

地理信息系统与遥感应用

第六讲 空间分析专题三

南方科技大学·环境科学与工程学院

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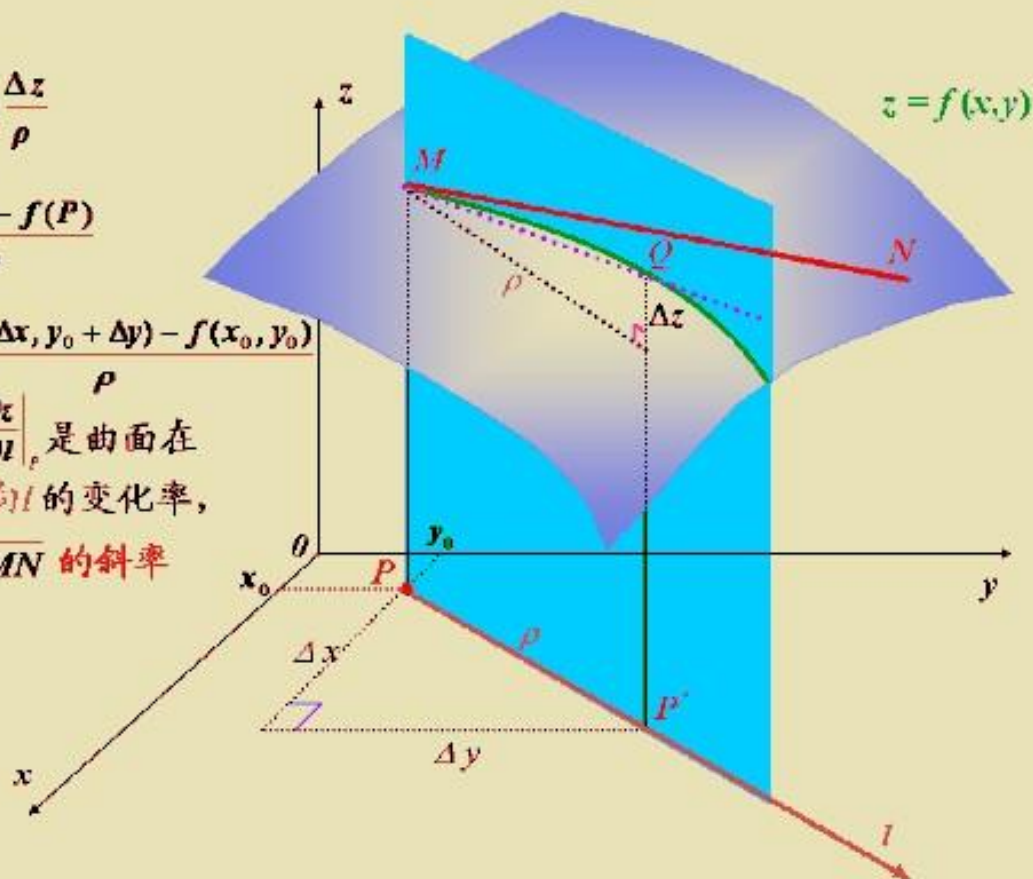
Slope

$$\left. \frac{\partial z}{\partial l} \right|_P = \lim_{\rho \rightarrow 0} \frac{\Delta z}{\rho}$$

$$= \lim_{\rho \rightarrow 0} \frac{f(P') - f(P)}{\rho}$$

$$= \lim_{\rho \rightarrow 0} \frac{f(x_0 + \Delta x, y_0 + \Delta y) - f(x_0, y_0)}{\rho}$$

方向导数 $\left. \frac{\partial z}{\partial l} \right|_P$ 是曲面在点 P 处沿方向 l 的变化率，即半切线 \overline{MN} 的斜率



32

$$\frac{\partial f}{\partial x} i + \frac{\partial f}{\partial y} j,$$

a	b	c
d	e	f
g	h	i

$$\text{slope_radians} = \text{ATAN} \left(\sqrt{([dz/dx]^2 + [dz/dy]^2)} \right)$$

$$\text{slope_degrees} = \text{ATAN} \left(\sqrt{([dz/dx]^2 + [dz/dy]^2)} \right) * 57.29578$$

$$dz/dx = ((c + 2f + i) - (a + 2d + g)) / (8 * x_cellsize)$$

$$dz/dy = ((g + 2h + i) - (a + 2b + c)) / (8 * y_cellsize)$$

50	45	50
30	30	30
8	10	10

$$\begin{aligned} dz/dx &= ((c + 2f + i) - (a + 2d + g)) / (8 * x_cellsize) \\ &= ((50 + 60 + 10) - (50 + 60 + 8)) / (8 * 5) = (120 - 118) / 40 = 0.05 \end{aligned}$$

