Implementing Best Management Practices for Timber Harvest Operations

from the Alaska Forest Resources and Practices Regulations

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DIVISION OF FORESTRY
DEPARTMENT OF NATURAL RESOURCES

Please note:
This booklet is a work in progress. If you have any questions about sections in the booklet, please contact Rick Rogers, Division of Forestry:
phone: 907-269-8473; email: Richard.rogers@alaska.gov. Rick will find answers to your questions, and keep a list of edits and clarifications that need to made in the future. By contacting him with questions, future revisions will make this booklet a more useful document. Thanks!!

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INTRODUCTION:
Guidance for Best Management Practices (BMP) Compliance Monitoring

Purpose

- Document how frequently the operators are implementing a BMP when it applies to the harvest activity they are conducting.
- Document whether the operators are correctly applying the BMP.
- It is not the purpose of this project to determine if implementation of the BMP is necessary to protect water quality, or to evaluate the effectiveness of the BMP in protecting water quality.

Scope

- Compliance monitoring shall be conducted on all current timber harvest operations subject to the Forest Resources and Practices Act.
- Complete compliance score sheets on selected harvest activities during routine inspections of timber harvesting operations on state, other public, and private timber lands.[1]

What to Monitor

- Select recently completed units to check for compliance with timber harvest related BMPs. Evidence of how well the BMPs were implemented is best viewed soon after harvest has been completed when disturbances associated with yarding activity can be readily discerned.
- Select recently built roads to check for compliance with road construction related BMPs. Newly constructed roads usually have not been significantly modified by subsequent use or maintenance operations.
- Select roads used for hauling during the current operating season to check for compliance with active road maintenance BMPs.
- Select roads not currently being used for hauling but that were used in previous seasons to check for compliance with inactive road maintenance BMPs. Give preference to roads that were used last season.
- Select roads accessing a drainage that are used to haul timber from a number of units, as well as roads used to access the units themselves, for compliance monitoring. Generally avoid monitoring short spurs terminating in landings.
- Select roads recently closed by the operator for compliance with road closure BMPs. Stay up to date with what roads the operator is planning to close that are still readily accessible and don't require an excessive amount of time to inspect.

Procedure

- You do not need to need to monitor all aspects of the operation for compliance during each inspection. On state sales plan to complete all relevant sections of the score sheet to assist in sale administration.
- Select one or two harvest activities during an inspection to complete a score sheet on. The intent is to gather as many samples from as many operations as possible during the year.
- Select activities on a portion of the operation you are already planning to visit as part of the inspection.
- Select a road or unit, or a particular harvest activity(s) to evaluate prior to going out in the field and incorporate compliance monitoring into your inspection plan for the day.

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[1] Submit copies of all completed Compliance Monitoring Score Sheets and the corresponding Field Inspection Reports to the Training Officer.

- Keep the harvest area or road you are evaluating and scoring to a reasonable size. It is harder to assess compliance and assign a score as an area increases in size or the road becomes longer. It also tends to favor assignment of mid-range scores, biasing the results.
- Keep the harvest area or road being evaluated to a size and location that can be readily identified.
- Do not fill out a score sheet on a portion of the operation if you're just driving through it. Take the time to get out on the ground and walk the road or unit being evaluated.
- Evaluate a single unit or, if the unit is quite large, a setting(s) within the unit.
- When evaluating a unit, also evaluate the roads within the unit to expand the amount of monitoring conducted. Both activities can be evaluated on the same score sheet.
- Avoid evaluating road segments that are longer than a mile. As the number of times a BMP is applicable increases, varibility in how well the BMP was implemented each time makes it increasingly difficult to consistently assess and score the BMP.
- Consider utilizing road junctions to define the road segment to monitor. This will usually ensure the road segment being assessed was built to the same standards.
- Avoid ending road segments on stream crossings since it is important to include them in the monitoring.

Applicability

- The applicability of a BMP appearing on the score sheet is dependent upon the harvest activity being evaluated, the terrain, the location of waterbodies, and other site specific characteristics encountered in the field.
  For example:
  - BMPs covering the construction and adequacy of a drainage system are always applicable whenever a road is constructed.
  - BMPs relating to log stringer bridges are only applicable to streams crossed by a log stringer bridge.
  - Riparian related BMPs are applicable if a harvest activity is adjacent to a classified waterbody, or if a harvest activity occurs within the associated riparian area.
- A BMP is still applicable despite the lack of any perceived adverse impacts to water quality resulting from the operator's failure to implement it. The goal of the current compliance monitoring program is to determine if the operators are consistently implementing the BMPs. Impacts to water quality resulting from an operator's failure to implement a BMP will be studied in another phase of the program.
- Score a BMP as "not applicable" if it can not be implemented because the operator failed to implement a prior BMP.

Scoring

- Scores are based on answers to the following questions:
  - Is the BMP applicable to the harvest activity?
  - Did the operator implement it?
  - How frequently did the operator implement it?
  - How well was the BMP implemented?
- Scoring criteria may vary somewhat from BMP to BMP but will usually have the following characteristics.
  - **1 -** An attempt was rarely made to implement the BMP when it was applicable to a harvest activity. The BMP was applied in a manner that was ineffective in achieving the desired result.
  - **2 -** An attempt was occasionally made to implement the BMP when it was applicable to a harvest activity. The BMP was applied in a manner that was sometimes effective in achieving the desired result.

3 - An attempt was usually made to implement the BMP when it was applicable to a harvest activity. The BMP was applied in a manner that was somewhat effective in achieving the desired result.

4 - The BMP was frequently implemented when it was applicable to a harvest activity. The BMP was applied in a manner that was usually effective in achieving the desired result.

5 - The BMP was consistently implemented when it was applicable to a harvest activity. The BMP was applied in a manner that was effective in achieving the desired result.

n.a. - The BMP was not applicable to the harvest activity assessed.

- Score the BMP using the characteristic that has the lowest performance by the operator. For example:
  - The operator frequently implemented the BMP when it was applicable but the manner in which they applied it was only somewhat effective in achieving the desired result. In this instance the BMP would be scored as a three (3).
- It will be easier to distinguish between the implementation of a BMP, and how effective it was applied for some BMPs than for others.
  For example:
  - Installation of a cross drain or relief culvert that is angled down grade and out sloped will provide more effective drainage than one that is installed straight across the road.
  - Runoff may not enter a cross drain with a perched inlet at low flows unless a ditch block is also installed. Together they are more effective in providing the required drainage.
  - Sediment generated from erosion of excess road overburden excavated from within a riparian area that is deposited outside the riparian area but on the side of a ridge facing the stream is more likely to enter the stream than if it was placed on the back side of the same ridge.

Comments

- Comments are intended to assist the inspector in preparation of the associated inspection report and to give any reviewer an insight into what is affecting implementation of the BMP.
- Note which BMPs were not applicable because the operator failed to implement a prior BMP.
- Note the reason for rating any BMP a 1, 2 or 3. Was the BMP infrequently implemented? Was the BMP poorly or partially executed?
  For example:
  - Ditch blocks are installed on only 2 of 5 relief culverts.
  - Ditch blocks are inadequate to direct dirtchline flows into relief culverts and prevent overwhelming the capacity of the ditchline.
  - Drainages were clean of debris for only 20 feet above culvert inlets. Small debris is partially blocking culvert inlets.
  - Operator failed to split on stream. Slash and debris are partially blocking the stream channel.
- Note any observation about the effectiveness of a BMP for future monitoring. Did implementation of the BMP acheive the desired result?
  For example:
  - Erodible soils were grass seeded but the grass failed to become established. Slopes continue to erode.

- Ditchline flows are eroding the toe of a cut slope, causing the slope to continue sloughing. Additional drainage is required to divert runoff away from the toe of the slope.
- Unable to keep fly rock out of anadromous fish stream when conducting approved blasting along approach to stream crossing.

STREAM CLASSIFICATION MATRIX: SUMMARY OF REGULATIONS AND STATUTES

Stream Type	Private land	State land	Other public land
All Regions	Use 11 AAC 95.265 (b) through (f) for specific procedures on classifications (i.e., water body classification changes along its length, field inspections, field reviews, reclassifications, saltwater bodies). [11 AAC 95.265 (b)-(f)]		
Region I	See also 11 AAC 95.265(g) and its Table A for clarifications on determining when a stream is anadromous.	Classification of surface waters must indicate whether or not the surface waters are anadromous or contain high value resident fish under AS 41.17.950. [AS 41.17.950(1),(10) and 11 AAC 95.265(a)(4)] In the absence of a site-specific determination by the deputy commissioner, the state forester shall presume for planning purposes that a stream is anadromous if it is connected to anadromous waters that are without department documentation of a physical blockage and has a stream gradient of 8 percent or less. [AS 41.17.118(c)]	Classification of surface waters must indicate whether or not the surface waters are anadromous or contain high value resident (HVR) fish under AS 41.17.950. [AS 41.17.950(1),(10) and 11 AAC 95.265(a)(4)]
Type I-A waterbody	An anadromous water body that (A) is a stream or river of any size having an average gradient of eight percent or less, with banks held in place by vegetation, channels that are not incised, and a substrate composed of rubble, gravel, sand, or silt; (B) consists of wetlands and lakes, including their outlets; *and* (C) is an estuarine area delimited by the presence of salt-tolerant vegetation. [11 AAC 95.265(a)(1) and AS 41.17.950(27)]		
Type I-B waterbody	An anadromous water body that does not meet the definition of a Type I-A water body. [11 AAC 95.265(a)(1) and AS 41.17.950(28)]		
Type I-C waterbody	A water body that is not anadromous, that is a tributary to a Type I-A or Type I-B water body, and that has a gradient of 12 percent or less. [11 AAC 95.265(a)(1) and AS 41.17.950(29)]		
Type I-D waterbody	A water body that is not anadromous, that is tributary to a Type I-A or Type I-B water body, and that has a gradient greater than 12 percent. [11 AAC 95.265(a)(1) and AS 41.17.950(30)]		
Other waterbodies	Any surface waters that do not meet the criteria set out in AS 41.17.950(27)-(30) do not have a riparian area, but are subject to surface water quality protection best management practices in accordance with this chapter. [11 AAC 95.265(a)(1)] (See also All Regions Other waterbodies, below)		

STREAM CLASSIFICATION MATRIX, CONTINUED

Stream Type	**Private land**	**State land**	**Other public land**
Region II	Classification of surface waters must indicate whether surface waters are anadromous or contain HVR fish under AS 41.17.950 [11 AAC 95.265(a)(2)]	Classification of surface waters must indicate whether or not the surface waters are anadromous or contain high value resident fish under AS 41.17.950. [AS 41.17.950(1),(10) and 11 AAC 95.265(a)(4)] In the absence of a site-specific determination by the deputy commissioner, the state forester shall presume for planning purposes that a stream is anadromous if it is connected to anadromous waters that are without department documentation of a physical blockage and has a stream gradient of 8 percent or less. [AS 41.17.118(c)]	Classification of surface waters must indicate whether or not the surface waters are anadromous or contain high value resident (HVR) fish under AS 41.17.950. [AS 41.17.950(1),(10) and 11 AAC 95.265(a)(4)]
Region III		In the absence of a site-specific determination by the deputy commissioner, the state forester shall presume for planning purposes that a stream is anadromous if it is connected to anadromous waters that are without department documentation of a physical blockage and has a stream gradient of 8 percent or less. [AS 41.17.118(c) - state, and AS 41.17.119(2) - other public land]	
Type III-A waterbody	(A) nonglacial high value resident (HVR) fish water body greater than three feet in width at the ordinary high water mark; (B) nonglacial anadromous water body; or (C) backwater slough; [11 AAC 95.265(a)(3) - private, 95.265(a)(5) – other public land, and AS 41.17.950(31) - definition]		
Type III-B waterbody	A glacial high value resident fish water body or a glacial anadromous water body; does not include a glacial backwater slough; [11 AAC 95.265(a)(3) - private, 95.265(a)(5) – other public land, and AS 41.17.950(32) - definition]		
Type III-C waterbody	A nonglacial high value resident fish water body that is less than or equal to three feet in width at the ordinary high water mark and that does not contain anadromous fish. [11 AAC 95.265(a)(3) - private, 95.265(a)(5) – other public land, and AS 41.17.950(33) - definition]		
All Regions Other waterbodies	For all lands, the operations recognized under this chapter shall be conducted in a manner that does not cause or constitute a substantial factor in causing a degradation of water quality. [11 AAC 95.185(b)] All surface waters, regardless if those waters are classified under AS 41.17.950, are protected under 18 AAC 70 [11 AAC 95.900(82)].		

