

7-9-15

Soil Quality Test Bucket Checklist (USDA-NRCS National Soil Survey Center)



(* = volume discount available)

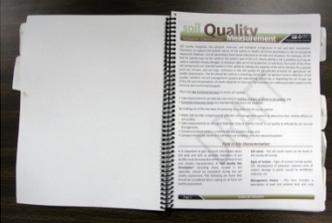
Photo	Item	Quantity	Specifications	Use	Approximate cost, provider information, and notes
	Fishing bucket and seat with padded top – 6 gallon	1 each	Model #2933300118	Container for all test supplies	\$14.00* Scheels Company
	Binder containing Soil Health Assessment Guides for Educators and associated material	1 each	Based on original soil quality test bucket, but expanded by NRCS-led team to include interpretations, management, and other information about individual soil tests	Provide guidance for soil quality sampling and eight field soil quality tests (respiration, soil organic matter, pH, electrical conductivity, infiltration, bulk density, nitrogen, and phosphorus)	Edited and developed by Nebraska Soils Education Team and NRCS. Free pdf copies available at http://cropwatch.unl.edu/cropwatch-youth/soil_lessons and http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/health/assessment/?cid=nrcs142p2_053870
	Willow Creek fishing vest (available in L, XL, and 2XL)	1 each	Model #940239 or #1K322116	Hold soil health quick field test equipment and other supplies	\$59.99 Cabela's (recommend labeling pockets for supplies commonly used in field tests) http://www.cabelas.com/product/Cabelas-Willow-Creek-Vest/1406951.uts?WTz_l=Header%3BSearch-All+Products

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	Soil organic matter color chart	1 per bucket	University of Illinois pocket guide #AG-1941 (other methods of estimating organic matter may also be used)	Estimate soil organic matter in soils that have a dark-colored surface layer	\$75.00 for pack of 100 + \$7.50 for shipping = \$82.50 University of Illinois PubsPlus https://pubsplus.illinois.edu/AG1941-PK.html
	Pen and field notebook	1 per bucket	Ink pen and pocket-sized notebook	Record field notes, soil quality notes, and test values	\$1.50 CVS Pharmacy
	Calculator	1 per bucket	Pocket-sized calculator	Basic calculations	\$1.00 Dollar General
	Permanent marker and four resealable plastic bags	1 set per bucket	Permanent marker and quart-sized resealable plastic bags	Hold soil samples in labeled bags	\$1.00 for marker and \$0.40 for four bags = \$1.40 Dollar General
	Four 1.5-volt batteries	1 set per vest	#675 hearing aid battery	Extra batteries for electrical conductivity (EC) probe	\$4.00* Battery Patrol or other supplier

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	Soil electrical conductivity (EC) probe and thermometer; adjustment screwdriver	1 per bucket	Hanna Instruments #HI98331 standardized with 1.41 deciSiemens/m (0.01M KCl); includes adjustment screwdriver and instructions. Case bought separately and fitted with resistor so meter does not need to be calibrated every time (calibration measurements are recorded on EC probe).	Measure EC of 1:1 soil and water mixture or compost, or measure EC of saturated soil in field. Also for measuring air and soil temperature. EC measurement for non-saline soils can be used to estimate soluble nutrients in soil water and nutrient cycling/tie-up in soil.	<p>\$86.00 Hanna Instruments 270 George Washington Highway Smithfield, RI 02917 (1-800-426-6287)</p> <p>Other distributors: Zoro tools, Amazon, Gemplers http://www.testequipmentdepot.com</p>
	Oakton standard solution; 1413 microSiemens/cm or 1.41 deciSiemens/m	1 per bucket	Hanna Instruments #HI7031M or Gemplers #RGM75; 1413 microSiemens/cm or 1.41 deciSiemens/m for calibrating EC probe	After calibration of EC probe with standard solution, check resistance reading using resistor attached to EC probe case. Record calibration measurement on probe.	<p>\$11.00 Hanna Instruments (address and phone number above)</p> <p>Other distributors: Gemplers</p>

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	Resistor; sheath (case) for EC probe and resistor	1 per bucket	Radio Shack 470-ohm, 1/2-watt resistor #271-1115; small plastic tube to fit resistor inside; industrial strength Velcro to attach resistor #54042 to Bucket Boss utility knife sheath (case)	Resistor for quick in-field calibration of EC probe	Resistor: Radio Shack Sheath: Bucket Boss Company All-Spec Industries P.O. Box 63249 Charlotte, NC 28401 http://www.all-spec.com/products/54042.html?gclid=COFR0NiQgrkCFcmf4AodK0wAzA Industrial strength Velcro (superior hold): PN 90593; 4-foot x 2-inch strips
	Calibrated coffee measuring scoop	1 per bucket	29.5 ml (1/8 cup)	Measure soil and water for 1:1 mixture	\$1.50 Ecko brand at any grocery store or \$1.67 Mainstays brand at Walmart
	Two 40-dram vials	1 set per bucket	Specimen bottles at least 3" (7.6 cm) tall that hold 107 to 140 ml (marked at 107 ml)	Container for 1:1 soil and water mixture for nutrient tests and for water measurement for infiltration test	Any brand of specimen bottle that meets specifications. For infiltration test, 107 ml of water is needed for 1" depth if 3" ring is used (amount of water needed for 1" depth varies depending on size of ring).
	Hach nitrate/nitrite test strips	1 per bucket	25 strips and bottle with color chart for nitrate/nitrite	Nitrate/nitrite test in hand, 1:1 soil and water mixture nitrate/nitrite test, or nitrate/nitrite test for water	\$18.35 Hach Co. #2745425 Hach Co. Purchase Orders PO Box 608 Loveland, CO 80539-0608

