Weed Community Dynamics and Agronomic Productivity in Alternative Irrigation Systems in California Rice. Whitney B. Brim-DeForest[1*], Bruce A. Linquist[1], Kassim Al-Khatib[1], and Albert J. Fischer[1]. [1]Department of Plant Sciences, University of California, Davis [*]wbrimdeforest@ucdavis.edu

The composition of weed communities and relative abundance of weed species in agricultural environments is affected by a number of factors, both abiotic and biotic. In rice, two of the primary abiotic factors are soil moisture and oxygen saturation. Flood irrigation favors species that tolerate anaerobic (low oxygen) environments, while flush irrigation and drain events favor species that are better adapted to aerobic (high oxygen) environments. Since 2000, California has experienced a series of ever-worsening droughts. Rice, a traditionally flooded crop, has come under increasing scrutiny. A number of alternative irrigation systems have been proposed, including continuous flushing and flooding with an early drain. For growers, weed competition is one of the most limiting factors to maintaining high yields, so understanding the shifts among species in weed communities under the proposed alternative irrigation systems is vital. The primary objectives of this research were: 1) to determine weed community composition in rice under alternative irrigation systems at canopy closure and at harvest and 2) to quantify differences in yields between irrigation systems in both the presence and absence of weed competition.

The experiment took place from 2013-2014 at the Rice Experiment Station in Biggs, CA. Three irrigation systems were compared: 1) Drill-Seeded Alternate Wet and Dry (DS-AWD); 2) Water-Seeded Alternate Wet and Dry (WS-AWD); and 3) Water-Seeded Conventional (WS-Control). The DS-AWD was seeded by drill into dry soil to a depth of approximately 2 cm. It was flushed for emergence, and again whenever Volumetric Water Content (VWC, in $cm^3\ cm^{-3}$) reached 35%. The WS-AWD and WS-Control were broadcast-seeded onto dry soil, and flooded to 10 cm above the soil surface within 24 hours. The WS-AWD treatment remained flooded until canopy closure of the rice, at which point water was allowed to drain. After draining, the WS-AWD treatment was flushed again whenever soil VWC reached 35%. Dominant weed species were evaluated at canopy closure and at harvest: watergrass (*Echinochloa* (L.) Beauv. spp)., smallflower umbrella sedge (*Cyperus difformis* L.), sprangletop (*Leptochloa fusca* (L.) Kunth), ricefield bulrush (*Schoenoplectus mucronatus* (L.) Palla), ducksalad (*Heteranthera rotundifolia* (Kunth) Griseb.) and redstem (*Ammannia* L. spp.). Relative cover and dry biomass at harvest of each species were assessed in nine quadrats per treatment plot. Weedy and weed-free rice yields were harvested and adjusted to 14% moisture.

Over both years, weed-free yields were not significantly different across the three irrigation systems (ANOVA, $p > 0.05$). Weedy yields were significantly less in the DS-AWD than in the WS-AWD and WS-Control across both years (Tukey-Kramer HSD Mean Separation, $p < 0.05$). Ducksalad and watergrass were the predominant weed species present in the WS-AWD and WS-Control at canopy closure over both years. In the DS-AWD, watergrass and sprangletop were the only two species present at canopy closure. At harvest, ducksalad had completed its life cycle, so watergrass was the predominant species across all irrigation systems, though the relative biomass was significantly greater in the DS-AWD than in the other systems ($p < 0.05$). The only

significant difference found in species composition between the WS-AWD and WS-Control was the significant increase in biomass of smallflower umbrella sedge in the WS-AWD at harvest in both 2013 and 2014 ($p < 0.05$). The increase may be due to the biphasic emergence pattern of smallflower umbrella sedge, which could be stimulated by the drain at canopy closure in the WS-AWD treatment.