

# Best Management Practices and the Logging Sediment Control Act in West Virginia

Dr. Jingxin Wang  
West Virginia University  
Division of Forestry and Natural Resources  
Morgantown, WV 26506

# Outline

- Best Management Practices (BMPs)
- BMPs in West Virginia and Logging Sediment Control Act (LSCA)
- West Virginia BMP Guidelines

# BMPs

- BMPs are designed to reduce non-point source pollution.
- The primary objectives are to:
  - Minimize sedimentation
  - Protect water quality

# Streamside Management Zones (SMZ Width vs. Slope)

	Slope %										
	0	10	20	30	40	50	60	70	80	90	100
Maine	25	45	65	85	105	125	145	165			
New Hampshire	50	70	90	110	130	150	170	190			
Ohio <sup>1</sup>	25	45	65	85	105	125	145	165	185	205	225
Pennsylvania	25+	45+	65	85	105	125	145	165			
Virginia	60	70	100	100	100	120					
West Virginia <sup>2</sup>	100	100	25								

<sup>1</sup> Widths are doubled in Critical Areas. These are areas that require extra precaution.

<sup>2</sup>Stream types: Perennial, Intermittent, and Ephemeral.

# Waterbar Spacing vs. Slope

	Slope %							
	2	5	10	15	20	25	30	40
Maine	250-400	135-250	80-135	60-80	45-60	<45		
Maryland	Spacing (ft.) = 1000/(% slope +2.5)							
New Hampshire	250	135	80	60	45	35		
Ohio	250	135	80	60	45	40	35	
Pennsylvania	250	135	80	60	45	40	35	30
Virginia	250	135	80	60	45	35		
West Virginia *	100	50	50	50	50	40	40	40

Relationship of Water bar Spacing (ft) and Slope of Skid Roads of Other States.

\*Revised in 2009.

# BMP Compliance Comparisons

---

	Year	Landings	Skid Roads	Haul Roads	SMZ's	Overall
Maine	1998	77%	67%	68%	66%	71%
New York	2000	87%	59%	78%	73%	74%
Vermont	1991	80%	70%	41%	—	64%
West Virginia	1996	76%	62%	52%	—	63%

---

BMP Compliance in some Northeastern States.

Brynn and Clausen 1991, Briggs et al. 1998, Schuler and Briggs 2000, Egan et al. 1998)

# BMPs Implementation Cost

By region in Virginia

Region	BMPs Cost \$/Acre		
	Max.	Min.	Median
Coastal plain	39.53	3.17	8.11
Piedmont	64.64	3.17	25.75
Mountains	94.41	12.10	29.29

(Source: The average cost per harvested acre to implement BMPs was studied (Worrell and Shafer 1998)).

- Estimated BMP cost per harvested acre for the mountains is about 3.6 times the cost for harvest sites in the coastal plain.
- The median cost in the mountain region is \$29.29 per harvested acre.
- The conditions of logging operations in WV are similar to these of mountain region of Virginia.
- The value of \$29.29 could be useful as a reference for BMP implementation cost in WV.