RIPARIAN STANDARDS MATRIX: SUMMARY OF REGULATIONS AND STATUTES

General guidance: AS 41.17.115 (Intent for riparian areas)

Stream Type	Private land	State land	Other public land
Region I	Private forest land adjacent to the following types of waters and located in Region I is subject to the riparian protection standards established in this subsection. [AS 41.17.116(a)]	(A) harvest of timber may not be undertaken within 100 feet immediately adjacent to an anadromous or high value resident fish water body; (B) between 100 and 300 feet from the water body, harvest of timber may occur but must be consistent with the maintenance of important fish and wildlife habitat as determined by the state forester with due deference to the deputy commissioner. [AS 41.17.118(a)(2)]	Harvest of timber may not be undertaken within 100 feet of an anadromous or high value resident fish water body; [AS 41.17.119(1)]
Type I-A waterbody	(A) operations within 100 feet of the water body or to the break of the slope, whichever area is smaller, shall be conducted in compliance with slope stability standards established in regulations adopted under this chapter; and (B) harvest of timber may not be undertaken within 66 feet of the water body; [AS 41.17.116(a)(1)]		
Type I-B waterbody	(A) operations within 100 feet of the water body or to the break of the slope, whichever area is smaller, shall be conducted in compliance with slope stability standards established in regulations adopted under this chapter; and (B) harvest of timber may not be undertaken within 66 feet of the water body or to the break of the slope, whichever area is smaller; [AS 41.17.116(a)(2)]		
Type I-C waterbody	(A) operations within 100 feet of the water body or to the break of the slope, whichever area is smaller, shall be conducted in compliance with slope stability standards established in regulations adopted under this chapter; and (B) the operator shall, where prudent, retain low value timber within 25 feet of the water body or to the limit of the area described in (A) of this paragraph, whichever area is greater, where the width of the water body is (i) greater than 13 feet at the ordinary high water mark; or (ii) greater than eight feet at the ordinary high water mark if the channel is incised; [AS 41.17.116(a)(3)]		

RIPARIAN STANDARDS MATRIX, CONTINUED

Stream Type	Private land	State land	Other public land
Type I-D waterbody	(A) operations within 50 feet of the water body or to the break of the slope, whichever area is smaller, shall be conducted in compliance with slope stability standards established in regulations adopted under this chapter; and (B) the operator shall, where prudent, retain low value timber within 25 feet of the water body or to the limit of the area described in (A) of this paragraph, whichever area is greater, where the width of the water body is (i) greater than 13 feet at the ordinary high water mark; or (ii) greater than eight feet at the ordinary high water mark if the channel is incised. [AS 41.17.116(a)(4)]	See guidelines on previous page.	See guidelines on previous page.

Stream Type	Private land	State land	Other public land
Region II	A timber harvest operation within 100 feet from the shore or bank of an anadromous or high-value resident fish water body must be located and designed primarily to protect fish habitat and surface water quality from significant adverse effects [11 AAC 95.260(b)].	(Same as Region I, previous page) (A) harvest of timber may not be undertaken within 100 feet immediately adjacent to an anadromous or high value resident fish water body; (B) between 100 and 300 feet from the water body, harvest of timber may occur but must be consistent with the maintenance of important fish and wildlife habitat as determined by the state forester with due deference to the deputy commissioner. [AS 41.17.118(a)(2)]	(Same as Region I, previous page) Harvest of timber may not be undertaken within 100 feet of an anadromous or high value resident fish water body; [AS 41.17.119(1)]

RIPARIAN STANDARDS MATRIX, CONTINUED

Stream Type	Private land	State land	Other public land
Region III	Private forest land adjacent to the following types of waters and located in Region III is subject to the riparian protection standards established in this subsection: [AS 41.17.116(b)]		
Type III-A waterbody	Harvest of timber may not be undertaken within 66 feet of the water body; [AS 41.17.116(b)(1)]	Harvest of timber may not be undertaken within 100 feet of the water body, except that, between 66 feet and 100 feet from the water body, harvest of timber may be undertaken where consistent with the maintenance of important fish and wildlife habitat as determined by the state forester with the concurrence of the deputy commissioner; [AS 41.17.118(a)(1)(A) and AS 41.17.119(2)]	
Type III-B waterbody	Harvest of timber may not be undertaken within 33 feet of the water body; between 33 feet and 66 feet from the water body, up to 50 percent of standing white spruce trees having at least a nine-inch diameter at breast height may be harvested without requiring a variation; [AS 41.17.116(b)(2)]	Harvest of timber may not be undertaken within 50 feet of the water body; between 50 feet and 100 feet from the water body, up to 50 percent of standing white spruce trees having at least a nine-inch diameter at breast height may be harvested; [AS 41.17.118(a)(1)(B) and AS 41.17.119(2)]	
Type III-C waterbody	Harvest of timber within 100 feet of the water body must be located and designed primarily to protect fish habitat and surface water quality as determined by the state forester with due deference to the deputy commissioner. [AS 41.17.116(b)(3)]	Harvest of timber within 100 feet of the water body must be consistent with the maintenance of important fish and wildlife habitat as determined by the state forester with due deference to the deputy commissioner; [AS 41.17.118(a)(1)(C) and AS 41.17.119(2)]	

SLOPE STABILITY STANDARDS MATRIX: SUMMARY OF REGULATIONS AND STATUTES

An operator shall adhere to the following standards when conducting timber harvest activity in an area identified in the table below, summarizing 11 AAC 95.280(a) and (b):

(1) avoid constructing a road that will undercut the toe of a slope that has a high risk of slope failure;
(2) within the riparian area of streams not subject to AS 41.17.116(a)(3)(B) or 41.17.116 (a)(4)(B) [guidelines for retaining low-value timber on Type I-C and Type I-D streams], in the operator's discretion, leave low-value timber where prudent;
(3) achieve full or partial suspension in yarding operations;
(4) fall timber away from streams in V-notches; and
(5) avoid sidecasting of displaced soil from road construction to the maximum extent feasible. [11 AAC 95.280(d)]

<table>
<tr><th>Stream Type</th><th>Private land</th><th>State land and other public land</th></tr>
<tr><td>Region I</td><td rowspan="4">The area within 100 feet of an ordinary high water mark of a Type I-A, I-B, or I-C water body or to the break of the slope to that water body, whichever occurs first [11 AAC 95.280(a)(1)]</td><td rowspan="5">Within 100 feet of an ordinary high water mark of an anadromous or high value resident fish water body, or a water body with a gradient of 12 percent or less that is tributary to an anadromous or high value resident fish water body, and within 50 feet of all other tributaries to anadromous and high value resident fish water bodies; [11 AAC 95.280(b)(1)]</td></tr>
<tr><td>Type I-A</td></tr>
<tr><td>Type I-B</td></tr>
<tr><td>Type I-C</td></tr>
<tr><td>Type I-D</td><td>The area within 50 feet of an ordinary high water mark of a Type I-D water body or to the break of the slope, whichever occurs first [11 AAC 95.280(a)(2)]</td></tr>
<tr><td>REGION II</td><td>None.</td><td>Within 100 feet of an ordinary high water mark of an anadromous or high value resident fish water body [11 AAC 95.280(b)(2)].</td></tr>
<tr><td>REGION III</td><td colspan="2">None.</td></tr>
</table>

BMP COMPLIANCE DESCRIPTIONS BY CATEGORY

GENERAL

11 AAC 95.815(b) – 1. DISPOSAL OF WASTE MATERIALS - PETROLEUM PRODUCTS

APPLICABILITY

- Applies to every forest operation. Evaluate all areas outside the camp, sort yard or other permitted facilities.

OBJECTIVES

- To prevent any petroleum-contaminated soils or materials from entering and polluting surface waters.

REQUIREMENTS

- Remove all petroleum products and their containers from the operating area.
- Remove all oil-contaminated filters, absorbent pads, or soils from the operating area.
- Dispose of all petroleum products or petroleum contaminated waste material in accordance with the requirements of DEC. (Note: final disposal is not considered in ratings.)

NOTES

- Look for containers and spills especially at landings, road turnouts, intersections and rock pits.

Rating	Number or size of fuel and oil spills found in the operating area:	Number of petroleum product containers, or amount of waste materials found in the operating area
1	Large number, or large spills	Large number
2	A number	A number
3	Signs of minor fuel or oil spills	Some
4	Signs of an occasional fuel or oil spill	Occasionally
5	None	None

11 AAC 95.815(b) – 2. DISPOSAL OF WASTE MATERIALS - DISPOSAL OF SCRAP METAL

APPLICABILITY

- Applies to every forest operation. Evaluate all areas outside the camp, sort yard or other permitted facilities.

OBJECTIVES

- To prevent metal or leachates from oxidation of metal parts from entering and polluting surface waters.

REQUIREMENTS

- Remove all machine parts, wire rope, scrap culverts, and similar scrap metal from the operating area.
- Dispose of all scrap metal in accordance with the requirements of DEC.

NOTES

- Check for old straw line, guylines, or worn out running lines at the landing, along the edge of the approach roads, and the backline of the unit. Check approaches to bridge crossings for leftover cable.
- Look along the road, around rock pits, or at stream crossings for scrap culverts.
- Look around landings, rock pits, road intersections, and turnouts for equipment parts.

Rating	Number of pieces of discarded scrap metal or culverts, cable, or equipment parts found throughout the operating area:
1	Many
2	A number
3	Some
4	Occasional
5	None

RIPARIAN AREAS

11 AAC 95.265. CLASSIFICATION OF SURFACE WATER BODIES

APPLICABILITY

- Private land: Type A, Type B, Type C, or Type D water body.
- Public land: Anadromous or high value resident fish water bodies.

OBJECTIVES

- To identify and correctly classify all surface waters so appropriate and applicable BMPs can be implemented on them.

REQUIREMENTS

- Classify surface water bodies on private land in accordance to the criteria contained in AS 41.17.950(27) - (30).
- Classify surface water bodies on state managed and other public lands in accordance with criteria contained in AS 41.17.950(1)&(10).

NOTES

- All surface waters found in the field with a perennial flow along a defined channel, or an intermittent flow along a defined channel significant for protection of downstream water quality should be identified on a map of harvest operations.
- Factors in determining whether the stream is significant for protection of downstream water quality:
    - Frequency of flow (During snowmelt only? Fall storms only?)
    - Volume of flow the channel can hold
    - Stability of banks and bed material
    - Amount of debris in the channel
    - Volume of flow in the receiving water body

- Uses of the receiving water body

Rating	Number of streams that have riparian areas and are required to be classified are shown on the map:	Streams that are correctly classified:
1	A few	None
2	Some	A few
3	Many	Some
4	Most	Most
5	All	All
N/A	No streams requiring a designated riparian area in the proposed harvest area.	

11 AAC 95.280(d)(5). DEPOSITION OF EXCESS EXCAVATED MATERIAL IN A RIPARIAN AREA

APPLICABILITY

- Private land: Type A, Type B, Type C, or Type D water bodies' riparian areas.
- Public land: Anadromous or high value resident fish water bodies' riparian areas, and designated areas on tributaries.

OBJECTIVES

- To prevent depositing any more erodible material than necessary near a surface water, to minimize scour, bank erosion, or debris jams and debris torrents.
- To protect the riparian area immediately adjacent to a stream so the vegetation can continue to function as a filter strip and remove sediment carried by runoff from the road.
- To minimize the amount of sediment that enters a riparian area, to lessen the likelihood of overwhelming the capability of the filtering vegetation to remove sediment.

REQUIREMENTS

- Avoid sidecasting excess overburden and excavated material into a riparian or other designated area to the maximum extent feasible.
- Other related requirements:
    - Where feasible, cross stream channels at right angles;
    - Locate the road to fit the topography; and
    - Avoid deep gullies with fine textured soils.

NOTES

- Is sediment from the waste disposal site likely to enter the riparian area?
- Competent excavated material can be used for required fills. Some excess material and overburden can be swung and disposed of outside the riparian area, while greater amounts may have to be end hauled.
- Is the approach wider than necessary for the depth of fill required to accommodate the road width? Do fill slopes exceed a ratio of 1½ to 1 to a notable degree?

- Shots should be designed to fracture the rock so it can be excavated and used as fill at the crossing, or for construction of the roadbed.

