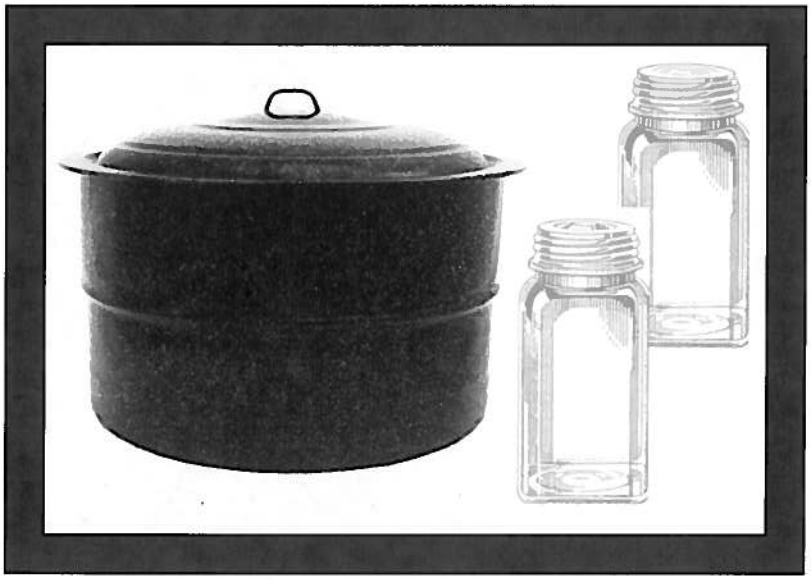
Colorado State University

Extension

MJ1042
Member's Manual



4-H Food Preservation: Boiling Water Canning

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Notes to Project Helper

This activity guide is for youth who want to learn about home food preservation. They can't do it without your help. You play a key role in helping them learn the basic information skills and safety behind food preservation. With your help they will set goals, find resources and evaluate their own progress as they complete this manual.

Your Responsibilities

- Become familiar with the material in this book.
- Assist youth in selecting and completing food preservation projects appropriate for their skills.
- Guide youth through thinking about why something happens or why it doesn't.
- Encourage youth to complete difficult tasks to expand their skills.
- Help youth learn about their strengths and weaknesses.
- Help youth evaluate their completed activities for quality. Questions located at the end of each activity will help youth think through the steps of the project and how to apply their new skills in their everyday lives.
- Be an example with kitchen and food safety rules.

The Home Food Preservation Series

There are four manuals for youth in the *Home Food Preservation* series: *Freezing* for ages 8-18, *Drying* for ages 8-18, *Boiling Water Canning* for ages 8-18 *and Pressure Canning* for ages 14-18. The manuals may be used by anyone in these age groups regardless of their prior knowledge of home food preservation. Each manual includes an achievement program to help youth identify their goals and keep track of their accomplishments.

At the beginning of each manual you will find a list of objectives for the project. Each activity will include a short lesson followed by hands on activities and questions for further learning.

These manuals have been written using USDA food preservation guidelines. When preserving food at home, be sure to always follow current USDA canning recipes and guidelines. Contact your local Extension Office for a list of these resources.

Resources

So Easy to Preserve, University of Georgia
2011 or most current Ball Blue Book
CSU Fact Sheet 9.341-Canning Tomatoes and Tomato Products

USDA Bulletin 539 Complete Guide to Home Canning

Websites

http://www.ext.colostate.edu/pubs/pubs.html#nutrition
http://nchfp.uga.edu/publications/publications_usda.html
http://www.freshpreserving.com
http://www.uga.edu/nchfp

Using Experiential Learning & Life Skills

Experiential learning is the process of "Do, Reflect, Apply." This process is used as an inquiry-based approach to learning. Rather than providing information to the participants they experience, share, process, generalize and apply what they are learning.

Do: Experience the activity, perform, do it. This could be a group activity or experience. It involves doing, it may be unfamiliar and it pushes the learner to a new level.

Reflect: Share reactions, observations. The learners talk about their experiences while doing the activity. They share their reactions and observations and freely discuss their feelings.

Apply: Generalize to connect the experience to real-world examples. Identify general trends and what are some real life examples of when they could use what they have learned.

Apply: Apply what was learned to a similar or different situation or practice. Discuss how new learning can be applied to other situations.

The Iowa State Life Skills Model helps identify the life skills that youth attain through the experiential learning process.

The Life Skills used in the manual include:

Head
- Wise Use of Resources
- Planning/Organizing
- Goal Setting
- Critical Thinking

Heart
- Communication

Hands
- Marketable Skills
- Self-Motivation

Health
- Healthy Lifestyle Choices
- Disease Prevention

My Plans

This page is intended to help you plan how to finish this manual.

- Select your Helper and write down contact information
- Set goals for each year and write them in your e-record story.
- Complete at least four activities each year
- Complete a presentation or demonstration each year

Project Helper: _____
Contact Information: _____

Achievement Program

Do at least four activities located on pages 23-40 in the manual. You can also make up your own activities. Ask your project helper to initial each activity after you've completed it.

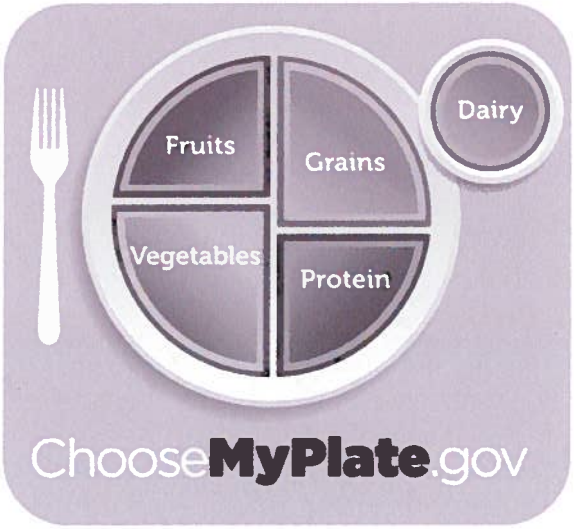
Selected Activities		
Activities	**Date Completed**	**Helper's Initials**

Exploring *Choose MyPlate*

It is important to save your bounty of foods from your garden or local area to enjoy throughout the year. Preserving food yourself means having an abundant supply of a variety of foods when the fresh products are not readily available. Unless food is preserved in some manner, it begins to spoil soon after it is harvested.

It is important to learn about the nutrients that your foods contain in order to choose the best choices for a healthy eating plan. There are many foods to choose from, but some of them are better choices than others. Making food choices for a healthy lifestyle can be as simple as using these 10 tips. Use these ideas to balance your calories, to choose foods to eat more often, and to cut back on foods to eat less often.

1. Balance calories. Find out how many calories you need for a day as a first step in managing your weight. Go to www.ChooseMyPlate.gov to find your calorie level.
2. Enjoy your food, but eat less. Take the time to fully enjoy your food as you eat it. Eating too fast or when your attention is elsewhere may lead to eating too many calories.
3. Avoid oversized portions. Use a smaller plate, bowl, and glass. Portion out foods before you eat.
4. Foods to eat more often. Eat more vegetables, fruits, whole grains, and fat-free or 1% milk and dairy products. Make these foods the basis for meals and snacks.
5. Make half your plate fruits and vegetables. Choose red, orange, and dark-green vegetables like tomatoes, sweet potatoes, and broccoli, along with other vegetables for your meals. Add fruit to meals as part of the main meal or side dishes or as dessert.
6. Switch to fat-free or low-fat (1%) milk. They have the same amount of calcium and other essential nutrients as whole milk, but fewer calories and less saturated fat.
7. Make half your grains whole grains. To eat more whole grains, substitute a whole-grain product for a refined product – such as eating whole wheat bread instead of white bread or brown rice instead of white rice.
8. Foods to eat less often. Cut back on foods high in solid fats, added sugars, and salt. They include cakes, cookies, ice cream, candies, sweetened drinks, pizza, and fatty meats like ribs, sausages, bacon, and hot dogs. Use these foods as occasional treats, not everyday foods.
9. Compare sodium in foods. Use the Nutrition Facts label to choose lower sodium versions of foods like soup, bread, and frozen meals. Select canned foods labeled "low sodium," "reduced sodium," or "no salt added."
10. Drink water instead of sugary drinks. Cut calories by drinking water or unsweetened beverages. Soda, energy drinks, and sports drinks are a major source of added sugar, and calories, in American diets.



A healthy meal starts with more vegetables and fruits and smaller portions of protein and grains. One of the benefits of preservation is that you can enjoy your fruits and vegetables all throughout the year. Think about how you can adjust the portions on your plate to get more of what you need without too many calories. And don't forget the dairy – make it the beverage with your meal or add fat-free or low-fat dairy products to your plate.

- **Grains:** Grains are used to make bread, cereal, rice and pasta. These foods are made from wheat, rye, oats and rice. Whole grains are higher in fiber than others. Look for whole wheat or other whole grains on the ingredient label. Half of the foods you eat from the grains group should be whole grains. Eat at least 3 ounces of whole-grain cereals, breads, crackers, rice, or pasta every day. Foods from the grains group have carbohydrates. Carbohydrates are fuel our bodies need.

