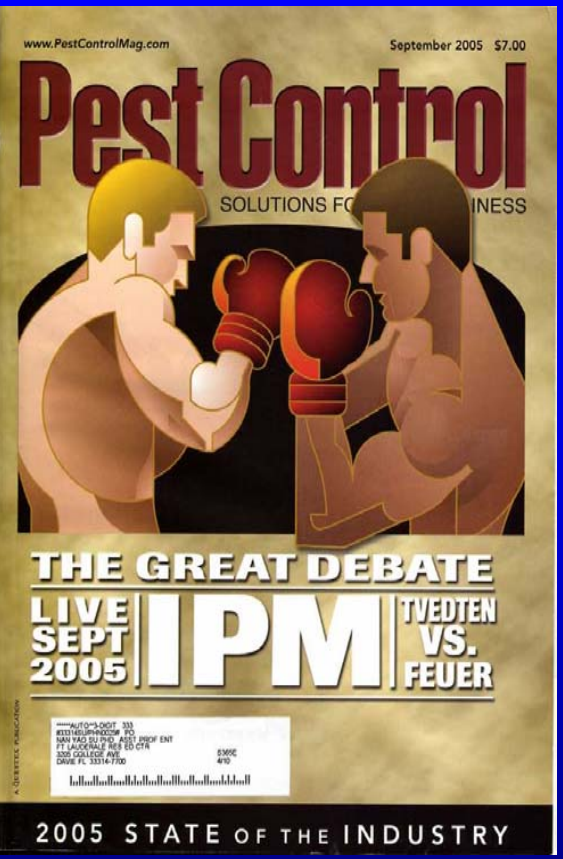
Integrated Pest Management for Subterranean Termites

Nan-Yao Su
Department of Entomology & Nematology
Ft. Lauderdale Research & Education Center
University of Florida



- "…using all available tools to prevent and control pest infestation," (S. Kells, Univ. of Minnesota)
- "…different IPM definitions…from academia …and regulators..." causes public confusion, and PMP industry needs to create a universal definition of IPM (F. Andorka, Editor, Pest Control)
- "….offer control without pesticides…" (S. Tvedten, PMP)
- "…pesticides are part of IPM…" (A. Feuer, PMP)

"…(some) groups now use the term IPM to justify their continued heavy use of pesticides in pest control…" (Pimentel, D. 1997. *Techniques for Reducing Pesticide Use*)

Integrated Pest Management

- IPM represents a philosophy rather than a specific control measures (Dent 1992)
- A pest control measure is justified only when ‘the density of the pest at which the loss through damage exceeds the cost of control’ (Mumford & Norton 1984)
- A **cost-benefit** issue

IPM for Subterranean Termites? (Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- An IPM program for subterranean termites is not just a mixture of individually ineffective tools
- The overall objective of an IPM program should be the **protection of a structure** from subterranean termite populations using the most **cost-effective** methods
- It is probably unrealistic to apply the cost-benefit model …for agricultural IPM directly to an urban pest management program….(however) the underline concept of IPM to use a cost-effective approach to solve pest problem…is the same
- Cost does not only include labor, equipment and materials, but also the inherent risk of liability and actual health and environmental risk

IPM for Subterranean Termites?
(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- An IPM program for subterranean termites is not just a mixture of individually ineffective tools
- The overall objective of an IPM program should be the protection of a structure from subterranean termite populations using the most cost-effective methods

- It is probably unrealistic to apply the cost-benefit model …for agricultural IPM directly to an urban pest management program….(however) the underline concept of IPM to use a **cost-effective** approach to solve pest problem…is the same
- Cost does not only include labor, equipment and materials, but also the inherent **risk** of liability and actual health and environmental risk

Cost-Benefit Structure for Subterranean Termite IPM
(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- Potential damage (D) > Fee (F)
- F = T (total operation cost) + P (net profit)
- Total operation cost (T)
  - T = l + m + e + r + o
  - l: labor, m: materials, e: equipment, r: risk, o: overhead
- D > l + m + e + r + o + P
- Most difficult to predict: **D** and **r (risk)** cost

