

**User Evaluation of Nu-Arbor 1-Two Root Injector
by Bob Pledger for Save Georgia's Hemlocks, Inc.**

This test of the 1-Two Root Injector was conducted by a potential consumer user. Findings are personal opinion based on prior experience and both objective and subjective observation. Findings are not based upon stringent test controls. The test was conducted with an inexperienced consumer user in mind vs. an experienced commercial applicator.

Date of test: October 7, 2012

Source of Nu-Arbor 1-Two Root Injector: Rustic Countysides, Inc. – Stephen Quaife – 706-212-0490 – Clayton, GA

Injector Condition: Relatively new, i.e., less than six months usage. At receipt of 1-Two for testing, it had not been thoroughly cleaned after last usage, and although tank was empty and dry, there was a material amount of water in the system, i.e., pressure chamber, hose and probe, containing chemical based on the observation of a milky solution dribbling from probe and which was subsequently dispensed by pumping. The probe was dribbling the milky solution without any pressure being pumped into tank. Before test was started, the probe tip was removed along with the check spring and internal ball valve used to stop unwanted chemical loss. The ball & seat were cleaned and trash removed, then reassembled. Leakage issue was easily resolved.

Purpose of test: Test was conducted based upon usage of a 1-Two Root Injector as an application vehicle of pesticides in the treatment of hemlocks for the hemlock woolly adelgid infestation. Test was conducted primarily for two purposes:

- To make a practical hands-on comparison of use in relation to a Kioritz soil injector.
- To evaluate its use in landscape vs forestry conditions.

Test Findings: Practical Hands-on Comparison

- 1-Two is much bulkier and heavier than Kioritz due to tank, hose and probe combination.
- Weight increases substantially when tank loaded to capacity, ie, 4 gallons, or to any greater volume than that held by Kioritz. Loaded to capacity weights are 35 lbs. for the Nu-Arbor and 10 lbs for Kioritz based on the weight of water at 8.5 lbs per gallon.
- The added weight of the Nu-Arbor concentrated in the reservoir or tank raises the operator center of gravity approximately 18" and reduces operator stability on rough, steep terrain increasing the probability of falls.
- 1-Two probe is longer than the Kioritz soil injector thus increasing difficulty of movement in forestry underbrush and increasing the effort REQUIRED to inject chemical solution at ground levels, particularly when situation dictates standing downhill from injection site. Tester is 6'1" tall and had problems inserting probe into ground in situations where injection site was uphill. Device measurements are:

	NuArbor 1-Two Root Injector	Kioritz Soil Injector
Overall length: top of pump pad to probe tip	48 ½"	40 ¼"
Length from top of handle to probe tip	43"	33 ¾"

- Pump action requires more force than Kioritz and dosage dispensed varies materially based upon force applied vs. Kioritz.
- Calibration requires tools to partially dismantle top of body near pump knob.
- Probe dispensing holes near end of probe just above tip are not recessed as they are in Kioritz and clog more easily in red clay.
- No depth plate on probe provided thus requiring usage by experienced operator for effective dosing at correct level, however, it allows application at various depths when duff, etc may have built around the trunk up to greater depth than Kioritz depth plate allows.
- Designed to dispense 1/4 oz. solution per pump which is greater than the 1/6 oz. per pump dispensed by Kioritz thus reducing the number of pumps to properly apply same dosage.
- Cleanup after usage was more involved, particularly to fully clear tank, pressure chamber, hose and probe. After tank was drained by pouring wash water out, it took almost 40 pumps to evacuate the system to assure dry storage, as is required for proper storage per owner's manual. In comparison, it requires only 5 to 7 pumps for Kioritz. Dry storage is required to minimize any deterioration of internal parts due to residual chemical or fertilizer residue for both injectors. The internal ball valve of the unit tested was already showing signs of deterioration after its relatively short time of usage by its owner.

General Conclusions:

- 1-Two not as easy to operate due to the added force required to dispense the designed and expected dosage.
- 1-Two requires more time and effort to properly clean after usage.
- 1-Two much bulkier due to tank, hose and probe thus limiting flexibility of movement in tight situations such as are frequently found in forestry situations such as surrounding thick plant undergrowth.
- Overall weight of 1-Two is greater than the Kioritz when empty and particularly when tank filled to capacity.
- Additional weight inhibits movement in forestry situations, particularly when climbing. Also increases instability of operator on rough, steep terrain.
- The longer length of the body and probe increases the difficulty of movement and difficulty of inserting probe into ground and pumping, particularly when required to stand at level below injection site in steep terrain situations. May be more easily operated by taller than average people.
- Tools are required to calibrate the 1-Two.
- The 1-Two provides more potential functionality regarding depth of application, particularly for very experienced applicators.
- The 1-Two dispenses a greater amount of chemical solution per pump than the Kioritz.

In the opinion of this tester, the 1-Two Root Injector is generally better suited for use by experienced applicators, particularly in landscape situations. It does not appear to be as user friendly to less experienced non-professional applicators and is not suited for practical use in forestry situations with

thick surrounding underbrush and/or steep uneven terrain such as in the hemlock conservation areas of north Georgia and similar situations.

If considering the purchase of a Nu-Arbor 1-Two Root Injector, the potential small property owner, consumer buyer and ultimate non-professional user or organization may want to carefully consider the following pros & cons in making a decision and should weigh the advantages and disadvantages based upon their intended primary use. These pros and cons resulted from testing specifically and only for use in the treatment of hemlocks for the woolly adelgid infestation in forested situations and some conclusions are based upon comparison with the Kioritz* soil injector.

Pros

- Tank capacity designed for treatment of a large number of trees.
- Tank capacity minimizes the number of mix and load cycles required to treat large number of trees.
- Best use is on relatively flat terrain.
- Best use is in surroundings with little underbrush and/or surrounding limbs.
- Tube and probe length provides more functionality in application at varying depths and is best used by an experienced applicator.
- Requires fewer pumps at 1/4th oz solution per pump to apply required dosage.

Cons

- Unit including tank, hose and body is heavy.
- When filled to tank capacity, unit is extremely heavy.
- Weight and bulk of unit make it impractical for use in heavy underbrush and/or on steep terrain.
- Increased height of center of gravity may cause instability of operator.
- Body & probe length may make the unit much harder to operate for shorter people.
- Requires more force to aggressively pump to deliver designed dosage.
- Continuous usage for long periods accelerates tiring of operator.
- Current hose length is short thus reducing flexibility of movement and reach.
- Time and effort for cleaning of unit for storage.
- Requires tools and partial disassembly to recalibrate unit.
- Does not provide a depth gauge for application of treatment solution at a recommended depth.

The Nu-Arbor 1-Two Root Injector Product Information provided with the purchased units and on the Nu-Arbor web site references a “front air vent.” This front air vent is not currently shown or

mentioned on the current Parts List. It is referenced in the Troubleshooting section of the Product Information and is used to resolve a vapor lock problem.

As I understand from the Nu-Arbor people, the initial or original 1-Two units available in the market did not have a vapor lock problem and no front air vent was needed. However, after a redesign of the unit, the vapor lock problem materialized and another redesign was required and completed which added the front air vent used to release trapped air and resolve the problem.

* The manufacturer of the Kioritz soil injector has discontinued production and the soil injector is no longer available for purchase. There are Kioritz soil injectors available to be borrowed in many north Georgia counties within the natural hemlock habitat. A listing of the publically available soil injector sources which loan soil injectors can be found at www.savegeorgiashemlocks.org on the Contacts and Sources page.