



## **Curriculum Guide for “Changing Weather Challenges and Adaptation Strategies for Northeastern U.S. Tree Fruit Growers”**

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## I) Introduction

This curriculum guide was created to assist Climate Fellows in leading a three session workshop series for groups of tree fruit growers to work their way through the primary component of the curriculum, the **“Self-study Checklist - Changing Weather Challenges and Adaptation Strategies for Northeastern U.S. Tree Fruit Growers.** Grower use of the Self-study Checklist is the core activity of the curriculum. This Curriculum Guide is not intended for direct use with workshop participants. It is an internal document for workshop organizers and leaders.

The other main, though secondary, component document in the curriculum is **“Recent and Near-future Climate Trends Important to Tree Fruit Production in the Northeastern U.S.”** That document provides background information on the weather changes expected for the in the Northeastern U.S. over the next 35 years. Understanding that content is helpful but not essential for using the Self-study Checklist.

Two slide sets are also provided as supplementary material in case they are deemed useful for 1) introducing the types of climate and weather changes expected in the Northeastern U.S. in the coming decades; and 2) introducing adaptation concepts.

The Self-study checklist was created by four professional wholesale and retail apple growers from MA, ME, NH and VT, and an Extension IPM advisor – (referred to as the “Tree Fruit Team”). A defining aspect of the checklist is calling upon farmer experience to identify risks and solutions.

The goals for this curriculum are:

- \* Provide a tool that Northeastern U.S. tree fruit growers can use to identify actions they can take to make their operations less vulnerable to weather risks that occur now and that are expected to increase over the next 30 years.

- \* Provide an overview of weather changes likely to occur in the next 30 years that are relevant to the operation of commercial tree fruit orchards in the Northeast.

- \* Introduce tree fruit growers to concepts and methods they can use to adapt their orchard operations to accommodate changing climatic conditions in the Northeastern U.S.

- \* Identify critical research, Extension, and other public and private sector support needs for the Northeast tree fruit industry.

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## II) Curriculum Framing

### “Changing weather” vs. “Climate change”

It will come as a surprise to no one that there are different opinions about the reality and reasons for climate change. The agricultural community does not necessarily share the perspectives of Climate Fellows Project staff about the causes and urgency of climate change (e.g. Banerjee et al., 2018). Research has found that farmers who believe that climate change is occurring and attributable to human activity are more likely to express concern about impacts and support adaptive action (e.g. Arbuckle et al., 2013). Conversely, farmers who attributed climate change to natural causes, or were uncertain or did not believe it is occurring, were less interested in or supportive of adaptation.

This curriculum is about helping tree fruit growers adapt to changing weather, not the causes and political and economic responses to climate change at the national or global scale. Background information on climate science with respect to changing weather is available from NASA, NOAA, EPA and other credible sources, as well resource links in the reference section of this curriculum guide (e.g. Skeptical Science, 2018; Winkler, 2018). Persons who organize workshops to deliver this curriculum should have a basic understanding of the driving forces behind climate change, but climate science is not the topic of the curriculum.

Even if greenhouse gas emissions are sharply curtailed in the next few years, because of lag in the climate system, continued changes in the weather over the next 30 years are very likely to occur. Tree fruit growers by the nature of their crop, are long-term planners. Because of climate change, the need for flexible and adaptive long-term planning to succeed in a changing context has increased.

Addressing climate change at the global scale or the reasons why it is happening are not pertinent topics for this curriculum. Time spent on global climate change would take away time from the focus of this curriculum. By staying away from polemical debate and focusing on curriculum content, the workshop leaders can avoid engaging filters that can distort communication, block free exchange of ideas, and interfere with incorporating information into decisions. By avoiding those issues, the workshop can focus on steps that tree fruit growers can take to succeed in context with changing environmental conditions.

The Tree Fruit Team members who helped create the Self-study Checklist do not all agree that human-caused greenhouse gas emissions are the driving factor for changing weather in the Northeast. In developing this curriculum, we chose to respectfully acknowledge that there are differences of opinion about the causes of climate change and changing weather in the Northeast. Doing so allowed us to get beyond that, and to construct the checklist of weather related challenges without being distracted by extraneous issues, and to focus on shared agreement that making a profit growing tree fruit in the Northeast has never been easy, and that it has become more difficult in the last decade because of the added complication of more erratic weather.

All four of the grower members of the team report that the frequency of spring frosts resulting in major apple crop loss has increased from what was roughly a 1-in-30 year event for their parents' or grandparents' generation to a multiple event per decade frequency. Tree Fruit Team members agree that the apparent trends of warmer average temperatures, earlier spring warm up and bud break, more intense rain events, longer summer dry spells, and warmer autumns, have occurred with enough regularity to be seen as the new normal and not just random weather fluctuations.

