Scientific Name: *Juniperus horizontalis* **Common Names:** Creeping juniper

Above: *Juniperus horizontalis*, John Ruter, University of Georgia, Buggwood.org, some rights reserved CC BY, cropped from original

Life Form: Shrub

Site Preferences: Wide range of habitat. Open ground, sandy beaches and dunes, dry, rocky slopes, grasslands, open bogs, banks (International Union for Conservation of Nature and Natural Resources., 2000).

Tolerances: Some fire-tolerance, drought tolerant, heat tolerant, cold tolerant, tolerant to acidic and basic soils (Gucker, 2006).

Distribution: Across Canada (Gucker, 2006; iNaturalist.ca, 2018)

Plant Identification:

J. horizontalis is an evergreen shrub with long primary branches that spread horizontally forming a mat, and secondary, shorter branches which grow upward (CYSIP: Botany, n.d.; Natural Resources Canada, 2015). Plant size can vary based on conditions, but typical branch length and plant height are 3 – 5 meters and less than 30 cm, respectively. Leaves overlap like scales on young branches, but spread out like needles as branches mature. Leaves are long and narrow with a sharp point, and range from green to bluish in color. Seed is produced in female cones which are small, berry-like, and blue-grey in color. Each cone contains approximately 1-6 seeds. Male cones are produced on separate plants and appear as a small brown, oval cluster of scales (Gucker, 2006).

Above: *Juniperus horizontalis* leaves, Rob Routledge, Sault College, Buggwood.org, some rights reserved CC BY

Harvesting Considerations:

In central Yukon, fruit are ready to harvest in late August or early September (CYSIP: Botany, n.d.). Although collection can be delayed, it is recommended that the fruit are collected as soon as possible to prevent losses to wildlife (Banerjee, Creasey, & Gertzen, 2001; J. M. Baskin, 2009; Smreciu, Gould, & Wood, 2013). *J. horizontalis* female and male cones occur only on separate plants, so these plants cannot self-fertilize. The fruit do not fully mature until the second year after formation (Gucker, 2006), so it is important to ensure that seeds being collected are from the correct year. Plants often regenerate through sprouting roots from branches (Miller, 1978). When choosing individuals to sample in a population, consider that side by side plants may be clones of the same individual. To reduce chances of collecting from clones, inspect population and set a minimum collection distance between plants. Determine sampling strategy based on size and makeup of population. If population is small, sample as randomly as possible. If population is large and has little variation, use a grid or transect to sample individuals. If there is variation in environmental features within the population, break the population into groups based on this and sample individuals randomly within each group, choosing a proportional number of individuals based on its size relative to the entire population (Way, 2003). Numbers

of hollow seeds can vary considerably between individuals. Collect 10-20 fruit from several individuals in the population and remove seed. Cut seed with sharp blade and examine the inside with a 10x or 20x hand lens to determine proportion of hollow, damaged or infested seeds. If possible, increase harvest to accommodate for proportion of hollow seeds. Ensure your harvest plans will not remove more than 20% of the available seeds (Way & Gold, 2014).

Seed Collection:

Assess ripeness of fruit before collection. Pick or strip fruit by hand directly into a collecting bag. Do not strip fruit if there are large quantities of green fruits present (Banerjee et al., 2001; Smreciu et al., 2013).

Above: *Juniperus horizontalis* fruit, Rob Routledge, Sault College, Buggwood.org, some rights reserved CC BY

Post-Harvest Handling:

Remove large debris and transfer seeds into aerated plastic bags or other breathable container. Ensure seeds do not overheat in direct sunlight or in a parked car (Gold, 2014). Fruit can be spread to prevent overheating, but should not be allowed to dry too much as this causes flesh to be more difficult to remove (J. M. Baskin, 2009). Label all bags inside and out. Inspect collections from different collectors before combining (Way & Gold, 2014).