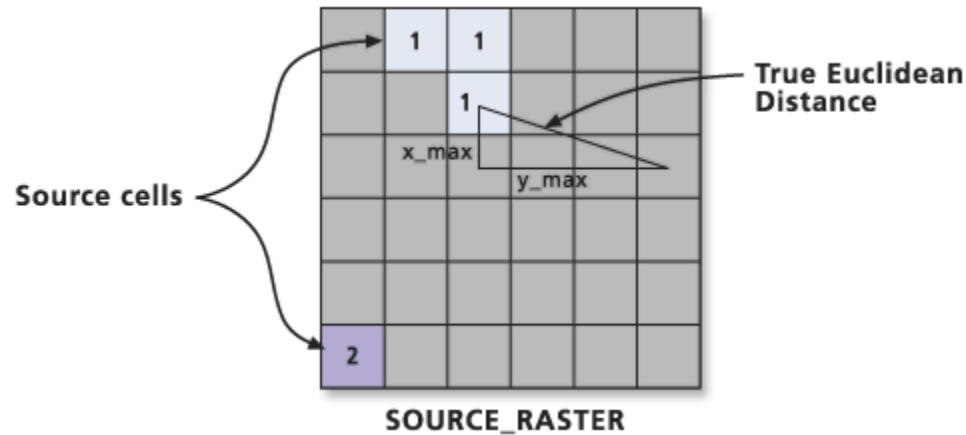
$$\begin{aligned} dz/dy &= ((g + 2h + i) - (a + 2b + c)) / (8 * y_cellsize) = \\ &= ((8 + 20 + 10) - (50 + 90 + 50)) / (8 * 5) = (38 - 190) / 40 = -3.8 \end{aligned}$$

59	56	59
71	75	70
60	63	57

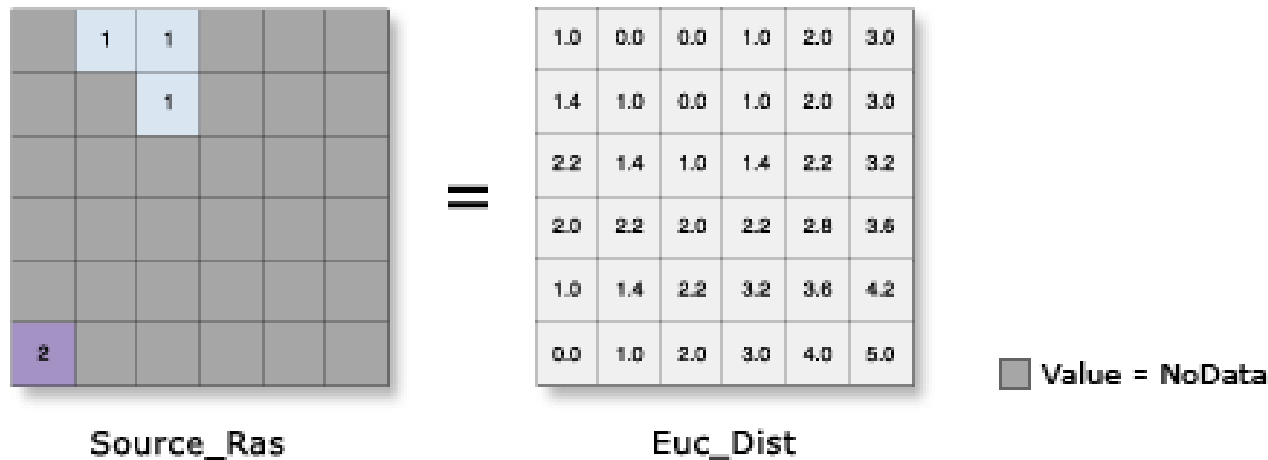
$$\begin{aligned} \text{rise_run} &= \sqrt{([dz/dx]^2 + [dz/dy]^2)} = \sqrt{((0.05)^2 + (-3.8)^2)} = \sqrt{ \\ &= \sqrt{(0.0025 + 14.44)} = 3.80032 \end{aligned}$$

