

**GRANT NUMBER: C-9994861-11**

**WORKPLAN TITLE: Best Management Practices Implementation on Timber  
Harvests in Kentucky**

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**Kentucky Division of Forestry**

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# Executive Summary

The overall goal of the Best Management Practices Implementation on Timber Harvests in Kentucky project was to facilitate the reduction of non-point source pollution (NPS) originating from timber harvesting operations, through the increased use of properly implemented silvicultural Best Management Practices (BMPs). The primary focus of the study was to evaluate the overall extent of proper BMP implementation across the state, determine what areas need to be improved, and to use this information to improve logger and inspector training. This was accomplished by conducting a survey to evaluate the extent to which BMPs are being properly implemented on timber harvests across Kentucky; continuing the on-going Kentucky Forest Conservation Act training regimen for Division of Forestry field personnel; and providing (with grant funds), eight Kentucky Master Logger (KML) continuing education classes focusing on regional BMP implementation issues.

Site evaluations were conducted between September 2012 and July 2013 by the staff of the Timber Harvest Compliance Section of the Kentucky Division of Forestry (KDF). The timber harvesting operations were located via aerial reconnaissance and chosen by utilizing a random number generator.

Analysis of the data from the survey revealed areas in the timber harvest compliance inspection process that could be improved. Training was developed to address these areas and has been presented to KDF inspectors and their supervisors. Due to the 2013 re-organization of KDF from nine districts to five regions the proposed number of trainings was reduced accordingly. Visits to recently inspected sites with the KDF inspectors and their supervisors allowed for targeted discussion and training concerning issues with BMP implementation and enforcement on individual sites.

The least implemented BMPs for each of the four designated topographic regions of the state were identified and were the focus of eight grant funded KML continuing education classes conducted between February 2014 and July 2014. A ninth class was conducted in September 2014.

Future surveys will study the effectiveness of the new KDF training regimen and modifications to the KML education program. This will allow additional refinements to be made to BMP implementation and associated reductions in NPS pollution from timber harvesting operations.

# Introduction & Background

Research studies have shown the value and effectiveness of proper best management practices (BMPs) implementation in reducing non-point source (NPS) pollution from silvicultural operations. Dr. Lloyd Swift, USFS, Coweeta Hydrologic Laboratory stated, "that the value and effectiveness of BMP practices are so painfully obvious that additional research effort to establish their worth cannot be justified". One such study proves just that, when BMPs were applied correctly, they were effective in protecting water quality in 99% of the cases (Wisconsin Department of Natural Resources, 1999). The same study also observed that improper/inadequate implementation provides little additional protection over not applying BMPs at all. In harvest sites where BMPs were not applied or applied inadequately/improperly, a minor impact to water quality was observed nearly 60% of the time, and major impacts occurred on 6% of the harvest. It is obvious that the key to controlling NPS from timber-harvesting operations is proper use and implementation of appropriate BMPs.

The Kentucky Forest Conservation Act [KFCA] (KRS149.330-149.355) requires in part that beginning on July 15, 2000 any logger or operator engaged in the conduct of any timber harvesting operations shall use appropriate best management practices. The required practices are further defined in the Best Management Practices for Silviculture section of *The Kentucky Agriculture Water Quality Plan*. The statute provides for the designation as a bad actor and the assessment of civil penalties against any logger or operator who fails to implement appropriate BMPs after a progression of enforcement steps designed to give the operator opportunities to implement the BMPs correctly.

Since July 15, 2000 KDF forest ranger technicians have been inspecting known timber harvests for BMP implementation. Although the KFCA requires BMP use on all timber harvesting operations, the statute does not include a requirement for loggers to inform KDF that a harvest is taking place. Therefore, until this study was completed, it was not known what percentage of timber harvests KDF was able to inspect or on what percentage of timber harvests appropriate BMPs were actually being used as required.

The overall goal of the Best Management Practices Implementation on Timber Harvests Study is to reduce NPS pollution originating from timber-harvesting operations through the adequate use of properly implemented silvicultural BMPs. The study was designed to provide information that would meet the following objectives:

- Evaluate the overall extent that BMPs are being properly implemented in Kentucky and determine areas needed to be improved.
- Compare current and historical BMP implementation rates to identify positive or negative trends over time.
- Identify current and future logger training needs, modify existing training programs, and develop new continuing education programs that are tailored to address the needs.
- Determine the effectiveness of KDF inspections and enforcement. Identify modifications needed in inspector training and inspection and enforcement protocols to make them more effective.
- Estimate the percentage of harvesting operations that KDF is inspecting and determine if this level of inspection activity is adequate to meet the state's needs.

Several of the Southern states (ex. Florida, North Carolina, Texas, and South Carolina) have established histories of monitoring timber harvests for BMP implementation using differing methodologies. These differing methodologies made comparing results difficult and in some cases impossible. Therefore, the Southern Group of State Foresters (SGSF), an association of leaders of 15 state forestry agencies, developed guidelines designed to help standardize the individual states monitoring processes thus allowing comparison between the results and compilation of results region wide. This study and the two previous studies (2005 and 2008) were conducted following the framework outlined by the SGSF.

# Materials and Methods

The KDF served as the lead agency for and administrator of this study. The field monitoring and data collection was conducted by KDF's Timber Harvest Compliance Section.

The study was designed utilizing the framework outlined in the SGSF's *Silvicultural Best Management Practices Implementation Monitoring...A Framework for State Forestry Agencies*. This document is included as Appendix B. Due to the varied nature of the topography of Kentucky and using the United States Forest Service's *Forest Product Output* survey to represent the volumes of removed roundwood from each of the seven survey units; the state was divided into four topographic regions. These regions were the Cumberland, Bluegrass and Knobs, Central, and Western and Western Coalfields. A map indicating which counties were included in each region is included as Appendix C.

Using the United States Forest Service's *Forest Product Output* survey to determine the percentage of volumes removed, the 120 sites necessary to achieve a 90% confidence level in the statewide results were allocated to the four regions as follows:

- Cumberland Region – 50
- Bluegrass and Knobs Region – 10
- Central Region – 30
- Western and Western Coalfields Region – 30

Once the regions were identified, potential sites for implementation monitoring were identified by flying gridlines across the individual regions during the spring and summer of 2012 and spring of 2013 using aircraft and pilots from the Kentucky Department of Transportation's Division of Air Services. Latitude and longitude for each site were determined and recorded using Garmin GPS receivers. A map indicating the locations of all potential sites is included as Appendix D. After all potential monitoring sites for a region were located, the sites were assigned a random numerical identification using the Internet based random number generator [www.randomizer.org](http://www.randomizer.org). The random number generator was used a second time to select the sites to be monitored for that region. Additionally, alternate sites in each region were randomly chosen to be used as replacements for any sites determined not to fit the parameters of the study (Harvest occurred more than six to nine months prior to monitoring; land use had changed; or site did not fit the KFCA definition of a timber harvest). To minimize travel time and expense, and maximize monitoring efficiency, all sites in a county, including alternates, were monitored during the field visit to that county, thus avoiding duplicate trips to a specific local. Savings from this practice were greater than anticipated. This allowed for the re-allocation of grant funds to purchase digital cameras for all KDF inspectors for use in documenting violations.

Field visits and data collection commenced in May 2012 and concluded in August 2013. Harvest site characteristics, BMP implementation data, and if the failure to properly implement a particular BMP resulted in an existing or potential adverse change in the chemical, physical or biological condition of a water body (significant risk), were documented using the form attached as Appendix E. All sites where a significant risk was determined to be present were referred to the appropriate KDF regional office for inspection and enforcement. To minimize any potential bias and variation in interpretation, all data were collected by one individual and the determination if a site had been inspected by KDF was made after the site visit and BMP implementation had been documented. A map indicating the locations of sites monitored is included as Appendix F.

# Results and Discussion

A total of 125 individual timber harvesting operations were monitored. Table 1 contains the general site information collected. Data from question 57 on the survey form have been omitted from all calculations as they were a duplication of question 53.

Table 1

	# of Applicable Sites	% of Applicable Sites
<b>Site inspected by KDF</b>	42	34%
<b>Site under active KDF enforcement action</b>	3	2%
<b>Site active at time of monitoring</b>	33	26%
<b>Terrain</b>		
Flat	6	5%
Hilly	81	65%
Steep	38	30%
<b>Risk of Erosion</b>		
Low	15	12%
Medium	92	74%
High	18	14%
<b>Stream Types Present</b>		
Ephemeral	114	91%
Intermittent	60	48%
Perennial	37	30%
Coldwater Aquatic habitat	0	N/A
<b>Distance to nearest permanent water body</b>		
<300'	56	45%
300-800'	11	9%
800-1600'	19	15%
>1600'	30	31%



Overall proper BMP implementation was 74% (+/- 2%). Table 2 shows the implementation rates for each individual BMP standard, the number of harvest sites where each standard was applicable and able to be determined, the computed margin of error for each implementation rate and the number of significant risks associated with the lack of proper implementation.

Table 2

BMP Standard	# of Applicable Sites	Implementation Rate	Margin of Error +/-	# of Significant Risks
<b>BMP # 1: Access Roads, Skid Trails and Landings</b>				
<b>Access Roads</b>				
Access Roads constructed to minimize grade	105	99%	2%	1
Drainage Structures used at proper intervals	68	64%	12%	6
Drainage Structures properly implemented.	68	63%	12%	2
Bridges or culverts used where feasible.	34	88%	11%	3
Stream/Channel crossings at right angles.	47	98%	4%	1
Rutting is minimized	104	95%	4%	1
Access Roads promptly reshaped	80	75%	10%	2
Access Roads promptly revegetated	75	57%	12%	7
<b>Skid Trails</b>				
Skid Trails constructed to minimize grade	123	83%	7%	4
Drainage Structures used at proper intervals	109	41%	9%	28
Drainage Structures properly implemented	96	50%	10%	4
Bridges or culverts used where feasible	49	35%	14%	17
Stream/Channel crossings at right angles.	77	81%	9%	10
Rutting is minimized	123	80%	7%	4
Skid Trails promptly reshaped	118	55%	9%	15
Skid Trails promptly revegetated	117	35%	9%	19
<b>Landings</b>				
Landings located outside of SMZ	124	81%	7%	6
Landings properly drained	124	93%	5%	1
Rutting is minimized	124	95%	4%	2
Landings promptly reshaped	108	91%	6%	2
Landings promptly revegetated	106	49%	10%	6

Table 2 cont.

BMP Standard	# of Applicable Sites	Implementation Rate	Margin of Error +/-	# of Significant Risks
<b>Ephemeral Channels</b>				
Disturbed soil absent from ephemeral channels	115	63%	9%	22
Concentrated Slash absent from ephemeral channels	115	58%	9%	11
<b>BMP #2: Revegetation</b>				
Erodable or severely eroded areas revegetated	103	34%	9%	25
<b>BMP #3: Streamside Management Zones (SMZs)</b>				
<b>Perennial Streams, Lakes and Ponds</b>				
50% overstory tree retention in SMZ for 25ft. Slopes <15%	33	84%	13%	2
50% overstory tree retention in SMZ for 55ft. Slopes >15%	11	91%	17%	1
Equipment use in SMZ avoided except where necessary	39	82%	12%	3
Roads, trails and/or landings in SMZ constructed to protect water quality	30	63%	18%	11
Tree Debris absent from channels and lodged	37	78%	14%	5
<b>Intermittent Streams</b>				
Equipment operation within 25 feet avoided	61	69%	12%	11
Water Quality protected where unavoidable	50	62%	14%	13
Tree Debris absent from channels and lodged	61	57%	13%	14
Mechanical site preparation avoided in SMZ	54	85%	10%	6
<b>Roads/Trails in Stream Channels</b>				
Roads and trails located outside of stream channels except where necessary	78	88%	7%	8
Where channels are used, is it for minimum distance necessary	24	63%	20%	5

Table 2 cont.

BMP Standard	# of Applicable Sites	Implementation Rate	Margin of Error +/-	# of Significant Risks
<b>Cold Water Aquatic Habitats</b>				
Only individual trees or small groups of trees removed	0	N/A	N/A	N/A
75% of original canopy intact within 60 foot SMZ	0	N/A	N/A	N/A
Adjacent understory vegetation undisturbed	0	N/A	N/A	N/A
<b>Equipment</b>				
Fluids not drained from equipment near streams	65	97%	4%	0
Equipment parked away from stream banks	61	95%	6%	0
<b>BMP #4: Sinkholes</b>				
Drainage diverted away from sinkholes	10	80%	25%	1
Soil/debris/waste absent from sinkholes	10	90%	19%	0
Equipment fluids properly disposed of	9	100%	0%	0
<b>BMP #5: Logging debris</b>				
Equipment not left on stream banks				
Equipment fluids not drained onto ground	108	97%	3%	1
Equipment fluids not allowed to wash into stream	103	100%	0%	0
Equipment fluids properly disposed of.	110	93%	5%	2
Cans, bottles, bags, equipment parts etc. properly disposed of	123	79%	7%	0
<b>BMP #7: Fertilization</b>				
Minimum amount necessary used	3	100%	0%	0
Use adjacent to water avoided	3	100%	0%	0
Use within 30 feet of sinkhole bottom avoided	0	N/A	N/A	N/A

Table 2 cont.

BMP Standard	# of Applicable Sites	Implementation Rate	Margin of Error +/-	# of Significant Risks
<b>BMP #10: Silviculture in Wetland Areas</b>				
Permanent road construction minimized	0	N/A	N/A	N/A
Landings located on higher ground	0	N/A	N/A	N/A
Vehicular traffic minimized	0	N/A	N/A	N/A
Stream and slough crossings avoided	0	N/A	N/A	N/A
50% of stream and slough overstory intact	0	N/A	N/A	N/A

$$\text{Margin of error: } m = 2 \sqrt{\frac{P(100 - P)}{n}}$$

M=margin of error

P=percent implementation for individual BMP

N=number of applicable sites

Table 3 shows the comparison of implementation rates for sites which KDF inspected and sites that were not inspected, and if the two implementation rates are significantly different. Statistical significance was determined using a parametric two sample t-test subsequent to performing an arcsine square root transformation on the data set.

Table 3

BMP Standard	Implementation Rate - Inspected Sites	Implementation Rate - Non Inspected Sites	Statistically Significant
<b>BMP # 1: Access Roads, Skid Trails and Landings</b>			
<b>Access Roads</b>			
Access Roads constructed to minimize grade	97%	100%	No
Drainage Structures used at proper intervals	72%	60%	No
Drainage Structures properly implemented.	72%	61%	No
Bridges or culverts used where feasible.	80%	95%	No
Stream/Channel crossings at right angles.	94%	100%	No
Rutting is minimized	92%	97%	No
Access Roads promptly reshaped	65%	80%	No
Access Roads promptly revegetated	53%	59%	No
<b>Skid Trails</b>			
Skid Trails constructed to minimize grade	68%	90%	Yes
Drainage Structures used at proper intervals	51%	36%	No

Table 3 cont.

BMP Standard	Implementation Rate – Inspected Sites	Implementation Rate – Non Inspected Sites	Statistically Significant
Drainage Structures properly implemented	51%	49%	No
Bridges or culverts used where feasible	40%	31%	No
Stream/Channel crossings at right angles.	70%	86%	No
Rutting is minimized	80%	80%	No
Skid Trails promptly reshaped	51%	57%	No
Skid Trails promptly revegetated	38%	34%	No
<b>Landings</b>			
Landings located outside of SMZ	74%	85%	No
Landings properly drained	90%	94%	No
Rutting is minimized	95%	95%	No
Landings promptly reshaped	92%	90%	No
Landings promptly revegetated	46%	51%	No
<b>Ephemeral Channels</b>			
Disturbed soil absent from ephemeral channels	66%	61%	No
Concentrated Slash absent from ephemeral channels	63%	55%	No
<b>BMP #2: Revegetation</b>			
Erodible or severely eroded areas revegetated	36%	33%	No
<b>BMP #3: Streamside Management Zones (SMZs)</b>			
<b>Perennial Streams, Lakes and Ponds</b>			
50% overstory tree retention in SMZ for 25ft. Slopes <15%	73%	90%	No
50% overstory tree retention in SMZ for 55ft. Slopes >15%	75%	100%	X
Equipment use in SMZ avoided except where necessary	79%	84%	No
Roads, trails and/or landings in SMZ constructed to protect water quality	56%	67%	No
Tree Debris absent from channels and lodged	69%	83%	No
<b>Intermittent Streams</b>			
Equipment operation within 25 feet avoided	50%	79%	Yes
Water Quality protected where unavoidable	45%	73%	Yes
Tree Debris absent from channels and lodged	45%	64%	No

Table 3 cont.

BMP Standard	Implementation Rate – Inspected Sites	Implementation Rate – Non Inspected Sites	Statistically Significant
Mechanical site preparation avoided in SMZ	70%	94%	Yes
<b>Roads/Trails in Stream Channels</b>			
Roads and trails located outside of stream channels except where necessary	79%	94%	Yes
Where channels are used, is it for minimum distance necessary	50%	75%	No
<b>Cold Water Aquatic Habitats</b>			
Only individual trees or small groups of trees removed	N/A	N/A	N/A
75% of original canopy intact within 60 foot SMZ	N/A	N/A	N/A
Adjacent understory vegetation undisturbed	N/A	N/A	N/A
<b>Equipment</b>			
Fluids not drained from equipment near streams	91%	100%	Yes
Equipment parked away from stream banks	95%	95%	No
<b>BMP #4: Sinkholes</b>			
Drainage diverted away from sinkholes	75%	83%	X
Soil/debris/waste absent from sinkholes	75%	100%	X
Equipment fluids properly disposed of	100%	100%	X
<b>BMP #5: Logging debris</b>			
Equipment not left on stream banks			
Equipment fluids not drained onto ground	94%	99%	No
Equipment fluids not allowed to wash into stream	100%	100%	No
Equipment fluids properly disposed of.	94%	92%	No
Cans, bottles, bags, equipment parts etc. properly disposed of	68%	84%	No
<b>BMP #7: Fertilization</b>			
Minimum amount necessary used	N/A	100%	X
Use adjacent to water avoided	N/A	100%	X
Use within 30 feet of sinkhole bottom avoided	N/A	N/A	N/A

Table 3 cont.

BMP Standard	Implementation Rate – Inspected Sites	Implementation Rate – Non Inspected Sites	Statistically Significant
<b>BMP #10: Silviculture in Wetland Areas</b>			
Permanent road construction minimized	N/A	N/A	N/A
Landings located on higher ground	N/A	N/A	N/A
Vehicular traffic minimized	N/A	N/A	N/A
Stream and slough crossings avoided	N/A	N/A	N/A
50% of stream and slough over-story intact	N/A	N/A	N/A

X denotes sample size less than 20

Table 4 shows the combined BMP implementation for the four topographic regions of the state. Statistical significance and margin of error are omitted due to sample size limitations.

Table 4

BMP	Western & Western Coalfields	Central	Bluegrass & Knobs	Cumberland	State
BMP # 1: Access Roads, Skid Trails and Landings	76%	68%	78%	70%	71%
BMP #2: Revegetation	55%	26%	25%	30%	34%
BMP #3: Streamside Management Zones (SMZ's)	86%	82%	97%	72%	79%
BMP #4 Sinkholes	100%	93%	100%	60%	90%
BMP #5: Logging debris	93%	95%	92%	88%	92%
BMP #7: Fertilizers	100%	N/A	N/A	N/A	100%
BMP #10: Timber harvesting in wetland areas	N/A	N/A	N/A	N/A	N/A

Implementation on access roads, skid trails and landings was determined separately as was implementation for intermittent and perennial streams. Due to these improvements in the specificity of the data collected, a direct comparison of specific BMP standard implementation rates from the current study and two similar studies completed in 2005 and 2008 is not possible. A general comparison of overall implementation rates does indicate a steady improvement in BMP implementation since the 2005 study. Table 5 contains the same data as table 4 for the study completed in 2005 and table 6 contains the data from the study completed in 2008. The survey form for the study completed in 2005 is included as appendix G and the survey form for the study completed in 2008 is included as appendix H for comparison with the form from the current study (appendix E).

Table 5

BMP	Western & Western Coalfields	Central	Bluegrass & Knobs	Cumberland	State
BMP # 1: Access Roads, Skid Trails and Landings	53%	65%	60%	52%	57%
BMP #2: Revegetation	15%	27%	14%	8%	14%
BMP #3: Streamside Management Zones (SMZ's)	64%	74%	50%	68%	67%
BMP #4 Sinkholes	NA	100%	NA	NA	100%
BMP #5: Logging debris	69%	87%	0%	80%	76%
BMP #7: Fertilizers	NA	NA	N/A	N/A	N/A
BMP #10: Timber harvesting in wetland areas	40%	20%	NA	40%	35%

Table 6

BMP	Western & Western Coalfields	Central	Bluegrass & Knobs	Cumberland	State
BMP # 1: Access Roads, Skid Trails and Landings	73%	75%	64%	60%	68%
BMP #2: Revegetation	59%	60%	33%	22%	41%
BMP #3: Streamside Management Zones (SMZ's)	74%	74%	67%	64%	67%
BMP #4 Sinkholes	100%	95%	100%	100%	96%
BMP #5: Logging debris	96%	96%	80%	76%	86%
BMP #7: Fertilizers	N/A	N/A	N/A	N/A	N/A
BMP #10: Timber harvesting in wetland areas	15%	100%	NA	80%	45%

Overall BMP implementation has steadily increased from 47% in 2005 to 68% in 2008 and finally 74% during the current study. A significant increase in implementation has occurred where the greatest potential for detrimental impacts to water quality exists. Implementation rates for the primary sediment producers on a timber harvest, roads, trails and landings, has improved from 57% to 71% while the implementation rates for Streamside Management Zones have improved from 67% to 79%. Any fluctuations in implementations rates where sinkholes, fertilizers and wetlands are involved should be discounted due to the limited number of sites where the associated BMPs were applicable. Successful implementation of BMP #2 (revegetation of eroded or highly erodible areas) continues to be an issue. This is due to a variety of reasons including but not limited to; failure to sew seed, climactic conditions, compromised soil structure, limited soil fertility and seed viability. Methods to address many of these situations are available but some are beyond the logger's control.



# Conclusions

While the percentage of timber harvests inspected by KDF personnel has declined due to reductions in staffing levels, the combination of education and enforcement has steadily improved the BMP implementation rates from 56% in 2005 to 74%. The associated decrease in documented significant risks to water quality indicate that nonpoint source pollution resulting from timber harvesting operations within Kentucky is declining. Future studies will verify if the efforts to educate loggers and inspectors concerning proper implementation of improved stream crossings, water control measures and re-vegetation have successfully capitalized on past successes.

Continuation of the practice of reviewing recently inspected harvests by THC program staff with inspectors and supervisors is critical to facilitate statewide enforcement consistency and accuracy.

## Lessons Learned

- Significant savings were achieved by conducting monitoring visits on alternate sites in conjunction with primary sites within the same local
- Conducting aerial detection during the growing season significantly reduced the number of sites that were unusable due to excessive time since harvest completion
- Collecting separate implementation data for access roads, skid trails and landings resulted in greater specificity of data, but complicated comparative analysis with data from previous studies
- Unanticipated events such as agency re-organizations, require alterations to project design and implementation

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# Application Outputs

Application Date	Actual Begin Date	Planned End Date	Planned Begin Date	Watershed
6/30/13		Duration	Duration	Submit all final materials to the CDFR for review and approval.
6/30/13		Duration	Duration	Submit all final written notes on all work to the CDFR for review and approval. Final date to be determined.
6/30/13		6/1/2013	6/1/2013	Final review of the Johnson Creek Watershed submittal. Report and/or participants in the CDFR presentation. Present to CDFR.
4/30/13	5/1/13	6/1/2013	6/1/2013	Implementation Monitoring Survey Form Completion. Submit to CDFR for approval.
4/1/13	3/1/13	5/31/2013	4/1/2013	Database review and creation.
4/30/13	4/24/13	6/1/2013	6/1/2013	Survey of the Western and Eastern Coalfields Region.
3/14/13	3/7/13	6/1/2013	6/1/2013	Final Review of Western Coalfields Region.
10/7/12	10/2/12	10/2/2013	9/27/2012	Survey of the Eastern Region.
3/13/13	11/9/12	2/1/2013	4/1/2013	Site Visit Eastern Region.
6/2/13	6/4/13	8/1/2013	7/1/2013	Survey of the Central Region.
8/2/13	6/29/13	9/1/2013	7/1/2013	Site Visit Central Region.
8/24/13	8/20/13	10/1/2013	10/1/2013	Survey of the Mountain and North Region.
9/23/13	9/2/13	3/1/2014	9/1/2013	Site Visit the West and North Region.
7/2/13	8/1/13	6/1/2014	6/1/2013	Data Analysis.
3/1/13	2/1/13	7/1/2014	7/1/2013	Completion of the KDFR inspection reports.
3/8/14	2/4/13	3/1/2014	3/1/2013	Submission of KDFR inspection reports to CDFR for review and approval.
3/6/14	2/13/13	8/30/2014	6/1/2013	Presentation of inspection findings to KDFR inspectors and support staff.
9/23/14	1/20/14	9/30/2014	10/1/2013	Completion of the final KMI Containing Education Programs.
1/22/14	1/22/14	4/31/2014	11/1/2013	Submission of the final KMI Containing Education Programs to DOW for review and approval.
8/1/14	1/2/14	5/31/2014	3/31/2013	Address resolution of KMI Containing Education Programs.
9/23/14	7/1/14	8/31/2014	1/1/2014	Presentation of the final KMI Containing Education Programs.
10/27/14	9/1/14	10/31/14	9/1/14	Final inspection decision for KDFR inspection and approval to document BMT violations on inspected higher watersheds.
6/20/14	6/1/14	3/31/15	9/1/14	Conduct initial assurance monitoring on watershed currently being inspected by KDFR personnel to facilitate accurate and consistent enforcement.
6/20/15	7/10/14	7/31/15	9/1/14	Meet with KDFR regional personnel to address enforcement cases identified during quality assurance monitoring.
6/28/15	6/1/15	9/1/2015	8/1/2015	Final Final Report.
9/1/15	9/1/15	10/1/15	10/1/15	Submit three copies of the final report and submit three copies of all project products to CDFR.

## Appendix A

## Application Outputs

Milestone	Dates			
	Expected Begin Date	Expected End Date	Actual Begin Date	Completion Date
Submit all draft materials to the Cabinet for review and approval.	Duration	Duration		6/30/15
Submit advanced written notice on all workshops, demonstrations, and/or field days to the Cabinet.	Duration	Duration		6/30/15
Upon request of the Division of Water, submit Annual Report and/or participate in the Cabinet sponsored biennial NPS Conference.	1/1/2012	10/1/2015		6/30/15
Implementation Monitoring Survey Form Created and submitted to NPS for approval	1/1/2012	3/31/2012	2/15/12	4/3/12
Database design and creation	4/15/2012	5/31/2012	3/15/12	5/1/12
Survey Flights Western and Western Coalfields Region	6/1/2012	8/31/2012	4/24/12	4/25/12
Site Visits Western and Western Coalfields Region	7/15/2012	9/15/2012	5/7/12	5/24/12
Survey Flights Eastern Region	9/31/2012	4/31/2013	10/15/12	10/17/12
Site Visits Eastern Region	4/15/2013	5/15/2013	11/5/12	3/13/13
Survey Flights Central Region	6/1/2013	8/15/2013	6/4/13	6/5/13
Site Visits Central Region	8/15/2013	9/15/2013	6/25/13	8/8/13
Survey Flights Bluegrass and Knobs Region	10/1/2013	12/15/2013	8/23/12	8/24/12
Site Visits Bluegrass and Knobs Region	9/1/2012	3/31/2014	9/5/12	9/27/12
Data Analysis	9/15/2012	6/31/2014	5/15/12	7/31/15
Creation of 9 (6)KDF inspector trainings	9/31/2012	7/31/2014	2/1/13	3/6/14
Submittal of KDF inspector trainings to DOW for review and approval	11/31/2012	3/31/2015	2/4/13	3/6/14
Presentation of inspector trainings to KDF inspectors and supervisors	9/15/2012	8/30/2014	2/13/13	3/6/14
Creation of 4 regional KML Continuing Education Programs	10/15/2012	9/30/2014	1/2/14	9/25/14
Submittal of regional KML Continuing Education Programs to DOW for review and approval.	11/15/2012	4/31/2015	1/22/14	1/22/14
Advertise availability of KML Continuing Education Programs	2/01/2013	5/31/2015	1/2/14	8/1/14
Presentation of regional KML Continuing Education Programs	1/1/2015	8/31/2015	2/12/14	9/25/14
Purchase cameras and accessories for KDF inspectors and supervisors to document BMP violations on inspected timber harvests	9/10/14	10/1/14	9/15/14	10/27/14
Conduct quality assurance monitoring on harvest sites currently being inspected by KDF personnel to facilitate accurate and consistent enforcement.	9/10/14	3/31/15	9/10/14	6/30/15
Meet with KDF regional personnel to address enforcement issues identified during quality assurance monitoring	9/10/14	3/31/15	9/10/14	6/30/15
Draft Final Report	9/1/2015	9/1/2015	8/1/15	8/28/15
Submit three copies of the Final Report and submit three copies of all products produced by this project.	10/1/15	10/1/15	9/1/15	9/1/15

## Budget Summary

### Original Project Budget

Budget Categories	319(h) Dollars	Match	TOTAL
Personnel	\$31,490.57	\$31,010.83	\$62,501.40
Supplies	\$1,108.90		\$1,108.90
Equipment			
Travel	\$18,080.00		\$18,080.00
Contractual	\$28,650.00		\$28,650.00
Operating Cost		\$21,875.49	\$21,875.49
Other			
<b>TOTAL</b>	<b>\$79,329.47</b>	<b>\$52,886.32</b>	<b>\$132,215.79</b>

### Budget Revision 1 (September 2014)

Budget Categories	319(h) Dollars	Match	TOTAL
Personnel	\$29,990.57	\$31,010.83	\$61,001.40
Supplies	\$10,608.90		\$10,608.90
Equipment			\$0.00
Travel	\$10,080.00		\$10,080.00
Contractual	\$28,650.00		\$28,650.00
Operating Cost		\$21,875.49	\$21,875.49
Other			\$0.00
<b>TOTAL</b>	<b>\$79,329.47</b>	<b>\$52,886.32</b>	<b>\$132,215.79</b>

The first revision to the original budget subtracted \$8000 from 319(h) Travel and \$1500 from 319(h) Personnel and reallocated those funds to 319(h) Supplies to facilitate the purchase of digital cameras and accessories for all KDF inspectors and supervisors. The purpose of the cameras is to document BMP violations on harvests inspected by KDF. KDF received approval from DOW for this budget revision on September 8, 2014.

