

Let's Preserve: Meat, Poultry, Fish, and Seafood

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Canning is one way to preserve food. This publication provides accurate, up-to-date methods for safely canning meat, poultry, and seafood. For general directions on how to can, refer to *Let's Preserve: Canning Basics* (EC434).

Determine Your Altitude

Water boils at 212°F at sea level. As the elevation increases, water boils at lower temperatures and foods take longer to cook. To ensure safely canned foods at altitudes above sea level, lengthen the processing time for boiling-water canning methods. For the pressure canning methods, increase the pressure to assure a safely canned product.

The map below (*Figure 1*) shows Nebraska altitudes. Find your area and check the tables in this publication for the correct processing time or pressure for your altitude.

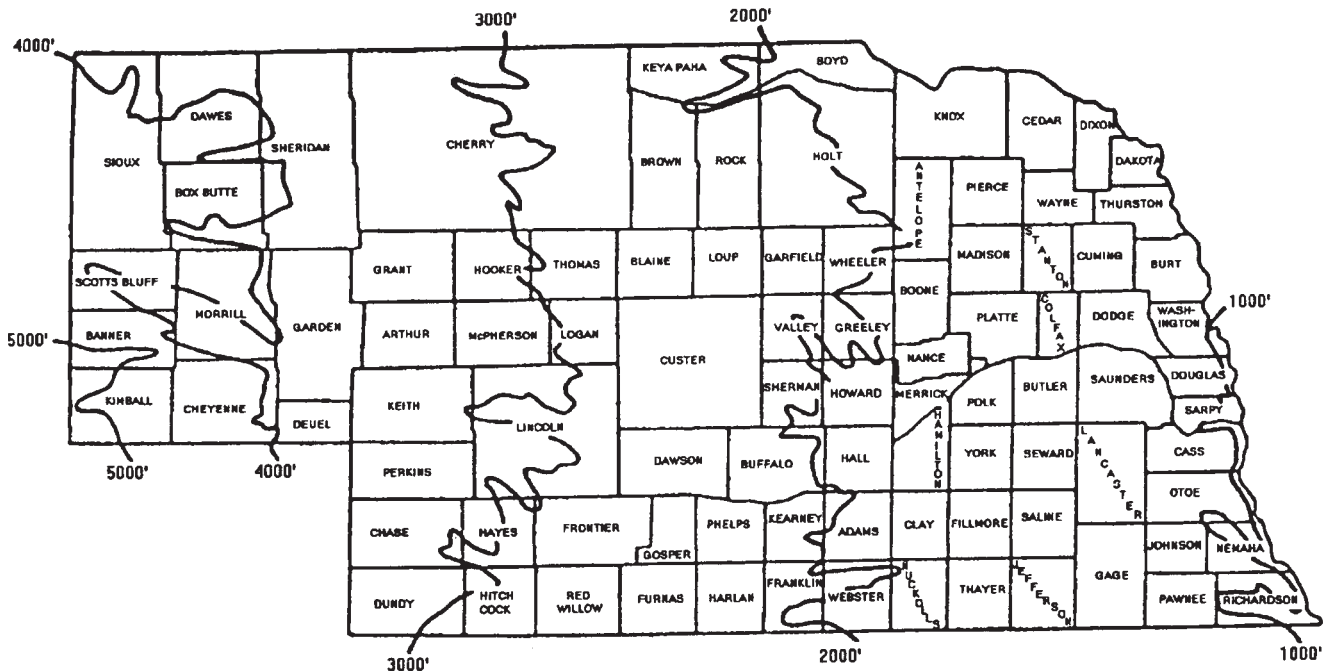


Figure 1. Altitude ranges in Nebraska.



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Chicken or Rabbit

Procedure: Choose freshly killed and dressed, healthy animals. Large chickens are more flavorful than fryers. Dressed chickens should be chilled for 6 to 12 hours before canning. Dressed rabbits should be soaked one hour in water containing 1 tablespoon of salt per quart, and then rinsed. Remove excess fat. Cut the chicken or rabbit into suitable sizes for canning. Can with or without bones.

Hot pack — Boil, steam, or bake meat until about two-thirds done. Add 1 teaspoon salt per quart to the jar, if desired. Fill jars with pieces and hot broth, leaving 1 ¼-inch headspace.

Raw pack — Add 1 teaspoon salt per quart, if desired. Fill jars loosely with raw meat pieces, leaving 1 ¼-inch headspace. Do not add liquid. Adjust lids and process according to chart on Page 3.

