Nantucket Pine Tip Moth
Rhyacionia frustrana (Comstock)
Lepidoptera: Tortricidae

Waters, W. E. 1974. Sequential sampling applied to forest insect surveys. In: *Proceedings of IUFRO/SAF/SUNY symposium on monitoring forest environments through successive sampling*. June 24-26; Syracuse, NY; 290-311.

Objective: To develop a sequential sampling for the integrated pest management of *R. frustrana*.

Abstract: A sequential sampling plan was developed from data on the Nantucket pine tip moth, *Rhyacionia frustrana* (Comstock), infesting loblolly pine, *Pinus taeda* L., in eastern Maryland. Larval feeding can cause substantial terminal and subterminal shoot deformation and reduced growth. In Maryland, *R. frustrana* has 2-3 generations a year with pupae of the final generation overwintering inside shoots. This sampling plan was intended for the first generation of *R. frustrana* as a basis for deciding if control measures were needed for the next generation.

A maximum of 50 trees, selected randomly, was recommended at each survey point. If ≤10% of trees had infested terminals, then control was not recommended. If ≥20% of trees had infested terminals, then control was recommended. If the percentage of infested terminals was between 10-20% after all 50 trees had been sampled, then control was warranted with an estimate >15%, and not warranted with an estimate <15%.

Sampling Procedure: Select sample trees randomly in the area of concern. Examine the terminal bud cluster for the presence of *R. frustrana*. If *R. frustrana* is present, then record the terminal as infested. Reference the sequential sampling plan, and continue sampling until a decision is met (Fig. 1). A maximum of 50 trees is sampled at each survey point. If after sampling 50 trees the cumulative count of infested trees lies in the continue sampling zone (i.e., no decision zone), then select the category closest to this count. Changing either the class limits or the risk levels will alter the size of the no decision zone as well as changing the number of terminals to be examined (Figs. 2, 4).

Note: The distribution of *R. frustrana* follows a binomial distribution.
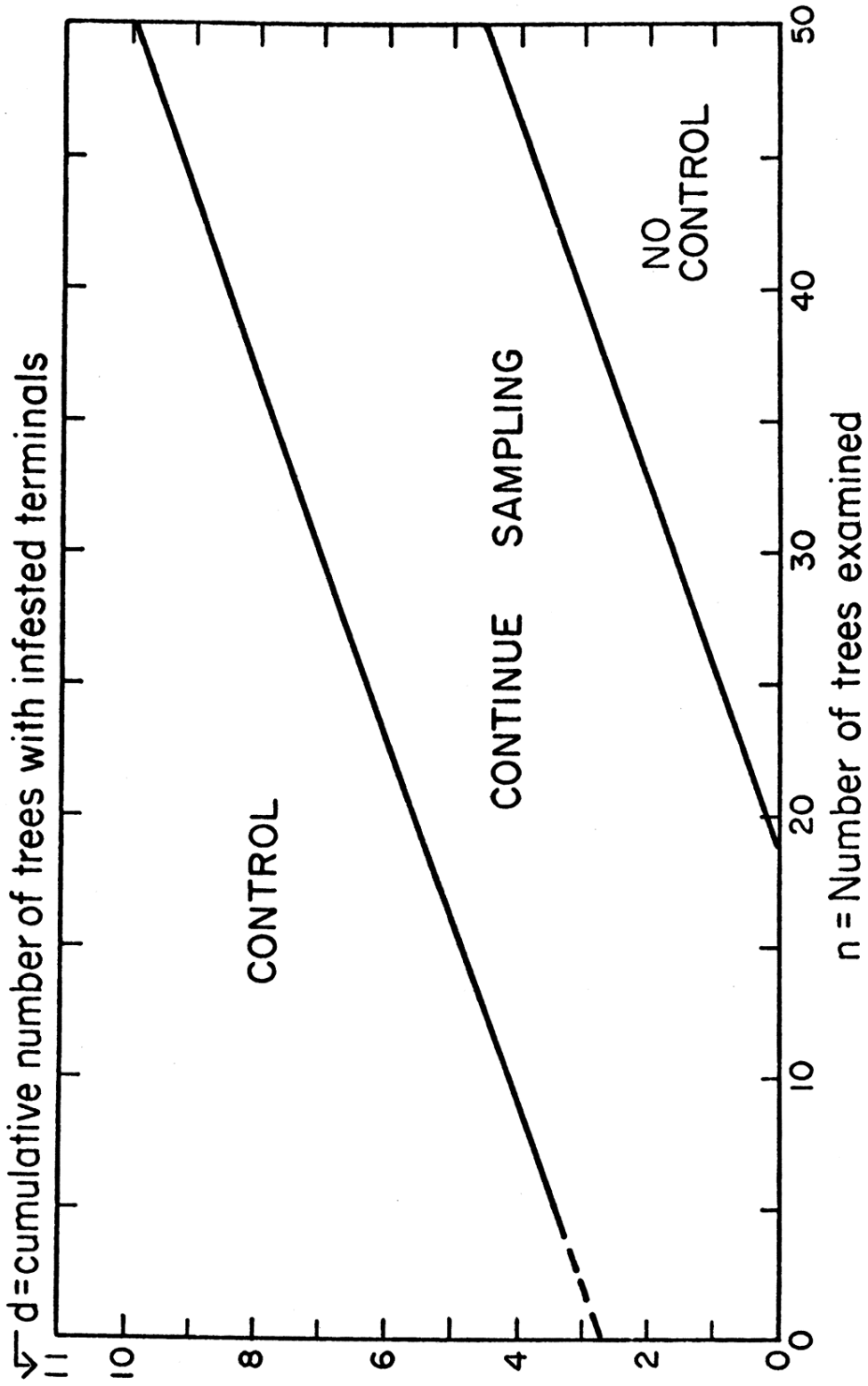
Figures:

