
18 become more obvious just in the 1990s, and now the
19 2000s.

20 In order for maple syrup to be produced, maple sap
21 needs to flow upwards in the tree, and that is not
22 occurring, for the benefit of Vermont farmers. It's
23 occurring because the maple tree is trying to get sugar
24 to the developing buds at the tips of the branches. And
25 the actual mechanism of sap flow is well understood.

1 And it involves freezing temperatures at night,
2 temperatures below 27 degrees Fahrenheit, and then
3 warming temperatures above 32 degrees during the day,
4 preferably on the order of 37 to 38 degrees Fahrenheit.

5 And that causes bubbles to form within the sap, which
6 then drive the sap up the tree, is the mechanism that
7 the tree uses, to -- what's called translocate this sap.

8 The sap itself will vary in sugar content,
9 depending on the genetics of the tree, the actual
10 location, but also on something called the cold recharge
11 period. And that cold recharge period would be
12 prolonged periods of time below 32 degrees Fahrenheit,
13 and that triggers the conversion of starch to sugar,
14 which then makes the sap sweet.

15 And so the normal seasonal pattern would be for a
16 cold recharge period through parts of November,
17 certainly December, January, and then beginning mid to
18 late February, when temperature fluctuation goes from
19 that cold at night to warm during the day, sap flow
20 begins, and the sap is sweet because of that prolonged
21 cold recharge period.

22 We are seeing that the sap season, which is
23 normally from, again, this -- end of February through
24 the end of March, it is becoming shorter. It's
25 occurring earlier in the season. This creates a problem

1 for many maple sugar manufacturers because they're used
2 to tapping around -- tapping their trees around
3 President's Day in February, and if the sap flow begins
4 before that, then that's a problem. And we are seeing
5 that the sap flow period is occurring earlier and
6 earlier.

7 We are also seeing that the end of the sap season
8 is occurring earlier and earlier as well. It's been
9 shortened by about 10 percent just over the last 40
10 years, and that just indicates the kinds of changes
11 we're likely to see.

12 And the last few sugar seasons -- I know it's a
13 very limited data set, but the last few sugar seasons
14 have been fairly poor to bad, and it has to do with
15 having winter temperatures in December in the 50s and
16 60s, instead of that period for the cold recharge. The
17 quality of syrup produced is impacted by that.

18 Q Are there other impacts besides reduction in the
19 quantity that would be associated with increasing
20 temperatures?

21 A Well, quantity would be the major impact. One is
22 also seeing an impact on the quality of the syrup. That
23 first sap run is a real moneymaker. That's when the sap
24 has the highest sugar content and the lowest metabolic
25 by-products, and as a result, that sap makes the Grade A

1 fancy syrup, and is later in the season when you get
2 Grade B, and then Grade C syrup, so if you haven't
3 tapped your trees and you have missed that first sap
4 flow, you have missed an important part of the season.

5 Q Referring you back to the slide we discussed
6 earlier, does this illustrate any additional impacts
7 that might be expected to the maple sugar production?

8 A Obviously you can't tap maple trees if you don't
9 have maple trees, and so, a warming of six degrees to 10
10 degrees Fahrenheit would eliminate maple sugar season.

11 Q Do you hold -- how certain are you in the opinions
12 you have just given with respect to warming temperatures
13 on New England and Vermont forests?

14 A If the warming occurs, that is projected by the
15 scenarios, I am very certain of that.

16 MR. RIELLY: Thank you, Dr. Rock.

17 THE COURT: Are you seeking to introduce any
18 of these particular demonstratives?

19 MR. RIELLY: I would like to -- yes, I would
20 like to move to introduce the exhibits that he has
21 discussed, including the Wake report that I gave the
22 Court earlier.

23 THE COURT: Okay?

24 MR. BYRNE: The Wake report, the NERA -- the
25 two versions of the NERA report are clearly hearsay.

1 THE COURT: Well, the question is whether they
2 form the basis of his opinion.

3 MR. BYRNE: I haven't heard -- I heard a
4 little bit about the NERA and the Wake report, but I am
5 not sure that they are admissible as substantive
6 evidence for the truth of the matter asserted.

