# Using Precut Sequential Coded Wire Tags

A frequent inquiry to NMT concerns options for individually marking small numbers of small organisms. The Coded Wire Tag (CWT) is suitable for tagging very small organisms, and individual identification is possible with the Sequential Coded Wire Tag (sCWT).

The sCWT is a 1.1 mm length of stainless steel wire, 0.25 mm in diameter, with both a batch code (to uniquely identify the spool from which the tag was cut) and an individual number. All precut tags use the sCWT format. Please read An Introduction to Sequential Coded Wire Tags for more details about the sCWT format.

Large-scale CWT programs require injection and detection equipment that would be cost-prohibitive for a study where relatively few animals are tagged. To make these smaller programs feasible, NMT offers precut sequential tags that can be individually injected using a simple syringe type injector (Single Shot Injector). Detectors are not always required for tag recovery, and there is an option of equipment rental for short term projects.

Precut tags are supplied mounted in two columns on waterproof paper (Figure 1). We cut the tags and lay them on the paper in order, starting with the initial reference tag, followed by a tag to be injected (in the fish column), followed by a reference tag, then a tag to inject, and so on down the columns. Because of the layout of the coding on the wire, the individual numbers on the tags do not increment by one for each following tag. For example, the third tag cut from the wire will not necessarily have the individual number 00003.

There are two ways to keep track of the tag code that is being injected:

1. Retain one tag at the beginning and end of each batch. If the batch is one animal (i.e. you want individual identification) then you will alternately retain a reference tag and inject a tag. Thus for individual identification, only one tag in two is deployed in an animal, and you will need to buy twice as many tags as animals you plan to identify. For larger batches, retain a tag, inject the tags sequentially from the reference tag column and fish column, then retain a tag at the end of the batch. When a tag is recovered, its position on the data sheet or its batch group can be determined by reading the reference tags.

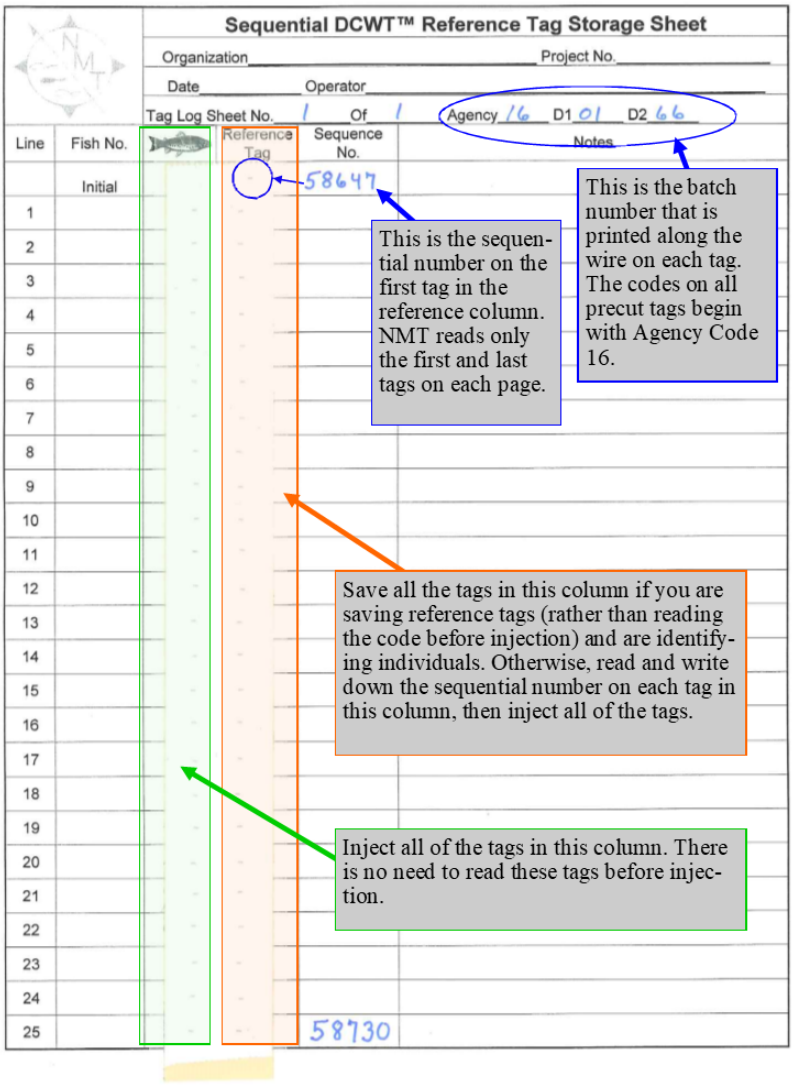


**Figure 1 Precut tags are mounted on sheets of waterproof paper and loaded and injected individually with a Single Shot Injector.**

