Anaerobic digestion (AD), the conversion of complex organic matter to methane, occurs through a series of reactions mediated by different guilds of microorganisms. AD process imbalances, such as organic overload or high organic loading rates (OLR), can result in the accumulation of volatile fatty acids (VFA) e.g., propionate, which must be degraded to maintain stable reactor function. VFAs are metabolized by syntrophic fatty acid-degrading bacteria (SFAB) in association with methanogenic archaea (collectively, syntrophic microbial communities, SMC). Despite their indispensable role in AD, little is known about the ecology of SFAB, especially under stressed conditions. To facilitate ecological studies, four quantitative PCR assays, targeting propionate- and butyrate-degraders were developed, and applied to a variety of methanogenic environments. The highest SFAB abundance was observed in propionate enrichment cultures and anaerobic reactors. In addition, SFAB and methanogen abundance varied with reactor configuration and substrate identity. The contribution of SMC to AD function and stability was investigated in lab-scale reactors exposed to two forms of disturbance: shock overload (pulse disturbance) and increased OLR (press disturbance). SMC dynamics were linked to AD function using physicochemical and molecular techniques. The first experiment examined the effect of shock overloads on SMC structure and function. Results showed that functional resilience to the pulse disturbance in reactors was linked to the abundance of propionate-degraders and Methanosarcinaceae. Reactors with reduced numbers of these microorganisms displayed increased VFA buildup, however, there was a subsequent increase in the abundance of propionate-degraders and Methanosarcinaceae which improved the functional resilience in these reactors to the next perturbation. The second experiment examined the effect of increased OLRs on SMC structure and function. SMC decreased in abundance with increasing OLR. Prior to system collapse, a decrease in aceticlastic methanogens corresponded with an increase in syntrophic acetate oxidizers and hydrogenotrophic methanogens. In summary, this work demonstrates that an increased abundance of syntrophic fatty acid degrading microbial communities are essential in AD during stressed conditions, such as organic overload and high OLRs. These results could change how digesters are monitored and aid in the design of better anaerobic treatment processes.