- **Vegetables:** Vegetables provide several different vitamins and minerals your body needs. Vegetables can be dried or canned, frozen or fresh. Vitamin A is found in dark green vegetables such as broccoli and spinach; and dark yellow and orange vegetables such as carrots and sweet potatoes. Vitamin A keeps the cells in our body healthy to protect us against infections. Vitamin A also aids the growth of healthy skin, bones, and teeth. We should eat a variety of vegetables every day, including cooked dry beans and peas.

- **Fruits:** Fruits provide vitamins and minerals. Fruits can be dried or canned, frozen or fresh. Choose whole or pieces of fruit that are frozen, fresh, canned or dried. Oranges, grapefruit, strawberries and melons have Vitamin C which helps our bodies to heal and resist infections and it helps your body absorb the iron in the food you eat. It is also needed for healthy teeth, gums, and blood vessels. Deep yellow fruit like apricots and cantaloupe have Vitamin A.

- **Oils:** We do need some for good health. Get your oils from fish, nuts, and liquid oils such as corn oil, Canola oil or Olive oil. Foods that are high in fat include chips, fries, snack cakes, cookies and candy.

- **Dairy Products:** Milk gives us calcium to keep our bones and teeth strong. Milk and foods made from milk are the best sources of calcium. While you are growing, your bones need the calcium in your foods, so have three to four servings from the milk group every day.

- **Protein Foods**: Meats and Beans provide iron and protein for our body. Meats can be frozen, home canned or dried as jerky. Iron moves oxygen throughout your body in your red blood cells. Protein promotes the growth and repair of body tissues. Foods in this group include meats, poultry, fish, eggs, beans, nuts and peanut butter. When you eat a food from the protein group, it should be lean – that means it doesn't have much fat in it. Baking, broiling, or grilling are the best choices for cooking protein foods rather than frying because they do not add fat to the meat.

Choose MyPlate Worksheet

***Choose MyPlate* Worksheet:** For one day keep track of all the food you eat and how much of each food you eat. Record the food you ate and the amount on the *Choose MyPlate* Worksheet. After you have listed your choices, then list each food item in its food group; for example if you had a banana for breakfast, list it under the Fruits group, milk in the Milk group and so on. Now, add up your total for each food group. Compare your totals to the amount you should be eating for your age and gender. Answer the following questions.

- What food groups were lacking?

  _____

- Do you need to eat less of any food group?

  _____

- What changes could you have made on this day to eat better?

  _____

- List two goals for yourself to improve your eating.

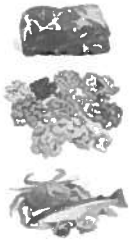
  1._____

  2._____

This worksheet can be used as a selected activity for multiple years. It is a good idea to track the foods you eat on a regular basis to check and see how you are doing?

Choose MyPlate Worksheet:
For Kids

Check how you did yesterday and set a goal to aim for tomorrow. Star all the foods that were home preserved.

Write in your choices from yesterday	Food and Activity	Goal (Based on a 1800 Calorie Pattern	List Each Food Choice In Its Food Group*	Estimate Your Total
Breakfast: Lunch: Snack: Dinner: Physical Activity	**Grains** 	**6 ounces equivalents** (1 ounce equivalent is about 1 slice bread, 1 cup dry cereal, or ½ cup cooked rice, pasta or cereal		**___ounce equivalent**
	Vegetables 	**2-1/2 cups** (choose from dark green, orange, starchy, dry beans and peas, or other veggies)		**___cups**
	Fruits 	**1-1/2 cups** (choose from fresh, frozen, canned or dried) 1 ½ cups is equal to ¾ dried		**___cups**
	Dairy Products 	**3 cups** (1 cup yogurt or 1-1/2 ounce cheese = 1 cup milk)		**___cups**
	Protein Foods 	**5 ounces equivalents** (1 ounce equivalent is 1 ounce meat, chicken or turkey, or fish, 1 egg, 1 T. peanut butter, ½ ounce nuts, or ¼ cup dry beans)		**___ounce equivalent**
	Physical Activity 	At least **60 minutes** of moderate to vigorous activity a day or most days		

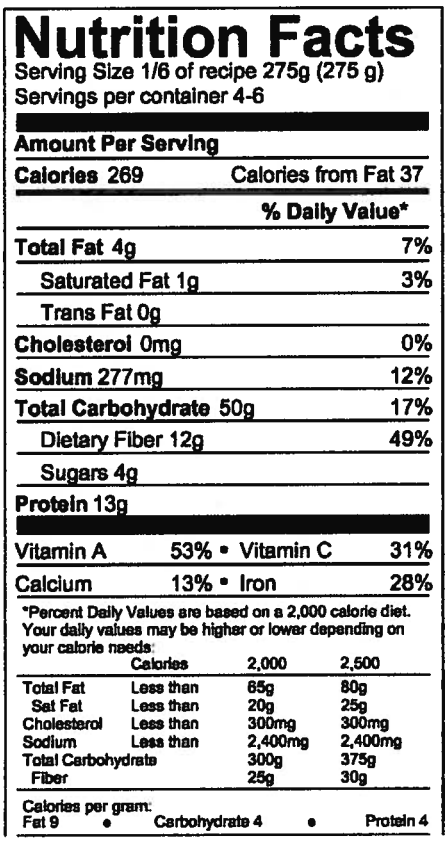
How did you do yesterday? ☐ Great ☐ So-So ☐ Not So Great
My food goal for tomorrow is: _____
My activity goal for tomorrow is: _____

*Some foods don't fit into any group. These "extras" may be mainly fat or sugar – limit your intake of these

Reading Food Labels

Smart eating is part of growing and staying healthy. *Choose MyPlate* helps you make good choices for a healthy, balanced diet. Pay attention to the amount of foods from each food group to help you find out if you eat enough or too much of some foods. When you completed your *Choose MyPlate* Worksheet, did you find that you were not eating all of the right foods?

It is not always easy to know what amount of food is a serving. For example, how many crackers are in a serving? How much cereal do you pour in a bowl for a serving from the Grain Group? The answers are easy if you know where to look.



Nutrition Facts

Serving Size 1/6 of recipe 275g (275 g)
Servings per container 4-6

Amount Per Serving	
Calories 269	Calories from Fat 37
	% Daily Value*
Total Fat 4g	7%
Saturated Fat 1g	3%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 277mg	12%
Total Carbohydrate 50g	17%
Dietary Fiber 12g	49%
Sugars 4g	
Protein 13g	
Vitamin A 53% • Vitamin C	31%
Calcium 13% • Iron	28%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

Most foods in the grocery store must now have a nutrition label and list of ingredients. Look for the Nutrition Facts Label on the food package or container. This label shows the serving size, how many servings are in the package or container, and other nutritional information, such as a list of ingredients in descending order.

Serving Size: The first place to start when you look at the Nutrition Facts Label is the serving size. Just below that is the number of servings in the package or container. The Nutrition Facts Label on this chili label shows that a serving size is 1/6 of the recipe. This can of chili contains 4-5 servings.

Calories provide a measure of how much energy you get from a serving. In this can of chili there are 269 calories in one serving of the chili.

% Daily Value (%DV): The %DV is the amount of a nutrient in one serving compared to dietary recommendations. What is the %DV for Total Fat in the can of chili? Nutritional Analysis: The nutritional analysis is like having a Nutrition Facts Label for the recipe. We should limit our intake of Total Fat, Cholesterol, and Sodium. Look for foods low in saturated fats, trans fats, and cholesterol. (5%DV or less is low, 20%DV or more is high). Most of the fats you eat should be polyunsaturated and monounsaturated fats. Keep total fat intake between 20% to 35% of calories.

Is the %DV for saturated fat high or low on the can of chili?

Sodium: The Dietary Guidelines for Americans suggest that we need to lower our sodium intake to less than 2300 milligrams per day to reduce the risk of high blood pressure. Most of the sodium we eat comes from processed foods, not from the saltshaker. When we do our home preserving, we can control the amount of sodium added to our product. That is another advantage of home preserving. One teaspoon of salt equals about 2300 milligrams of sodium. Ask yourself the following questions.

How much sodium is in the can of chili if you ate the whole container? Figure that there were 4 servings in the can.
How much sodium is in one serving?
Is the %DV for sodium for one serving, high or low?

Sugar: Sugars are found naturally in fruits, (fructose) and fluid milk and milk products (lactose). The majority of sugars in typical American diets are sugars added to foods during processing, preparation, or at the table. The dietary Guidelines for Americans suggest that we need to reduce the intake of calories from solid fats and added sugars. In home food preservation, we can control the amount of sugar added to fruits and other products.

Be sure to get enough of Potassium, Dietary Fiber and Vitamins and Minerals. Remember that 5%DV is low and 20%DV or more is high. Is the calcium listed on the label high or low?

Going Further: You might want to collect your own label then answer the following questions. What is the food item? What is the serving size? How many calories are in the item per serving?

You may also want to collect several different brands of the same item and compare the labels. Compare cartons of fruit juice with fruit drink, or several boxes of dry cereal or energy bars.

How Much Should You Eat?

ChooseMyPlate.gov or nutrition.gov to give you amounts that you should eat to stay healthy. It depends on your age, whether you are a girl or boy, and how active you are. Kids who are more active burn more calories, so they need more calories. The following guidelines are only estimates for how much you need of each food group.