7 To the extent he relies on them -- I don't believe
8 that they are admissible under the rules. He can
9 certainly rely on them, but they are not admissible for
10 the truth of the matter asserted. And they're only
11 admissible to the extent he actually discussed them in
12 his opinions, because those reports go well beyond the
13 scope of what he has testified here today and what he
14 has disclosed in his expert report.

15 THE COURT: All right. Do you want to lay a
16 foundation as to whether or not he relied upon these
17 individual reports, NERA -- I thought he has already
18 established that he relied upon NERA, but in
19 particular, the Wake report, to substantiate or support
20 any of his testimony?

21 CONTINUED DIRECT EXAMINATION

22 BY MR. RIELLY:

23 Q Dr. Rock, with respect to the NERA reports, did you
24 rely on those in coming to your opinions today?

25 A Yes. Yes, I did.

1 Q And again, your role in producing those reports was
2 what?

3 A I was the lead author, editor.

4 Q And with respect to the Wake and Markham 2005
5 report, was that something that you relied on in
6 developing your opinions today?

7 A I have relied on them. They were part of the
8 documents that are cited in my deposition. My major
9 reliance is upon the New England Regional Assessment,
10 the NERA.

11 THE COURT: All right. Well, for the purpose
12 of introduction of these documents, it seems to me that
13 they form the basis of your opinion. If you cited them
14 in your report, you relied upon them to form your
15 opinion. And for -- it's not for the truth of the
16 matter asserted therein.

17 It's as a substantiation of his opinion.
18 Therefore, they are relevant for that particular purpose
19 and they are admitted.

20 MR. RIELLY: And I think in addition, the
21 demonstratives we showed would be admitted for the same
22 purpose.

23 THE COURT: The demonstratives have been
24 admitted constantly throughout this trial and I am not
25 so sure if there's a rule of evidence which says they

1 are supposed to be admitted, but they have been, so any
2 objection to the demonstratives?

3 MR. BYRNE: We have no objection to the
4 demonstratives as being reflective of his testimony.

5 THE COURT: You agree that if an expert comes
6 in and testifies, and the expert says that they are
7 relying upon a particular document to substantiate their
8 opinion, the document is relevant and admissible for
9 that particular purpose? It's not hearsay. It goes to
10 the basis of the opinion.

11 Mr. Clubok disagrees, but --

12 MR. CLUBOK: Well, your Honor, playing my role
13 of Mr. Hemley this morning, I think that's technically
14 not correct. Experts are allowed to rely on
15 inadmissible hearsay. No question about that. And they
16 are allowed to discuss the hearsay for purposes of
17 explaining their opinions. But it's inadmissible
18 hearsay and so it is, by definition, inadmissible,
19 and --

20 THE COURT: You are correct. And if it's
21 offered for that purpose, to prove the truth of the
22 matter asserted therein, then it's inadmissible because
23 that is what hearsay is. But if it's offered as the
24 basis of an opinion, it's not being offered to prove the
25 truth of the matter asserted therein, and therefore,

1 it's not hearsay.

2 MR. CLUBOK: I think Mr. Hemley -- I almost
3 said Dr. Hemley -- is my evidence professor now. He has
4 been at least last couple of weeks. I think he would
5 say that it is not admissible into evidence for any
6 purpose. You can certainly refer to it as explaining
7 this was the basis of your opinion, and it's perhaps --
8 without a jury, it's probably a distinction without too
9 much of a difference.

10 THE COURT: It is.

11 MR. CLUBOK: But for the record, and for Mr.
12 Hemley' benefit, I will make that objection.

13 THE COURT: Okay, but the objection is not a
14 hearsay one. Your point may be right. Maybe opinions
15 are not introduced, but this has nothing to do with
16 hearsay. This has to do with the basis of his opinion
17 and, quite frankly, I would not read this document for
18 the truth of the matter asserted within the document, or
19 the basic conclusion. It's -- it's whether or not there
20 is sufficient credibility to his testimony based upon
21 what he relied upon.

22 MR. CLUBOK: Yes. And by the way, that was
23 the disagreement I was having with Mr. Hemley yesterday
24 when he agreed with your Honor: That for the purposes
25 of assessing the Daubert worthiness of his testimony, I

1 would agree with you those kinds of documents are --
2 certainly should be available to the Court.

3 THE COURT: Okay.

4 MR. BYRNE: I think the basis of the opinion
5 is governed by 703, and it says that the facts and data
6 are otherwise inadmissible, but they may be discussed.
7 That doesn't mean that the underlying documents would be
8 admitted.

