


**Plant Propagation Protocol for *Salix maccalliana* Rowlee**

ESRM 412 – Native Plant Production Spring 2020

Protocol URL: [https://courses.washington.edu/esrm412/protocols/\[SAMA12.pdf\]](https://courses.washington.edu/esrm412/protocols/[SAMA12.pdf])

NOTE: Since *Salix maccalliana* Rowlee is a rare and sensitive species, not much is published about its propagation. Therefore, propagation information is for *Salix boothii* Dorn (Booth’s Willow), since it is the most similar to *Salix maccalliana* Rowlee according to the Washington Department of Resources (2).

<b>TAXONOMY</b>	
Plant Family	Saliceae (1)
Scientific Name	<i>Salix maccalliana</i> Rowlee (1)
Common Name	McCalla’s willow (1)
Species Scientific Name	<i>Salix maccalliana</i> (1)
Scientific Name	N/A
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Velvet-fruited willow (1)
Species Code (as per USDA Plants database)	SAMA12
<b>GENERAL INFORMATION</b>	
Geographical range	<p>Lower 48 states (5). Widely scattered through Canada, from the Pacific Northwest Coast eastward to Quebec, south to ND, MN, and northeastern WA. Rare in the Yukon, ND, MN, Ontario, and Quebec. (2)</p> 

Ecological distribution	Bogs, fens, swamps, wetlands, and marshes in open, low-lying sites; often in peaty soils, sometimes restricted to hummocks. (2) Marly or bouldery lakeshores and <i>Calamagrostis</i> grassland. (4)
Climate and elevation range	Elevations in WA: 460-900 m (1500-3000 ft) (2)
Local habitat and abundance	Common associated species include thinleaf alder ( <i>Alnus incana</i> ssp. <i>Tenuifolia</i> ), water birch ( <i>Betula occidentalis</i> ), resin birch ( <i>Betula glandulosa</i> ), broadleaf cattail ( <i>Typha latifolia</i> ), sedges ( <i>Carex</i> spp.), and horsetails ( <i>Equisetum</i> spp.).(2)
Plant strategy type / successional stage	Even in the best habitats, <i>S. maccalliana</i> never seems to be abundant; instead, it usually occurs as scattered individuals in a shrub community dominated by the more common and aggressive <i>S. petiolaris</i> (slender-leaved willow) or <i>S. discolor</i> (pussy willow). Although these habitats may be influenced by cyclical droughts and by localized spring flooding, they are basically stable environments with little or no history of human influence. It appears that <i>S. maccalliana</i> rarely, if ever, occurs in abandoned agricultural land, roadsides, or other grossly disturbed habitats. Under ideal conditions, a vigorous, well-established individual can produce dozens of stems that can grow to a height of over 4 m (13 ft.) and live 20 to 25 years. But individual stems rarely achieve such an age or size as they are often browsed heavily by white-tailed deer ( <i>Odocoileus virginianus</i> ) or moose ( <i>Alces alces</i> ), and are frequently top-killed by wildfire or more often by prescribed burns intended to improve wildlife habitat. <i>Salix maccalliana</i> responds to this sort of damage by resprouting vigorously and repeatedly, if necessary, from a diffuse root crown and from layered branches ( <a href="#">Smith 2008</a> ). (8)
Plant characteristics (life form (shrub, grass, forb), longevity, key characteristics, etc.)	<p>Upright shrub 1-5 m tall with reddish brown branches; twigs yellow brown to reddish brown and hairy when young, becoming hairless. Leaves alternate, upper surface bright green and shiny with a stout yellowish midrib, elliptic-lanceolate to oblong, up to 8 x 2.5 cm but usually smaller, often finely scalloped or toothed along the margins (sometimes entire); hairless, firm, and leathery when mature. Under surface paler green, hairless, and not usually white-waxy. Stipules minute or absent. Winter buds covered with a single, non resinous caplike scale.</p> <p>Male and female catkins borne on separate plants. Bracts of both male and female catkins tawny yellow to pale brownish, 3-5 mm long, smooth to hairy. Male flowers with 2 stamens; filaments hairy below. Catkins develop with the leaves in May.</p> <p>Fruit capsules are 9-12 mm long, covered with dense curly white hairs, on a stipe up to 2 mm long.</p> <p>(2)</p>