Grains: Grains are measured in ounce equivalents. Eat 5 to 6 ounces every day, and remember that at least half of these should be whole grains. An ounce equivalent equals:

1 slice of bread
½ cup of cooked cereal, such as oatmeal
½ cup of rice or pasta
1 cup of cold cereal

4- 8 year olds need 4 to 5 ounce equivalents each day
9-13 year old girls need 5 ounce equivalents each day
9-13 year old boys need 6 ounce equivalents each day
14-18 year old girls need 6 ounce equivalents each day
14-18 year old boys need 7 ounce equivalents each day

Vegetables: You need to eat dark green and orange vegetables. Vegetable servings are measured in cups. Vegetables can be canned or dried, frozen or fresh.

4- 8 year olds need 1 ½ cups of veggies each day
9-13 year old girls need 2 cups of veggies each day
9-13 year old boys need 2 ½ cups of veggies each day
14-18 year old girls need 2 ½ cups of veggies each day
14-18 year old boys need 3 cups of veggies each day

Fruits: Fruit is part of a healthy diet. Here is how much fruit you need. Fruit can be canned or dried or frozen or fresh.

4-8 year olds need 1 cup to 1 ½ cups of fruit each day
9-13 year old girls need 1 ½ cups of fruit each day
9-13 year old boys need 1 ½ cups of fruit each day

14-18 year old girls need 1 ½ cups of fruit each day
14-18 year old boys need 2 cups of fruit each day

One-fourth cup of dried fruit is equal to ½ cup fresh fruit.

Dairy Products: Calcium builds strong bones to last a lifetime, so you need to get these foods in your diet.

4-8 year olds need 1 cup to 2 cups of milk or another calcium rich food each day
9-13 year old girls need 3 cups of milk or another calcium rich food each day
9-13 year old boys need 3 cups of milk or another calcium rich food each day
14-18 year old girls need 3 cups of milk or another calcium rich food each day
14-18 year old boys need 3 cups of milk or another calcium rich food each day

Protein Foods: These foods contain iron and lots of other important nutrients. These foods, like grains, are measured in ounce equivalents. An ounce equivalent equals:

1 ounce of meat, poultry, or fish
¼ cup cooked dry beans
1 egg
1 tablespoon of peanut butter
A small handful of nuts or seeds

4-8 year olds need 3 to 4 ounce equivalents each day
9-13 year old girls need 5 ounce equivalents each day
9-13 year old boys need 5 ounce equivalents each day
14-18 year old girls need 5 ounce equivalents each day
14-18 year old boys need 6 ounce equivalents each day

Let's Plan a Menu

Planning a menu can be fun when you base it on the *Choose MyPlate.* Using the guidelines we have talked about, determine how much food you should eat daily from each of the food groups. Then divide the total amount of food you should eat each day among three meals and one or two snacks.

Make your meals fun and interesting. Try to include; a variety of foods to make the meal interesting and healthy; different colors and shapes of food that make the meal appealing when served together; different textures and flavors, some crunchy foods and some soft foods, chewy foods and liquids or maybe spicy foods and mild foods; and hot and cold foods.

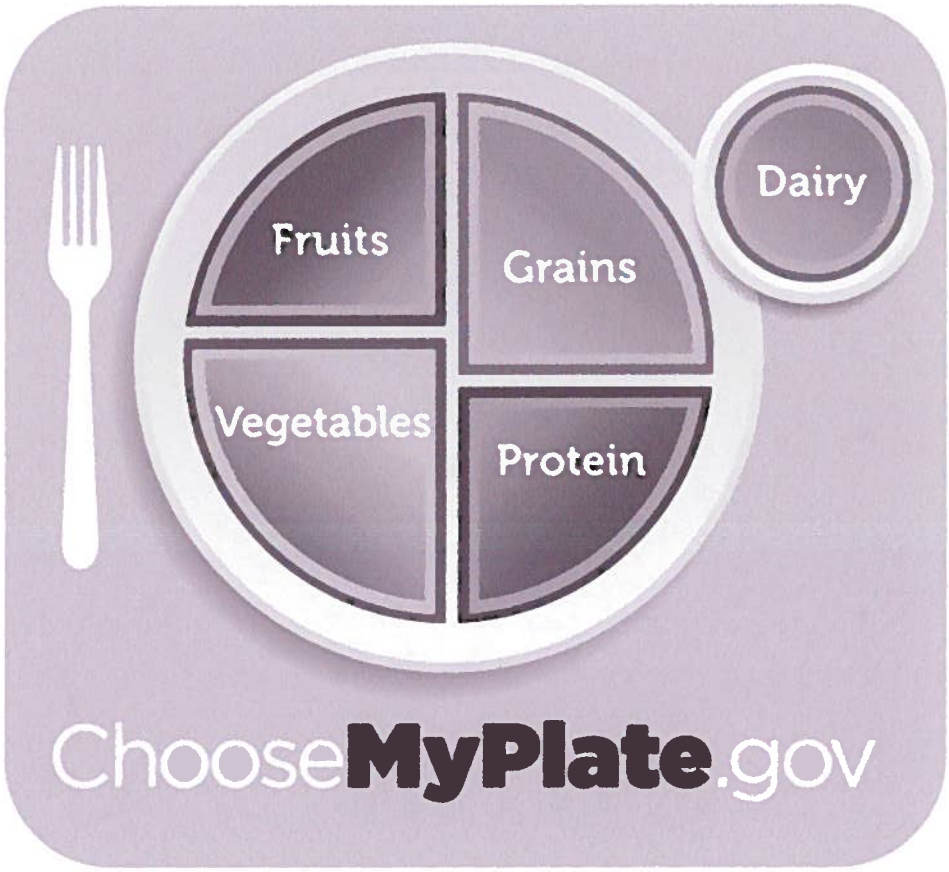
Your menu should include foods from at least three or four of the five food groups at each meal.

Remember to include foods that you have made in your project. It might be dried fruits or canned fruits, frozen vegetables or salsa and canned products. You might want to include your trail mix for a snack that you did in the drying manual.

If you want another challenge, plan all the meals for a day, or a week including snacks. You might choose to rate the meals for texture color and taste. You might also want to compare the meals to

Choose MyPlate to see if you have provided the recommended number of servings for each food group.

Going Further: Organize your menus in a binder or file. You might choose to exhibit them at your fair as part of your Food Preservation project.



Types of Food Preservation

There are seven major methods of food preservation:

1. Refrigeration
    - Slows the growth of microorganisms
    - Slows action of enzymes
2. Freezing
    - Prevent growth of microorganisms
    - Slows, but does not stop enzyme action
3. Canning
    - Heat destroys the microorganisms that may be present in the food
    - Yeasts and molds are destroyed when food reaches 190F
    - Pressure canning enables the processing of canned foods at temperatures higher than boiling water, where dangerous bacteria are killed
    - Proper canning practices, removes air from the jars, leaving a vacuum
    - Molds and some yeasts are unable to grow in a vacuum
4. Sweetening and Acidifying Jellies and Jams
    - Added sugar and acid tie up free water and lowers pH
5. Pickling and Fermenting
    - Fermenting uses bacteria to produce lactic acid and lowers the pH
    - Added acid (fresh pack) controls pH with vinegar
6. Drying
    - Removes water and prevents growth of microorganisms
    - Dried foods must be packaged in oxygen and moisture proof containers
7. Salting
    - Chemically bonds water, inhibiting growth of microorganisms

Kitchen and Food Safety Basics

Kitchen Safety

Kitchens are safe! It's the people who work in the kitchens who create problems. Problems can be prevented if equipment and utensils are used properly and sharp items and hot foods and water are handled carefully. When working in the kitchen, one must be aware of safety hazards that may occur and take precautions to prevent injuries or accidents from happening by creating and maintaining a safe working environment.
The most common accidents happen in the kitchen, such as burns, cuts and falls. While cooking should be fun, you need to follow a few basic rules.

- Don't be in a hurry. Accidents happen when you're in too much of a hurry.
- Always clean up spills. Serious injury can occur when someone falls due to a wet floor.
- Never leave food unattended. Many fires develop while not paying attention to what is cooking.
- Don't use a towel in place of a hot pad. Always use potholders in both hands.
- Turn handles to the side and away from the edge of the stove.
- When cutting food, always cut away from you. Learn how to handle a knife properly.
- Never put a sharp knife or utensil in a sink of soapy water. Someone might put their hands in the sink and cut themselves on the knife.
- Don't leave a metal spoon in a pot that is boiling.
- When opening the lid on a steaming pan, always lift away from you. Steam can burn just as easily as boiling liquid.
- Don't use electrical appliances around the sink or water.
- Avoid loose clothing and flowing hair. If you have long hair, tie it back.

Food Safety

- Wipe up spills when they happen.
- Wash hands with soap under warm water for at least 20 seconds. Dry hands on a disposable paper towel or a towel designated just for hands.
- Use clean towels and dishcloths.
- Never put a spoon in your mouth, and then back in the food.
- Avoid cross contamination by using separate cutting boards for meat and fruits and vegetables.
- Keep all preparation and cooking surfaces clean.
- Thoroughly clean all dishes, equipment and utensils with hot, soapy water after use.
- Follow the 2 hour rule. Never leave prepared foods on the counter for longer than 2 hours.