9 THE COURT: Well, if you were to attack his
10 opinion in any particular way -- in other words, if you
11 were to ask him any particular question attacking his
12 opinion -- would he not then be able to introduce the
13 bases of the opinion to support the -- his opinion?
14 Contrary --

15 MR. BYRNE: Well, I think this goes back to
16 the discussion that you and Mr. Hemley had.

17 THE COURT: Right.

18 MR. BYRNE: The exception to the hearsay rule
19 in the learned treatise. I think what he can do is read
20 sections of the document out of there. The document
21 itself may not be -- but that's our position and we
22 understand it.

23 THE COURT: All right. And if -- I am going
24 to admit them, and if that's improper and you get a
25 reversal ever you needed so, based upon that, you should

1 go on a nationwide speaking tour. Because --

2 MR. BYRNE: I will keep that in mind, your
3 Honor.

4 (Defendants' Exhibits 2297, 2298 and 2303 were
5 received in evidence.)

6 CROSS EXAMINATION

7 BY MR. BYRNE:

8 Q Good morning, Dr. Rock.

9 A Good morning.

10 Q Now, it's -- your understanding of the Vermont
11 regulations is that they are adopting the California
12 regulations which set a fuel economy standard of 34
13 miles per gallon, correct?

14 A Correct.

15 Q Now, you can't tell me as an expert, one way or the
16 other, whether there will be even a thousandth of a
17 degree reduction in the ambient temperature in Vermont
18 that will be caused by the regulations, correct?

19 A That is correct.

20 Q And you can't tell me any reduction in temperatures
21 that would occur because of the adoption of the
22 regulations, correct?

23 A Correct.

24 Q And it's impossible, in your view, to project
25 temperature changes in Vermont into the future until we

1 get a regional climate model, correct?

2 A I believe we have reasonable climate models.

3 Q Well, at your deposition, you said it was
4 impossible until we get a regional climate model,
5 correct?

6 A Correct.

7 Q And your theory is that without a reduction of two
8 degrees in Fahrenheit temperature, the impacts that you
9 describe in your expert report will occur anyway,
10 correct?

11 A An increase of two degrees would occur anyway? Is
12 that what you are asking?

13 Q Let me start again. Your theory is that without a
14 reduction of two degrees in Fahrenheit temperature, the
15 impacts that you describe in your expert report will
16 occur anyway, correct?

17 A Correct.

18 Q So your theory is that in order to avoid the
19 impacts in your expert report, you would have to reduce
20 the current temperature by two degrees, correct?

21 A Correct.

22 Q And when you say a reduction of two degrees in
23 Fahrenheit, you mean an absolute reduction.

24 A How would you define absolute?

25 Q Well, you didn't have any difficulty answering that

1 question in your deposition, did you, Dr. Rock?

2 A All right.

3 Q All right. So you would agree it would have to be
4 an absolute reduction, correct?

5 A Correct.

6 Q So, for example, if the average temperature today
7 is 42 degrees Fahrenheit, we would have to go back to 40
8 degrees Fahrenheit, correct?

9 A We couldn't use a daily temperature. It would need
10 to be an average annual temperature decrease.

11 Q So, for example -- well, if we had an average
12 annual temperature of 42 degrees Fahrenheit today, we
13 would have to go back to an average annual temperature
14 of 40 degrees Fahrenheit, correct?

15 A Actually, I am thinking in the opposite direction.
16 We would not want to go above 34 -- excuse me, 44
17 degrees Fahrenheit.

18 Q Do you recall your deposition, Dr. Rock?

19 A Pardon?

20 Q You recall your deposition?

21 A I do not.

22 Q Okay. And at that deposition, you swore to tell
23 the truth, did you not?

24 A Correct. But I think what we are talking about is
25 reducing the amount of warming, not decreasing the

1 current temperature by two degrees Fahrenheit.

2 Q Dr. Rock, were you asked this question and did you
3 give this answer.

4 MR. BYRNE: Page 32, line 21. Clip nine.

5 [The video deposition of Barrett Rock was
6 played in open court as follows:

7 Q. So if the average temperature today is 42
8 degrees Fahrenheit, we would have to go back to 40
9 degrees Fahrenheit?