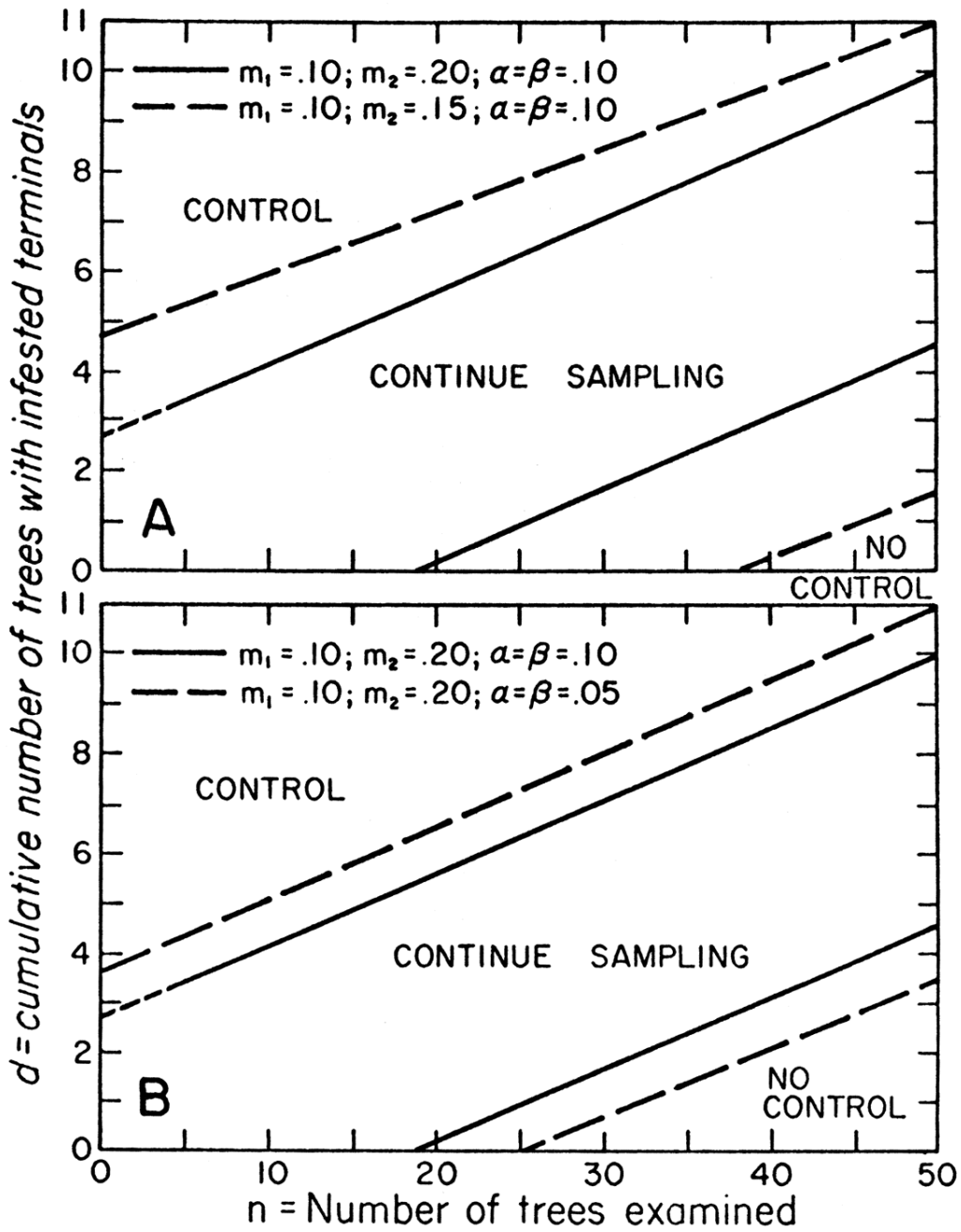Figure 1   Sequential graph for sampling Nantucket pine tip moth in loblolly pine

