

MICROPLASTICS IN DUNE SANDS FROM OUTER CAPE COD, MASSACHUSETTS

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INTRODUCTION

“MICROPLASTICS”

Plastic pieces with largest dimension <5 mm.

Primary microplastics:

- pellets intentionally made for personal care products and released from industrial spillage
- filaments released in effluent from the washing of synthetic clothing)

Secondary microplastics:

- fragments and films from breakdown of larger plastic debris

Research on this relatively new topic is evolving rapidly.

DISTRIBUTION AND IMPORTANCE

- found in beach, subtidal, offshore, and deep sea sediments
- not studied in dune sands, rocky shores, salt marshes
- of concern: ingestion by coastal and marine organisms.



Figure 1: Nesting piping plovers and least terns are threatened species on Cape Cod.

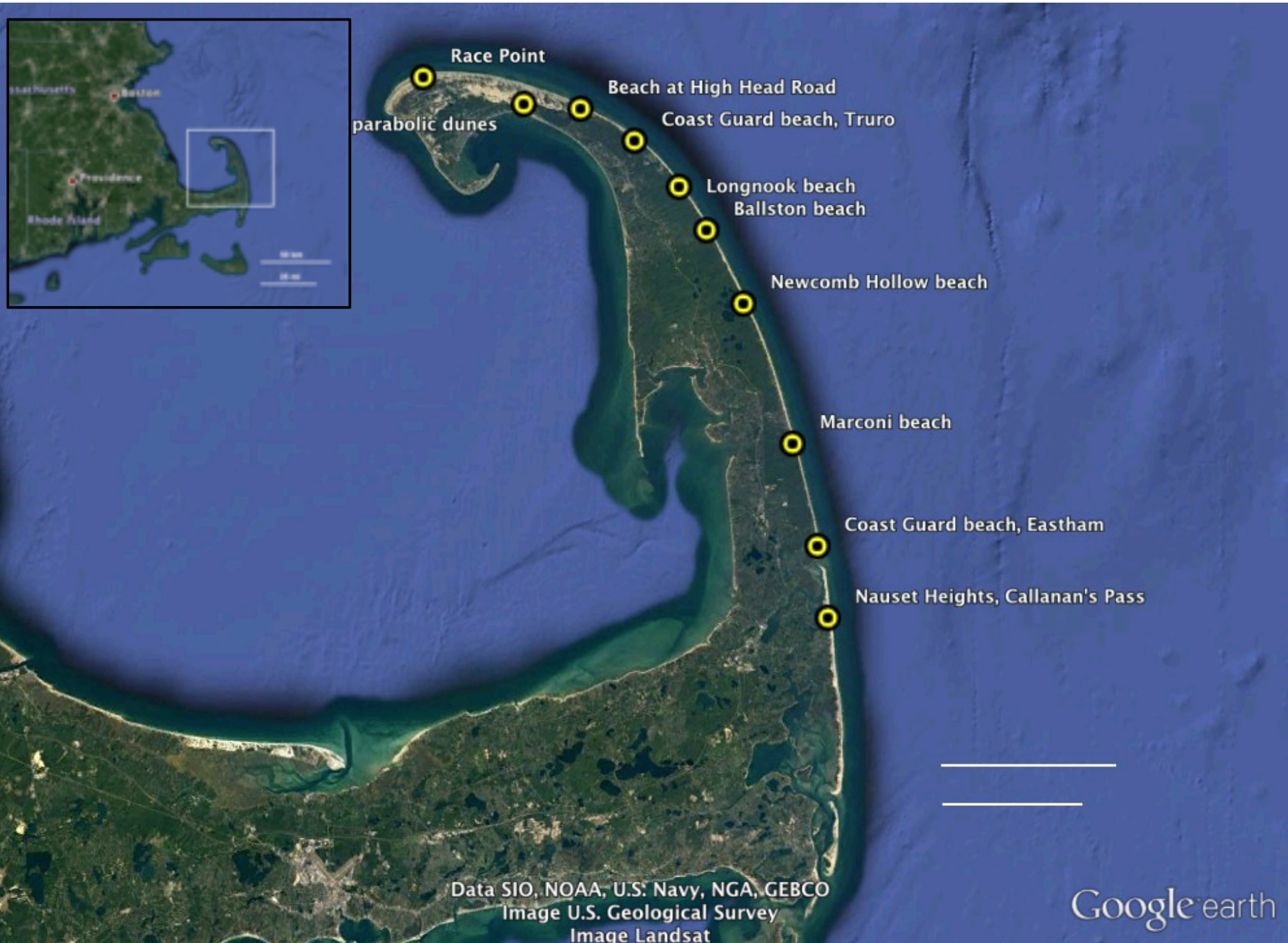


Figure 2: Ten sample sites.