# BMPs in West Virginia

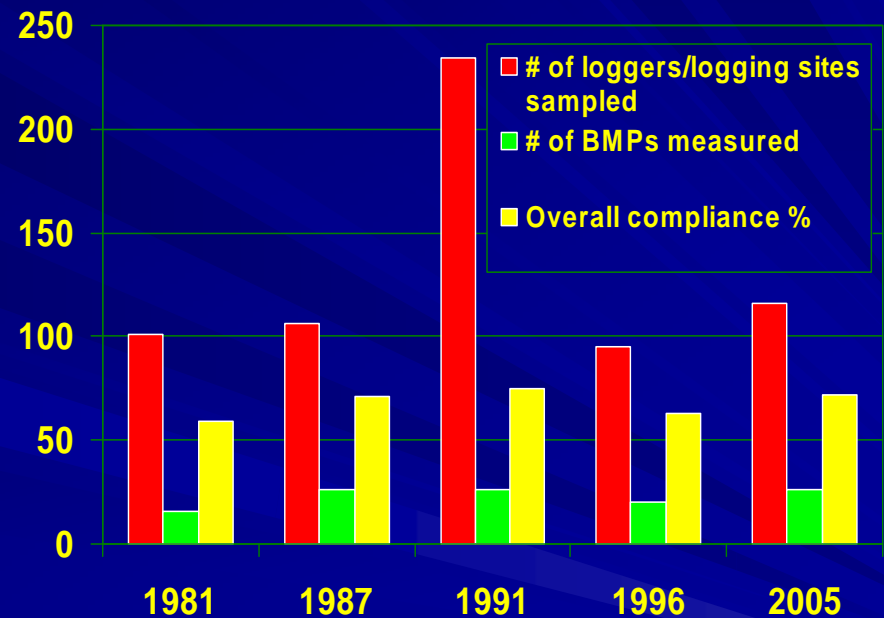
- The BMPs were initiated in 1972.
- BMP guidelines were revised in 1989, 1995, 1996, 2001, 2002, 2005, and 2009.
- Statewide BMP assessments
  - Have been evaluated five times since 1981.
  - Last compliance assessment in 2005.
- Recent assessments were conducted through the WVDOF and WVU.

(Source: Wang et al. 2004)



# BMPs Assessments in WV

- An increase in compliance was seen from 63% in 1996 to 72% in 2005.
- This increase can be attributed to BMP training and workshops offered by the WVDOF
- The data collected will allow future assessment comparisons.



(Source: Wang et al. 2004)

# Logging Sediment Control Act

- The Logging Sediment and Control Act (LSCA) was enacted in 1992.
- The WVDOF is the agency in charge of
  - Enforcing and explaining the LSCA
  - BMP guidelines

# Logging Sediment Control Act

- The LSCA specifically mandates (WVDOF 2006):
  - Logger licensing,
  - Logger certification,
  - Timbering operation notification
  - Logging operation posting,
  - Enforcement capability, and
  - Reclamation.
- There must be a certified logger on each job site:
  - First-aid, BMPs, and Logging Safety
  - \$50 for certification
  - Recertification or renewal for two years
  - Retraining every three years