Food Preservation Food Safety

- Always use a current, tested recipe. DO NOT make up recipes as they have not been tested to make sure the product is safe to store and eat.
- Make sure to adjust for altitude. Processing times or pressure must be adjusted on most recipes because they are written for people who live at sea level. Since water boils at lower temperatures as altitude increases, it is necessary to increase processing times or pressure to ensure the food is safe.

Boiling Water Canner Altitude Adjustments	
Altitude in Feet	**Increase Processing Time**
1,001 to 3,000	5 minutes
3,001 to 6,000	10 minutes
6,001 to 8,000	15 minutes
8,001 to 10,000	20 minutes

- Add acid (lemon juice or citric acid) to canned tomato products as a margin of safety.
  - Lemon Juice – 1 tablespoon per pint, 2 tablespoons per quart
  - Citric acid – ¼ teaspoon per pint, ½ teaspoon per quart
- Be sure to use the correct equipment for each preservation technique.
  - Boiling water canner for acid foods
  - Pressure canner for low-acid foods
  - Dehydrator for drying
  - Freezer with plenty of space for freezing
- Preservation does not improve the quality of any food. Always use fresh, ripe, un-bruised, high quality produce for food preservation.

Basic Food Preservation Equipment

Equipment	Use	Canning	Drying	Freezing
Dry measuring cups	Used to measure dry and solid ingredients. They usually come in a nesting set of 1 cup, ½ cup, 1/3 cup, and ¼ cup.	X	X	X
Liquid measuring cups	Used to measure liquids. You can see through the cup to measure and there is headspace.	X	X	X
Measuring spoons	Used to measure small quantities of dry and liquid ingredients. Measure liquid ingredients carefully to avoid spills.	X	X	X
Sharp knives and Cutting boards	Used to cut food to desired size. Wash knives and cutting boards after each use in warm soapy water.	X	X	X
Potholders	Used to protect hands when working with hot pans.	X	X	X
Rubber spatula	Used to scrape the side of the bowls or pans. You can use the flat side to level dry or solid ingredients when measuring.	X	X	X
Large pans	Use heavy duty pans are best for cooking ingredients. Do not use aluminum pans as they break down under the required heat.	X	X	X
Long handled spoons	Used to stir. Choose spoons that are tall enough that they will not fall down into the ingredients.	X	X	X
Mixing bowls	Used to hold and combine ingredients. Made of pottery, glass, metal or plastic. Come in different sizes.	X	X	X
Funnel	Used to pour liquid items into jars.	X		X
Colander	Used to drain water from foods after washing.	X	X	X
Timer	Used to time food preparation and processing times.	X	X	X
Food Chopper, Blender or Food Processor	Used to chop, blend, and puree items for food preservation. These optional items can cut back on preparation time. Handle them under the supervision of an adult.	X	X	X
Labels, permanent markers	Used to identify the type of food, pretreatment step and date.	X	X	X
Double-Boiler	Used to extract juice and to cook fruit leather before drying.	X	X	
Boiling Water Canner	Use stainless steel, enamel on steel or aluminum boiling water canner. Canner needs to have a wire rack and tight fitting lid. Needs to be deep enough to have 1-2	X		

	inches of boiling water above jars. Flat bottoms are best on electric ranges.			
Jars and Lids	Used to hold preserved foods. Choose Mason type, threaded, home canning jars with 2-part lids. Recommended sizes: ½ pint, 1 ½ pint, quart and ½ gallon (only for juice).	X	X	X
Jar Lifter	Used to lift hot jars safely from canners with large sure-grip tongs. These tongs work with regular and wide mouth canning jars.	X		
Bubble Remover & Headspace Measurer	Use a flexible tool that has graduations on one end to accurately measure headspace and is tapered on the other end to remove bubbles from the jar. Only use plastic versions.	X		
Lid Wand	Use a plastic utensil with a magnetic tip to remove lids from simmering water.	X		
Peeler	Used to remove the skin of vegetables.	X	X	X
Cheesecloth/Jelly Bag	Used to extract juice from fruit or to hold herbs when making pickles and other canning products.	X		
Crock	Use 5-gallon stone crock or food-grade plastic container. Used for fermenting foods.	X		
Scale	Used to weigh fruit and vegetables for preserving.	X		X

Throughout this manual teaspoon and tablespoon have been abbreviated as tsp. and tbsp.

Boiling Water Canning Basics

Objectives

- Learn how to safely preserve fruits, tomatoes, fruit spreads and pickles.
- Learn how to use home canned foods you prepared in healthy recipes.
- Learn to show others how to preserve foods by boiling water canning.

Why Can Foods?

Food preservation can be a safe and economical way to preserve quality food at home. We preserve foods to prevent food spoilage and to have an abundant supply of a variety of foods when fresh produce isn't available. Individuals can control the quality of the food being preserved. Canning is one way to preserve the foods from your garden or that are grown in your local area. In this manual we will review safe canning procedures using a boiling water canner.

Canning Basics

Low Acid vs. High Acid Foods and Processing Methods

Foods are either processed in a pressure canner or boiling water canner to control molds, yeasts and bacteria that can be present in our foods. Whether food should be processed in a pressure canner or boiling water canner depends on the acidity or pH of the food. The term "pH" is a measure of acidity; the lower its value, the more acid in the food. If the acid level is high enough, dangerous bacteria cannot grow, so the food only needs to reach a boiling temperature to be made safe. However, if the food is a low-acid food, there is potential for growth of botulism.

Botulism spores are hard to destroy so the higher the canner temperature the more easily they are destroyed. All low acid foods must be canned at a temperature of 240°F to 250°F which is only attainable in pressure canners. The exact time needed in the pressure canner depends on the type of food being canned, the way it is packed into the jars and the size of the jars. **Use only USDA approved recipes for canning.**

High-acid foods contain enough acid to block bacteria growth, or destroy them more rapidly when heated. Acid foods have a pH of 4.6 or lower. These foods include:

- Fruits
- Pickles
- Sauerkraut
- Jams
- Jellies
- Marmalades
- Fruit butters
- Salsas
- Tomatoes (after acid is added)

Low-acid canned foods are not acidic enough to prevent the growth of these bacteria. Low-acid foods have a pH value of higher than 4.6. These foods include:

- Meats (bear, beef, lamb, pork, veal and venison)
- Seafood
- Poultry
- Milk

- All fresh vegetables

Canning methods **NOT** Recommended:

- Open-kettle canning
- Oven canning
- Microwave oven canning
- Dishwasher canning
- Steam canner

Altitude Adjustments

Using processing times for canning food at sea level can result in food spoilage if you live at altitudes of 1,000 feet or higher. Water boils at lower temperatures the higher in altitude you go. Lower boiling temperatures are less effective in killing bacteria, therefore, increasing processing time will compensate for the lower temperature.

To destroy microorganisms in acid foods processed in a boiling water canner, you must process jars for the correct amount of time in boiling water and cool the jars at room temperature.

Foods may spoil if you fail to add to the processing time for elevations above 1,000 feet, process for a shorter time than specified or cool jars in cold water.

The table below indicates the amount of time to add to processing times for different altitudes. Process times for ½-pint and pint jars are the same and processing times for 1 ½ pint and quart jars are the same.

Boiling Water Canner Altitude Adjustments	
Altitude in Feet	**Increase Processing Time**
1,001 to 3,000	5 minutes
3,001 to 6,000	10 minutes
6,001 to 8,000	15 minutes
8,001 to 10,000	20 minutes

Hot Packing vs. Raw "Cold" Packing

Hot packing is the practice of heating prepared food to boiling, simmering for 2 to 5 minutes and promptly filling jars loosely with the hot food. It is the best way to remove air from food. Also, the color and flavor of hot packed foods will last longer than raw packed foods.

Raw "cold" packing is the practice of filling jars tightly with freshly prepared, but unheated food. Some foods processed this way may float. The air that was not released before processing can cause food to discolor within 2 to 3 months. Raw-packing is more suitable for vegetables processed in a pressure canner or soft fruits that may be bruised by handling.

With both practices, the food is covered with boiling juice, syrup or water. This practice will help to remove air – shrinking food, helps keep food from floating, increases the vacuum seal and improves shelf life.

Getting Ready to Can – General Information

Selecting Produce

Produce needs to be canned at its peak of quality – within hours of harvest. Examine produce carefully for freshness and wholesomeness. Discard small pieces that are damaged or moldy. Trim small diseased spots from large produce. Apricots, nectarines, peaches, pears and plums will have more flavor if they have been ripened for one or more days between harvest and canning. If you delay canning, store produce in a shady, cool place.

Washing and Peeling

Rinse, don't soak produce in cold water. For dirty garden produce, first rinse with outside hose, then rinse one to three times in the kitchen sink.

Jar Selection

Use regular and wide-mouth Mason-type, threaded, home canning jars with self-sealing lids. Use only ½ pint, pint, 1 ½ pint and quart jars. Half-gallon size jars may be used for canning very acid juices. With careful use and handling, Mason jars can be reused many times. Jars need to be checked each year for cracks and chips throughout the jar as well as on the sealing surface. Other commercial jars with mouths that cannot be sealed with two-piece canning lids should not be used.