The Team members who created the Self-study Checklist agree that:

- \* Field experience largely corroborates statements in scientific reports about measured trends in temperature and rainfall.

- \* Weather at their locations seems to have become more erratic over the past 10-20 years, with formerly unusual episodes of heat, cold, rain, and drought becoming more frequent or extreme.

- \* It is prudent to become familiar with the best available science-based projections for continued changes in the weather in the coming decades, and to consider the potential impacts on tree fruit production.

- \* It is necessary for the vitality of the tree fruit industry in the Northeast to consider adaptation measures to reduce sensitivity and increase resilience to plausible future weather conditions, regardless of their cause.

- \* Differing views on the role of human causation do not have to be a roadblock for a curriculum that focuses on adaptation to weather challenges.

### **Reasons for a 30-year time frame**

The focus of this curriculum is adapting tree fruit production in the Northeast to current weather challenges and those expected over the next 30 years. That requires a basic understanding of the currently available 30-year weather projections for the Northeast. This curriculum presents scientifically credible information from peer-reviewed or government-sanctioned sources to help producers make the best possible decisions.

The Tree Fruit Team chose to focus on the nearest 30 years because that is of most immediate concern and within the timeframe of management decisions made today. Due to inertial lag in the climate system, climate change impacts on near future weather (i.e. the next 30 years) are to a large degree already built into the climate system and are thus more predictable than changes beyond 30 years. Unknown factors such as future human greenhouse gas emissions and technological advances make predictions beyond a 30-year time frame much less reliable. Regardless of what happens after 2050, it is the challenges of the next 30 years that requires primary and immediate attention by tree fruit growers.

## **Characteristic of tree fruit adaptation options**

A complicating aspect of climate change is that in addition to changes in the average values, weather appears to be becoming both more erratic and extreme. Tree fruit orchards are long-term investments, with multi-year establishment times and high upfront establishment costs. It is more difficult and expensive to adjust a perennial crop production system than it is to adjust a system for annual crops.

There are no “one size fits all” solutions for the expected weather challenges. The Self-study checklist includes a wide range of potential adaptation options, even options that are unlikely to be suitable for most growers. Even if not applicable to most situations, it may be useful to some and may stimulate ideas for other possible responses for other growers. The scope of the issues identified and adaptation solutions considered is limited to those that are directed toward continued tree fruit production without inclusion of changing to alternate crops.

## **Intended audience**

The primary target audience for the guide is tree fruit growers in the Northeastern U.S. who operate at any commercial scale or market segment (wholesale, retail, Pick Your Own, organic, IPM, etc.). Outcomes from the curriculum may stimulate adaptive changes by service and support agencies and industries, but because of the farm specific nature of the adaptation inventory process, the curriculum is only applicable to farmers, not their service providers. Service providers can play important roles in helping to formulate and implement adaptation decisions, but the choices for what is needed and what makes sense for their situation are the purview of the participating growers.

## **Research priorities**

The Self-study Checklist identifies research priorities related to specific weather challenges. We present these ideas to encourage investigation by university research and Extension staff; federal, regional, and state research programs, such as USDA (NIFA, SCRI etc.), Northeast IPM Center, and Northeast SARE; as well as research programs funded by growers in New York, Pennsylvania, and New England.

Tree fruit production has always had need for applied research, and climate change challenges increases that need even more. The challenges posed by changing weather continue and exacerbate the perennial question on how to get more support for applied research by both the private and public sectors.

### III) Curriculum Delivery

The Tree Fruit team does not see need for developing entirely new delivery or evaluation paradigms. Overall, Northeast tree fruit growers are satisfied with current channels of newsletter, websites, Extension meetings, field days, and informal networking by which information and new ideas move through the grower community, and back and forth among growers, Extension and researchers. New content to meet new challenges does not necessarily require new delivery methods. The Tree Fruit Team’s basic assumption with regard to curriculum delivery is that “If it isn’t broken, don’t fix it.”

Those existing relationships are based on mutual respect. It is essential that the curriculum be provided as a tool for self-discovery, not a didactic lecture from those who pretend to know to those who are presumed to need instruction. That may work for teaching second graders, but it does not work for adult education, especially when the audience knows more about the topic than the presenter does. The suggestions for curriculum delivery presented below were written by the Extension (non-grower) member of the Tree Fruit Team. However, as an informative preamble, consider the following comment by one of the grower team members about the March 2018 project planning meeting:

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“As a 6th generation farmer I was pretty well offended that most of the presenters took every chance they got to imply farmers were below them, simple, and needed talked down to. The main take away I got from the sessions was that these people expect the farmers to collect their data for them so they can then turn around and tell the same farmers what to do... I’m sorry but if I needed advice on how to adapt to a changing climate I would go to the 80-year-old neighbor on the farm next door, not to any of these officials who look like they’ve never spent a day on the farm in their lives...”