Ground or Chopped Meat

Bear, beef, lamb, pork, sausage, veal, venison

Procedure: Choose fresh, chilled meat. With venison, add one part high-quality pork fat to three or four parts venison before grinding. Use freshly made sausage, seasoned with salt and cayenne pepper (sage may cause a bitter off-flavor). Shape chopped meat into patties or balls, or cut cased sausage into 3- to 4-inch links. Cook until lightly browned. Ground meat may be sauteed without shaping. Remove excess fat. Fill jars with pieces. Add boiling meat broth, tomato juice, or water, leaving 1-inch headspace. Add 1 teaspoon of salt per quart to the jars, if desired. Adjust lids and process according to chart on Page 3.

Strips, Cubes, or Chunks of Meat

Bear, beef, lamb, pork, veal, venison

Procedure: Choose quality, chilled meat. Remove excess fat. Soak strong-flavored wild meats for one hour in brine water containing 1 tablespoon of salt per quart. Rinse. Remove large bones.

Hot pack — Precook meat until rare by roasting, stewing, or browning in a small amount of fat. Add 1 teaspoon of salt per quart to the jar, if desired. Fill jars with pieces and add boiling broth, meat drippings, water, or tomato juice (especially with wild game), leaving 1-inch headspace.

Raw pack — Add 1 teaspoon of salt per quart to the jar, if desired. Fill jars with raw meat pieces, leaving 1-inch headspace. Do not add liquid. Adjust lids and process according to chart on Page 3.

Meat Stock (Broth)

Beef: Saw or crack fresh trimmed beef bones to enhance extraction of flavor. Rinse bones and place in large stockpot or kettle, cover bones with water, add pot cover, and simmer three to four hours. Remove bones, cool broth, and pick off meat. Skim off fat, add meat removed from bones to broth, and reheat to boiling. Fill jars, leaving 1-inch headspace. Wipe rims of jars with a dampened, clean paper towel. Adjust lids and process according to the chart on Page 3.

Chicken or turkey: Place large carcass bones in a large stockpot, add enough water to cover bones, cover pot, and simmer 30 to 45 minutes or until meat can be easily stripped from the bones. Remove bones and pieces, cool broth, strip meat, discard excess fat, and return meat trimmings to broth. Reheat to boiling and fill jars, leaving 1-inch headspace. Wipe rims of jars with a dampened, clean paper towel. Adjust lids and process according to the chart on Page 3.

Recommended Pressure for Pressure Canners

				Dial-Gauge Canner Gauge Pressure (PSI) at Altitudes of:			Weighted-Gauge Canner Gauge Pressure (PSI) at Altitudes of:	
	Style of Pack	Jar Size	Process Time	0- 2,000 ft	2,001- 4,000 ft	4,000- 6000 ft	0- 1,000 ft	Above 1,000 ft
Chicken or Rabbit	Hot and Raw (Without bones)	Pint	75 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Quart	90 min	11 lb	12 lb	13 lb	10 lb	15 lb
	Hot and Raw (With bones)	Pint	65 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Quart	75 min	11 lb	12 lb	13 lb	10 lb	15 lb
Ground or Chopped Meat	Hot	Pint	75 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Quart	90 min	11 lb	12 lb	13 lb	10 lb	15 lb
Strips, Cubes or Chunks of Meat	Hot and Raw	Pint	75 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Quart	90 min	11 lb	12 lb	13 lb	10 lb	15 lb
Meat Stock	Hot	Pint	20 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Quart	25 min	11 lb	12 lb	13 lb	10 lb	15 lb

Fish and Seafood

Clams

Whole or minced

Procedure: Keep live clams on ice until ready to can. Scrub shells thoroughly and rinse, steam five minutes, and open. Remove clam meat. Collect and save clam juice. Wash clam meat in water containing 1 teaspoon salt per quart. Rinse and cover clam meat with boiling water containing 2 tablespoons lemon juice or ½ teaspoon citric acid per gallon. Boil two minutes and drain. To make minced clams, grind clams with a meat grinder or food processor. Fill jars loosely with pieces and add hot clam juice and boiling water if needed, leaving 1-inch headspace. Adjust lids and process according to chart on Page 5.

King and Dungeness Crab Meat

It is recommended that blue crab meat be frozen for best quality.