**PROPAGATION DETAILS**

Ecotype	
Propagation Goal	Plants (3)
Propagation Method	Vegetative (3)
Product Type	Bareroot (field grown) (3)
Stock Type	1+0 (3)
Time to Grow	1 year (3)
Target Specifications	Height: 12 in.   Caliper: 3/1 in   Root System: Root system must balance top growth (3)
Propagule Collection Instructions	If nursery grown, collect hardwood cuttings from stooling beds that are hedged to maintain juvenile wood that is straight for ease of handling and sticking in field beds. Hardwood cuttings can also be wild collected. Collect from either source in late winter before budbreak and cut to 8-10 in lengths. (3)
Propagule Processing/Propagation Characteristics	Unknown

Pre-Planting Propagule Treatments	Cuttings can be wrapped, bundled and stored in a cooler until they are stuck in field beds.
Growing Area Preparation / Annual Practices for Perennial Crops	Soils: Taylorsville Sandy clay loam with Cca horizon shallower than 12,” Taylorsville sand clay loam variant with Cca deeper than 12,” Taylorsville clay loam variant with Cca horizon shallower than 12,” and Taylorsville clay loam variant with Cca horizon deeper than 12”  Field Bed Preparation: Mark out and form beds as needed and apply 0:45:0 (N:P:K) in April. Apply 2-3 in of compost to cutting beds prior to sowing. Apply sulfur during May. Weed beds as needed throughout the growing season.  Irrigation: When soil becomes dry, irrigate overhead with a 2 in aluminum pipe. (3)
Establishment Phase	Stick cuttings by hand in prepared field beds during early spring to a depth of inches. After sticking, firm soil around stems to remove air pockets, and irrigate. Rooting occurs when field soils warm in later spring and rapidly produce root growth. (3)
Length of Establishment Phase	1 month after rooting in late spring. (3)
Active Growth Phase	Fertilization: Apply Morgro 21-0-0 (N:P:K) with a Gandy spreader (setting 18, speed 2 mph, rpm 1100 to 1200) the second week of each month during the growing season; from April to August. Apply fertilizer at a rate of 120 lbs/acre. Irrigate for at least 45 minutes following all fertilizer applications to ensure the foliage will not burn and fertilizer gets incorporated into the root zone. Fertilizer is not applied when foliage is wet. All sulfur and 0-45-0 (N:P:K) applications must be mechanically incorporated since these amendments are not mobile in the soil. Root Pruning Procedures: Prune roots after they are well established in June. Test an area to see if cuttings can handle root pruning. If excessive wilting occurs, do not prune. Irrigate heavily for 2-3 days prior to pruning to saturate the root zone. Set pruning blade to slightly wrench seedlings as they are pruned. Check pruning depth frequently and adjust as needed. Irrigate for a minimum of 2 hours following root pruning to settle soil back around roots. This step is critical to eliminate post root pruning mortality. Irrigate field heavily for 2-3 days to further settle the soil.  Top Pruning: Top pruning is typically done with a sickle bar mower attached to the 656. Operational speed varies, but is not done above 1200 rpm. Cut at the desired height, constantly checking and adjusting the cut during the process. Keep field workers behind the cutting head. (3)
Length of Active Growth Phase	4 months (3)
Hardening Phase	Hardening begins during the third week of August or when dormancy is induced. No fertilizer is applied after August 28 <sup>th</sup> . Irrigation frequency and duration is shortened and applied only when needed. (3)