### Budget Revision 2 (April 2015)

#### Final Budget

Budget Categories	319(h) Dollars	Match	TOTAL	Final Expenditures
Personnel	\$30,572.36	\$31,010.83	\$61,583.19	\$64,608.39
Supplies	\$10,538.31		\$10,538.31	\$10,538.31
Equipment				
Travel	\$10,330.00	\$200.00	\$10,530.00	\$11,662.56
Contractual	\$27,888.80		\$27,888.80	\$27,888.80
Operating Cost		\$21,675.49	\$21,675.49	\$22,287.82
Other			\$0.00	
<b>TOTAL</b>	<b>\$79,329.47</b>	<b>\$52,886.32</b>	<b>\$132,215.79</b>	<b>\$136,985.88</b>

The second budget revision allocated previously unspent funds to 319(h) Travel, 319(h) Personnel and Match Travel to allow for additional quality assurance site visits and

meetings with regional personnel. KDF received approval from DOW for this budget revision on May 4, 2015.

The Kentucky Division of Forestry was reimbursed \$79,329.47. All dollars were spent; there were no excess project funds to reallocate. This project did generate overmatch provided by Kentucky Division of Forestry. This overmatch was not posted to the grant.

Budget Revision 1 (September 2014)

Budget Category	Match	FY14 Dollars	TOTAL
Personnel	231,000.00	231,000.00	462,000.00
Supplies	210,000.00	210,000.00	420,000.00
Equipment			
Travel			
Construction			
Operating Cost	251,874.47	251,874.47	503,748.94
Other			
TOTAL	712,874.47	712,874.47	1,425,748.94

The first revision to the original budget was approved 2/10/14 from 319,000 Dollars and 21,500 (from 1994) Dollars. The second revision was approved 5/19/14 for 21,000 Dollars to facilitate the purchase of digital cameras and accessories for all KDF inspectors and support staff. The amount of the current revision is 251,874.47 Dollars on the total requested by KDF. KDF received approval from DOW for this budget revision on September 2, 2014.

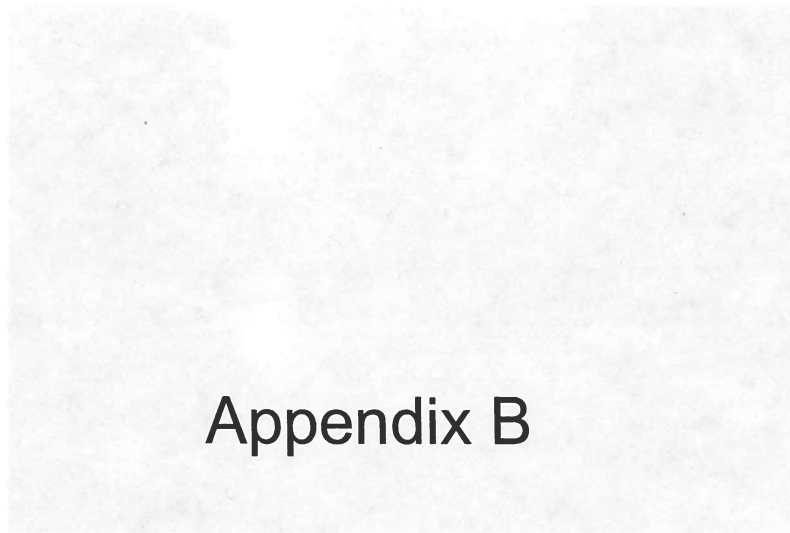
Budget Revision 2 (April 2015)  
Final Budget

Budget Category	Match	FY14 Dollars	FY15 Dollars	TOTAL
Personnel	231,000.00	231,000.00	231,000.00	462,000.00
Supplies	210,000.00	210,000.00	210,000.00	420,000.00
Equipment				
Travel				
Construction				
Operating Cost	251,874.47	251,874.47	251,874.47	503,748.94
Other				
TOTAL	712,874.47	712,874.47	712,874.47	1,425,748.94

The second budget revision on allocated forestry match funds is 21,000 Dollars (2015). Personnel and Match Level to allow for additional digital camera and accessories.

Silviculture Best Management Practices  
Implementation Monitoring

A Framework for State Forestry Agencies



## Appendix B



Southern Group of State Foresters  
Water Resources Committee

June 2011

# Silviculture Best Management Practices Implementation Monitoring

*A Framework for State Forestry Agencies*



SOUTHERN GROUP  
STATE FORESTERS

Southern Group of State Foresters  
Water Resources Committee

June 2007



# Silviculture Best Management Practices Implementation Monitoring

## *A Framework for State Forestry Agencies*

Southern Group of State Foresters  
Water Resources Committee

June 2007

## Foreword

The Federal Water Pollution Control Act Amendments recognized nonpoint source pollution, and called on states to develop and implement water quality management plans. Since then, state forestry and state water quality agencies have been working closely with the Environmental Protection Agency (EPA) to minimize silviculture-related sources of nonpoint source pollution.

To address silviculture related water pollution in the southern states, a traditional regulatory approach was initially proposed. However, after further analysis and consultation with the forestry community, EPA and the states generally agreed that a non-regulatory approach was more effective. This approach was based primarily on education and field demonstration, with the following basic components:

1. Identification of Best Management Practices (BMPs) to protect water quality during forestry operations; and
2. Widespread education/training of forestry practitioners and forest landowners to facilitate the implementation of BMPs; and
3. Routine monitoring of forestry operations to determine the level of BMP implementation.

To date, all southern states have developed silviculture BMPs, which have been approved by EPA. Most of these states have recently revised or updated their BMPs to keep current with changing information and technology. Likewise, all southern states have developed and conducted education and training sessions for forestry practitioners, landowners, managers and loggers, which include the distribution of materials and emphasize BMP implementation.

However, not all of these states have developed routine BMP monitoring procedures to measure actual implementation levels. In addition, no model procedure for conducting such monitoring exists. Thus, states with monitoring programs have measured and reported BMP implementation using significantly different methods. Consequently, monitoring results have been met with varying degrees of acceptance by the public and by regulatory agencies. Inconsistency among states with respect to statistical design, reproducibility, and general objectivity have been cited as areas of concern.

In order to improve and maximize the integrity of BMP implementation monitoring in the South, the Southern Group of State Foresters appointed a Task Force to develop recommendations for a more consistent approach to BMP monitoring in the region. Specifically, the Task Force was charged with developing a framework to provide south-wide guidance for monitoring BMP implementation that would be statistically sound, objective, and technically defensible. This framework would achieve analytical consistency and results would be generally comparable among states.

The Task Force, composed of hydrologists and water quality specialists from state forestry agencies, U.S. Forest Service, and forestry industry, in consultation with EPA Region IV, met during 1996 – 1998 and completed the initial document. On March 25-26, 2002, a subcommittee of that Task Force reconvened and completed this revision.

#### **Task Force Members**

Jeff Vowell – Chairman, Florida Division of Forestry\*  
Frank Green, Georgia Forestry Commission\*  
Tim Adams, South Carolina Forestry Commission  
Darryl Jones, South Carolina Forestry Commission\*  
Robin Bible, Tennessee Division of Forestry  
Sam Austin, Virginia Department of Forestry  
Matt Poirot, Virginia Department of Forestry\*  
Gary Cole, Alabama Forestry Commission\*  
Burl Carraway, Texas Forest Service\*  
Mike Sampson, Mississippi Forestry Commission\*  
John Greis, U.S. Forest Service\*  
David Hoge, U.S. Forest Service\*  
Bruce Prud'homme, U.S. Forest Service\*  
Rob Olszewski, Plum Creek Timber Company  
Jim Shepard, National Council of the Paper Industry for Air and Stream Improvement

\* Subcommittee members, 2002

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## Introduction

This document is presented as an Implementation Monitoring Framework within which state forestry agencies can build or revise their current monitoring programs. Widespread utilization of this document within the region is expected to improve consistency among states in the specific aspects of BMP monitoring listed below. In addition, the recommendations for each specific aspect are envisioned to be core elements of a credible evaluation and reporting process.

### Monitoring Frequency

*Issue:* How frequently should BMP implementation monitoring be conducted and reported?

*Alternatives Considered:* Annual, biennial, every three years and continual monitoring.

*Recommendation:* Statewide implementation monitoring should be conducted and reported at a minimum of every three years.

*Rationale:* Due to the large number of forestry operations conducted annually, the number of sites necessary to achieve statistical reliability, and the logistics of locating, visiting and evaluating them, annual monitoring and reporting is often not practical. Further, there are no significant advantages of annual monitoring and reporting that justify the additional burdens.

Monitoring and reporting on at least a three year basis is more logistically achievable, and is consistent with typical 319 funding cycles for states receiving federal grants. In addition, monitoring at this frequency is considered often enough to allow visual observations of on-site problems and take timely corrective action.

### Site Selection

*Issue:* What characteristics should a forestry site/operation exhibit in order to qualify as a BMP implementation monitoring site?

*Alternatives Considered:*

1. Minimum/no minimum area (acres)
2. Presence/absence of surface water on site
3. Time since treatment (years)
4. Site selection methodology (to eliminate bias)
5. Sample size (statistically valid confidence interval)

*Recommendations.*

1. No minimum area, but a site must be part of a normal, ongoing silvicultural operation, i.e., not in the process of conversion to another land use.

*Rationale:* Since forestry operations occur on tracts of all sizes and BMPs apply regardless of acres involved, all forestry operations should be eligible for monitoring. However, operations that include timber harvesting as part of a change in use, should be disqualified regardless of the size of the operation. Such activities would not accurately reflect normal silvicultural operations.

2. The presence of surface water features is not necessary for a site to be eligible for BMP implementation monitoring.

*Rationale:* BMP implementation in most states is not contingent upon the presence of surface water on-site. However, those states that have proximity restrictions associated with BMP implementation should select monitoring sites using the appropriate criteria.

3. The most recent silviculture activity(s) on a site to which BMPs apply must not have been completed more than 2 years prior to implementation monitoring.

*Rationale:* Forestry operations more than 2 years prior are increasingly difficult to evaluate because of rapid regrowth of vegetation and more difficult access. Likewise, evidence of erosion and sedimentation become less visible over time, as does the opportunity to correct such problems without "re-disturbing" sensitive areas.

4. Sites for implementation monitoring may be located using aerial reconnaissance, severance tax records, notification logs, or other available sources of information. However, it is essential to achieve random, stratified random or randomized cluster statistical design to obtain an unbiased sample.

*Rationale:* Several data sources can provide the information necessary to select a random sample of forestry operations sites. However, it is important that the sample population accurately reflect actual conditions in a given state. For example, portions of a state in which forestry operations are concentrated should be sampled accordingly, as should those with fewer operations.

5. The sample size should be sufficient to achieve an estimate of implementation that is  $\pm 5\%$  within the 95% confidence interval.

*Rationale:* To maximize the validity and credibility of the monitoring results, the number of sites evaluated for BMP implementation should be calculated to provide minimum error ( $\pm 5\%$ ) and high confidence (95%). Designing a statistically valid sampling procedure for implementation monitoring and analyzing the results should be consistent with "Sampling and Estimating Compliance with BMPs" (1) and/or the *Statistical Guide for BMP Implementation Monitoring* found in the Appendix.

## Practices to be Evaluated

*Issue:* Which categories of practices should be evaluated for BMP implementation monitoring?

*Alternatives Considered:* Harvesting; Site Preparation (mechanical, chemical, burning); Forest Roads; Stream Crossings, Streamside Management Zones, Firebreaks, Forest Chemical Application (fertilization, herbicides).

*Recommendation:* All of the above alternatives should be evaluated.

*Rationale:* These BMP categories contain all practices that are generally associated with operational silviculture in the South.

### **Basis for Practice Evaluation and Reporting**

*Issue:* On what basis should BMPs be evaluated and reported?

*Alternatives Considered:* Individual practices, Categories of practices, Overall site.

*Recommendation:* Evaluation and reporting should include all three levels of BMPs listed above.

*Rationale:* Evaluation of BMPs at the practice level provides the basic measure of on-site BMP implementation. This level of information also allows for comparison of a specific practice among all monitoring sites and against any other site variables. Such comparisons are useful for identifying those variables most often associated with non-implementation.

In addition, by evaluating categories of practices, monitoring can provide broader conclusions about BMP implementation for stream crossings, roads, etc. Also, this information can identify training needs for forestry agency personnel, and education needs for forestry practitioners.

It is likewise useful to water quality agencies, other interested parties and particularly forest landowners to know the overall or cumulative level of BMP implementation for individual forestry operations. This is a primary and traditional measure of program success, and indicates the efficacy of the non-regulatory approach to controlling silvicultural related nonpoint source pollution.

### **Scoring Methodology**

*Issue:* How should BMP implementation monitoring be scored?

*Alternatives Considered:* Pass/Fail; Graduated Scale; Percent Correct Implementation; Yes/No

*Recommendation:* An individual practice should be scored as “Yes” when applied as specified in the state's BMP Manual. If a particular practice is not applicable, this should be noted as well. Any significant deviation from practice specifications should result in a

“No” answer for BMP implementation. Categories and overall scores should be expressed as a simple percentage of all applicable practices. For example, if 100 practices were applicable but only 90 were actually implemented correctly, then the score would be 90% for that category or site, as the case may be.

*Rationale:* Evaluating whether or not BMPs have been properly implemented, and their applicability to specific site conditions yields the most objective and reproducible method of implementation monitoring. While some judgment will always be necessary in questionable situations, objectivity can be maximized by training. In addition, subjectivity and confusion are minimized by avoiding practice evaluations based on graduated scales for partial implementation, or arbitrary "Pass/Fail" declarations. Simple “Yes/No” scoring of BMPs also facilitates the calculation, summarization and reporting of category and overall implementation levels on a percentage basis.

## **Risk Assessment**

*Issue.* How should the risk to water quality resulting from failure to implement BMPs be evaluated and documented?

*Alternatives Considered:* No evaluation of risk; Risk evaluated and significant risk noted.

*Recommendation:* Risk to water quality should be evaluated and significant risk documented. Significant risk may be attributed to non-implementation for a specific BMP, category of BMPs or the overall operation. The field evaluation of significant risk should be based on existing on-the-ground conditions resulting from failure to correctly implement BMPs, that if left unmitigated will likely result in an adverse change in the chemical, physical or biological condition of a waterbody. Such change may or may not violate water quality standards.

Key site conditions often associated with significant risk include, but are not limited to; steep topography and highly erodible soils. Forestry operations conducted under one or more of these conditions without proper implementation of certain BMPs may have a high potential to result in significant risk to water quality. Some examples of forestry activities where significant risks have been identified are equipment operation in close proximity to surface waters, stream crossings, logging slash disposal and intensive mechanical site preparation. A list of on-site indicators of significant risks to water quality is located in the Appendix.

Significant risk should be considered as a situation or set of conditions that can be remedied or otherwise mitigated (2). In addition, failure to implement BMPs that results in risks to site productivity, road usability or other site values should not be considered a significant risk in the context of implementation monitoring. Significant risk should be directly and exclusively related to water quality impairment.



*Rationale:* Documenting the occurrence of significant risk serves a number of useful and practical purposes. First, risk assessment lends much credibility and integrity to the BMP monitoring process by recognizing that high risk conditions can occur, and that prevention and/or restoration is a high priority for state forestry agencies. Second, routine documentation of significant risk will determine whether such instances are the exception rather than the rule, and that lack of BMPs during a silviculture operation may not necessarily equate to or result in a water quality problem - this is particularly important as it relates to BMP effectiveness monitoring (3). Finally, providing forest landowners with an objective risk assessment is a valuable public service that not only protects the environment, but can also protect the landowner and/or operator from what might otherwise result in enforcement proceedings or other personal liability.

### **Follow-up Actions**

*Issue:* What specific actions should states take following BMP implementation monitoring?

*Alternatives Considered:* No follow-up; Courtesy copies of monitoring results, Personal visit; Referral (where necessary) to regulatory agency.

*Recommendation:* Landowners who have participated in the implementation monitoring should be provided a copy and explanation of the monitoring results. In addition, participating landowners should receive recommendations for any remedial actions deemed necessary by the field observer. In cases where a significant risk has been identified, state forestry personnel should attempt to schedule a follow-up site visit with the landowner, to insure that recommendations were understood and implemented satisfactorily.

*Rationale:* Follow-up activities with landowners and/or loggers serves as a useful educational opportunity, as well as a demonstration of cooperation and courtesy. The BMP monitoring data provides an excellent focal point for reviewing the performance of an operator and the responsibilities of the landowner, in terms of water quality and site protection. Remedial or other actions can also be recommended at this time, as can commendation for a job well done.

Where a significant risk has been identified in the monitoring process, an on-site follow-up can be vital to insuring that the landowner/operator is aware of the seriousness of the situation and advised of remedial actions. Potential consequences of inaction can be explained and discussed at that time also, and should include environmental impacts as well as possible enforcement actions or other liabilities. This effort can provide the basis for fulfilling the responsibilities of the state forestry agency, and provide the landowner with the information from which to make an informed decision.

## References

- (1) McNew, Ronald W. 1990. Sampling and Estimating Compliance with BMPs, in Workshop on Implementation of Forestry Best Management Practices. Southern Group of State Foresters and USDA Forest Service. Atlanta, GA. January 23-25, 1990. Edited by G. Dissmeyer
- (2) Vowell, Jeffery L. and Roy Lima, 2002. Results of the 2001 Silviculture BMP Compliance Survey. Florida Department of Agriculture and Consumer Services, Division of Forestry; Tallahassee, Florida.
- (3) Dissmeyer, George E. 1994. Evaluating the Effectiveness of Forestry Best Management Practices in Meeting Water Quality Goals or Standards. USDA Forest Service, Miscellaneous Publication 1520.

## Acknowledgements

The Southern Group of State Foresters wishes to thank the Task Force members and acknowledge the assistance provided by the water resource specialists from other state forestry agencies in the Southern Region. In addition, appreciation is expressed to the U.S. Forest Service Southern Region and the U.S. EPA Region IV for considerable expertise in this effort. Finally a special thanks is expressed to George Dissmeyer (retired, U.S. Forest Service) for his leadership in helping organize and initiate this process.

## Glossary

**Implementation Monitoring** – The process used to determine the proper application of BMPs according to the specifications in individual state BMP Manuals.

**Risk Assessment** – The process and criteria used to identify a significant risk to the chemical physical or biological integrity of water quality.

**Significant Risk** – An existing on-the-ground condition resulting from failure to correctly implement BMPs, that if left unmitigated will likely result in an adverse change in the chemical, physical or biological condition of a waterbody. Such change may or may not violate water quality standards.

Statistical Guide for  
BMP Implementation Monitoring

## **APPENDIX**

Statistical Guide for BMP Implementation Monitoring

Significant Water Quality Risk Indicators

Dr. Ron Moore, Professor, University of Arkansas  
John C. G. USDA's Region 8 Hydrologist  
Hughes Station, Little Rock, Arkansas

Southern Group of State Foresters  
Water Resource Committee

October 2006

**Statistical Guide for  
BMP Implementation Monitoring**

by

Hughes Simpson, Texas BMP Coordinator  
John Greis, USDAFS Region 8 Hydrologist  
Dr. Ron McNew, Professor, University of Arkansas

Southern Group of State Foresters  
Water Resources Committee

October 2006

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## Introduction

Implementation monitoring is the process used to determine the proper application of Best Management Practices (BMPs) according to the specifications in individual state BMP Manuals. In 1999, the Southern Group of State Foresters (SGSF) endorsed a monitoring framework designed to provide regional guidelines for monitoring BMP implementation so that consistency and reliability of southern state efforts would be maximized. The framework calls for evaluations to be conducted on randomly selected forestry operations and to result in data that is statistically valid.

Field evaluations consist of answering “yes”, “no”, or “not applicable” to questions regarding proper implementation of specific BMPs. These are typically broken down into several activity categories (roads, trails, stream crossings, etc.). Each question represents a specific BMP (“yes” means the BMP was implemented correctly and “no” means it was not). If a BMP listed on the evaluation form was not applicable to that site, “not applicable” is recorded. Additionally, the presence of a significant risk to water quality is noted for each question if, due to a lack of or malfunction of a BMP, water quality has been impacted or is clearly threatened. To determine the implementation rate, the total number of “yes” answers is summed and then divided by the total number of applicable answers (yes / yes + no) to determine the total BMP Implementation rate, expressed as a percent, for the site.

After combining all results, BMP implementation may be reported for the state, regions of the state, landowner types, forestry activities, river basins or watersheds, and BMP groups or other categories of interest for reporting purposes. Strengths (BMPs along streams) and weaknesses (BMPs on roads) are generally identified from the results.

In 2004, a task force of the SGSF Water Resources committee was formed to develop this statistical guidebook to assist the southern state forestry agencies with BMP implementation monitoring design and reporting. Included with this guidebook is an Excel spreadsheet created to help states determine how many sites are needed to conduct a statistically reliable survey, calculate the margin of error for each BMP evaluated and reported, and analyze statistical trends in BMP implementation.

Major elements in the design of a statistically valid BMP implementation survey include:

- sampling intensity (total number of sites needed for the survey)
- methodology of choosing sites
- how to ensure randomness of the samples
- stratification of field sites (# of samples per county, landowner type, etc.) so that sound conclusions can be drawn from each.

Key calculations for the analysis of a BMP implementation survey will include:

- determining statistical significance of BMP trends
- confidence intervals and margin of error

## Survey Design

### Determining the sample size, or number of sites to evaluate

$$n = \frac{4p(100 - p)}{m^2}$$

Where **n** = the number of sites to evaluate

**p** = the estimated overall percent implementation in the state

**m** = the margin of error (5%)

#### Notes:

- **p** must be estimated because it is unknown (% implementation from the most recent round of monitoring may be used)
- The closer the estimated value of **p** is to 100, the lower the value of **n** will be.
- **n** is highest when **p** is estimated to be 50%.
- **m** is the margin of error associated with the estimate of **p**. There is .95 (95%) probability that the sample taken will produce an estimate which differs from **p** by a value of **m**

#### Example:

$$n = \frac{4p(100 - p)}{m^2}$$

Where **p** (overall BMP implementation) is estimated at 80%

$$n = \frac{4(80) * (100 - 80)}{5^2}$$

$$n = \frac{6400}{25}$$

$$n = 256$$

#### Using the spreadsheet.

The spreadsheet is set up so that all that must be entered is the estimated value of **p** (Est. % BMP Impl). It will then automatically calculate the number of sites to evaluate based on an embedded formula and a margin of error equal to 5% (as recommended by the SGSF framework).

**\* These equations calculate the minimum number of sites necessary to evaluate. Increasing the sample size will yield an even more accurate estimate of BMP implementation. A minimum of 100 sites is recommended.**

### Data Storage

BMP implementation monitoring data can be stored in a number of different formats. The easiest is an Access database consisting of the individual state's BMP monitoring form (checklist), data tables, queries, and reports. Site evaluations can then be entered directly into the database in a user friendly format. Queries and filters can be created to display the "target" data (i.e. implementation scores for tracts in which a professional forester was involved) for export to the *Statistical Guidebook Spreadsheet*. Reports can provide a quick glance at the results of the survey (i.e. % implementation by county). GIS programs can import data for geographical representation and further analysis. A sample database is available for states to customize to fit their needs.

### Site Selection

BMP field sites may be selected in a number of ways: aerial reconnaissance, severance tax records, timber deeds, drive-bys etc. To avoid bias, it is important that personnel involved in the site selection process do not contact consulting foresters, industry foresters, or large landowners to provide a list of recent harvesting operations. This could bias samples to the "good" sites. Of equal importance is to avoid selecting sites thought to be either "good" or "bad". The SGSF framework calls for sites to be no older than 2 years after the most recent treatment activity.

### Ensuring Randomness

Ensuring randomness is critical in any type of sampling. One way to help achieve randomness is to identify twice as many sites as are needed for the survey, and use a random number generator to identify specific sites to monitor.

### Stratification of Field Sites by Ownership, Watershed, or Other Factors

Stratifying the monitoring sites based on important characteristics such as ownership type, watershed, or physiographic region, can add substantial value to the survey's results. It is important that the sample taken be reflective of the actual conditions. There are two ways to accomplish this:

- Take a truly random sample from the population (this will solve the stratification but is extremely difficult).
- Intentionally select sample sites based on their stratum

Forest Inventory and Analysis (FIA) data may be used to estimate the number of sites undergoing forestry operations by landowner type. This percentage can then be used to estimate the number of monitoring sites each landowner group should comprise.



## Data Analysis

### Margin of Error

The margin of error expresses the maximum likely difference observed between the sample mean and the true population mean with 95% probability. It is an important statistical calculation and can be performed for an individual BMP evaluation question (i.e. SMZ width). The following formula is used to perform this calculation:

$$m = 2\sqrt{\frac{P(100-P)}{n}}$$

Where **m** = margin of error for a single BMP  
**P** = the percent implementation for a single BMP  
**n** = the number of sites on which the BMP were evaluated

#### Notes:

- If the actual value of **P** is larger than the estimated value of **P**, then the actual margin of error will be smaller than **m**.
- This equation is not valid for a subset of all possible sites (i.e. calculating margin of error from the % BMP implementation for NIPF landowners.)
- For a BMP that is not applicable to all sites, the actual margin of error will be larger than **m**.
- Estimating the average % BMP implementation across all possible sites for a group of BMPs and then using this number of sites will produce a margin of error that is smaller than **m**.
- If the value of **P** is 100%, the margin of error is not zero. No calculation can be made.

#### Example:

$$m = 2\sqrt{\frac{P(100-P)}{n}}$$

Where **P** (% BMP impl. for adequate SMZ width) was evaluated to be 89% on 125 sites

$$m = 2\sqrt{\frac{89(100-89)}{125}}$$

$$m = 2\sqrt{\frac{979}{125}}$$

$$m = 2\sqrt{7.832}$$

$$m = 5.597$$

Using the spreadsheet:

The spreadsheet is designed to calculate the margin of error for a single BMP. All that must be entered is the % implementation for a single BMP (% for single BMP) and the number of sites on which that BMP was evaluated (# of sites).

### 95% Confidence Interval

The 95% confidence interval is a tool that statisticians use to demonstrate their confidence in the measured mean of a sample. It provides a range for which they are 95% confident (i.e. 19 times out of 20) that the actual mean will be found within that range. To calculate the 95% confidence interval, you must also calculate the mean, variance, standard deviation, standard error, and margin of error.

Example:

Let's calculate the 95% confidence interval for the following sample:

95%, 80%, 88%, 100%, 77%

First calculate the mean.

$$\frac{95+80+88+100+77}{5} = \frac{440}{5} = 88\%$$

Then calculate the variance.

