## $Bmp (k\_opt = 81)$ Silhouette and Z-score 8.0 0.5 0.6 Pathway genes Acvr1 Acvr2b Bmpr1b Acvrl1 0.4 0.4 Acvr2a Bmpr2 Bmpr1a 0.2 Silhouette 0.3 Gene Co–Expression Above Threshold 0.1 Acvr1 0.0 Acvrl1 No. cell types Bmpr1a 300 Bmpr1b Z-score 200 4 Acvr2a Acvr2b 200 50 100 150 Number clusters Bmpr2 Profile Dispersion Plot ECDF of Profile Dispersions 1.00 Global UMAP: Pathway ON type — pathway — pos control — transcriptome 100 1.00 Cell type diversity (PCA) 75 Fraction of clusters 50 25 0.00 0 50 100 150 60 20 40 80 Cell state dispersion Pathway profile Motifs, Dispersion ≥ 90<sup>th</sup> percentile Motif Tissue Composition sqrt(No. cell types) Bmpr1a Bmpr1b Acvr2a Acvr1 sqrt(No. cell types) Pathway genes Bmpr1a Bmpr1b Acvrl1 Acvr2a

0.5

0.0

0.2

0.7

