Do Not Look at These Solutions until After you Have Completed the Module 3 Watershed Hydrologic Analysis

Watershed boundary based on topographic information. Highlighted main drainage above location of interest, and adjacent drainages.

Subdivided into 3 subwatersheds for more appropriate hydrologic analyses. Need area, CN, and Tc for each subarea, then can use WinTR-55 to calculate the hydrographs from each and the combined hydrograph.

Need to evaluate alternative flow drainage pathways to identify the likely Tc. In this case, four candidate paths are examined.
Subwatershed A
area: 96 acres
CN (B soils and good woods cover): 55
Tc: 0.7 hrs
alternative flow paths need to be evaluated
(there is no specific channel, so only sheetflow and shallow concentrated flow)
flowpath A1 (woods, light underbrush):
  sheetflow: 150 ft at 4.7%  19 min
  shallow conc flow:
    1800 ft at 4.7%  3.9 ft/sec and 1800 ft = 660 sec = 11 min
    900 ft at 0.5%  1.1 ft/sec and 900 ft = 810 sec = 14 min
  total travel time: 41 min = 0.7 hrs
flowpath A2 (woods, light underbrush):
  sheetflow: 150 ft at 7.8%  18 min
  shallow conc flow:
    860 ft at 5.8%  3.3 ft/sec and 860 ft = 288 sec = 5 min
    950 ft at 0.5%  1.1 ft/sec and 950 ft = 855 sec = 14 min
  total travel time: 36 min = 0.6 hrs

Subwatershed B
area: 139 acres
CN (B soils and good woods cover): 55
Tc: 1.2 hrs
alternative flow paths need to be evaluated
(there is no specific channel, so only sheetflow and shallow concentrated flow)
flowpath B1 (woods, light underbrush):
  sheetflow: 150 ft at 1.4%  31 min
  shallow conc flow:
    740 ft at 1.4%  1.5 ft/sec and 740 ft = 490 sec = 8 min
    3100 ft at 1.3%  1.6 ft/sec and 3100 ft = 1940 sec = 32 min
  total travel time: 71 min = 1.2 hrs
flowpath B2 (woods, light underbrush):

- Sheetflow: 150 ft at 1.4% 31 min
- Shallow conc flow:
  - 820 ft at 8.5% 5.0 ft/sec and 820 ft = 160 sec = 3 min
  - 2110 ft at 1.4% 2.0 ft/sec and 2110 ft = 1060 sec = 18 min
- Total travel time: 52 min = 0.9 hrs

flowpath B3 (woods, light underbrush):

- Sheetflow: 150 ft at 1.0% 35 min
- Shallow conc flow:
  - 240 ft at 3.0% 2.8 ft/sec and 240 ft = 85 sec = 1 min
  - 3820 ft at 1.3% 2.0 ft/sec and 3820 ft = 1910 sec = 32 min
- Total travel time: 68 min = 1.1 hrs

Subwatershed C

- Area: 134 acres
- CN (B soils and good woods cover): 55
- Tc: 0.7 hrs

flowpath C1 (woods, light underbrush):

- Sheetflow: 150 ft at 2.4% 9 min
- Shallow conc flow:
  - 2530 ft at 3.6% 2.8 ft/sec and 2530 ft = 900 sec = 15 min
  - 1550 ft at 0.7% 1.4 ft/sec and 1550 ft = 1110 sec = 18 min
- Total travel time: 42 min = 0.7 hrs

flowpath C2 (woods, light underbrush):

- Sheetflow: 150 ft at 9.1% 14 min
- Shallow conc flow:
  - 830 ft at 8.3% 3.8 ft/sec and 830 ft = 220 sec = 4 min
  - 1550 ft at 0.7% 1.4 ft/sec and 1550 ft = 1110 sec = 18 min
- Total travel time: 36 min = 0.6 hrs

Worksheet 5a: Basic watershed data

<table>
<thead>
<tr>
<th>Subbasin name</th>
<th>Discharge area</th>
<th>Trunk conc</th>
<th>Total time through subbasin</th>
<th>Downstream subbasin</th>
<th>Total time to outlet</th>
<th>Rainfall curve number</th>
<th>Rainfall intensity</th>
<th>Total</th>
<th>Referee</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>2500 ft²</td>
<td>0.7</td>
<td>6.0</td>
<td>55</td>
<td>2.1</td>
<td>0.52</td>
<td>0.3</td>
<td>0.53</td>
<td>0.53</td>
</tr>
<tr>
<td>B</td>
<td>1500 ft²</td>
<td>1.2</td>
<td>6.9</td>
<td>55</td>
<td>2.1</td>
<td>0.64</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>C</td>
<td>1000 ft²</td>
<td>0.7</td>
<td>6.9</td>
<td>55</td>
<td>2.1</td>
<td>0.44</td>
<td>0.6</td>
<td>0.6</td>
<td>0.6</td>
</tr>
</tbody>
</table>
### Worksheet for Basic Watershed Data

<table>
<thead>
<tr>
<th>Sub-watershed Name</th>
<th>Description</th>
<th>Area (ac)</th>
<th>Weighted CN</th>
<th>Ts (yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern Sub-watershed</td>
<td>Channel</td>
<td>180.00</td>
<td>85.00</td>
<td>0.700</td>
</tr>
<tr>
<td>Southern Sub-watershed</td>
<td>Outlet</td>
<td>184.00</td>
<td>85.00</td>
<td>0.700</td>
</tr>
</tbody>
</table>

- **Receiving Reach**: Outlet
- **Reach Length (ft)**: 1350
- **Average Width (ft)**: 5.0
- **Average Side Slope**: 0.3
- **Structure Name**: Channel

### Reach Data

<table>
<thead>
<tr>
<th>Stage (ft)</th>
<th>Flow (cfs)</th>
<th>Elevation (ft)</th>
<th>Top width (ft)</th>
<th>Velocity (fps)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>0.5</td>
<td>1.000</td>
<td>3.25</td>
<td>0.000</td>
<td>0.336</td>
</tr>
<tr>
<td>1.0</td>
<td>3.045</td>
<td>0.000</td>
<td>0.000</td>
<td>0.493</td>
</tr>
<tr>
<td>2.0</td>
<td>15.040</td>
<td>22.00</td>
<td>17.00</td>
<td>0.720</td>
</tr>
<tr>
<td>5.0</td>
<td>121.442</td>
<td>100.00</td>
<td>35.00</td>
<td>1.214</td>
</tr>
<tr>
<td>10.0</td>
<td>647.046</td>
<td>250.00</td>
<td>65.00</td>
<td>1.849</td>
</tr>
<tr>
<td>20.0</td>
<td>3722.595</td>
<td>1300.00</td>
<td>125.00</td>
<td>2.964</td>
</tr>
</tbody>
</table>