Step 1.  $USS = 95^2 + 80^2 + 88^2 + 100^2 + 77^2 = 39,098$

Step 2.  $SUM = 95 + 80 + 88 + 100 + 77 = 440$

Step 3.  $CF = 440^2 / 5 = 193,600 / 5 = 38,720$

Step 4.  $CSS = 39,098 - 38,720 = 378$

Step 5.  $DF = 5 - 1 = 4$

Step 6.  $Variance = 378 / 4 = 94.5$

Next calculate the standard deviation.

$$\text{Std dev.} = \sqrt{\text{variance}} = \sqrt{94.5} = 9.721$$

After that, calculate the standard error.

$$\text{Std. error} = (\text{Std dev.} / \sqrt{\text{number of sites}}) = 9.721 / \sqrt{5} = 4.347$$

Next, calculate the margin of error.

$$\text{Margin of Error} = 2(\text{Std. error}) = 2(4.347) = 8.695$$

Finally, use the margin of error to calculate the 95% confidence interval.

$$95\% \text{ Confidence interval} = \text{Mean} \pm \text{Margin of Error} = (79.305, 96.695)$$

### *Using the Spreadsheet*

The spreadsheet is set up so that all that must be entered is the individual tract scores (Indiv. % Impl) and the total number of sites (# of sites). The spreadsheet automatically calculates the mean, variance, standard deviation, standard error, margin of error, and the 95% confidence interval (low and high ends).

### **BMP Trend Analysis**

Analyzing trends or patterns in BMP implementation can be useful to target areas or ownership types for concentrated educational efforts (i.e. additional logger training workshops). Commonly reported trends include higher BMP implementation rates when professional foresters are used, the landowner is familiar with BMPs, and the logger has attended BMP training.

In order to determine trends in BMP implementation, several statistical analyses should be performed. First, a parametric two sample t-test is conducted because of the large sample size. This percentage data must undergo an arcsine square root transformation prior to analysis. Percentage data must be transformed because they are not normally distributed, which invalidates the normality assumption of the parametric test. A non-parametric test (Wilcoxon) may also be performed to add greater statistical validity.

To determine statistical significance, the resulting  $P$  value was compared to the level of significance. The  $P$  value is the probability of observing a value of the test statistic as contradictory (or more) to the null hypothesis as the computed value of the test statistic. In these tests, a 0.05 (5%) level of significance was used. For the two implementation ratings to be significantly different, the  $P$  value must be lower than the level of significance.

### *Using the spreadsheet:*

The spreadsheet is set up so that all you have to do is enter the individual scores for the tracts that answered “yes” to the particular trend question and likewise for those that answered “no” in the respective column. It will then perform the arcsine square root transformation and conduct a parametric two sample t-test on the new data, based on a level of significance of .05. This value will be used to determine whether the difference in implementation scores for that particular trend is statistically significant. This classification is noted by the answer “TRUE” found under the Stat. Diff column.

**\*\*The arcsine square root transformation was conducted so that Microsoft Excel could perform the analysis. More robust tests (non-parametric tests like the Wilcoxon) may be conducted to add greater statistical validity. These tests are not included in basic Microsoft Excel programs but can be found in programs like *JMP, SAS, or Statistica*.**

## Area Weighting BMP Implementation Data

Results are typically reported giving equal weight to all sites (i.e. a 20 acre tract counts the same as a 450 acre tract when compiling all data). Statistically, tracts could also be weighted based on their acreage, i.e. larger tracts would have a greater influence on the total % BMP implementation than the smaller tracts. This analysis can be performed to provide information on how the practices are impacting the total landscape. Both methods are useful in reporting BMP implementation rates, though the SGSF framework does not call for area-weighting. The following formula may be used to perform this calculation.

$$AW \% = \Sigma (((\text{indiv } A / \text{Total } A) * 100)) * \% \text{ Impl})))$$

Where **AW %** = area weighted BMP implementation %  
**A** = area (acres)  
**% Impl** = individual tract % BMP implementation

*Example:*

For this example, let's use 5 individual tract scores and their respective size:

95% - 100 acres, 80% - 35 acres, 88% - 70 acres, 100% - 275 acres, 77% - 20 acres

*Equal weighted % BMP Implementation = Sum of scores divided by number of sites*

$$\frac{95 \ 80 \ 88 \ 100 \ 77}{5} = \frac{440}{5} = 88\%$$

*Area weighted % BMP implementation = Sum of scores proportional to tract size*

<b>% BMP Impl</b>	<b>Tract Size</b>	<b>% of Total</b>	<b>AW %</b>
95	100	20	19
80	35	7	5.6
88	70	14	12.3
100	275	55	55
77	20	4	3.1
<b>Total</b>	<b>500</b>	<b>100</b>	<b>95</b>

$$= 95\%$$

*% of Total = Tract Size / Total Size*

*AW % = % of Total \* % BMP Implementation for each individual tract*

*Area Weighted % BMP Implementation = Sum of individual AW %*

### *Using the spreadsheet.*

The spreadsheet is set up so that all that must be entered are the individual percent BMP implementation rates and their respective tract sizes in acres. It will then automatically weight the BMP implementation scores based on the tract size.

### **Reporting**

Using the statistical procedures contained in this guide, BMP Implementation data can be reported in the following ways:

- Overall % BMP implementation for the state
- % BMP implementation by landowner group
- % BMP implementation by BMP category
- Area weighted % BMP implementation

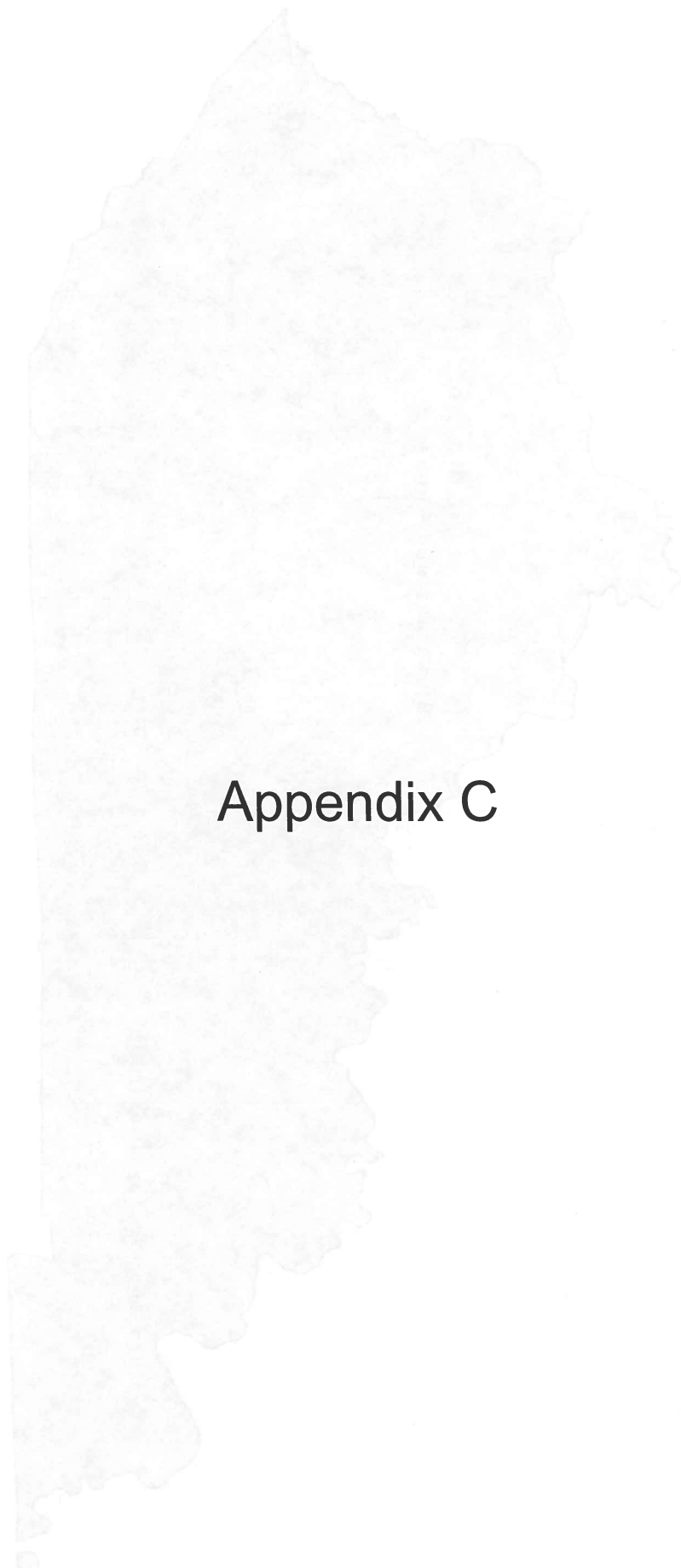
## Significant Water Quality Risk Indicators

**Significant Water Quality Risk** – An existing on-the-ground condition resulting from failure to correctly implement BMPs, that if left unmitigated will likely result in an adverse change in the chemical, physical or biological condition of a waterbody. Such change may or may not violate water quality standards.

### On-Site Indicators of Significant Risk to Water Quality

The conditions listed below are often associated with significant water quality risks. They should be viewed as “red flag” warnings that the chemical, physical and/or biological quality of adjacent waterbodies will likely be threatened if not mitigated.

- Temporary stream crossings remain in channel following operation
- Stream crossings and approaches not stabilized
- Logging debris in waterbody affecting or obstructing flow
- Evidence of excessive sediment entering waterbody from adjacent treated area
- Canopy completely or almost completely removed from SMZ on perennial waterbody
- Evidence of heavy equipment operation in stream channel
- Waterbody banks compromised by equipment or skidding activities
- Water diversion devices absent or severely compromised on roads or skid trails where runoff is likely to enter waterbody
- Ruts or other excessive physical damage to soils and cover within the SMZ
- Fill material in stream crossing without adequate means for conveyance of flow
- Un-stabilized fireline tied directly into waterbody
- Oil, chemicals, batteries or other hazardous materials leaking or remaining on site following operation
- Road or skid trail too steep or so poorly located that stabilization is improbable
- Excessive defoliation of riparian vegetation caused by herbicide application



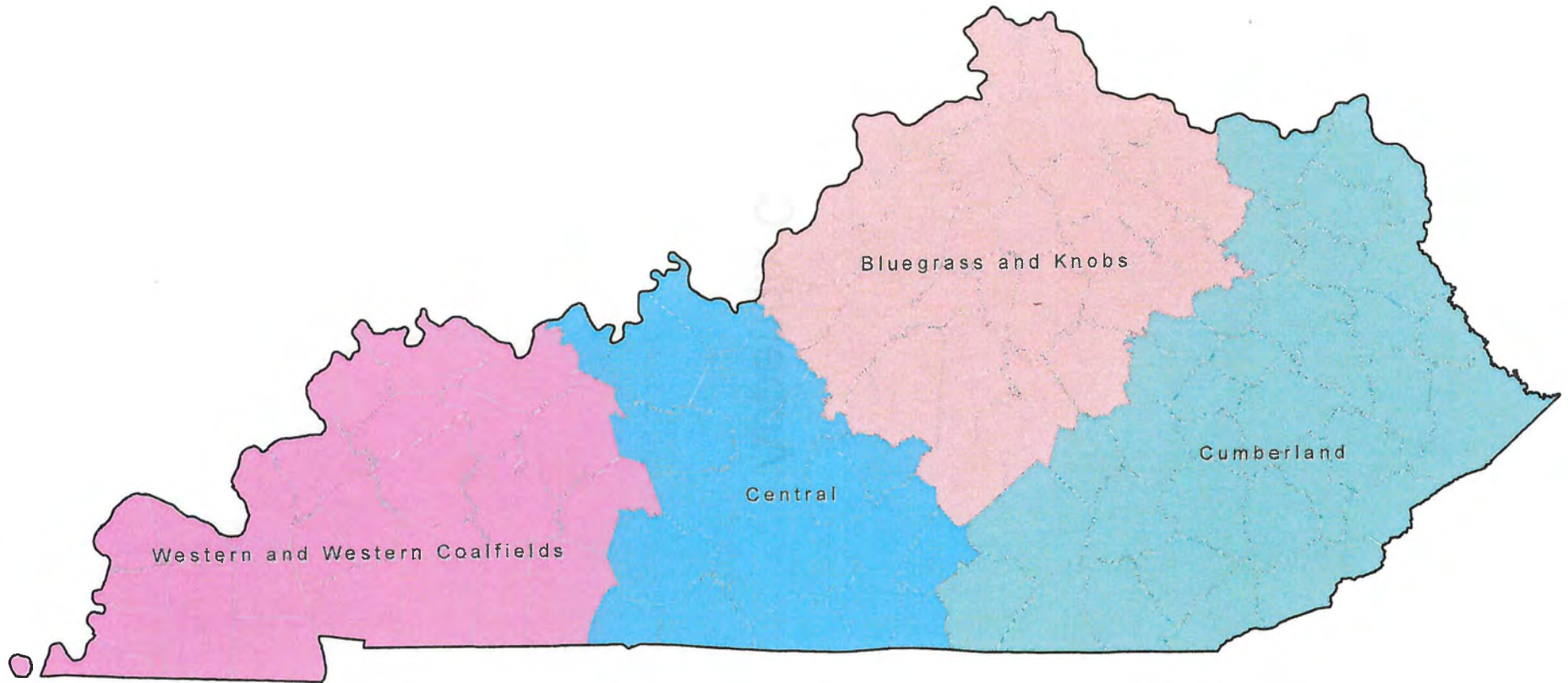
# Appendix C

Monitoring Regions

Best Management Practices Implementation on Timber Harvests in Kentucky

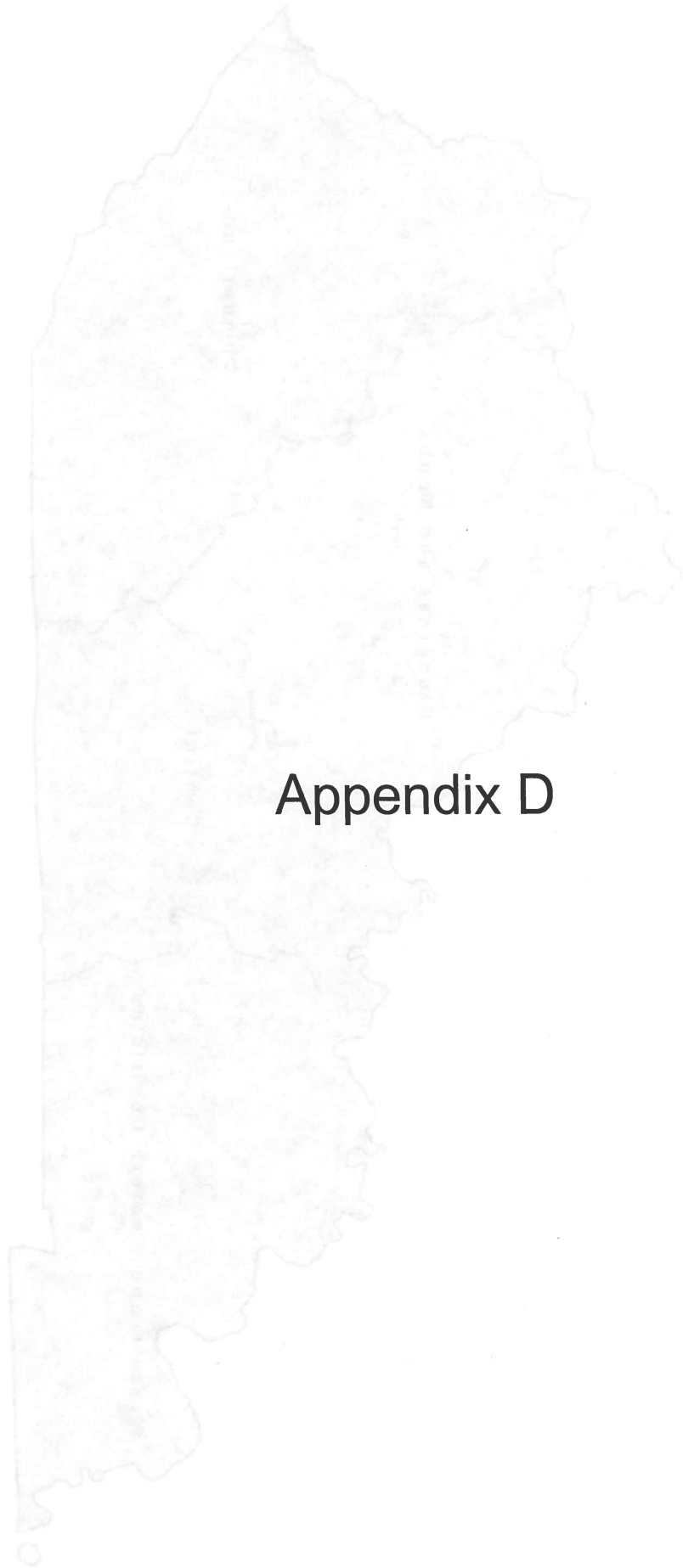
# Best Management Practices Implementation on Timber Harvests in Kentucky

## Monitoring Regions







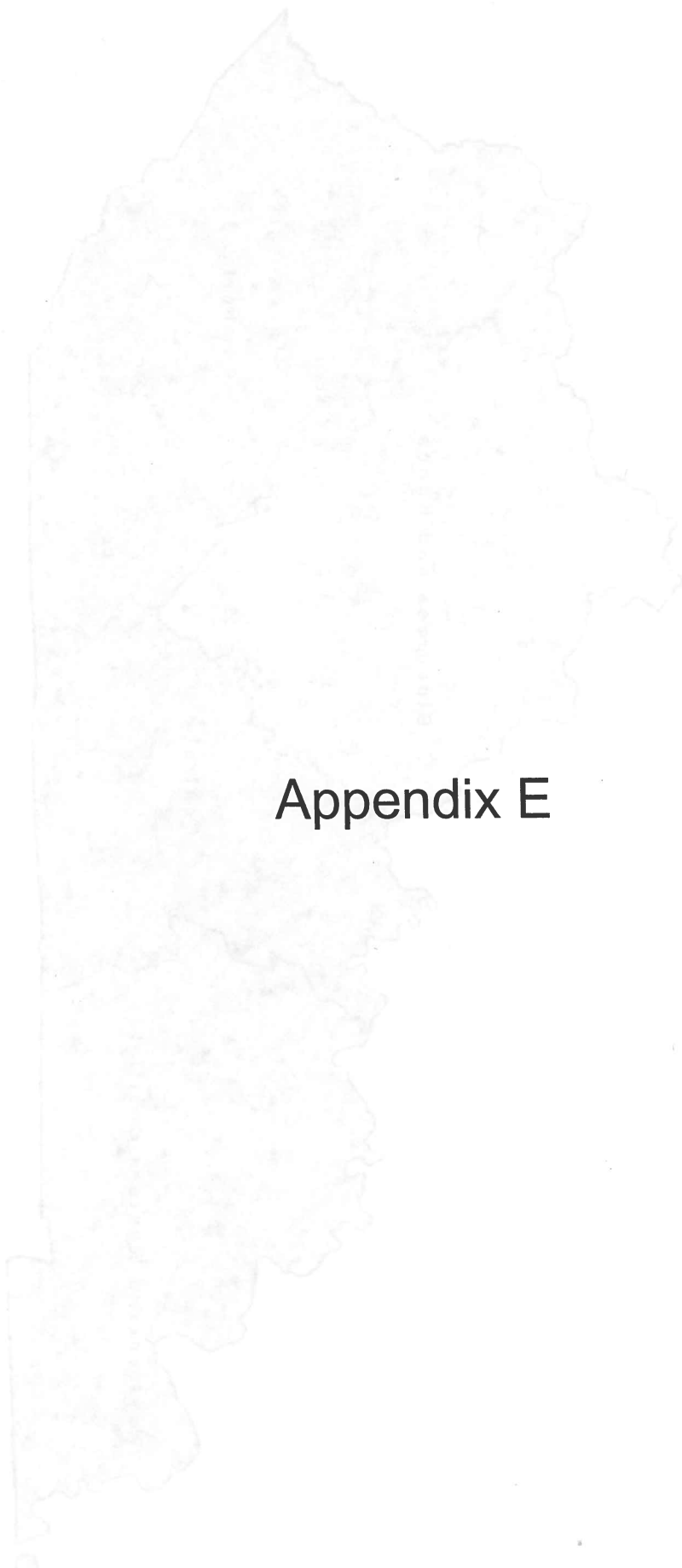


## Appendix D

МОНГОЛЫН ТАСВИР

Баяр Мандагмаевийн Үлэсний Төлөөлөгчид Хамтарсан Төрийн Байгууллага





# Appendix E

Limpaq Haxwaxa Gaxaxaxa Aqaxaxaxa Daxaxaxa

Daxaxaxa Haxwaxa Gaxaxaxa Aqaxaxaxa Daxaxaxa



ENERGY AND ENVIRONMENT CABINET  
KENTUCKY DIVISION OF FORESTRY  
BMP IMPLEMENTATION MONITORING CHECKLIST

**GENERAL**

1. County: \_\_\_\_\_ 2. District: \_\_\_\_\_ 3. Monitoring Region: \_\_\_\_\_  
 4. Site ID#: \_\_\_\_\_ 5. Date: \_\_\_\_\_ 6. Latitude: \_\_\_\_\_ 7. Longitude: \_\_\_\_\_  
 8. Monitoring Inspector/s: \_\_\_\_\_ 9. Site is active:  Yes  No

**SITE CHARACTERISTICS**

10. Terrain:  Flat  Hilly  Steep 11. Erodibility Risk:  Low  Medium  High  
 12. Stream Type/s Present:  Ephemeral  Intermittent  Perennial  CAH  
 13. Distance to nearest permanent water body:  <300'  300-800'  800-1600'  >1600'

**MINIMUM BMP REQUIREMENT IMPLEMENTATION**

**BMP #1 - ACCESS ROADS, SKIDS TRAILS, LANDINGS**

ACCESS ROADS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
14. Access Roads constructed to minimize grade?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Drainage Structures used at proper intervals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Drainage Structures properly implemented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Bridges or Culverts used where feasible?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Stream/Channel Crossings at right angles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Rutting is minimized? <i>Retirement of Access Roads</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Access Roads promptly reshaped?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Access Roads promptly revegetated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SKID ROADS/TRAILS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
22. Skid Roads/Trails constructed to minimize grade?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Drainage Structures used at proper intervals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Drainage Structures properly implemented?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Bridges or Culverts used where feasible?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
26. Stream/Channel Crossings at right angles?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
27. Rutting is minimized? <i>Retirement of Skid Roads/Trails</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
28. Skid Roads/Trails promptly reshaped?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
29. Skid Roads/Trails promptly revegetated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

LANDINGS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
30. Landings located outside of SMZ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Landings properly drained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
32. Rutting is minimized? <i>Retirement of Landings</i>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
33. Landings promptly reshaped?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
34. Landings promptly revegetated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**BMP #1 - ACCESS ROADS, SKIDS TRAILS, LANDINGS cont.**

EPHEMERAL CHANNELS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
35. Disturbed Soil absent from ephemeral channels?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
36. Concentrated Slash absent from ephemerals?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**BMP #2 - REVEGETATION**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
37. Erodible or severely eroded areas revegetated?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**BMP #3 – STREAMSIDE MANAGEMENT ZONES (SMZ)**

PERENNIAL STREAMS, LAKES AND PONDS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
38. 50% Overstory >25 ft for slopes<15%, (SMZ)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
39. 50% Overstory >55 ft for slopes>15%, (SMZ)?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
40. Equipment use in SMZ avoided except where necessary?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Roads, trails and/or landings in SMZ constructed to protect water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Tree Debris absent from channels and lodged?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

INTERMITTENT STREAMS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
43. Equipment operation within 25 feet avoided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
44. Water Quality protected where unavoidable?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Tree Debris absent from channels and lodged?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Mechanical Site Prep. avoided in SMZ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ROADS/TRAILS IN STREAM CHANNELS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
47. Roads and trails located outside of stream channels except where necessary?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
48. Where Channels are used, is it for minimum distance necessary?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

COLD WATER AQUATIC HABITATS

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
49. Only individual trees or small groups removed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. 75% original canopy intact within 60 foot SMZ?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
51. Adjacent understory vegetation undisturbed?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

EQUIPMENT

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
52. Fluids not drained from equip. near streams?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Equipment parked away from stream banks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**BMP #4 – SINKHOLES**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
54. Drainage diverted away from sinkholes?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Soil/debris/waste absent from sinkhole?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Equipment fluids properly disposed of?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**BMP #5 – LOGGING DEBRIS**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
57. Equipment not left on stream banks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Equipment fluids not drained onto ground?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
59. Equipment fluids not allowed to wash into stream?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Equipment fluids properly disposed of?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Cans, bottles, bags equipment parts etc. properly disposed of?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**BMP #7 – FERTILIZATION**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
62. Minimum amount necessary used?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Use adjacent to water avoided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Use within 30 ft of sinkhole bottom avoided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**BMP #10 – SILVICULTURE IN WETLAND AREAS**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	N/A	Not Determined	Yes	No
65. Permanent road construction minimized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. Landings located on higher ground?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
67. Vehicular traffic minimized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
68. Stream and slough crossings avoided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
69. >50% stream and slough overstory remains?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**KDF INSPECTION and CASE HISTORY**

70. Has KDF Inspected Site  Yes  No

71. KDF Site Code: \_\_\_\_\_

72. KDF Case #: \_\_\_\_\_

73. KDF Case Closed Date: \_\_\_\_\_

**BMP's CITED**

74. BMP #1  75. BMP #2  76. BMP #3  77. BMP #4  78. BMP #5  79. BMP #7  80. BMP #10

**COMMENTS**

\_\_\_\_\_

\_\_\_\_\_

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BMP #4 - PINKHOLES

BMP #4 - PINKHOLES	Yes	No	Not Determined	Not Determined	Not Determined
51. Drainage diversions away from wetlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
52. Sedimentation control near wetlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Equipment fluids properly disposed of?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

51. Drainage diversions away from wetlands?  
 52. Sedimentation control near wetlands?  
 53. Equipment fluids properly disposed of?

BMP #5 - LOGGING DEBRIS

BMP #5 - LOGGING DEBRIS	Yes	No	Not Determined	Not Determined	Not Determined
54. Equipment not left on stream banks?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Equipment fluids not spilled onto ground?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. Equipment fluids not allowed to wash into stream?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
57. Equipment fluids properly disposed of?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
58. Gas, bottles, cans, paint cans, etc. properly disposed of?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

54. Equipment not left on stream banks?  
 55. Equipment fluids not spilled onto ground?  
 56. Equipment fluids not allowed to wash into stream?  
 57. Equipment fluids properly disposed of?  
 58. Gas, bottles, cans, paint cans, etc. properly disposed of?

BMP #7 - FERTILIZATION

BMP #7 - FERTILIZATION	Yes	No	Not Determined	Not Determined	Not Determined
59. Minimum amount necessary applied?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
60. Use adjusted to water quality?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
61. Use within 20 ft. of single stream avoided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

59. Minimum amount necessary applied?  
 60. Use adjusted to water quality?  
 61. Use within 20 ft. of single stream avoided?

BMP #10 - SILVOCULTURE IN WETLAND AREAS

BMP #10 - SILVOCULTURE IN WETLAND AREAS	Yes	No	Not Determined	Not Determined	Not Determined
62. Fertilizer not applied near wetlands?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
63. Landings located on higher ground?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
64. Vent or traffic minimized?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
65. Stream and stream crossings avoided?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
66. 100% stream and riparian area buffer maintained?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

62. Fertilizer not applied near wetlands?  
 63. Landings located on higher ground?  
 64. Vent or traffic minimized?  
 65. Stream and stream crossings avoided?  
 66. 100% stream and riparian area buffer maintained?