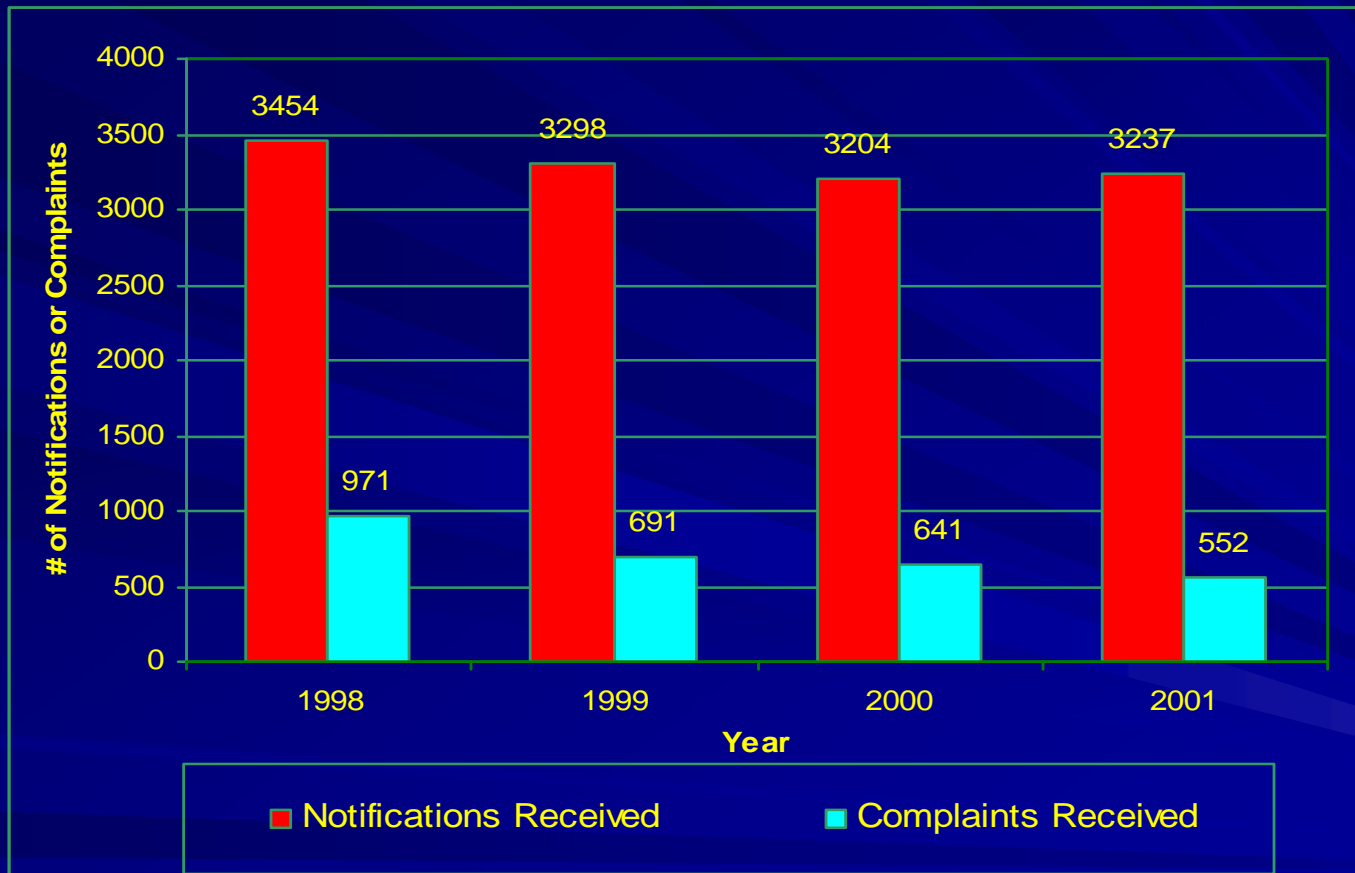
# Logging Sediment Control Act

- The LSCA states that a timbering operation notification form must be submitted within three days of starting a new operation.
- Reclamation of a site must be completed within seven days of completion.
  - If reclamation cannot be completed in seven days the WVDOF must be contacted.

