

# Recovery Plan for Bacterial Blight and Bacterial Leaf Streak of Rice

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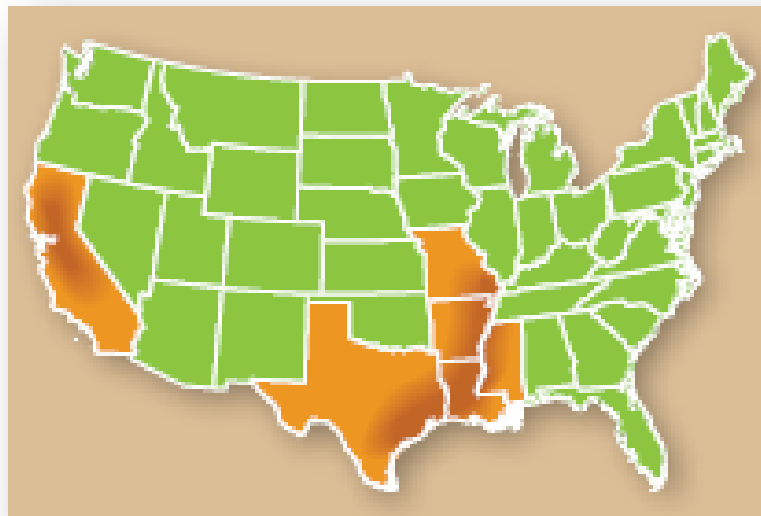


# Background of Recovery Plan

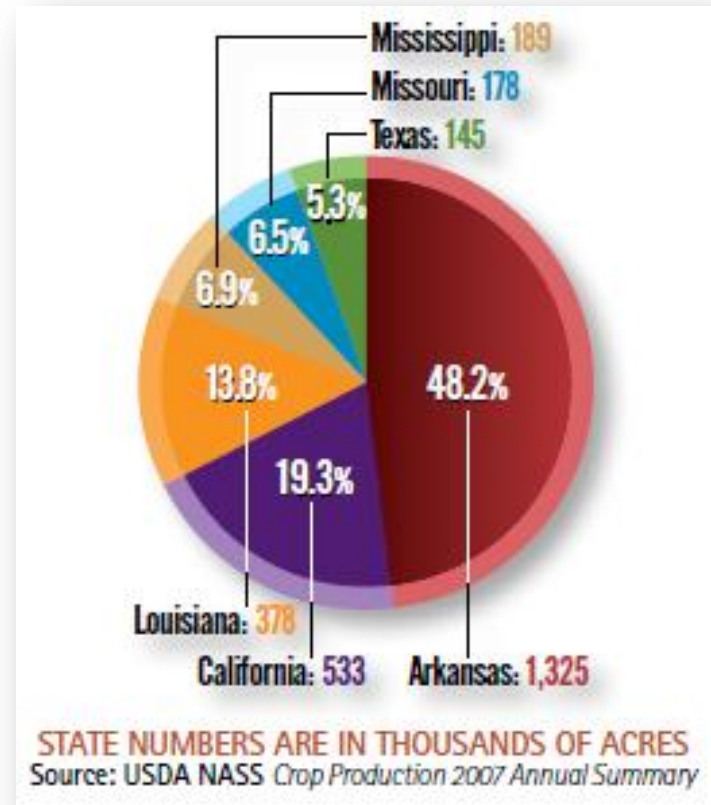
- **History:**
  - Initial start: 2006 (A. Bogdanove, lead)
  - Re-start: 2011 (J. Leach, lead)
- **Writing Team:**
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  - Pamela Ronald, UC-Davis
  - Lindsay Triplett of Colorado State University
  - Tom Mew, IRRI (retired)\*

# Rice Production in the USA

- Grown over 2 million acres in six states
- 2011 value \$2.63 billion
- Half exported



USA Rice Federation



# *X. o. pvs oryzicola & oryzae:* Two distinct lifestyles

## *X. oryzae pv. oryzicola:*

- Bacterial leaf streak (BLS) of rice
- Invades through wounds or stomates
- Intercellular: moves and lives in between mesophyll parenchyma



## *X. oryzae pv. oryzae:*

- Bacterial blight (BB) of rice
- Invades through wounds or hydathode water pores
- Vascular: moves and lives in xylem vessels