# Appendix F

KOP INSPECTION and CASE HISTORY

70. Has KOP Inspected Site?  Yes  No

71. KOP Case # \_\_\_\_\_

72. KOP Case Closed Date: \_\_\_\_\_

BMP #17

73. BMP #17  BMP #18  BMP #19  BMP #20  BMP #21  BMP #22  BMP #23  BMP #24  BMP #25  BMP #26  BMP #27  BMP #28  BMP #29  BMP #30

COMMENTS

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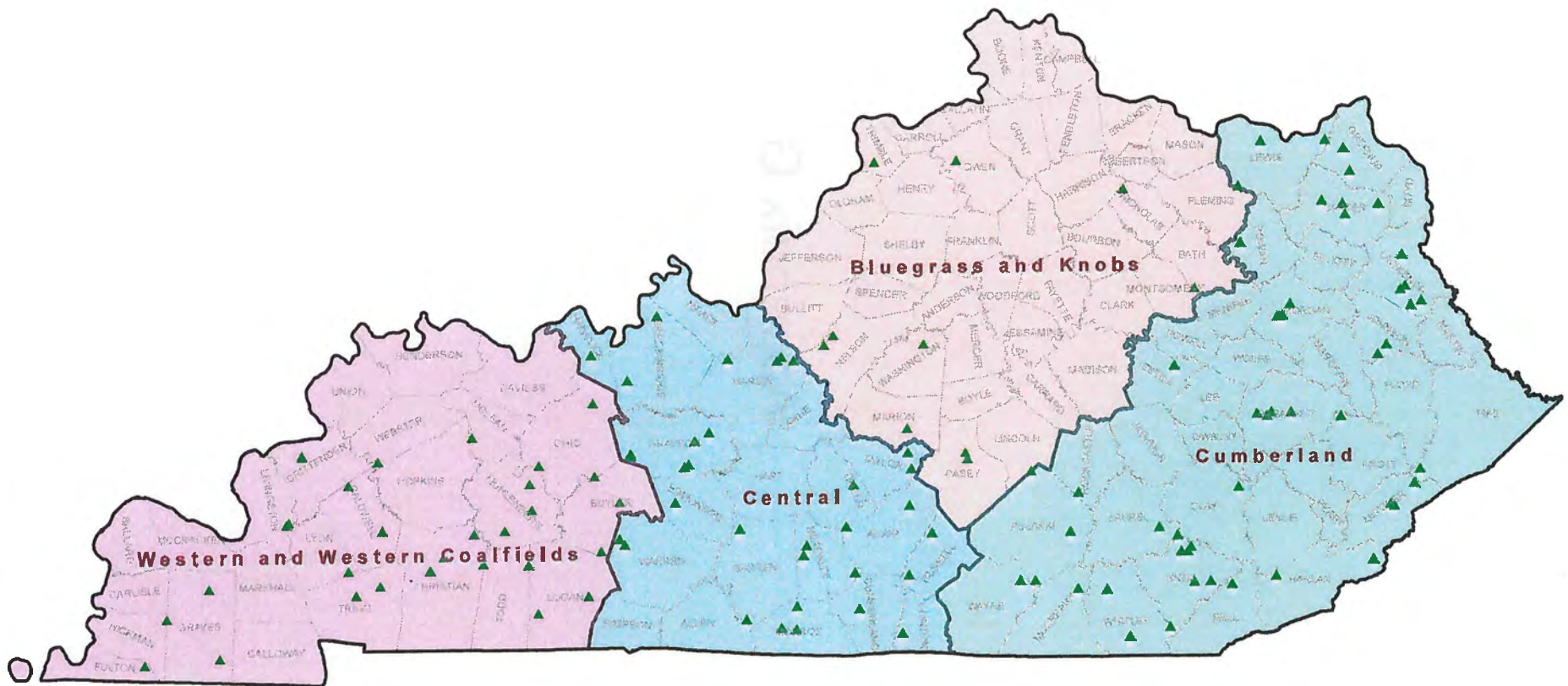
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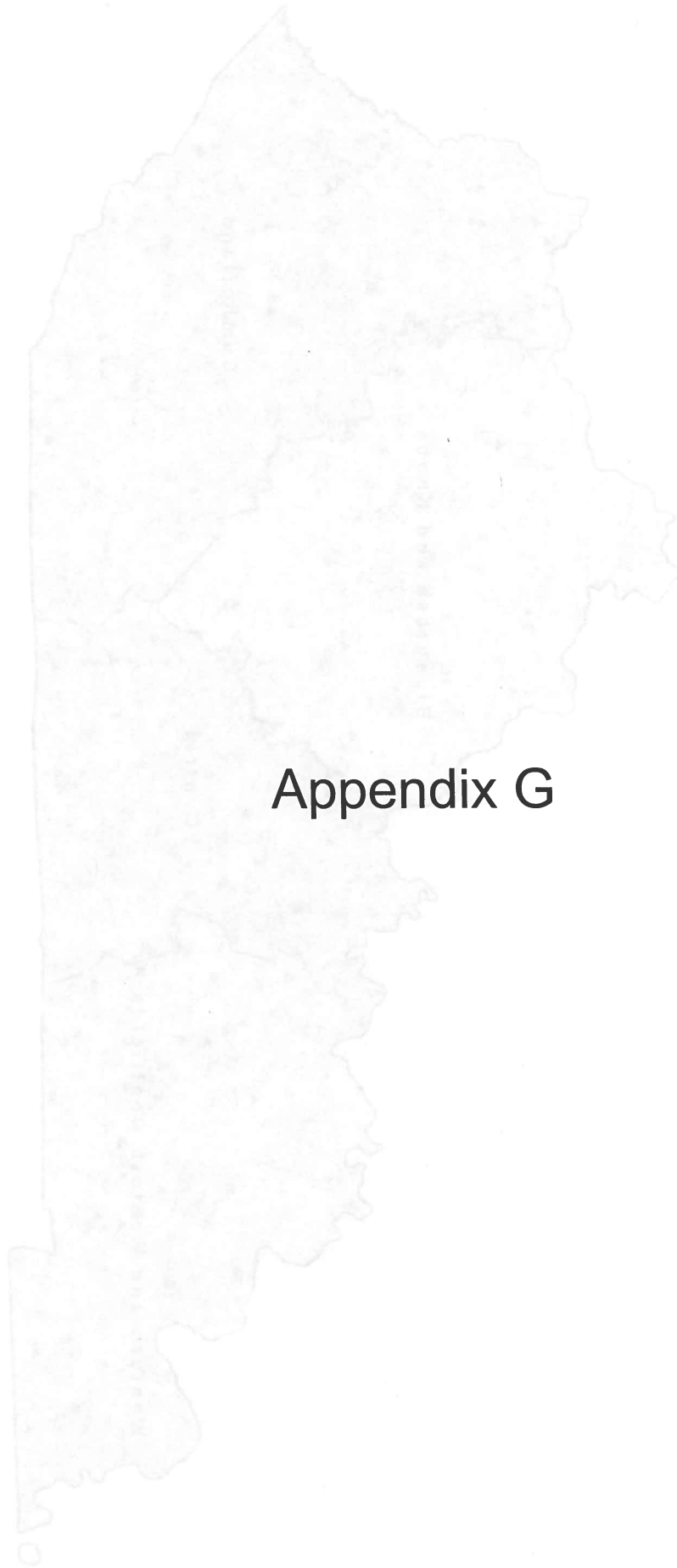




# Best Management Practices Implementation on Timber Harvests in Kentucky

## Timber Harvests Monitored





# Appendix G

Timber Harvests Monitoring

Great Watershed Practices Implementation on Timber Harvests in Kentucky

ENVIRONMENTAL AND PUBLIC PROTECTION CABINET  
KENTUCKY DIVISION OF FORESTRY  
BMP COMPLIANCE MONITORING CHECKLIST

**GENERAL**

1. Date \_\_\_\_\_  
2. Compliance Monitoring Inspector/s \_\_\_\_\_

**SITE CHARACTERISTICS**

3. Has KDF Inspected:    Yes                      No
4. Terrain:              Flat              Hilly              Steep
5. Erodability Hazard:    Light              Medium              High
6. Stream Type/s Present: Perennial Intermittent Ephemeral
7. Distance to nearest permanent water body:  
   <300'              300-800'              800-1600'              1600' +

USE MINIMUM REQUIREMENTS AS EVALUATION CRITERIA

**BMP #1 - ACCESS ROADS, SKIDS TRAILS, LANDINGS**

( ) Not Applicable

Significant Risk?

- |   |   |   |    |   |   |
|---|---|---|----|---|---|
| 8. Roads & trails constructed to minimize grade   | Y | N | NA | Y | N |
| 9. Drainage structures used at proper intervals   | Y | N | NA | Y | N |
| 10. Drainage structures properly implemented      | Y | N | NA | Y | N |
| 11. Bridges or culverts used where feasible       | Y | N | NA | Y | N |
| 12. Stream crossings at right angles              | Y | N | NA | Y | N |
| 13. Ephemerals not blocked, tops not concentrated | Y | N | NA | Y | N |
| 14. Landings out of SMZs and drained properly     | Y | N | NA | Y | N |
| 15. No excessive rutting                          | Y | N | NA | Y | N |
| 16. Roads, trails & landings promptly retired     | Y | N | NA | Y | N |
| 17. Access limited                                | Y | N | NA | Y | N |

**BMP #2 - VEGETATIVE ESTABLISHMENT OF DISTURBED SOILS**

( ) Not Applicable

Significant Risk?

- |   |   |   |    |   |   |
|---|---|---|----|---|---|
| 17. Erodible or severely eroded areas revegetated | Y | N | NA | Y | N |
|---|---|---|----|---|---|

**BMP #3 - STREAMSIDE MANAGEMENT ZONES (SMZ)**

( ) Not Applicable

Significant Risk?

- |   |   |   |    |   |   |
|---|---|---|----|---|---|
| 18. Roads and trails out of stream channels except... | Y | N | NA | Y | N |
| 19. <u>Perennial Streams</u>                          |   |   |    |   |   |
| 50% overstory tree retention in SMZ                   | Y | N | NA | Y | N |
| a. Slopes <15% = 25 - 55 feet                         | Y | N | NA | Y | N |
| b. Slopes >15% = 55 - 90 feet                         | Y | N | NA | Y | N |
| c. Equipment use in SMZ is minimized                  | Y | N | NA | Y | N |
| 20. <u>Intermittent Streams</u>                       |   |   |    |   |   |
| a. Equipment operation 25 feet away                   | Y | N | NA | Y | N |
| b. Tops & debris out of channels                      | Y | N | NA | Y | N |
| 21. <u>Cold Water Aquatic Habitat Streams</u>         |   |   |    |   |   |
| a. 60 foot SMZ  | Y | N | NA | Y | N |
| b. 75% overstory trees retained                       | Y | N | NA | Y | N |
| c. Understory vegetation undisturbed                  | Y | N | NA | Y | N |
| 22. Remedial measures for overcutting in SMZs         | Y | N | NA | Y | N |
| 23. Equipment parked away from stream banks           | Y | N | NA | Y | N |







**ENVIRONMENTAL AND PUBLIC PROTECTION CABINET  
KENTUCKY DIVISION OF FORESTRY  
BMP IMPLEMENTATION MONITORING CHECKLIST**

**GENERAL**

1. Site ID#: \_\_\_\_\_ 2. Date: \_\_\_\_\_ 3. Latitude: \_\_\_\_\_ 4. Longitude: \_\_\_\_\_  
 5. Compliance Monitoring Inspector/s: \_\_\_\_\_ 6. Site is active:  Yes  No

**SITE CHARACTERISTICS**

7. Has KDF Inspected:  Yes  No 8. KDF Site Code: \_\_\_\_\_  
 9. Terrain:  Flat  Hilly  Steep 10. Stream Type/s Present:  
 Ephemeral  Intermittent  Perennial  CAH  
 11. Erodibility Risk:  Low  Medium  High 12. Distance to nearest permanent water body:  
 <300'  300-800'  800-1600'  >1600'

USE MINIMUM REQUIREMENTS AS EVALUATION CRITERIA

**13. BMP #1 - ACCESS ROADS, SKIDS TRAILS, LANDINGS**      Applicable?  Yes  No

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
14. Roads & trails constructed to minimize grade	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. Drainage structures used at proper intervals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. Drainage structures properly implemented	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. Bridges or culverts used where feasible	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. Stream crossings at right angles	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. Disturbed Soil is absent from Ephemeral Channels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. Concentrated Tops are absent from Eph. Channels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
21. Landings are located outside of SMZs except.....	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
22. Landings are properly drained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
23. Rutting is minimized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
24. Roads, trails & landings promptly retired	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
25. Access has been limited/restricted	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**26. BMP #2 - VEGETATIVE ESTABLISHMENT OF DISTURBED SOILS**      Applicable?  Yes  No

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
27. Erodible or severely eroded areas revegetated	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



**28. BMP #3 - STREAMSIDE MANAGEMENT ZONES (SMZ)      Applicable?    Yes    No**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
29. Roads and trails out of stream channels except...	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Perennial Streams

50% overstory tree retention in SMZ

30. Slopes <15% - >25 feet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
31. Slopes >15% - > 55 feet	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

32. Equipment use in SMZ has been minimized	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Intermittent Streams

33. Equipment operation within 25 feet avoided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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34. Tops & debris out of channels	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Cold Water Aquatic Habitat Streams

35. 60 foot SMZ	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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36. 75% overstory trees retained	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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37. Adjacent understory vegetation undisturbed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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38. Equipment parked away from stream banks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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**39. BMP #4 – SINKHOLES      Applicable?    Yes    No**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
40. Diversion of drainage in sinkhole avoided	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
41. Pushed or concentrated debris absent from sinkhole	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
42. Equipment fluids properly disposed of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**43. BMP #5 – LOGGING DEBRIS      Applicable?    Yes    No**

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
44. Equipment not left on stream banks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
45. Equipment fluids not allowed to run onto ground	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
46. Equipment fluids properly disposed of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
47. Cans, paper, etc. properly disposed of	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



48. BMP #7 – FERTILIZERS  Applicable?  Yes  No

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
49. Minimum amount necessary used <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
50. Use adjacent to water or sinkholes avoided <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

51. BMP #10 - TIMBER HARVESTING IN WETLAND AREAS  Applicable?  Yes  No

	BMP Successfully Implemented				Significant Risk Present?	
	Yes	No	NA	Not Determined	Yes	No
52. Minimal number of roads & trails <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
53. Landings on higher ground <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
54. Vehicle traffic minimized <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
55. Stream crossings avoided <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
56. >50% of overstory tree cover retained <input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

**OVERALL COMPLIANCE WITH BEST MANAGEMENT PRACTICES**

FAILS  
 NO EFFORT      POOR

FAIR       PASS  
                     GOOD      EXCELLENT

**COMMENTS:**

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# Appendix I



# KFCA

KENTUCKY FOREST CONSERVATION ACT  
KRS 149.330-355

This work was funded in part by a grant from the U.S. Environmental Protection Agency under §319(h) of the Clean Water Act through the Kentucky Division of Water to the Kentucky Division of Forestry (Grant #C9994861-11)

# KRS 149.344

## Use of appropriate best management practices

(1) Two (2) years from July 15, 1998, any logger or operator engaged in the conduct of any timber harvesting operations shall use appropriate best management practices

(2) No Logger or operator shall conduct any timber harvesting operations in a manner that is causing or will likely cause water pollution

(3) If the cabinet determines that a logger or operator engaged in timber harvesting operations has failed to use the appropriate best management practices or is causing water pollution, the cabinet shall...

# KRS 149.344

Use of appropriate best management practices

...Give the logger or operator a written warning of the facts alleged to constitute the failure to use the best management practice or the water pollution, and a reasonable period for abatement and compliance

## KRS 149.330-Definitions for KRS 149.330 to 149.355

(8) "Timber harvesting operations" means activities directly related to cutting or removal of trees from the forest as a raw material for commercial processes or purposes, including timber preharvesting and postharvesting activities associated with the implementation of appropriate best management practices.

"Timber harvesting operations" does not include:

- (a) The cutting of firewood;
- (b) The cutting of evergreens grown for the traditional Christmas holiday season;
- (c) The removal of trees incidental to clearing for coal mining or farm purposes or incidental to ground-disturbing construction activities; including well sites, and access roads and gathering lines for oil and natural gas operations;

## KRS 149.330-Definitions for KRS 149.330 to 149.355

(8) "Timber harvesting operations" means activities directly related to cutting or removal of trees from the forest as a raw material for commercial processes or purposes, including timber preharvesting and postharvesting activities associated with the implementation of appropriate best management practices.

"Timber harvesting operations" does not include.

(d) The cutting of trees for maintaining existing, or during construction of; rights-of-way for public highways or public utilities; unless those trees are being sold or provided as raw material for commercial wood product purposes;

(e) The cutting of trees by an individual, nonindustrial landowner on his own property, if the cutting is performed by the individual, nonindustrial landowner.

## KRS 149.330-Definitions for KRS 149.330 to 149.355

(5) "Logger" means any person who conducts timber harvesting operations for commercial purposes

(6) "Operator" means any person who operates or exercises control over any timber harvesting operation

(7) "Person" means any individual, partnership, corporation, association, society, joint stock company, firm, company, or business organization, and any agency or instrumentality of federal, state, or local government, including any publicly-owned utility or any publicly-owned corporation of federal, state or local government.

## KRS 149.330-Definitions for KRS 149.330 to 149.355

(1) "Best Management practices" means **effective, practical, economical, structural, or nonstructural** methods that prevent or reduce the movement of sediment, nutrients, pesticides, and other pollutants from the land to surface or groundwater, or that otherwise protect water quality from potential adverse effects of timber harvesting operations as developed by the Division of Forestry and approved by the Agriculture Water Quality Authority.

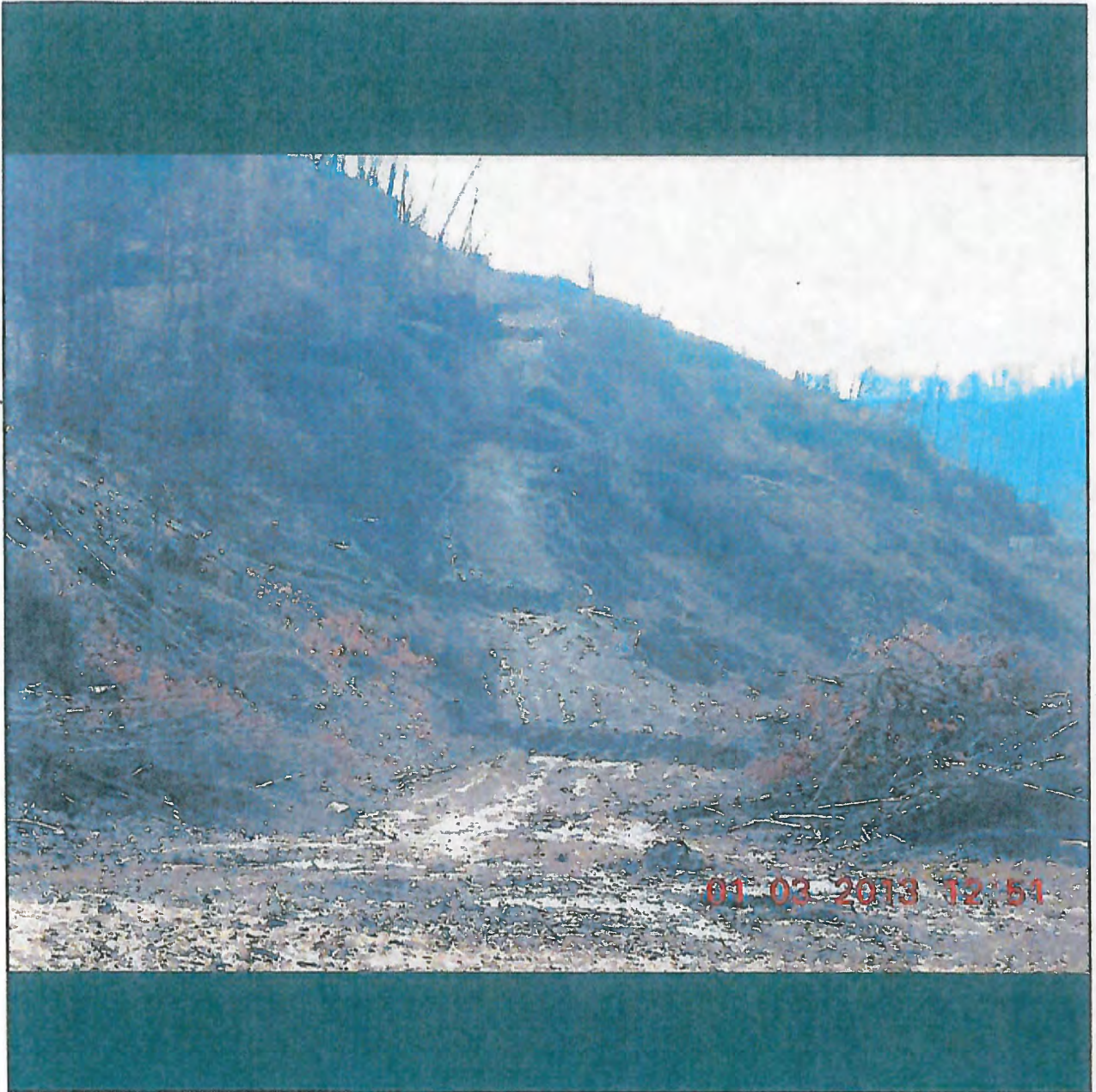


## Silviculture BMP #1 Access Roads, Skid Trails, and Landings AWQA Minimum Requirements

Roads and skid trails should be constructed to minimize grades. Water bars, culverts, or other drainage structures should be installed at intervals appropriate to remove water from the roads surface to prevent damage and erosion to the road or the forest floor from channelized flow. Where feasible, install and use bridges or culverts to cross streams (perennial and intermittent) or ephemeral channels. Where bridges or culverts are not used, roads and skid trails should cross streams or ephemeral channels at right angles. Disturbed soil or concentrated logging slash should not be left in ephemeral channels. Yards and landings should be located outside of streamside management zones (SMZs) and should have adequate drainage. Skidders or other logging equipment should not be operated off hard-surfaced roads under conditions that may cause the development of excessive rutting. After silvicultural activities are completed, roads and log landings should be promptly reshaped, revegetated, and retired. Vehicle access to these areas should be controlled unless the landowner wishes to maintain them for personal use.

Roads and skid trails should be constructed to minimize grade. Waterbars, culverts, or other drainage structures should be installed at intervals appropriate to remove water from the road or skid trail ...  
Where feasible, install and use bridges or culverts to cross streams or ephemeral channels.











Where bridges or culverts are not used, roads and skid trails should cross streams or ephemeral channels at right angles.



Disturbed soil or concentrated logging slash should not be left in ephemeral channels





Yards and landings should be located outside of streamside management zones (SMZs) and..



01.23.2013 10:35

...and should have adequate drainage (see minimum requirements in Silvicultural BMP No. 3).



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Skidders and other logging equipment should not be operated off hard-surfaced roads under conditions that may cause the development of excessive rutting.



**AFTER** silvicultural activities are completed, roads, skid trails and log landings should be **promptly** reshaped and revegetated (see minimum requirements for Silvicultural BMP No. 2).







## Silviculture BMP #2 Revegetation

### AWQA Minimum Requirements

Sediment producing, erodible, or severely eroded areas, such as logging roads, skid trails and log landings, should be revegetated as soon as possible.







### Silviculture BMP #3 Streamside Management Zones AWQA Minimum Requirements

In areas adjacent to **perennial** streams, lakes, and ponds, forest buffers should be maintained for a minimum surface distance of 25 to 55 feet on ground with less than 15% slope, and a minimum surface distance of 55 to 95 feet on ground with slope of 15% or greater. Management activities are acceptable in these areas, however, equipment operation should be avoided except at designated crossings, and at least 50% of the original tree overstory (canopy cover) should be retained to shade the water and to maintain water temperature.

## Silviculture BMP #3 Streamside Management Zones AWQA Minimum Requirements

In areas adjacent to **intermittent** streams, complete removal of overstory trees is acceptable. Equipment operation should be avoided in a zone of at least 25 feet on each side of an intermittent stream except for designated crossings. Where minimum distances are not possible, roads, trails and landings can be located at less than the recommended distances but should be constructed to protect water quality. Mechanical site preparation should be excluded from areas adjacent to intermittent streams to maintain the duff layer and filtering capacity. Tops or other logging debris which may block the intermittent stream channel should be removed or placed such that it will not cause a blockage.

## Silviculture BMP #3 Streamside Management Zones AWQA Minimum Requirements

In no case should stream beds be used as roads or for the skidding of logs except where the geology or other physical conditions of the site (rock walls, notches, or other limiting factors) leave no other alternatives for access, or where road or skid trail placement in normally recommended locations is either impossible or will cause a higher degree of water quality degradation. If an exception due to physical site conditions is necessary, stream channels may be used as roads or for skidding only for the minimum distance required.

## Silviculture BMP #3 Streamside Management Zones AWQA Minimum Requirements

Coldwater Aquatic Habitats (CAHs) (high quality trout streams), as designated by the Kentucky Division of Water, need additional protection. CAHs should have only individual trees or small groups of trees removed within the 60-foot-wide strip on either side of the stream. A minimum of 75% of the original tree overstory (canopy cover) should also be left intact. Understory vegetation immediately adjacent to CAH streams should be left undisturbed.

Fertilizers and pesticides should be applied in SMZs only in compliance with silviculture BMP's 7 and 8 respectively. Fluids should not be drained from equipment near streams, and logging equipment should not be parked near stream banks where direct runoff of pollutants from equipment into the stream is likely to occur.

In areas adjacent to perennial streams, lakes, and ponds.....  
Management activities are acceptable in these areas, however **at least** 50% of the original tree overstory (canopy cover) should be retained .....



Where minimum distances are not possible, roads, trails, and landings can be located at less than the recommended distances but should be constructed to protect water quality.









Take precautions to prevent tree debris, such as tops from harvested trees, from remaining in or being washed into perennial streams.



In areas adjacent to intermittent streams, complete removal of overstory trees is acceptable. Equipment operation should be avoided in a zone of at least 25 feet on each side of an intermittent stream except for designated crossings. Where minimum distances are not possible, roads, trails and landings . . . should be constructed to protect water quality.





Take precautions to prevent tree debris, such as tops from harvested trees, from remaining in or being washed into intermittent streams

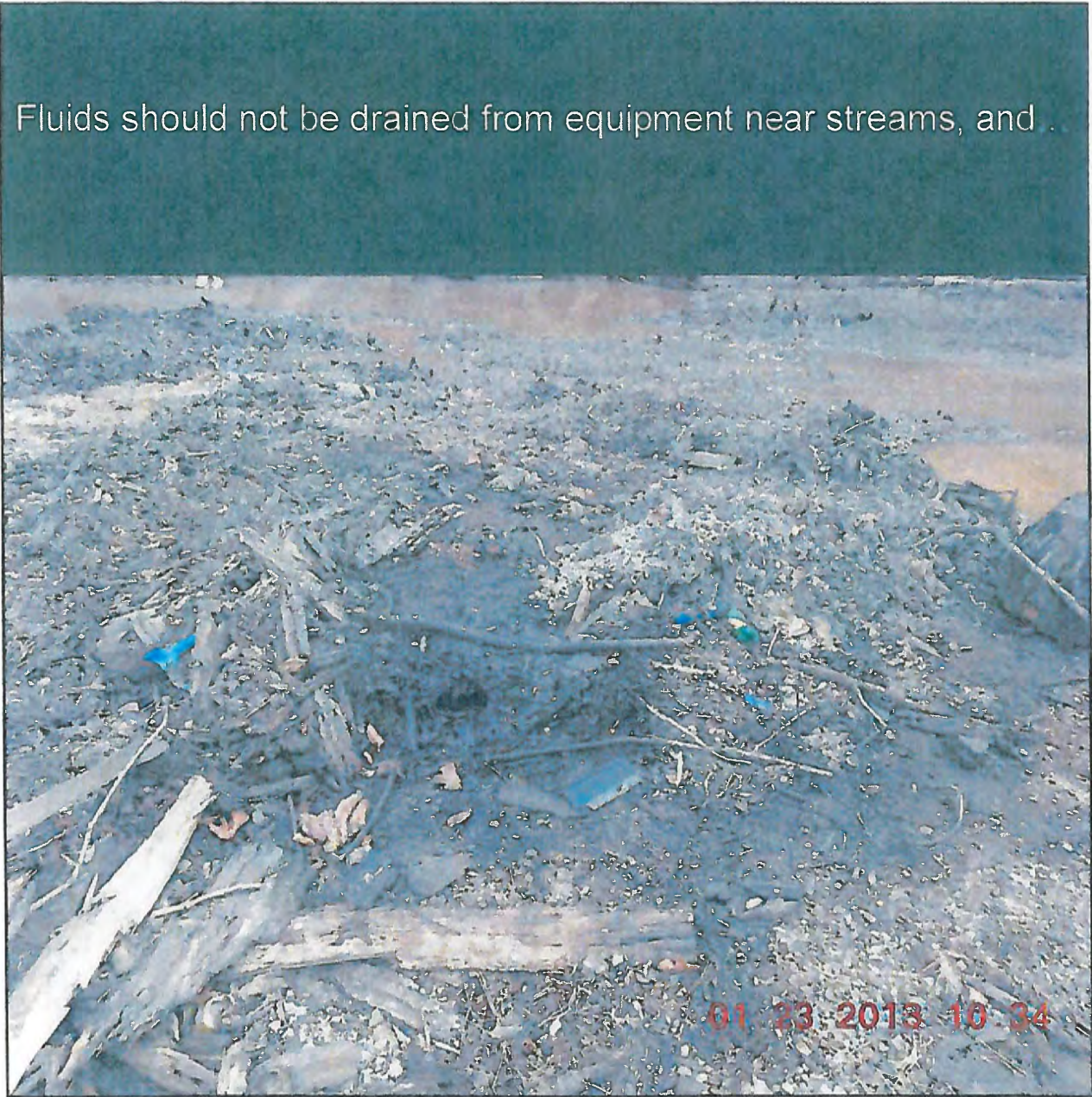


In no case should stream beds be used as roads or for the skidding of logs except.





Fluids should not be drained from equipment near streams, and .



01 23 2013 10 34

...logging equipment should not be parked near stream banks where direct runoff of pollutants from equipment into the stream is likely to occur.





## Silviculture BMP #4 Sinkholes

### AWQA Minimum Requirements

Runoff from haul/access roads, skid trails, and log landings shall be diverted so as not to drain directly into sinkholes, sinking streams, or caves. (Note that if runoff does enter a sinkhole, a UIC permit may be required.) Soil, logging debris, or other waste material shall not be pushed into the bottom of a sinkhole or into any noticeable sinkhole opening.