# Logger Licensing

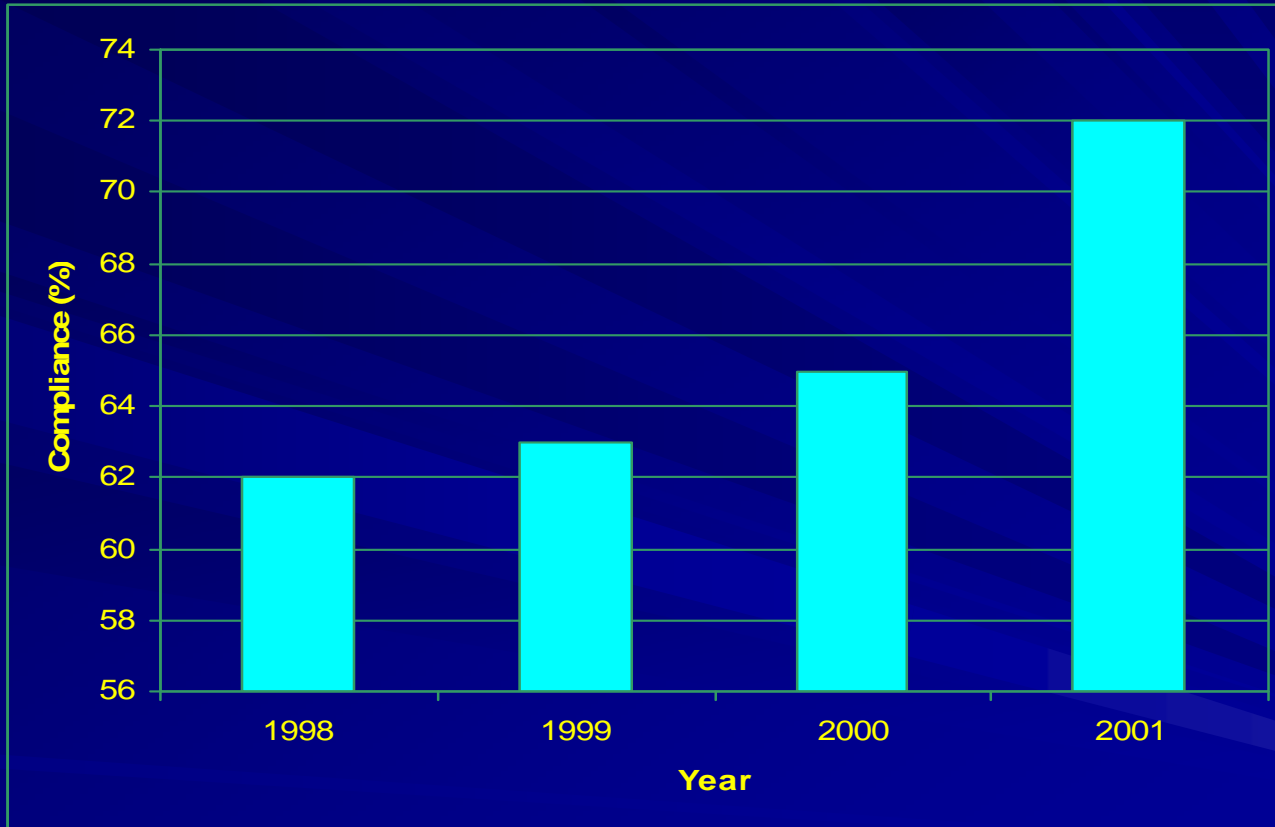
- Anyone conducting a logging operation, buying timber or buying logs for resale is required to be licensed by the WVDOF. The annual fee is \$50.
- The logger is registered by the WV Dept. of Taxes and Revenues.
- It implies that the operator will protect environment quality through the judicious use of BMPs.
- WVDOF citations \$250-\$500 for each violation.