Rating	Amount of excavated overburden and debris sidecasted or pushed ahead into the riparian area:	Amount of material and fly rock deposited in the riparian area from blasting:	Amount of material or debris in the stream, or amount of eroded material contributing sediment to the stream:
1	Excessive	Excessive	Significant
2	Large	Excessive	Some
3	Some. More suitable material used than needed to achieve a stable angle of repose for the crossing fill.	Some	Some
4	None. More suitable material used than needed to achieve a stable angle of repose for the crossing fill.	Some	Some additional erosion is occurring but is contributing a minor amount of sediment to the stream.
5	None. A reasonable amount of suitable fill and surfacing material needed to form the road prism was used to construct the crossing.	When blasting, shots were designed to retain fractured parent material within the road prism and minimize deposition of fly rock in the riparian area.	None.
N/A	No road was constructed through a riparian or other designated area.		

11 AAC 95.285(b). ROAD LOCATION IN A RIPARIAN AREA

APPLICABILITY

- Private land: Type A, Type B, Type C, or Type D water bodies' riparian areas
- Public land: Anadromous or high value resident fish water bodies' riparian areas

OBJECTIVES

- To minimize the amount of road construction and resulting disturbance within a riparian area. Eroded material close to the stream is more likely to cause sedimentation because of fewer opportunities to design sediment control features into the drainage system.
- To prevent unnecessary crossings, which can contribute sediment.

- To protect the riparian area immediately adjacent to a stream so the vegetation can continue to function as a filter strip and remove sediment carried by runoff from a road or harvest unit.

REQUIREMENTS

- Avoid locating roads within a riparian area except to cross a water body, or if there is no other feasible location for the road.
- A road within a riparian area must be designed and located to minimize significant adverse effects on fish habitat and water quality.
- Other related requirements:
  - Where feasible, cross stream channels at right angles;
  - Minimize the number of stream crossings;
  - Locate the road to fit the topography; and
  - Locate the road away from or upstream of a meander bend or recently abandoned channel.

NOTES

- A road location away from the riparian area that allows for conventional logging methods to harvest the timber is preferable. Review harvest plans for the drainage that may suggest feasible alternative road locations.
- The road should be located outside the riparian area, unless locating the road outside the riparian area is likely to cause slope failures, excessive erosion, or sedimentation that would have a greater adverse impact on the stream.
- The road design should include drainage features that minimize or direct road runoff away from the adjacent stream, and effectively control sediment.

<table>
<tr><th>Rating</th><th>Stream crossing necessity:</th><th>Alternate road locations:</th><th>Road design and location's impacts on fish habitat and water quality:</th></tr>
<tr><td>1</td><td>Not required to reach proposed harvest areas</td><td>Feasible alternative locations outside the riparian area</td><td>Significant adverse</td></tr>
<tr><td>2</td><td>Feasible alternative crossings requiring less road construction in riparian area</td><td rowspan="2">Roads could be relocated to reduce the length of road constructed within the riparian area</td><td>Some significant adverse</td></tr>
<tr><td>3</td><td>Feasible alternative crossing sites</td><td>Some adverse</td></tr>
<tr><td>4</td><td rowspan="2">Stream crossing required</td><td>No feasible alternative road locations except within riparian area</td><td>Reduces adverse impacts</td></tr>
<tr><td>5</td><td>No feasible alternative locations</td><td>Minimizes adverse impacts</td></tr>
<tr><td>N/A</td><td colspan="3">No roads located within the riparian area</td></tr>
</table>

11 AAC 95.350(c). BANK INTEGRITY – LEAVING HIGH STUMPS IN A RIPARIAN AREA

APPLICABILITY

- Private land: designated riparian areas along a Type A, Type B, Type C, or Type D water body.
- State and other public land: designated riparian areas along all anadromous or high value resident fish water bodies.

OBJECTIVES

- To prevent felled or bucked timber from entering streams.
- To leave high stumps in the riparian area where they will not cause frequent hang-ups or other operational difficulties when yarding the setting.
- To avoid creating conditions conducive to erosion and stream sedimentation. Trees or logs rolling downhill can disrupt soils and damage the streambed or banks. A tree or log in a stream can change the flow pattern.
- To avoid changing sediment storage and the rate of sediment transport through a stream system. Damage to the streambed or banks can destabilize the stream channel causing additional scour of the streambed or erosion of the banks.
- To avoid creating conditions conducive to initiation of debris torrents. Debris carried into streams, or existing material and debris mobilized by activity in the stream channel may form unstable debris dams, especially in steep, incised channels. If these structures fail under the right conditions they can lead to debris torrents.

REQUIREMENTS

- Where feasible and necessary, leave high stumps in a riparian area to prevent felled and bucked timber from entering surface waters.

NOTES

- This BMP is usually only applicable to terrain that requires cable yarding.
- High stumps are needed where the side slopes are steep enough that felled and bucked timber will roll or slide downhill.
- Stumps have to be high enough for boles or substantial branches to catch and hold on, but not every stump has to be cut high to retain felled timber on the hillside. High stumps are most effective if trees are felled parallel to the contours.
- Deflection has to be adequate so one end of the log can be suspended and lifted over a high stump above it.
- Did timber slide or roll into the adjacent stream?
    - Evidence that a tree slid butt first into a stream after being felled: a gradually deepening scar that ends at the stream with a chunk taken out of the steam bank.
    - Evidence of trees rolling downhill after being felled: accumulation of limbs and tops in the stream channel or damage to the bank as they were yarded out; bank material deposited above the stream channel.

Rating	Riparian areas with high stumps where deflection was adequate to minimize hang-ups:	Amount of timber slid or rolled downhill into adjacent stream channels:
1	None	Large amount
2	A few areas	Frequent
3	Some areas	Some
4	Most areas	Occasionally
5	All areas	None
N/A	High stumps not needed to keep timber from entering surface waters.	

11 AAC 95.355(e)(1). FELLING AND BUCKING - FALLING TIMBER INTO A RIPARIAN TIMBER RETENTION AREA

APPLICABILITY

- Private land: designated timber retention area along a Type A and Type B water body.
- State and other public lands: designated timber retention areas along all anadromous or high value resident fish water.

OBJECTIVES

- To prevent damage to trees designated for retention in a riparian area.
- To prevent damage to soils or understory vegetation caused by equipment operating in a riparian area.

REQUIREMENTS

- Where feasible, do not fall timber into a timber retention area.

NOTES

- Look for tops and limbs within the riparian area.
- Walk back out along the axis of a top to find the corresponding stump. Look at the undercut for evidence that the cutter tried to direct the tree away from the riparian area.
- Consider any approved variance harvest or special considerations for falling the unit near the riparian area.
- Do not consider trees felled within a riparian timber retention area as part of an approved variance when making this determination.

Rating	Trees felled into timber retention areas?	Cutting strips laid out in a manner that forced the cutters to fall trees into timber retention areas?	Cutters attempted to swing or directionally fall trees away from timber retention areas?
1	Often	Yes	No
2	Large number	Many	Some attempt
3	Frequently	Some	Frequently
4	Occasionally	No	Often
5	No evidence	No	Yes
N/A	There are no riparian areas in the operating area with a timber retention requirement.		

11 AAC 95.360(c)(4). CABLE YARDING APPLICABILITY

- Private land: cable yarding activities in or near designated riparian areas along a Type A, Type B, Type C, Type D water body.
- Public land: cable yarding activities in or near designated riparian areas along all anadromous or high value resident fish water bodies.
- All ownerships: cable yarding activities that parallel surface waters.

OBJECTIVES

- To avoid creating conditions conducive to soil erosion adjacent to surface waters.
- To avoid disturbances to the bed and banks of a stream caused by removing logs that enter the stream channel during yarding operations.

REQUIREMENTS

- Minimize soil disturbance in or near a riparian area.
- Minimize soil disturbance adjacent to other surface waters.
- Prevent logs from rolling into a surface water or riparian area.

NOTES

- Logs should be partially or fully suspended when yarding.
- Landings should be selected to minimize side hill yarding near the stream or riparian area (e.g., positioned so logs are yarded uphill and away from the stream as much as possible).
- Landings should not be located near an incised stream, especially when yarding downhill. (A high lead system has limited suspension capabilities.)
- When yarding, was the butt rigging correctly positioned to keep logs from rolling downhill?
- Could other yarding methods have been used (that would have provided greater suspension or more control over the log when side hill yarding.)?

Rating	Soil disturbance caused by yarding, to the riparian area, stream bed and banks:	Amount of debris deposited in stream channel:	Effort made to minimize soil disturbance, or prevent logs from rolling into riparian areas or streams when laying out and yarding the setting:
1	Significant	Significant	None
2	Noticeable amount	Large amount	Some
3	Some	Debris in channels chunked out when yarded	Some practices followed to prevent damage
4	Occasional	Minor amount	Practices generally followed to prevent damage
5	None	None	Practices followed to prevent damage
N/A	There are no applicable streams in the operating area.		

11 AAC 95.365(b). SKIDDING OPERATIONS IN RIPARIAN AREAS

APPLICABILITY

- Private land: designated riparian areas along a Type A, Type B, Type C, or Type D water body on private land.
- State and other public land: designated riparian areas along all anadromous or high value resident fish water bodies.

OBJECTIVES

- To minimize operation of track or wheeled equipment operation in a riparian area, minimizing ground disturbance.
- To prevent damage to retained timber, understory vegetation, and soils. Unless one end of a log is suspended, skidding a turn of logs through a riparian area can cause extensive damage to soils and remaining trees.

REQUIREMENTS

- Minimize the number of skid routes through a riparian area.
- Minimize damage to retained trees, understory vegetation and soils.
- Maintain one-end suspension of logs.

NOTES

- Cat or skidder logging in Region I should be discouraged in riparian areas, unless skidding is conducted over frozen ground, or on some glacial outwash soils capable of supporting operation of the equipment without causing much damage to the soil structure.
- Shovel yarding should rarely require a skid trail within the riparian area. An exception might be where a stream is crossed to shovel log a small patch of timber on the other side without having to construct a road. Where feasible, the operator should reach into the riparian area to remove a log after having positioned the shovel outside the riparian area. Trees within a riparian area should have been felled and bucked so any log segment is reachable from outside the riparian area. A large log might require walking a shovel in and out of the riparian area to enable it to lift the log and achieve the required one end suspension, or to reach logs resulting from an approved harvest variation. If so, the shortest possible route should be followed. Maneuvering around a rock outcrop may also be a reason for entering a riparian area.
- Some broken tree branches or crushed vegetation are expected. Also, some small trees may have been felled to facilitate getting an approved variance tree out. An operator should be able to lift logs and swing them out of the riparian area with a very little disturbance. Variance tree logs can be lifted at one end and dragged towards the shovel until they are clear of other retained trees before lifting and swinging them away from the riparian area. Compliance with this requirement may only be possible on very wet sites if yarding is conducted when the ground is frozen.
- Was one-end suspension of the log achieved? With shovel yarding this should rarely be difficult to accomplish, unless the shovel is not close enough to a large tree to achieve the required lift.

Rating	Unnecessary equipment operation or skid trails within the riparian area:	Damage to retained trees and understory vegetation:	Soil disturbance from equipment operation and skidding:
1	Excessive	Significant	Significant
2		Frequent	Frequent
3	Some	Moderate	Moderate
4	No unnecessary equipment operation in riparian area	Minimal	Minor
5	No equipment operation in riparian area	Minimal	None
N/A	There are no applicable streams in the operating area.		

TIMBER HARVESTING

11 AAC 95.345(a)&(b). LANDING LOCATION, CONSTRUCTION & OPERATION

APPLICABILITY

- Applies to all sites where logs are landed by cable yarding or skidding equipment, including helicopters.

OBJECTIVES

- To locate landings where they, and the operations conducted from them, will have the least impact on surface waters. Landings are focal points for harvest operations, and many impacts associated with harvesting activities can be minimized by selecting appropriate landing locations.
- To prevent deposition of logs and debris in surface waters. The large amount of waste and debris generated at a landing can end up in adjacent surface water if the landing is located too close, or on a hillside immediately above the water body.
- To avoid creating conditions conducive to erosion, mass wasting and stream sedimentation. Landings can disturb a lot of ground, drainage from haul and yarding roads lead towards them, and they can intercept ephemeral drainages. Landings are generally level and at least partially built on fill. Constant equipment operation and standing water can cause excessive deformation of the surface material and generate sediment. Poor drainage combined with the weight of fill material on steep side hills can lead to fill failures and mass wasting.