## Silviculture BMP #4 Sinkholes

### AWQA Minimum Requirements

Fluids drained from equipment shall not be drained onto the ground. They should be collected in a container, transported off site, and recycled or disposed of properly.



## Silviculture BMP #4 Sinkholes

### AWQA Minimum Requirements

Fertilizer and pesticide usage in the vicinity of a sinkhole with no swallet should pose no problem. However, a buffer zone should be employed in the vicinity of a sinking stream or sinkhole with an open swallet.



## Silviculture BMP #5 Logging Debris

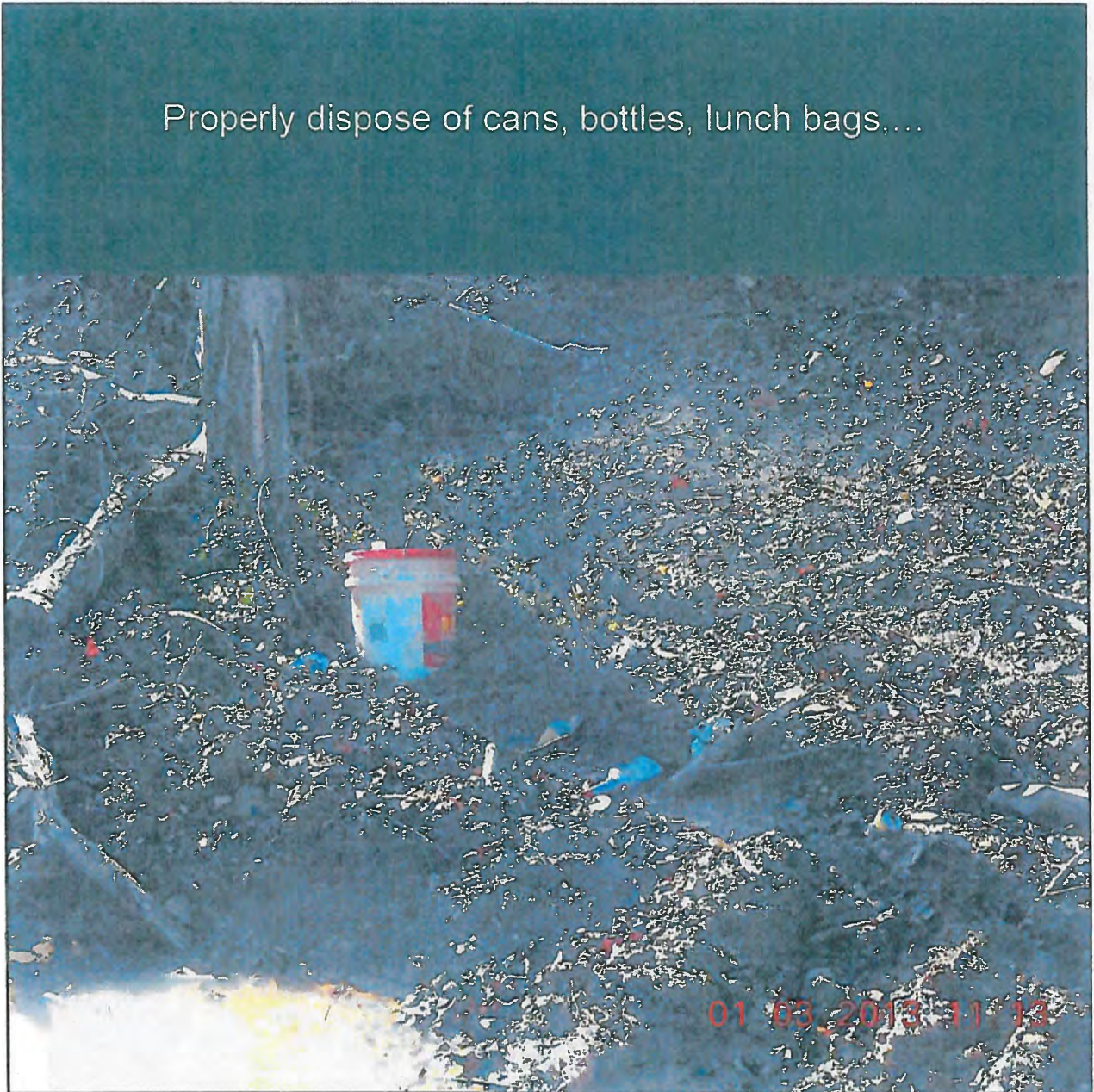
### AWQA Minimum Requirements

~~Take precautions to prevent tree debris, such as tops from~~ harvested trees, ~~from remaining in or being washed into perennial streams.~~ Equipment should not be left on stream banks, nor oil or equipment fluids changed in a manner by which pollutants may drain onto the ground or wash into a stream. Properly dispose of cans, bottles, lunch bags, oil filters or air filters, etc. Properly dispose of used oil, hydraulic fluids, and other fluids.

## Silviculture BMP #3 Streamside Management Zones AWQA Minimum Requirements

. . Take precautions to prevent tree debris, such as tops from harvested trees, from remaining in or being washed into perennial streams.

Properly dispose of cans, bottles, lunch bags,...



01 03 2013 11 13

oil filters, air filters, etc

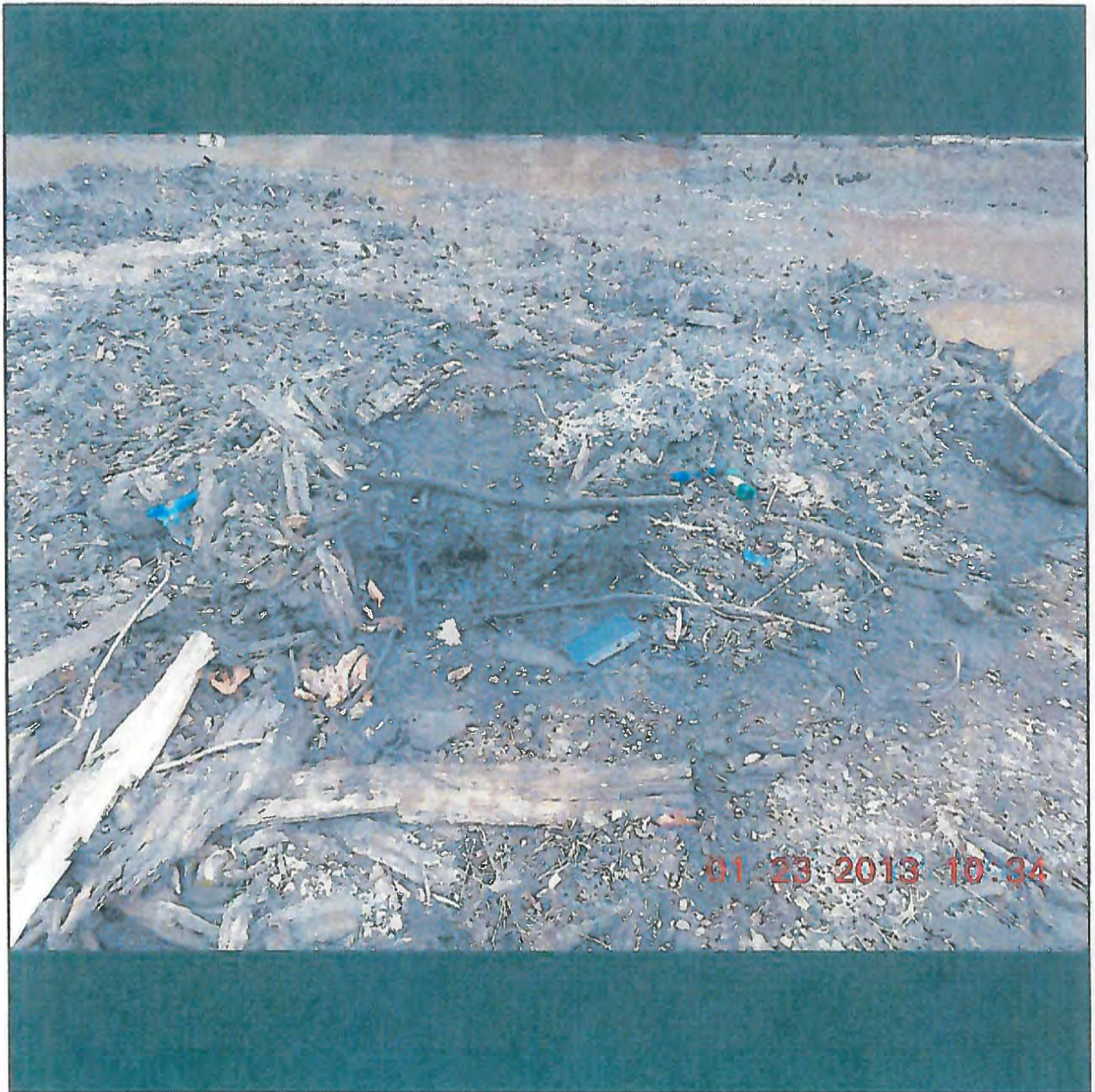


Properly dispose of used oil, hydraulic fluids, and other fluids.











## Silviculture BMP #7 Fertilization

### AWQA Minimum Requirements

In Silviculture, use only the amount of fertilizer necessary and stay away from bodies of water or those areas immediately adjacent to them. The use of fertilizers in SMZ's is generally undesirable, and fertilizer should be applied only in strict compliance with label directions. Use of fertilizer within 30 feet of the bottom of any sinkhole or noticeable opening is undesirable.



## 2.2 TYPES OF INSPECTIONS AND INSPECTION FREQUENCY

There are four types of inspections an Inspector may be required to conduct. These four types of inspections are:

- A. **Initial** - This is the first inspection of a harvesting operation for compliance with the BMP and water quality requirements of the Kentucky Forest Conservation Act and the presence of a Master Logger on site and in charge. The initial inspection will be completed within a maximum of ten (10) working days of discovery, weather and schedule permitting; including newly discovered operations that have been recently completed. (See the **Logger No Longer On-Site** in this section.)
- B. **Periodic** - This is a follow-up inspection of a harvesting operation which was in compliance at the time of the previous inspection. The periodic inspection will be performed at times as deemed appropriate by the inspector and the district management team. A harvesting operation will be inspected a minimum of once every two months, if it continues that long.
- C. **Compliance** - This is a follow-up inspection of a harvesting operation that was out of compliance at the time of the last inspection. This is a follow-up to some sort of enforcement action. The compliance inspection will be completed as soon as possible after the reasonable time period designated in the enforcement action has elapsed.
- D. **Final** - This is an inspection performed after the harvest operation has been completed to inspect for BMP implementation and water quality standards. An operation is considered completed when the equipment has been moved off the harvesting site. The final inspection will be completed within ten (10) working days, weather and schedule permitting, after the Division is aware the operation has been completed.
- E. **Logger No Longer On-site** - This is not a type of inspection but a procedure. If the logging operation has been completed and the logger has left the site before the inspector arrives, the inspector will complete the inspection. If there are no violations or water quality problems, mark the Inspection Report Initial/Final and enter the same in the database. State that the logger is no longer on-site in the comment section. If there are violations or water quality problems and the inspector knows who the logger was or can find out without a lot of research, follow the KFCA procedure and issue the Written Warning to the logger. If the inspector cannot identify the responsible logger without a lot of work, follow the Agriculture Water Quality Act (AWQA) corrective measures process,

mark the Inspection Report Initial/Final and enter the same in the database. In the comments section, state that the inspection report was turned over to the Division of Water field office and copy the THC Section. The AWQA process is initiated by the inspector contacting the District Office, which in turn will contact the Division of Water and the local conservation district with information on the site.

- F. **Landowner Refuses To Allow Logger to Implement BMPs** – Talk to landowner and inform him/her that if the logger is not allowed to implement BMPs, the AWQA process will be followed and the landowner becomes responsible for the BMPs. If the landowner still will not allow the logger to implement the BMPs, follow the above procedure for AWQA process initiation.

**Note: Any alteration in the frequency of inspections requires the approval of the district management team.**

Form: TH - 1  
Revised: 1/26/2005



COMMONWEALTH OF KENTUCKY  
ENVIRONMENTAL AND PUBLIC PROTECTION CABINET  
DEPARTMENT FOR NATURAL RESOURCES  
DIVISION OF FORESTRY

Acreage: \_\_\_\_\_  
Ck. Pt: \_\_\_\_\_  
Lat: \_\_\_\_\_  
Long: \_\_\_\_\_  
Dia. Method: \_\_\_\_\_

\_\_\_\_\_ DISTRICT  
\_\_\_\_\_  
Address \_\_\_\_\_  
City State Zip Code \_\_\_\_\_

Contact District Office at: \_\_\_\_\_

**TIMBER HARVESTING INSPECTION REPORT**

SITE CODE: \_\_\_\_\_ INSPECTION TYPE: INITIAL \_\_\_\_\_ PERIODIC \_\_\_\_\_ COMPLIANCE \_\_\_\_\_ FINAL \_\_\_\_\_

Owner/Operator: \_\_\_\_\_ Landowner: \_\_\_\_\_  
Company: \_\_\_\_\_ Address: \_\_\_\_\_  
Address: \_\_\_\_\_ City, State, Zip: \_\_\_\_\_  
City, State, Zip: \_\_\_\_\_ Harvest Acreage: \_\_\_\_\_  
Master Logger: \_\_\_\_\_ Master logger ID Number: \_\_\_\_\_  
Location Description: \_\_\_\_\_

**PERFORMANCE STANDARD INSPECTED**

IN COMPLIANCE	YES	NO	N/A	IN COMPLIANCE	YES	NO	N/A
Master Logger On-site	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BMP #4-Sinkholes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BMP #1-Access Roads, Skid Trails, Landings	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BMP #5-Logging Debris	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BMP #2-Revegetation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BMP #7-Fertilizers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
BMP #3-Streamside Management Zones	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	BMP #10-Wetlands	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

COMMENTS/OTHER CONDITIONS: \_\_\_\_\_

**Abatement & Compliance**

TYPE OF ENFORCEMENT ACTION: \_\_\_\_\_ CASE NO.: \_\_\_\_\_

Have the remedial measures from above enforcement action been satisfactorily completed?  YES  NO

Remedial measures that have not been completed: \_\_\_\_\_

Violators of KRS 149.342-344 may be deemed a bad actor and may be liable for a civil penalty up to \$1,000 per violation

INSPECTOR: \_\_\_\_\_ RECEIVED BY: \_\_\_\_\_

DATE OF INSPECTION: \_\_\_\_\_ SIGNATURE: \_\_\_\_\_

Personal Service: \_\_\_\_\_ First Class Mail: \_\_\_\_\_ Delivered Certified Mail/USPS No: \_\_\_\_\_



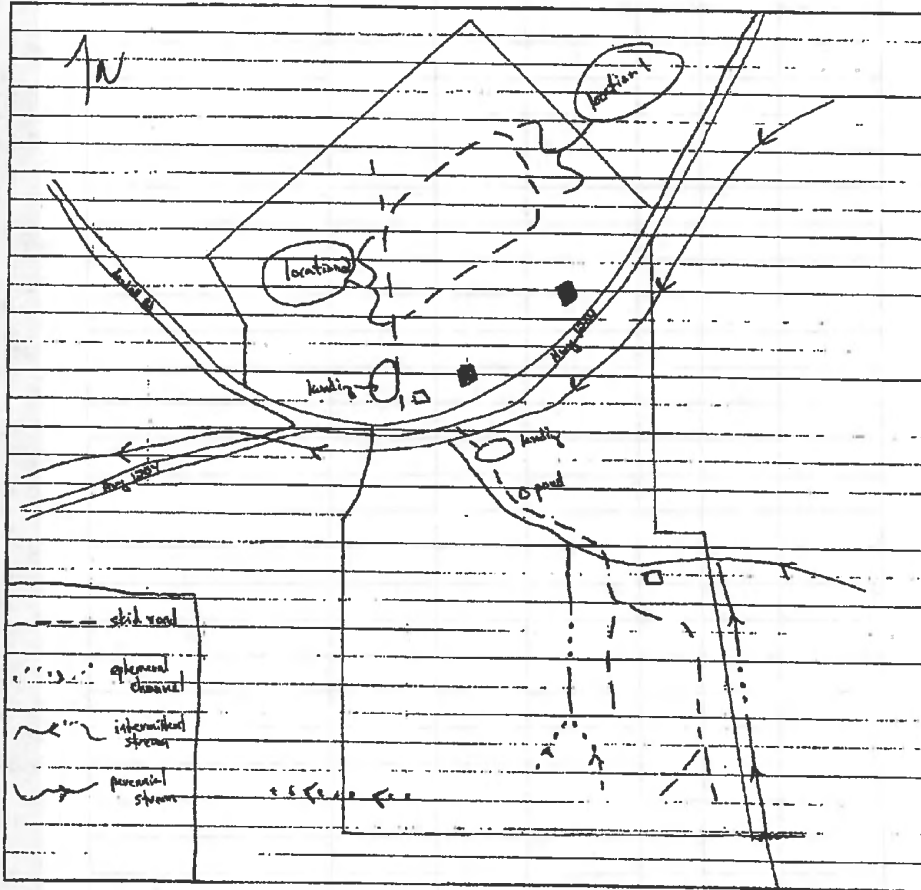
TM-8  
7/15/2000

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR NATURAL RESOURCES  
DIVISION OF FORESTRY

SITE CODE: 041-02-006

CASE NO.: 00659

TIMBER HARVESTING CONTINUATION SHEET



Inspector: Chris Scott

Date: 4/22/02

Page 2 of 2 Pages





TH - 9  
5/18/2004

COMMONWEALTH OF KENTUCKY  
ENVIRONMENTAL AND PUBLIC PROTECTION CABINET  
DEPARTMENT FOR NATURAL RESOURCES  
DIVISION OF FORESTRY

Embossed Case  
09001

\_\_\_\_\_ DISTRICT  
\_\_\_\_\_  
Address  
\_\_\_\_\_  
City, State, Zip Code

**TIMBER HARVESTING WRITTEN WARNING**

TO: \_\_\_\_\_ SITE CODE: \_\_\_\_\_  
Owner/Operator  
\_\_\_\_\_  
Company  
\_\_\_\_\_  
Address  
\_\_\_\_\_  
City, State, Zip Code

LANDOWNER: \_\_\_\_\_  
COUNTY: \_\_\_\_\_  
DATE OF INSPECTION: \_\_\_\_\_

This is to advise you that as specified below, you are in violation of provisions of KRS 149.344 at the timber harvesting operation located at:

A description of the violation(s) follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective measures required: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective measures must be completed by: \_\_\_\_\_

Violators of KRS 149.344 may be deemed a bad actor and liable for a civil penalty up to \$1,000 per violation. If you fail to implement the best management practices or corrective measures, then the cabinet will issue a Notice of Violation.

Issued By: \_\_\_\_\_ Date: \_\_\_\_\_  
Name/Title

Name of person to whom Written Warning was delivered:

\_\_\_\_\_  
Type or Print  
\_\_\_\_\_  
Signature Date: \_\_\_\_\_

Delivered Personal Service: \_\_\_\_\_ Delivered Certified Mail: \_\_\_\_\_ USPS No. \_\_\_\_\_

## ENFORCEMENT PROTOCOLS

- Enforcement should result in compliance with BMPs, mitigation of current damage from water pollution, and prevention of future violations.
- The goals of enforcement are for each timber harvesting operation to have a master logger on site and in charge, to have BMPs implemented, and to prevent water pollution.
- Effective enforcement depends on the best professional judgment of the individuals who administer the enforcement of the mandated timber harvesting standards.
- Issuing the Written Warning (and subsequent actions) is intended to give the logger notice that the site is not in compliance. Treat the actions as notification of non-compliance, not as a penalty.

# Violations

- Take photos of all violations preferably every inspection, but at minimum 3 times during the inspection process. Photos and chronology of the violations are key to proving our case.
  - Try to take from the same spot
  - Keep track in field notes or separate log sheet of photos, such as # 1 is 001-03-001 tops in intermittent, area A on map
  - Try to take digital photos on compliance inspection for Special Order, email to Tim or Larry
- Utilize Flagging
  - Stream crossing violations
  - Tops in channels
  - Skid roads

## VIOLATION DESCRIPTION

- BMP #1: Failure to install adequate water control structures – Location's 1 & 3 on sketch map; and remove concentrated logging slash left in ephemeral channel – Location 4 on sketch map.
- BMP #2: Failure to revegetate eroded or highly erodible areas – Locations 1, 2, & 3 on sketch map

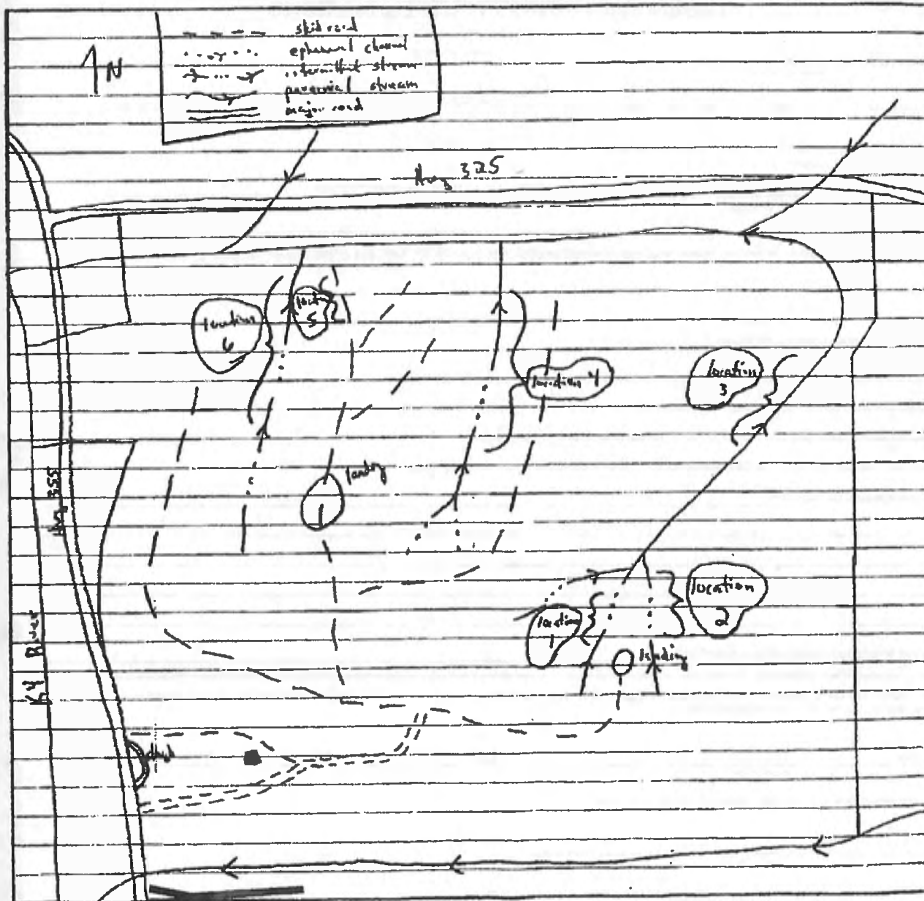
**VIOLATION DESCRIPTIONS  
SHOULD NOT CHANGE!**

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR NATURAL RESOURCES  
DIVISION OF FORESTRY

SITE CODE: 187-01-003

CASE NO.: 00623

TIMBER HARVESTING CONTINUATION SHEET



Inspector: Chris Sest

Date: 2/21/02

TH - 9  
5/18/2004

COMMONWEALTH OF KENTUCKY  
ENVIRONMENTAL AND PUBLIC PROTECTION CABINET  
DEPARTMENT FOR NATURAL RESOURCES  
DIVISION OF FORESTRY

Embossed Case  
09001

\_\_\_\_\_ DISTRICT  
\_\_\_\_\_  
Address  
\_\_\_\_\_  
City, State, Zip Code

**TIMBER HARVESTING WRITTEN WARNING**

TO: \_\_\_\_\_ SITE CODE: \_\_\_\_\_  
Owner/Operator  
\_\_\_\_\_  
Company LANDOWNER: \_\_\_\_\_  
\_\_\_\_\_  
Address COUNTY: \_\_\_\_\_  
\_\_\_\_\_  
City, State, Zip Code DATE OF INSPECTION: \_\_\_\_\_

This is to advise you that as specified below, you are in violation of provisions of KRS 149.344 at the timber harvesting operation located at:

A description of the violation(s) follows: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective measures required: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Corrective measures must be completed by: \_\_\_\_\_

Violators of KRS 149.344 may be deemed a bad actor and liable for a civil penalty up to \$1,000 per violation. If you fail to implement the best management practices or corrective measures, then the cabinet will issue a Notice of Violation.

Issued By: \_\_\_\_\_ Date: \_\_\_\_\_  
Name/Title

Name of person to whom Written Warning was delivered:

\_\_\_\_\_  
Type or Print  
\_\_\_\_\_  
Signature Date: \_\_\_\_\_

Delivered Personal Service: \_\_\_\_\_ Delivered Certified Mail: \_\_\_\_\_ USPS No. \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_ Pages

## CORRECTIVE MEASURES REQUIRED

- BMP #1: Install adequate water control structures – Locations 1 & 3 on sketch map. Remove concentrated logging slash from ephemeral channel – Location 4 on sketch map.
- BMP #2: Revegetate eroded/highly eroded areas – Locations 1, 2 & 3 on sketch map.

**CORRECTIVE MEASURES  
MAY CHANGE!**

TM-6  
7/18/2000

COMMONWEALTH OF KENTUCKY  
NATURAL RESOURCES AND ENVIRONMENTAL PROTECTION CABINET  
DEPARTMENT FOR NATURAL RESOURCES  
DIVISION OF FORESTRY

SITE CODE: 187-01-003

CASE NO.: 00623

TIMBER HARVESTING CONTINUATION SHEET

remedial measures that have not yet been completed (continued):

location 3: BMP# 5 - remove logging debris from perennial stream  
location 4: BMP# 3 - remove tops from intermittent stream  
location 5: BMP# 1 - install adequate water control structures  
location 6: BMP# 3 - remove tops from intermittent stream

Inspector: Chris Skiff

Date: 2/21/02



## ENFORCEMENT PROTOCOLS FOR REPEAT BAD ACTORS

The enforcement process for loggers or operators that have been issued two (2) or more bad actor designations is abbreviated. The enforcement steps for repeat bad actors are as follows:

- Written Warning
- Special Order
- An Emergency order may be issued at any time the situation warrants
- The period of time indicated on the written warning for abatement and compliance shall not exceed one (1) week from the date it is issued.



**ENVIRONMENTAL AND PUBLIC PROTECTION CABINET**

**Ernie Fletcher**  
Governor

**Department for Natural Resources**  
Division of Forestry  
627 Comanche Trail  
Frankfort, Kentucky 40601  
www.kentucky.gov

**Lajuana S. Wilcher**  
Secretary

**Leah W. MacSwords**  
Director

**MEMORANDUM**

**TO:** Users of the Kentucky Forest Conservation Act Inspector Manual

**FROM:** Leah W. MacSwords, Director  
Division of Forestry

**DATE:** March 23, 2006

**SUBJECT:** Changes in Kentucky Forest Conservation Act Inspector Manual

Please make the following changes in the Kentucky Forest Conservation Act Inspector Manual:

- Insert new pages 3-32 and 3-33 AND KTML Site Notification Log (attached).
- Record changes on INSPECTOR'S MANUAL RECORD OF CHANGES in Appendix VI in manual.
- Place this change notice in manual behind the INSPECTOR'S MANUAL RECORD OF CHANGES in Appendix VI in Manual.

These changes are effective upon receipt.

LWM:LL

Attachment

## KENTUCKY TEMPORARY MASTER LOGGER PROTOCOLS

New revisions of KRS 149.342 provide for designation of Kentucky Temporary Master Loggers. These protocols describe the process by which compliance with the statute and revisions of KAR 402 3:020 are to be handled.

A person who wants to be designated a Kentucky Temporary Master Logger (KTML) has to apply the Kentucky Master Logger Office with the application form and the \$50 application fee and register for a 3-day Kentucky Master Logger program along with the \$85 application fee for the 3-day program (or proof of registration for an approved equivalent reciprocal training program from another state), scheduled to be held within four months of issuance of the designation card. The Master Logger Office will issue the temporary designation card, a BMP field guide, and a County Guide to District Foresters' Offices. The designation card will state the name and address of the person designated, the date of issuance, and the date of expiration of the designation. The card is good for four months and is only available one time. (A once-in-a-lifetime offer!!!) There is no renewal. As with the regular designation card, the Kentucky temporary master logger in charge of a timber harvesting operation shall maintain his temporary designation card and a photo identification card and shall present them to the inspector when requested.

### **NOTIFICATION**

The logger or operator of a timber harvesting operation who uses a Kentucky temporary master logger shall, prior to beginning the harvest, notify the appropriate district office of the division of each operation on which the temporary master logger will be on-site and in charge. If an inspector is contacted at a location other than the division office, the notification is not valid until the information is transmitted to the appropriate office with all the pertinent information. The inspector must tell the logger that he/she must notify the appropriate district office so that information can be documented.