Subterranean termite damage

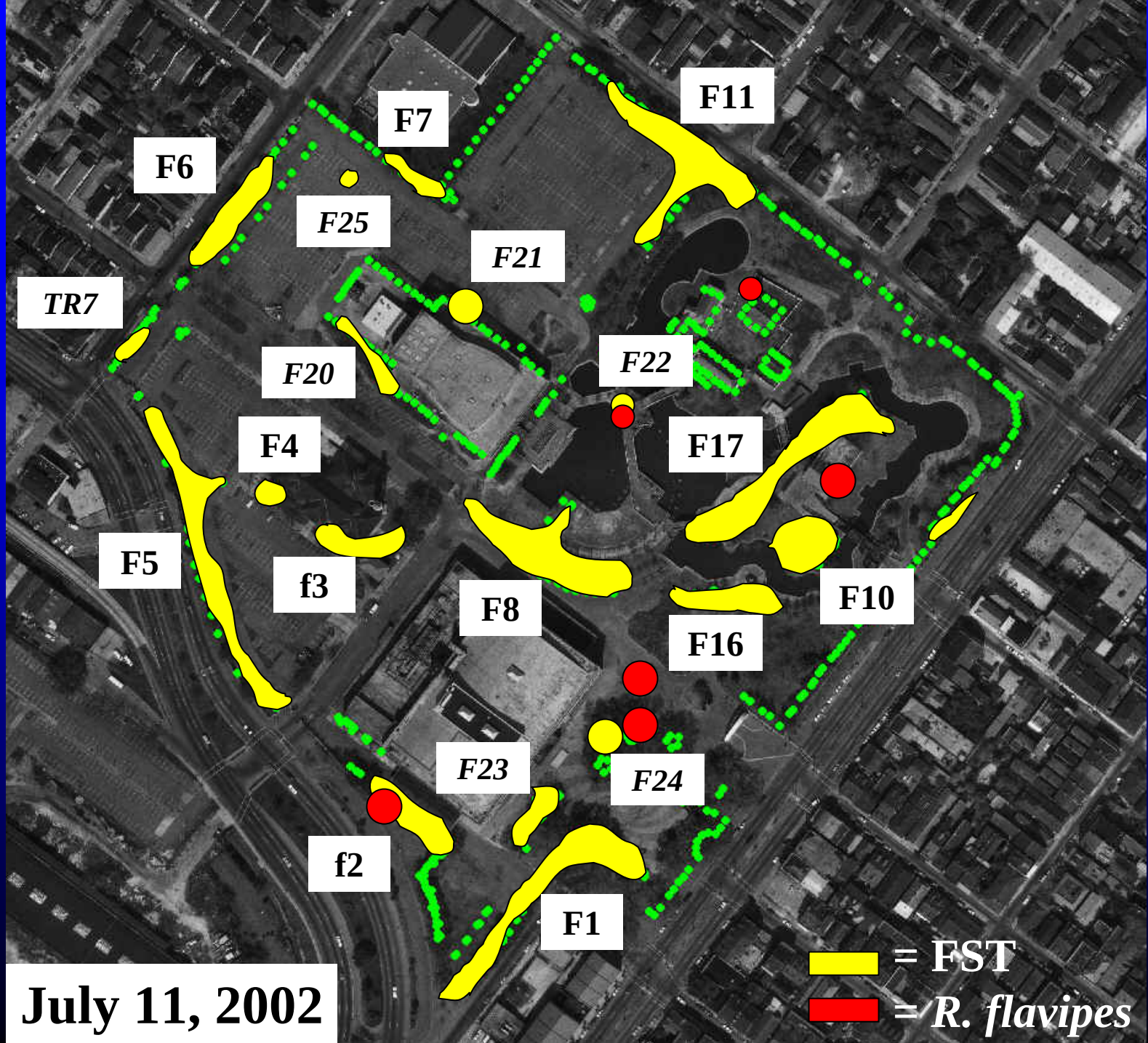
Subterranean termite damage potential

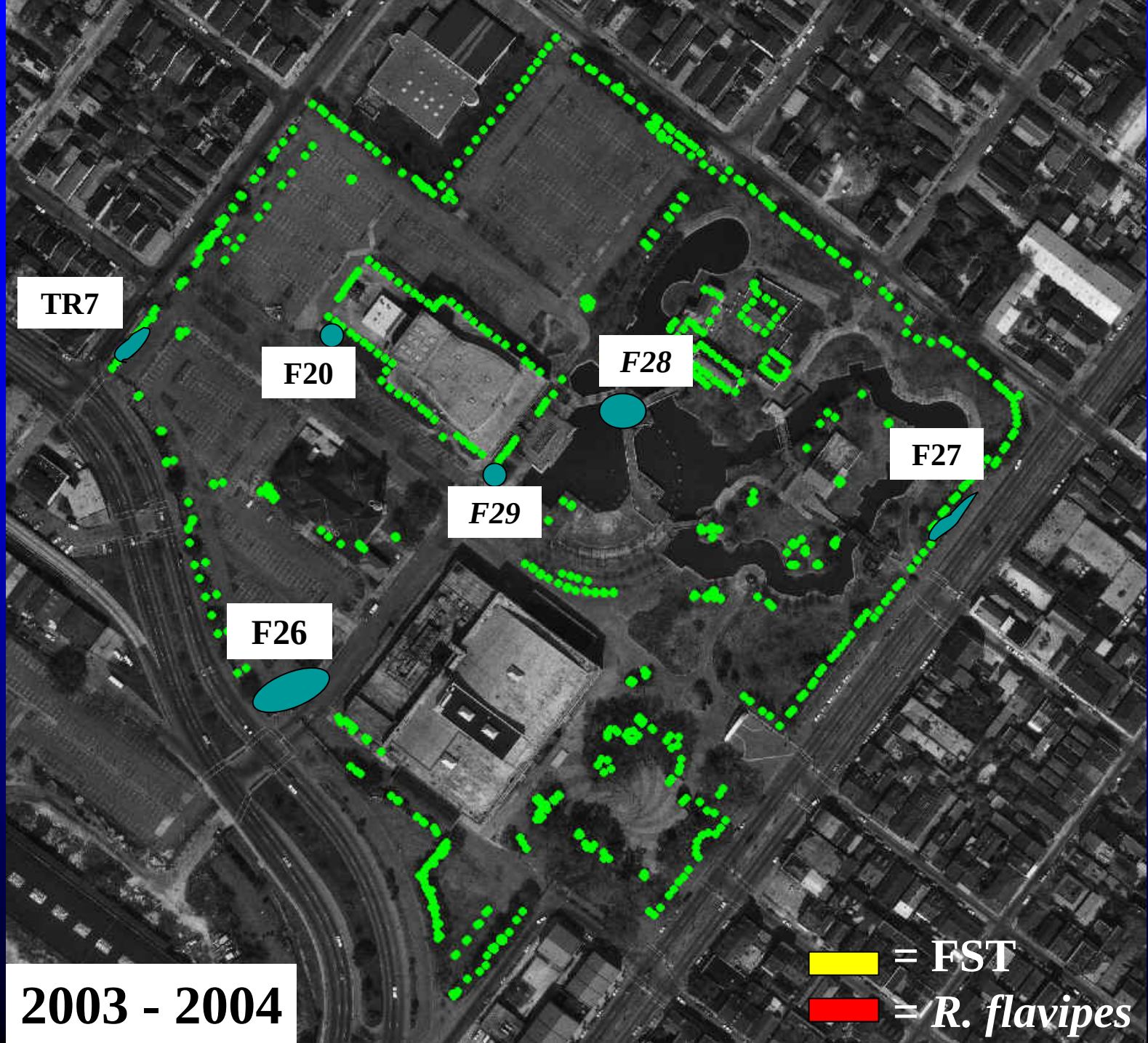
Cost-Benefit Structure for Subterranean Termite IPM
(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- Potential damage (D) = f(x)
- Total operation cost (T)
  - T = l + m + e + b + o
  - l: labor, m: materials, e: equipment, r: risk, o: overhead
- F = T + P (P: net profit)
- D > l + m + e + r + o + P

- Most difficult to predict: **D and r (risk) cost**
- **D** ≈ termite population density, conducive conditions, etc.
  - More termites, larger **D,** less termites, smaller **D**

  → Population management targeting at colony level
- **r** ≈ quantity and quality of insecticide use


F11
F7
F6
F25
F21
TR7
F22
F20
F4
F17
F5
f3
F8
F10
F16
F23
F24
f2
F1
= FST
= R. flavipes
July 11, 2002