METHODS

COLLECT SAMPLES

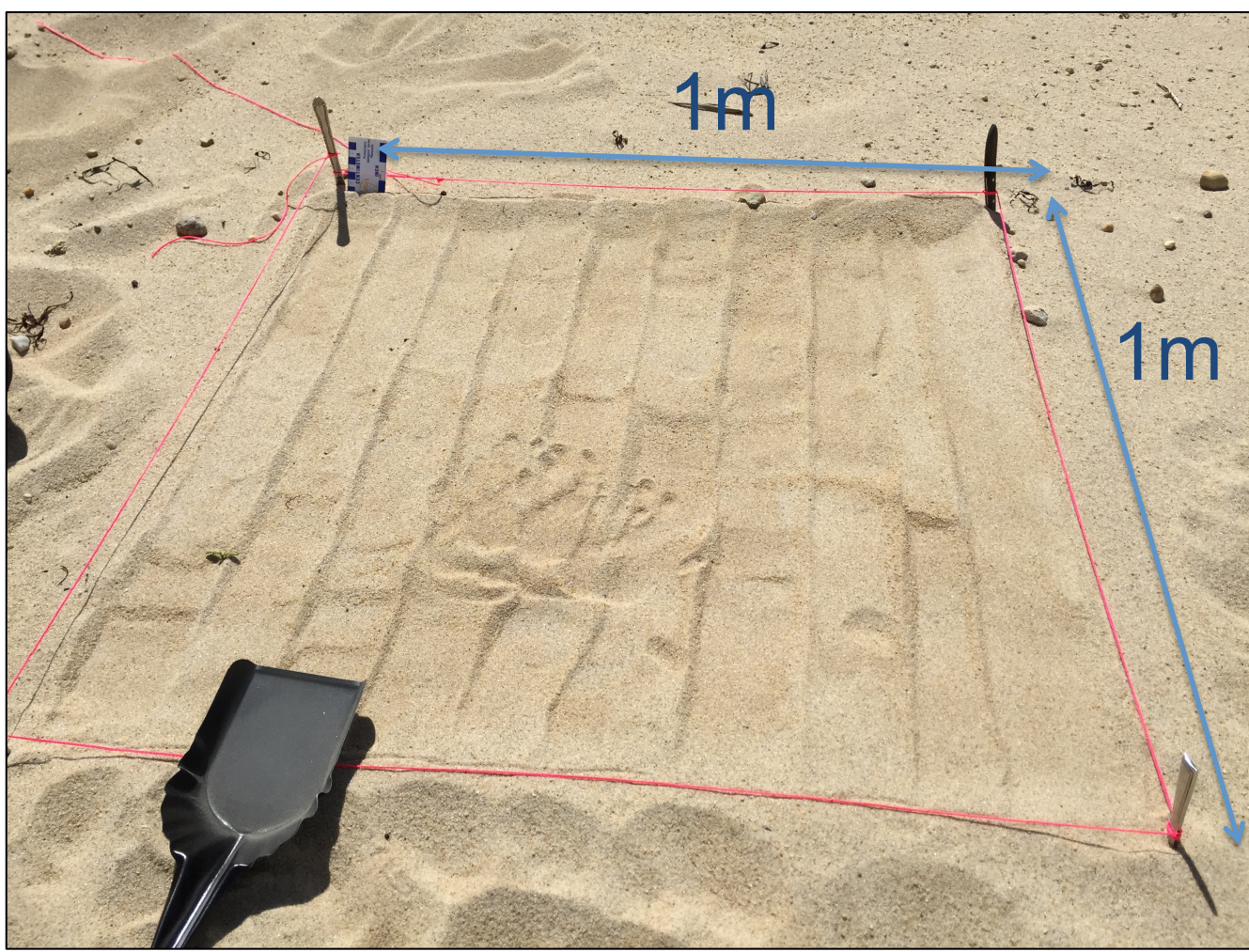


Figure 3: Field sampling protocol.

Standard operating procedure:

- sample surface
- sample subsurface to 5 cm
- 5mm sieve on-site
- collect with metal shovel in paper or foil bag