Notification shall be made by letter, facsimile (fax), email, telephone conversation or in person *at the district office*. A message left on an answering machine or voice mail service shall NOT constitute valid notification.

### **NOTIFICATION LOG**

The person receiving the information for notification shall fill out a Kentucky Temporary Master Logger Site Notification Log. Be sure to fill out all sections of the log.

1. The logger/operator name is the person who controls the harvesting operation and may or may not be the temporary master logger.
2. Notification date is the date the division office receives the notification.

3. The site code will be assigned by the district office by the standard procedure for that district. Indicate how the division was notified by checking the appropriate method.
4. Fill in the temporary master's name as it appears on his designation card.
5. Fill in the KTML number as it appears on his card. The number will include the letter "T" at the end -- ex: KY-073-013T.
6. Enter the expiration date from the card.
7. Fill in the landowner's name, the county where the property to be logged is located, and one of three methods for locating the boundary. The person can provide:
  - a. The latitude and longitude for the property
  - b. A USGS 7 ½ minute quad map with the location of the site clearly indicated or
  - c. A location description of the site in sufficient detail to enable to locate the site in the field.
8. Ask for and enter the anticipated harvest start date, which should be later than the notification date.
9. The person who is filling out the log shall print and sign his/her name and check when a copy goes to the file and when a copy is given to the appropriate ranger technician.

#### **INSPECTIONS**

Inspection of sites with temporary master loggers should occur as soon as possible so that proper BMPs can be discussed and encouraged. The inspections will be the same as any other harvesting site with the exception of more instruction on BMP use. Remember that using a temporary master logger does not excuse a harvest operation from compliance with BMPs.

#### **OPERATING PRIOR TO NOTIFICATION**

If a timber harvest operation using a temporary master logger is started before valid notification is provided, an Emergency Order is issued shutting down the operation and the Frankfort Timber Harvesting Compliance Section is notified as soon as possible. The THC section will notify the master logger office, the temporary master logger, and the logger/operator, if appropriate, that the designation has been revoked.

#### **OPERATING WITHOUT A KML OR TKML**

A logger or operator who starts a harvest without a Kentucky master logger or a Kentucky temporary master logger on-site and in charge will be issued an Emergency Order and will not be eligible to receive a Kentucky temporary master logger designation or be able to begin using a Kentucky temporary master logger on the site.

**Kentucky Temporary Master Logger Site Notification Log**  
402 KAR 3.020 9(3)

Logger/Operator Name \_\_\_\_\_

Notification Date \_\_\_\_\_ Site Code \_\_\_\_\_

How Notified: Voice mail or answering machine messages are not acceptable.

Letter \_\_\_\_\_ Fax \_\_\_\_\_ Email \_\_\_\_\_

Telephone \_\_\_\_\_ In Person \_\_\_\_\_

Temporary Master Logger Name \_\_\_\_\_

KTML Number \_\_\_\_\_ Expiration Date: \_\_\_\_\_

Location of Site

Land Owner's Name \_\_\_\_\_

County Where Site is Located \_\_\_\_\_

One of the following:

1). Latitude/Longitude \_\_\_\_\_

2). USGS 7 1/2 minute Quad Map with location of site shown attached \_\_\_\_\_

3). Location Description \_\_\_\_\_  
\_\_\_\_\_

Anticipated Harvest Start Date \_\_\_\_\_

KDF Employee Who Received the Notification \_\_\_\_\_

Please Print

\_\_\_\_\_  
Signature

# Appendix J

# Planning

**Create a map with all control points marked.**

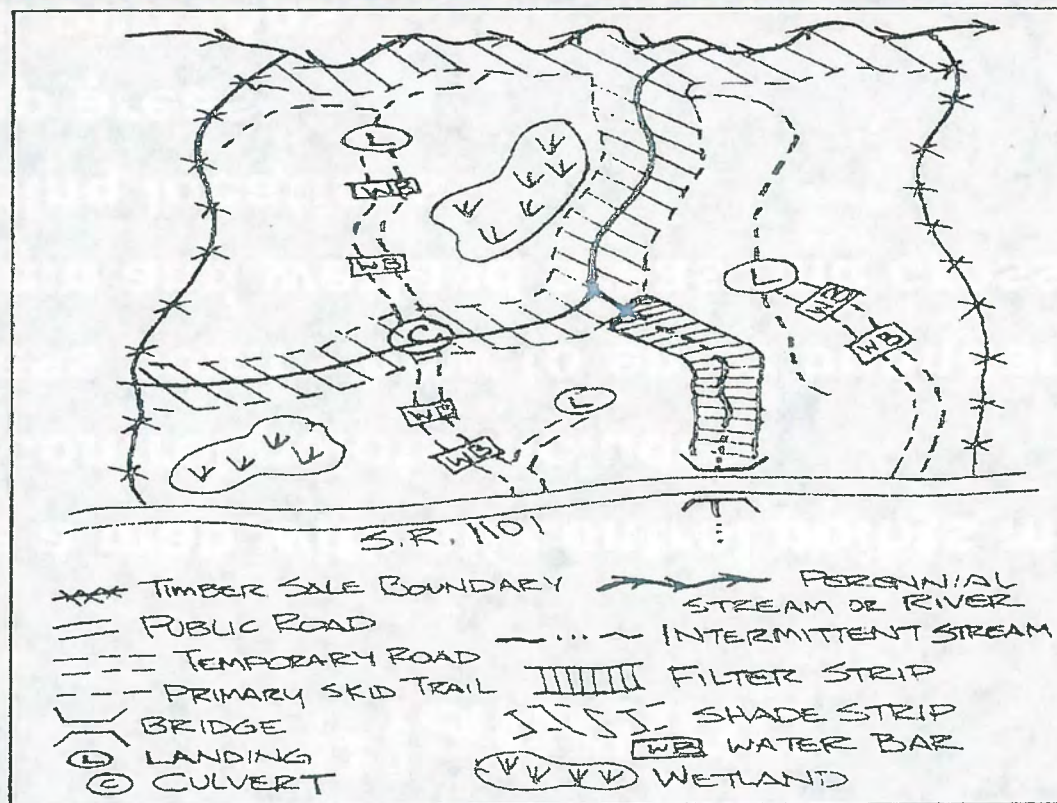
**Major control points include:**

- **Access point – how to enter boundary**
- **Stream and wetland areas and crossings**
- **Landing locations**
- **Steep areas**
- **Rock outcrops**

**Use topographical maps, aerial photos, PVA maps.**


**WALK THE SITE BEFORE STARTING  
EQUIPMENT**

# Planning Map



Site planning map





# BMP No. 1

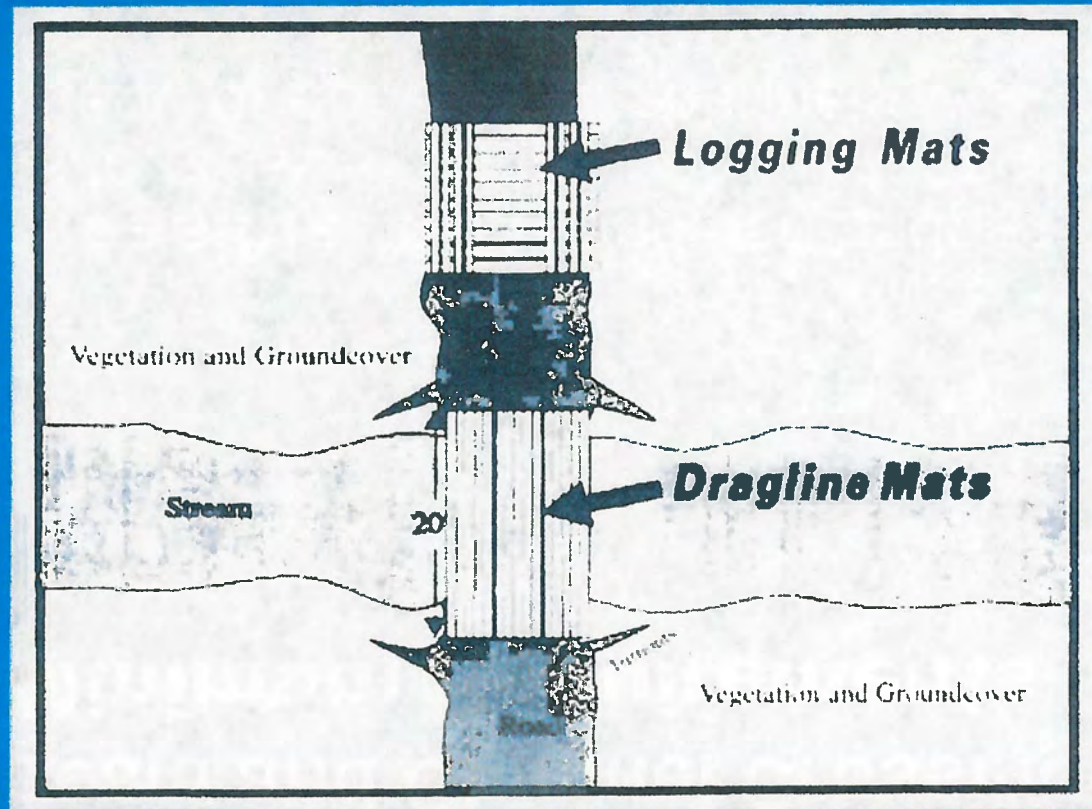
## Stream and Channel Crossings

### Minimum Requirements

- Where **feasible**, install and use bridges or culverts to cross streams (perennial and intermittent) or ephemeral channels.

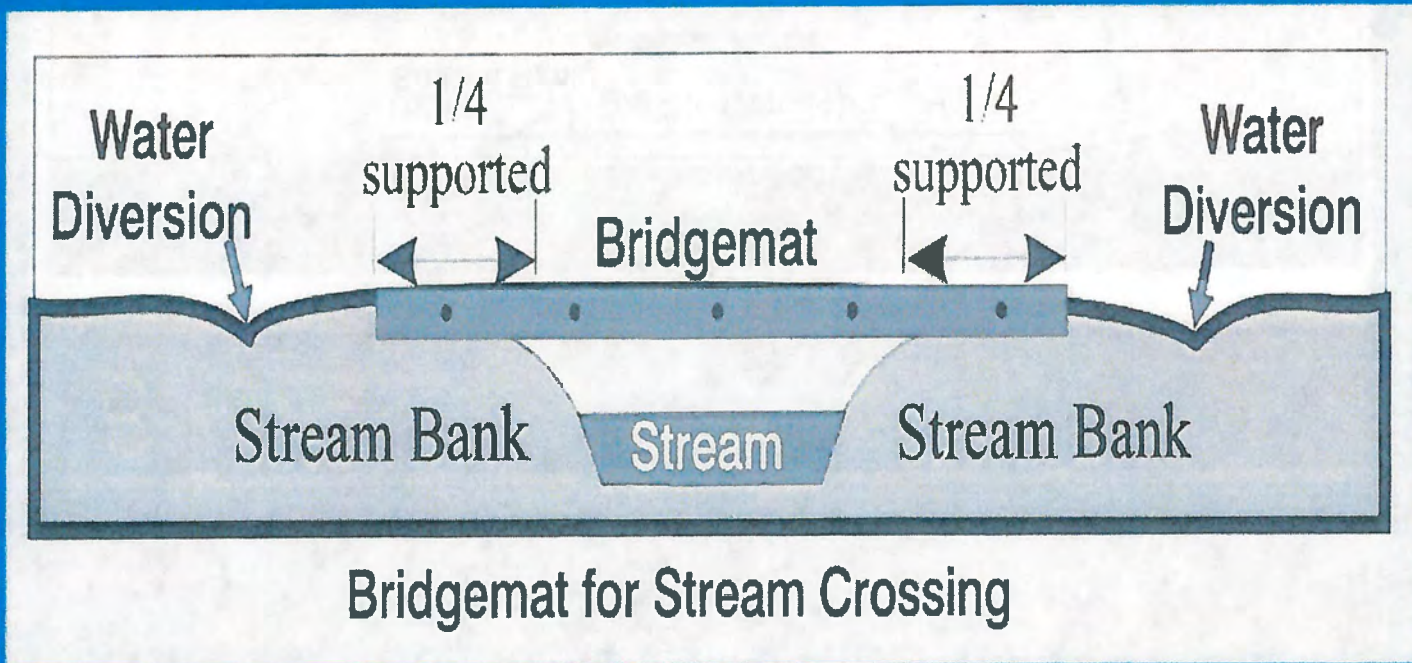
# Crossing Stream and Wet Areas

North Carolina Forest Service



# Bridgemat for Stream Crossing

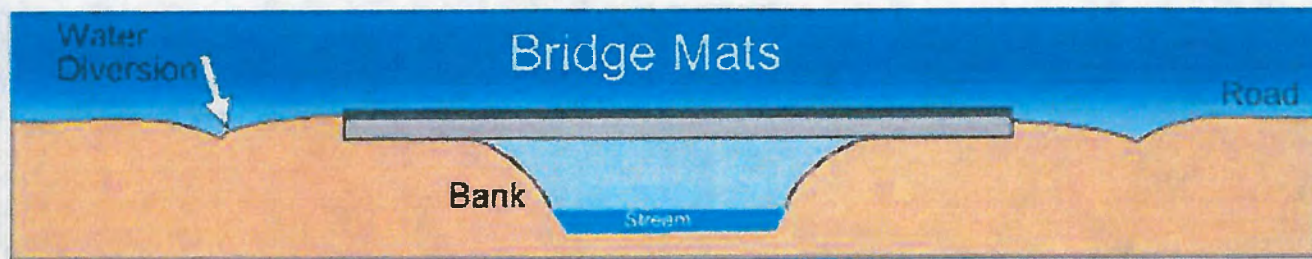
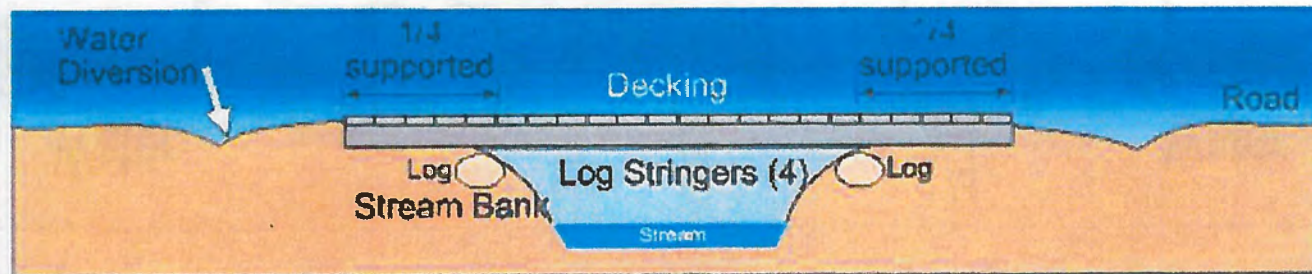
North Carolina Forest Service



# Bridge Crossings

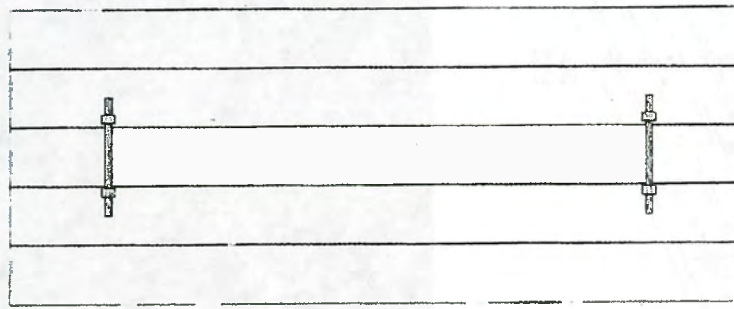
North Carolina Forest Service

## Bridges

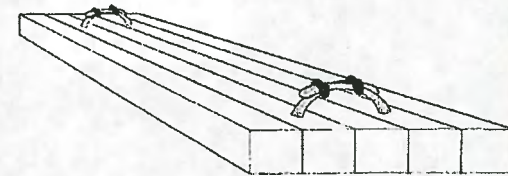


# Bridgemat Construction

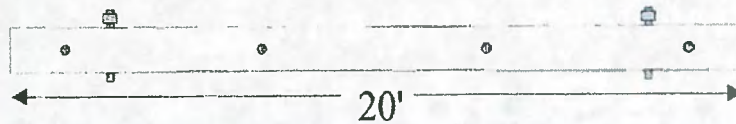
North Carolina Forest Service



5 oak 8"x8" 's bolted together with 1" bolts and cable sling at both ends



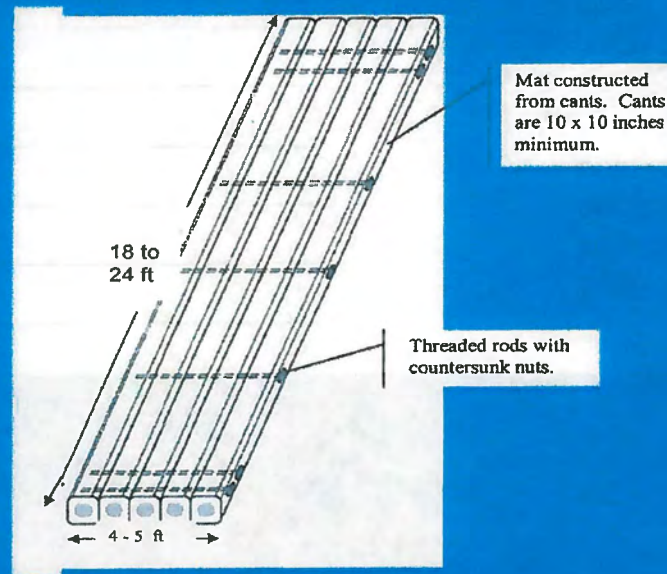
Available in 8'-30' lengths at widths at your specs.



# Portable Bridgemat Construction

North Carolina Forest Service

Portable Wood Skidder Bridge-Mat Design Sketch

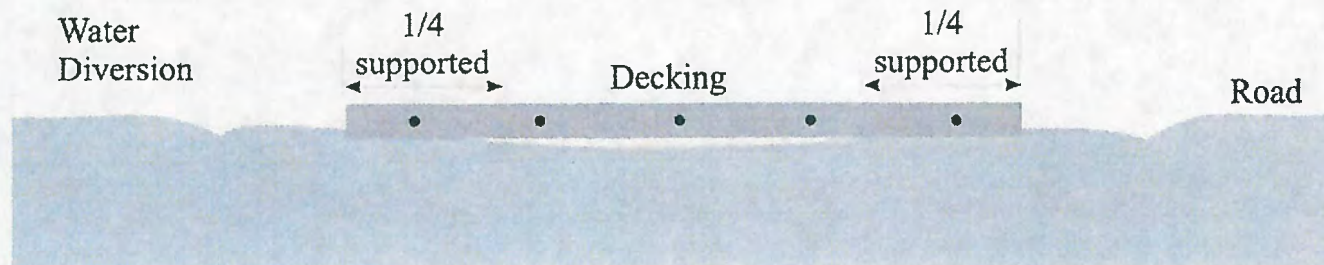
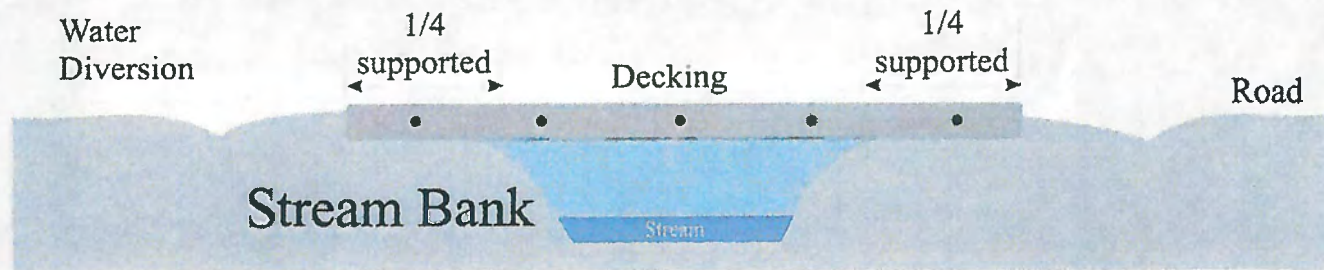