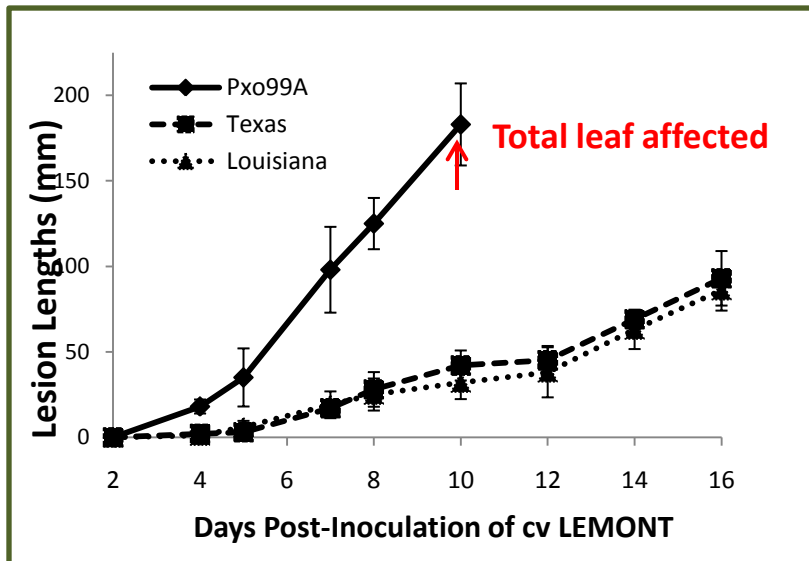
# Bacterial Blight, caused by *X. oryzae* pv. *oryzae*

- The most devastating bacterial disease of rice
- Endemic in Asia, Africa, Australia
- Not found in the Americas\*
- Controlled by genetic resistance

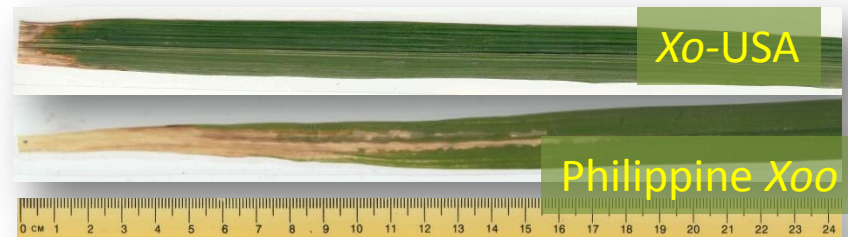


# Report of BB in the USA in 1980s

- Reported from Texas and Louisiana only, and on one susceptible variety (Lemont)
- Symptoms similar, but not identical, to BB
- Weakly virulent *Xanthomonas* isolated