So my advice to whomever reads this is, if you are having trouble talking to a farmer you probably need to check your ego at the door. They spend every day taking in their reality and dealing with survival on the most basic level. No matter how many degrees you have they know more than you. When you show up with a survey to measure something as nebulous as ‘adaptive capability’ they can smell your arrogance coming a mile away and it should be no surprise that they don’t want to participate.”

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While not all growers will feel that degree of alienation, because of the scenario wherein workshop participants know their needs better than anyone else, exacerbated by the antagonism that can accompany discussion of climate change, it is essential that this curriculum be presented and function as a self-directed process. That can include collaborative assistance but not in such a way that it is perceived as directive lecturing. An “information-deficit, technology transfer” strategy is definitely not appropriate. In addition to the self-directed nature of the sessions and individual homework, the primary interactions and dialogue should be among growers. Workshop leaders should function as facilitators not as lecturers.

With those cautions in mind, what follows are suggestions for a three-session workshop series to introduce the Self-study Checklist, provide useful background information, provide a framework for individual and collective consideration and communication of adaptation strategies, and to collect participant evaluations to improve the process for the next iteration.

### **Workshop Leadership**

Having a recognized grower opinion leader serve as the workshop co-leader would be helpful to lend credibility and interest in the curriculum. Co-leadership with an Extension partner is recommended so that the Extension partner can provide workshop planning and logistics support. The Extension co-leader can also be part of the workshop presentation, but having a respected grower serve as the “face” of the curriculum can add commitment and energy to the process. The project’s social learning literature reviews (Schattman et al. 2018, White 2018) found that farmers learn readily through social networks, often prefer to learn from and validate knowledge from peers, and trust messengers with direct experience more than people with degrees and titles.

It would be worthwhile to hire a professional facilitator to run both the introductory and follow-up meeting. Not only would their skill at managing dialogue be useful, they would be seen as an independent referee only there to guide the process, not to influence the content. Thus having a facilitator would provide another buffer to avoid the perception of a top-down didactic tone. The social learning literature reviews (Ibid.) found that facilitation and communication were critical to the success of participatory case studies.

A peer leader must demonstrate sincere engagement with the curriculum. A lack of sincerity and interest on their part would be extremely detrimental. Attributes to look for in influential growers for this role include (based on White, 2018):

- \* A track record of engagement with the grower community.
- \* Influential as an opinion leader.
- \* Respected by their peers as both personally and professionally successful.
- \* Sought after for advice.
- \* Open to trying to new things, but also deliberate about making changes with discretion.
- \* “Early adopters” who are not opinion leaders would not be a good fit.

## **Workshop Participants and Group process**

Risk management considerations can differ based on farm specific characteristics such as location, site, scale, production system, access to resources, age and work or educational background of principal decision maker(s), orchard history in terms of longevity and also with respect to experience with weather challenges, business structure, and other pressures which drive decision-making (Jemison et al., 2014). Diverse perspectives can be of value, but it is also important to insure that there is enough similarity among participants for their perspectives to be relevant for each other. Therefore, for an audience of commercial growers it would be best to limit participation to other commercial growers.

Maintaining at least a minimum geographic distance between partners assigned to report on each other's "Self-study Checklist" experience could help reduce issues related to nearby orchards being competitors.

Interaction and dialogue not only provides opportunity for learning from others, it also promotes deeper understanding by having to formulate our own understanding in order to communicate it to others. Thus the old saying that if you want to really learn something, try to teach it to somebody else. By meeting with other growers to discuss their observations and responses to the Self-study Checklist, growers will increase the benefit they receive. The group process provides social "permission" to actively engage in climate change adaptation, and incentive to do so as a social norm.

This social engagement process is more likely to result in productive use of the curriculum than simply handing out long documents for people to read on their own. However, it is also true that the essential activity of this curriculum, a self-directed review of each farm's unique profile with regard to weather challenges, is inherently a single-farm activity. A group meeting approach can supplement, incentivize, and energize the individual experience by placing it in a social context.

Climate change and impending weather risks create emotional stress. The topic can be daunting and overwhelming. Perhaps lighthearted elements such as awards for best adaptation plan or most original idea could relieve some of that weight if done in such a way so as not to trivialize the subject or the serious nature of the topic to participating growers.

