Protecting family drinking water in rural Alaska

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Transport of fecal bacteria in a rural Alaskan community

Why do the study?

- Risk associated with open water and sewer
- About 1/3 of rural Alaska without piped or closed haul system (as of 1999)
- Determine pathways in order to offer recommendations for eliminating them

Photo: M. Ford

Objective: Determine the pathways of fecal bacterial movement

Hypotheses:

- Human fecal bacteria are present in the community and not limited to the dump.
- Objects such as tires and boots can carry fecal contamination within the community and into the home.
- Fecal contamination is present in the environment and moving at breakup.

Photo: M. White

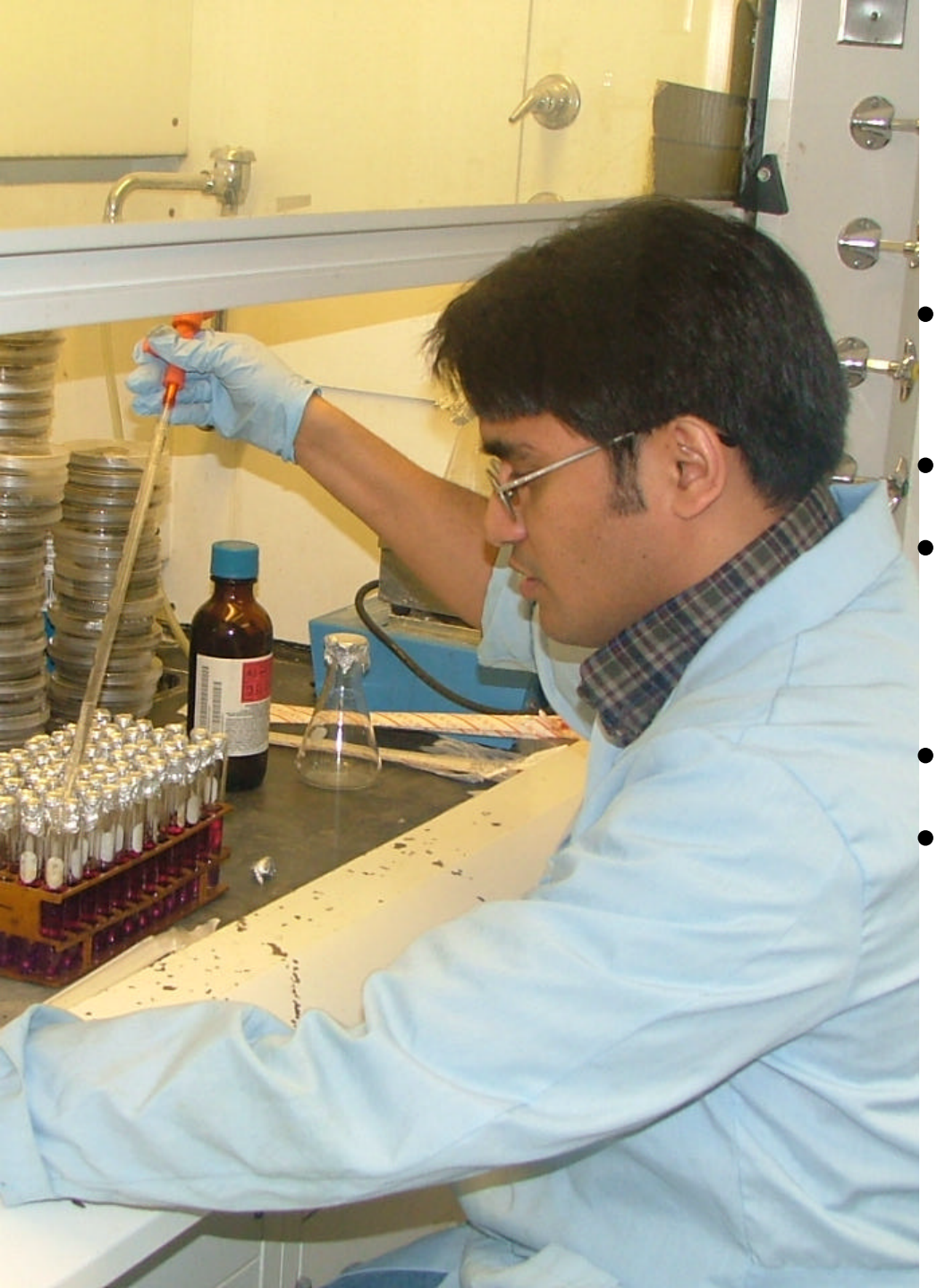
Objective: Determine the pathways of fecal bacterial movement

Hypotheses:

- Surfaces within the home and school are contaminated with fecal bacteria.
- Drinking water is insufficiently protected, putting people at risk for fecal-oral diseases.