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	Hach ortho-phosphate test strips	1 per bucket	50 strips and bottle with color chart for phosphate	Phosphorus test in hand or 1:1 soil and water mixture phosphorus test	\$20.53 Hach Co. #2757150 (address above)
	Hydriion pH paper and dispenser	1 roll per bucket	Roll of pH test paper 15' long with pH range of 1 to 12. Paper for various pH ranges is available; order according to range of pH for soils in the local area	In-field pH test for soil and water or 1:1 soil and water mixture	\$6.70 Gemplers Company #PH50 http://octopart.com/50+hydriion+dispner-gempler-s-27042355 Strips can be ordered from various suppliers and have a narrower pH range.
	Aluminum cylinder and driving cap (picture shown with driving cap and bevel) (Wood block and mallet can be substituted for driving cap.)	2 sets per bucket	3" outside diameter steel sections 5" long. Bevel bottom of ring with a mark around the ring at 3" from bottom. It is important that ring has narrow walls and is beveled correctly at bottom.	Measure bulk density, infiltration, water content, porosity, and respiration of soil.	\$17.15 to \$22.40 apiece plus shipping www.bulldogmf.com Michael Dougan, Shop Manager P: 970-434-9998; F: 970-434-9556; C: 720-226-6434 michael@bulldogmf.com Grainger Company (1-800-240-6373) Search product ID 9TYX2 http://www.grainger.com/product/GRAINGER-APPROVED-SOIL-TEST-KIT-REPLACEMENT-9TYX2?nls=1&nlsit=0.8&ssf=0&searchQuery=9TYX2 Local metal shops can also fabricate.

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	2-lb dumbbell, or rubber mallet and wood block	1 per bucket	"Cap strength" neoprene 2-lb dumbbell, or rubber mallet with wood handle and 2" x 4" wood block	Drive cylinder into ground using driving cap (see previous item) or wood block	Dumbbell: \$3.00 Walmart #0255613042 Stanley rubber mallet: \$14.88 Walmart #5121857432 2" x 4" wood block (buy from any supplier or use scrap piece of wood)
	u-dig-it folding hand shovel and trowel	1 per bucket	Amazon #381440	Dig, excavate, and mix soil	\$7 to \$15 Amazon Gear for Adventure 1 Buffalo Street Hamburg, NY 14075 (716) 646-4327 or various other suppliers
	Small tape measure 6-10' long	1 per bucket	Tape measure with lock button and English and metric units	Measure soil sampling depth, row space, cylinder dimensions, etc.	\$2.50 various hardware stores
	Solvita Garden Care Kit (soil life respiration kit)	1 per bucket	Two jars, color chart, interpretative guide, and six paddles	Chamber for 24-hour soil respiration and mineralized nitrogen test comparison	\$40.00* Solvita Garden Care Kit Woods End Laboratories, Inc. PO Box 297 290 Belgrade Road Mt. Vernon, ME 04352 (Minimum of 25 for volume discount.)

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	Small measuring containers	2 per bucket (not placed in bucket)	Opaque 5-quart containers with English and metric units	Soil and water collection or measurement	\$1.70* True Value Hardware
	Plastic cylinder (clear cups)	4 per bucket	16-oz Solo clear plastic cups	Aggregate stability comparison and slaking test and demonstration	\$2.00/pack Target
	Wire mesh	2 rolls per bucket	1/4" mesh cut to fit onto top of cup (3' rolls)	Hold soil clod in cup for aggregate stability comparison and slaking test and demonstration	\$1.00 per two 3' rolls Menards, Home Depot, Lowes
	Flat, serrated dinner knife	1 per vest	5" handle and 3.25" blade	Trim soil from bottom and around edge of cylinder for bulk density and AWC tests	\$0.40 Dollar General
	Cellophane squares and rubber bands	4 per bucket	Clear cellophane gift wrap or no-cling wrap used for flowers (not too sticky so easily removed)	To apply water uniformly for infiltration test and to cap ring for transport	Grocery or hobby stores or floral shops