Charging a small fee for participating in the three workshop sessions would provide funding to cover some expenses for facility, printing, and food. In addition, having a financial investment, even if small, helps insure that participants are truly interested in engaging with the issue. Commitment to not only attend, but to also actively participate in all three sessions is key for vital and productive discussions as the core activity of the workshops. People place more value on something if they spent money on it versus a program offered for free.

Other incentives such as pesticide applicator recertification credits should not be offered for the same reason. The objective is to gather a group of tree fruit growers who are interested and committed to assessing the needs and opportunities to adapt their orchard businesses to emerging weather patterns that differ from the past.



## **IV) Workshop Session Outlines**

### **Before Session 1.**

A copy of the Self-study Checklist should be provided to each participant ahead of the workshop, as well as a copy of “Recent and Near-future Climate Trends Important to Tree Fruit Production in the Northeastern U.S.” This document should be accompanied by a letter introducing the objectives and agenda for each of the workshop sessions, a short introduction to the workshop leaders, and a message from the workshop leaders expressing their enthusiasm for the learning process and social connections that will occur.

A pre-workshop self-assessment survey should also be sent to each workshop participant. The survey can be online or on paper and must be anonymous.

### **Session 1 Objectives.**

The first session has four objectives:

1) Collect pre-class self-assessments of familiarity with workshop topics.

2) Build comfort and familiarity for communication with fellow workshop participants. Even though the checklist could function as a stand-alone tool for individual, self-directed use, it is important to introduce the process by which the group will individually and collectively engage with the checklist.

3) Provide a background context of scientific information about climate change in the Northeast. This both informs and incentivizes engagement with the checklist to identify adaptation options. Grower interest in adaptation to changing weather is affected by familiarity with climate change, and information from trusted messengers can influence perception of climate change (e.g. Gramig et al. 2013).

4) Introduce the “Self-Study Checklist - Changing Weather Challenges & Adaptation Strategies” as the core component of this curriculum. Introduce the “Recent and Near-future Climate Trends Important to Tree Fruit Production in the Northeastern U.S.” as a background resource for understanding changes in the weather that affect tree fruit production.

5) Create commitment and momentum for self-directed use of the checklist between sessions 1 and 2.

## **Session 1 Activities.**

The following activities are suggested to accomplish those objectives.

1) **Introduction** of the workshop leaders and objectives of the workshop series.

Review objectives of this session.

An atmosphere of collegiality, respect, and confidentiality should be explicitly established by consensus. Spending too much time on atmospherics and process can be a problem, but a few minutes to discuss group agreement on what is in bounds and out of bounds would be worthwhile. Even though confidentiality cannot be enforced, the establishment of it as consensus principle can foster a more secure environment for communication.

**20 minutes.**

2) **Pre-class survey**

Collect surveys sent to participants a week before class. Participants who have not already done so fill out the short survey to assess their familiarity with changing weather and adaptation. **10 minutes.**

3) **An ice-breaking exercise** where participants interview each other to find out

- a) who the other person is,
- b) where they live and farm,
- c) their activity and experience with tree fruit production,
- d) why the other person is attending the workshop,
- e) what they hope to gain from it, and finally,
- f) one example of a case where weather affected their farming work.

By having each person discover that information from another and then introduce that person to the group, a social familiarity and bond is formed and barriers to communication are reduced. Thus, each interview needs to collect and record five bits of information about the other person, and then the process reverses. The introductory interviews can be completed in about 20 minutes. This is followed by reporting. Allowing 5 minutes for each pair to introduce each other to the group means that in order to keep this step from taking more than an hour, the number of workshop participant should be limited to no more than eight pairs, i.e. 16 people. Many other icebreaker exercises could be used. This one has the advantage of also beginning discussion of the topic.

**10 minutes for each partner to interview the other = 20 minute partner interviews**

**+ 40 minutes (5 minutes per pair x 8 pairs)**

**= total 60 minutes.**

**Break - 20 minutes.** Have food and beverages available.

4) **Slide presentation.** To facilitate comprehension of the background information in the “Recent and Near-future Climate Trends” document, a slide presentation covering highlights from the Northeast climate summary is provided with the curriculum (“Farmer Response to Changing Weather, Part 1”). The presenter should be thoroughly familiar with the “Recent and Near-future Climate Trends” document. Better still would be a deeper familiarity with the mechanisms and recent history of climate change. Most of the slides are simple graphics that do not require long discussion. 45 minutes for presentation and 15 minutes of Q&A should be adequate.