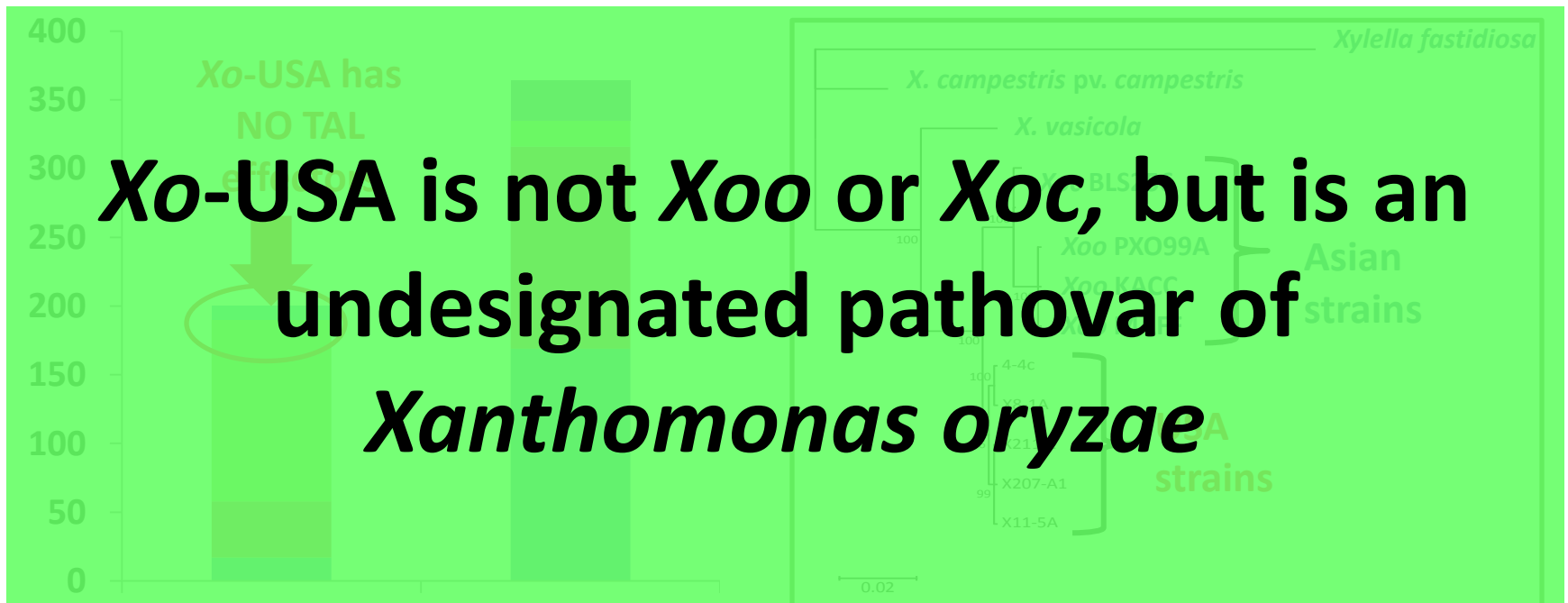
Triplett et al., 2011



Scissor clip inoculation of rice with *Xo*-USA and a Philippine *Xoo* (10 dpi of cv. Azucena)

# *Xo-USA* is not *Xoo* or *Xoc*

- *Xo-USA* have no TAL effectors; *Xoo* & *Xoc* have multiple TAL
- Phylogenetic comparisons based on genome sequences group USA strains apart from *Xoo* & *Xoc*



***Xo-USA* is not *Xoo* or *Xoc*, but is an undesignated pathovar of *Xanthomonas oryzae***

Absent in *Xo-USA*      Unique to *Xo-USA*

Triplet et al., 2011

# Bacterial Leaf Streak caused by *Xanthomonas oryzae* pv. *oryzicola*

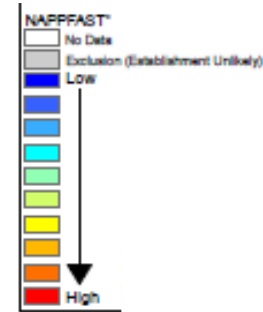
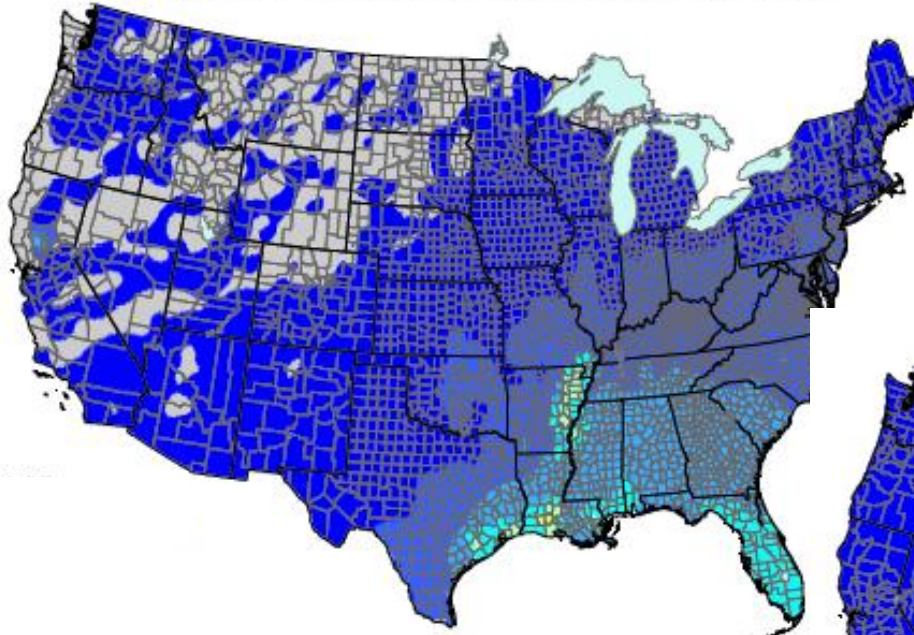
- Emerging as important in China, Africa
- Endemic to Asia, Africa, Australia
- Never reported in the Americas
- Controlled by genetic resistance: QTL-based