Materials and Methods

Study site



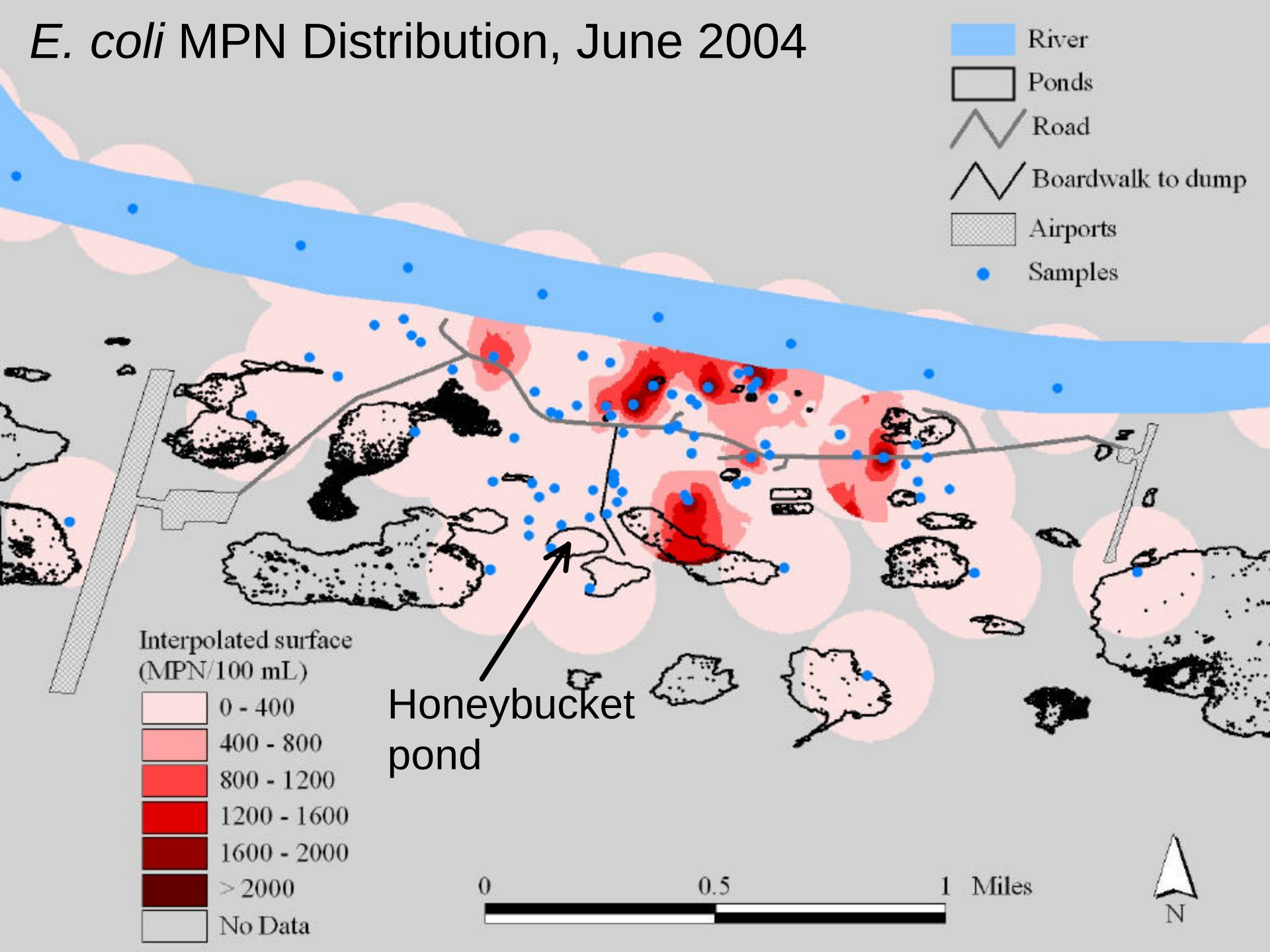
Materials

- Colilert (total coliform and *E. coli*)
- Enterolert (*Enterococcus*)
- Quantitray
  - Most probable number (MPN)
- ColorPac
- Labs
  - Source Tracking (*Enterococcus*)
  - *Cryptosporidium*/*Giardia*
  - MPN

