18. The 2d Gaussian is $G = \frac{1}{2\pi\sigma^2} e^{-r^2/2\sigma^2}$.
This can be integrated to yield the quantity enclosed as a function of other parameters.

$$F = \frac{1}{2\pi\sigma^2} \int_0^{2\pi} \int_0^R e^{-r^2/2\sigma^2} dr$$

$$= \sigma^{-2} \int_0^R e^{-r^2/2\sigma^2} dr$$

letting $s = -r^2/2\sigma^2$, such that $ds = -r/\sigma^2$,

$$F = -\int_{-R}^{0} e^s ds = -[e^s]_{-R}^{0} = -[e^{-r^2/2\sigma^2}]_0^R$$

$$F = -[e^{-R^2/2\sigma^2} - e^0]$$

$$F = 1 - e^{-R^2/2\sigma^2}$$

Therefore, the aperture radius as a function of sigma is

$$\frac{R}{\sigma} = \sqrt{-2\ln(1-F)}$$

The FWHM of a Gaussian is $FWHM = 2\sqrt{2\ln 2}\,\sigma$
$FWHM = 2.3548\,\sigma$

So, $\sigma = FWHM/2.3548$ and hence

$$\boxed{\frac{R}{FWHM} = \frac{\sqrt{-2\ln(1-F)}}{2.3548}}$$

$\frac{R}{FWHM}(50\%) = 0.500$

$\frac{R}{FWHM}(95\%) = 1.039$

$\frac{R}{FWHM}(98\%) = 1.188$

Choosing an aperture radius equal to or slightly larger than the FWHM (seeing) gives you 95-98% of the light, so $R \geq FWHM$ is a reasonable choice.

$\frac{R}{FWHM}(99\%) = 1.289$, so if FWHM can be as large as $1.2\, FWHM_0$, the ideal aperture for ensuring at least 99% of the light is always enclosed would be

$$\frac{R}{1.2\, FWHM} = 1.289$$

$$\downarrow$$

$$\frac{R}{FWHM} = 1.547$$

, i.e. an aperture radius of about 1.5x the seeing.