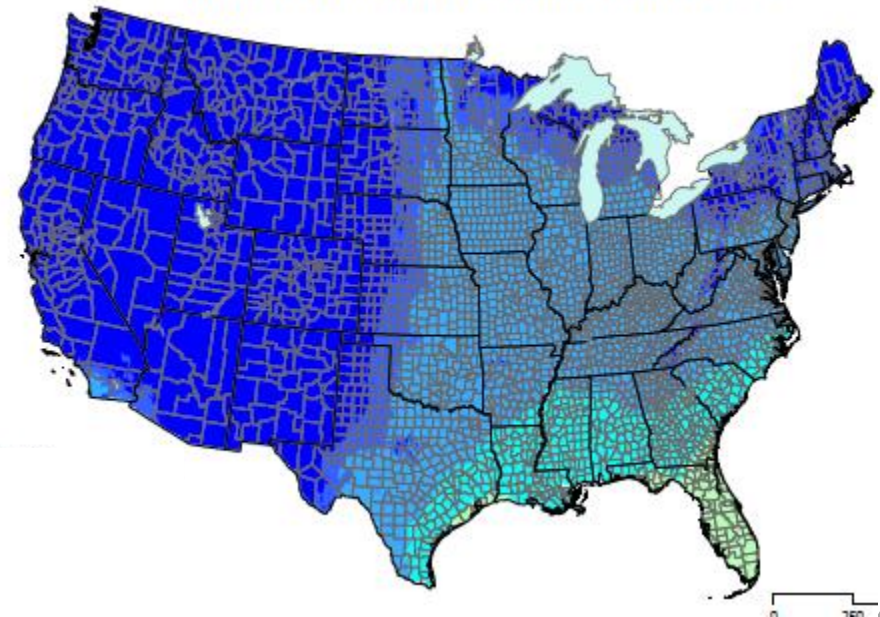


# Risk Maps for BB & BLS in the USA

Risk Map  
*Xanthomonas oryzae* pv. *oryzicola*, Bacterial Leaf Streak of Rice



NAPFAST Map  
*Xanthomonas oryzae* pv. *oryzae*, Bacterial Leaf Blight of Rice



- Risk of BB or BLS establishing in the USA is low

# What if BB or BLS arrive?

- **Surveillance:**

- Would they be recognized & diagnosed?
  - Diagnostic tools that distinguish are available to distinguish the pathogens, but not field level
  - No race-specific diagnostics for *Xoo*
  - Are appropriate positive controls readily accessible?

- **Control:**

- Are they likely to persist in US production systems?
- Chemical controls have inconsistent efficacy in Asian cropping systems, but here?
- Eradication, if contained area
- Resistance is best option (single R gene for BB; QTL for BLS), but not incorporated into US varieties

# Research Needs

- **Surveillance:**

- Develop and adopt improved field-level detection tools, seed-detection protocols, and certification approaches
- Improve tools for rapid and accurate characterization of the race structure of the *Xoo* pathogen population
- Develop the physical resources to test, conserve, store, & maintain strains or DNA of *Xo*

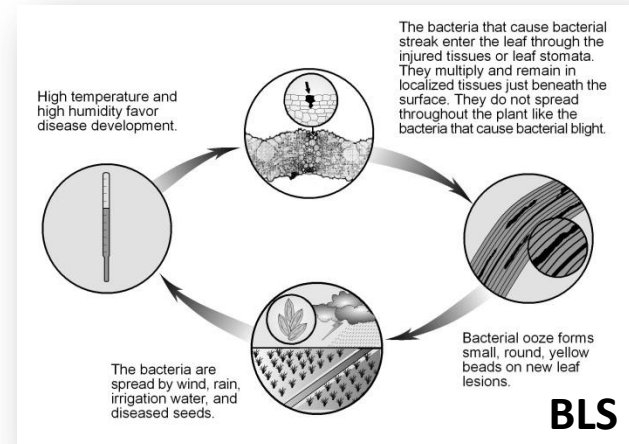
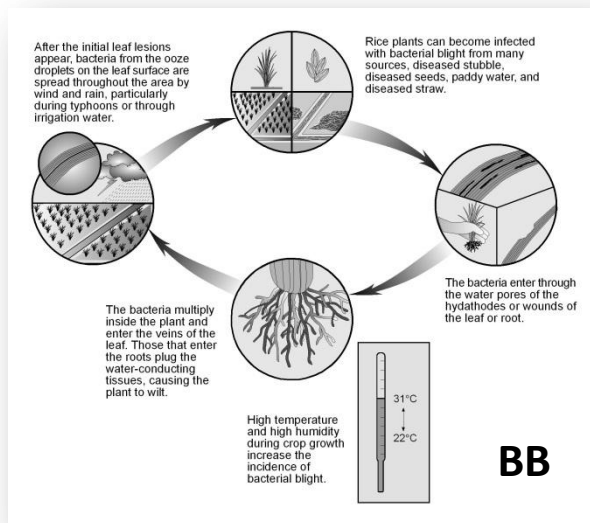
- **Breeding:**

- Assess key US germplasm for resistance in countries where BB and BLS are indigenous
- Incorporate widely effective disease R genes, and identify and incorporate sources of broad-spectrum resistance

# Extension Needs

- **Training:**

- Educate and train extension personnel, growers and crop advisors in the symptomatology and detection of BB and BLS in field conditions
- Adopt uniform detection/diagnosis protocols among quarantine agencies worldwide (*Vera Cruz\**)



Vera Cruz et al., in press