Procedure: Keep live crabs on ice until ready to can. Wash crabs thoroughly, using several changes of cold water. Simmer crabs 20 minutes in water containing ¼ cup lemon juice and 2 tablespoons salt (or up to 1 cup salt, if desired) per gallon. Cool in cold water, drain, remove back shell, then remove meat from body and claws. Soak meat two minutes in cold water containing 2 cups lemon juice or 4 cups white vinegar and 2 tablespoons salt (or up to 1 cup salt, if desired) per gallon. Drain and squeeze meat to remove excess moisture. Fill half-pint jars with 6 ounces of meat, and pint jars with 12 ounces, leaving 1-inch headspace. Add ½-teaspoon citric acid or 2 tablespoons lemon juice to each half-pint jar, or 1 teaspoon citric acid or 4 tablespoons lemon juice per pint jar. Add hot water, leaving 1-inch headspace. Adjust lids and process according to chart on Page 5.

Fish

Blue, mackerel, salmon, steelhead, trout, and other fatty fish except tuna

Caution: Bleed and eviscerate fish within two hours of being caught. Keep cleaned fish on ice until ready to can.

Note: Glass-like crystals of magnesium ammonium phosphate sometimes form in canned salmon. There is no way for the home canner to prevent these crystals from forming, but they usually dissolve when heated and are safe to eat.

Procedure: Remove head, tail, fins, and scales.

Wash and remove all blood. Split fish lengthwise, if desired. Cut cleaned fish into 3 ½-inch lengths. Fill pint jars, skin side next to glass, leaving 1-inch headspace. Add 1 teaspoon salt per pint, if desired. Do not add liquids. Adjust lids and process according to chart on Page 5.

Oysters

Procedure: Keep live oysters on ice until ready to can. Wash shells. Heat five to seven minutes in preheated oven at 400°F. Cool briefly in ice water. Drain, open shell, and remove meat. Wash meat in water containing ½ cup salt per gallon. Drain. Add ½ teaspoon salt to each pint, if desired. Fill half-pint or pint jars with meat and hot water, leaving 1-inch headspace. Adjust lids and process according to chart on Page 5.

Tuna

Tuna may be canned either precooked or raw. Pre-cooking removes most of the strong-flavored oils. The strong flavor of dark tuna flesh affects the delicate flavor of white flesh. Many people prefer not to can dark flesh. It may be used as pet food.

Note: Glass-like crystals of magnesium ammonium phosphate sometimes form in canned tuna. There is no way for the home canner to prevent these crystals from forming, but they usually dissolve when heated and are safe to eat.

Procedure: Keep tuna on ice until ready to can. Remove viscera and wash fish well in cold water. Allow blood to drain from stomach cavity. Place fish belly down on a rack or metal tray in the bottom of a large baking pan. Cut tuna in half crosswise, if necessary. Precook fish by baking at 250°F for 2 ½ to 4 hours (depending on size) or at 350°F for 1 hour. The fish also may be cooked in a steamer for 2 to 4 hours. If a thermometer is used, cook to an internal temperature of 165° to 175°F. Refrigerate cooked fish overnight to firm the meat. Peel off the skin with a knife, removing blood vessels and any discolored flesh. Cut meat away from bones. Cut out and discard all bones, fin bases, and dark flesh. Quarter. Cut quarters crosswise into lengths suitable for half-pint or pint jars. Fill into jars, pressing down gently to make a solid pack. Tuna may be packed in water or oil, whichever is preferred. Add water or oil to jars, leaving 1-inch headspace. Add ½ teaspoon salt per half-pint, or 1 teaspoon salt per pint, if desired. Adjust lids and process according to chart on Page 5.

Recommended Pressure for Pressure Canners

				Dial-Gauge Canner Gauge Pressure (PSI) at Altitudes of:			Weighted-Gauge Canner Gauge Pressure (PSI) at Altitudes of:	
	Style of Pack	Jar Size	Process Time	0- 2,000 ft	2,001- 4,000 ft	4,001- 6000 ft	0- 1,000 ft	Above 1,000 ft
Clams	Hot	Half-pint	60 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Pint	70 min	11 lb	12 lb	13 lb	10 lb	15 lb
King and Dungeness Crab Meat		Half-pint	70 min	11 lb	12 lb	13 lb	10 lb	15 lb
		Pint	80 min	11 lb	12 lb	13 lb	10 lb	15 lb
Fish	Raw	Pint	100 min	11 lb	12 lb	13 lb	10 lb	15 lb
Oysters		Pint and Half-pint	75 min	11 lb	12 lb	13 lb	10 lb	15 lb
Smoked Fish		Pint	100 min	11 lb	12 lb	13 lb	15 lb	15 lb
Tuna		Pint and Half-pint	100 min	11 lb	12 lb	13 lb	10 lb	15 lb

Canning Smoked Fish

Salmon, rockfish and flatfish (sole, cod, flounder), and other fish

Caution: Safe processing times for other smoked seafoods have not been determined. Those products should be frozen. Smoking fish should be done by tested methods. Lightly smoked fish is recommended for canning. Because it has not been cooked, do not taste lightly smoked fish before canning.