Preparing Jars

Check all jars to make sure that they are free of cracks or chips, especially on the rim of the jar, which is the sealing surface. If the sealing surface is damaged you may not get a good seal and the jar could break. Before every use wash jars in hot water with detergent and rinse well. This may be done in a dishwasher. Jars that are processed for less than 10 minutes must be sterilized (at altitudes above 1000 feet, all process times are more, so jar sterilization is not necessary).

Sterilizing jars – Place jars right side up on the rack in a boiling water canner. Fill the canner and jars with hot (not boiling) water to one inch above the tops of the jars. Boil 10 minutes. Remove and drain hot sterilized jars one at a time, fill with food, add lids, and tighten screw bands and process.

Headspace

The unfilled space above the food in the jar and below the lid is called headspace. All approved recipes will tell you how much headspace is required for that product. This space is needed for expansion of the food during processing and for forming the vacuum seal. Too little headspace may cause food to expand and bubble out of from the jar during processing. Too much headspace may cause the food at the top to discolor in storage.

Filling a Jar

Using a funnel, fill jars with food and add liquid to cover the food. Release air bubbles using a bubble remover by moving it up and down around the edges and in the center of the jar to allow air bubbles to escape. Adjust the headspace by adding or removing liquid, then clean the jar rim (sealing surface) with a

dampened paper towel. Place the preheated lid, onto the cleaned jar rim. Then fit the metal screw band over the flat lid.

Tightening Screw Bands

Use your thumb and two fingertips to turn the screw band very gently until you feel the slightest resistance. Then reposition your hand and tighten another 1½ inches.

- If rings are too loose, liquid may escape from jars during processing, and seals may fail.
- If rings are too tight, air cannot vent during processing, and food will discolor during storage. Over tightening may also cause lids to buckle and jars to break, especially with raw-packed, pressure-processed food.

Testing for a Seal

1. Press the middle of the lid with a finger. If the lid springs up when you release your finger, the lid is not sealed.
2. Tap the lid with the bottom of a teaspoon. If there is a dull sound the lid is not sealed. If the food is in contact with the underside of the lid, it will also cause a dull sound. If the jar is sealed correctly, it will make a ringing, high-pitched sound.
3. Hold the jar at eye level and look across the lid. The lid should be concave (curved down slightly in the center). If center of lid is either flat or bulging, it may not be sealed.

Storing Canned Food

Do you leave screw bands on jars after food is processed? Screw bands are not necessary for storage. When stored properly screw bands can be used for years. If they are left on the jars, they can become difficult to remove; they often rust and may not work properly a second time. After jars have cooled, remove screw bands, wash them with warm soapy water, dry and store for future use.

Wipe the jars with a damp cloth to remove any food residue. Label the jars and store them in a cool, dark dry location.

Labeling

Labeling is very important for canned foods. Below is a list of information that should be on the labels for each jar that you can.

- List the name of product
- List the date canned
- List the ingredients
- Processing information (i.e. raw-hot pack, processing time, altitude adjustment)
- Source of recipe (i.e. Ball Blue Book, USDA Canning Guide, So Easy To Preserve, 4-H project manual)
- List any other information you may want to know about the canned product

How To Process Food in a Boiling Water Canner

Boiling-water canners must be deep enough so that at least 1 to 2 inches of briskly boiling water will cover the tops of the jars. For adequate heat transfer, a flat bottom canner must be used on an electric range. To ensure uniform processing of all jars, the canner should be no more than four inches wider in diameter than the element on which it is heated.

Step 1: Fill canner half-full with water and bring to a simmer (180°F for hot pack, raw pack 140°F). Position canner rack over simmering water. (see note below)	**Step 6:** Put the canner lid in place and adjust heat to high, bringing water to a rolling boil.
Step 2: Prepare recipe according to USDA directions.	**Step 7:** When water is boiling, set timer for adjusted processing time. Maintain rolling boil for entire processing time. You may need to adjust heat to maintain a rolling boil without boiling over. *
Step 3: Fill hot jars to appropriate headspace and adjust lids and rings.	**Step 8:** After processing is complete, turn off heat and remove lid. Allow jars to sit for 5 minutes in canner before removing.
Step 4: Place jars on canner rack immediately after each jar is filled. Lower the rack into canner.	**Step 9:** Remove jars from canner and place upright on a dry towel. Make sure there is plenty of space around jars for air to circulate.
Step 5: Make sure water completely covers jars and lids by 1-2 inches. Add boiling water if needed.	**Step 10:** Allow jars to cool naturally, undisturbed for 12 to 24 hours before checking for a seal.

Note: Not all canner racks are set up to be positioned inside the canner over the water. If the rack you are using is not, just place the filled jars directly on the rack in the bottom of the canner.

* If canner stops a rolling boil, bring canner back up to a full rolling boil and begin processing time again.

Activities

Let's Can Fruit

1. Making Syrup

Adding syrup to a canned fruit helps retain its flavor, color and shape. Using the chart below, prepare each type of syrup and taste test each sample.

Preparing and using syrups						
		Measures for Water and Sugar For 9-Pt Load*		For 7-Qt Load		
Syrup Type	**Approx. % Sugar**	**Cups Water**	**Cups Sugar**	**Cups Water**	**Cups Sugar**	**Fruits commonly packed in syrup ****
Very Light	10	6 ½	¾	10 ½	1 ¼	Approximates natural sugar level in most fruits and adds the fewest calories.
Light	20	5 ¾	1 ½	9	2 ¼	Very sweet fruit. Try a small amount the first time to see if your family likes it.
Medium	30	5 ¼	2 ¼	8 ¼	3 ¾	Sweet apples, sweet cherries, berries, grapes.
Heavy	40	5	3 ¼	7 ¾	5 ¼	Tart apples, apricots, sour cherries, gooseberries, nectarines, peaches, pears and plums.
Very Heavy	50	4 ¼	4 ¼	6 ½	6 ¾	Very sour fruit. Try a small amount the first time to see if your family likes it.

Chart from USDA Complete Guide to Home Canning

* This amount is also adequate for a 4-quart load.

** Many fruits that are typically packed in heavy syrup are excellent and tasteful products when packed in lighter syrups. It is recommended that lighter syrups be tried, since they contain fewer calories from added sugar.

Journaling

Which syrup did your prefer and why?

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What challenges did you have with this activity?

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What other observations do you have about this activity?

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2. Raw Pack vs. Hot Pack a Fruit

Select a fruit from the chart below that has both Hot and Raw pack instructions. Prepare the fruit by washing, draining, coring and peeling if necessary and cutting into uniform pieces. Process this fruit both as a raw pack and a hot pack according to chart instructions, remembering to adjust for altitude.

Canning Method. Fruits are acid enough to be safely processed in a boiling water canner. Begin counting processing time when the water comes back to a rolling boil.
Headspace. Leave ½ inch headspace for both the fruit and liquid, unless stated otherwise in chart below.

				PROCESS TIME (MIN.) AT VARIOUS ALTITUDES			
FRUIT	**PREPARATION**	**Pack**	**Jar Size**	**0-1000 Ft.**	**1001-3000 Ft.**	**3001-6000 Ft.**	**Over 6000 Ft.**
Apples	Wash, peel, core and slice. To prevent darkening, put into ascorbic acid solution*. Drain. Boil 5 minutes in light syrup or water. Pack, cover with boiling cooking liquid.	Hot	Pints and Quarts	20	25	30	35
Applesauce	Wash, peel and core apples. Slice apples and place in an 8 to 10 quart pot with ½ cup water. Heat quickly until tender. Press through sieve or food mill. Add sugar to taste to sauce. Reheat sauce to a rolling boil and pack into hot jars.	Hot	Pints Quarts	15 20	20 25	20 30	25 35
Apricots, nectarines, peaches, pears	Wash. Peel if desired (peaches peel best when first dipped in boiling water, then cold water). Halve fruits, remove pits or cores. Slice if desired. To prevent darkening, put into ascorbic acid solution*. Drain.						
	Hot pack. Heat fruit through in hot syrup. Pack fruit and cover with boiling syrup.	Hot	Pints Quarts	20 25	25 30	30 35	35 40
	Raw pack. Pack fruit, cover with boiling syrup.	Raw	Pints Quarts	25 30	30 35	35 40	40 45
Asian Pears	Asian pears are lower in acid than Bartlett or other similar varieties of pears. In order to can safely, add lemon juice before processing. Can Asian pears using the following method. Wash. Peel, halve, and remove cores. Slice if desired. To prevent darkening, put in ascorbic acid solution*. Drain.						

