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b. Grass seeding has limited success in preventing surface erosion from slopes exceeding the angle of repose. (See BMP 14.5 Road and Trail Erosion Control Plan; BMP 14.8 Measures to Minimize Surface Erosion; and BMP 14.12 Control of Excavation and Side cast Material).

c. Perennial grass, forb, shrub, and tree species can be utilized for initial cover. Perennials should be planted from May 15 to August 15 for best results. Fertilization, mulching, hydro seeding, erosion netting or fabrics and/or bioengineering techniques may be required to ensure success. Recommended grass and legume seed mixtures and fertilizer depend on soil and climatic conditions. Quick growing annuals should be considered after August 15 to establish a quick cover crop prior to winter.

d. Hydro seeding has been used successfully in Southeast Alaska on ground disturbances associated with road construction. Experience indicates that hydro seeding should be considered whenever practicable. This demonstrated success might be applicable to other ground disturbing situations.

Also, the type and amount of disturbance and the purpose of revegetation influence the recommendation. Suggested guides for the Alaska Region are A Revegetation Guide for Alaska, 1983, and A Handbook for Forest Roadside Erosion Control in British Columbia, 1980.

3. IMPLEMENTATION: Guidelines for erosion control plans will be developed in the environmental analysis. It is the responsibility of the individual administering the contract or permit to assure that the provisions of the approved erosion control plan and associated specifications (for example, seeding and mulching), and other contract permit control documents are implemented. Projects are subsequently monitored to assess the revegetation effectiveness, and need for follow-up action.

4. REFERENCES. FSM 2522, 2405, 2472, and 7721, Timber Sale Contract Provisions B(T)6.6 and C(T)6.6; R-10 SPS 625 193, and R10-SA SPS 204 293. A Revegetation Guide for Alaska, Alaska Rural Development Council Pub. No. 2 (1983). A Handbook for Forest Roadside Erosion Control in British Columbia, Ministry of Forests B.C., Land Mgmt Rpt #4, ISBN 0-7719-8276-3, January 1980.

13 - TIMBER MANAGEMENT

Timber harvesting and reforestation are the culmination of several years of timber resource assessment and detailed project planning. The site disturbing activities consist of felling, bucking, skidding, yarding, loading and hauling, site preparation, tree planting, and other silvicultural activities associated with stand establishment and maintenance.

Timber sale planning generally starts 5 to 10 years before the proposed timber sale is sold. Each harvest proposal is considered by an interdisciplinary team (IDT), which conducts an environmental analysis. Based on the analysis, the NEPA document is prepared displaying the estimated effects of the proposed timber sale, which is tiered to the Forest plan. Harvest unit design, post-harvest activities, and monitoring for all resource values are integrated and

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displayed with management objectives through the development of integrated site-specific silvicultural prescriptions. After the timber sale plan is approved, the Timber Sale Contract and Appraisal are prepared using contract provisions that satisfy management constraints and mitigation measures recommended in the environmental analysis. The Forest Service Representative and the Timber Sale Administrator administer the terms of the Timber Sale Contract.

The line of authority for the Timber Sale Contract starts with a first officer, who has been delegated Contracting Officer (CO) authority by the Regional Forester, or a Forest Supervisor. The Forest Service Representative (FSR), the Timber Sale Administrator (TSA), the Harvest Inspector, the Engineering Representative (ER), and the Construction Inspector, complete the contract team and assure contract implementation. The CO designates the FSR in writing and lists the authorities, duties, and responsibilities. The CO or the FSR designates the TSA and the ER in writing and lists their authorities, duties, and responsibilities. The FSR or ER designates the Construction Inspector in writing and lists their authorities, duties, and responsibilities. The CO, FSR, or TSA designates the Harvest Inspector in writing and lists the authorities, duties, and responsibilities. The individuals are known as the Timber Sale Administration Team.

If a qualified small business purchaser elects to have the Forest Service construct the roads as per section 14(i) of the NFMA, the road construction activities have a different line of authority. Refer to the general discussion under Section 14 - Transportation Facilities for this line of authority.

For the purposes of this Handbook all reference to the Contracting Officer includes the legally authorized representatives designated in writing. Relevant Timber Sale Contract Clauses are listed in 2509.22, 13 - Exhibit 01.