10 A. Correct.]

11 BY MR. BYRNE:

12 Q Were you asked that question and did you give that
13 answer?

14 A I was, yes.

15 Q And you have done no modeling of the effect of the
16 Vermont regulations on the amount of snow in Vermont,
17 correct?

18 A Correct.

19 Q And you have done no modeling to determine the
20 impact of the Vermont regulations on Vermont maple syrup
21 production, correct?

22 A Correct.

23 Q And you have done no modeling to determine the
24 impact of the regulations on the Vermont ski industry,
25 correct?

1 A Correct.

2 Q And you can't give an expert opinion, one way or
3 the other, whether the past trends in temperature will
4 continue in the future, correct?

5 A I cannot.

6 Q I think you previously mentioned that you are not
7 an expert in the modeling of greenhouse gases?

8 A Correct.

9 Q And you were not involved in the selection of the
10 Hadley and the Canadian models, correct?

11 A I was not.

12 Q And you did -- you did not see the inputs that were
13 put into the Hadley and the Canadian models, correct?

14 A Correct.

15 Q And you have not actually reviewed the computer
16 code that runs the Hadley and the Canadian models?

17 A Correct.

18 Q And you did not see the actual raw data come out of
19 the models, correct?

20 A Correct.

21 Q And isn't it true that using global models
22 downscaled for use as regional models is not the ideal
23 way to forecast future temperatures?

24 A Correct.

25 Q And regional models which take into account local

1 geography, topography, land cover conditions, are solely
2 needed, correct?

3 A Correct.

4 Q Now, the primary elements of New England climate
5 are coastal orientation, grade change in elevation,
6 latitude, and the position of the zone of westerlies,
7 correct?

8 A Correct.

9 Q And the Hadley model doesn't take that into
10 account, correct?

11 A Does not. It's a global model.

12 Q And the Canadian model does not take those into
13 account either?

14 A That is correct.

15 Q Now, both models make certain assumptions about CO2
16 increases, correct?

17 A Correct.

18 Q And the assumptions include such things as power
19 plants in China?

20 A I think the assumptions are a -- essentially a
21 doubling of CO2, and I don't know that it defines where
22 that additional CO2 would be coming from.

23 Q Well, this assumption includes such things as power
24 plans in China, correct?

25 A Yes, it would have to.

1 Q It also includes such things as maybe lawn mowers
2 in India?

3 A Probably does.

4 Q And looking at the Hadley model, you can't tell me
5 how much less temperature there will be in Vermont if
6 the regulations are adopted, correct?

7 A I cannot.

8 Q And you can't say the same thing with the Canadian
9 model, correct?

10 A Correct.

11 Q Now, we should not and cannot expect either of
12 these models to be correct in projecting regional
13 climate conditions 100 years in the future, correct?

14 A You said regional, correct?

15 Q I did.

16 A Yep.

17 Q Is that --

18 A I would imagine that is correct.

19 Q And you can't say, based on your expertise, whether
20 the Hadley model or the Canadian model is correct for
21 any period of time, correct?

22 A Correct.

23 Q Now, we -- I guess, last Tuesday, we looked at a
24 few other models, correct?

25 A Correct.

1 Q And these models encompassed four different
2 combinations of demographic changes: social and
3 political development, and basic broad technological
4 development, correct?

5 A Along with CO2 levels, correct.

6 Q And for each of these areas -- demographic change,
7 social and political development and broad technological
8 development -- there are assumptions?

9 A Correct.

10 Q And you don't know what the assumptions actually
11 are for demographic change, social and political
12 development and broad technological development,
13 correct?

14 A Correct. And that -- that is what introduces some
15 of the uncertainty in model projections. We don't --
16 they're really uncertainties, not in the model but
17 rather in the assumptions that go into that model.

18 Q In fact, they are highly uncertain, correct?

19 A I can't answer that.

20 Q Well, we will get back to that.

21 You lack the expertise to evaluate any of the
22 assumptions that go into these models, correct?

23 A Remember, I am not a modeler.

24 Q And the tool of modeling of -- modeling rests on
25 the reasonableness of the assumptions that go into that

1 model, correct?

