

Conasauga Mushwad Shale Gas Play in the Appalachian Thrust Belt in Alabama,

William A. Thomas, Department of Earth and Environmental Sciences, University of Kentucky, Lexington, KY 40506-0053, geowat@uky.edu

The Conasauga shale gas play in the Appalachian thrust belt in Alabama focuses on the Gadsden mushwad, which is a tectonically thickened, ductile duplex of shale-dominated Conasauga Formation. The regional décollement of the Appalachian thrust belt in Alabama is in a Lower to Middle Cambrian (Rome and Conasauga Formations) shale-dominated weak layer. A regional stiff layer (Upper Cambrian and Lower Ordovician Knox Group) of massive carbonate rocks controls the structural geometry of thrust sheets. The floor of the Gadsden mushwad is the regional décollement; the roof is the broken, deformed, and partly eroded Dunaway Mountain thrust sheet. The leading edge of the mushwad formed over a frontal ramp, where the regional décollement rises northwestward over the down-to-southeast Birmingham basement fault in the footwall.

The Conasauga Formation (now in the Gadsden mushwad) is palinspastically restored as the fill of the Birmingham basement graben, where the formation is a thick succession of dark-colored shale and thin-bedded limestone. In contrast, both northwest and southeast of the basement graben, the Conasauga Formation is thinner and is a shallow-marine, massive carbonate. Thickness and facies of the Conasauga Formation reflect synsedimentary Middle Cambrian extension along the boundary faults of the Birmingham basement graben.

During late Paleozoic thrust translation, ductile deformation and accretion of the weak layer from the footwall into the allochthon further thickened the already thick shale-dominated Conasauga Formation in the Birmingham basement graben as the mushwad nucleated and enlarged along the large-scale frontal ramp over the Birmingham basement fault at the northwest boundary of the graben. Two circumstances led to the shale gas resource: (1) deposition of a thick succession of shale and thin-bedded limestone in the Birmingham basement graben and (2) nucleation and tectonic thickening of the Gadsden mushwad at a frontal ramp over the Birmingham basement fault, which provided a buttress to thrust propagation.