13.1 – PRACTICE: Timber Sale Planning

1. **OBJECTIVE.** To incorporate soil and water resource considerations into timber sale planning.

2. **EXPLANATION.** This is an administrative practice. Timber sale planning considers: (1) watershed conditions, including natural disturbances and past management impacts; (2) transportation systems in relation to timber harvest activities; (3) potential effects on soil and water resources; (4) identification of sensitive areas; (5) methods to minimize adverse water quality impacts associated with project implementation, including site-specific measures described in BMP 13.2; (6) cumulative effects, including natural sensitivity, land disturbance history, and threshold of concern or risk; and (7) monitoring needs. Other factors may be considered as necessary.

The recommendation of BMPs at the planning level helps focus harvest unit layout needs, and improves the BMP implementation process.

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3. IMPLEMENTATION. During the NEPA process, an interdisciplinary team evaluates watershed characteristics and soil and water resource response to proposed timber harvest and related activities. The NEPA process identifies any necessary soil and water resource protection measures. The citation of BMPs at the planning level is helpful for identifying and prescribing site-specific water quality protection measures. The timber sale contract includes provisions to meet resource protection requirements as directed by the NEPA decision document.

4. REFERENCES. FSM 1950, 2431.1, 2431.2, 2511, 2532.03(4), and 2531; 36 CFR 219.13(h)(1); the Timber Sale Contract; individual Forest Plans; FSH 2409.18.

13.2 – PRACTICE: Timber Harvest Unit Design

1. OBJECTIVE. To incorporate site-specific soil and water resource considerations into integrated timber harvest unit design criteria.

2. EXPLANATION. This is an administrative and preventive practice. The proposed timber harvest units are evaluated to estimate site-specific impacts and determine appropriate measures to minimize soil erosion and water quality degradation. Harvest unit design incorporates site-specific information and field verification in order to consider: (1) stream channel protection; (2) potential slope instability and erosion hazard; (3) size and shape of unit; (4) landform characteristics; (5) road and skid trail network; (6) logging system design; (7) relative risk of wind throw; (8) wetland protection; and (9) Karst area protection.

Where adverse water quality, soil productivity impacts, or undesirable stream flows are likely to result, the harvest unit design must be modified, special mitigation measure identified, individual units deleted, and/or the natural recovery rate accelerated by using watershed improvement measures.

3. IMPLEMENTATION. Practices and techniques to assure acceptable soil and water resource protection are identified in the environmental analysis. Successful unit design requires an integrated interdisciplinary effort from site evaluation through project administration. Site-specific application of environmental analysis direction is carried out by the sale preparation and sale administration teams, with consultation and assistance from technical resource staffs as appropriate. The need for monitoring and evaluation is identified in the NEPA document.

4. REFERENCES. FSM 2471, 2405.13, 2471.2, 2405.13, and 2482; FSH 2409.15, 2409.23 and 2409.18; 36 CFR 219.13(d) and (e); 11 AAC 95.355.

13.3 – PRACTICE: Designating Water Quality Protection Needs on Sale Area/Unit Release Maps

1. OBJECTIVE. Delineate the location of protection areas and ensure their recognition, proper consideration, and protection on the ground.

2. EXPLANATION. This is an administrative practice. Where applicable, the following features that can affect water quality are designated for protection on the Sale Area/Unit Release

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Map (and described in associated contract provisions), an integral part of the Timber Sale Contract.

a. Location and category of stream courses to be protected:

"A" Stream courses - (blue and white striped flagging) - includes Class I streams and Class II streams which flow directly into Class I streams.

"B" Stream courses - (orange and white striped flagging) - Class III streams having characteristics of instability and sediment production.

"C" Stream courses - (green and white striped flagging) - include other streams and V-notches designated for soil and water quality protection.

b. Wetlands, riparian areas, meadows, lakes

c. Boundaries of harvest units

d. Specified roads

e. Roads where log hauling is prohibited or restricted.

f. Structural improvements

g. Areas with specific skidding and yarding needs

h. Known sources of rock for roadwork, and rip rapping.

i. Other features required by Division "C" Contract Provisions

j. Domestic or public water supply source

k. Slash disposal treatments within or adjacent to riparian areas

l. Areas of known mass instability

m. Caves and significant karst areas

3. IMPLEMENTATION. The interdisciplinary team identifies and delineates these and other features on project maps along with a description of each feature. Channel-type maps may be used to identify stream classes, fish utilization, and habitat capability. Riparian areas should be mapped using riparian, soils, vegetation, and channel-type criteria. Stream class and riparian area boundaries may require adjustment following field verification. Changes are noted on the Sale Area/Unit Release Map at the time of contract preparation. The Purchaser and the Forest Supervisor Representative as necessary, prior to harvesting, review the features on the ground.