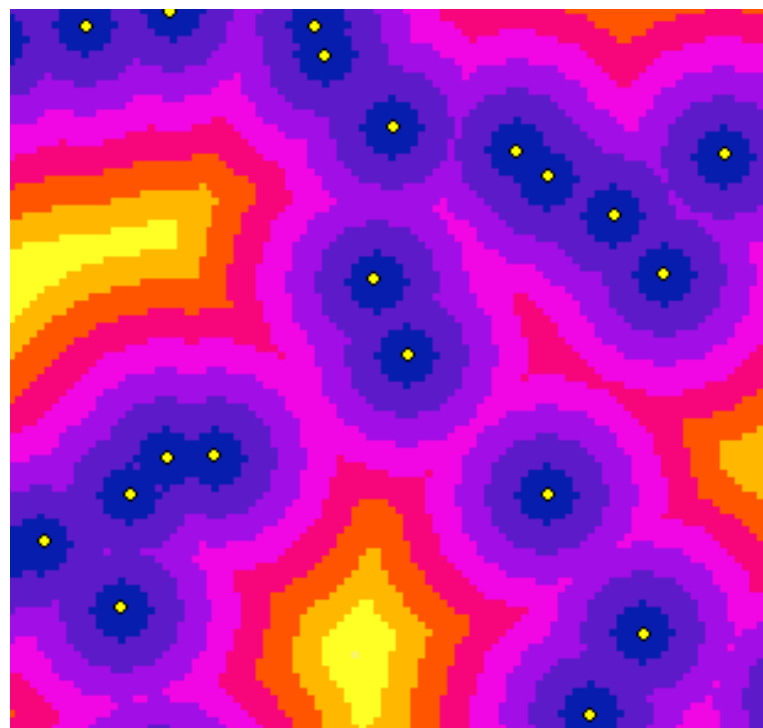
$$\begin{aligned} \text{slope_degrees} &= \text{ATAN}(\text{rise_run}) * 57.29578 = \text{ATAN}(3.80032) * \\ &57.29578 = 1.31349 * 57.29578 = 75.25762 \end{aligned}$$

Euclidean Distance

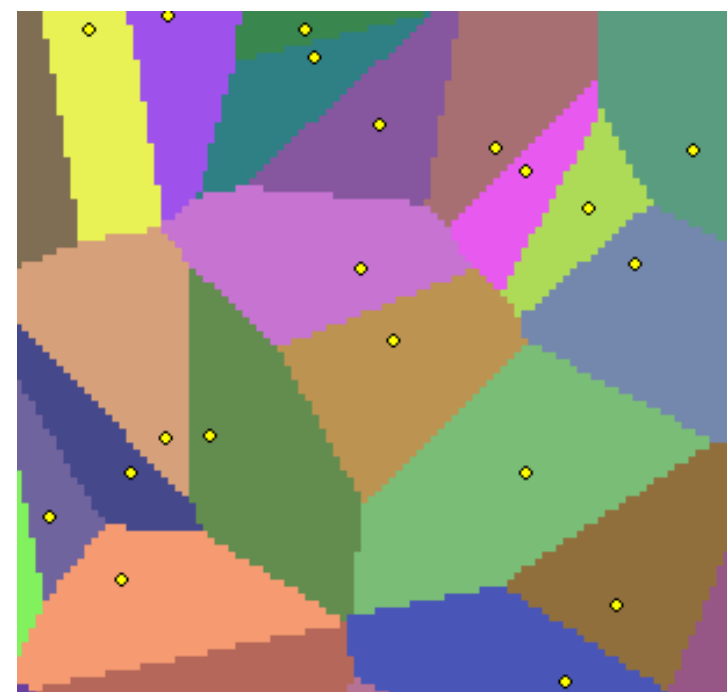


- [Euclidean Distance](#) gives the distance from each cell in the raster to the closest source.
 - ✓ Example of usage: What is the distance to the closest town?
- [Euclidean Direction](#) gives the direction from each cell to the closest source
 - ✓ Example of usage: What is the direction to the closest town?
- [Euclidean Allocation](#) identifies the cells that are to be allocated to a source based on closest proximity.
 - ✓ Example of usage: What is the closest town?