# LSCA Statistics



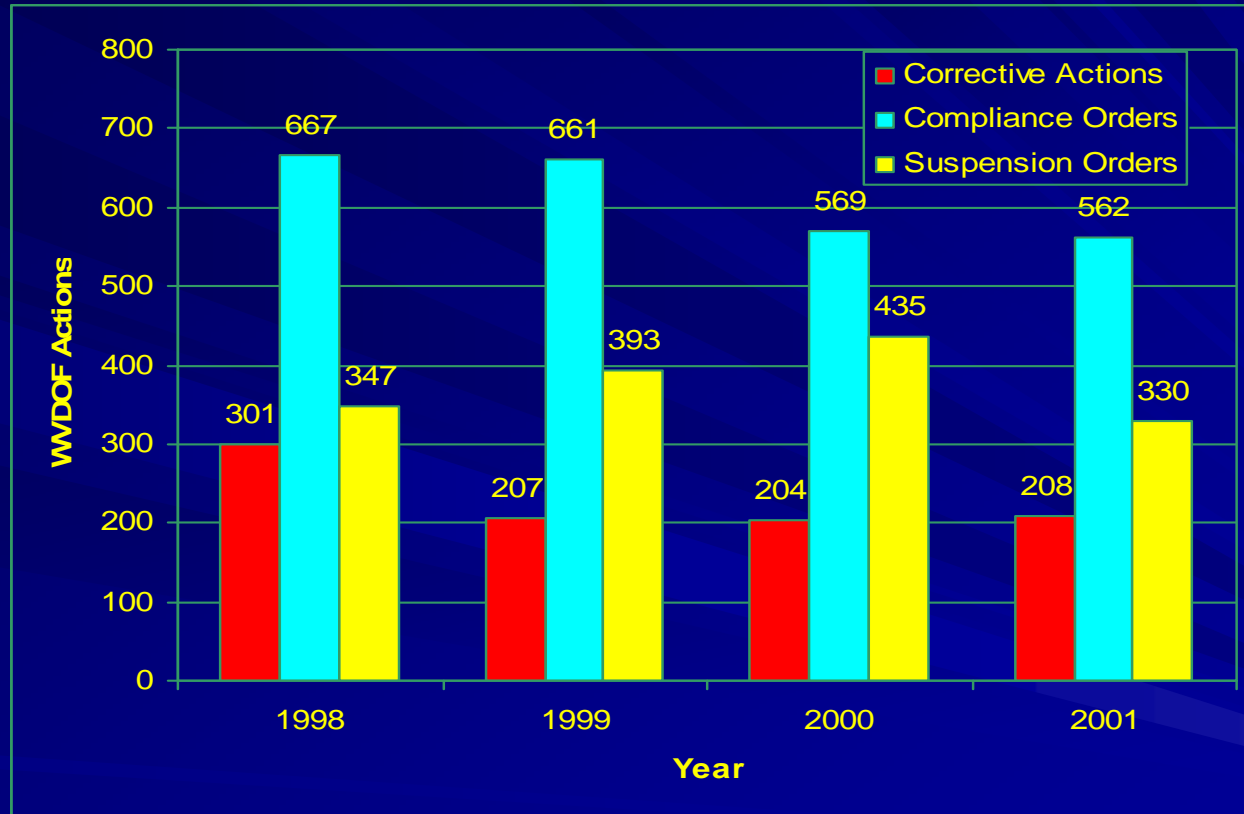
(Source: Wang et al. 2004)

# LSCA Statistics (Cont'd)



(Source: Wang et al. 2004)

# LSCA Statistics (Cont'd)



(Source: Wang et al. 2004)



# LSCA Noncompliance Problems

- LSCA Administrative Procedures (45-50%)
  - No license
  - No notification
  - Job not reclaimed
- Pollution Control BMPs (20-40%)
  - Skid/haul road
  - Muddy water
  - County/state road

(Source: Wang et al. 2004)

# BMPs Guidelines

- Major categories are:
  - Streamside Management Zones (SMZs), haul roads, skid trails, and landings
- Changes include:
  - Culvert spacing
  - Water bar spacing
  - Gravel on haul roads
  - Seeding and mulching
  - Streamside Management Zone width
  - Citations issued by foresters

# SMZ Definition

- Streamside Management Zone (SMZ) –
  - land adjacent to perennial, intermittent and ephemeral streams and ponds or lakes
  - special attention needs to be paid during forestry operations.
- Filter strip – a protective strip of undisturbed forest soil between areas disturbed to mineral soil and a stream bank.

# Stream Types

- Perennial stream – they are usually shown on a topographic map as a solid blue line.
- Intermittent stream - they are usually shown on a topographic map as a broken blue line.
- Ephemeral stream – a flow as a result of wet weather conditions when the ground is saturated. Not shown on topographic maps.

# Guidelines for SMZs

- The minimum SMZ's width:
  - Distance between roads or landings and a perennial or intermittent stream should be 100 ft. slope distance.
  - On ephemeral streams, it should be 25 ft.
- Equipment operation in this area should be limited.
- However, cutting trees and pulling trees are permitted in the area.

# Guidelines for SMZs

- Truck roads and skid trails should not be within the SMZs except when entering and leaving stream crossing.
- Landings should be located outside the SMZ's where practical.
- Recommended spacing of drainage structures such as culverts, water bars, turn-outs and broad-based dips should be used.

# Guidelines for SMZs

- Directional felling should be used to minimize stream disturbance.
- Felled tops in streams should be pulled from the stream channel on all perennial and intermittent streams.