REQUIREMENTS

- A landing must be located, constructed, and operated in a manner that avoids surface and standing waters, except when frozen.
- Minimize using muskegs for landings.
- Avoid locating a landing where logs and vegetative debris will enter surface and standing waters.

- Minimize sedimentation of surface and standing waters.

NOTES

- The landing location should promote a layout that reduces adverse impacts of the operation.
- Does the location and design for the landing minimize the need for sidecasting excavated material, or is excessive fill material required to construct it? Locating landings on ridges or benches along the hillside can greatly reduce the amount of excavation and fill required to construct them.
- Landings should not be built larger than needed to accommodate setting up the yarder, and for safely landing and loading logs.
- If the landing is located on steep or unstable slopes, it should be constructed to prevent soil erosion and mass wasting.
- The landing, as well as trails and roads leading to it, should be effectively drained.

Rating	Landing's proximity to surface waters:	Amount of debris from the landing entering surface waters:	Drainage directed onto the landing? / Runoff eroding fill, generating sediment?
1	Close, prevents implementation of other BMPs	Significant	Yes / Yes, significant
2	Close, limits implementation of other BMPs	Frequently	Yes / Yes, large amount
3	Near, limits implementation of other BMPs	Some	Some, water ponding on landing / Yes, some
4	Location limits effective implementation of other BMPs	Occasionally	Some / Some
5	Location facilitates effective implementation of other BMPs	None	No / No
N/A	The setting was helicopter yarded. No landings were constructed within the setting evaluated.		

11 AAC 95.350(a). BANK INTEGRITY – AVOID DISTURBING VEGETATION ADJACENT TO SURFACE WATERS

APPLICABILITY

- Vegetation adjacent to surface and standing waters.

OBJECTIVES

- To minimize disturbing residual trees and understory vegetation bordering a stream when yarding a setting, by minimizing ground disturbance next to a stream.

- To avoid creating conditions favorable to erosion and mass wasting by protecting residual trees and understory vegetation. Their undisturbed root systems retain and stabilize soils.

REQUIREMENTS

- Minimize disturbance of residual trees and understory vegetation adjacent to surface and standing waters.

NOTES

- Were logs yarded across or was equipment operated in the area adjacent to a stream?
- Were there other ways the setting could have been harvested that would have avoided the need to yard or operate equipment adjacent to a stream?
- Were there other means of laying out the setting that would have resulted in having more deflection and obtaining one end or full suspension of the turn?

Rating	Disturbance of residual trees and the understory vegetation:
1	Damage to a significant number
2	Frequent disturbance
3	Some disturbance
4	Occasional disturbance
5	No disturbance
N/A	No yarding was conducted adjacent to a stream.

11 AAC 95.350(b). BANK INTEGRITY – AVOID DISTURBING LARGE WOODY DEBRIS IN STREAM

APPLICABILITY

- Applies to the streambeds and banks of surface waters, and standing waters larger than one-half acre.

OBJECTIVES

- To avoid disturbing large woody debris embedded in the streambed or banks of streams.
- To avoid creating conditions conducive to erosion and stream sedimentation. Removing large woody debris decreases stream roughness and can cause scour or erosion.
- To avoid changing sediment storage and the rate of sediment transport through a stream system. Disturbance of large woody debris can release stored gravel, reduce the capacity of the stream to store gravel, and increase the gravel transport rate through the stream system.
- To avoid loss of habitat forming structures in the stream channel. Large woody debris can form pools and riffles important for fish, so disturbance should be minimized.
- Less disturbance minimizes chances of erosion, stream sedimentation, changes to sediment storage and transport patterns, and loss of fish habitat.

REQUIREMENTS

- Where feasible, avoid disturbing roots, stumps, and deadfalls embedded in the streambed or banks of surface waters, and standing waters larger than one-half acre.

NOTES

- Were logs yarded across or up a stream channel? Were there other ways (using other equipment or methods) the setting could have been yarded?
- Could the stream have been split yarded? Unless the channel bends, or streams are too close together, logs should be yarded away from a stream.
- Were there other means of laying out the setting to get better suspension of the turn?

Rating	Amount of disturbance of large woody debris in the streambed and stumps along the stream banks:
1	Significant amount
2	Frequent
3	Some
4	Occasional
5	None
N/A	No timber was yarded across or through a stream channel.

11 AAC 95.355(c). FELLING AND BUCKING TIMBER – REMOVAL OF TREES AND DEBRIS

APPLICABILITY

- All nonfish-bearing surface or standing waters.

OBJECTIVES

- To avoid falling trees into a stream where possible.
- To avoid creating conditions conducive to erosion and stream sedimentation. Falling trees into streams can damage the streambed or banks. Streams flowing around the tree, as well as tree removal, can cause further damage.
- To avoid changing sediment storage and the rate of sediment transport through a stream system. Damage to the streambed or banks can destabilize the stream channel, causing scour or erosion.
- To avoid creating conditions conducive to debris torrents. New debris, or existing debris mobilized by activity in the stream channel, may form unstable debris dams, especially in steep, incised channels. If these structures fail they can cause debris torrents.

REQUIREMENTS

- Remove trees felled into nonfish-bearing surface or standing waters and their debris at the earliest feasible time, to the extent necessary to avoid degradation of water quality..

NOTES

- Trees felled into non-fish bearing waters must be removed at the earliest feasible time (usually not possible until the setting containing the stream is yarded, unless the stream is along a road).
- Any significant amount of debris that may cause degradation of water quality in the stream or in downstream segments of the stream must be removed.

- Sometimes removing a tree or a log from a stream can cause more damage to the streambed or banks and riparian area than leaving it (e.g., dragging it down the stream).

Note: Applies to Private Land--nonfish-bearing Type C and D water bodies; Public land--nonfish-bearing tributaries to anadromous and high value resident fish streams, and non-classified surface and standing waters..

Rating	Number of trees left in a stream after harvest operations were completed:	Amount of debris left in a stream:
1	Large number	Significant
2	Some	Large amount
3	A number	Some
4	Occasional	Occasional
5	None	None
N/A	No streams in the setting	

11 AAC 95.355(d). FELLING AND BUCKING TIMBER – BUCKING AND LIMBING WITHIN A STREAM

APPLICABILITY

- Applies to all surface waters on private, state and other public lands.

OBJECTIVES

- Same as 355(c), above.

REQUIREMENTS

- Do not buck or limb any portion of a tree lying between the banks of a surface water body unless necessary to protect fish habitat or water quality.

NOTES

- It is easiest to tell if trees were limbed or bucked before removing them from the stream if observed before setting.
- Other evidence:
  - Sawdust piles left between the banks of the stream.
  - Sawn off limbs left in the stream or piles of severed limbs left on the bank.
  - Tops or long butts left in the stream.
- If the stream contains fish, the operator may have been required to remove the limbs under 11 AAC 95.355(b).
- If limbs are piled near a stream crossing, the operator may have been required to limb and remove the branches of right-of-way timber.

Note: Private and public lands--streams with designated riparian area; Public lands--tributaries to anadromous or high value resident fish streams.

Rating	Trees felled across a stream:	Trees bucked or limbed between the banks of a stream:
1	Large number	All
2	A number	Many
3	Some	Some
4	Occasional	Only those necessary to be removed from fish stream waters
5		None
N/A	No trees felled across a stream.	

11 AAC 95.360(a&b). CABLE YARDING - YARDING ADJACENT TO SURFACE WATERS

APPLICABILITY

- Applies when yarding adjacent to all surface waters.

OBJECTIVES

- To yard away from or fully suspend logs over surface waters when feasible, minimizing disturbance of the stream channel or banks.
- To avoid degradation of water quality when cross-stream yarding. Yarding practices must minimize disturbance and prevent significant erosion when logs can't be yarded away from or be fully suspended over surface waters.

REQUIREMENTS

- Where feasible, yard away or fully suspend logs above surface waters.
- When yarding across surface waters, avoid degrading water quality.
- Do not create significant erosion when yarding up, down, or across V-notches.

NOTES

- When feasible, logs should be yarded away from or fully suspended over surface waters.
- If not feasible, yarding corridors should cross a stream at as near to a right angle as possible.
- Were an excessive number of corridors used to yard the required volume of timber across surface waters? Some options to limit corridors: locating corridors as close as possible to a right angle to the stream, keeping yarding distances past the stream channel as short as possible, constructing a landing close to the stream channel so only a few wide corridors are needed, using a carriage with a drop or tag line that can be pulled further to the side, or using a side block on the haul back.
- Did yarding a V-notch cause a significant amount of erosion? Downhill yarding a V-notch should be avoided whenever possible. Yarding distances should be kept fairly short, tail trees and rider blocks rigged, and a high lead yarder with good brakes must be set up away from the toe of the slope. A tail tree and rider block should be used when yarding across a V-notch to achieve enough lift to

avoid damaging the sides of the V-notch. Other yarding methods and equipment are better suited to yarding a V-notch.

- Were trees near a stream that had to be yarded to the opposite side bridged across it when they were felled? Bridging stream channels helps to keep tops and braches out of the stream channel and puts most of the bole on the side nearest the yarder. The far end of the log can then be choked and the log pivoted away from the stream rather than yarded across it.
- Were bumper logs used to protect the stream bank? Placing logs in the stream channel parallel to the near bank can help protect the stream bank from being broken down by the impact of the logs hitting them as a turn is yarded across.
- Was the ground frozen when the setting was yarded? Frozen ground and a layer of snow can help reduce the impacts caused by cross-stream yarding.

Rating	How well the layout split on stream channels:	Measures taken to protect streams when yarding across them:
1	No streams were split on	None
2	A few streams split on.	Occasionally
3	Some streams yarded across that could have been split on	More measures could have been readily implemented.
4	Most streams split on or full suspension achieved when yarding across.	
5	Yarding corridors kept to a minimum. Streams split on, or full suspension achieved when yarding across.	Stream banks protected.
N/A	No streams were located within the setting evaluated.	

11 AAC 95.360(c) (1-3). CABLE YARDING

APPLICABILITY

- Applies to all settings that were cable yarded.

OBJECTIVES

- To obtain as much lift on a turn of logs as feasible.
- To avoid soil disturbance as much as feasible when cable yarding.

REQUIREMENTS

- When feasible, make the maximum use of available deflection.
- Where feasible, yard uphill.
- When downhill yarding, use deflection to lift the leading edge of the log.

NOTES

- Uphill yarding should be favored as much as possible when laying out the settings. Deflection is easier when yarding uphill than when yarding downhill or across a hill.

Rating	Deflection used to lift the leading ends of logs throughout the setting?	Amount of soil disturbance visible across the setting:
1	Not used	Significant
2	Occasionally used	Frequent
3	Available deflection used over some of the setting	Some
4	Available deflection used over most of the setting	Occasional
5	Available deflection used throughout the setting	None
N/A	No cable yarding was conducted within the setting.	

11 AAC 95.365(f). SKIDDING OPERATIONS

APPLICABILITY

- Applies to all track or wheeled skidding operations.

OBJECTIVES

- To avoid disturbance to the ground cover and the soil, to minimize erosion and stream sedimentation.
- To locate and design skid trails to minimize sedimentation by keeping them from leading toward surface waters, minimizing the width of skid trails, and ensuring good drainage.

REQUIREMENTS

- Use puncheon where significant ground disturbances may contribute to sedimentation of surface water.
- Locate skid trails to minimize degradation of surface water quality.
- Use water bars or other appropriate techniques as necessary to prevent or minimize sedimentation.
- Keep skid trails to the minimum width feasible.
- Outslope skid trails where feasible, unless an inslope is necessary to prevent logs from sliding or rolling downhill off the skid trail.

NOTES

- Skid trails should not lead toward surface waters, to avoid concentrating runoff and sediment in water bodies.
- Puncheon helps to spread the weight of equipment over the ground, reducing the depth and amount of ground disturbance and protecting underlying vegetation.
- Skid trails should be narrow to reduce ground disturbance and sedimentation.
- Frozen ground and a layer of snow can greatly reduce the impacts from skidding operations, especially on wet sites.

Rating	Skid trails' proximity to surface waters:	Ground disturbance:	How well drained are the skid trails?	Erosion and sedimentation:
1	Near	Severe	Poorly drained	Significant
2	Near	Large		Frequent
3	Some near	Some	Some poorly drained	Some
4	Generally avoided	Some	Generally well drained	Some
5	Avoided	Little	Well drained	Little
N/A	There are no skid trails to evaluate.			

11 AAC 95.365(g). SKIDDING OPERATIONS – WATER BARRING

APPLICABILITY

- Applies to all tracked or wheeled skidding operations.