Length of Hardening Phase	1 month (3)															
Harvesting, Storage and Shipping	The lifting window is during mid November when cuttings are completely dormant. Cuttings are hand lifted after the beds have been undercut at a depth of 12 inches using a lifter. Fall lifted stock are “heeled in” in sandy soils after they have been graded and bundled in bundles of 25. They are lifted in spring before they break dormancy then stored in our cooler on stacked pallets. Keep the cooler between 36-40 degrees F and at a relative humidity of 92-98% with good air circulation. (3)															
Length of Storage	Unknown															
Guidelines for Outplanting /	Unknown															
Other Comments	<p style="text-align: center;"><b>Genetic Effects Rapid Assessment Matrix</b>  <b>To identify potential undesirable outcomes through the introduction of off-site plant stock</b></p> <p><i>Note: Divided boxes under breeding system headings depict relative concerns for success on site and genetic effects on site as shown below. See preceding text for rationale for each category.</i></p> <div style="display: flex; align-items: center;"> <div style="border: 1px solid black; padding: 5px; margin-right: 20px;"> <table style="width: 100%; height: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; text-align: center;">Success on site</td> <td style="width: 50%;"></td> </tr> <tr> <td style="border-top: 1px solid black; border-right: 1px solid black;"></td> <td style="text-align: center;">Genetic effects on site</td> </tr> </table> </div> <div> <p>Codes:</p> <p>DP = Distance problematic</p> <p>DLP = Distance less problematic</p> <p>NP = Distance not problematic</p> <p>-- or ++ → lesser or greater likelihood for problems</p> </div> </div> <p><i>Sensitive:</i> a listed or otherwise uncommon species, subspecies or variety of special concern  <i>Hybridization issues:</i> high potential for hybridization among species, subspecies, varieties or races  <i>Small or large population:</i> a measure of existing on-site or nearby population size relative to the size of the introduction  <i>Predominant breeding system:</i> mixed mating systems will engender concern intermediate to the two extremes</p> <table border="1" style="margin: 10px auto; border-collapse: collapse;"> <thead> <tr> <th rowspan="2" style="text-align: center;">Species Status and On-site/Nearby Extant Population Size</th> <th colspan="2" style="text-align: center;">Predom. Breeding System</th> </tr> <tr> <th style="text-align: center;">Selfing</th> <th style="text-align: center;">Outcrossing</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">Sensitive species or hybridization issues Small population</td> <td style="text-align: center;">DP</td> <td style="text-align: center;">DLP</td> </tr> <tr> <td style="text-align: center;">Sensitive species or hybridization issues Large population</td> <td style="text-align: center;">DP</td> <td style="text-align: center;">DLP</td> </tr> </tbody> </table>	Success on site			Genetic effects on site	Species Status and On-site/Nearby Extant Population Size	Predom. Breeding System		Selfing	Outcrossing	Sensitive species or hybridization issues Small population	DP	DLP	Sensitive species or hybridization issues Large population	DP	DLP
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	(6)  This species is listed as “sensitive” in Washington state. (5)															

### INFORMATION SOURCES

References	<p>(1) “Salix Maccalliana Rowlee.” <i>Canadensys</i>, data.canadensys.net/vascan/taxon/9126.</p> <p>(2) <a href="https://www.dnr.wa.gov/publications/amp_nh_sama12.pdf">https://www.dnr.wa.gov/publications/amp_nh_sama12.pdf</a>.</p> <p>(3) Trimmer, Eddie. “Protocol Information: Salix Boothii.” <i>Reforestation, Nurseries and Genetics Resources</i>,</p>
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	<p>npr.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=salicaceae-salix-2710.</p> <p>(4) “Flora of North America.” <i>Salix Maccalliana</i> , <a href="http://www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=242445783">www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=242445783</a>.</p> <p>(5) “Salix Maccalliana Rowlee.” <i>National Resource Conservation Service</i>, U.S. Department of Agriculture , <a href="http://plants.usda.gov/core/profile?symbol=SAMA12#">plants.usda.gov/core/profile?symbol=SAMA12#</a>.</p> <p>(6) Decision-Making Protocols for Propagation and Introduction of Native Planting Stock, Friends of Buford Park</p> <p>(7) Sverre , S. “Salix Maccalliana Rowlee.” <i>Brock University</i>, <a href="https://dr.library.brocku.ca/handle/10464/11884">https://dr.library.brocku.ca/handle/10464/11884</a>.</p> <p>(8) “Minnesota Range Map.” <a href="https://www.dnr.state.mn.us/Rsg/Profile.html?Action=ElementDetail&amp;SelectedElement=PDSAL021T0">https://www.dnr.state.mn.us/Rsg/Profile.html?Action=ElementDetail&amp;SelectedElement=PDSAL021T0</a>.</p>
Other Sources Consulted	<p>“How to Start Willow Cuttings.” <i>Bluestem Nursery</i>, <a href="http://www.bluestem.ca/start-cuttings.htm">www.bluestem.ca/start-cuttings.htm</a>.</p> <p>“Salix Maccalliana.” <i>Lady Bird Johnson Wildflower Center - The University of Texas at Austin</i>, <a href="http://www.wildflower.org/plants/result.php?id_plant=SAMA12">www.wildflower.org/plants/result.php?id_plant=SAMA12</a>.</p> <p>Weeks, Sally S., and Harmon P. Weeks. <i>Shrubs and Woody Vines of Indiana and the Midwest Identification, Wildlife Values, and Landscaping Use</i>. Purdue University Press, 2014.</p>
Protocol Author	Cheyenne Jobe
Date Protocol Created or Updated	05/08/2020