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4. REFERENCES. Timber Sale Contract Provisions B(T)1.1, B(T)6.6, B(T)6.5, B(T)6.65, C(T)6.42#, C(T)6.51, C(T)6.65, and C(T)6.61#; FSM 2432.2 and 2432.3; FSH 2409.15 and R-10 Supp. to 2409.18.

13.4 – PRACTICE: Timber Sale Operating Schedule

1. OBJECTIVE. To ensure that erosion control and timing responsibilities are incorporated into the Operating Schedule.

2. EXPLANATION. This is an administrative practice. Purchasers must adhere to soil and water resource recommendations determined through the interdisciplinary process and incorporated into the Timber Sale Contract. The Purchaser's responsibilities are specified in the Timber Sale Contract through various provisions:

- a. Contract provision B(T)6.3 "Control of Operations" requires the Purchaser to furnish a general plan of operations describing planned periods for completion of erosion control measures.
- b. Contract provision B(T)6.31 "Operating Schedule" requires the Purchaser to provide an annual schedule of anticipated road maintenance and erosion control work.
- c. Contract provision B(T)6.312 (Long-Term Contract) requires issuance of a Logging Construction Approval Notice as a prerequisite to harvest operations and road construction.
- d. Contract provision C(T)6.314 "Timing of Logging Operation" may be used as necessary to limit the Purchaser's operations to specified periods.
- e. Contract provisions B(T)6.6 and C(T)6.6 "Erosion Prevention and Control" can be used to control operations when ground conditions are such that significant damage to resources will result.

3. IMPLEMENTATION. Limited operating periods are identified and recommended during the environmental analysis by the interdisciplinary team. When necessary, the contract includes provision C(T)6.314 to control timing of operations. Under provision B(T)6.6, the Contracting Officer will monitor on-going activities on the timber sale, and will take such action as necessary, including suspension of activities, to control operations so that significant resource damage is prevented.

4. REFERENCES. Timber Sale Contract Provisions: B(T)6.3, B(T)6.31, B6.312 (Long-Term Contract), B(T)6.65, B(T)6.6, C(T)6.3, C(T)6.6, and C(T)6.314#; FSM 2451, 2451.63, and 2453.2; FSH 2409.18, R-10-C6.314 option 1 or 2, R-10-C6.314.

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13.5 – PRACTICE: Identification and Avoidance of Unstable Areas

1. OBJECTIVE. To avoid triggering mass movements and resultant erosion and sedimentation by excluding unstable areas from timber harvest.

2. EXPLANATION. This is an administrative and preventive practice. Where potentially unstable areas cannot be harvested without long-term effects, they are taken out of the suitable forestland base in the Forest Plan and are classified as unsuitable forestland. At the forest plan level, slope gradients of 72 percent or more are removed from the tentatively suitable timber base due to high risk of soil mass movement. These lands are not managed for timber production because existing harvesting technologies have a high probability of causing long-term damage to soil productivity and watershed conditions. Timber suitability can be re-assessed, if improved harvesting technologies are developed.

3. IMPLEMENTATION. At the project planning level the Forest Supervisor or District Ranger may approve timber harvest on slopes of 72 percent or more on a case-by-case basis, based on the results of an on-site analysis of slope stability and an assessment of potential impacts of accelerated mass wasting on down slope and down stream beneficial uses of water and other resources. During the environmental analysis, the interdisciplinary team identifies unstable areas using input (Soil Resource Inventory Maps, Slope Stability Maps) provided by various resource staffs. When slopes are classified as potentially unstable, a field investigation will be completed to obtain information to be used in a stability analysis. Where unstable areas are presently classified as suitable forest lands and timber cannot be harvested without causing long-term effects on the soil and water resources, they should be recommended for reclassification as unsuitable forest lands.