TR7
F20
F28
F27
F29
F26
= FST
= R. flavipes
2003 - 2004

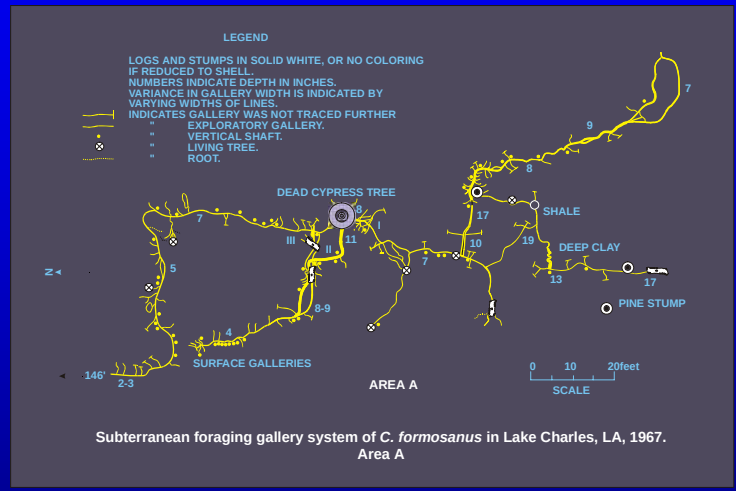
Cost-Benefit Structure for Subterranean Termite IPM

(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- Potential damage (D) > Fee (F)
- Total operation cost (T)
  - T = l + m + e + b + 0
  - l: labor, m: materials, e: equipment, r: risk, o: overhead
- F = T + P (P: net profit)
- D > l + m + e + r + o + P
- Most difficult to predict: **D** and **r (risk)** cost
- **D** ≈ termite population density, conducive conditions, etc.
  - More termites, larger **D,** less termites, smaller **D**
  - → Population management targeting at colony level
- **r** ≈ quantity and quality of insecticide use

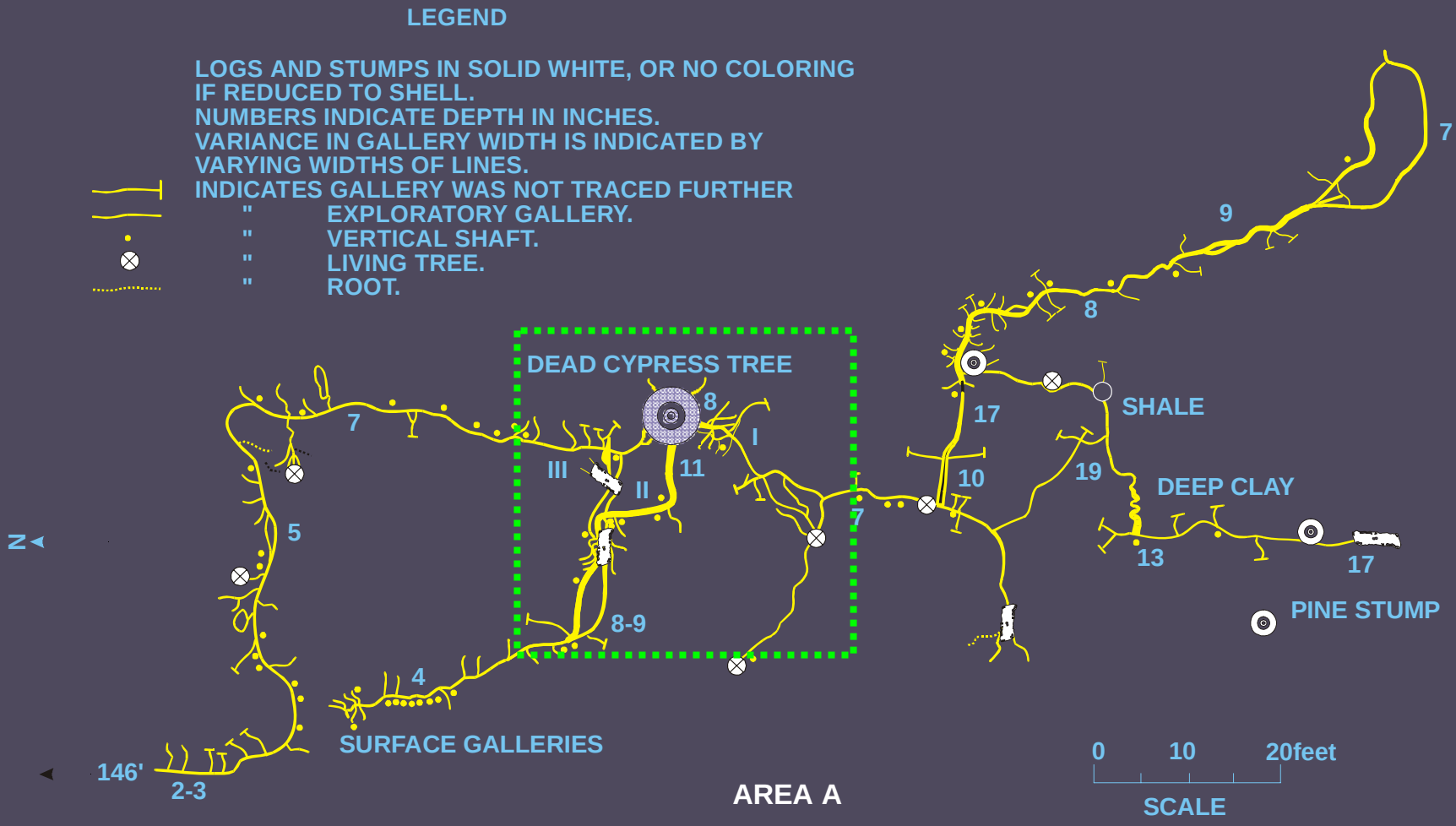
Basic Unit of Control Target in the Population Management of Subterranean Termites