OBJECTIVES

- To prevent erosion of skid trails.
- To prevent sediment-laden runoff from reaching surface waters.

REQUIREMENTS

- Water bar skid trails or otherwise stabilize to prevent erosion from entering surface waters.

NOTES

- Water bars are needed when a skid trail causes soil disturbance or changes drainage patterns. Examples include skid trails:
  - crossing a hillside,
  - running downhill towards a surface water,
  - impeding overland flows (even on flat ground)
  - causing extensive soil disturbance, or
  - intercepting a number of ephemeral drainages.
- Water bars should be constructed across the width of the skid road. They should be at an angle to the skid road with the downhill end lower to facilitate drainage. The downhill side of the upper end should be blocked as necessary to prevent runoff from going around the end of the water bar. Both ends of the water bar should be free of obstructions. On flat grades the water bar can provide cross-flow drainage for overland flows and should be dug deep enough to prevent ponding.
- Water bars need to be located and spaced frequently enough to divert runoff from the skid trail before it picks up enough volume and velocity to cause significant erosion.
- Severely disturbed soils may need additional measures to stabilize them and prevent erosion. Measures such as revegetating exposed soils or covering the skid trails with slash can protect the exposed soils from rainfall-induced rill erosion.

Rating	Water bar installation:	Sedimentation occurring:
1	None installed	Significant
2	Infrequently installed	Frequent??
3	Poorly installed	Some
4	Some additional needed	Occasionally
5	Adequate number installed	None
N/A	No skid trails to evaluate	

ROAD CONSTRUCTION

11 AAC 95.290(c). TREAT UNSTABLE SOILS TO MINIMIZE SEDIMENTATION

APPLICABILITY

- Applies to unstable soils exposed during road construction.

OBJECTIVES

- To prevent or minimize sedimentation. Avoid generating sediment that can enter streams.
- To prevent or minimize erosion of unstable soils.

REQUIREMENTS

- Treat unstable soils with effective and appropriate erosion control measures.

NOTES

- Sedimentation is less likely the farther away the road is from the stream. Intervening vegetation or terrain features can filter and trap sediment.
- Low spots or intervening ridges can intercept runoff, allowing suspended sediment to filter or settle out before reaching surface waters.
- Unstable soils usually must be stabilized before any measures can be taken to prevent or minimize erosion and revegetate exposed soils.
- Were there feasible and practical alternative treatment measures that would be more effective in preventing erosion?

Rating	Erosion control measures taken to treat unstable soils:	Erosion prevented or minimized:	Sedimentation occurring:
1	None	No	Significant
2	Occasionally	Occasionally effective	Notable
3	Appropriate measures taken along a portion of the road segment	Somewhat effective	Some
4	Frequently	Usually effective	Minor
5	Appropriate measures applied to all unstable soils	Effective	None
N/A	Road construction exposed no unstable soils along the road segment evaluated.		

11 AAC 95.290(d). END-HAULING AND FULL-BENCH CONSTRUCTION

APPLICABILITY

- Applies to road construction activity likely to overload an unstable slope by placing fill or sidecasting material onto it.
- Applies to road construction activity if subsequent erosion of sidecasted material is likely.

OBJECTIVES

- To avoid overloading unstable slopes with fill for road construction or sidecasted material.
- To avoid mass wasting. Slope failures, most likely to occur when soils are saturated, can result in landslides or debris torrents.
- To avoid erosion of sidecasted material.
- To avoid degradation of water quality by sediment deposition and erosion of slide material.

REQUIREMENTS

- Use end-hauling or full-bench construction techniques if mass wasting from overloading on an unstable slope or erosion of sidecast material is likely to occur and cause degradation of surface or standing water quality.

NOTES

- Fill for road construction or sidecasting excavated material should not be placed on unstable slopes (can cause landslides or debris torrents).
- Fine-grained, erodible material should not be sidecasted in the vicinity of surface waters, but rather taken to a spoil disposal site where the terrain and vegetation allows suspended sediment to filter or settle out before runoff from the site can reach any surface waters.
- To determine whether the slope is unstable, look for evidence of past slope failures (overgrown slide paths, colluvial fans, slumps, or other depositional areas), slopes greater than 67 percent, or J-butted trees.
- To determine whether soils are susceptible to mass wasting, look for poorly-drained marine sediments, a strike of bedrock conducive to sliding, and ephemeral drainages.
- The transport of sediment into a stream is less likely the farther away the road is from the stream.
- Low spots or intervening ridges can block debris flows and intercept runoff, allowing suspended sediment to filter or settle out before reaching surface waters.
- To determine whether material been sidecasted, look for stumps with material piled up against them. Also, a lack of stumps below the excavated road prism may indicate their burial by sidecasted material. Extensive cut slopes and the lack of any spoil disposal sites can also indicate sidecasting.

Rating	Full-benched road construction where needed to avoid overloading an unstable slope?	Where was excavated material from road construction placed?	Frequency with which erodible material sidecasted in close proximity to surface waters:
1	No	Always sidecasted on unstable slopes	Always
2	Occasionally	Usually sidecasted on unstable slopes	Usually
3	Sometimes	Frequently sidecasted on unstable slopes	Frequently
4	Usually	Usually end hauled to avoid sidecasting on unstable slopes	Occasionally
5	Yes, wherever needed	Always end hauled to avoid sidecasting on unstable slopes	Never
N/A	Sediment from mass wasting or erodible material is not likely to enter or cause a degradation of surface waters.		

11 AAC 95.290(e) FALL TREES AWAY FROM SURFACE WATERS

APPLICABILITY

- Applies to all road construction.
- Applies to all surface waters when necessary to avoid degradation of water quality.

OBJECTIVES

- To prevent introducing debris into a stream in sufficient quantity to degrade water quality.
- To ensure review of the proposed activity by OHMP under AS 41.14.870.
- To remove debris from a stream as soon as possible, before it has a prolonged and irreversible adverse effect on fish habitat or water quality.

REQUIREMENTS

- Where feasible, fall trees away from all fish-bearing waters, standing waters, and other surface waters.
- Do not fall a tree into anadromous fish waters cataloged under AS 41.14.870 without prior written approval of OHMP.
- If introduced, remove limbs and other small debris from other fish-bearing waters within 48 hours, and remove the bole as soon as the necessary equipment is at the site.
- If introduced, remove debris from nonfish-bearing surface waters and standing waters at the earliest feasible time when necessary to avoid degradation of water quality.

NOTES

- Observe the stumps along the approaches out to a tree height from the stream.
  - Do the undercuts indicate the faller attempted to fall the trees away from the stream?
  - If the undercut faces the stream, is the stump close enough so the bole would have bridged the stream?
- Has debris been removed from the streams along pioneered or constructed roads?
- Check downstream from stream crossings to see if any debris has collected or formed a jam.
- Is the stream incised, or does the stream channel consist of readily erodible material?
- Are there old downstream side channels that the stream could readily divert into?
- On cataloged streams, check with OHMP to see if the operator obtained permission from them that allowed the operator to place trees in the stream during installation of the crossing structure.
- Try to schedule an inspection when you expect the operator will be falling the right-of-way near fish-bearing waters.
- Determine if debris left in a stream is sufficient to block fish passage, divert the stream, increased scouring of the streambed and erosion of the stream banks, or create a debris jamb capable of blocking stream flow and initiating a debris torrent.

Rating	Where feasible, was an attempt made to fall trees away from surface waters?	Is the stream clean of limbs and other woody debris generated by road construction activity?
1	Rarely	Large amounts of slash and debris jams found in the stream.
2	Occasionally	Notable pockets of slash accumulations found in the stream.
3	Usually, or were often felled so they bridged the stream.	Scattered slash found in the stream at and below the crossing site.
4	Frequently or, where prudent, were felled so they bridged the stream	Occasional pieces of larger slash found in the stream.
5	Yes, consistently except where permitted by OHMP under AS 41.14.870.	Clean of larger slash, some needles and small trigs found in the stream.
N/A	The road being evaluated does not cross any surface waters.	

11 AAC 95.290(j). DISPOSAL OF WASTE MATERIAL FROM ROAD CONSTRUCTION

APPLICABILITY

- Applies to all excess material generated from road construction that is not sidecasted.

OBJECTIVES

- To dispose of waste material where it will not enter surface waters, away from surface waters and/or with vegetation suitable for filtering or settling out suspended sediments.
- To avoid erosion of waste material.

REQUIREMENTS

- Deposit all material in a suitable upland site stabilized by effective and appropriate erosion control measures.
- See related requirements under 11 AAC 95.325, 11 AAC 95.815, 18 AAC 60.

NOTES

- A spoil disposal site must be located on stable soils, away from any surface waters, marshes, muskegs, or riparian areas.
- Erodible soils must be stabilized by a suitable method.
- Low spots in the terrain or intervening ridges can intercept runoff, allowing suspended sediment to filter or settle out before reaching surface waters.
- The disposal site should be rehabilitated.

<table>
<tr><th>Rating</th><th>Likelihood of material entering surface waters:</th><th>Erosion control measures taken to stabilize material:</th></tr>
<tr><td>1</td><td rowspan="2">Likely</td><td>None</td></tr>
<tr><td>2</td><td rowspan="2">Some</td></tr>
<tr><td>3</td><td rowspan="2">Less likely</td></tr>
<tr><td>4</td><td rowspan="2">Yes</td></tr>
<tr><td>5</td><td>Unlikely</td></tr>
<tr><td>N/A</td><td colspan="2">No excess waste material from road construction was disposed of off-site.</td></tr>
</table>

ROAD DRAINAGE

11 AAC 95.295(b) - 1. NUMBER OF DRAINAGE STRUCTURES

APPLICABILITY

- Construction of drainage systems on forest roads.

OBJECTIVES

- To avoid exceeding the capacity of the ditch. Runoff flowing down the ditchline must be relieved before it can overwhelm the capacity of the ditch, flooding the road.
- To prevent erosion of adjacent cut slopes or roadbed material. As flows increase, so does their capability to cause erosion, especially on steeper grades.
- To keep roads constructed on unstable soils well drained.
- To control discharge of sediment-laden runoff from a road. Runoff collected by the road drainage system needs to be spread out across the hillside to
  - avoid erosion that would be caused by a more concentrated flow, and

- allow vegetation to filter out suspended sediment.

REQUIREMENTS

- Install and space drainage structures as necessary to accommodate peak flows or to assure adequate drainage of unstable soils. Inadequate drainage of a road saturates the soil and decreases stability.
- Prevent degradation of surface water quality. Sediment-laden runoff from a road needs to be spread out across the hillside so sediment can be filtered out by vegetation.

NOTES

- Less frequent spacing of drainage structures is permissible if the parent material of roadbed is not erodible, such as rock or gravel, or the topography is not conducive to erosion. More frequent spacing is required where soil is unstable or where peak flows require more drainage structures to prevent degradation of surface water quality.
- To determine whether accumulated flows are eroding cut banks or roadbed material adjoining the ditchline, look for undercutting and slumping of cut banks and widening of the ditchline where sections of the roadbed have been washed away.
- To determine whether the ditch capacity is being exceeded, look for places where the ditchline flows have escaped the ditch and flowed down or across the road (scouring of roadbed material).
- Ditchline flows need to be reduced where the grade increases, and where soils are highly erodible.
- Wetter hillsides require more drainage structures to handle anticipated flows.
- If subsurface flow dominates on a well-drained hillside, roads will usually not intercept subsurface flows, requiring fewer drainage structures.
- Discharges near surface waters should be minimized, potentially requiring additional relief structures to reduce the drainage area.
- Fewer drainage structures may be needed where the terrain prevents runoff from reaching surface waters.
- Sediment entering surface waters indicates a need for more drainage structures.

Rating	Does the road segment have enough drainage structures to adequately handle peak flows?	Amount of erosion of roadbed, cut slopes, and fills:
1	No	Significant
2	No	Throughout the road segment
3	Portions of the road do not	On some portions of the segment
4	Yes, on most of the road segment	In a few places
5	Yes	None
N/A	No drainage structures were required along the road segment evaluated.	

11 AAC 95.295(b) – 2. DRAINAGE STRUCTURES INSTALLED ON NATURAL DRAINAGES

APPLICABILITY

- Construction of drainage systems on forest roads.

OBJECTIVES

- To prevent road construction from blocking any natural drainage.
- To prevent a road from washing out.

REQUIREMENTS

- Install drainage structures on all natural drainages.