				PROCESS TIME (MIN.) AT VARIOUS ALTITUDES			
FRUIT	**PREPARATION**	**Pack**	**Jar Size**	**0-1000 Ft.**	**1001-3000 Ft.**	**3001-6000 Ft.**	**Over 6000 Ft.**
Asian Pears continued	***Hot pack.*** Heat fruit to boil in hot syrup. Add 2 tablespoons bottled lemon juice per quart or 1 tablespoon per pint to the jars. Fill jars with hot Asian pears and cooking syrup.	Hot	Pints	20	25	30	35
			Quarts	25	30	35	40
Berries	Choose firm berries with no mold. Wash and drain.						
	Hot pack. Bring berries and sugar (1/2 cup per quart) to a boil in covered saucepan. Shake pan to prevent sticking. Pack hot berries and extracted juice.	Hot	Pints and Quarts	15	20	20	25
	Raw pack. Pack berries. Shake jar gently to obtain full pack. Cover with boiling syrup. **Note:** The quality of canned strawberries is poor.	Raw	Pints	15	20	20	25
			Quarts	20	25	30	35
Cherries Sweet or pie	Wash cherries. Remove pits, if desired.						
	Hot pack. Add ½ cup water, juice, or syrup per quart cherries. Bring to boil in covered saucepan. Pack hot cherries and cover with cooking liquid.	Hot	Pints	15	20	20	25
			Quarts	20	25	30	35
	Raw pack. Pack cherries. Shake jar to obtain full pack. Add ½ cup hot liquid to each jar. Add more liquid if necessary.	Raw	Pints and Quarts	25	30	35	40
Figs	Figs are low in acid. To can safely, acid must be added to each jar. Select firm, ripe, uncracked figs. Do not can overripe fruit with very soft flesh. Wash thoroughly. Drain. Do not peel or remove stems.	Hot	Pints	45	50	50	60
	Hot pack. Cover figs with water and boil 2 minutes. Drain. Gently boil figs in light syrup for 5 minutes. Add 2 tablespoons bottled lemon juice per quart or 1 tablespoon per pint to the jars. Fill jars with hot figs and cooking syrup.		Quarts	50	55	60	65

				PROCESS TIME (MIN.) AT VARIOUS ALTITUDES			
FRUIT	**PREPARATION**	**Pack**	**Jar Size**	**0-1000 Ft.**	**1001-3000 Ft.**	**3001-6000 Ft.**	**Over 6000 Ft.**
Fruit puree	Stem, wash, drain, peel and remove pits if necessary. Measure fruit into large saucepan, crushing if desired. Add 1 cup hot water per quart of food. Cook slowly until soft. Press through sieve or food mill. Add sugar to taste. Reheat puree to a boil and pack into hot jars. Leave ¼ inch headspace.	Hot	Pints and Quarts	15	20	20	25
Plums	Remove stems and wash. To can whole, prick skins on two sides of plums with fork to prevent splitting. Freestone varieties may be halved and pitted. ***Hot pack.*** Add plums to hot syrup and boil 2 minutes. Cover saucepan and let stand 20-30 minutes. Fill jars with hot plums, cover with cooking syrup. ***Raw Pack.*** Fill jars with raw plums, packing firmly. Cover with hot syrup.	Hot and Raw	Pints Quarts	20 25	25 30	30 35	35 40
Rhubarb	Wash; cut into ½ inch pieces. Add ½ cup sugar per quart; let stand to draw out juice. Bring to a boil. Fill jars with hot rhubarb and extracted juice.	Hot	Pints and Quarts	15	20	20	25

Source: Hillers, Val. 2009. Canning Fruits. PNW 199. Pullman, WA: Washington State University Extension

*** Anti-darkening & ascorbic acid treatments:**

Pure powdered form. Seasonally available among canners' supplies in supermarkets or health food stores. One level teaspoon of pure powder weighs about 3 grams. Use 1 teaspoon per gallon of water as a treatment solution.

Vitamin C tablets. Economical and available year round in many stores. Buy 500-milligram tablets; crush and dissolve six tablets per gallon of water as a treatment solution.

Commercially prepared mixes of ascorbic and citric acid. Seasonally available among canners' supplies in supermarkets. Sometimes citric acid powder is also sold in supermarkets, but it is less effective in controlling discoloration. Follow manufacturer's directions for amounts to use.

Journaling

What fruit did you choose to can? _____

What challenges did you have with this activity?

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What other observations do you have about this activity?

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Let's Can Tomatoes

3. Canning Tomato Products

Select a tomato product from the table below and follow the instructions for that method or preservation. Select firm, underipe-to-ripe tomatoes. Use of decayed or overripe tomatoes may result in spoilage of canned products. Do not can tomatoes from dead or frost-killed vines. Wash the tomatoes in cool running water.

To can crushed, whole, or halved tomatoes, remove the skins by dipping them in boiling water for 30 to 60 seconds or until the skins split. Dip them in cold water, then slip off the skins and remove the cores. Yields will vary. The amount generally needed per quart is as follows:

Type	**Pounds needed per quart**
Whole or halved tomatoes	2 ¾
Tomato Juice	3 ¼
Tomato Sauce	5 to 6 ½

Adding Acid: To ensure safety in tomato products, add acid to jars of whole, crushed, or juiced tomatoes before processing.

- Bottled Lemon Juice: 1 tbsp. per pint; 2 tbsp. per quart.
- Citric Acid USP: ¼ tsp. per pint; ½ tsp. per quart
- Vinegar (5%): 2 tbsp. per pint; 4 tbsp. per quart (flavor changes may be undesirable)

Sugar may be added to mask sour flavor of the acids: 1 tsp. per pint; 2 tsp. per quart.

Adding Salt: Salt is added to tomatoes for flavor, not to preserve them. Therefore, it may be omitted. If you use salt, add ½ tsp. to each pint jar, 1 tsp. to each quart jar.

Recommended process times for tomatoes and tomato products in a boiling water canner

				PROCESS TIME (MIN.) AT ALTITUDES OF			
TOMATOES	**PREPARATION**	**Pack**	**Jar Size**	**0-1000 Ft.**	**1001-3000 Ft.**	**3001-6000 Ft.**	**Over 6000 Ft.**
Whole or halved packed in water	Prepare tomatoes as directed above. Leave whole or halve. ***Raw Pack***: Fill hot jars with raw, peeled tomatoes. Cover with hot water, leaving ½ inch headspace.	Raw	Pints	40	45	50	55
	Hot Pack: Add enough water to cover tomatoes in a large pan and boil gently for 5 minutes. Fill hot jars with hot tomatoes and cover with hot cooking liquid, leaving ½ inch headspace. Add acid to jars of both hot and raw pack products. If desired, add salt. Adjust lids and process in a boiling water canner.	Hot	Quarts	45	50	55	60

Whole or halved packed in Tomato juice	Prepare tomatoes as directed above. To prepare tomato juice wash, remove stems and trim off bruised or discolored portions. To prevent juice from separating into water and pulp layers, quickly cut about 1 pound of tomatoes into quarters and heat immediately to boiling in a sauce pan while crushing. Continue to slowly add and crush freshly cut tomato quarters to a boiling mixture (Make sure the mixture boils constantly and vigorously while you add the remaining tomatoes.) Simmer 5 minutes after adding all pieces. ***Raw Pack:*** Heat tomato juice in a saucepan. Fill hot jars with raw tomatoes and cover with hot tomato juice, leaving ½ inch headspace. ***Hot Pack:*** Completely cover tomatoes with tomato juice in large pan. Boil gently for 5 minutes. Fill jars with hot tomatoes and cover with hot tomato juice, leaving ½ inch headspace. Add acid as directed to jars of both hot and raw pack products. If desired, add salt. Adjust lids and process in a boiling water canner.	Raw Hot	Pint Quart	85 85	90 90	95 95	100 100
Whole or halved packed raw without added liquid	Prepare tomatoes as directed above. Leave whole or halve. Loosely fill jars with raw tomatoes, pressing until spaces fill with juice. Leave ½ inch headspace. Add acid and, if desired, add salt. Adjust lids and process in a boiling water canner.	Raw	Pint Quart	85 85	90 90	95 95	100 100
Tomato sauce	Wash tomatoes, remove stems, and trim off bruised or discolored portions. Heat and press as for making tomato juice. Simmer in large-diameter pan until sauce reaches desired consistency. (Volume should be reduced by about one-third for thin sauce, or by about one-half for thick sauce.) Fill jars, leaving ½ inch headspace. Add acid and, if desired, add salt. Adjust lids and process in boiling water canner.	Hot	Pints Quarts	35 40	40 45	45 50	50 55

Source: Raab, Carolyn A. 2010. Canning Tomatoes and Tomato Products. PNW 300. Corvallis, OR: Oregon State University Extension Service.

Journaling

What tomato product did you choose to can?

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What challenges did you have with this activity?

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What other observations do you have about this activity?

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4. Tomato Salsa

4 cups peeled, cored, chopped tomatoes
2 cups seeded, chopped long green chiles
½ cup seeded, chopped jalapeno peppers
¾ cup chopped onion
4 cloves garlic, finely chopped
2 cups vinegar (5%)
1 tsp. ground cumin (optional)
1 Tbs. oregano leaves (optional)
1 Tbs. fresh cilantro (optional)
1 ½ tsp. salt

Yield: About 4 pints

Caution: Wear plastic or rubber gloves and do not touch your face while handling or cutting hot peppers. If you do not wear gloves, wash hands thoroughly with soap and water before touching your face or eyes.

Peel and prepare chile peppers as described below. Wash tomatoes and dip in boiling water for 30 to 60 seconds or until skins split. Dip in cold water, slip off skins and remove cores. Combine all ingredients in a large pot and bring to a boil, stirring frequently. Reduce heat and simmer 20 minutes, stirring occasionally. Fill hot salsa into hot pint jars, leaving ½ inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process.

Choosing and Peeling Peppers

Peppers range from mild to scorching in taste. It is the "heat" factor that makes many salsa fans want to experiment with recipes. Use only high quality peppers, unblemished and free of decay. You may substitute one type of pepper for another, including bell peppers (mild) for some of the chilies. However, do not increase the total amount of peppers in any recipe.