Cheyenne Jobe

ESRM 412

June 1, 2020

Protocol Revision Statement


On my updated version of my first protocol for SAMA12, I have...

- Removed the brackets around SAMA12 in the protocol URL
- Moved the note about using Booth's Willow propagation info below the "Propagation Details" heading
- Fixed the formatting for the "Taxonomy" section and added the author and year in the parenthesis containing my source number next to each of the "Common Names" (I got those common names from my Source 1, but within that source, they are cited)
- Edited the "Geographical range" section to include WA as a place my species is rare in
- Italicized the scientific names in the "Local Habitat and Abundance" section
- Removed the "<br>" from the "Target Specifications" section (that is how my source described their specifications, but I'm unsure what it means)
- Removed the table from "Other Comments" and replaced it with general warnings and recommendations for sensitive species from a different source
- Tried to include additional source information in my "references" section wherever possible

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 Protocol URL: <https://courses.washington.edu/esrm412/protocols/SAMA12.pdf>  
 Revised by author June 1, 2020

<b>TAXONOMY</b>	
<b>Plant Family</b>	
Scientific Name	Saliceae (1)
Common Name	Willow Family
<b>Species</b>	
Scientific Name	
Scientific Name	<i>Salix maccalliana</i> Rowlee (1, )
Varieties	N/A
Sub-species	N/A
Cultivar	N/A
Common Synonym(s)	N/A
Common Name(s)	Velvet-fruited willow (1, Harms 2006) McCalla's willow (1, Soper and Heimburger 1994)
Species Code (as per USDA Plants database)	SAMA12
<b>GENERAL INFORMATION</b>	



<p>Geographical range</p>	<p>Lower 48 states (5). Widely scattered through Canada, from the Pacific Northwest Coast eastward to Quebec, south to ND, MN, and northeastern WA. Rare in WA, the Yukon, ND, MN, Ontario, and Quebec. (2)</p>  <p>(8)</p>
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<p>Ecological distribution</p>	<p>Bogs, fens, swamps, wetlands, and marshes in open, low-lying sites; often in peaty soils, sometimes restricted to hummocks. (2) Marly or bouldery lakeshores and <i>Calamagrostis</i> grassland. (4)</p>
<p>Climate and elevation range</p>	<p>Elevations in WA: 460-900 m (1500-3000 ft) (2)</p>
<p>Local habitat and abundance</p>	<p>Common associated species include thinleaf alder (<i>Alnus incana</i> ssp. <i>Tenuifolia</i>), water birch (<i>Betula occidentalis</i>), resin birch (<i>Betula glandulosa</i>), broadleaf cattail (<i>Typha latifolia</i>), sedges (<i>Carex</i> spp.), and horsetails (<i>Equisetum</i> spp.).(2)</p>