To adjust spans for fitting devices

# Mats for both stream crossing and wet area crossing

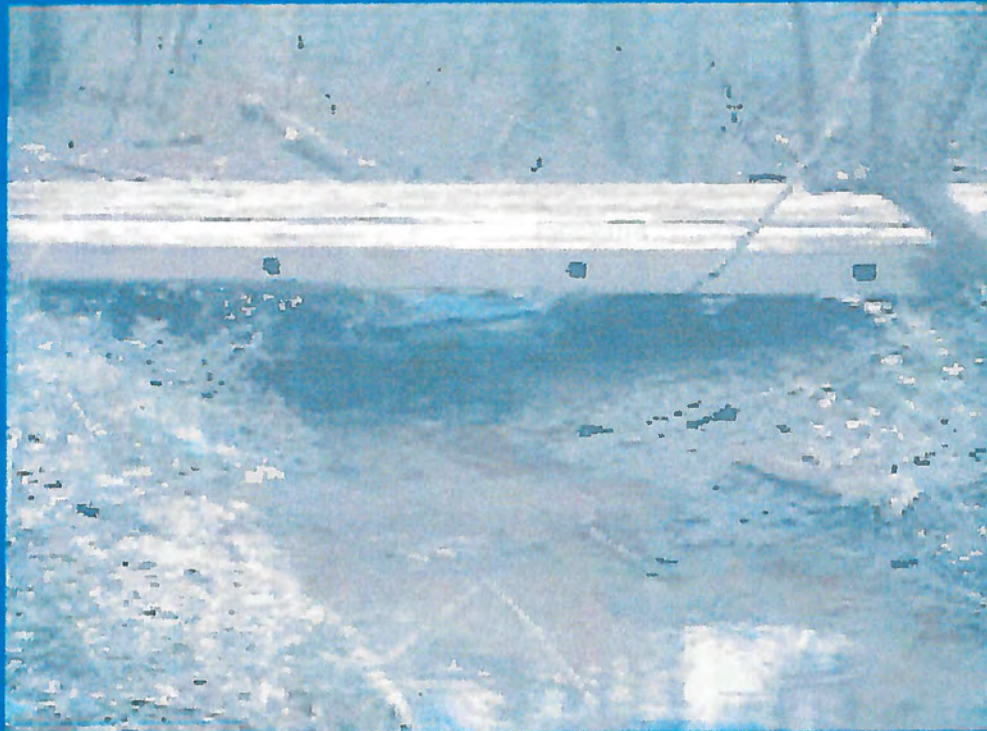
North Carolina Forest Service

## Dragline Mats



# Bridge Mat Crossing

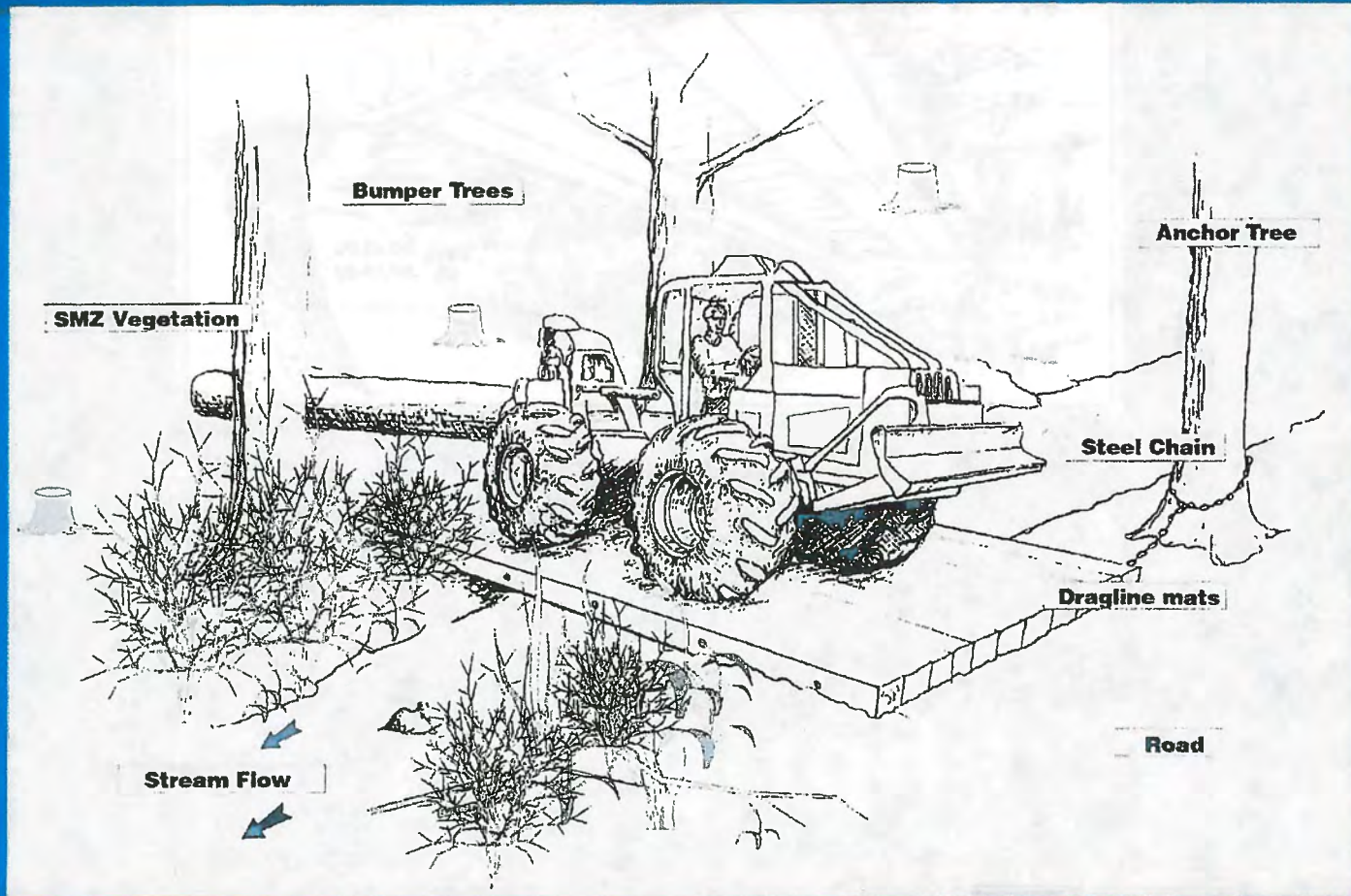
North Carolina Forest Service



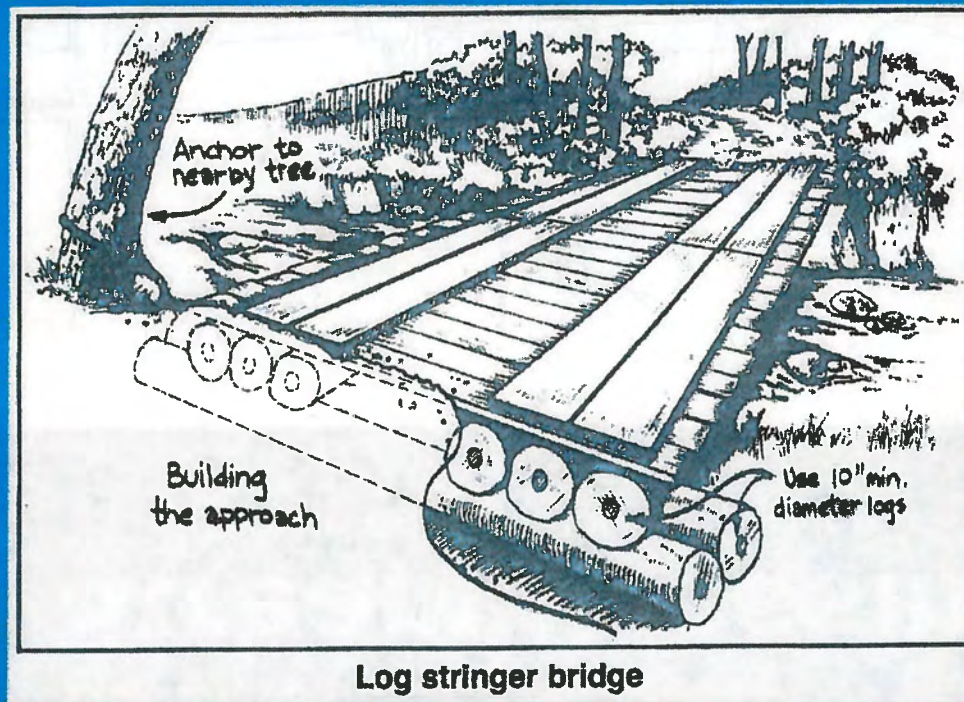


# Stream Crossing

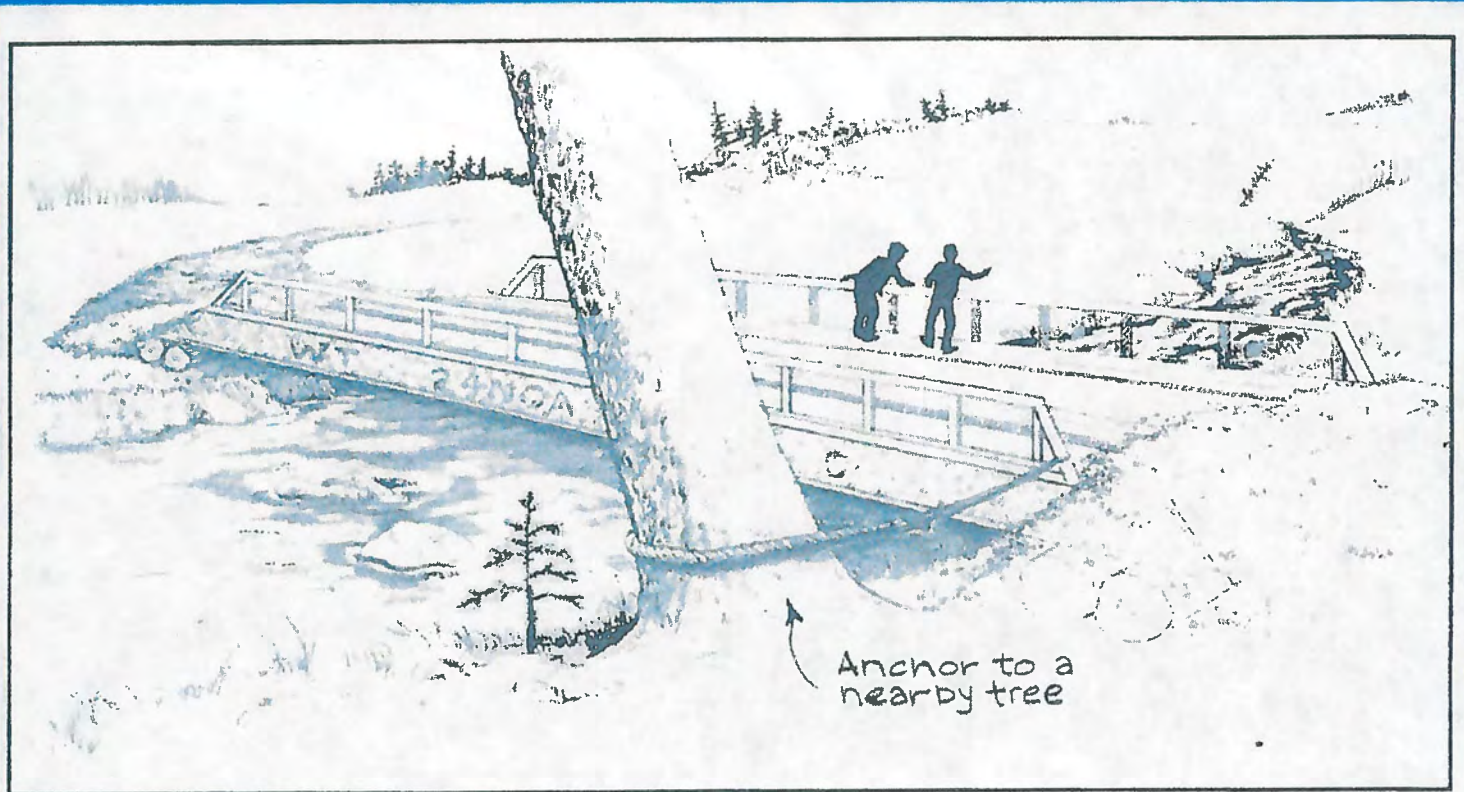
North Carolina Forest Service



# Log Bridge



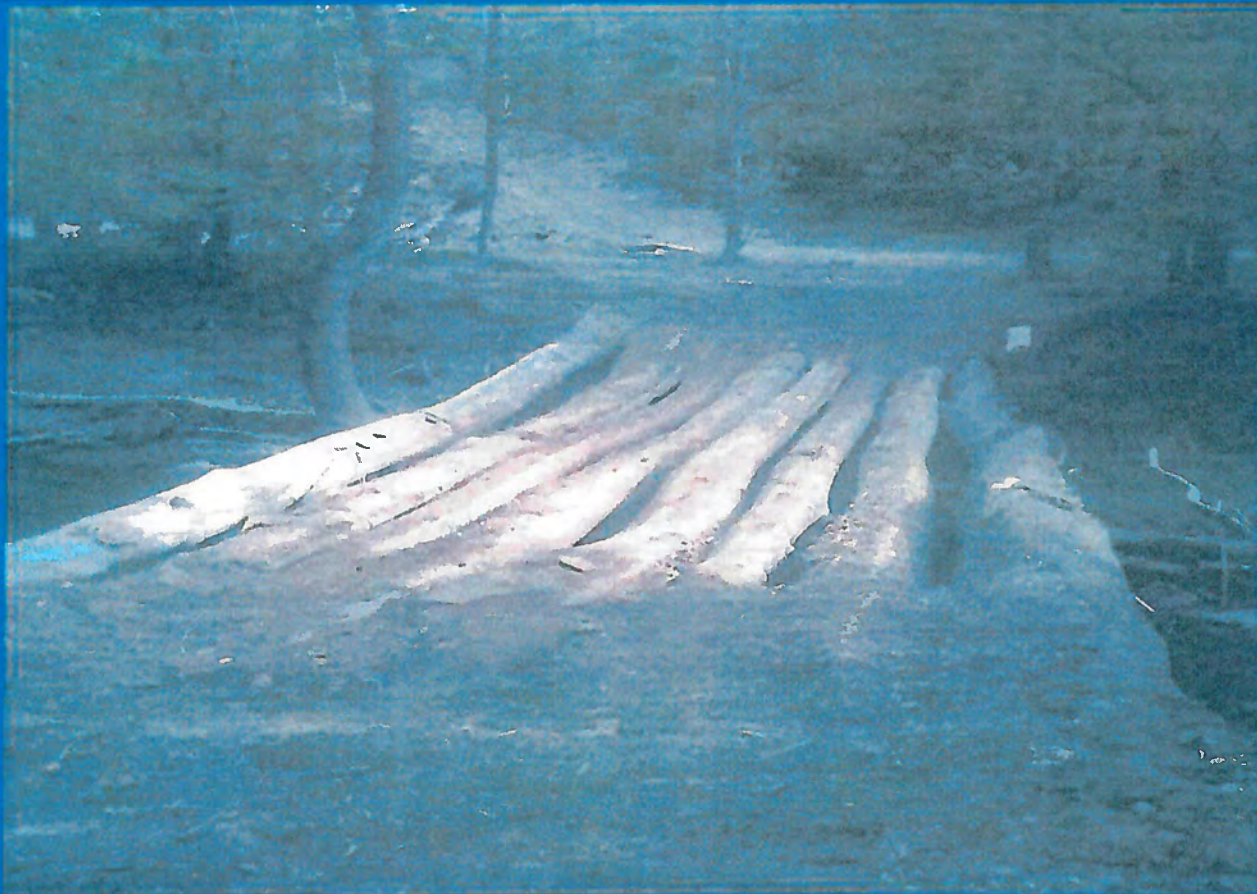
# Steel Bridge



Anchor to a nearby tree

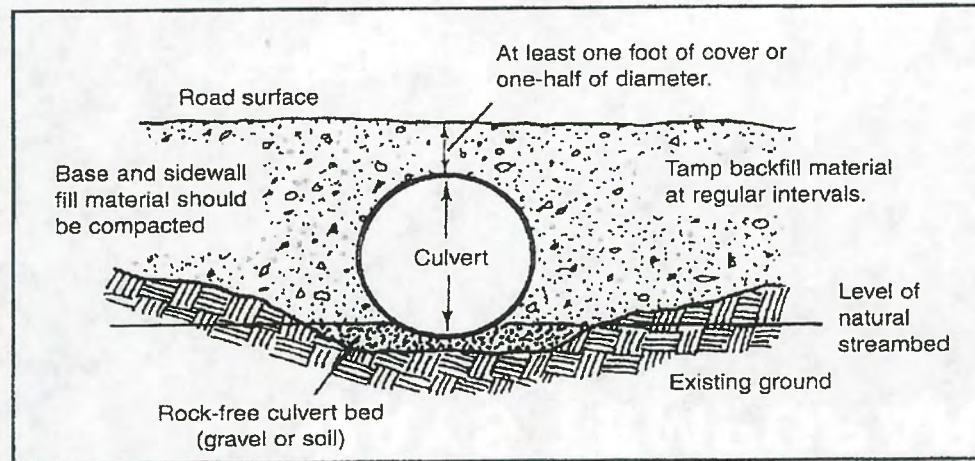
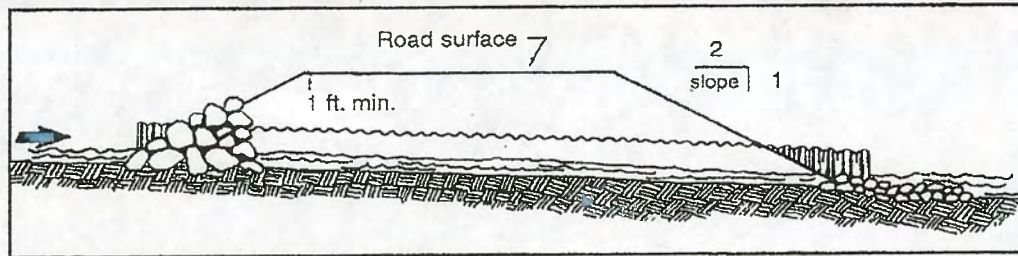
Steel bridge

# Stringer Bridge



# Culvert

*Install culverts so there is no change in the natural stream bottom elevation.*



*Installation of culverts.*

(Adapted from Montana Department of State Lands, 1992.)

# Hollow Log

**ALWAYS TEMPORARY!**





# **BMP No. 1**

## **Stream and Channel Crossings**

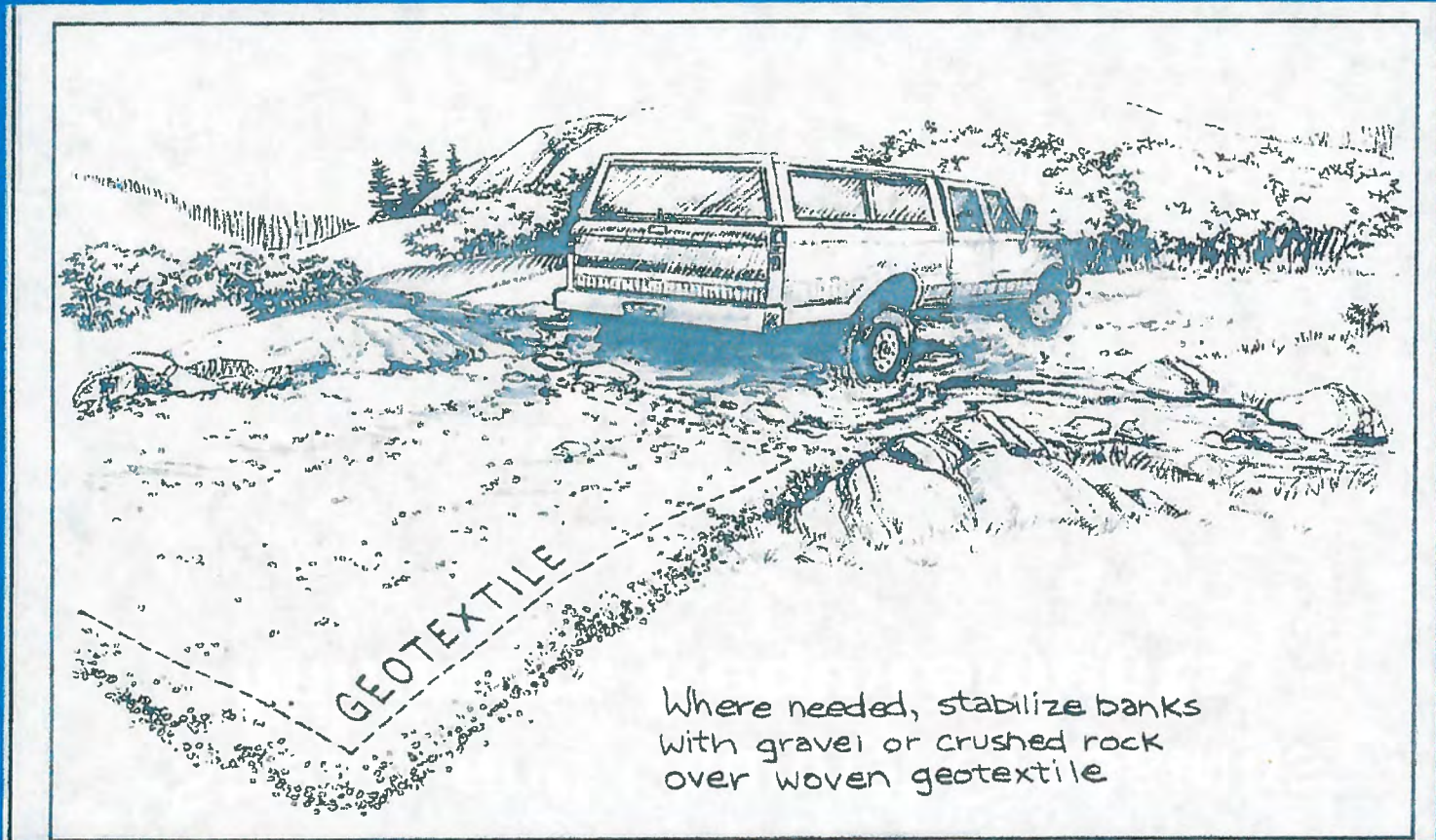
### **Minimum Requirements**

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- Where bridges or culverts are not used, roads and trails should cross streams and channels at right angles.

# Geotextile Ford





# Pennyrile Ford





# **BMP No. 1**

## **Drainage Structures**

### **Minimum Requirements**

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Water bars, culverts or other drainage structures should be installed at intervals appropriate to remove water from the road or skid trail to prevent damage and erosion to the surface of the road or trail or the forest floor from channelized flow

# Water Control

Water control structures divert water from the road into vegetation on either side.

**Use both during operation and after operation completed.**

Spacing varies with the slope or grade of the road and soil type. They include:

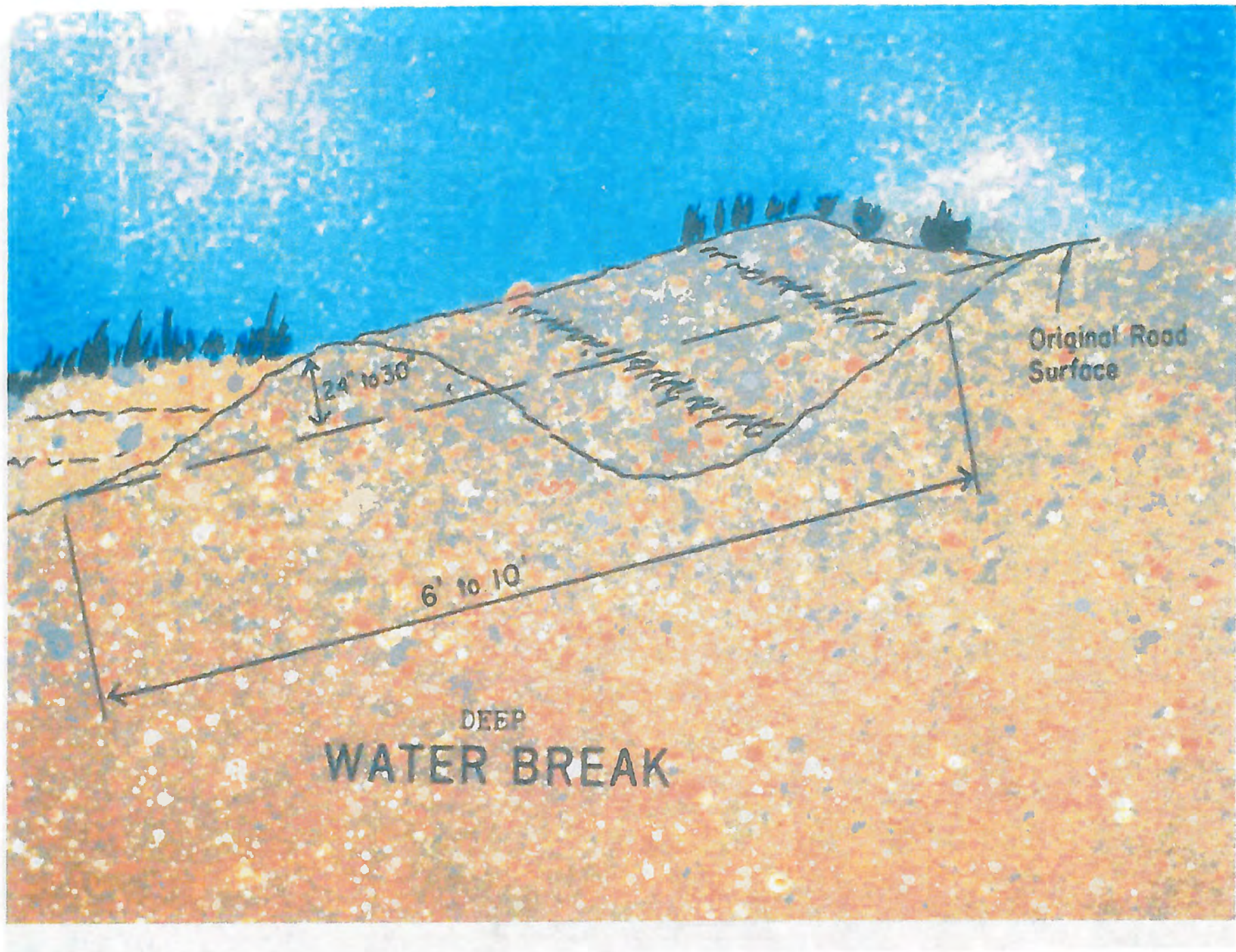
- **Water Bars – earth-berm, log, conveyor belt**
- **Broad-based dips**
- **Open-topped culverts**
- **Straw or hay bales**

# Water Control II

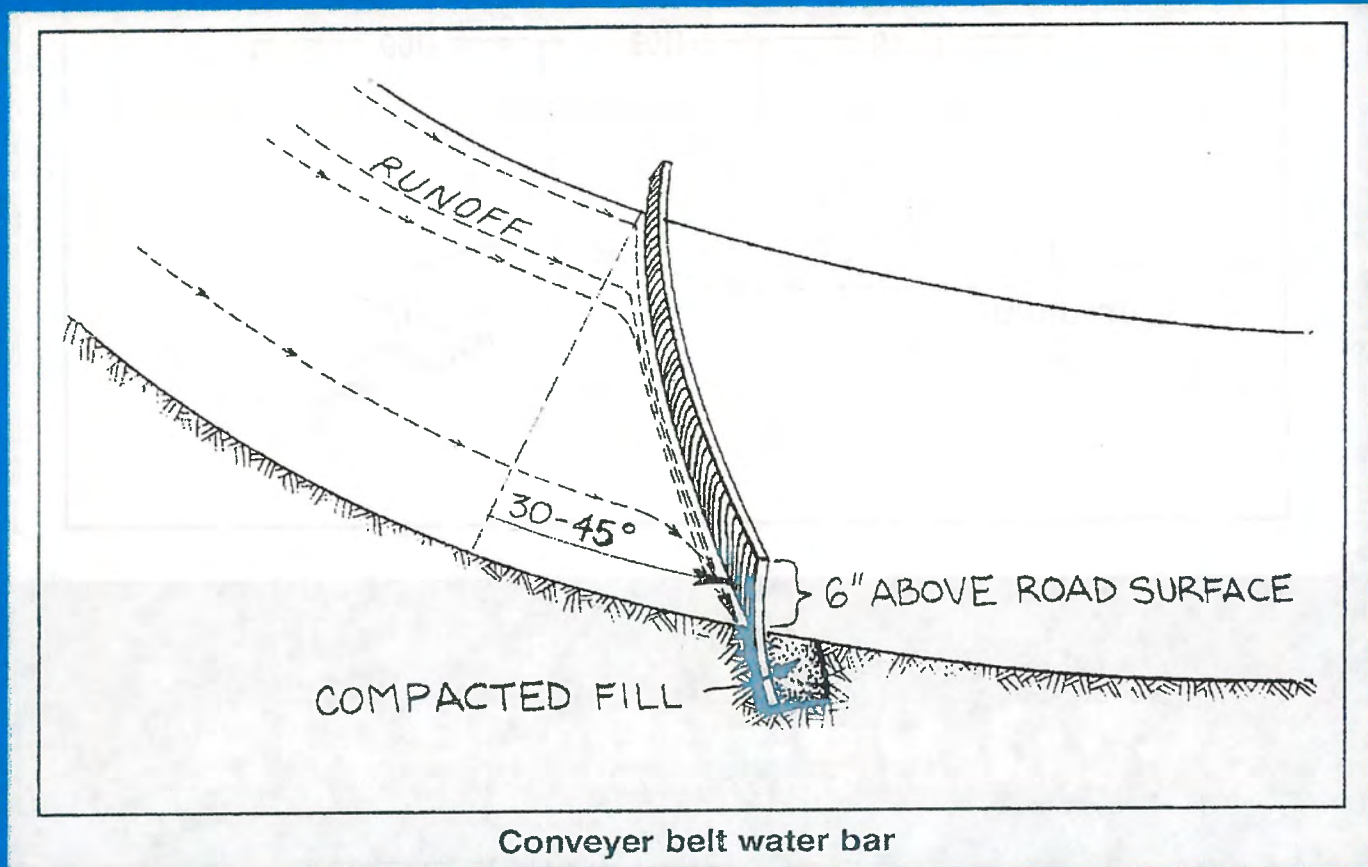
- **Road profile – crowning, insloping, outsloping**
- **Roadside ditches**
- **Cross-drainage - used for seeps and for roadside ditches**
- **Diversion or wing ditches – Turn-outs**

# Installing Water Control Structures

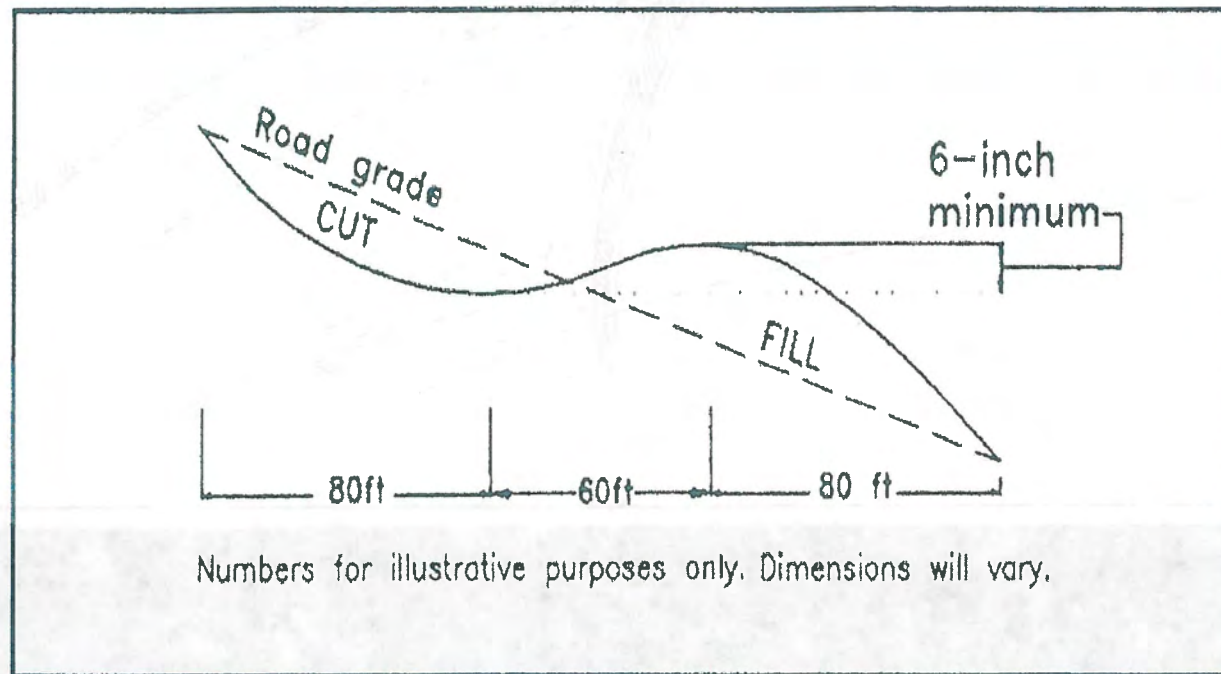
- Place structure at 30-degree to road or trail
- Make sure structure is high enough to prevent water from running over it
- Make sure upper side is open and tied to bank so water will not by-pass structure
- Make sure lower end is open so water will not pond and go over it – remove berms
- Space structures close enough together so water does not cause gullies on road or trail



# Conveyor Belt Water Bar



# Broad-based Dip

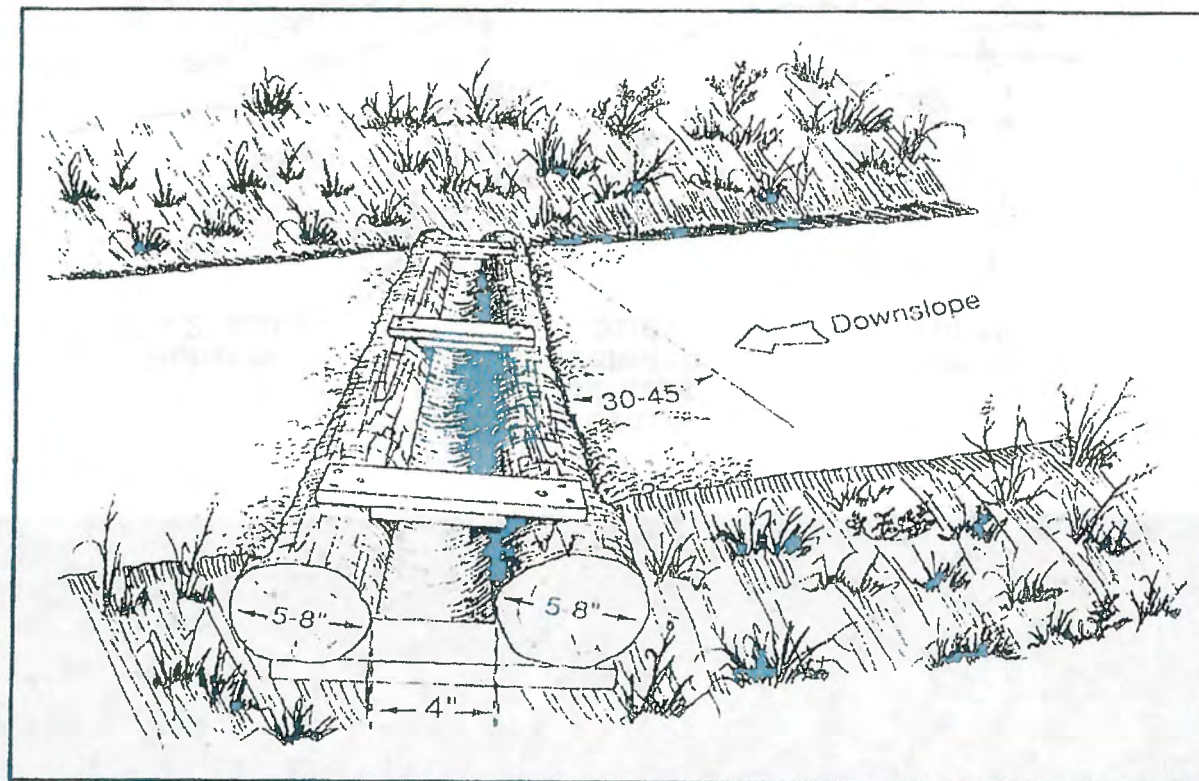


Numbers for illustrative purposes only. Dimensions will vary.