If it is decided during the NEPA process to construct roads across or operate on unstable areas, the interdisciplinary team should disclose and document the risk and potential impact of slope failure. Mitigation measures will be required and incorporated into the Timber Sale Contract, and may include special drainage structures, rock buttresses, retaining structures, or restrictions on blasting and/or excavation under saturated soil conditions (see BMP 14.7).

4. REFERENCES. FSM 2405.13; FSH 7109.51, 36 CFR 219.24

13.9 – PRACTICE: Determining Guidelines for Yarding Operations

1. OBJECTIVE. To select appropriate yarding systems and guidelines for protecting soil and water resources.

2. EXPLANATION. This is an administrative and preventive practice. Yarding systems and operational guidelines are selected to meet resource objectives. Initial considerations include applicable silvicultural treatments and transportation systems to be used. Preliminary yarding suitability may be interpreted from soil and land type inventories, geologic maps, and climatic and hydrologic information. The watershed factors to consider include: slope gradient and aspect, soil and slope stability, erodability and compactibility, vegetative cover,

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stream course protection needs, riparian areas, wetlands, meadows, and other factors that may affect water quality, flood, and sediment yield potentials.

Yarding systems that are considered feasible in Alaska include: high lead, skyline, helicopter, shovel, and tractor.

Cable yarding includes high lead and skyline. The objective of using cable yarding is to avoid ground-based systems and/or to achieve log suspension. Where feasible, uphill yarding is preferred for all cable systems.

1. High lead Yarding: Although partial suspension may be obtained, this is basically a ground lead system. Where suspension is necessary to protect resource values, helicopter or skyline systems are recommended over high lead.
 - a. High lead yarding is appropriate where resource protection does not require full or partial log suspension and when shovel yarding or tractor skidding is inappropriate.
 - b. Split yarding can be used to minimize impacts to stream courses. This involves making the stream course a setting boundary that allows yarding away from, rather than across, the stream course.
2. Skyline Yarding: These systems utilize log suspension and can reduce soil disturbance. Suspension capabilities vary depending upon the system and the terrain. Partial suspension is the norm, but full suspension can be achieved where the terrain is favorable. The use of lift/tail trees can increase suspension and payload.
 - a. Suspension may be required on steep or unstable slopes, over sensitive soil, and in riparian areas or wetlands where tractor, shovel or high lead yarding is inappropriate. Yarding deflection must be considered during yarding suspension feasibility analysis.
 - b. Full log suspension is normally difficult to obtain. Therefore, field verification should be done where it is anticipated full suspension is necessary to protect resource values.
3. Helicopter Yarding: Helicopter yarding is a true aerial system; the logs are fully suspended from the pick-up point to the landing. While helicopter yarding is simple in concept, the operation is very costly and time-sensitive. Helicopter yarding optimizes weight yarded per unit of time.
 - a. Helicopter yarding is applicable to all terrain conditions and suitable for most silvicultural prescriptions.
 - b. Helicopter yarding requires less road construction, and may be suitable for providing access across unstable terrain.

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4. Shovel Yarding: The determination of ground suitable for shovel logging is based on site-specific conditions including: slope, topography, soils and hydrologic conditions. When applied properly, shovel yarding is an efficient and an environmentally sound technique for logging on and around sensitive sites. On certain soil types, this logging system minimizes soil churning and rutting when compared to ground-based yarding systems. In sensitive riparian areas, damage to stream courses and lifting rather than dragging logs across these areas can minimize side slopes. The following general guidelines should be considered:

- a. Slopes up to 20 percent may be suitable for shovel yarding. This guideline applies to the slope over which the loader tracks will travel and not to short steep pitches that the boom can reach. Proposed shovel yarding on slopes greater than 20 percent should undergo interdisciplinary review.
- b. Areas with broken, uneven topography, or an area dissected by numerous incised drainages may not be suitable for shovel yarding.
- c. On sites having soils with low bearing strength, tracks need to be supported by logging slash, shrubs, other woody material, or pads to prevent rutting. This mattress material should be removed where necessary to restore the natural drainage pattern.
- d. Live streams will not be crossed without the use of a temporary structure, such as a log mat.
- e. Trees should be felled to facilitate use of predetermined travel corridors to limit potential for soil disturbance. Any areas where the machine must excavate in order to maneuver should be avoided.
- f. Spur roads for shovel access should be minimized and/or obliterated after use.
- g. The number of turns on shovel trails should be limited, depending on soil type and vegetative cover. Wide arc turns can reduce soil disturbance on shovel trails.