EXTRACT AND OBSERVE

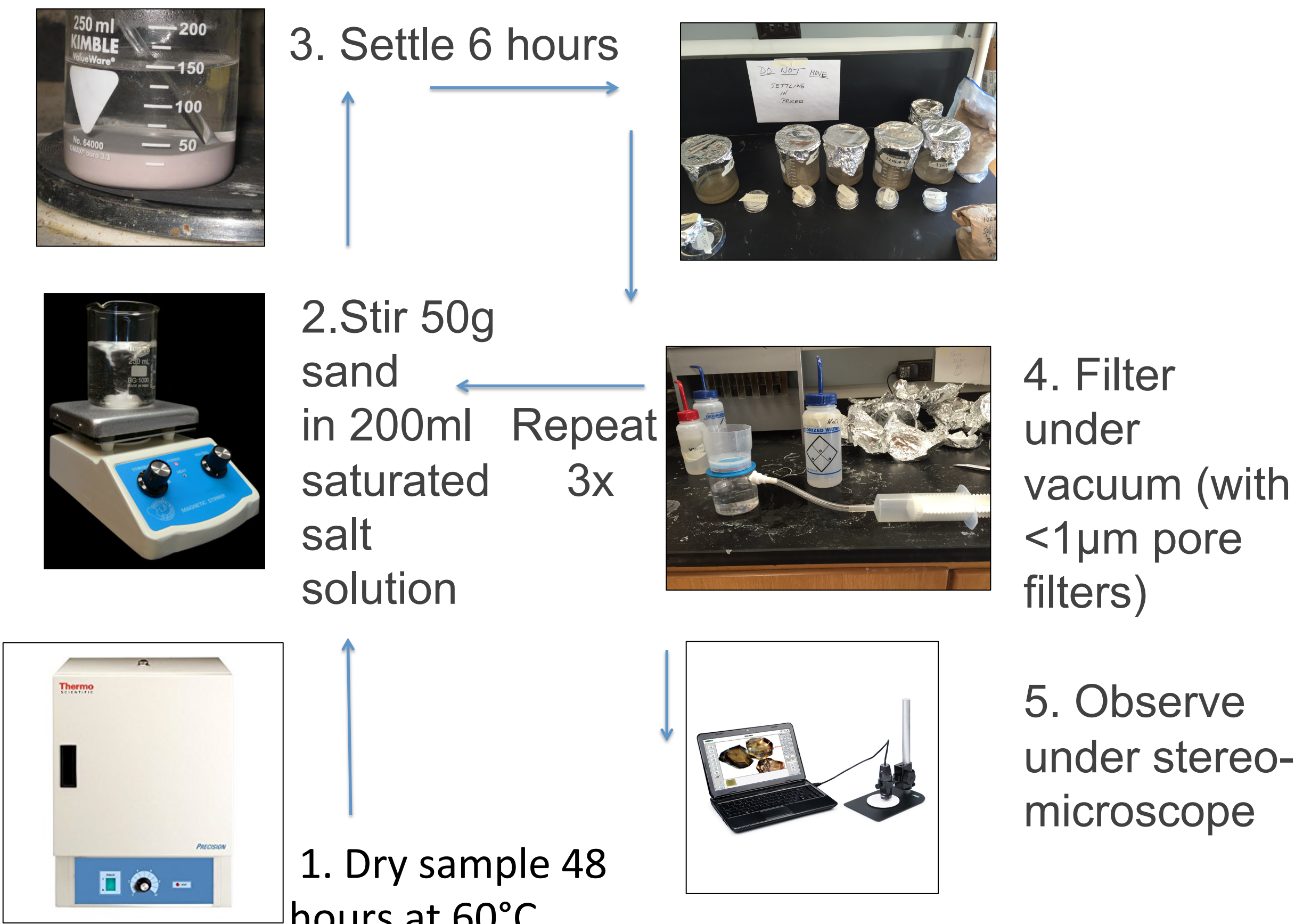


Figure 4: Laboratory protocol. Five steps starting at lower left.

PRELIMINARY RESULTS

Surface and subsurface samples from three locations examined thus far:

- Race Point beach, Provincetown (12016S, 12016SB)
- Dune blowout, Provincetown parabolic dune field (102016S, 102016SB)
- Coast Guard beach dune, Eastham (62016S, 62016SB)