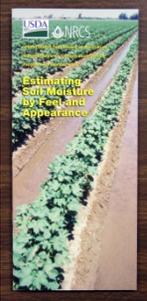
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	"Estimating Soil Moisture and Texture by Feel and Appearance" brochure	1 per bucket	NRCS program aid number 1619	Estimate soil moisture and texture	<p>Free pdf copy available at http://www.nrcs.usda.gov/wps/portal/NRCS/detail/mt/newsroom/?cid=nrcs144p2_056492.</p> <p>Also available at http://cropwatch.unl.edu/cropwatch-youth/soil_lessons.</p>
	Plastic bottle with dispenser	1 per bucket	Small bottle (6 oz or 180 ml) with dispenser	Storing and use of distilled water for soil tests	\$1.36* U.S. Plastic Corporation #60140 (discount for >96)
	*AccuGrow Soil Test Strips (pH, nitrate, phosphate, and potassium)	1 per bucket	10 see-through test strips for pH, nitrate, phosphate, and potassium	For use with soil slurry; excellent for in-hand test or 1:1 test methods. A table that provides quantitative calibration conversions (to ppm and lbs per acre) for A, B, C, and D qualitative readings is available (conversion table).	<p>\$9.60* (\$31.50 retail) Environmental Test Systems PO Box 4659 Elkhart, IN 46514 Email etsorders@hach.com</p> <p>*These strips are an alternative for Hach strips for nitrate/nitrite and phosphate tests and for Hydrion pH rolls shown in the list above.</p>

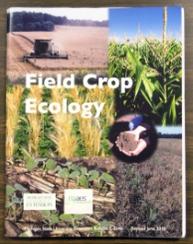
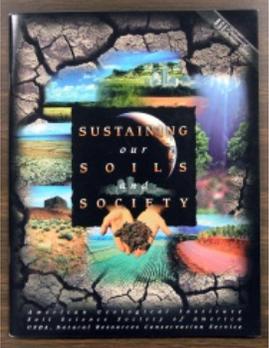
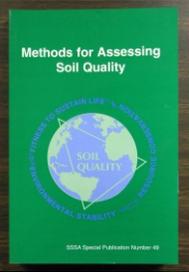
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	Ohaus CL 2000 portable electronic balance	1 per bucket, (not placed in bucket)	Comes with 3 AAA batteries (AC/DC adapter available for additional cost)	2,000-g capacity balance for weighing soil, water, and containers for bulk density, porosity, and moisture calculations	\$37.00* (\$44.40 retail) Hogentogler & Co., Inc, PO Box 2219 Columbia, MD 21045-1219 (410-381-2390)
	"Field Crop Ecology"	1 per bucket	Michigan State University Extension publication E2646	Soil ecology primer for teacher reference and other educational purposes	\$17.00 per copy A & R Communications 117 Central Services Michigan State University East Lansing, MI 48824 (517-432-1555, ext. 228)
	"Sustaining Our Soils and Society"	1 per bucket	American Geosciences Institute publication	Background information on the role of soils in sustaining society	\$9.95 per copy American Geosciences Institute 4220 King Street Alexandria VA 22302-1502 Email pubs@agiweb.org ; phone 703-379-2480, ext. 101 Free pdf copy available at http://www.agiweb.org/pubs/pubdetail.html?item=603601 .

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	"Methods for Assessing Soil Quality"	1 per bucket	Soil Science Society of America Special Publication 49 (issued 1996)	Reference for scientists on soil quality testing (highlighted index of most pertinent sections provided to educators)	\$25.00 per copy Soil Science Society of America Contains scientific information and background on most common methods of assessing soil quality.
	"SOIL! Get the Inside Scoop"	1 per bucket	Soil Science Society of America publication	Soil science primer for students in kindergarten through 12th grade	\$13.00 per copy Soil Science Society of America
	Spade, hand soil probe, and flag on wire (A penetrometer can also be added to the bucket for assessing soil compaction.)	1 of each item per bucket (not placed in bucket)	Various suppliers	Spade for digging and analyzing soil structure, texture, roots, biota, compaction, structure, etc.; probe for gathering soil samples; and flag or penetrometer to assess and compare compaction.	Various suppliers and costs

Have questions about ordering supplies or their uses? Contact Michael Kucera at michael.kucera@lin.usda.gov.

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CONVERTING LETTER QUANTITY READINGS TO AMOUNTS

For AccuGro Soil Test Strips

The chart below is based on a Silt Loam soil/medium texture with an estimated bulk density of 1.29 g/cm³ and a sampling depth of 8" (20.3 cm). To convert mg/L (ppm) to pounds/acre-8 " multiply the analysis concentration given below by 2.18

Nutrient	Concentration mg per Liter				Amount lbs per Acre			
	A	B	C	D	A	B	C	D
Nitrogen	0.5	2.5	7.0	20	1	5.5	15.3	43.6
Phosphorus	1	4	10	25	2.2	8.7	22	55
Potassium	0	15	55	125	0	33	120	273

For soils with a different bulk density multiply the 2.18 factor by the new bulk density divided by 1.29. Likewise for a different soil sampling depth, multiply the 2.18 factor by the new sampling depth in inches divided by 8.