2. Read all tags in the reference tag column before injecting any tag. The number on the tag in the "Fish" column can be deduced as it will be between the number above and below it in the reference column. Once you have read all of the reference tags, all of the tags can be deployed in animals. Inject tags alternately from the fish column and from the reference column so that they stay in order.

Precut tags are loaded, one at a time, into the syringe of a Single Shot Injector (Figure 2) for injection into the animal. This process takes a little time and patience but is viable for experiments involving only hundreds of animals. Peterson and Key (1992) reported being able to tag juvenile walleye (*Stizostedion vitreum*) at a rate of up to one fish per 5-10 seconds using a Single Shot Tag Injector.

**Figure 2: A Single Shot Injector is used to inject precut Sequential Coded Wire Tags.**

Correct tag placement is critical to obtaining high rates of tag retention. Once the depth of the tag has been determined, it can be helpful to wrap a piece of tape around the needle to use as a gauge.

The tag must be recovered for decoding under a low-power microscope or with NMT's Magniviewer (Figure 3). This usually involves killing the animal, but in some cases, it is feasible to inject the tag into tissue from which it can be excised without serious harm. Examples include between fin rays, in adipose fins, and in other transparent tissue of fish (Oven and Blankenship, 1993). Alternatively, it may be possible to use the tag location to differentiate between a small number of individuals or batches; the T-Wand Detector can resolve tag location within about 5 cm.

**Figure 3: The Magniviewer is a portable, battery-operated device used to magnify and view CWT. Individual tags can be held with the brass pencil and viewed in the Magniviewer, or a strand of wire can be inserted into it. The Magniviewer operates on AA batteries and can be used anywhere.**

Extracting the tag from the tissue usually involves an electronic tag detector, generally a V Detector or Handheld Wand Detector. However, if it is known which animals are tagged (perhaps all of them in a laboratory experiment) it may be possible to locate and recover the tag using a small magnet. Hager (1975) recovered CWT from the heads of juvenile salmon by removing the whole head and digesting it with a proteolytic enzyme in a magnetic stirring device; the liberated tags adhered to the stirring rod. Elrod and Schneider (1986) used a similar technique with a potassium hydroxide solution. In some situations it is useful to know which

individuals are tagged, without having to use a secondary mark. A detector then becomes necessary unless the tag is visible.

A Tag Reading Jig (Figure 4), which is supplied with two magnetic pencils to hold the tags, greatly facilitates handling and reading of recovered tags. Alternatively, the NMT Magniviewer incorporates a small microscope, illumination, and a tag reading pencil in a convenient format. One of these packages should be considered essential for reading tags in anything beyond the smallest feasibility trials.

**Figure 4: Tag Reading Jig with Pencil. The CWT is held between the tips of two pencils so that the tag can be rotated under a microscope.**

Costs depend on the number of tags required. A typical complete set if electronic detection isn't needed would be:

- Precut and magnetized sCWT mounted on sheets (minimum order is 200 tags)
- Single Shot CWT Injector
- Tag Reading Jig including two pencils

Species successfully tagged with CWT include many freshwater and marine fish, and various amphibians, reptiles, crustacea, molluscs and annelids. Please contact NMT Biology (biology@nmt.us; +1-360-468-3375) for advice on using CWT with your species.

## References


Elrod, J. H. and C. P. Schneider. 1986. Evaluation of coded wire tags for marking lake trout *Salvelinus namaycush.* North American Journal of Fisheries Management 6:264-271.

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Oven, J. H. and H. L. Blankenship. 1993. Benign recovery of coded wire tags from rainbow trout. North American Journal of Fisheries Management 13:852-855.

Peterson, M. S. and J. P. Key. 1992. Evaluation of hand-tagging juvenile walleyes with binary-coded wire microtags. North American Journal of Fisheries Management 12:814-818.