2 A Correct.

3 Q And you can't say that the assumptions that go into
4 these models are reasonable?

5 A Just repeat that, please.

6 Q Sure. And you can't say that the assumptions that
7 go into these models are reasonable?

8 A That would be correct.

9 Q And you don't know what the mathematical formula
10 that go into any of these models are?

11 A No, no.

12 Q And these global models rely on projections as
13 well, correct?

14 A The global models give projections.

15 Q And they also rely on projections, correct?

16 A That I do not know.

17 Q Well, for example, the global models rely on
18 projections in changes in population, correct?

19 A Correct.

20 Q And the global models also rely on projections of
21 demographics?

22 A Correct.

23 Q And they also rely on projections of technology?

24 A Correct.

25 Q And they rely on projections of international

1 trade?

2 A Correct.

3 Q And they rely on projections of other socioeconomic
4 factor, correct?

5 A I assume so.

6 Q And the projections for demographics, population,
7 technology, international trade and other socioeconomic
8 factors are highly uncertain, correct?

9 A I can't answer that. I don't know how highly
10 "highly" is.

11 Q Would you please turn to page 469.

12 A 461?

13 Q 469, please.

14 A Matt, you know I am a bit hard of hearing. 461 or
15 469?

16 Q 469.

17 A Nine, okay.

18 Q Are you there, Dr. Rock?

19 A Yes, I am.

20 Q Line 13: "Do you know if the projections of
21 demographics, population, technology, international
22 trade and other socioeconomic factors are highly
23 uncertain?"

24 And your answer was?

25 A "I would assume they are." Again, I don't know

1 that for a fact.

2 Q So you don't know -- you really don't know one way
3 or the other what these projections are, or what their
4 variability is or any of those factors, correct?

5 A As a modeler, I would be able to answer that
6 differently, but as a nonmodeler, that would be correct.

7 Q Let me talk to you just a little bit about the
8 tipping point. It's your view that the tipping point
9 concept is not a good concept, correct?

10 A I will ask you to repeat that.

11 MR. RIELLY: Objection, your Honor.
12 Objection. This is well outside the scope of his
13 expertise and testimony.

14 THE COURT: He is not being called to testify
15 to anything other than assuming, that this initial model
16 is employed, what would the impact -- is valid, what
17 would the impact be upon the Vermont, or northeast
18 community. He is not being asked on global warming or
19 tipping theory or anything of that particular sort. So
20 objection sustained.

21 BY MR. BYRNE:

22 Q Let's talk a little bit about skiing.

23 THE COURT: His testimony is limited to what
24 impact would exist, assuming that there is this
25 temperature increase, together with the fact that there

1 is a temperature increase.

2 MR. BYRNE: I think that the answer to that --
3 I know you have sustained it, but 705 gives me broad
4 latitude to go and address the bases of his opinion and
5 examine those sorts of inquiries.

6 THE COURT: To whether or not there's a
7 tipping theory? He is not being offered as -- in that
8 way at all. So, anyway, objection sustained.

9 BY MR. BYRNE:

10 Q You have done no modeling on the effect of the
11 Vermont regulations on the amount of snow in Vermont,
12 correct?

13 A Correct.

14 Q And you can't say one way or the other that the
15 number for ski tourism will go up or down based on the
16 implementation of the fuel economy regulations in
17 Vermont, correct?

18 A I cannot.

19 Q Now, the analytical tool that you use in your
20 expert report to address the skiing issue is to look at
21 a New Hampshire area and then draw inference to the
22 Vermont area, correct?

23 A Well, we also looked at the historic
24 snow-on-ground, and annual snowfall.

25 Q Well, that is one of the things that you did,

1 correct?

2 A Correct.

3 Q And in attempting to draw an inference, you looked
4 at -- you essentially took a sample size of one and
5 tried to draw the inference to the Vermont area,
6 correct? One study?

7 A Well, I think one has to assume that Vermont and
8 New Hampshire are going behave in similar fashions.

9 Q Well, the study looked at a number of factors,
10 including the capital investment in snowmaking,
11 grooming, economic diversification, the interstate
12 highway access system, cost of liability insurance, and
13 bigger vertical drops, correct?

14 A Correct.

15 Q And all of these factors related to the success of
16 the New Hampshire ski resorts, are factors that you
17 would have to looked look at in determining whether you
18 should make an inference from this report to the Vermont
19 ski area, correct?

20 A Correct.

21 Q And you have testified that you don't have the
22 expertise necessary to inform the Court as to whether it
23 ought to draw this inference or not, correct?