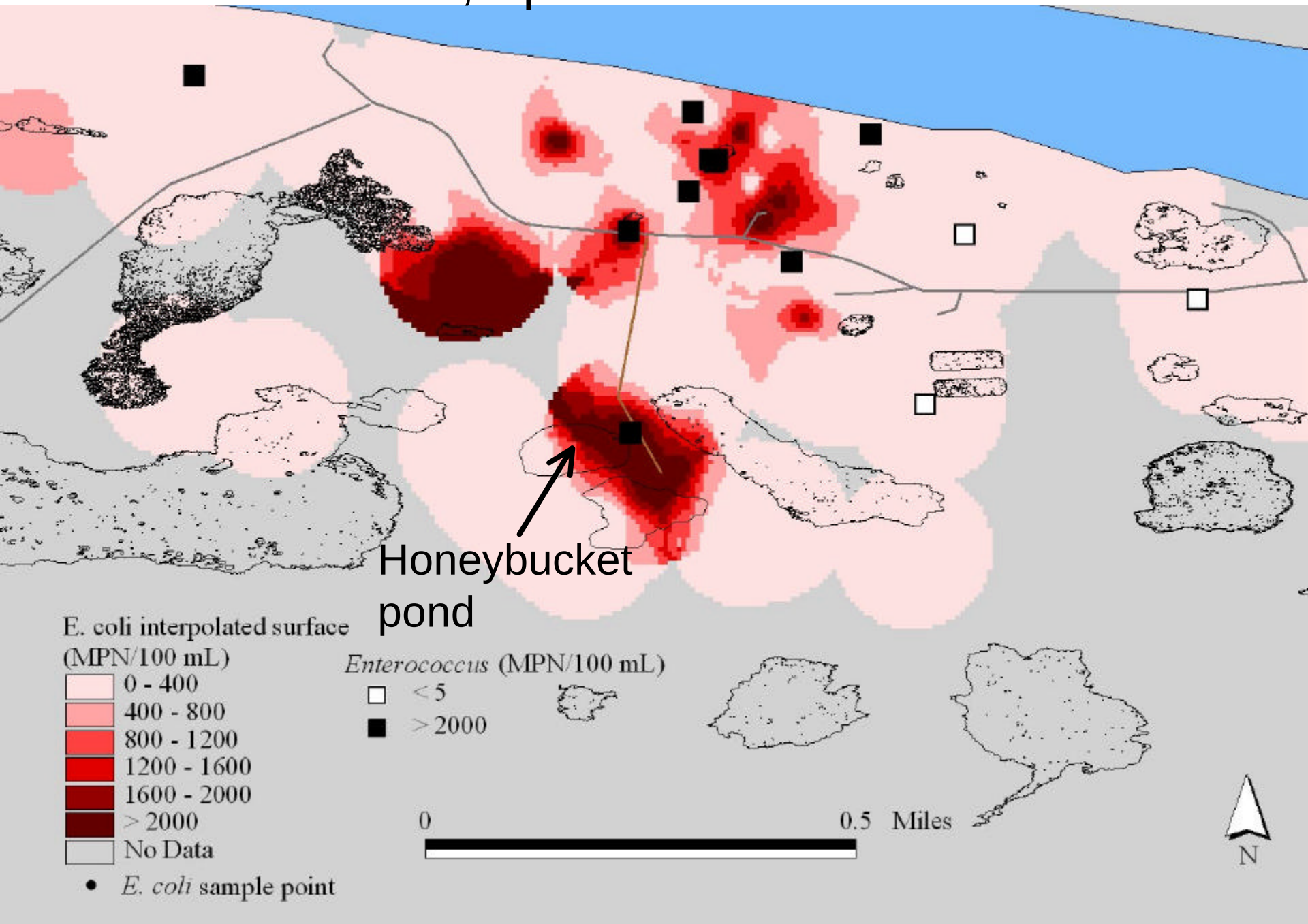
Results and Conclusions

- Distribution
- Transport
- Transfer

E. coli MPN Distribution, June 2004



Bacteria Distribution, April 2005



Dog
houses

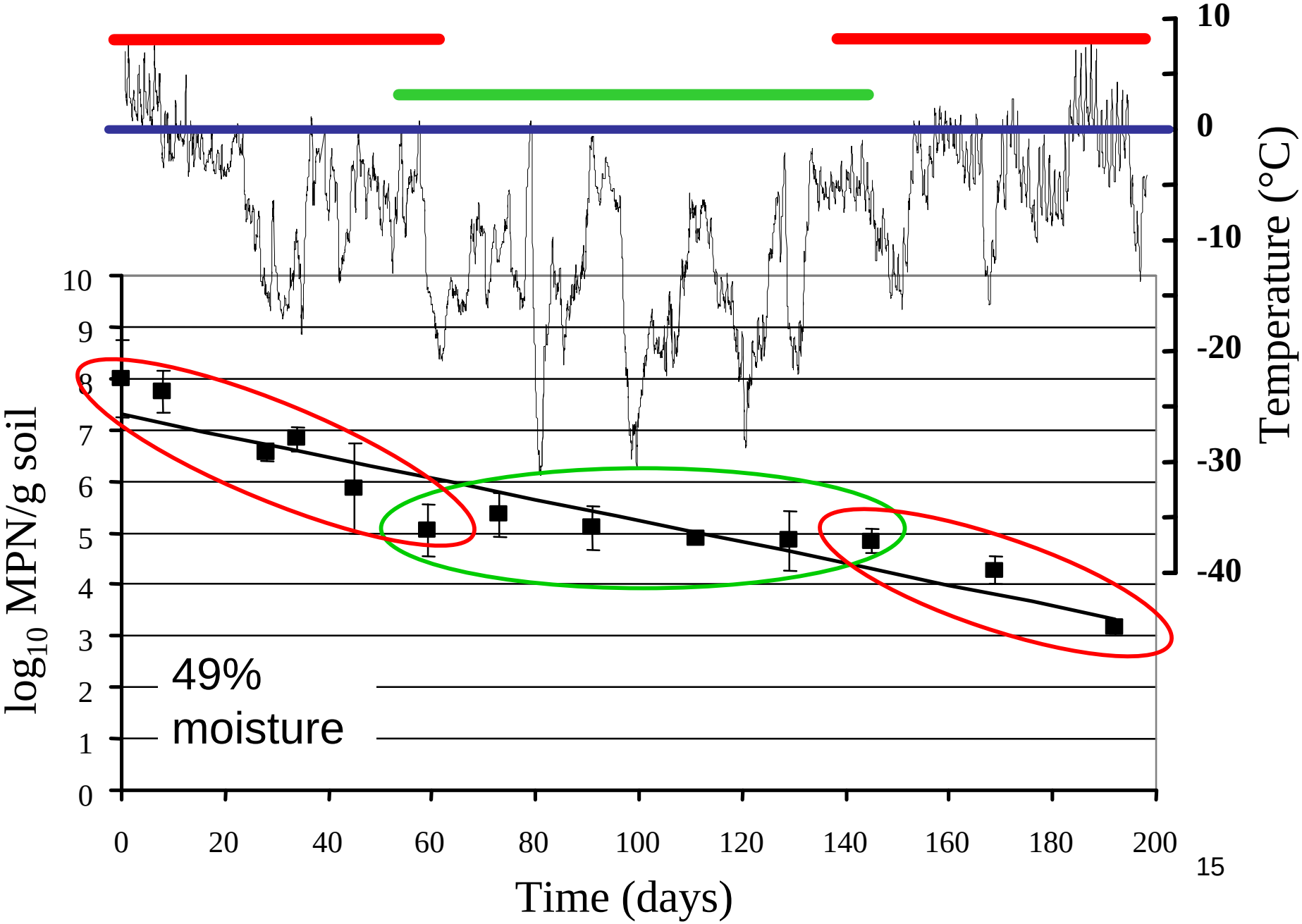
Conclusions
Distribution of fecal bacteria

- More than a background level
- Human contamination in town
- Multiple sources in mid-town drainage
- Greater quantity of *E. coli.* present at breakup time