Follow these recommended canning instructions carefully. Use a 16- to 22-quart pressure canner for this procedure. Do not use smaller pressure saucepans; safe processing times haven't been determined. Do not use quart jars or tin cans. Half-pints could be safely processed for the same length of time as pints, but the quality of the product may be less acceptable.

Smoked fish is considered a delicacy. Whether caught or purchased, fish can be smoked successfully at home. Once smoked, fish has a short shelf life. Even refrigeration won't guarantee that smoked fish will be safe to eat. The bacteria that cause botulism food poisoning could start to grow after two to three weeks of refrigeration.

For long-term storage, smoked fish must be frozen or canned. Canning is preferred by many who smoke fish at home. Smoked fish must be processed in a pressure canner to destroy *clostridium botulinum* spores. The length of processing time needed to guarantee safety can affect the quality of home-canned smoked fish. Canning tends to dry the flesh, darken the color, and intensify the smoked flavor. However, it's not safe to reduce the processing time to lessen these undesirable quality changes. Instead, the smoking procedure must be modified.

Fully smoked fish dry enough to eat tends to be too dry and strong flavored after canning. For best quality, fish that will be canned should be smoked for a shorter time than ready-to-eat products. Lightly smoked fish must be promptly canned to assure that it will be safe and top quality. Don't eat it before canning. Some bacteria survive the short smoking process. They'll be destroyed during canning.

The following smoking procedure will give the best results if you're planning to can fish.

Preparing Fish for Smoking

Different species of fish require different preparation techniques. Salmon usually are prepared by removing the backbone and splitting. Bones usually are not removed. Rockfish and flatfish, such as sole, cod, and flounder, should be filleted.

You'll need about $\frac{2}{3}$ pound of smoked fish for each pint canning jar. About 1 $\frac{1}{2}$ to 3 pounds of whole fish will yield this amount of smoked fish depending on

the amount of waste removed, such as head, tail, fins, and entrails. Be sure to use good quality, firm fish. Smoking and canning won't improve poor quality! Keep fish refrigerated or on ice before smoking.

1. Remove blood and scales (and skin, if desired) and rinse well with fresh, cool water.
2. Cut prepared fish into pieces that will fit vertically into pint canning jars, about 1 inch shorter than jar height. Salt will be more uniformly absorbed if pieces are a similar size.

Salting

Soaking fish in a strong salt solution (brine) before smoking will give a good surface texture and retard surface spoilage.

1. For each 2 to 3 pounds of prepared fish, dissolve 1 cup of salt in 7 cups of water.
2. Soak thin pieces of fish ($\frac{1}{2}$ inch at the thickest point) for about 5 to 10 minutes. Larger, thicker pieces of fish (over $\frac{1}{2}$ inch thick) will need 30 to 45 minutes of soaking.

Note: If you want less salt in the finished product, reduce the brining time and smoke for no longer than one hour. Be sure to can lower-salt fish immediately after smoking to ensure safety.

Smoking for Canning

Small factory-made smokers are suitable for smoking fish that will be canned. Lightly smoked fish doesn't have to reach the internal temperature required for ready-to-eat products, which is 160°F for at least 30 minutes.

Although heat isn't needed to smoke fish for canning, some heat is helpful if a drier product is desired. The temperature of home smokers will be 140° to 160°F as a result of the combined heat of burning chips and a hot plate. This temperature is high enough to dry the fish if air flow isn't severely restricted.

- Smoke the amount of fish that you plan to can that same day.
- Smoke fish for up to two hours, depending on the level of smoke flavor desired.

Since lightly smoked fish isn't safe to eat, don't taste it to see if it's done. The best way to judge doneness is to measure weight loss. Weight is lost as moisture evaporates during smoking. A 10 percent weight loss yields a moist, good-quality product after canning. The moisture loss in most ready-to-eat smoked fish is generally 20 to 30 percent. Lightly smoked oily fish such as black cod and Chinook salmon will seem very moist due to their higher fat content.

You can measure weight loss easily with a kitchen scale. Calculate percentage of loss by comparing the difference in the weight of one piece of raw fish before and after smoking. For example:

- (A) Weigh a piece of fish before smoking.
- (B) Weigh the same piece of fish after smoking.
- (C) Subtract the ending weight (B) from the beginning weight (A) to calculate weight loss (C).
- (D) Divide weight loss (C) by beginning weight (A).
- (E) Multiply (D) by 100 to calculate percent of weight loss.