NOTES

- Drainage structures must be capable of handling peak flows (estimate by width and depth of channel at high water mark).
- Consider flow restrictions through culverts when determining if they are adequate to handle anticipated flows.

Rating	Number of natural drainages lacking adequate drainage structures:	Drainages flowed across the road?
1	Majority	Yes
2	Many	Drainages with inadequate relief
3	A few	In places
4	Occasional	Some drainage structures have been exceeded
5	None	No
N/A	There are no natural drainages along the road segment being evaluated.	

11 AAC 95.295(d). OUTSLOPING AND DITCHING ROADS

APPLICABILITY

- Forest roads utilizing through-cuts or partial/full bench road construction.

OBJECTIVES

- Provide drainage structures to collect and carry runoff away from a road. Design road so drainage structures intercept and carry runoff from the hillside and inside portions of a crowned road surface.
- To help drain the roadbed. Design road so runoff will flow off the surface.

REQUIREMENTS

- Roads must be outsloped, or ditched on the uphill side.

NOTES

- When a road is confined by a hillside, runoff from the road and ephemeral drainages from the hillside must be collected. Short sections of road that cut through a ridge may not require a ditch if the road can be graded or banked so runoff will drain off the road within a short distance.
- If a ditch is needed on the uphill side of a road, it should be constructed as an integral part of the road, collecting runoff from the hillside and road surface. It should be close enough to the road so a grader can pull and clean it.

- Straight sections of road should visually slope to the outside edge of the road. Winding sections should be distinctly banked to direct runoff towards the inside corner of the curve and off the road.
- Erosional patterns should show that runoff is rapidly seeking the outer edge and does not flow for an extended distance down the road.

Rating	Road segment ditched or outsloped?	Ditch adequate to handle normal flows along road segment?	On portions of the road segment where no ditch is installed, effectiveness of outsloping the road in directing runoff to and off the edge of the road:
1	No	N/A	N/A
2	Only partially	No	Only marginally effective
3	Partially	Yes, normal flows	Somewhat effective
4	Along most of road segment	Yes, peak flows on most of road segment	Not entirely effective
5	Yes	Yes, peak flows	Effective
N/A	No ditching or outsloping along the road segment is required.		

11 AAC 95.295(f). DIVERSION OF DITCHLINE RUNOFF AWAY FROM SURFACE WATERS

APPLICABILITY

- Applies to ditches along all forest roads.
- Applies to unstable soils and surface waters.

OBJECTIVES

- To provide ditchline relief prior to the road crossing a surface water.
- To avoid directing the discharge from a ditch onto unstable soils.

REQUIREMENTS

- To the extent feasible, direct ditchline runoff away from unstable soils and surface waters, and onto vegetative areas.

NOTES

- Discharges should be directed away from stream channels, intermittent stream channels, and unstable soils.
- A drainage structure should be provided as close as practical to the stream crossing to relieve the ditchline before flows reach the crossing site.
- Drainage relief should be provided where outflows can percolate into the soil, or drainage should be directed through sufficient vegetation to remove suspended sediment before reaching surface waters.
- Low spots in the terrain or intervening ridges can be used to intercept discharges from the drainage relief structure, allowing suspended sediment to filter or settle out before reaching adjacent surface waters.

Rating	When feasible, were drainage features designed or installed to divert ditchline flows away from surface waters or unstable soils along the road segment?
1	No
2	Yes, along a portion of the segment, but were not very effective.
3	Yes, along most of the segment, and were somewhat effective.
4	Yes, generally effective
5	Yes,
N/A	The road segment crossed no surface waters or unstable soils.

11 AAC 95.295(i). PROTECTION OF ERODIBLE SOILS AND FILL SLOPES

APPLICABILITY

- Applies to discharges from cross drains, culverts or diversion ditches.

OBJECTIVES

- To prevent erosion and sediment generation.

REQUIREMENTS

- Outfalls may not discharge onto erodible soils or fill slopes without adequate outfall protection.

NOTES

- If outfalls are discharging onto erodible soils or fill slopes, ensure adequate protection is provided to prevent erosion of the soil or failure of the fill slope.

Rating	Were protective measures taken to prevent erosion of erodible soils and fill slopes along a portion of the road segment?	Adequacy of measures to protect against erosion:
1	No.	N/A
2	Along a portion of the road segment.	Occasionally adequate
3	Along much of the road segment	Somewhat adequate
4	Along the whole road segment	Usually adequate
5		Always adequate
N/A	No drainage structures discharged onto erodible soils or fill slopes along the road segment evaluated.	

BRIDGES

11 AAC 95.300(a)(1). BRIDGE APPROACHES: INSTALL RELIEF CULVERTS

APPLICABILITY

- All bridge approaches constructed across streams along forest roads.

OBJECTIVES

- To design a bridge crossing that will withstand damage from anticipated floods over the lifespan of the bridge.

REQUIREMENTS

- Minimize potential flood damage to the crossing structure by installing relief culverts through approach roads or by other means.

NOTES

- Streams with floodplains require addition drainage considerations when designing and constructing the approach road and crossing structure.
- Most floodplains have side or overflow channels that will be crossed by approach roads; sometimes they are hidden by brush or vegetation, and may be intermittent or limited to flood events.
- To determine the extent of the floodplain, examine vegetation, sediment deposits, or debris trapped by brush or other understory vegetation.
- A relief dip should be incorporated into the approach road to allow for passage of flood waters that exceed the drainage design for the road. It should be located where it will protect the bridge abutments from erosion but away from any side channels.

Rating	Drainage structures installed on side channels along the approaches to the bridge crossing?	How often were additional drainage structures installed along the approaches to the bridge crossing?	How much erosion is flooding causing to the approach roads?
1	None	Never	Significant
2	A few	Occasionally	Some
3	All	Number of structures not adequate to prevent road from flooding.	
4	Appropriately-sized structures on all.	Structures usually adequate to prevent flooding.	Flooding confined to relief dip in road.
5		Structures adequate to prevent flooding.	Relief dip protects abutments from extreme high flows.
N/A	Approaches to the bridge crossing do not cross a floodplain.		

11 AAC 95.300(a)(2). ONE END OF PERMANENT LOG OR WOOD BRIDGE ANCHORED.

APPLICABILITY

- All permanent log and wood bridges constructed across streams along forest roads.

OBJECTIVES

- To prevent a log or wood bridge from being washed downstream by a flood.
- To prevent a bridge carried downstream from causing physical damage to the stream.
- To minimize equipment operation in a stream or riparian area when retrieving or removing a washed out bridge.

REQUIREMENTS

- A permanent log or wood bridge must be firmly anchored at one end.

NOTES

- Water under a wooden bridge can float it and carry it off its abutments.
- The bridge must be securely anchored to a physical structure that will not be disturbed by floodwaters, typically by: 1) drill steel driven through the sill logs into the ground, 2) sills tied back to large stumps along the approaches, or 3) to deadmen buried in the approach fills. The bridge superstructure must also be tied to the bridge sills.
- Anchors must be capable of withstanding high flows that overtop the stream banks. Stumps should be firmly fixed in the ground, and not be affected by floodwaters that overtop the stream banks in the vicinity of the crossing. Deadmen should be covered by large rock that will not be moved by floodwaters, and buried in sections of the road that are protected from erosion and have adequate overflow drainage structures installed.

Rating	How is the bridge anchored?	How is the anchor attached?
1	No attempt was made to firmly anchor one end of the bridge.	
2	The bridge is not firmly attached to the anchor. The bridge superstructure is not tied to the anchor.	
3	The bridge is attached to a marginal anchor.	The anchoring stump is not firmly fixed in the ground, or the deadman is not adequately buried.
4	The bridge is firmly attached to an anchor.	The anchor may be adversely affected by flood waters.
5	The bridge is firmly attached to an adequate number of secure anchors.	
N/A	The bridge under review is not constructed from logs or wood.	

11 AAC 95.300(a)(3). EARTH EMBANKMENT PROTECTED FROM EROSION.

APPLICABILITY

- All bridge approaches along forest roads.

OBJECTIVES

- To prevent erosion of earth embankments used in constructing bridge approaches.
- To prevent sedimentation of surface waters at stream crossings.

REQUIREMENTS

- Protect earth embankments constructed for use as a bridge approach from erosion.

NOTES

- This BMP applies to bridge approaches constructed from readily erodible materials. Approaches constructed with rock should still have retaining walls or other structures adequate to keep fill material from entering surface waters.

- Erodible material must be protected from erosion by plantings, seeding, riprap or other ground cover. Retaining walls, bulkheads, or other means may also be employed.

Rating	How is embankment protected from erosion?	Amount of erosion of earth embankment
1	No attempt made.	Significant
2	Marginal attempt made.	Notable amount
3	Somewhat protected.	
4	More or less protected.	Some
5	Well-stabilized and protected.	None
N/A	The embankment under review was not constructed from earth or other erodible material.	

11 AAC 95.300(a)(4). CURBS AND FILTER FABRIC INSTALLED ON ROCK DECKED BRIDGE.

APPLICABILITY

- Applies to all rock decked bridges along forest roads.

OBJECTIVES

- To prevent road surfacing material from falling within the ordinary high water marks of the water body.

REQUIREMENTS

- On rock-decked bridges, install curbs (brow logs) to contain road surfacing material, and install filter fabric underneath road surfacing material to prevent it from falling within the ordinary high water marks of the water body.

NOTES

- Bridge stringers and brow logs should be tightly fitted and cabled together. Material contained solely by filter fabric can accumulate between gaps in the stringers.
- Gaps or insufficient overlap between pieces of filter fabric can allow material to breach the fabric. Coverage must be complete while rocking the bridge.
- Brow logs should be high enough to contain the depth of rock required to distribute loads over the bridge stringers. Fabric should extend up the side of the brow log so material can not fall through gaps between the brow log and bridge stringers.
- Road material should not be entering the stream. For this BMP, do not consider sediment or material introduced into the stream channel brought onto the bridge by truck traffic, carried down the road by runoff, or pushed off the bridge when grading (those causes are addressed by other BMPs).

Rating	Brow logs installed when constructing bridge?	Filter fabric or pole chinking used to contain rock surfacing material?
1	Neither brow logs or filter fabric were used in constructing the bridge.	
2	Yes	No
3	Yes	No filter fabric used, but pole chinking fills the gaps between log stringers.
4	Yes	Filter fabric used, but does not fully contain rock decking material.
5	Yes	Filter fabric used and fully contains rock decking material.
N/A	The bridge under review is not decked with rock.	

11 AAC 95.300(a)(8). MINIMIZE DISTURBANCE TO BED AND BANK OF STREAM.

APPLICABILITY

- Applies to all bridges installed along a forest road.

OBJECTIVES

- To avoid disturbing bank vegetation and bed armouring of a stream, to minimize sedimentation and scour.

REQUIREMENTS

- Install bridge in such a way as to minimize disturbance to the bed and banks of a stream.

NOTES

- Related BMPs must be considered when selecting a location for a crossing site.
- Equipment crossings are often unavoidable but should be kept to a minimum. Selected equipment crossing sites should have low banks that equipment can easily negotiate without having to climb the banks using their tracks. Use of the excavator arm to support one end of the machine while walking forward can help prevent the tracks from digging into the bank for traction, or the machine from sliding down the bank. A streambed composed of large cobble or rock minimizes disturbance of the streambed material. An alternative equipment crossing site should be considered if significant damage to the streambed or banks will result from trying to cross in the immediate vicinity of the selected bridge crossing.
- Unless limited by site conditions, the bridge span should be long enough to keep any excavation for the sill logs back from the stream banks.
- There should be little disturbance of the understory vegetation along the bank except for removal of trees or large shrubs that interfere with installation of the bridge, or where equipment crossed. Some disturbance may be observed where bridge stringers or other parts of the bridge were temporarily rested before being set in place.

- Site conditions may require placement of riprap or other structures to protect the bridge abutments from high flows. In-stream work or structures should have been noted or approved prior to installation of the bridge.
- Under this BMP, sediment should be attributable to erosion of the stream bank or streambed resulting from damage caused by construction of the bridge.