Seed Processing:

Debris can be removed by winnowing (J. M. Baskin, 2009). Place a box fan at the end of a tarp and turn on low speed to begin with. Pour a small amount of fruit in front of fan. Leaves and twigs should be blown further than fruit and therefore be separated. Adjust speed if this is not happening and pour a few more seeds. When speed has been determined, slowly pour all fruit in front of fan. Brush away debris (Tallgrass Prairie Centre, 2009). To remove flesh from seeds, place in a blender with taped or rubber coated blades to prevent damage to seeds (Matheus & Omtzigt, 2013; Rao et al., 2006). Macerate with a water to fruit ratio of 1:2½. Pulp and remaining debris can be floated off the top while full seeds sink to the bottom of the blender (J. M. Baskin, 2009). Use short pulses and low speeds to further reduce damage to seeds (Rao et al., 2006). Spread out to dry in a well-ventilated area between 5°C and 20°C with low relative humidity (15% RH is recommended). *J. horizontalis* seeds likely have orthodox seed behavior and should be dried down to 15% equilibrium relative humidity (eRH), or 3-7% of their initial fresh weight moisture content before storing. eRH is a measure of the relative humidity of seeds at equilibrium with air in a sealed chamber and can be measured with a hygrometer (Linington & Manger, 2014b). (J. M. Baskin, 2009; Hay & Probert, 2013; Linington & Manger, 2014a). Seeds should be placed in labelled, air-tight containers for storage. Ensure containers are clearly labelled.

Seed Storage:

Store seeds in freezer at -18 °C ± 3 °C for long-term conservation (FAO, 2014). For active collections being stored for 10 years or less, seeds can be stored between 0°C and 10°C. Longevity of orthodox seeds increases with low moisture content and low temperatures (Rao et al., 2006).

Germination Pre-treatment:

These seeds require cold stratification for 90 days prior to germination (C. C. Baskin & Baskin, 2014). Place seeds on a moist substrate at 3°C to 5°C. This can be done in a refrigerator. When attempting to germinate seeds, it is important to note that seeds of the same species can have different germination requirements based on their location of growth. Dormancy can also vary based on storage conditions. For example, drying seeds can induce dormancy in some seeds, while others lose their dormancy during storage (Basey, Fant, & Kramer, 2015; Probert, Manger, & Adams, 2003). If seeds have been dried prior to germination, soaking seeds in a solution of 0.5% sodium hypochlorite (NaOCl) for 10 minutes, then rinsing with water for 1 minute prior to germination will reduce the chance of rehydration damage. If this treatment is not available, suspend dry seeds over water in a sealed container for 24 hours (Davies, Sacco, & Newton, 2015).

Seed Germination:

For germination testing, label germination containers with collection number, species, germination conditions, start date, and number of seeds. Place germination paper into petri dishes. Wet paper just enough so that paper is moist but there is no standing water. Place a representative sample of seeds into Petri dish and space in an even grid. Multiple dishes may be required depending on sample size. Place lids on Petri dishes and place in germination chamber (or area with stable temperature) (Davies et al., 2015). Seeds should not be in direct sunlight but exposed to daylight. Monitor seeds daily and record proportion of seeds having germinated. Moisten filter paper as necessary. Most seeds will have germinated by 28 days; however it is advisable to run germination tests for as long as possible to ensure all seeds are being germinated (Smreciu et al., 2013). Continue test until no more seeds germinate or all seeds have germinated. 42 days is the recommended time for germination testing unless slow germination is expected (Davies et al., 2015). Seeds that have not been germinated should be assessed. If seeds look healthy inside, it is possible that gemination conditions or length of germination is not suitable for a portion of the seeds. A tetrazolium test can be used to determine viability of remaining seeds to determine if germination is due to inappropriate conditions or seeds that are unviable (Hay & Probert, 2013). When planting in soil, seed between 0.6 cm and 1.2 cm. Grows best in warm, moist soils in spring.

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