# Guidelines for Haul Roads

- Final center line grade of road should be 10% or less.
- Steeper gradients not to exceed 15% are permissible for distances up to 200 ft.
- Free-flowing watercourses should be crossed as close to a right angle to the stream as possible.



# Guidelines for Haul Roads

- Road gradients approaching water crossing
  - should be broken
  - surface water should be dispersed
  - so it will not flow directly into watercourse.
- Roads may be out-sloped for cross drainage.
- Truck roads that intersect public highways
  - should have gravel
  - aggregate up to 200 ft.
  - keep mud off the highway.

# Guidelines for Haul Roads

- If roads are to be used after logging,
  - broad-based dips and bridges should be left intact and
  - they can be periodically maintained by the landowner.
- If not to be used, remove the drainage structures and build water bars.

# Guidelines for Skid Trails

- Gradients should not be steeper than 15%
- With exception of short, steep segments not exceeding 20%.
- During logging, cross drainage, including turn-outs and water bars should be installed at least every 100 feet.
- Approaches to water crossing should be near to right angles to the stream direction as possible.

# Guidelines for Skid Trails

- Upon completion of skidding, areas subject to erosion should be stabilized quickly.
  - First smoothing the surface and then
  - Establishing water bars.
- Never skid in a stream or directly through a stream.

# Guidelines for Landings

- Adequate SMZs should be left between landings and streams.
- Should be located on dry, firm sites
- Have a slight slopes to allow drainage
- Should be seeded immediately following completion of operations
- Should be no larger than necessary

# Guidelines for Water Bars on Skid Trails

- What is a water bar?
  - a water control structure constructed across a skid road ( $30^{\circ}$  to  $45^{\circ}$ ),
  - usually from soil, to intercept and divert water from road surface.

# Guidelines for Water Bars on Skid Trails

- Permanent water bars are usually constructed at least 1 foot in depth with fill behind it at least 18” high.
- Temporary water bars are usually constructed at least 6 inches to 1 foot in depth.

# Permanent Water Bars

- Installation should be at an angle of 30<sup>0</sup> to 45<sup>0</sup> downslope or more to turn surface water off the road or trail.
- A shallow trench should be dug 1 foot below the surface of the road or trail and extend beyond both sides.
- Fill dirt from the dug water bar should be at least 18” high.



# Permanent Water Bars

## Suggested Spacing to Use in WV

<b>Grade of Road (%)</b>	<b>Distance Between Water Bars (ft.)</b>
<5	100
5-20	50
>20	40

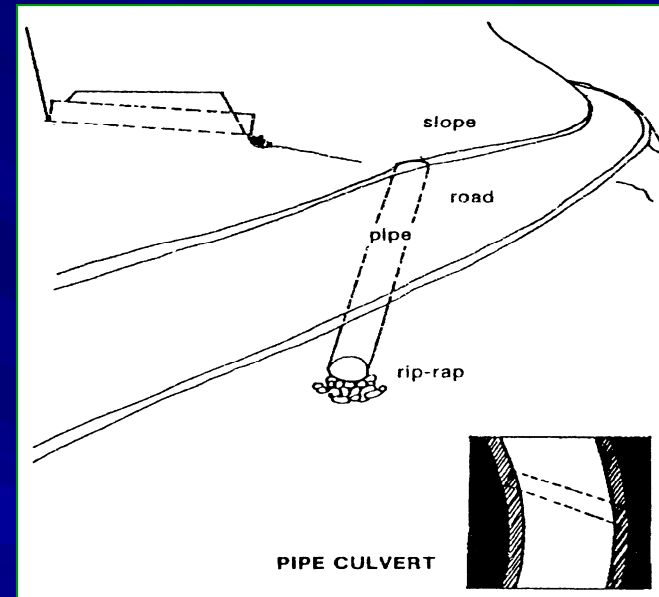
(Source: WV DOF BMPs Guideline 2009)

# Temporary Water Bars

- Spacing for temporary water bars should not exceed 100 ft. apart.
- The depth of a temporary water bar should be 6 inches to 1 foot.
- Temporary water bars are used only for:
  - temporary shutdown or
  - erosion control during road construction

# Guidelines for Pipe Culvert

- Pipe length should be long enough to both ends and extend beyond side slope toes.
  - On haul roads, the minimum length is 25 ft.
  - On skid roads, the length is 20 ft.
- The minimum diameter pipe recommended for use is 15”.
- Erosion protection should be provided for outflows of culverts.