24 A Correct.

25 Q I want to talk to you a little bit about maple

1 trees.

2 You have no expert opinion one way or the other
3 whether the Vermont regulations will stop the
4 disappearance of maple trees in Vermont, correct?

5 A That is correct.

6 Q And sitting here today, and all the work you have
7 done up until now, you can't tell me one way or the
8 other whether the regulations will have any impact on
9 the maple trees in Vermont, correct?

10 A Correct.

11 Q Now, counsel showed you the Iverson study and gave
12 you a little graph.

13 A Iverson and Prasad; Prasad and Iverson.

14 Q Now, you are using the Iverson study to forecast
15 the loss of the maple trees, correct?

16 A Correct.

17 Q But, you can't use Iverson's study in that way, can
18 you?

19 A And why not?

20 Q Glad you asked. Could you pull up Z22.7.

21 THE COURT: You had an opportunity to testify.
22 Would you read what doctors Iverson and Prasad have to
23 say about their study?

24 A Well, it's hard for me to read that, but, it's
25 either told or fold "increase in the level of

1 atmospheric CO2. We emphasize that potential future
2 ranges presented here do not represent forecasts, but
3 rather an indication of the potential impact on species
4 distribution."

5 Q That's true that Iverson relies on climate models
6 as well, correct?

7 A Correct.

8 Q And Iverson also uses a technique called RTA,
9 correct?

10 A That I do not know.

11 Q So you don't actually know what sort of climate
12 modeling analysis or models Iverson actually uses?

13 A Well, we know they used the Canadian and the
14 Hadley.

15 Q Right. And then to go from the Canadian model to
16 the loss of maple trees, you are not even sure what he
17 uses to get to that conclusion?

18 A I am not a modeler.

19 Q Okay. Why don't we take a look at -- you want to
20 look at page 468.

21 THE COURT: This document hasn't been marked.
22 Do you have a number for purposes of identification?

23 MR. BYRNE: We will mark it as 1263.

24 THE COURT: 1263.

25 MR. BYRNE: It's the '98 study of Iverson and

1 Prasad.

2 BY MR. BYRNE:

3 Q What does it say on page 468? That does show that
4 they use regression tree analysis, correct?

5 A I believe so, yes. Yes.

6 Q Have you followed what Iverson and Prasad have said
7 about regression tree analysis since then?

8 A I have not.

9 Q Would it surprise you to learn that Iverson says,
10 "Among its disadvantages, RTA may suffer from an
11 unstable output, in other words, a small change in data
12 can produce quite a different tree"?

13 A I would not be surprised, no. These modelers are
14 always trying to improve the products that they
15 generate.

16 Q Now, you can't tell me one way or the other whether
17 the amount of income generated from maple syrup
18 production will go up or down based on the
19 implementation of the regulations, correct?

20 A I cannot.

21 Q And both climatic and nonclimatic factors affect
22 the production of maple syrup?

23 A Certainly.

24 Q And you cannot predict whether any of the
25 nonclimatic factors will push maple syrup producers out

1 of business regardless of the effect of the increasing
2 temperature, correct?

3 A That is correct.

4 Q And it is not within your realm of expertise to
5 opine or make any statement on the nonphysiological
6 factors that go into the maple syrup production,
7 correct?

8 A Correct.

9 Q Let's talk a little bit about fall colors. You
10 have identified essentially three independent variables
11 in your attempt to find a connection between rising
12 temperatures and fall colors, correct?

13 A Correct.

14 Q And those are sugar in the leaf, first frosts, and
15 the length of day, correct?

16 A Correct.

17 Q Now, you haven't collected any data about the
18 amount of sugar in the leaf for the product of trying to
19 determine an association between rise in temperatures
20 and fall colors?

21 A I have not.

22 Q In attempting to determine an association between
23 rise in temperatures and fall colors, your dependent
24 variable is the change in fall colors, correct?

25 A Correct.

1 Q And you have not attempted to do any analysis
2 between your dependent variables and your independent
3 variable, correct?

4 A Correct.

5 Q And the first frost data that you do have now is
6 only for Burlington, Vermont, correct?

7 A Correct.

8 Q And you haven't attempted to control for the effect
9 of urbanization, have you?

10 A No. I would point out that the Burlington data are
11 the only Vermont data available. The other comes from
12 Northfield, Vermont, and that was not available online
13 when I began that analysis.