For example:

$$\begin{array}{r} 8 \text{ ounces beginning weight (A)} \\ -7 \text{ ounces ending weight (B)} \\ \hline 1 \text{ ounce weight loss (C)} \end{array}$$

$1 \text{ ounce (C)} \div 8 \text{ ounces (A)} = .125 \text{ (D)}$

$.125 \text{ (D)} \times 100 = 12.5 \text{ percent (E)}$

This 12.5 percent weight loss would yield a fairly moist piece of smoked fish after canning. A 20 to 30 percent weight loss would tend to be too dry after canning.

Note: If your smoked fish cannot be processed immediately, refrigerate it for processing later that day. If canning will be delayed for more than one day, freeze the fish. Frozen smoked fish must be thawed to refrigerator temperature before canning. Thaw fish in the refrigerator, not on the counter.

Canning Procedure

The directions for filling the pressure canner for processing smoked fish are different than directions for other pressure canning. Follow these directions carefully for properly processed smoked fish.

1. If smoked fish has been frozen, thaw in the refrigerator until no ice crystals remain before canning.
2. Measure 4 quarts (16 cups) of cool tap water and pour into the pressure canner. (Note: The water level probably will reach the screw bands of pint jars.) Do not decrease the amount of water or heat the water before processing begins. Doing so could result in underprocessing because the canner will heat up and cool down more quickly.
3. Pack smoked fish vertically into jars, leaving 1-inch headspace between the pieces and the top of the jar. The fish may be packed either loosely or tightly.
4. To get a good seal, clean jar rims with a clean, damp paper towel before putting on lids.
5. Adjust lids and put jars into the canner on a rack. Jars may be double-stacked if another rack is used to separate layers in the canner.

6. Heat the canner on a high range setting until steam escapes from the air vent.
7. Vent the canner by allowing the steady stream of steam to escape for 10 minutes. This prevents cold spots that result in underprocessing.
8. Close the petcock as directed and adjust the heat to reach the required pressure. Process according to the chart on Page 5.
9. At the end of processing, turn off heat. If using an electric range, remove the canner from the heating element. Let the canner cool slowly. When the pressure returns to zero, remove jars. Leaving jars in the canner for an extended time could result in spoilage or a stuck lid.
10. After cooling jars for 12 to 24 hours, test the seals. If jars have sealed correctly, they will make a ringing, high-pitched sound when tapped with a metal spoon. Jars that haven't sealed can be reprocessed if this is discovered within 24 hours. Use new lids and process again for 110 minutes. Because reprocessing could affect quality, a better option is to either refrigerate and consume the contents within two to three weeks or freeze for later use.

Storing Canned Smoked Fish

Label and date jars and store them in a clean, cool, dark, dry place. Storing them in direct sunlight, in areas that are hot (such as near hot pipes, a range, or a furnace), or in areas where they might freeze (such as in uninsulated garages) could affect quality or cause spoilage.

Using Canned Fish

Examine jars for signs of spoilage before use, such as discoloration, an unnatural odor, unsealed lids, or spurting liquid when the jar is opened.

If the fish has spoiled, it should be detoxified before discarding. Don't taste food that shows signs of spoilage. To detoxify, carefully place unopened jars with food in a large pan with a lid. Add enough water to cover the jars, put lid on the pan, and boil for 30 minutes. Then cool and discard the food. Wash your hands, counters, and can opener with soap and water.

If any of the following apply, the fish has been underprocessed and should be detoxified and discarded even if there are no signs of spoilage:

- if canned in an oven
- if canned in a boiling-water canner
- if canned for too little time in a pressure canner
- if canned at the wrong pressure

Note: Underprocessed fish may be safely reprocessed if the error is discovered with 24 hours after canning.

Fish that has been correctly processed and shows no signs of spoilage may be heated in the oven before eating for an extra margin of safety. This will destroy the toxin produced by *clostridium botulinum* bacteria. Refer to instructions in *Let's Preserve: Canning Basics* (EC434).

Resources

1. *Complete Guide to Home Canning*. Agriculture Information Bulletin No. 539. 2009. http://www.uga.edu/nchfp/publications/publications_usda.html

2. Raab, C.A. Home Canning Smoked Fish. Pacific Northwest Extension Publication, PNW 450.
3. Raab, C.A. Smoking Fish at Home - Safely. Pacific Northwest Extension Publication PNW 238.

This publication has been peer reviewed.

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