T-Wand Detector Testing – Summary for Coded Wire Tag Improvement Team

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NMT began field testing the T-Wand in the fall of 2010, and we continued testing through 2011. In addition to the hatchery sampling described in the table below, we have done extensive laboratory testing, sampled at ports, during stream sampling, at processing plants, and at traps, used the wands as QC devices during tagging, and visited numerous other sampling sites with the T-Wand. The T-Wand was not compared with other detectors during all tests. We collected comments from experienced and inexperienced samplers, and have made extensive modifications to the wand. Based on this work, we conclude the following about the T-Wand:

- The T-Wand is highly accurate when used properly. As with the blue wand, and any other equipment, training is important. We noticed that without instruction, samplers do not necessarily use it in a way that optimizes tag detection.
- The T-Wand has a significantly higher detection range than the blue wand, and this also makes the T-Wand more sensitive to interference from other sources of magnetism. Care must be taken to be aware of these and to arrange sampling areas to minimize interference. There are going to be locations where it is not possible to eliminate interference, but these locations are few. In general, moving a foot or two away from a source of interference is enough to eliminate the problem. It is important to remove watches and to be aware of rain gear snaps and zippers.
- The T-Wand was found to be easier and more comfortable to use than the blue wand by nearly every experienced sampler.
- Sampling live fish is faster and more accurate with the T-Wand compared to the blue wand. Mouth wanding is not really feasible in live fish, and is eliminated with the T-Wand. Sampling live fish works best if the fish is held by one person, and wanded by another.
- The T-Wand is fully waterproof. It has been submerged for extensive periods in fresh and saltwater with no water intrusion. As an additional precaution, the interior electronics are fully coated.
- The T-Wand floats, but it is not suitable for use below 10 feet deep.
- The T-Wand can withstand extensive exposure to a wide range of temperatures.
- The T-Wand is shielded from interference from radio waves.
- The T-Wand case and electronics are better able to withstand impacts than the blue wand.

Hatchery sampling used to test the T-Wand. Sampling is primarily by NMT staff, but with frequent participation by agency staff. This table includes quantitative sampling only. Other hatchery sampling was done to evaluate sampling methods, to expose experienced samplers to the T-wands in order to solicit feedback, and to test aspects of the T-Wand other than tag detection.

Date	Location	Species	Number Sampled	Resampled?	Results and comments
10/26/11	Chilliwack River Hatchery, Chilliwack, BC	Chinook	Hundreds	Sampled first with T-Wand, then with the R9500.	Results were the same between the R9500 and the T-Wand.
1/5/11	Skookumchuck Hatchery, Tenino, WA	Coho	100	No	
1/4/11	Bingham Creek Hatchery, Matlock, WA	Coho	200	Sampled first with T-Wand, then with the R9500.	No fish had tags, and this was correctly verified with the R9500.
12/28/10	Bingham Creek Hatchery, Matlock, WA	Coho	200	Sampled first with T-Wand, then with the R9500.	Found one tag with the T-Wand, this was verified by the R9500.
11/2/10	Little White Salmon NFH, Cook, WA	Chinook	850 males 650 females	Sampled first with T-Wand, then with the R9500.	About 20 to 25% were tagged. Many males were well over 100 cm, and most of the females were over 80 cm. Missed one tag with T-Wand in a very large male (108 cm) because it was not wanded on the sides of the head. With even the largest females, wanding along the top of the head was fine, but males larger than about 90 cm have to be wanded on the sides and top of the head. Worked within 15 feet of an electro-anesthesia unit, but it did not cause interference.
11/1/10	Forks Creek Hatchery, Shelton, WA	Coho		Fish were sorted first with R9500, then with T-Wand.	T-Wands confirmed the R9500 results.
10/28/10	George Adams Hatchery, Shelton, WA	Coho	400	Sampled first with T-Wand, then with the R9500.	Results were the same between the R9500 and the T-Wand. Used only a quick swipe (up and down) across the top of the head.
10/27/10	Bingham Creek Hatchery, Matlock, WA	Coho	Hundreds	Sampled first with T-Wand, then with R9500.	We did not miss any tags, but did have a couple of false positives. These fish were large for coho, but all of the tags were easily found with two passes (up/down) on the back of the head (no side sampling). We find that it is important to hold the fish by the gills rather than the tail. When the

					fish are held by the tail, they tend to swing back during wanding and it is hard to get good contact between the fish and the wand.
10/26/10	Lake Quinault Hatchery, Quinault, WA	Chinook	49 females 25 males	First with blue wand (including mouth wanding), then with T-Wand. (Ron Olson, NWIFC, did all of the wanding)	All fish were very large, at least 80 cm (the threshold at which the samplers have to wand in the mouth). 63 of the 74 fish were tagged. The blue wand detected 62 tags wanding outside, and 63 wanding inside the mouth. The new wand detected all 63. With these large fish, we determined that you must wand across the back of the head, and on each side to ensure the tags are detected, particularly in the males. Two tags were not detected on the first swipe across the back of the head, but were easily found on the side swipes (meaning that the wand was across the eyes). The T-wand easily detected the one tag that the blue wand could find only by mouth wanding. (We resampled this fish with the blue wand to verify that this result was correct). This was a big male. We had a single false positive with the T-Wand, likely interference from raingear. Resampling showed no tag.
10/25/10	Forks Creek Hatchery, Shelton, WA	Chinook	6 totes (about 600-800)	Sampled first with T-Wand, then with R9500.	Results were the same between the R9500 and the T-Wand.
10/20/10	George Adams Hatchery, Matlock, WA	Coho	60 males and 60 females	Sampled first with T-Wand, then with R9500.	One tag was missed when the T-Wand wasn't in good contact with the fish. The tag was detected easily when resampled, otherwise all other results were the same between the T-Wand and the R9500.

10/14/10	Clear Creek Hatchery, Fort Lewis, WA	Chinook	641	Sampled first with T-Wand, then with R9500. Ron Olson (NWIFC) participated in sampling.	We missed 7 tags that were detected by the R9500. When these were resampled with the T-Wand, the tags were easily found. At least two of those fish were missed when one sampler forgot to turn on the sound, and two were missed by one sampler who was moving the wand much slower than the other samplers. All samplers agreed that one quick up/down motion across the back of the head when the fish is held by the gills should be the recommended training. Very large fish should also be wanded on each side of the head.
10/13/10	Forks Creek Hatchery, Shelton, WA	Chinook	575	Sampled first with T-Wand, then with R9500.	We found 73 tags - results were the same between the R9500 and the T-Wand.
10/6/10	Soos Creek Hatchery, Auburn, WA	Chinook	300	The fish had already been sampled with R9500.	Results were the same between the R9500 and the T-Wand. Fish ranged from 18" to fish that were too large to fit in the R9500.
10/6/10	Soos Creek Hatchery, Auburn, WA	Coho	30	The fish had already been sampled with R9500.	These were relatively small fish, and required minimal effort to detect tags. Results were the same between the R9500 and the T-Wand.
10/4/10	Soos Creek Hatchery, Auburn, WA	Chinook	443	Sampled first with T-Wand, then with R9500.	Fish ranged in size from ~18" to fish that were too big to fit through the R9500. We recovered 77 CWT - results were the same between the R9500 and the T-Wand.
10/4/10	Soos Creek Hatchery, Auburn, WA	Coho	158	Sampled first by the hatchery crew with the blue wand, and then we used the T-wand to resample fish in which tags hadn't been detected. The fish were then put through the R9500.	These were relatively small fish, and samplers used the absolute minimal wanding possible – one short swipe over the top of their heads. Recovered three tags with both the T-wand and the R9500.