

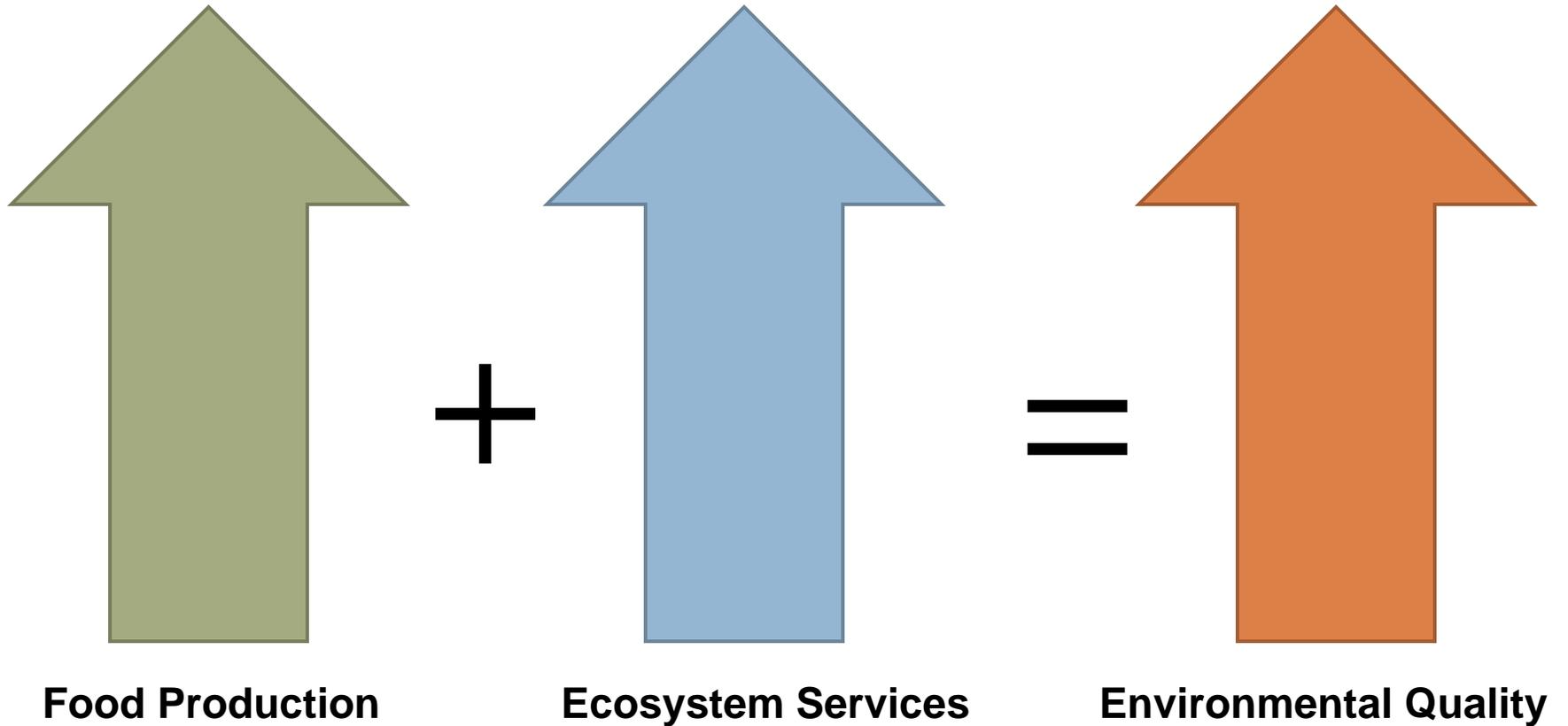
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20TH ANNUAL FREP CONFERENCE

October 30-31, 2012
DoubleTree Hotel
Modesto, California

Amrith Gunasekara, PhD
Science Advisor, California Department of Food and Agriculture