<p>Plant strategy type / successional stage</p>	<p>Even in the best habitats, <i>S. maccalliana</i> never seems to be abundant; instead, it usually occurs as scattered individuals in a shrub community dominated by the more common and aggressive <i>S. petiolaris</i> (slenderleaved willow) or <i>S. discolor</i> (pussy willow). Although these habitats may be influenced by cyclical droughts and by localized spring flooding, they are basically stable environments with little or no history of human influence. It appears that <i>S. maccalliana</i> rarely, if ever, occurs in abandoned agricultural land, roadsides, or other grossly disturbed habitats. Under ideal conditions, a vigorous, well-established individual can produce dozens of stems that can grow to a height of over 4 m (13 ft.) and live 20 to 25 years. But individual stems rarely achieve such an age or size as they are often browsed heavily by white-tailed deer (<i>Odocoileus virginianus</i>) or moose (<i>Alces alces</i>), and are frequently top-killed by wildfire or more often by prescribed burns intended to improve wildlife habitat. <i>Salix maccalliana</i> responds to this sort of damage by resprouting vigorously and repeatedly, if necessary, from a diffuse root crown and from layered branches (<a href="#">Smith 2008</a>). (8)</p>
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**PROPAGATION DETAILS**

NOTE: Since *Salix maccalliana* Rowlee is a rare and sensitive species, not much is published about its propagation. Therefore, propagation information is for *Salix boothii* Dorn (Booth’s Willow), since it is the most similar to *Salix maccalliana* Rowlee according to the Washington Department of Resources (2).

Ecotype	
Propagation Goal	Plants (3)
Propagation Method	Vegetative (3)
Product Type	Bareroot (field grown) (3)
Stock Type	1+0 (3)
Time to Grow	1 year (3)
Target Specifications	Height: 12 in. Caliper: 1-3 in Root System: Root system must balance top growth (3)

Propagule Collection Instructions	If nursery grown, collect hardwood cuttings from stooling beds that are hedged to maintain juvenile wood that is straight for ease of handling and sticking in field beds. Hardwood cuttings can also be wild collected. Collect from either source in late winter before budbreak and cut to 8-10 in lengths. (3)
Propagule Processing/Propagule Characteristics	Unknown

Pre-Planting Propagule Treatments	Cuttings can be wrapped, bundled and stored in a cooler until they are stuck in field beds.
Growing Area Preparation / Annual Practices for Perennial Crops	Soils: Taylorsville Sandy clay loam with Cca horizon shallower than 12,” Taylorsville sand clay loam variant with Cca deeper than 12,” Taylorsville clay loam variant with Cca horizon shallower than 12,” and Taylorsville clay loam variant with Cca horizon deeper than 12”  Field Bed Preparation: Mark out and form beds as needed and apply 0:45:0 (N:P:K) in April. Apply 2-3 in of compost to cutting beds prior to sowing. Apply sulfur during May. Weed beds as needed throughout the growing season.  Irrigation: When soil becomes dry, irrigate overhead with a 2 in aluminum pipe. (3)
Establishment Phase	Stick cuttings by hand in prepared field beds during early spring to a depth of inches. After sticking, firm soil around stems to remove air pockets, and irrigate. Rooting occurs when field soils warm in later spring and rapidly produce root growth. (3)
Length of Establishment Phase	1 month after rooting in late spring. (3)

Active Growth Phase	<p>Fertilization: Apply Morgro 21-0-0 (N:P:K) with a Gandy spreader (setting 18, speed 2 mph, rpm 1100 to 1200) the second week of each month during the growing season; from April to August. Apply fertilizer at a rate of 120 lbs/acre. Irrigate for at least 45 minutes following all fertilizer applications to ensure the foliage will not burn and fertilizer gets incorporated into the root zone. Fertilizer is not applied when foliage is wet. All sulfur and 0-45-0 (N:P:K) applications must be mechanically incorporated since these amendments are not mobile in the soil.</p> <p>Root Pruning Procedures: Prune roots after they are well established in June. Test an area to see if cuttings can handle root pruning. If excessive wilting occurs, do not prune. Irrigate heavily for 2-3 days prior to pruning to saturate the root zone. Set pruning blade to slightly wrench seedlings as they are pruned. Check pruning depth frequently and adjust as needed. Irrigate for a minimum of 2 hours following root pruning to settle soil back around roots. This step is critical to eliminate post root pruning mortality. Irrigate field heavily for 2-3 days to further settle the soil.</p> <p>Top Pruning: Top pruning is typically done with a sickle bar mower attached to the 656. Operational speed varies, but is not done above 1200 rpm. Cut at the desired height, constantly checking and adjusting the cut during the process. Keep field workers behind the cutting head. (3)</p>
Length of Active Growth Phase	4 months (3)
Hardening Phase	Hardening begins during the third week of August or when dormancy is induced. No fertilizer is applied after August 28 <sup>th</sup> . Irrigation frequency and duration is shortened and applied only when needed. (3)