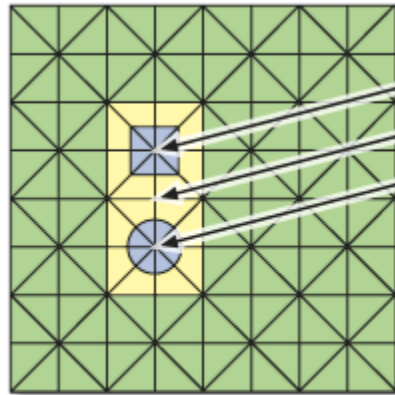




■ N
■ NE
■ E
■ SE
■ S
■ SW
■ W
■ NW



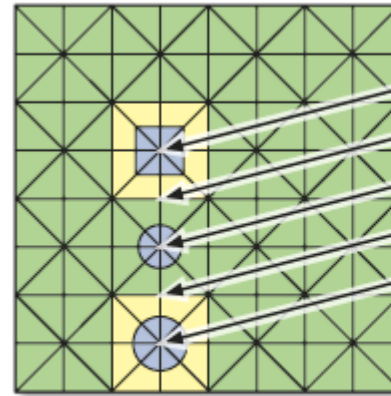
Cost Distance



Starting point (cost 1)
a1
End point (cost 2)

$$a1 = \frac{\text{cost 1} + \text{cost 2}}{2}$$

Horizontal and vertical
node calculations

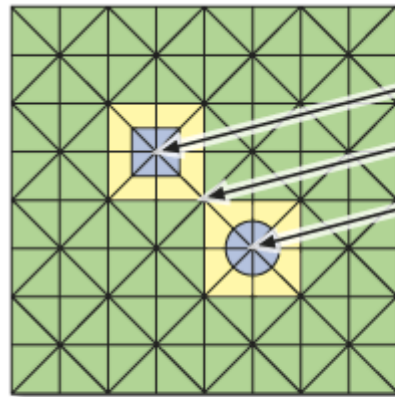


Starting point (cost 1)
a1
Mid point (cost 2)
a2
End point (cost 3)

$$a2 = \frac{\text{cost 2} + \text{cost 3}}{2}$$

$$\text{accum_cost} = a1 + a2$$

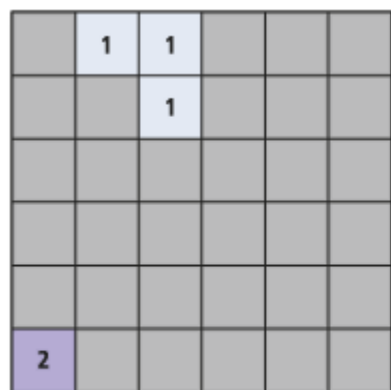
Accumulative cost
node calculations



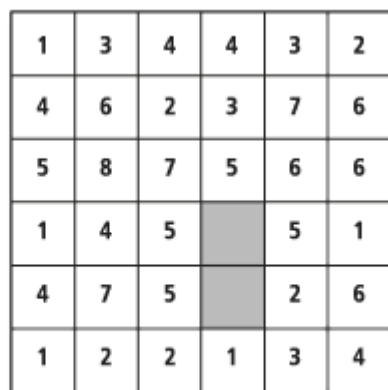
Starting point (cost 1)
a1
End point (cost 2)

$$a1 = 1.4142 \frac{(\text{cost 1} + \text{cost 2})}{2}$$

Horizontal and vertical
node calculations

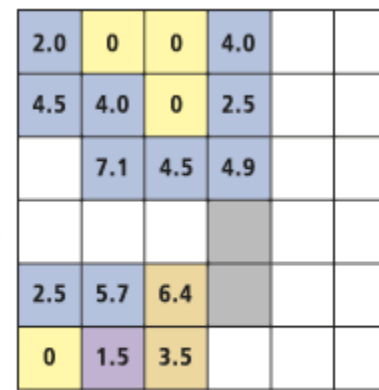


SOURCE_RASTER



COST_RASTER

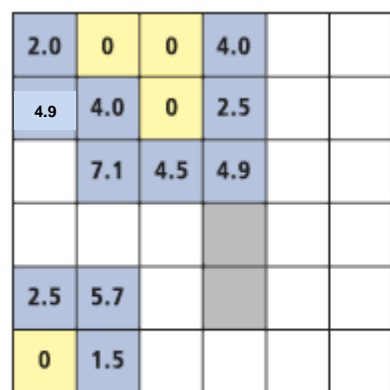
Value = NODATA



INPUT_RASTER

Active accumulative cost cell list							
1.5	2.0	2.5	2.5	4.0	4.0	4.5	4.5
4.9	5.7	7.1					