**60 minutes.**

5) **Document review.** The “Self-study Checklist” should be provided to each participant ahead of the workshop, as well as a copy of “Recent and Near-future Climate Trends Important to Tree Fruit Production in the Northeastern U.S.” The presumption should be that people have not read the documents ahead of time in any detail. We all learn by repetition, so even those who have read the documents closely will gain by a review of their content. This does not require page-by-page detail, but about 10 minutes to describe the outline for each of the two documents that form the core of the curriculum. A few extra minutes are included to address questions. The grower workshop leader should conduct this portion of the meeting.

**30 minutes.**

6) Give the **homework assignment for Session 2** scheduled for two weeks later. That interval allows enough time to get the work done, but is not so long that workshop members forget what happened at the previous session.

Six participants are charged to work through the Self-study Checklist, and to share their findings with an assigned Checklist partner who will present a 10-minute summary of their partner’s findings at the next session. Assign partners. The checklist summary partners should be different pairings than for the icebreaker introductions exercise. The grower workshop leader should describe the homework assignment.

To share each person’s complete list of weather issues and adaptation options at the next session would take too long. Announce that in order to get into useful level of detail, two participants, preferably volunteers, will discuss their Self-study Checklist responses in detail in Session 2. This provides additional incentive to do the homework. We all want to look good to our peers, tree fruit growers are no exception.

**15 minutes.**

7) **Closing questions and discussion.**

**15 minutes.**

**Total Session 1 duration: 3 hours and 50 minutes.**

### **Between Session 1 and Session 2.**

\* Participants complete the Self-study Checklist.

\* Six participants communicate with their checklist partners to write a summary of their partner's major issues and responses.

\* Two participants prepare a 20-minute presentation on their Self-study Checklist results. Course leader(s) should prepare questions to spark group discussion.

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### **Session 2 Objectives**

1. Build group cohesion for good communication.
2. Share experiences, reactions, and summaries of interactions with the Self-study checklist.
3. Provide an overview of Adaptation examples and concepts through the second slide presentation.
4. Work through two individual adaptation plans with some detail.
5. Address questions that arise in reviewing those plans.

### **Session 2 Activities**

1) **Check-in**, reconnect. Each participant describes something they did for fun since the previous session. **20 minutes.**

2) **Review session objectives.** Address any questions or comments about the homework assignment, or that arose since Session 1.  
**20 minutes.**

3) Six checklist partners give **10-minute summaries** of each other's responses to the Self-study Checklist.  
**60 minutes.**

Break **20 minutes.** Have food and beverages available.

4) **Slide presentation** on Adaptation examples and concepts.  
**40 minutes.**

5) First **20-minute review of a participant adaptation plan.** Presenters should prepare 20-minute summary of their Checklist results, followed by 10 minutes of Q&A with the group.  
**30 minutes**

6) Second **20-minute review of a participant adaptation plan**, followed by 10 minutes Q&A discussion with group.  
**30 minutes**

7) Review the **homework assignment for Session 3** scheduled for two weeks later. Ten participants to prepare 10-minute summary of their Checklist partner's results. One volunteer to give a 20-minute presentation of their work with the Checklist.  
**10 minutes**

**Total Session 2 duration: 3 hours and 50 minutes.**

### **Between Session 2 and Session 3.**

\* Participants continue work on their Self-study Checklist. This time with more background on Adaptation principles and methods.

\* Six participants communicate with their checklist partners to write a summary of their partner's major issues and responses.

\* Two participants prepare a 20-minute presentation on their Self-study Checklist results. Course leader(s) should prepare questions to spark group discussion.

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### **Session 3 Objectives**

1. Promote group cohesion for good communication.
2. Share experiences, reactions, and summaries of interactions with the Self-study Checklist.
3. Work through one individual adaptation plan with some detail.

### **Session 3 Activities**

1) **Review session objectives.** Address any questions that arose since Session 2.  
**10 minutes.**

2) **Check-in.** Each participant describes something he/she would like to change or add to their orchard business in the next ten years.  
**20 minutes.**

3) **Presentations. Six checklist partners give 10-minute summaries** of each other's responses to the Self-study Checklist.  
**60 minutes.**

Break. **20 minutes.** Have food and beverages available.

4) **Four checklist partners give 10 minute summaries** of each other's responses to the Self-study Checklist.  
**40 minutes.**

6) **Third 20-minute review of a participant adaptation plan,** followed by 10 minutes of Q&A discussion with group.  
**30 minutes**

5) **Discussion of how industry members can work together** and with state and university programs to support the types of adaptation activity discussed over the three sessions. **30 minutes**

6) Closure to summarize Sessions 1-3. **10 minutes**

7) Repeat of survey assessment tool. **10 minutes**

8) Course evaluation survey. **10 minutes**

**Total Session 3 duration: 4 hours.** (assuming there are 19 workshop participants, there would be 10 of the 10-minute summaries to cover in session 3.)