Peeling peppers: Wash and dry peppers; slit each pepper along the side to allow steam to escape. Blister skins using one of these two methods:

Oven or broiler method to blister skins – Place peppers in hot oven (400°F) or under a broiler for 6 to 8 minutes until skins blister.

Range-top method to blister skins – Cover hot burner (either gas or electric) with heavy wire mesh. Place peppers on burner for several minutes until skins blister.

To peel, after blistering skins, place peppers in a pan and cover with a damp cloth. (This will make peeling the peppers easier.) Cool several minutes; peel off skins. Discard seeds and chop.

Recommended process time for Tomato Salsa in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Hot	Pints	15 min	20 min	25 min

Source: USDA Complete Guide to Home Canning

Journaling
What challenges did you have with this activity?

What other observations do you have about this activity?

Let's Can Jams and Jellies

5. Making jams and jellies with added pectin

Purchase pectin from the store. Using the recipes with the container, prepare a jam and/or jelly using those instructions. Remember to adjust for altitude when processing.

Journaling
What fruit did you choose to can?

What challenges did you have with this activity?

What other observations do you have about this activity?

6. Making jam without added pectin

Wash all fruits thoroughly before cooking. Do not soak. For best flavor, use just- ripe fruit. Remove stems, skins and pits from fruit; cut into pieces and crush. For berries, remove stems and blossoms and crush. Seedy berries may be put through a sieve or food mill. Measure crushed fruit into large saucepan using the ingredient quantities specified in the table below.

Ingredient Quantities				
Fruit	**Cups crushed fruit**	**Cups sugar**	**Tbsp. Lemon juice**	**Yield (half-pints)**
Apricots	4 to 4 ½	4	2	5 to 6
Berries*	4	4	0	3 to 4
Peaches	5 ½ to 6	4 to 5	2	6 to 7
*Includes blackberries, boysenberries, dewberries, gooseberries, loganberries, raspberries and strawberries				

Add sugar and bring to a boil while stirring rapidly and constantly. Continue to boil until mixture thickens. Use one of the following tests to determine when jams and jellies are ready to fill in the jars. Remember to allow for thickening during cooling.

Temperature Test – Use a jelly or candy thermometer and boil until mixture reaches the temperature for your altitude (see Making Jelly without added pectin).

Refrigerator Test – Remove the jam mixture from the heat. Pour a small amount of boiling jam on a cold plate and put it in the freezing compartment of a refrigerator for a few minutes. If the mixture gels, it is ready to fill in the jars.

Remove from heat and skim off foam quickly. Fill sterile jars with jam. Use a measuring cup or ladle the jam through a wide-mouthed funnel, leaving ¼ inch headspace. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process.

Recommended process time for jam without added pectin in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Hot	Half pints or Pints	5 min	10 min	15 min

Source: USDA Complete Guide to Home Canning

Journaling

What fruit did you choose for your jam?

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What challenges did you have with this activity?

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What other observations do you have about this activity?

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7. Making jelly without added pectin

Use only firm fruits naturally high in pectin. Select a mixture of about ¾ ripe and ¼ under ripe fruit. Do not use commercially canned or frozen fruit juices. Their pectin content is too low. Wash all fruits thoroughly before cooking. Crush soft fruits or berries; cut firmer fruits into small pieces. Using the peels and cores adds pectin to the juice during cooking. Add water to fruits that require it, as listed in the table of ingredients below. Put fruit and water in large saucepan and bring to a boil. Then simmer according to the times below until fruit is soft, while stirring to prevent scorching. One pound of fruit should yield at least 1 cup of clear juice.

To Extract Juice					
			Ingredients added to each cup of strained juice		
	Cups of water to be added per pound of fruit	**Minutes to simmer fruit before extracting juice**	**Sugar (cups)**	**Lemon Juice (tsp.)**	**Yield from 4 cups of juice (half-pints)**
Apples	1	20 to 25	¾	1 ½ (optional)	4 to 5
Blackberries	None or ¼	5 to 10	¾ to 1	None	7 to 8
Crab Apples	1	20 to 25	1	None	4 to 5
Grapes	None or ¼	5 to 10	¾ to 1	None	8 to 9
Plums	½	15 to 20	¾	None	8 to 9

When fruit is tender, strain through a colander, then strain through a double layer of cheesecloth or a jelly bag. Allow juice to drip through, using a stand or colander to hold the bag. Pressing or squeezing the bag or cloth will cause cloudy jelly.

Using no more than 6 to 8 cups of extracted fruit juice at a time, measure fruit juice, sugar and lemon juice according to the ingredients in the table above and heat to boiling. Stir until the sugar is dissolved. Boil over high heat to the jellying point. To test jelly for doneness, use one of the following methods.

Temperature Test – Use a jelly or candy thermometer and boil until mixture reaches the following temperatures at altitudes of:

Sea Level	**1,000 ft.**	**2,000 ft.**	**3,000 ft.**	**4, 000 ft.**	**5,000 ft.**	**6,000 ft.**	**7,000 ft.**	**8,000 ft.**
220°F	218°F	216°F	214°F	212°F	211°F	209°F	207°F	205°F

Sheet or Spoon Test – Dip a cool metal spoon into the boiling jelly mixture. Raise the spoon about 12 inches above the pan (out of steam). Turn the spoon so the liquid runs off the side. The jelly is done when the syrup forms two drops that flow together and sheet or hang off the edge of the spoon.

Refrigerator Test – Remove the jam mixture from the heat. Pour a small amount of boiling jam on a cold plate and put it in the freezing compartment of a refrigerator for a few minutes. If the mixture gels, it is ready to fill in the jars.

Remove from heat and quickly skim off foam. Fill jars with jelly. Use a measuring cup or ladle the jelly through a wide-mouthed funnel, leaving ¼ inch headspace. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process.

Recommended process time for jelly without added pectin in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Hot	Half pints or Pints	5 min	10 min	15 min

Source: USDA Complete Guide to Home Canning

Journaling

What fruit did you choose to make your jelly?

What challenges did you have with this activity?

What other observations do you have about this activity?

8. Making a low sugar, no sugar, Splenda recipe

Purchase a low sugar pectin or pectin that is acceptable to use with alternative sweeteners. There are numerous non-sugar sweeteners that work well. This would be a chance to try honey, agave, sucralose (Splenda), Stevia tm. Use the recipes with the container to prepare a jam and/or jelly using those instructions. Remember to adjust for altitude when processing.

Journaling

What jam or jelly did you choose to can?

Did you choose low sugar, no sugar or Splenda recipes?

What challenges did you have with this activity?

What other observations do you have about this activity?

Let's Can Pickles

Suitable containers, covers and weights for fermenting foods

A 1-gallon container is needed for each 5 pounds of fresh vegetables. Stone crocks, food-grade plastic and glass containers all work well. Other 1- to 3- gallon nonfood-grade plastic containers may be used if lined inside with a clean food-grade plastic bag. **Caution: Be certain that foods contact only food-grade plastics. Do not use garbage bags or trash liners.**

Salts used in pickling

Use of canning or pickling salt is recommended. Fermented and non-fermented pickles may be safely made using either iodized or non-iodized table salt. However, the additives used to prevent caking in table salts may make the brine cloudy. Iodized salts can result in discolored or streaked pickles.

Vinegar used in canning

White distilled and cider vinegars of 5 percent acidity are recommended. White vinegar is usually preferred when canning a light colored fruit or vegetable.

Firming Pickles

Alum can be used to safely firm fermented pickles. Alum does not improve the firmness of quick-process pickles. Food-grade line – water solution, may also be used to firm pickles. Soak fresh cucumbers in the line-water solution for 12 to 24 hours before pickling them. Excess lime must be removed from the cucumbers for safe pickling. To remove excess line, drain the lime-water solution, rinse then re-soak the cucumbers in fresh water for 1 hour. Repeat the rinsing and soaking steps two more times.

9. Quick Fresh-Pack Dill Pickles

8 lbs. of 3 to 5 inch pickling cucumbers
2 gallons water
1 ¼ cups canning or pickling salt (divided)
1 ½ qts. vinegar (5%)
¼ cup sugar
2 qts. water
2 tbsp. whole mixed pickling spice
About 3 tbsp. whole mustard seed (1 tsp. per pint jar)
About 14 heads of fresh dill (1 ½ heads per pint jar) or4 ½ tbsp. dill seed (1 ½ tsp. per pint jar)

Yield: About 7 to 9 pints

Wash cucumbers. Cut 1/16-inch slice off blossom end and discard, but leave ¼ inch of stem attached. Dissolve ¾ cup salt in 2 gallons water. Pour over cucumbers and let stand 12 hours. Drain. Combine vinegar, ½ cup salt, sugar, and 2 quarts water. Add mixed pickling spices tied in a clean white cloth. Heat to boiling. Fill hot jars with cucumbers. Add 1 tsp. mustard seed and 1 ½ heads fresh dill per pint. Cover

with boiling pickling solution, leaving ½ inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process as below.

Recommended process time for Quick Fresh-Pack Dill Pickles in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Raw	Pints	10 min	15 min	20 min
	Quarts	15 min	20 min	25 min

Source: USDA Complete Guide to Home Canning

Journaling
What challenges did you have with this activity?

