An evolved Escherichia coli-derived phytase was evaluated for its efficacy in improving growth performance and nutrient utilization of broiler chicks. One hundred forty-four 7-d-old male broiler chicks were grouped by weight into 6 blocks of 6 cages with 4 birds per cage. Six corn-soybean meal-based mash diets were randomly assigned to cages within each block. The 6 diets were adequate P (7.7 g of P/kg of diet), low P (3.9 g of P/kg of diet), low P diet plus 0.75 or 1.5 g of inorganic P from monosodium phosphate, and low P diet plus the evolved Escherichia coli phytase at 500 or 1,000 units/kg of diet. The chicks were fed the experimental diets from 8 to 22 d of age. The evolved Escherichia coli phytase improved weight gain (P < 0.05), feed intake (P < 0.01), percentage tibia ash (P < 0.01), and retention of P (P < 0.001), Ca (P < 0.01), N (P < 0.05), and a number of amino acids (P < 0.05). The evolved Escherichia coli phytase was, therefore, efficacious in improving broiler growth performance, bone characteristics, and retention of P, Ca, N, and a number of amino acids.