Five replicates of each sample with three extractions done on each produced 15 filters per sample.

- all samples observed contain microplastic materials.
- filaments occur most frequently, followed by fragments, films, and pellets.

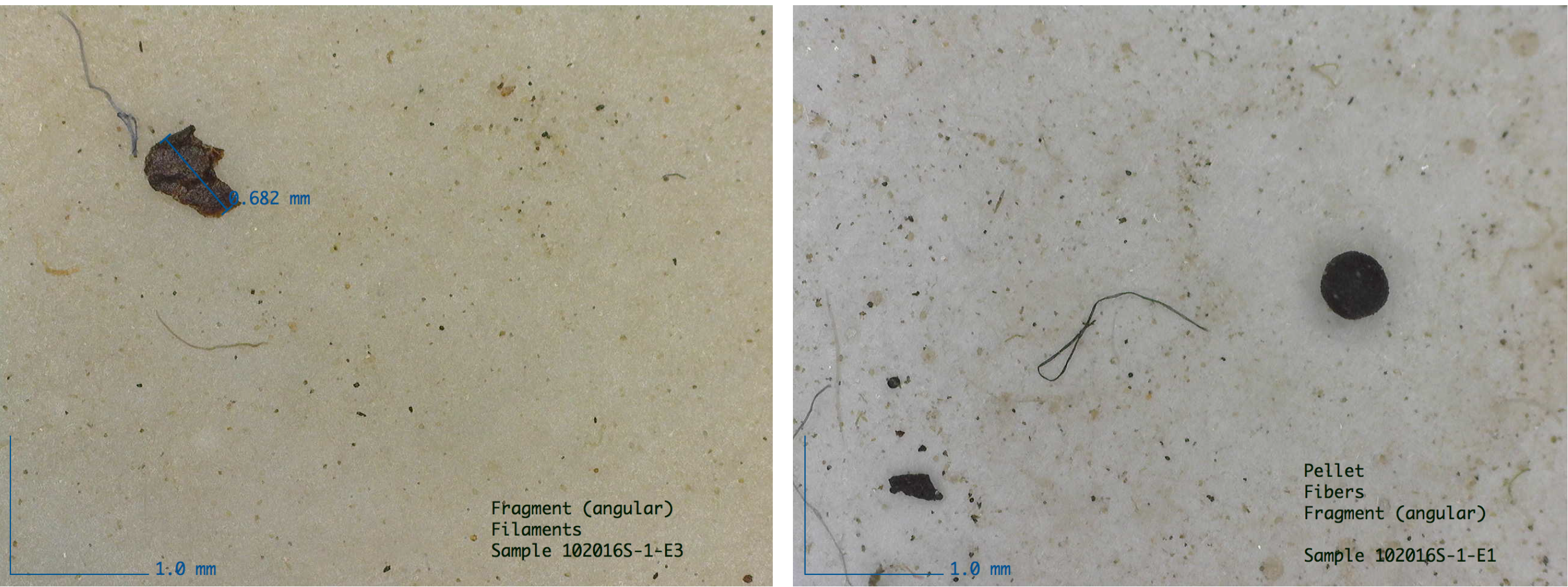


Figure 5: Filaments, fragments, and pellet from surface of dune blowout, sample 102016S.