## Summary of Session timelines

<b>Session 1</b>		
<b>Objectives</b>		
<ol style="list-style-type: none"> <li>1. Collect pre-class self-assessments of familiarity with workshop topics.</li> <li>2. Build comfort and familiarity for communication with fellow workshop participants.</li> <li>3. Provide background scientific information about climate change in the Northeast.</li> <li>4. Introduce the “Self-study Checklist - Changing Weather Challenges &amp; Adaptation Strategies” and “Recent and Near-future Climate Trends Important to Tree Fruit Production in the Northeastern U.S.” as the document components of this curriculum.</li> <li>5. Create commitment for self-directed use of the checklist between Session 1 and Session 2.</li> </ol>		
<b>Introductions</b>	20 minutes	Introduction of the workshop leaders and objectives of the workshop series. Review objectives and agenda of this session.
<b>Pre-class survey</b>	10 minutes	Collect surveys or have participants fill out short survey.
<b>Ice breaker - Partner interviews and reports</b>	60 minutes	10 minutes for each partner to interview the other = 20 minute partner interviews + 40 minutes for reports (5 minutes per pair x 8 pairs) = total 60 minutes.
<b>Break</b>	20 minutes	Food and beverages.
<b>Slide Presentation</b>	60 minutes	“Farmer Response to Changing Weather, Part 1” 45 minutes for slides, 15 for discussion during and after.
<b>Review course documents</b>	30 minutes	“Self-study Checklist - Changing Weather Challenges & Adaptation Strategies” “Recent and Near-future Climate Trends Important to Tree Fruit Production in the Northeastern U.S.”
<b>Homework assignment</b>	15 minutes	<ol style="list-style-type: none"> <li>1. Work through the Self-study checklist</li> <li>2. Share their findings with their assigned Checklist partner Partners will present a 10-minute summary of each other’s findings at the next session.</li> <li>3. Enlist two volunteers for a longer in depth presentation of their Checklist results.</li> </ol>
<b>Closing questions and discussion</b>	15 minutes	Total class duration: 230 minutes = 3 hours 50 minutes.
<b>Between Session 1 and Session 2</b>	<ul style="list-style-type: none"> <li>* Participants complete the Self-study Checklist.</li> <li>* Six participants communicate with their checklist partners to write a summary of their partner’s major issues and responses to present at the next session.</li> <li>* Two participants prepare a 20-minute presentation on their Self-study Checklist results.</li> </ul>	

<b>Session 2</b>		
<b>Objectives</b>		
<ol style="list-style-type: none"> <li>1. Build group cohesion for good communication.</li> <li>2. Share experiences, reactions, and summaries of interactions with the Self-study Checklist.</li> <li>3. Provide an overview of Adaptation examples and concepts through the second slide presentation.</li> <li>4. Work through two individual adaptation plans with some detail.</li> <li>5. Address questions that arise in reviewing those plans.</li> </ol>		
<b>Check-in</b>	20 minutes	Each participant describes something he/she did for fun since the previous session.
<b>Review objectives and agenda of this session.</b>	20 minutes	Address any questions or comments about the homework assignment, or that arose since Session 1. Discuss reactions to the two course documents.
<b>Self-study Checklist Partner Reports</b>	60 minutes	Six checklist partners each give a 10-minute summary of their partner's responses to the Self-study Checklist.
<b>Break</b>	20 minutes	Food and beverages.
<b>Slide Presentation on Adaptation principles</b>	40 minutes	"Farmer Response to Changing Weather, Part 2" 30 minutes for slides, 10 minutes for discussion during and after.
<b>Presentation on Checklist results #1</b>	30 minutes	Volunteer enlisted at Session 1 presents 20 minute more detailed summary of their Checklist results, followed by 10 minutes of group discussion. Course leader(s) should prepare questions to spark discussion.
<b>Presentation on Checklist results #2</b>	30 minutes	Same as above.
<b>Closing questions and discussion</b>	20 minutes	Total class duration: 230 minutes = 3 hours 50 minutes.
<b>Between Session 2 and Session 3</b>		<ul style="list-style-type: none"> <li>* Participants continue refining their Self-study checklist.</li> <li>* Ten participants communicate with their checklist partners to write a summary of their partner's major issues and responses to present at next session.</li> <li>* One participant prepares a 20-minute presentation on their Self-study checklist results.</li> </ul>

## Session 3

### Objectives

1. Promote group cohesion for good communication.
2. Share experiences, reactions, and summaries of interactions with the Self-study Checklist and responses to presentations.
3. Work through one individual adaptation plan with some detail.
4. Discuss follow-up activities.
5. Collect post-class self-assessments of familiarity with workshop topics and course evaluations.