(Source: WV DOF BMPs Guideline 2006)

# Culvert Spacing Guide for Cross Drainage (Ditch Drainage)

<b>Road Grade (%)</b>	<b>Metal Culvert Spacing (ft.)</b>
2-10	400-200
12	150
14	100
16	50

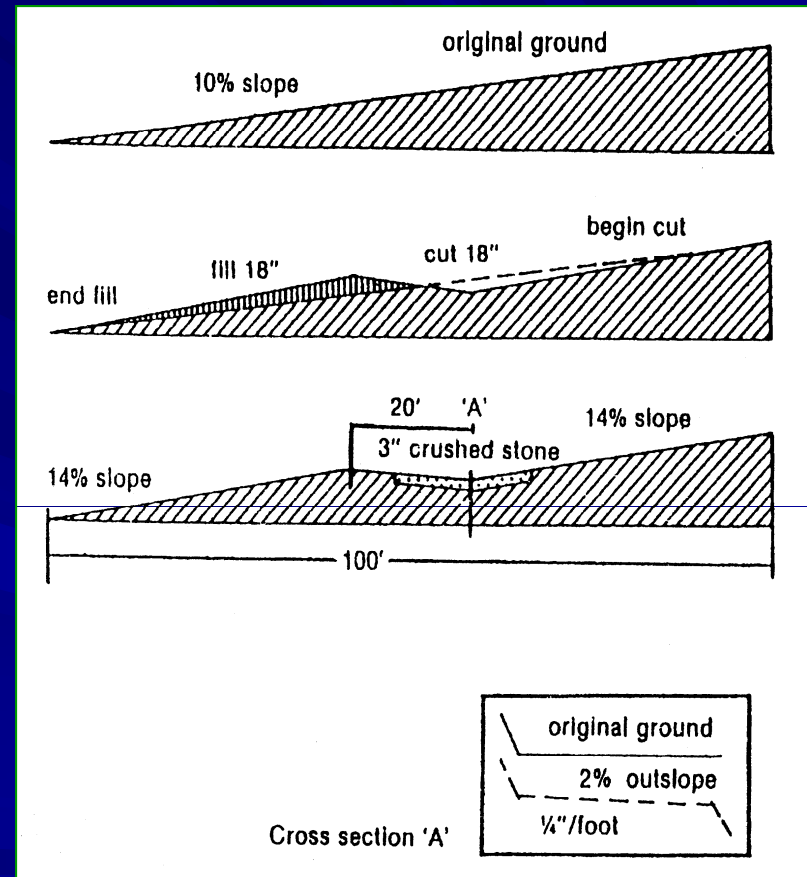
(Source: WV DOF BMPs Guideline 2009)

# Broad-based Drainage Dip

- A dip and reverse slope in a road surface
  - with an outslope in the dip
  - used for natural cross drainage
- Can be used on:
  - truck haul roads, and
  - skid roads having a gradient of 10% or less.
- Is not to be used for cross draining intermittent or live streams.

# Guidelines for Broad-based Drainage Dip

- A 20-foot and 3% reverse grade is constructed into the existing roadbed.
- Cutting from upgrade of the dip location and using cut material for the reverse grade.
- Spacing of broad-based dips should be about 100 ft. apart but never exceed 150 ft. apart.
- Cross drain outslope will be 2-3% maximum.



(Source: WV DOF BMPs Guideline 2006)