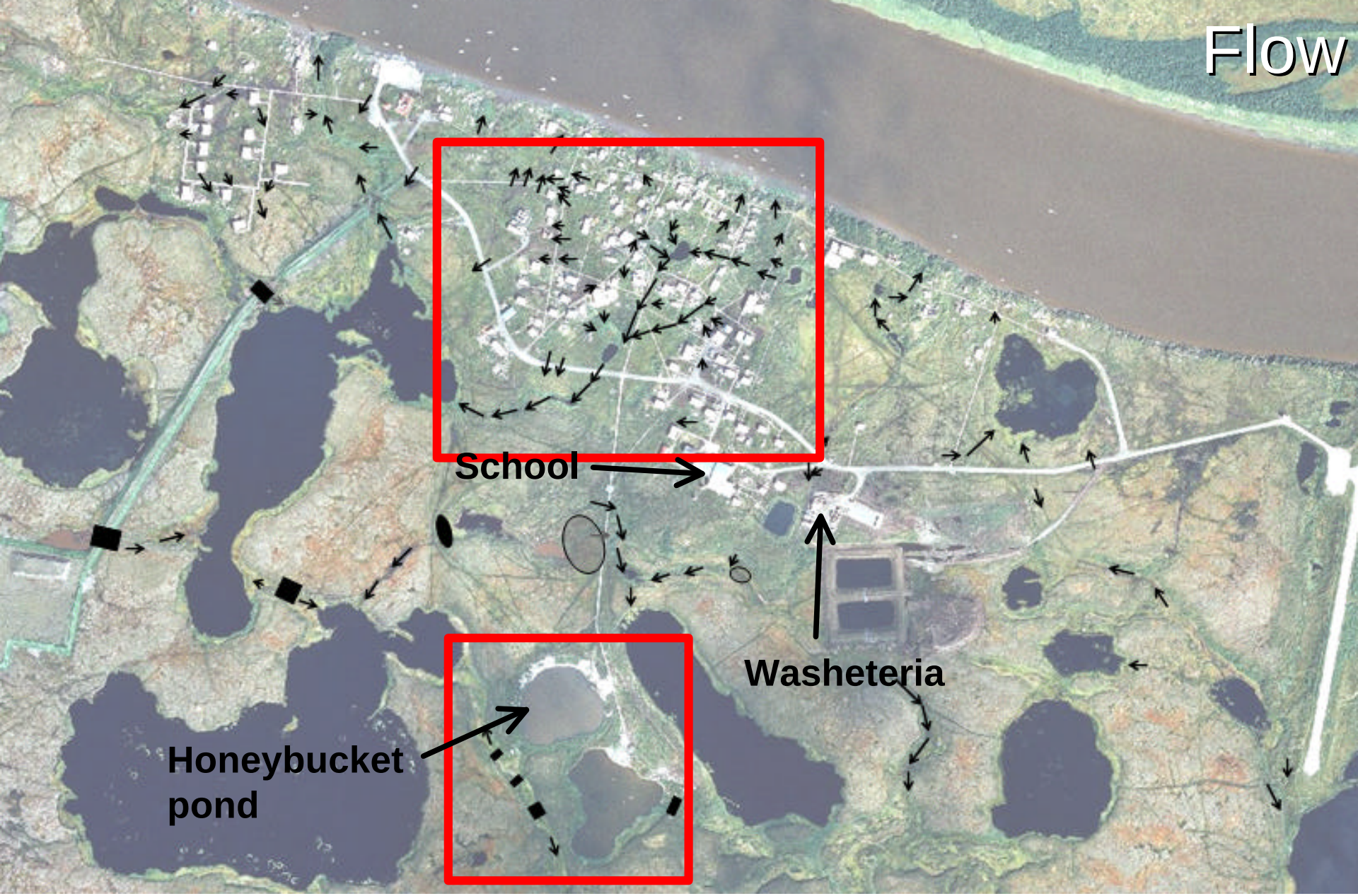
Transport

- ATV
- Boots
- Flowing water at breakup

Coliform Survivability as a Function of Temperature



Flow



Still frozen Ponding Flow direction

Conclusions
Transport of fecal bacteria

- Movement from dump on tires possible but flow unlikely
- Flow carries bacteria in town at breakup: dog and gray water

Transfer

- ATV to boardwalk
- Boots to floor
- Home surfaces

Conclusions on transfer of fecal bacteria

- Shoes carry bacteria into home
- Hands move bacteria inside
- Soap did not kill all bacteria in washbasins

Conclusions on Safety of Drinking Water

- Water is unprotected
- Drinking water not necessarily the source of breakup illness, but outbreak risk factor

Recommendations

- Practice good waste handling and disposal practices
- Eliminate drainage patterns that bring waste back into community
- Set up waste free routes for vehicles returning from dump
- Use small-mouthed containers and consider chlorination, or at the least handle dipper more carefully

Acknowledgements

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- Study village, school, participants, City and Traditional Councils

Questions?

Fred
Meyer
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