<b>Review objectives and agenda of this session.</b>	10 minutes	
<b>Check-in</b>	20 minutes	Each participant describes something he/she would like to change or add to their orchard business in the next ten years.
<b>Self-study Checklist Partner Reports</b>	60 minutes	Six checklist partners each give a 10-minute summary of their partner's responses to the Self-study checklist.
<b>Break</b>	20 minutes	Food and beverages.
<b>Self-study Checklist Partner Reports</b>	40 minutes	Four checklist partners each give a 10-minute summary of their partner's responses to the Self-study checklist.
<b>Presentation on Checklist results #3</b>	30 minutes	Volunteer enlisted at Session 2 presents 20 minute more detailed summary of their Checklist results, followed by 10 minutes of group discussion. Course leader(s) should prepare questions to spark discussion.
<b>Follow-up steps</b>	30 minutes	Discussion of how industry members can work together and with state and university programs to support the types of adaptation activity discussed over the three sessions.
<b>Closure</b>	10 minutes	Summarize Sessions 1-3. Thanks participants and other contributors.
<b>Repeat of participant self- assessment.</b>	10 minutes	Repeat self-assessment to measure effect of course on participant self-assessed knowledge.
<b>Course evaluation survey</b>	10 minutes	Feedback to improve next iteration and plan follow-up activities.

Total class duration: 240 minutes = 4 hours. (Assuming 19 workshop participants, leaving 10 for 10-minutes summaries in session 3).



## V) Workshop Extensions

\* A follow-up meeting could include access to or presentations by resource people such as experts in irrigation, soil drainage, weather tolerant cultivars or related topics; or service providers like NRCS and FSA. It would be best to constrain program overviews and focus on directly useful information. A series of bureaucratic presentations about programmatic details would be deleterious and in conflict with the grower-driven nature of the workshops. As in the workshop sequence, the focus of the meeting should be on grower identified issues and solutions.

\* Farmer panels on weather adaptation steps they taken at regional meetings such as the New England Vegetable and Fruit Conference in Manchester NH, the New York Empire State Producers Expo in Syracuse NY, and the Mid-Atlantic Fruit & Vegetable Convention in Hershey PA, as well as at single state grower association meetings.

\* Growers could share and discuss their adaptation plans, progress and outcomes on a web discussion forum hosted by the project. The web site could be private among course members, or it could be open to comments and improvement by the regional tree fruit grower community. This would be especially useful to respond to new challenges, opportunities, and adaptation as options become available.

\* Preventing, ameliorating, and working with waterlogged soils emerged as a key issue in our adaptation checklist discussion. An orchard floor health strategies workshop (physical soil properties) at one or more of the regional or single state meetings would be a useful outcome of this project. Other topics may arise as multiple growers use the curriculum, compare notes with other growers, and as the weather situation continues to evolve.

## VI) Evaluation

The pre- and post-workshop evaluations should be short, anonymous, and focused on the key objectives. The combination of identical pre- and post-course evaluation questions provides a direct comparison to document progress in achieving curriculum objectives.

The pre-class survey also provides an opportunity to discover particular interests or objectives of workshop participants. Therefore, in addition to questions with numerical scale responses to assess workshop familiarity with changing weather and adaptation, the pre-workshop survey should include at least one open-ended question for respondents to list interests or desired outcomes from the workshop. That information can be used to steer the sessions towards those interests.

Similarly, the post-workshop survey should include at least one open-ended question for respondents to review and comment on the content and the process of the workshop sessions. In addition to the value of the responses, formulating a reply to such a question serves as another opportunity for participants to process and perhaps incorporate more of what they learned.

The post-class evaluation provides an opportunity for workshop organizers to get useful feedback to improve subsequent iterations of the workshop.

The post-workshop survey should also include an open-ended question to ask for concrete examples of adaptation actions completed or commitments.

It seems infeasible to measure the economic payback from adaptation measures implemented because of the curriculum, given that an investment may be made to protect against weather events that are not likely to happen within the reporting time frame. It may be useful to ask if there tangible benefits from the adaptation process even without there having been enough time for infrequent weather events to have occurred.

A parallel measure would be to ask how much investment was made as a result of participation in the workshop sessions. If an assumption can be made that investment benefits are deemed to be worth no less than the costs, then investment expenditures can be plausibly interpreted as a measure of project benefits. However, in doing so it would also be important to seek input and report on benefits for which value cannot be measured on a monetary scale.