14 Q But it is available. I mean, you could go find it?

15 A Well, I haven't looked recently. Don't know.

16 Q Don't know. Now, you are not a -- an economist,
17 correct?

18 A Correct.

19 Q And you can't say how much of the 709 million in
20 fall tourism will change due to a change in temperature,
21 correct?

22 A I would say that is correct, but if we lose our
23 fall foliar displays, you are not going to have the
24 people coming to shop.

25 Q And that analysis is based on the Iverson and

1 Prasad study, correct?

2 A It's other things, but Iverson and Prasad is a part
3 of that.

4 Q And that's the same study -- you didn't look at his
5 2005 study, did you?

6 A No, I did not.

7 Q And you have made -- I wanted to ask you a couple
8 of quick questions about --

9 Isn't it true that to accurately look at the
10 climatical impacts on maple syrup production, you have
11 to have data on production per tap, correct?

12 A That would be the ideal situation, yes, but in
13 Vermont, those data do not exist.

14 Q Now, you have made no determination -- you made no
15 attempt to determine the net benefit on Vermont
16 agriculture that global warming might cause, correct?

17 A Just repeat the first part of it.

18 Q Sure. You made no attempt to determine the net
19 benefit on Vermont agriculture of global warming,
20 correct?

21 A I did not.

22 Q So you didn't look at such things as apples?

23 A No.

24 Q Cheese production?

25 A No.

1 Q The dairy industry?

2 A No.

3 THE COURT: How does cheese production
4 contribute to global warming?

5 MR. BYRNE: The other way around. Whether
6 global warming will benefit.

7 THE COURT: Oh, all right.

8 THE WITNESS: Or hurt cheese production.

9 THE COURT: How about goat cheese production?

10 MR. BYRNE: I don't know. I haven't looked
11 into it, your Honor, although I hear it's quite good.

12 THE WITNESS: I should also mention that as --
13 I should also mention that as temperatures increase,
14 dairy production will go down. So I assume that would
15 have an impact on cheese production.

16 BY MR. BYRNE:

17 Q And, you have not disclosed that opinion in your
18 expert report, have you, Dr. Rock?

19 A No, I did not.

20 MR. BYRNE: Move to strike.

21 THE COURT: That was more in response to what
22 I asked.

23 THE WITNESS: That's correct.

24 THE COURT: The motion is denied.

25 MR. BYRNE: All right.

1 BY MR. BYRNE:

2 Q You can't say one way or the other whether global
3 warming will have a positive or negative effect on
4 Vermont agriculture, correct?

5 A I cannot.

6 Q And you have done no on-balance determination of
7 whether tourism in Vermont will improve or decline based
8 on global warming, correct?

9 A Correct.

10 MR. BYRNE: Nothing further.

11 THE COURT: Okay? Mr. Rielly?

12 REDIRECT EXAMINATION

13 BY MR. RIELLY:

14 Q Dr. Rock, Mr. Byrne has just pointed out several
15 areas that you have not looked at. Based on your
16 expertise as a tree physiologist and an expert in forest
17 health, does the fact that you have not examined or done
18 models for the ski industry, or fall foliage, or maple
19 sugar production change your opinion in any way?

20 A None.

21 Q Does it change the certainty of your opinions?

22 A No.

23 Q Why is that?

24 A Pardon?

25 Q Why is that, with respect to --

1 A Simply because I know how trees will respond to
2 warming temperature, and that does not rely on the
3 models per se. It relies on my knowledge of tree
4 physiology.

5 Q Earlier, there was -- seemed to be some confusion
6 about this 40 to 42 degree change. Is it your testimony
7 that to preserve the sugar maple, the current average
8 temperature would have to fall by two degrees?

9 A No, no. We would like to keep the current average
10 temperature where it is, if possible.

11 Q Are you familiar with any recent studies that have
12 confirmed your -- the findings of NERA with respect to
13 regional temperatures?

14 A Yes.

15 Q And what were those?

16 A That would be the Markham and Wake study. And more
17 recently the Union of Concerned Scientists, the Hayhoe,
18 et al., 2006. Both of those confirm the findings of the
19 New England Regional Assessment.