One “tumbleweed” of filaments from a bulk sample was obtained by sieving and used to determine the composition of the filaments by FTIR (Fourier transform infrared) spectroscopy. FTIR detected rayon, the oldest commercial human-made fiber. It is a semi-synthetic cellulose-based polymer whose fibers are flame retardant and superabsorbent. It’s film equivalent, cellophane, is used for food wrap.



Figure 6: Microplastic “tumbleweed”.

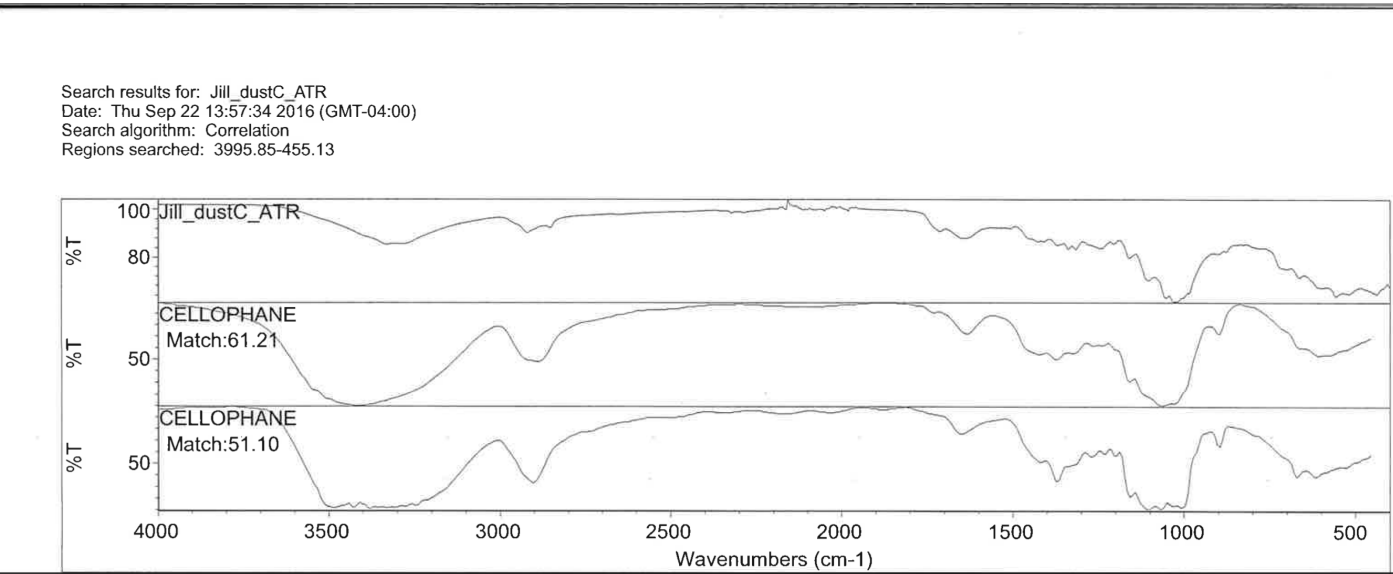


Figure 7: Infrared spectrum for sample 12016SB-1 and comparison with reference spectra for cellophane (film)/rayon (fiber).

CONCLUSIONS

This initial investigation suggests that microplastic particles:

- are ubiquitous in dune sands of Outer Cape Cod
- may (re)enter the terrestrial realm via landward aeolian transport

FURTHER WORK

This study has just begun and next steps are to:

- Extract microplastics from seven remaining samples from pre-summer tourist season sampling trip.
- Point count for abundance and type.
- Sample dune sites during winter season and investigate as above.

KEY REFERENCES

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