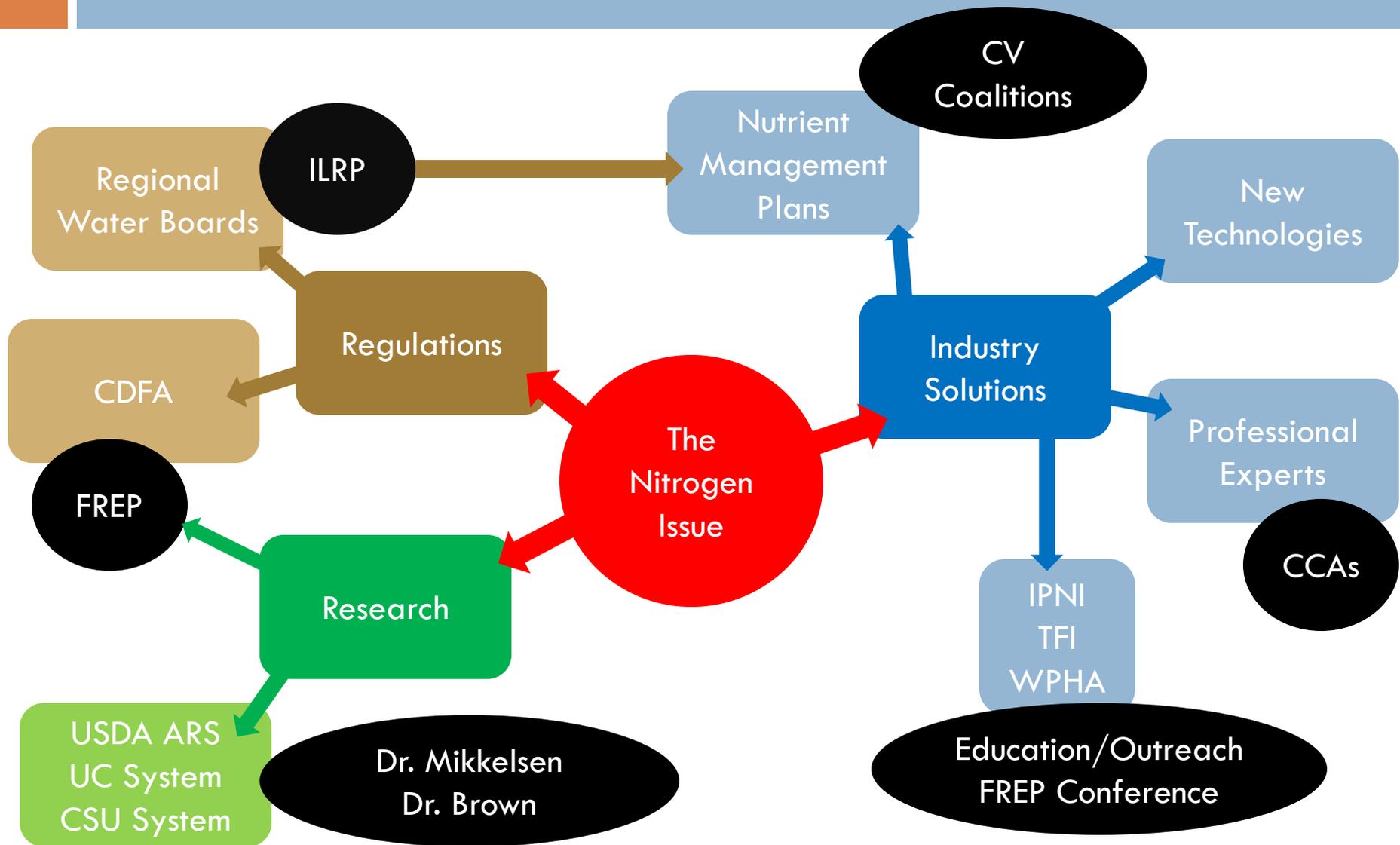
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Ecosystem Services

"the multiple benefits we gain from farming and ranching including crop and livestock production."

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Proceedings of the National Academy of Sciences

Fire ants self-assemble into waterproof rafts to survive floods

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Why does a single fire ant *Solenopsis invicta* struggle in water, whereas a group can float effortlessly for days? We use time-lapse photography to investigate how fire ants *S. invicta* link their bodies together to build waterproof rafts. Although water repellency in nature has been previously viewed as a static material property of plant leaves and insect cuticles, we here demonstrate a self-assembled hydrophobic surface. We find that ants can considerably enhance their water repellency by linking their bodies together, a process analogous to the weaving of a waterproof fabric. We present a model for the rate of raft construction based on observations of ant trajectories atop the raft. Central to the construction process is the trapping of ants at the raft edge by their neighbors, suggesting that some “cooperative” behaviors may rely upon coercion.

cooperative animal behavior | surface tension | adhesive | emergent | differential equation