The templates shown below for pre- and post-class knowledge surveys and a course evaluation can be modified to fit the particular needs of workshop organizers. Instead of forcing respondents to pick a discrete value and fill-in little boxes which digitizes and depersonalizes feedback, the use of analog ratings bars allows selecting intermediate answers. Because the bars are evenly scaled, the location of the X along the bar is easily recorded as a specific numerical value in tabulating replies.

## Self-assessment of familiarity with workshop topics

Please place an **X** along the response bar where it best fits your answer.

You can place the X right on one of the categorical answers (Strongly disagree, Disagree, Not sure/Neutral, Agree, Strongly agree), or you can place the center of the X anywhere along the line to indicate an intermediate level of agreement to the question.

1. I have sufficient knowledge of the weather changes that could occur in the next 30 years that are relevant to commercial tree fruit production at my location.

Strongly disagree	Disagree	Not sure or neutral	Agree	Strongly agree
- - - - -	- - - - -	- - - - -	- - - - -	

2. I have sufficient knowledge of the challenges and opportunities brought by changing weather to commercial tree fruit production at my location.

Strongly disagree	Disagree	Not sure or neutral	Agree	Strongly agree
- - - - -	- - - - -	- - - - -	- - - - -	

3. I have sufficient knowledge of actions I can take to make my farm less vulnerable to weather risks that occur now and that could increase over the next 30 years.

Strongly disagree	Disagree	Not sure or neutral	Agree	Strongly agree
- - - - -	- - - - -	- - - - -	- - - - -	

4. I have sufficient knowledge of how I can make an adaptation plan and of the information resources and contacts I can use in planning to make my farm less vulnerable to weather risks.

Strongly disagree	Disagree	Not sure or neutral	Agree	Strongly agree
- - - - -	- - - - -	- - - - -	- - - - -	

5. Open-ended question. What questions or topics about adapting tree fruit production to changing weather that you would like to see addressed in the workshop curriculum?

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## Workshop evaluation survey

Your anonymous response can help us do a better job in conducting this workshop in the future. Please place an **X** along the response bar where it best fits your answer.

You can place the X right on one of the categorical answers (Strongly disagree, Disagree, Not sure/Neutral, Agree, Strongly agree), or you can place the center of the X anywhere along the line to indicate an intermediate level of agreement.

1. The “Self-study Checklist” was a useful tool to help me increase my knowledge of steps I can take to adapt my orchard business to weather challenges and opportunities.

Strongly disagree                      Disagree                      Not sure or neutral                      Agree                      Strongly agree

| - - - - - | - - - - - | - - - - - | - - - - - |

2. The “Recent and Near-future Climate Trends in the Northeast” document helped me increase my knowledge of possible weather changes in the coming years.

Strongly disagree                      Disagree                      Not sure or neutral                      Agree                      Strongly agree

| - - - - - | - - - - - | - - - - - | - - - - - |

3. The slide presentation in Session 1 on recent and possible future weather changes in the Northeast helped me increase my knowledge of weather changes that could affect my orchard.

Strongly disagree                      Disagree                      Not sure or neutral                      Agree                      Strongly agree

| - - - - - | - - - - - | - - - - - | - - - - - |

4. The slide presentation in Session 2 on adaptation strategies and methods helped me identify and implement adaptations to weather challenges and opportunities.

Strongly disagree                      Disagree                      Not sure or neutral                      Agree                      Strongly agree

| - - - - - | - - - - - | - - - - - | - - - - - |

5. Hearing the 10-minute overviews of other grower’s Self-study Checklist responses helped me in my own adaptation planning.

Strongly disagree                      Disagree                      Not sure or neutral                      Agree                      Strongly agree

| - - - - - | - - - - - | - - - - - | - - - - - |

6. The more in depth 30-minute presentations and discussion by three growers of their Self-study Checklist responses helped me in my own adaptation planning.

Strongly disagree	Disagree	Not sure or neutral	Agree	Strongly agree
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -

7. The discussion of follow-up steps at the end of session 3 was a worthwhile addition to the workshop.

Strongly disagree	Disagree	Not sure or neutral	Agree	Strongly agree
- - - - -	- - - - -	- - - - -	- - - - -	- - - - -

8. How many of the three workshop sessions did you attend? \_\_\_\_\_

9. About how much time did you spend working through the Self-study Checklist?

\_\_\_\_\_

10. Open-ended question. Do you have comments or suggestions about the documents or the workshop sessions to make this curriculum more useful, enjoyable, or efficient?  
Do you have suggestions for follow-up activities?

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