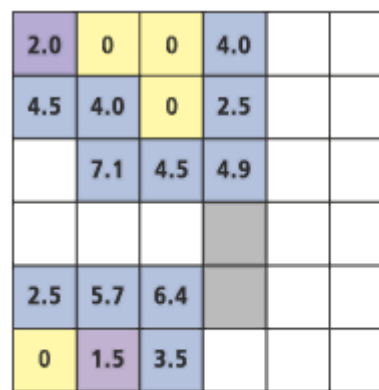
- Value = NODATA
- Cells on active cost list
- Source cell
- Allocated cells to cost distance
- New neighborhood cells to be added to active list



INPUT_RASTER

Active accumulative cost cell list							
1.5	2.0	2.5	2.5	4.0	4.0	4.5	4.5
4.9	5.7	7.1					

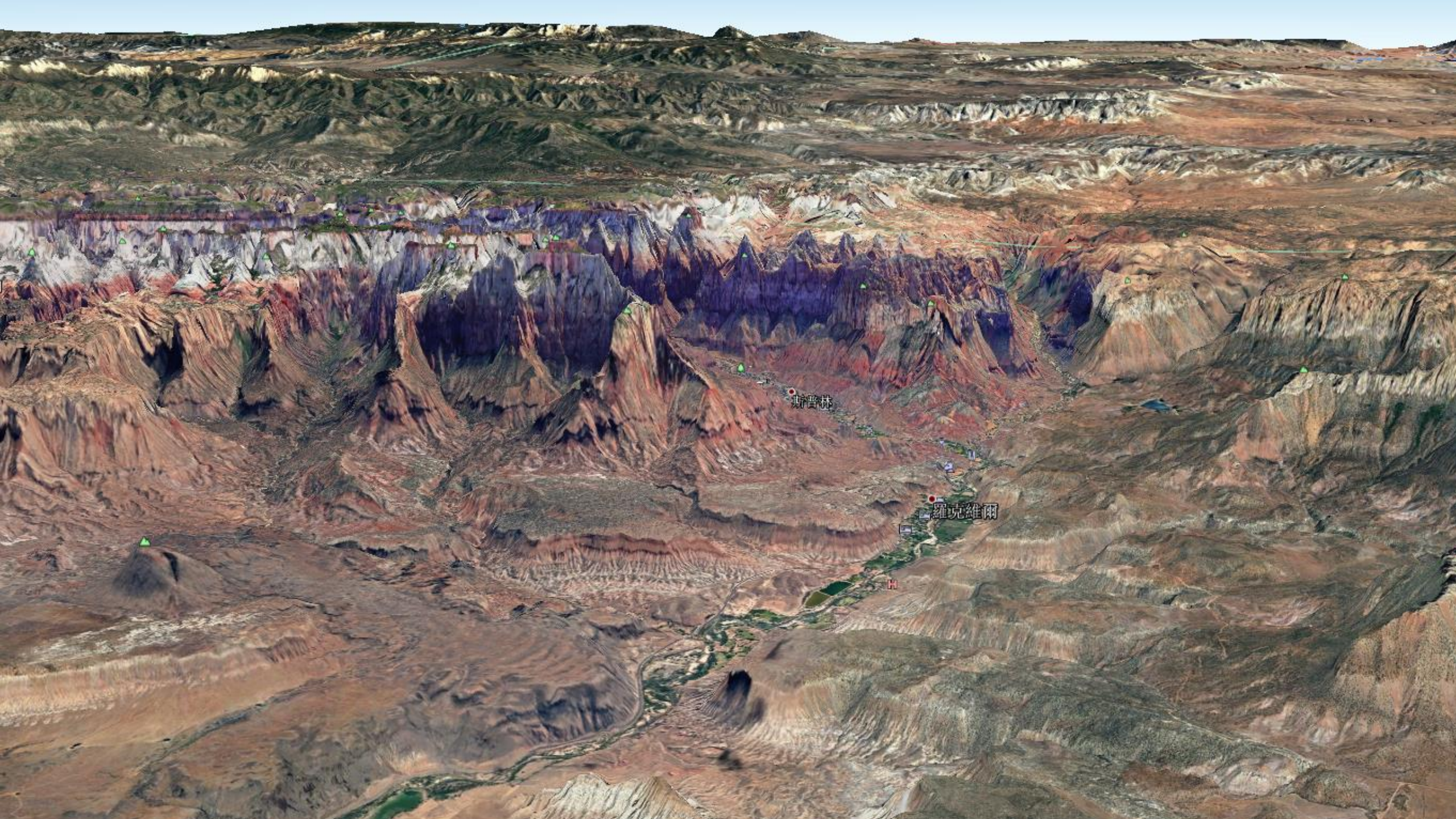
- Value = NODATA
- Cells on active cost list
- Source cell



