



Identify sources of fecal contamination

**CENSUS** allows water resource managers to cost effectively quantify fecal indicator bacteria and most importantly identify sources of the sources of fecal pollution. In a typical watershed, quantification MST analysis of source specific genetic targets could permit a manager to determine whether fecal inputs are due to:

- Humans (leaking sewers, CSOs, SSOs, failing septic systems, stormwater)
- Dogs (stormwater, urban runoff)
- Livestock (cattle and dairy operations)
- Wildlife (geese and seagulls)

#### **CENSUS Advantages:**

- Source Identification—Quantify source specific genetic markers to identify the fecal pollution source and guide corrective actions to improve water quality.
- Accurate—Direct analysis of sample removes the need to grow the bacteria thus eliminating biases associated with more traditional culture-based approaches.
- Rapid—Results are available within days (7–10 standard TAT) \* Rush service available
- Sensitivity—Practical Detection Limits (PDL) are as low as 100 cells per sample with a dynamic range over seven orders of magnitude.
- Flexibility—Analysis can be performed on almost any type of sample (water, sediment, soil, Bio-Traps, and others).
- Applicability—CENSUS assays are available for quantification of common sources of fecal pollution.

**Need the ability to quantify a unique population or function?  
MI can develop custom CENSUS targets. For more information,  
please call us at (865) 573-8188.**



#### **Approaches include:**

CENSUS is offered in a variety of formats to meet the objectives of your particular project. Please choose from the following:

*CENSUS—Are fecal indicator bacteria present and at what concentration?*

Our standard DNA based approach provides quantification of fecal indicator bacteria and source specific markers.

*CENSUS-Expression—Are fecal bacteria surviving in environmental samples?*

RNA as opposed to DNA is extracted and used to quantify active bacteria and source specific markers.

*CENSUS-Store—What were the baseline results before corrective actions?*

Collect those valuable points in time and store them for potential future analysis. Allows the collection of more data points at a lower cost. Samples can be stored and processed even years down the road.

**Targets available for the assessment of a variety of sources including:**

- Human
- Faulty septic tanks/fields
- Leaking sanitary sewers
- Sanitary Sewer Outflows
- Domestic Animals
- Dogs
- Cattle
- Wildlife
- Geese
- Seagulls
- And more!**

**How does CENSUS work?**

CENSUS is based on a technique called quantitative polymerase chain reaction (qPCR) whereby many copies of a specific gene are generated. As each gene copy is made, a fluorescent marker is released, measured, and used to quantify the number of target genes present in the sample. The gene copied during the process (target gene) is determined by short segments of DNA called "primers" which are added to the reaction mixture. In essence, qPCR is like a copy machine with a counter. The "primers" select which pages (target gene) of the

book (DNA) are copied and the counter keeps a running total of how many pages were copied (number of target genes in the sample).

Traditionally, culture-based methods such as plate counts or most probable number (MPN) analyses have been used to estimate bacterial populations in environmental samples. However, cultivation based approaches detect less than 10% of the targeted bacterial group thus severely underestimating the total population.

**Sample Collection**



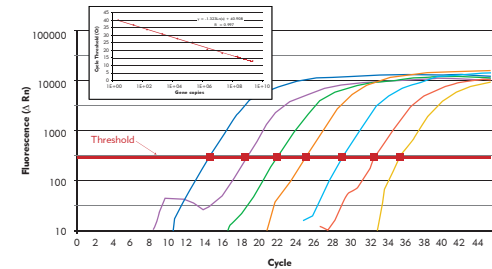
Water, sediment, or Bio-Trap<sup>®</sup> Sampler collected and shipped overnight on ice (4°C)

**DNA Extraction**



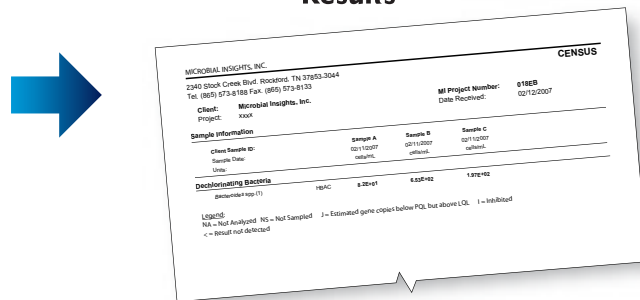
DNA is extracted from samples upon arrival

**Amplification**



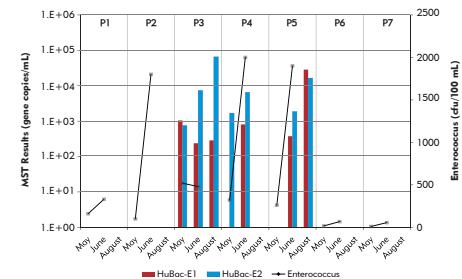
Quantitative Real-Time PCR is used to detect and quantify targets of interest (i.e. *Bacteroides* spp.)

**Results**



Results are emailed to project contact

**Assessment**



Results are integrated with other water quality parameters to aid management decisions