Rating	Disturbance to streambed, banks, or vegetation caused by instream activity:	Mitigation measures used to minimize damage (e.g., puncheon):	Amount of erosion of stream banks:
1	Excessive activity caused significant damage.	None	Significant
2	Activity caused notable damage.	None	Notable
3	Unnecessary stream crossings made during bridge construction. Unnecessarily wide right-of-way cleared on stream bank.	Puncheon only partially effective.	Some.
4	Unnecessarily wide right-of-way cleared on stream bank. Some disturbance of the stream bank is observable at the equipment crossing site.	Rip-rap to protect the bridge abutments was only place where needed, or as authorized by a Title 16 permit on fish streams.	Streambed, banks, and vegetation more or less intact.
5	Minimal disturbance was caused by equipment crossings and construction of the bridge and abutments.		Streambed, banks, and vegetation intact.
N/A	A bridge was not constructed at the crossing site under review.		

11 AAC 95.300(d). BRIDGE DOES NOT ENCROACH ON AN ANADROMOUS STREAM.

APPLICABILITY

- Applies to all bridges across anadromous streams along a forest road.

OBJECTIVES

- To prevent activities affecting an anadromous stream that require a Title 16 permit.
- To prevent, during an ordinary high water event, a crossing structure from constricting the flow of an anadromous stream.

REQUIREMENTS

- Do not narrow an anadromous stream between its ordinary high water marks.

NOTES

- If not cataloged, or a determination has not already been made, check with ADF&G to determine if the stream is anadromous.

- Sill logs or other abutments for the bridge should be installed back from the edge of the bank and above the line of ordinary high water to avoid encroaching on the stream.
- Bridge construction that involves activity within the channel of an anadromous stream requires a Title 16 permit. Check to see if a permit was issued and if it allows for encroaching on the stream channel. The Title 16 permit supercedes operator compliance with this BMP.

Rating	Are bridge abutments encroaching on the stream?
1	Yes, on both sides.
2	Yes, on one side.
3	One or both are close to the stream bank and partially encroaching on the stream.
4	One or both are close to the stream bank but do not encroach on the stream except as permitted by a Title 16 permit.
5	Both are away from the stream bank and do not encroach on the stream.
N/A	The stream is not anadromous.

CULVERTS

11 AAC 95.305(a)(3). CULVERT IS NOT PERCHED ON FISH BEARING WATERS.

APPLICABILITY

- Applies to all culverts installed on fish bearing waters.

OBJECTIVES

- To minimize changes to stream flows or stream morphology by culvert installations.
- To avoid creating a barrier to fish passage.

REQUIREMENTS

- For fish-bearing waters, the entrance (to the extent possible) and exit of a stream culvert must match the natural course of a stream channel ,and a culvert may not be perched at its inlet or outlet.

NOTES

- During low flows perched culverts may prevent fish passage, especially for small fry or smolt. Under ADF&G criteria a culvert perched more than four inches does not provide adequate fish passage.
- High flows through a perched culvert tend to erode the streambed below the culvert outlet, generating sediment and increasing the perch height.
- Stream flows redirected by a skewed culvert can erode the stream banks and change the course of the stream.
- To the extent possible, is the culvert bedded to match the stream channel? If possible, is the culvert buried so gravel has filled the bottom of the culvert?
- Deposition of gravel within the culverts increases roughness, helps to maintain the original stream gradient and reduces flows through the culvert that may inhibit fish passage.
- Is the inlet buried so the culvert is as level as possible? Under ADF&G criteria a culvert with spiral corrugations, 48” and less, does not provided adequate fish

passage if the gradient is greater than 1%. Burying the inlets also helps the culvert fill with gravel.

Rating	Amount that culvert is perched	How closely does the culvert lay follow the course of the natural stream channel?
1	More than 4" at one or both ends.	Significant deviation
2	Noticeably perched at one or both ends.	Noticeable deviation
3	Somewhat perched at one or both ends.	Approximates stream course
4	Slightly perched	Matches stream course to the extent possible
5	Neither end is perched	Matches stream course
N/A	An alternative crossing structure was installed on the stream.	

11 AAC 95.305(a)(4). CULVERT TERMINATES ON MATERIAL NOT READILY ERODIBLE.

APPLICABILITY

- Applies to all culverts installed along a forest roads.

OBJECTIVES

- To avoid erosion of road fill or streambed material.

REQUIREMENTS

- Culvert must terminate on material that will not readily erode.

NOTES

- Material at the outlet of the culvert must be adequate to resist or reduce the erosive force of the discharge.
- If material is not resistant, additional measures must be taken to minimize erosion, for example, the installation of a half round, flume, downfall culvert or similar structure. Outfall from that structure must be protected from erosion.
- To avoid blocking fish passage, do not require additional measures at the culvert outlet of a fish stream.

Rating	Effect of discharge from the culvert on stream channel.	How erodible is the road fill material on which the culvert terminates? Is erosion occurring?
1	Progressively down-cutting or eroding stream channel.	Erosive. Continued erosion occurring.
2	Large plunge pool below culvert outlet.	Large section has been eroded below culvert outlet.
3	Small plunge pool.	Discharge initially eroded some material before stabilizing.
4	Some minor erosion.	Some minor erosion
5	No plunge pool or downstream erosion.	Rock or other non-erosive material is in place.
N/A	An alternative crossing structure was installed on the stream.	

11 AAC 95.305(a)(7). CLEAR CULVERT INLETS OF MOBILE SLASH.

APPLICABILITY

- Applies to all culverts installed on nonfish-bearing waters along a forest road.

OBJECTIVES

- To prevent mobile slash generated during harvest activities from being carried downstream and blocking a culvert inlet.
- To prevent culverts from washing out

REQUIREMENTS

- For non-fish bearing waters, clear the stream channel for 50 feet above the culvert inlet of mobile slash or debris that may be expected to plug a culvert.

NOTES

- If only a small amount of slash, or small pieces, are left after cleaning the stream, the more likely it is the culvert will continue to function adequately. The few pieces of slash that don't pass through the structure can be cleaned out during routine road maintenance.
- If the slash or debris is imbedded, it is less likely to become mobile. Consider how well the slash is imbedded in the channel and the inherent stability of the streambed.
- What is the terrain like above the culvert? Changes in terrain above a culvert location can minimize the likelihood of slash being carried down to the culvert inlet.
- The larger the stream, the more likely high flows will mobilize slash left in the stream and carry it down to the culvert inlet.
- How big is the culvert? Small pieces of slash will pass through a culvert that is larger than the slash left in the stream channel.
- Is the culvert blocked or partially blocked by debris?

Rating	Effort to remove mobile slash in the first 50 feet of the stream above the culvert inlet.
1	No attempt made to remove slash.
2	Some attempt made to remove slash
3	Partly cleaned, or cleaned for less than 50 feet.
4	Most slash removed, and remainder is unlikely to be transported downstream, or it will pass through culvert (will not block culvert).
5	Cleaned of all mobile slash.
N/A	The stream is a fish bearing water body, or an alternate crossing structure was installed on the stream.

11 AAC 95.305(a)(8). ADEQUATE AND APPROPRIATE CATCH BASINS AND HEADWALLS.

APPLICABILITY

- Applies to any culvert along a forest road where a catch basin is required, or where a head wall is needed to direct water into a culvert or cross drain *(Includes water bars and removed drainage structures.)*.

OBJECTIVES

- To insure drainage enters and flows through a culvert, instead of bypassing the culvert and down the ditch or over the road. Where the parent soil material allows, and interference with fish passage is avoided, install a catch basin to collect water and direct it into the inlet of a culvert.

REQUIREMENTS

- Where appropriate and physically feasible, install a catch basis at the inlet to all culverts.
- Install a headwall to direct ditch flows into cross drains.

NOTES

- Catch basins are often needed to collect ditch water and divert it into a relief culvert. Side drainages that are not incised, or along roads with a slight bench cut, will often need catch basins to direct side drainages into a culvert and keep flows from diverting down the ditchline.
- Along a section of overlaid road a catch basin may be required to induce drainage towards the culvert inlet.
- An incised stream may not require a catch basin if placement of road fill prevents flows from being diverted, or if the grade is rolled to direct road drainage towards the culvert.
- It can be difficult to install a catch basin along a full bench road cut through rock. Extensive blasting may be required to gain enough room to install the catch basin. Other methods may be more suitable and cost effective.
- Is the ditch blocked on the downhill side of the entrance to a cross drain? Head walls should extend across the ditch and be at least as high as the adjacent road surface.

- Is the cross drain deep enough to handle anticipated flows? Cross drains ditched across the road should be as deep as the ditch or side drainage they are relieving. Angling and sloping the cross drain somewhat downhill will divert flows into and through the cross drain at a higher rate of flow.

Rating	Catch basins installed where appropriate?	Head walls installed on cross drains?	Effectiveness of catch basins and headwalls at directing water into the drainage structure
1	None.	None.	N/A
2	A few.	A few.	Marginal
3	Majority	Majority	Somewhat effective
4	Most.	Most.	Generally effective
5	All.	All.	Effective.
N/A	Catch basins or head walls were not appropriate on any culverts or cross drains along the section of road reviewed.		

11 AAC 95.305(a)(9). CULVERTS ARE PROPER LENGTH.

APPLICABILITY

- Applies to all culverts installed along a forest road.

OBJECTIVES

- To prevent road construction material from covering the ends of the culvert and restricting or blocking flows through it.

REQUIREMENT

- Culverts must be of sufficient length to prevent road overlay material from blocking the ends of the culvert.

NOTES

- What is the design width of the road? This basically determines how long the culvert will have to be.
- What is the depth of fill above the culvert? The greater the depth of fill over the culvert the longer it will have to be.
- What is the angle of repose for the road material? Material with a higher angle of reposed shortens the length of culvert required.
- Does the culvert extend all the way through the road fill? Check to make sure the culverts extends the full distance under the road.
- Do the ends of the culvert extend beyond the fill far enough to keep material from sloughing into the entrances to the culvert? The distance the culvert must extend beyond the road fill is determined by the angle of reposed of the fill material. This can be shortened if a retaining structure that contains the fill material is incorporated into the design.
- Is there allowance in the length of the culvert to anticipate widening of the road over time due to maintenance practices? Poor maintenance practices often result in widening of the road surface by grading material over the edge of the road that covers up the ends of the culverts.

Rating	Length of culvert compared to length of the road	Ends of the culvert buried by material and/or blocked?
1	Definitely too short.	Both ends buried and blocked.
2	Too short.	One or both ends are buried and partially blocked.
3	Marginally long enough.	One or both ends partially buried.
4	Long enough.	Installation allows one end to be partially buried.
5		Neither end buried or blocked.
N/A	An alternative crossing structure was installed on the stream.	

ROAD MAINTENANCE

Active Roads

11 AAC 95.315(b)(1) – 1. KEEP THE CULVERTS FUNCTIONAL

APPLICABILITY

- Applies to roads actively being used to haul logs or road building materials.

REQUIREMENTS

- Keep all culverts functional when maintaining active roads.

NOTES

- Culverts that are not functioning adequately because they are undersized or too short are a consideration when determining compliance with 11 AAC 95.295(b) or 11 AAC 95.305(a)(9).
- Have other drainage features necessary for the culverts to function as designed been maintained? Are headwalls and catch basins being maintained and are they directing runoff into the culverts?
- Is erosion occurring due to a lack of maintenance? Is the ditchline beyond the culvert eroding because runoff is bypassing the culvert and eroding the roadbed or cut-slope? Is water flowing across the road and eroding the roadbed?
- Whether the observed conditions are due to the failure to perform necessary maintenance, or a prior failure to implement another applicable BMP, must be determined.
- Consider a missing culvert, where one is required by 11 AAC 95.295(b) or 11 AAC 95.295(c), as non-functional.

Rating	Number of culverts blocked, damaged or missing.	Condition of drainage through culverts?	Drainage diverted away from the culverts or flowing across road?
1	Majority	Blocked or severely restricted	Yes.
2	Many		
3	Some, or many are partially blocked or damaged.	Significantly restricted	Some drainage diverted to next drainage structure.
4	A few are partially blocked or damaged.	Not significantly restricted.	No.
5	None.	Not restricted.	No.
N/A	No active roads in the harvest area being inspected. No culverts required along road segments inspected.		

11 AAC 95.315(b)(1) – 2. KEEP THE DITCHES FUNCTIONAL

APPLICABILITY

- Applies to roads actively being used to haul logs or road building materials.

REQUIREMENTS

- Keep ditches functional when maintaining active roads.

NOTES

- Are the ditchlines clear and free of obstructions between relief culverts, cross drains, or diversion ditches?
- Has equipment operation obliterated or cut off any ditchlines?
- Are the ditches adequate to handle the runoff draining into them? Ditches near the top of vertical curves that do not intercept any side drainages should not be a material consideration.
- Is erosion occurring? Erosion of the roadbeds or cut slopes can occur if ditches are blocked or damaged, or if the ditches are not big enough. For this BMP, do not consider erosional damage caused by a blocked culvert or other drainage structure.