INPUT_RASTER

Active accumulative cost cell list							
2.0	2.5	2.5	3.5	4.0	4.0	4.5	4.5
4.9	5.7	6.4	7.1				

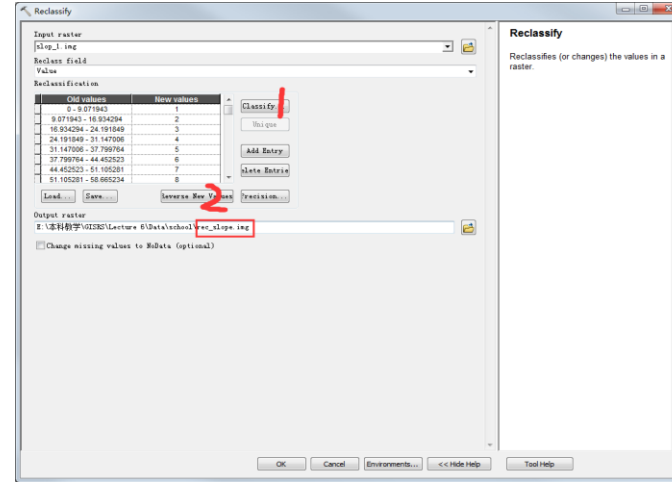
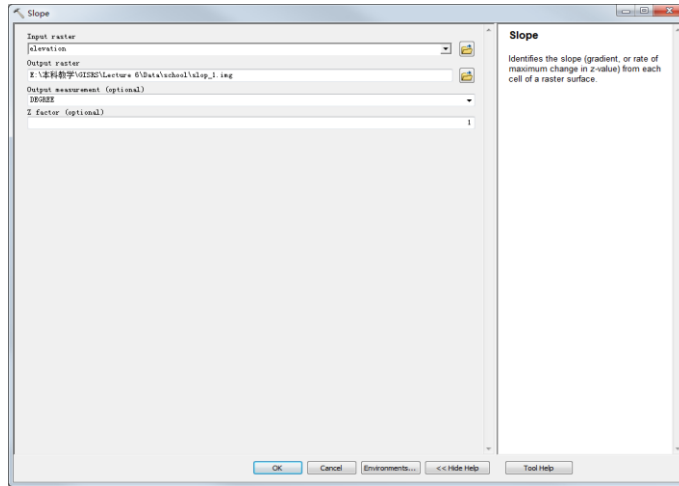
- Value = NODATA
- Cells on active cost list
- Source cell
- Allocated cells to cost distance



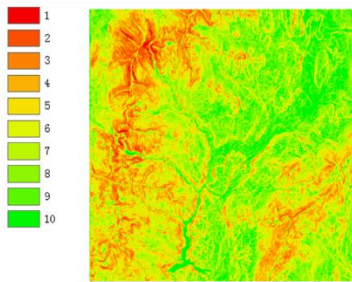
斯魯林

羅克維爾

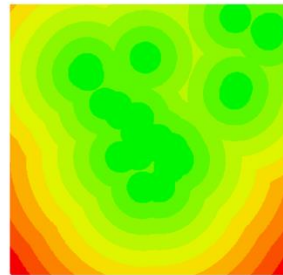
Lab6.1 新建学校选址与最优路线规划



Reclassified Slope



Reclassified distance to recreation sites



Reclassified distance to schools

