Planning 101

- What do we have?
- What do we need?

What do we need them for anyway?
Map out important features on the ground first...
main skid trails
filter areas
bridge (limit crossings to this one)
landings
track roads on gentle slopes

...then lay out the roads, trails, etc.
Asset or Liability?

Asset values

- Initial investment & replacement cost
- Emergency access
- Management access

Liabilities

- Delivery
- Garbage dumping
- Man-caused fire
- Maintenance costs
  - RMAP upgrade costs
Constructing Forest Roads

- Old method
- Modern method
What does a road cost?

- Permits
- Right-of-Way
- Grubbing/Clearing
- Drilling/Shooting
- Pioneering
- Culvert installations
- Rocking

~$65,000/mile
Example: Thirty years before harvest entry with 5 crossings per mile. Four out of five crossings need upgrade.

<table>
<thead>
<tr>
<th></th>
<th>Abandon one mile</th>
<th>Maintain one mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>B/C Ratio</td>
<td>3.16</td>
<td>4.08</td>
</tr>
<tr>
<td>Cash Flows (number)</td>
<td>5</td>
<td>53</td>
</tr>
<tr>
<td>Composite Rate of Return (%)</td>
<td>10.15</td>
<td>11.08</td>
</tr>
<tr>
<td>Internal Rate of Return (%)</td>
<td>1.09</td>
<td>N/A</td>
</tr>
<tr>
<td>Investment Length (yrs)</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Net Annual Equivalent ($)</td>
<td>$3,229.72</td>
<td>$3,563.64</td>
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<tr>
<td>Present Net Value ($)</td>
<td>$44,456.55</td>
<td>$49,052.87</td>
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<tr>
<td>PV-Benefits ($)</td>
<td>$65,000.00</td>
<td>$65,000.00</td>
</tr>
<tr>
<td>PV-Costs ($)</td>
<td>($20,543.45)</td>
<td>($15,947.13)</td>
</tr>
</tbody>
</table>
Set An Appropriate Design Standard

Standard should match expected use

- “All-Weather” hauling desired?
- Administrative vehicles?
  - Under what conditions?
- Maintenance vehicles?

Consider: “Most-Weather” design standards
**Crowned Road**

- **When to use:**
  - On high use roads.
  - When the road, ditches and other drainage structures can be routinely maintained.
  - On double-lane main hauling roads.
  - During periods of slippery or icy road conditions.
  - Effective on any road grade.

**Outslope Road**

- **When to use:**
  - On gentle grades (< 8%).
  - Where constructing and maintaining ditches is not possible.
  - On low use or unused roads.
  - In areas where the outslope can be maintained to prevent rutting.

**Inslope Road**

- **When to use:**
  - Surface drainage needs to be carried to a ditch.
  - If outsloping would cause fill erosion.
  - To avoid runoff from directly entering a stream.
  - Slippery road conditions.
  - On steeper road grades.
One way BMPs minimize impacts to water quality is by dispersing concentrated water flow. Circles indicate where BMPs disperse flow to the undisturbed forest floor.
“Most-Weather” Designs Incorporate

- Minimize changes to natural hydrologic pattern
  - Minimal ditch volumes
  - Avoid combining water sources
    - Springs, seep, ground water, overland flows, etc.

- Utilize outslope, inslope, and crown designs

- High tolerance for roadside vegetation
  - Promote low-growing vegetation
Outsloped Filter for Surface flows

Springs not accumulated

Filter for Overland flows
Rocked Dips
Improve Crossing
Self-Maintenance
Guidelines

- Water flows downhill.
- Reduce volumes and velocity of intercepted water to reduce erosion potential.
- Maintain natural pattern of water flow.
- "Cut the head, load the toe"
- Nothing goes over the side unless it can be compacted in place.
- Consider where flows will go if design is compromised or exceeded.
- Self-maintaining design preferred.
- Only use ditches when necessary…they can amplify failures.