Fig. 2. Comparison of decision boundaries of sequential sampling plan for Nantucket pine tip moth in loblolly pine: A with gap between m1 and m2 reduced, and B with risk levels reduced.
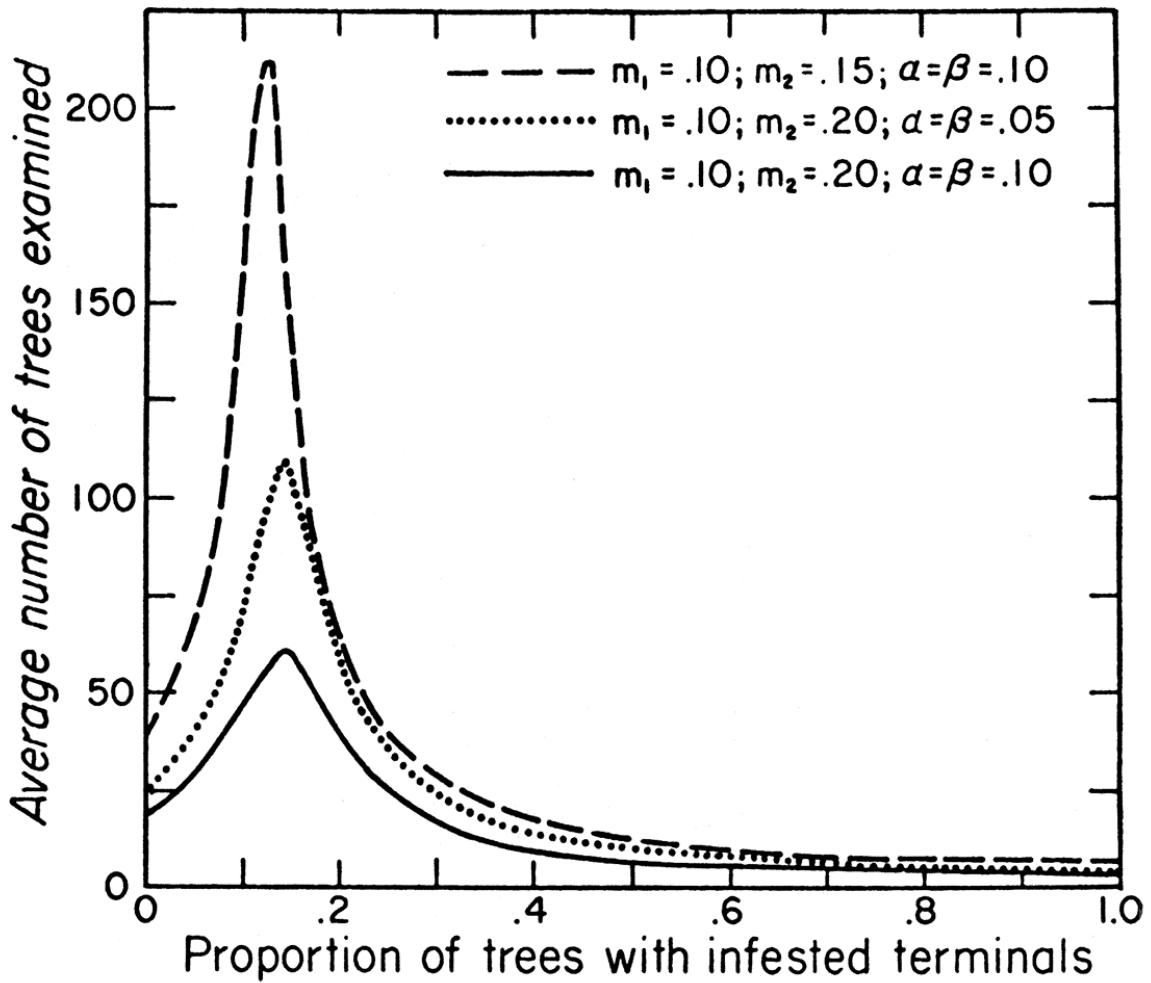
Fig. 4. Average Sample Number curve for the Nantucket pine tip moth sequential sampling plan(s).