- Colony



Subterranean foraging gallery system of *C. formosanus* in Lake Charles, LA, 1967. Area A

- Not an individual termite



Subterranean foraging gallery system of *C. formosanus* in Lake Charles, LA, 1967. Area A

Cost-Benefit Structure for Subterranean Termite IPM
(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- Potential damage (D) > Fee (F)
- Total operation cost (T)
  - T = l + m + e + r + o
  - l: labor, m: materials, e: equipment, r: risk, o: overhead
- F = T + P (P: net profit)
- D > l + m + e + r + o + P
- Most difficult to predict: **D** and **r (risk)** cost

Risk potentials for applying large quantity of potent, persistent liquid insecticides in soil near a home

Cost-Benefit Structure for Subterranean Termite IPM

(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- Potential damage (D) > Fee (F)
- Total operation cost (T)
  - T = l + m + e + b + 0
  - l: labor, m: materials, e: equipment, r: risk, o: overhead
- F = T + P (P: net profit)
- D > l + m + e + r + o + P
- Most difficult to predict: **D** and **r (risk)** cost
- **D** ≈ termite population density, conducive conditions, etc.
- **r** ≈ quantity and quality of insecticide use
  - Less persistent, less toxic insecticide used at smaller quantity

  → Less **r (risk)**

Cost-Benefit Structure for Subterranean Termite IPM
(Su & Scheffrahn 1998. *IPM Reviews 3: 1-13*)

- Most difficult to predict: **D** and **r** (risk) cost
- **D** ≈ termite population density, conducive conditions, etc.
  - More termites, larger **D**, less termites, smaller **D**

  → **Population management targeting at colony level**
- **r** ≈ quality and quantity of insecticide us

  → **Less persistent, less toxic insecticide used at smaller quantity**

  → Less **r (risk)**

Current Practices for Subterranean Termite Control in the United Sates
- Background -

- Comparison of pesticide use volume (per hectare)
  - Agriculture: 2.17 kg (Pimentel & Levitan 1986)
  - Liquid termiticides: 39 kg (at 0.1% solution) (La Fage 1986)
  - Termite baits: 0.065 kg (Sentricon data), 600-fold less than liquid termiticides

Current Practices for Subterranean Termite Control in the United Sates
- *A Reality Check* -

- Current termite control market and practices (2004)
  - Liquid termiticide: >80% market share
  - Termite baits: 25-30% market share
  - Vast majority of soil termiticide is applied for new buildings as mandate by building code; many of which may be unnecessary
  - No or little efforts for cultural control or better construction practices
  - Most homeowners are unaware of termite damage potential, control practice, etc, and typically rely on PMPs to make treatment decisions

Current Practices for Subterranean Termite Control in the United Sates
- *A Reality Check* -

- What is the answer??
  - Outreach education program to promote grass-root awareness for IPM targeting reduced-pesticide practice and termite population management
  - Area-wide population management program