Rating	Number of ditches blocked, damaged, or missing	Condition of drainage down the ditches
1	Majority	Blocked or severely restricted
2	Many	
3	Some, or many are partially blocked or damaged	Significantly restricted
4	A few partially blocked or damaged	Not significantly restricted
5	None	Not restricted
N/A	No active roads in the harvest area being inspected. No ditches were required along the road segments inspected.	

11 AAC 95.315(b)(4) - 1. KEEP THE ROAD SURFACE CROWNED OR OUTSLOPED

APPLICABILITY

- Applies to roads actively being used to haul logs or road building materials.

REQUIREMENTS

- Keep the road surface crowned or outsloped during operations when maintaining active roads.

NOTES

- The road cross-sections should slope to either shoulder, or to the outside shoulder.
- If the running surface is deformed or rutted, maintenance has not been performed frequently enough to comply with this BMP.
- Ruts cause surface erosion by accumulating and directing runoff to flow down the road.

Rating	Roads graded during operations?	Roadbeds crowned or outsloped?	Runoff draining off road surfaces?	Condition of road surface
1	Majority ungraded.	No.	No.	Severely rutted and deformed.
2	Many ungraded.	No, or outsloped only on curves.	Some.	Significantly rutted and deformed.
3	Some ungraded.	Poorly crowned or outsloped.	Partially.	Rutted in places, potholes.
4	Routinely.	Most.	Most surfaces.	Slightly rutted, a few potholes.
5	Frequently.	Yes.	Yes, well-drained.	Not rutted or deformed.
N/A	No active roads in the harvest area being inspected.			

11 AAC 95.315(b)(4) – 2. KEEP THE ROAD FREE FROM BERMS

APPLICABILITY

- Applies to roads actively being used to haul logs or road building materials.

REQUIREMENTS

- When maintaining active roads, keep the downhill side of the road free from berms, except those intentionally constructed for the protection of fill.

NOTES

- Berms are formed by not carrying material forward and letting it fall off the end of the grader blade, or by not pulling the outside shoulder back onto the roadbed when grading.
- Culverted fills are used to cross incised stream channels. Berms left along the edge of a road can carry runoff beyond the fill and direct it onto vegetated side slopes further down the road rather than letting it spill onto erodible fill material. This is a useful technique on climbing roads where cuts through

intervening ridges limit the ability to divert runoff off the road before reaching fill sections. It also is useful to direct runoff across a log stringer bridge where a steep approach would otherwise let it spill into the stream.

- A continuous berm accumulates runoff the further it extends down the road. The erosion potential increases as the volume of runoff and road grade increase.
- Where is runoff eventually flowing off the roads? Runoff will often breach a berm where the road grade or alignment allows it to pond: at the bottom of vertical curves, or the inside corners of banked horizontal curves. This often occurs where a road contours down into and out of a stream crossing.

Rating	Number of roads with berms along the outside shoulder	Frequency of continuous berms	Berms intercepting drainage off the roads?	Amount of erosion along the road shoulders
1	Majority	Most roads	Yes	Severe
2	Many	Many roads		Significant
3	Some	Continuous in places	Some drainage intercepted	Some
4	Some intermittent berms	Berms porous and not continuous	Temporarily intercepting some drainage	Slight
5	None			None
N/A	No active roads in the harvest area being inspected.			

11 AAC 95.315(b)(6). GRADING ROCK-DECKED BRIDGES

APPLICABILITY

- Applies to roads actively being used to haul logs or road building materials.
- Applies to bridges with rock decking.

REQUIREMENTS

- Avoid pushing material over the rub rails (brow logs) or through gaps in the bridge surface when maintaining active roads.

NOTES

- Are bridges decked with rock and graded periodically?
- Poorly fitted, damaged, or rotten stringers and brow logs can leave gaps in the bridge superstructure for material to fall through if not filled by chinking or fabric.
- Are the bridges decked with too much rock or are the brow logs too small to be effective? A deep layer of decking material often results from the grader carrying forward excess material off the approaches onto the bridge. Rather than grading out low spots the excess material fills them in and increases the amount of material decking the bridge.
- Material piled up against the sides of the brow logs indicates excess material is being carried forward onto the bridge. If it extends to the tops of the brow logs, some of the material will be pushed over the top of the logs when the grader

passes. Material coming off the end of the grader blade will fall off the bridge if the rock decking is higher than the brow log.

Rating	Gaps in bridge superstructures?	Number of brow logs with material piled against and/or over them
1	Large gaps in most	Material piled over many
2	Gaps in many	Material piled over some
3	Gaps in some	Material piled against many
4	Minor gaps in a few	Material piled against some
5	No gaps	No material piled against any
N/A	No active roads in the harvest area being inspected.	

INACTIVE ROADS

11 AAC 95.315(c)(2) ROADS LEFT IN A CONDITION NOT CONDUCIVE TO EROSION

APPLICABILITY

- Applies to roads not used for hauling logs or road building materials for one or more logging seasons.

REQUIREMENTS

- Keep the road surface crowned, out-sloped, or water barred and left in a condition that is not conducive to erosion.

NOTES

- Are road surfaces being maintained to promote drainage? Ruts cause erosion by directing runoff to flow down the road, eroding the road surface.
- Were appropriate water bars installed along the roads? Water bars are required at grade breaks to divert runoff away from steep road sections, or where the road surface starts showing evidence of rill erosion due to accumulated runoff flowing down the road.
- Deformed running surfaces prevent runoff from draining off the road. Saturated road surfaces are more erodible.

Rating	Number of roads crowned, outsloped, or water-barred	Runoff draining off road surfaces?	Condition of road surfaces
1	Majority are not	No	Severely rutted and deformed
2	Many are not	Some surfaces draining	Significantly rutted and deformed
3	Some are not	Partially draining off surfaces	Rutted in places, potholes have formed
4	Most are	Most surfaces draining	Slightly rutted in places, a few potholes.
5	All	Surfaces well-drained	No rutting or deformation
N/A	No inactive roads in the harvest area being inspected.		

11 AAC 95.315(c)(3) – 1. KEEP THE DRAINAGE STRUCTURES CLEAR AND IN GOOD REPAIR

APPLICABILITY

- Applies to roads not used for hauling logs or road building materials for one or more logging seasons.

REQUIREMENTS

- Keep drainage structures clear and in good repair.

NOTES

- Are headwalls and catch basins intact and cleaned out?
- Do the culverts have enough capacity to handle the runoff drained towards them? Is water backing up behind the culvert?
- Is erosion occurring due to a lack of maintenance? Is the ditchline beyond a culvert eroding because runoff is by-passing the culvert and eroding the roadbed or cut-slope?
- A missing culvert, where one is required to comply with 11 AAC 95.295(b) or 11 AAC 95.295(c), is not in compliance.

Rating	Number of drainage structures blocked, damaged, or missing	Drainage condition	Drainage diverted across roads?
1	Majority	Blocked or severely restricted	Yes
2	Many	Blocked or significantly restricted	
3	Some	Significantly restricted	Some
4	A few	Drainage not significantly restricted	
5	None	Drainage not restricted.	
N/A	No drainage structures required by 11 AAC 95.295(b) or (c) along the road segments inspected.		

11 AAC 95.315(c)(3) - 2. KEEP THE DITCHES CLEAR AND IN GOOD REPAIR

APPLICABILITY

- Applies to roads not used for hauling logs or road building materials for one or more logging seasons.

REQUIREMENTS

- Keep ditches clear and in good repair.

NOTES

- Are any ditches blocked or partially blocked by debris or material? Are the ditchlines clear and free of obstructions between relief culverts, cross drains, or diversion ditches?
- Are the ditches adequate to handle the runoff draining into them? Do flows exceed the capacity of the ditchline to contain them?

- Is erosion occurring? Erosion of the roadbed or cut slopes that can be attributed to a blocked or damage ditchline, or not having enough capacity to handle the runoff directed towards them, is evidence the ditches are not functioning adequately. Do not consider erosional damage caused by blocked culverts or other drainage structures.
- A missing ditch, where one is required by 11 AAC 95.295(d), is not in compliance.

Rating	Number of ditches blocked, damaged, or missing	Condition of drainage down the ditches
1	Majority	Blocked or severely restricted
2	Many	
3	Many partially blocked or damaged	Significantly restricted
4	A few partially blocked or damaged	Not significantly restricted
5	None	Not restricted
N/A	No ditches required by 11 AAC 95.295(d) along the road segments inspected.	

CLOSED ROADS

11 AAC 95.320(b)(1). LEAVE ROADS IN A CONDITION SUITABLE TO CONTROL EROSION

APPLICABILITY

- Applies to roads put-to-bed and no longer used by vehicles.

REQUIREMENTS

- Crown, out-slope, or water bar the road; or otherwise leave it in a condition suitable to control erosion.

NOTES

- Are suitable water bars installed along the roads? Water bars are required at grade breaks to divert runoff away from steeper road sections, or where the road surface starts to show evidence of rill erosion due to accumulated runoff flowing down the road.
- Are water bars installed on the approaches to surface waters? Diverting runoff before it can reach surface waters minimizes sedimentation.
- Are cross drains installed on all side drainages? Cross drains take intercepted side drainages across the road and prevent erosion of the roadbed by preventing water from flowing down the road.
- Significant erosion of the roadbeds is evidence the measures taken were insufficient, or not effective in controlling erosion.

Rating	Grading's effectiveness in preventing runoff from accumulating and eroding road surface	Number of water bars or other methods installed	Condition of roadbed
1	No attempt made	None	Severe erosion occurring
2	An attempt made, but not effective.		Significant erosion occurring
3		Some	Eroding in places.
4	Roads graded, effective.		Eroding in a few places.
5		Sufficient	No erosion
N/A	Roads used to haul timber, or inactive and still open to occasional use by vehicles.		

11 AAC 95.320(b)(2). LEAVE DITCHES IN A CONDITION SUITABLE TO REDUCE EROSION

APPLICABILITY

- Applies to roads put-to-bed and no longer used by vehicles.

REQUIREMENTS

- Leave ditches in a condition suitable to reduce erosion.

NOTES

- Are ditch blocks in place to direct runoff into cross drains or water bars? Are the water bars and cross drains cut into the roadbeds deep enough to drain the ditches and side drainages?
- How much runoff are the ditches accumulating? How many side drainages are intercepted by the ditchline?
- Are there provisions to take runoff off the road should sloughing cut-banks block a ditch?
- A missing ditch, where one is required by 11 AAC 95.295(d), is not in compliance.

Rating	Ditches cleaned, ditch blocks installed?	Cross drains or diversion ditches installed?	Amount of erosion of ditchlines occurring
1	No attempt made.	No	Severe erosion
2	A few ditches cleaned, ditch blocks installed	A few	Significant erosion
3	Some cleaned and blocks installed	Some necessary ones installed	Eroding in places
4	Most cleaned, blocks installed	Most necessary ones installed	Eroding in a few places
5	Yes	Yes	None
N/A	Roads are used to haul timber, or are inactive and still open to occasional use by vehicles; or roads were originally outsloped and no ditches installed		

11 AAC 95.320(b)(4) & (c). REMOVE BRIDGES, CULVERTS, AND FILLS FROM SURFACE WATERS

APPLICABILITY

- Applies to roads put-to-bed and no longer used by vehicles.

REQUIREMENTS

- Remove bridges, culverts and fills from surface waters.

NOTES

- Did the division determine that other measures would provide adequate protection? Review road close-out inspection reports to determine if the division approved alternative measures. If not fully implemented, note the reason for not complying with the BMP in the comment section.
- Were the streambeds of all fish-bearing waters restored to their natural conditions?
- Walls of the approach fills may be sloped to the angle of natural repose or stabilized by another method to prevent erosion and sedimentation.

Rating	Bridges and culverts removed?	Fish-bearing waters where fill was not removed	Approach fills stabilized?	Surface waters protected from excess fill material and stringers?	Alternative stabilization measures followed?
1	A few	Fill in most waters	No	No	No
2	Some	Some fill in most waters	A few		Sometimes
3	Most	Some fill in many waters	Many	Usually	Partially
4	All	Some fill in a few waters	Most	Yes	Mostly
5		All fill removed	Yes		Yes
N/A	The roads are being used to haul timber, or are inactive and still open to occasional use by vehicles.				

Notes