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What other observations do you have about this activity?

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10. Bread-and-Butter Pickles

6 lbs. of 4 to 5 inch pickling cucumbers
8 cups thinly sliced onions (about 3 pounds)
½ cup canning or pickling salt
4 cups vinegar (5%)
4 ½ cups sugar
2 tbsp. mustard seed
1 ½ tbsp. celery seed
1 tbsp. ground turmeric
1 cup pickling lime (optional) for use in variation below for making firmer pickles

Yield: About 8 pints

Wash cucumbers. Cut 1/16-inch off blossom end and discard. Cut into 3/16-inch slices. Combine cucumbers and onions in a large bowl. Add salt. Cover with 2 inches crushed or cubed ice. Refrigerate 3 to 4 hours, adding more ice as needed.

Combine remaining ingredients in a large pot. Boil 10 minutes. Drain and add cucumbers and onions and slowly reheat to boiling. Fill hot pint jars with slices and cooking syrup, leaving ½ inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process as below.

Variation for firmer pickles: Wash cucumbers. Cut 1/16-inch off blossom end and discard. Cut into 3/16-inch slices. Mix 1 cup pickling lime and ½ cup to 1 gallon water in a 2 to 3 gallon crock or enamelware container. **Caution: Avoid inhaling lime dust while mixing the lime-water solution.** Soak cucumber slices in limewater for 12 to 24 hours, stirring occasionally. Remove from lime solution, rinse, and re-soak 1 hour in fresh cold water. Repeat the rinsing and soaking steps two more times. Handle carefully, as slices will be brittle. Drain well.

Storage: After processing and cooling, jars should be stored 4 to 5 weeks to develop ideal flavor.

Recommended process time for Bread and Butter Pickles in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Hot	Pints or Quarts	10 min	15 min	20 min

Source: USDA Complete Guide to Home Canning

Journaling

What challenges did you have with this activity?

What other observations do you have about this activity?

11. Fermented Dill Pickles

Use the following quantities for each gallon capacity of your container.

4 lbs. of 4 inch pickling cucumbers
2 tbsp. dill seed or 4 to 5 heads fresh or dry dill weed
½ cup salt
¼ cup vinegar (5%)
8 cups water and one or more of the following ingredients:
- 2 cloves garlic (optional)
- 2 dried red peppers (optional)
- 2 tsp. whole mixed pickling spices (optional)

Wash cucumbers. Cut 1/16-inch slice off blossom end and discard. Leave ¼ inch of stem attached. Place half of dill and spices on bottom of a clean, suitable container. Add cucumbers, remaining dill, and spices. Dissolve salt in vinegar and water and pour over cucumbers. Add suitable cover and weight. (See suitable containers, covers and weights for fermented foods below.) Store where temperature is between 70°F and 75°F for about 3 to 4 weeks while fermenting. Temperatures at 55°F to 65°F are acceptable, but the fermentation will take 5 to 6 weeks. Avoid temperatures above 80°F, or pickles will become too soft during fermentation. Fermenting pickles cure slowly. Check the container several times a week and promptly remove surface scum or mold. **Caution: If the pickles become soft, slimy, or develop a disagreeable odor, discard them.** Fully fermented pickles may be stored in the original container for about 4 to 6 months; provided they are refrigerated and surface scum and molds are removed regularly. Canning fully fermented pickles is a better way to store them. To can them, pour the brine into a pan, heat slowly to a boil and simmer 5 minutes. Filter brine through paper coffee filters to reduce cloudiness, if desired. Fill hot jar with pickles and hot brine, leaving ½ inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rims of jars with a dampened clean paper towel. Adjust lids and process as below.

Recommended process time for Quick Fresh-Pack Dill Pickles in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Raw	Pints	10 min	15 min	20 min
	Quarts	15 min	20 min	25 min

Suitable covers and weights for Fermented Foods

Cucumbers must be kept 1 to 2 inches under brine while fermenting. After adding prepared vegetables and brine, insert a suitably sized dinner plate or glass pie plate inside the fermentation container. The plate must be slightly smaller than the container opening, yet large enough to cover most of the cucumbers. To keep the plate under the brine, weight it down with 2 to 3 sealed quart jars filled with water or a very large clean, plastic bag filled with 3 quarts of water containing 4 ½ tablespoons of canning or pickling salt. Be sure to seal the plastic bag. Freezer bags are suitable for use with 5-gallon containers. Covering the container opening with a clean, heavy bath towel helps to prevent contamination from insects and molds while the vegetables are fermenting.
Source: USDA Complete Guide to Home Canning

Journaling
What challenges did you have with this activity?

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What other observations do you have about this activity?

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12. Pickle Relish

3 qts. chopped cucumbers
3 cups each of chopped sweet green and red peppers
1 cup chopped onions
¾ cup canning or pickling salt
4 cups ice
8 cups water
2 cups sugar
4 tsp. each of mustard seed, turmeric, whole allspice, and whole cloves
6 cups white vinegar (5%)

Yield: About 9 pints

Add cucumbers, peppers, onions, salt, and ice to water and let stand 4 hours. Drain and re-cover vegetables with fresh ice water for another hour. Drain again. Combine spices in a spice or cheesecloth bag. Add spices to sugar and vinegar. Heat to boiling and pour mixture over vegetables. Cover and refrigerate 24 hours. Heat mixture to boiling and fill hot relish into hot jars, leaving ½ inch headspace. Remove air bubbles and adjust headspace if needed. Wipe rim of jars with a dampened clean paper towel. Adjust lids and process.

Recommended process time for Quick Fresh-Pack Dill Pickles in a boiling-water canner				
		Process Time at Altitudes of		
Style of Pack	**Jar Size**	**0-1,000 ft.**	**1,001-6,000 ft.**	**Above 6,000 ft.**
Hot	Half pints or pints	10 min	15 min	20 min

Source: USDA Complete Guide to Home Canning

Journaling

What challenges did you have with this activity?

What other observations do you have about this activity?

Other Boiling Water Canning Activities

13. Conduct Taste Tests

Select a fruit or tomato product and can using two different methods. Some suggestions are:

- Can fruit using two different syrup types (see Activity 1)
- Can fruit as a raw pack vs. hot pack (see Activity 2)
- Can tomatoes with tomato juice and without
- Record the results of your taste test
- Compare a commercially prepared item with a home preserved item

After preparing the two items being prepared, share them with a panel of at least four people. Here are some suggestions for your taste test:

- Do not tell the panel the preservation method used.
- Ask each panel member to write down comments about each of the samples they are comparing.
- Ask each panel to indicate which sample they prefer.
- Share the results with the panel.
- Record the results of your taste test.

Journaling

What types of canned foods did you compare in your taste test?

What challenges did you have with this activity?

What other observations do you have about this activity?

14. Labeling

It is important to label all home canned foods. Decide whether you can use the top of the lid or if you need to attach a label to the jar. Here are some important things to include on the label:

- List the name of product
- List date canned
- List ingredients
- Processing information (i.e. raw-hot pack, processing time, altitude adjustment)
- Source of recipe (i.e. Ball Blue Book, USDA Canning Guide, So Easy To Preserve, 4-H project manual).

Journaling

What canned food did you choose to label?

_____

What challenges did you have with this activity?

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What other observations do you have about this activity?

_____

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Going Further with Boiling Water Canning

Create Your Own Activity

Using one of the resource materials listed in the front of this manual, create your own activity. Resource materials are available at your local CSU Extension Office.

Here are some suggestions to help you:

- Identify the resource you will be using, for example; *So Easy to Preserve*
- Decide on the recipe or method you want to use
- Get equipment, food and packaging ready
- Follow the information and directions listed carefully
- Evaluate your end results

Journaling

What activity did you choose to do?

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_____

What challenges did you have with this activity?

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_____

What other observations do you have about this activity?

_____

_____

Menu Planning

Using the menu planning information listed in the front of this manual; develop a menu plan for your friends and family. Use some foods that you have boiling water canned to develop a healthy menu plan.

Journaling

What menu or menus did you plan?

_____

What challenges did you have with this activity?

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What other observations do you have about this activity?

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Show What You Have Learned

The purpose of a demonstration is for you to share some of the fun activities you completed or important information you learned about preserving foods by boiling water canning. You are required to give a demonstration to complete this project. Some ideas you might consider are:

- How to select suitable produce for canning
- Demonstrate the proper equipment for boiling water canning
- How to peel tomatoes
- Making a brine solution for pickling
- Explain the difference between jams and jellies made with and without added pectin
- Explain the difference between raw and hot pack
- Explain why you need to adjust for altitude and how to make the adjustment

Reflections on Boiling Water Canning

Do, Reflect and *Apply* are how 4-H youth "Learn by Doing." You have experienced several activities in this project, shared the results and discussed them with your club members, leaders and families. Apply what you have learned by showing others how to preserve food by boiling water canning. To show what you have learned, answer at least two of these questions.

- Explain why boiling water canning is an effective and economical way to preserve food.

  _____

  _____

- Why do produce need to be at their peak of quality for canning?

  _____

  _____

- Why do we need to make elevation adjustments to canning recipes?

  _____

  _____

- Explain how to test for a seal in home canned foods.

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  _____

- How could you use your boiling water canned foods as a way to help with long-term menu planning for your family?

  _____

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