20 Q Dr. Rock, could you identify the documents I just
21 gave you?

22 A This is a report on the New England climate impacts
23 assessment: Climate Change in the U.S. Northeast. This
24 has been provided by the Union of Concerned Scientists.
25 And this is more or less like the New England Regional

1 Overview. It's for the public.

2 This is the science on which it is based, and that
3 is an article by Catherine Hayhoe, et al., entitled Past
4 and Future Changes in Climate and Hydrological
5 Indicators in the U.S. Northeast.

6 Q Do you know what conclusions they made with
7 respect to northeast temperatures?

8 A Yes. That these northeast temperatures will
9 increase.

10 Q Do you know how they came to those conclusions?

11 A I know that they used a greater number of climate
12 models in their analysis. They used a total of nine
13 climate models. These models had been used to -- what I
14 will call hindcast, meaning that they project in a
15 backward fashion. You start off today, and you build
16 into the models that -- the various climate assumptions
17 that are in those models. But from the past, based on
18 observations. And then you see how well running the
19 model backwards matches with the observed temperature.
20 And so these models have been analyzed using that
21 methodology.

22 And the other thing that I like very much about
23 this recent work is that they use a higher emissions
24 scenario with the models, assuming business as usual in
25 terms of fossil fuel combustion and other variables.

1 And then they also have a lower emissions scenario,
2 which focus on trying to cap CO2 levels at 540 or 550
3 parts per million by 2100. And so they -- they give a
4 range of future scenarios based on whether we do nothing
5 to reduce CO2 emissions or we take steps to reduce CO2
6 emissions.

7 Q Do you know whether the hindcasting, as you call
8 it, that they undertook, was accurate in determining --

9 A Yes.

10 Q -- what the past temperatures were?

11 A The projections of past temperatures matched the
12 actual observed past temperatures rather well.

13 Q How does that affect your confidence in the --

14 A Gives me far more confidence in the models to
15 project the future.

16 MR. RIELLY: I think that's all I have.

17 THE COURT: Okay? All right?

18 MR. RIELLY: I would actually move -- if we
19 could get those reports in evidence, under the same
20 basis as before.

21 BY MR. RIELLY:

22 Q Dr. Rock -- well, let me ask this question.

23 Did you rely on those reports in coming to your
24 opinions today?

25 A My written opinion, not -- because they hadn't been

1 published at that time.

2 Q Your written, opinion meaning your declaration
3 earlier?

4 A Yes.

5 Q What about in your testimony today?

6 A Not substantially, no.

7 THE COURT: You don't want me to stretch
8 the admission of supporting journals, articles, to that
9 extent?

10 All right. Okay, any recross?

11 MR. BYRNE: My colleagues are telling me to
12 sit down, so I will sit down.

13 THE COURT: Pardon me?

14 MR. BYRNE: My colleagues are telling me to
15 sit down, so I will sit down.

16 THE COURT: Okay. Just so -- we can just turn
17 off the clock, for a second. You did a number -- work
18 on Camel's Hump in the '80s. I am familiar with that,
19 being a hiker. What is the state -- if you can just
20 tell me what the state of the mountain is at this point?

21 THE WITNESS: The state of the mountain in
22 1986 was of real concern because the red spruce were in
23 very active decline. 80 percent of the mature red
24 spruce on the mountain, that were healthy in 1966, the
25 year I graduated from University of Vermont -- and part

1 of the study that I was involved in at that time, 80
2 percent of those spruce trees had died in a very short
3 period of time.

4 With the enactment of the Clean Air Act amendment
5 in the early '90s, the conditions on the mountain are
6 improving, so -- that's good news.

7 THE COURT: I won't get into that in greater
8 detail. I was just curious. Okay.

9 Any further questions at all? Any further
10 questions?

11 MR. RIELLY: No, your Honor.

12 THE COURT: Okay. Thank you, Dr. Rock.

13 THE WITNESS: Thank you.

14 (Witness excused.)

15 THE COURT: All right? Now, is Dr. Christy
16 coming next?

17 MR. CLUBOK: I guess so, your Honor. A little
18 earlier than we thought we would be, but we will try
19 to --

20 (Brief pause.)

21 MR. CLUBOK: All right. Thank you, your
22 Honor. Appreciate it.

23 THE COURT: Okay.

24 MR. CLUBOK: Your Honor, we would like to call
25 Dr. John Christy.