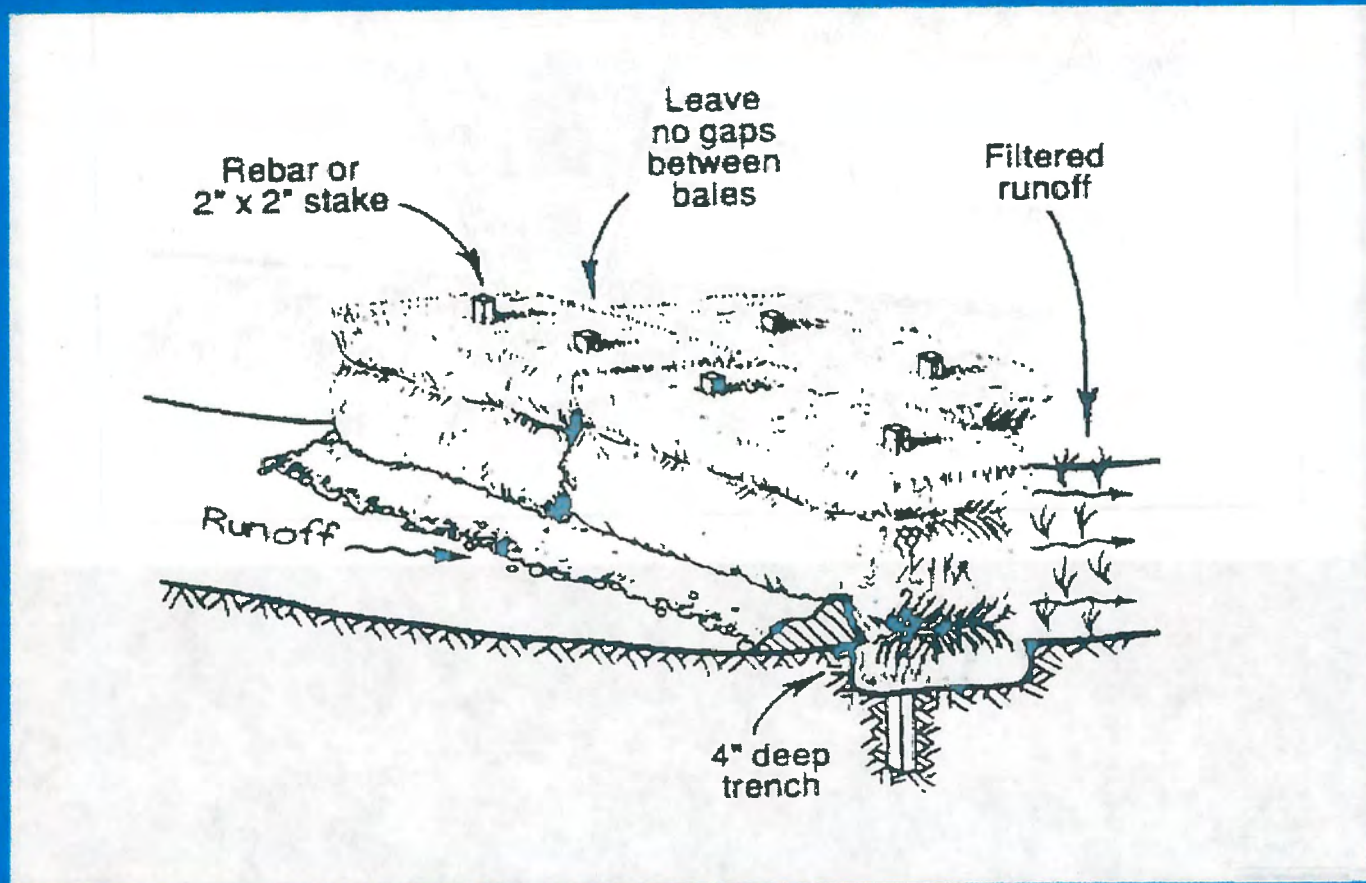
**Broad-based dip installation**



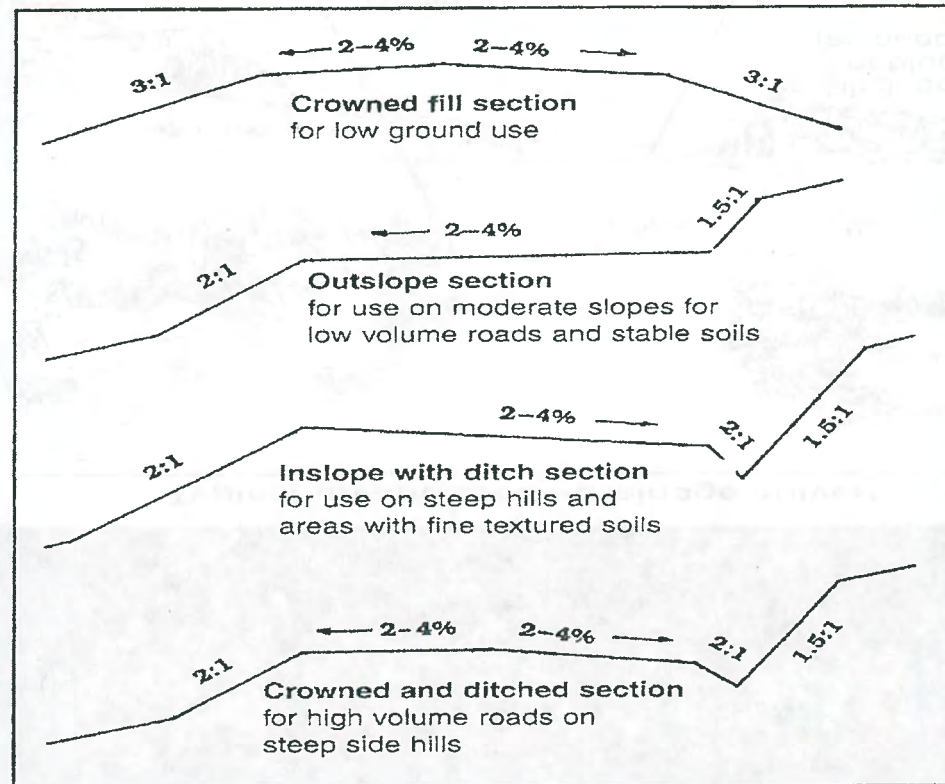
# Open-Top Culvert



# Bale Water Bar



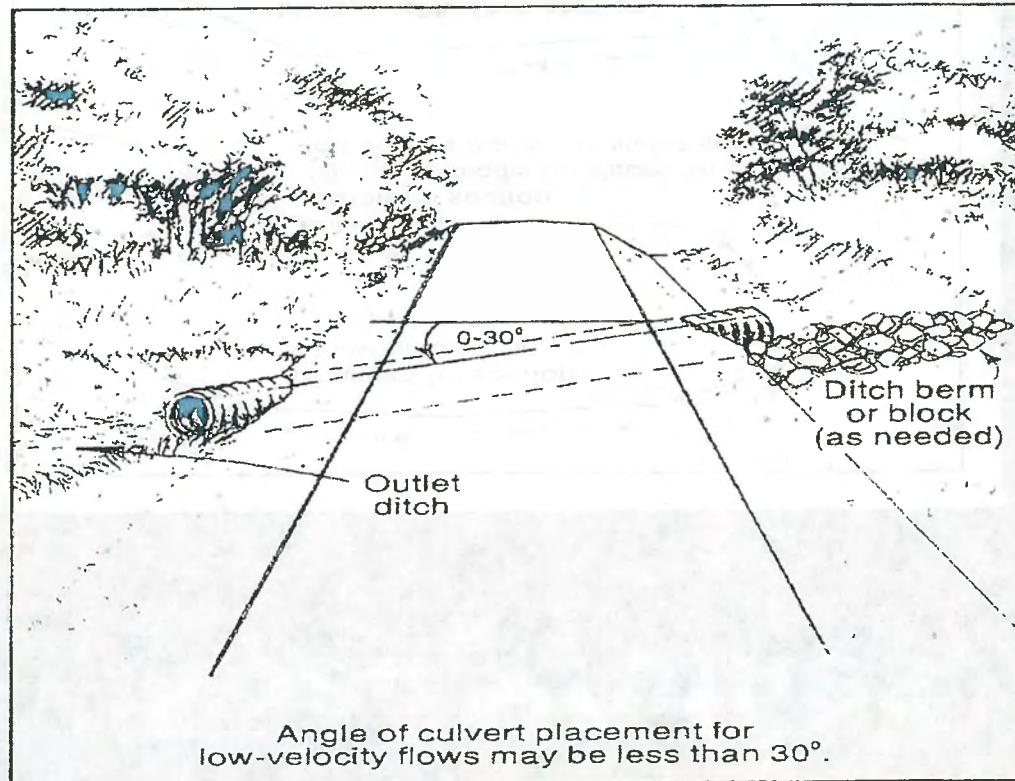
# Road Profiles



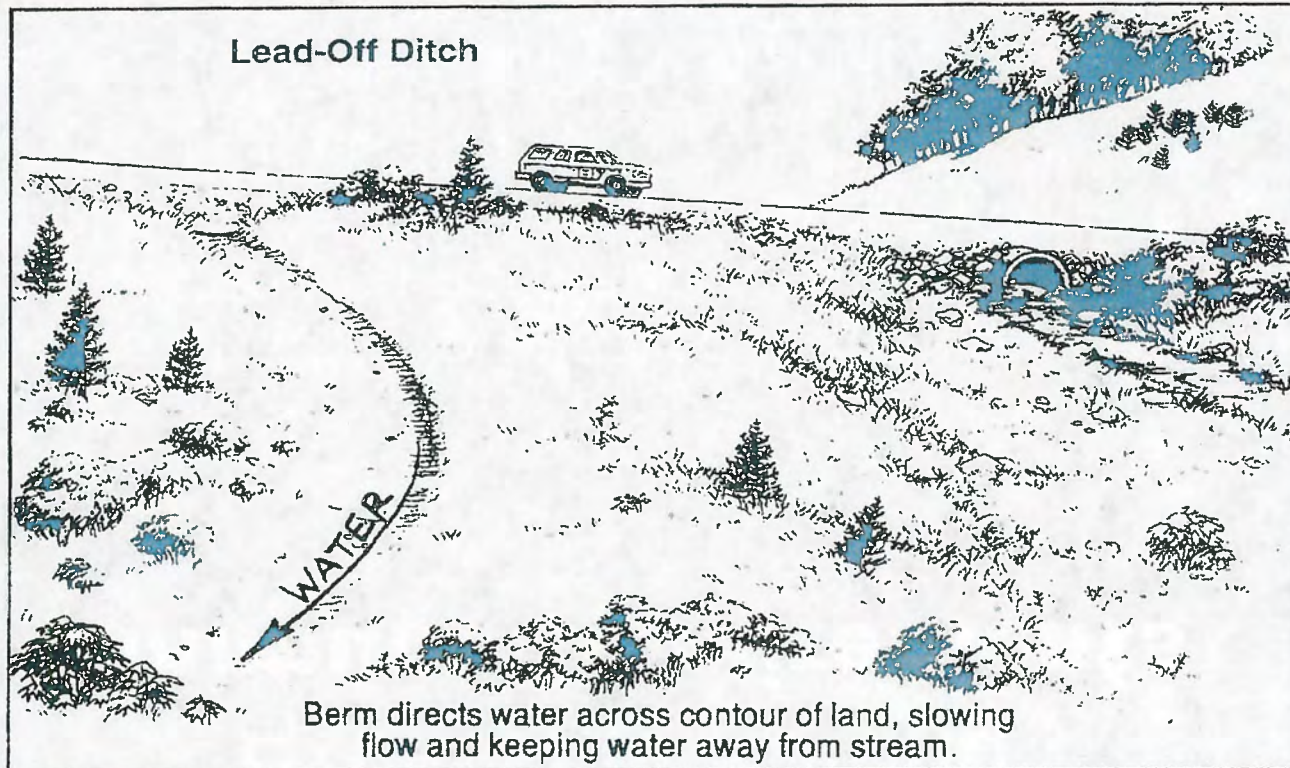
Typical road profiles for drainage and stability


# Cross Drainage

Typical upland cross-drainage culvert



# Turn-Out or Wing Ditch





# **BMP No. 1**

## **Excessive Rutting**

### **Minimum Requirements**

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Skidders or other logging equipment should not be operated off hard-surfaced roads under conditions that may cause excessive rutting.

Excessive rutting is defined as a point where ruts cannot be resurfaced with available equipment.

# Example of both excessive rutting and wet area crossing



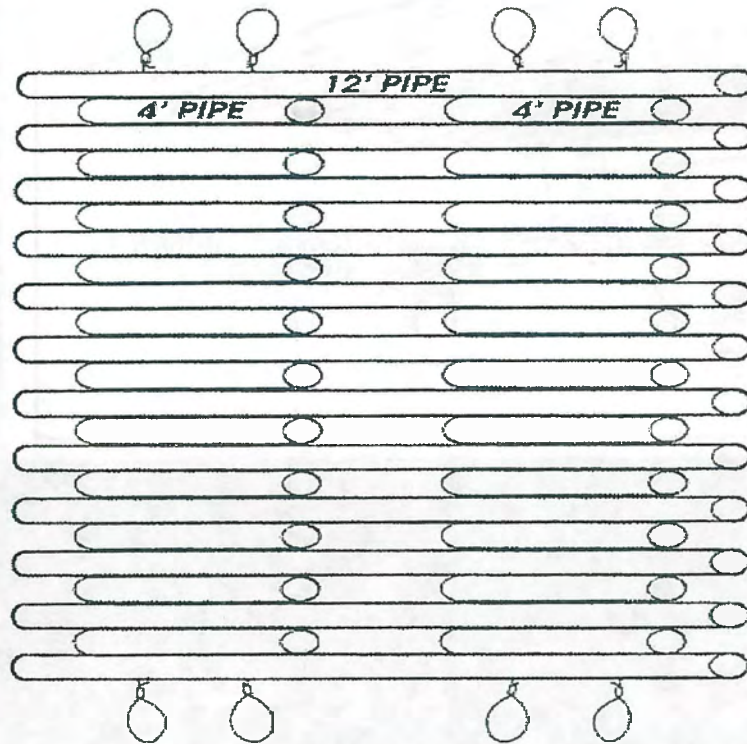
# Crossing Wet Areas

There are several ways to reduce rutting when crossing wet areas:

- Pipe mats
- Corduroy crossings
- Tire mats
- Wood mats or panels

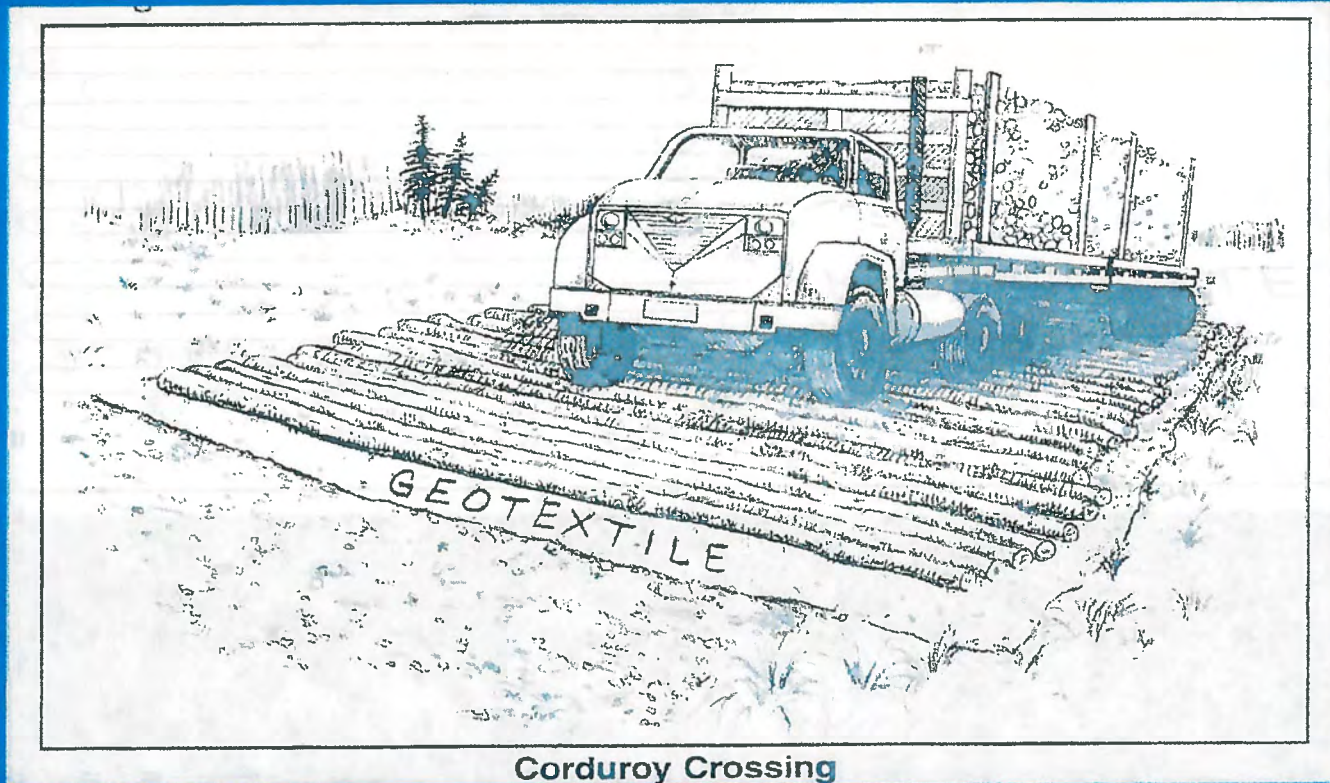


# Pipe Mat



**ASSEMBLED  
PIPE BUNDLE**

# Corduroy Crossing



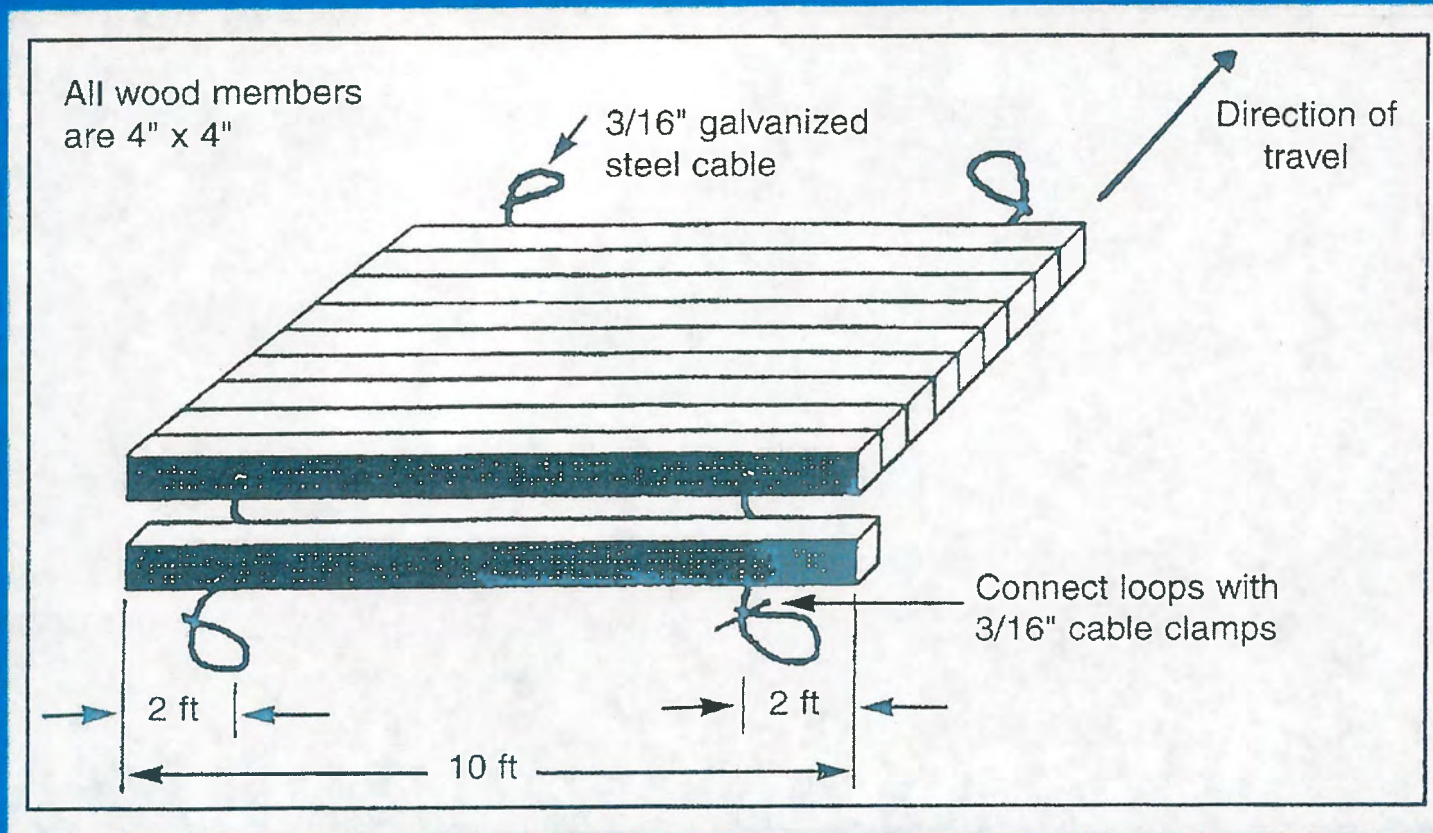
Corduroy Crossing

# Corduroy Crossing

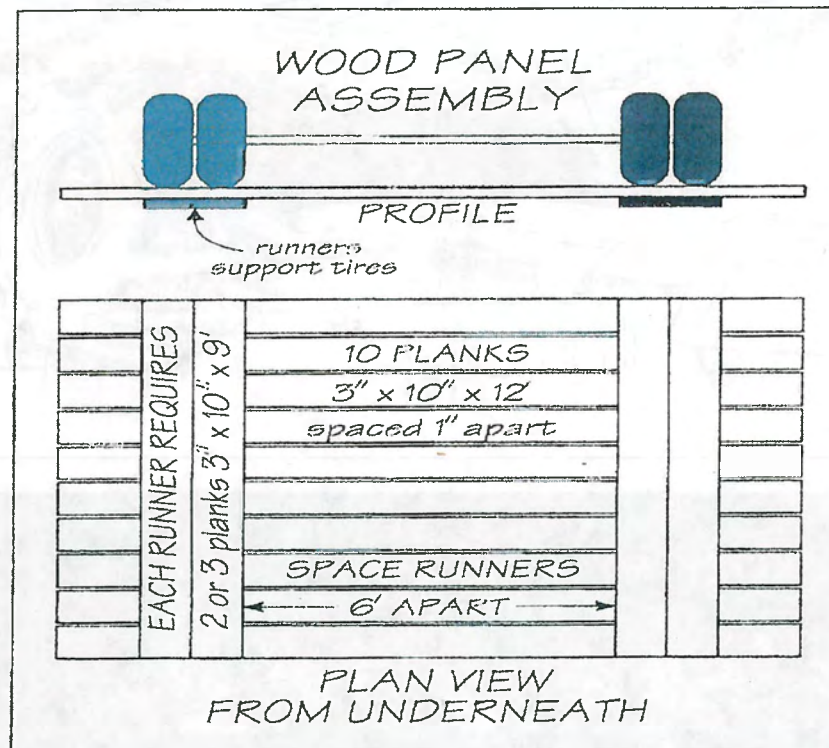


05.24.2012 14:38

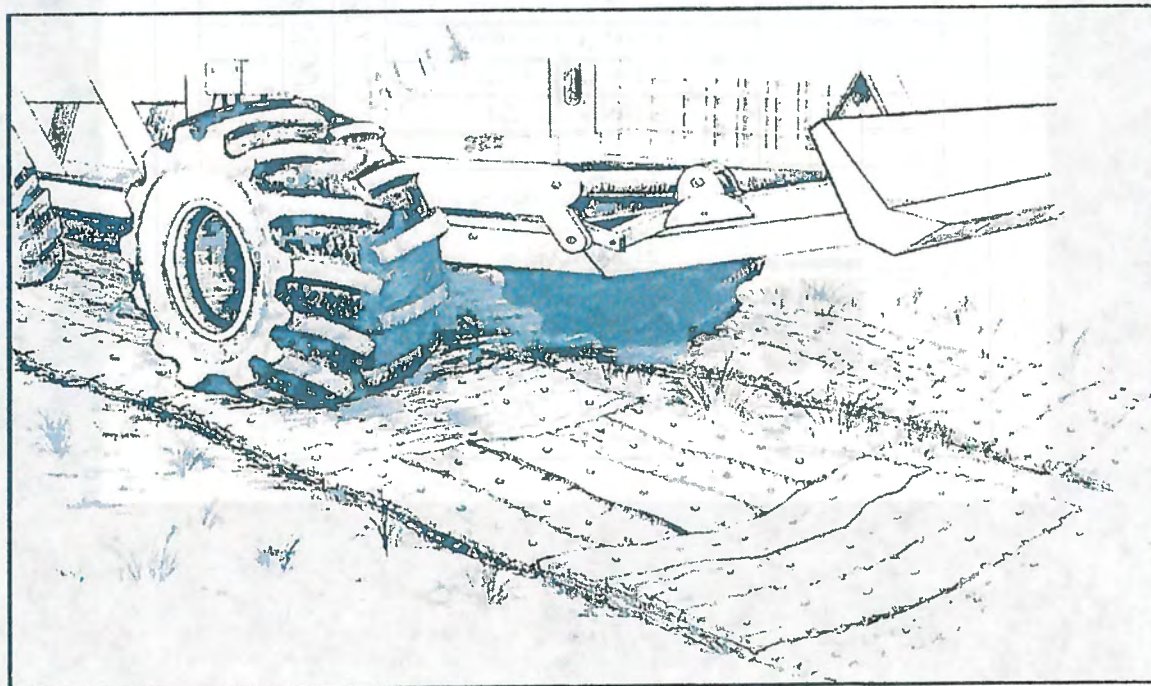
# Wood Mat



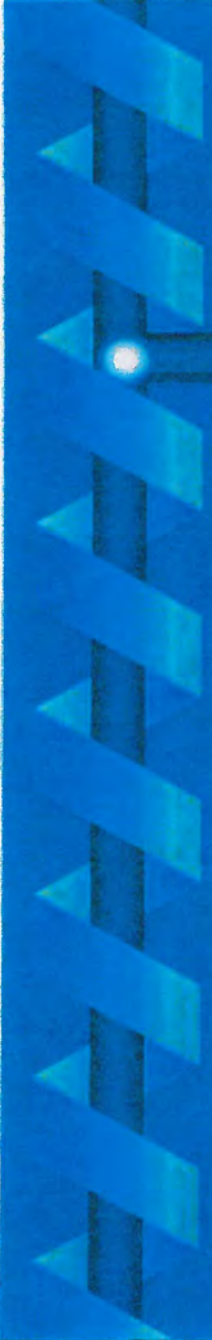
# Wood Panels



# Tire Mats



Tire mat crossing



# **BMP No. 1**

## **Ephemeral Channels**

### **Minimum Requirements**

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**Disturbed soil or concentrated logging slash should not be left in ephemeral channels.**

# Concentrated Logging Slash in Ephemeral Stream





# Disturbed Soil in Ephemeral Channel



**BMP No. 1**  
**Roads, Trails, and Landings**  
**Retirement**  
**Minimum Requirements**

**After logging is completed, roads, skid trails, and landings should be promptly reshaped and revegetated**

- **Retirement includes knocking off berms and installing water control structures and is done as soon as use of a road or section of road is completed.**

## **BMP No. 2**

### **Revegetation**

# **Minimum Requirements**

**Sediment producing, erodible, or severely eroded areas, such as logging roads, skid trails, and landings (bare ground), should be revegetated as soon as possible.**

# Severely Eroded Area



# Reshaped Landing



# Reshaped and Revegetated Road



## **BMP No. 3**

### **Streamside Management Zones**

A streamside management zone (SMZ) is a strip of woodland adjacent to a stream (or lake or pond) where only limited disturbance is desirable. Used for:

- Shading of perennial streams,
- Maintaining stream banks,
- Act as a filter to keep sediment and other pollutants from reaching the streams.

## **BMP No. 3**

# **Equipment Operations Minimum Requirements**

- In areas adjacent to **perennial** streams, lakes, and ponds, equipment operation should be avoided except at designated crossings for a minimum surface distance of 25 to 55 feet on ground with less than 15 percent slope, and a minimum distance 55 to 90 feet on ground with a slope of 15 percent or greater.
- In areas adjacent to **intermittent** streams, equipment operation should be avoided in a zone of at least 25 feet on each side of an intermittent stream except at designated crossings.



# Landing In Stream Channel



## **BMP No. 3**

# **Perennial & Intermittent Streams Minimum Requirements**

Where minimum distances are not possible, roads, trails, and landings can be located at less than the recommended distances but **should be constructed to protect water quality.**

# **BMP No. 3**

## **Perennial & Intermittent Streams**

### **Minimum Requirements**

Take precautions to prevent tree debris, such as tops from harvested trees, from remaining in or being washed into perennial and intermittent streams.

## **BMP No. 3**

# **Perennial & Intermittent Streams Minimum Requirements**

In **No Case** should stream beds be used as roads or for skidding of logs except where site conditions (rock walls, notches, or other limiting factors) leave **No Other Alternatives** for access or where road or skid trail placement in normally recommended locations is impossible or will cause a higher degree of water quality degradation.

# BMP No. 3

## Perennial & Intermittent Streams Minimum Requirements

**IF** an exception due to physical conditions is necessary, stream channels may be used as roads or for skidding **ONLY** for the **MINIMUM** distance required.

# **BMP No. 5**

## **Logging Debris**

### **Minimum Requirements**

- Properly dispose of used oil, hydraulic fluids , and other fluids.
- Properly dispose of cans, bottles, lunch bags, oil filters, or air filters, etc.

# Logging Debris