Length of Hardening Phase	1 month (3)
Harvesting, Storage and Shipping	The lifting window is during mid November when cuttings are completely dormant. Cuttings are hand lifted after the beds have been undercut at a depth of 12 inches using a lifter. Fall lifted stock are “heeled in” in sandy soils after they have been graded and bundled in bundles of 25. They are lifted in spring before they break dormancy then stored in our cooler on stacked pallets. Keep the cooler between 36-40 degrees F and at a relative humidity of 92-98% with good air circulation. (3)
Length of Storage	Unknown
Guidelines for Outplanting /	Unknown

Other Comments	Because this species is listed as “sensitive” in Washington state (5), it is important to keep in mind that on-site conservation and propagation wherever possible is more ideal than propagating in a nursery. Many rare and sensitive species have low germination rates for various reasons, both in the wild and in “captivity,” which means of the small sample of seed or cuttings taken from wild individual plants, you will most likely lose a decent portion of genetic diversity during germination. Cultural practices in a nursery setting also intentionally or unintentionally select for certain traits, further narrowing down genetic representation. (7)
<b>INFORMATION SOURCES</b>	
References	<p>(1) “Salix Maccalliana Rowlee.” <i>Database of Vascular Plants of Canada, Canadensys</i>, <a href="http://data.canadensys.net/vascan/taxon/9126">data.canadensys.net/vascan/taxon/9126</a>. (Full citations for each common name available through links from above URL)</p> <p>(2) Department of Natural Resources PDF publication adapted from <i>Field Guide to the Rare Plants of Washington</i> <a href="https://www.dnr.wa.gov/publications/amp_nh_sama12.pdf">https://www.dnr.wa.gov/publications/amp_nh_sama12.pdf</a>.</p> <p>(3) Trimmer, Eddie. “Protocol Information: Salix Boothii.” <i>Reforestation, Nurseries and Genetics Resources</i>,</p>
	<p><a href="http://npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=salicaceaesalix-2710">npn.rngr.net/renderNPNProtocolDetails?selectedProtocolIds=salicaceaesalix-2710</a>.</p> <p>(4) “Flora of North America.” <i>Salix Maccalliana</i> , <a href="http://www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=242445783">www.efloras.org/florataxon.aspx?flora_id=1&amp;taxon_id=242445783</a>. “Salix maccalliana Rowlee”, Bull. Torrey Bot. Club. 34: 158. 1907.</p> <p>(5) “Salix Maccalliana Rowlee.” <i>National Resource Conservation Service</i>, U.S. Department of Agriculture , <a href="http://plants.usda.gov/core/profile?symbol=SAMA12#">plants.usda.gov/core/profile?symbol=SAMA12#</a>.</p> <p>(6) Sverre , S. “Salix Maccalliana Rowlee.” <i>Brock University</i>, <a href="https://dr.library.brocku.ca/handle/10464/11884">https://dr.library.brocku.ca/handle/10464/11884</a>.</p> <p>(7) Richard, Sarah. “Considerations in the Propagation of Rare Plants.” University of Washington. Proceedings of the Conference: Native Plant Propagation and Restoration Strategies. Haase, D.L. and R. Rose, editors. Nursery Technology Cooperative and Western Forestry and Conservation Association. December t 2-13, 2007 . Eugene, OR.</p> <p>(8) “Minnesota Range Map.” <a href="https://www.dnr.state.mn.us/Rsg/Profile.html?Action=ElementDetail&amp;SelectedElement=PDSAL021T0">https://www.dnr.state.mn.us/Rsg/Profile.html?Action=ElementDetail&amp;SelectedElement=PDSAL021T0</a>.</p>

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