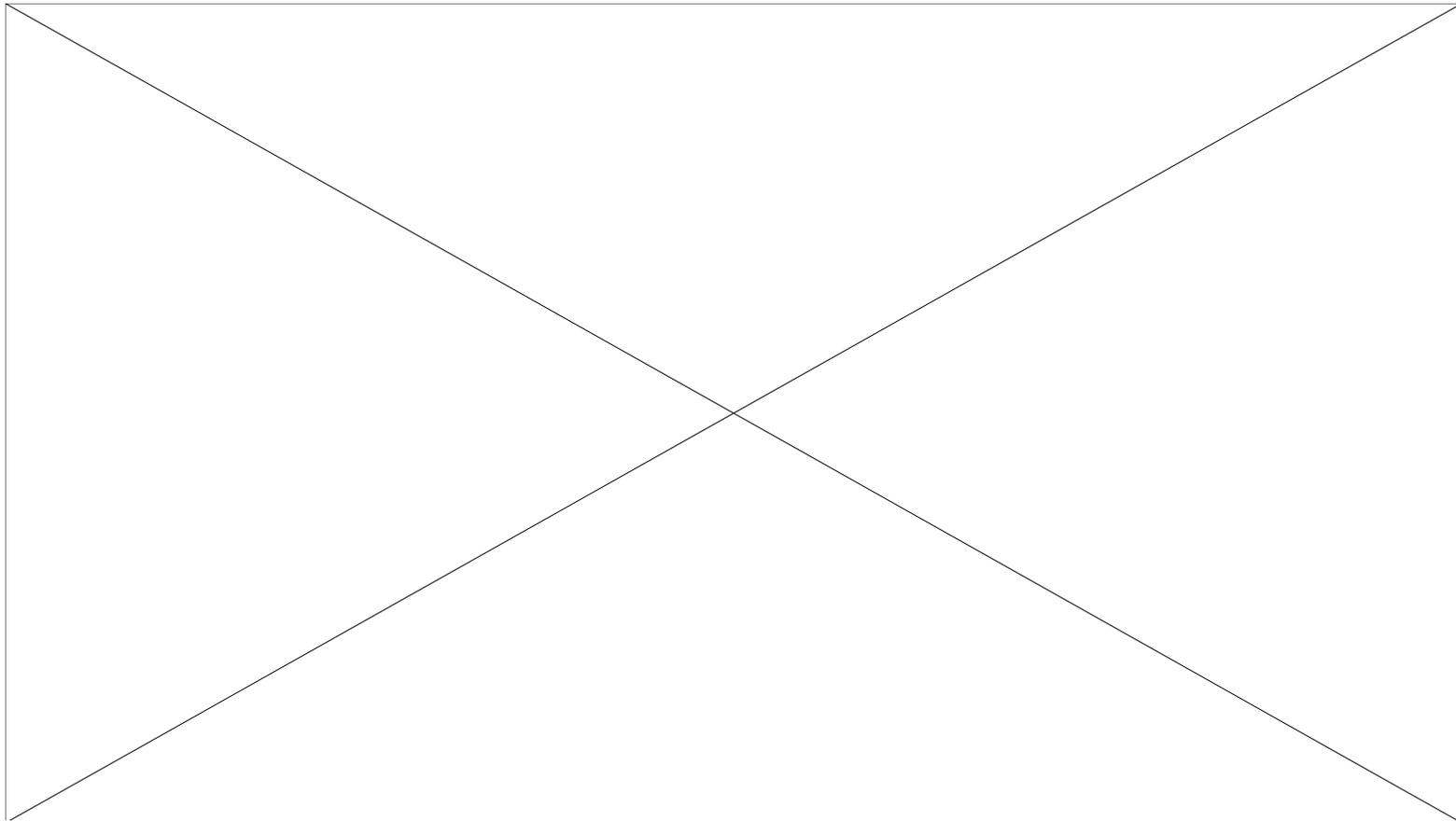
The cooperative behavior of flocks, schools, and swarms has received much attention by biologists (1, 2), mathematicians (3, 4), and roboticists (5, 6). Ants are particularly well known for their ability to work together to complete complex tasks such as foraging, nest construction, and food cultivation (7). In this study, we consider the fire ant *Solenopsis invicta*, originally from the rainforests of Brazil (8). Due to the regular flooding of its



APPLIED
MATHEMATICS

<http://www.pnas.org/content/early/2011/04/20/1016658108.full.pdf>

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<http://www.sciencefriday.com/video/04/28/2011/ant-rafts-and-caterpillar-robots.html>

THANKS AND SEE YOU TOMORROW