5. Tractor Skidding: Tractor skidding has generally proved to be inappropriate under the rain forest conditions common on the Tongass NF. However, under appropriate hydrologic, soil, and slope conditions, tractor skidding is an efficient logging technique. Methods of protecting soil and water resources during tractor skidding include:

- a. Slopes up to 35 percent may be suitable for tractor skidding. This guideline does not apply to short pitches greater than 35 percent that the tractor can negotiate without significant soil disturbance.
- b. End-lining may be appropriate for winching logs out of sensitive areas where the encroachment of heavy equipment would disturb soils and impair water quality.
- c. establishing a predetermined skid pattern and felling to the lead can minimize soil disturbance by reducing the need for tractor maneuvering.

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- d. Logging over frozen ground and/or snow with adequate depth and physical characteristics can protect the soil and residual vegetation, thereby preventing soil and water quality degradation.
- e. Where rutting occurs scarify the soil surface to improve drainage and regeneration.

3. **IMPLEMENTATION.** Land management objectives are set by the forest plan. These objectives are considered during the selection of silvicultural regeneration systems and logging methods, and are used in determining the intensity of, and restrictions on, land disturbing activities. Logging activities within riparian areas undergo interdisciplinary review prior to implementation. Timber Sale Contract Provisions specify conditions the yarding systems must meet to satisfy the land management objectives. The specific systems are included in the contract and designated on the Sale Area Map, and, in the case of the long-term sales, included in the Layout & Release for Logging form.

The Contracting Officer executes these prescriptions during sale contract, administration. In the case of the long-term timber sale contract, identification of logging systems and limitations on their operation will be included in the "harvest unit layout and release for logging form."

4. **REFERENCES.** Timber Sale Contract Provisions B(T)6.42, B(T)6.422, B(T)6.424, C(T)6.42#, and C(T)6.6; R-10-C6.42; FSM 2524 and 2451; FSH 2409.18; 2409.15; and 2509.23; Timber Sale Contract; FSM 2522; (FS Form CMA 2400-9 Rev 481, KMA 2400-19, Rev 682.); Fisher, James G. 1986. Logging with a hydraulic excavator: a case study. Master of Forestry Paper, Oregon State University; Hemphill, Dallas C. 1986. Shovel logging. Logging Industry Research Assoc., New Zealand. Technical Release Volume 8, no 1; Starnes, L.W. 1985. Preliminary time study, loader swing yarding. Timber Management Staff Report. Chatham Area, Tongass NF; Starnes, L.W. 1988. Shovel Logging, basic logging systems training notes. U.S. Forest Service, Region 6. Dent, D. Douglas "Professional Timber Falling; A procedural Approach", Portland, Oregon: Ryder Print Co., 1974, 182 pages. Conway, Steve "Timber Cutting Practices", San Francisco, California: Miller Freeman Publications, 1968, 65 pages. Mifflin, Ronald W. and Lysons, Hilton H. "Glossary of Forest Engineering Terms", Portland, Oregon: U.S.D.A. Forest Service, Pacific Northwest Forest Range Experiment Station, 1979 24 pages. Studier, Donald D. and Binkley, Virgil W. "Cable Logging Systems", Corvallis, Oregon: O.S.U. Book Store Inc., 1975 200 pages. Alaska Department of Labor, Division of Labor Standards and Safety, "Logging Occupational Safety and Health Standards", September 30, 1976, as amended August 8, 1990, 103 pages.

13.10 – PRACTICE: Log Landing Location and Design

1. **OBJECTIVE.** Design and construct landings to minimize soil erosion and water quality degradation.
2. **EXPLANATION.** This practice is both administrative and preventive. Timber Sale Contract requirements provide for erosion prevention and control measures on all landings.

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Provisions are made in the Timber Sale Contract for landings to have proper drainage. The Forest Service and Purchaser will agree to location of landing clearing limits prior to construction. The following criteria are used in evaluating landings:

- a. The cleared or excavated size of landings will not exceed that needed for safe and efficient log handling.
 - b. Select landing locations that meet the yarding objective and involve the least amount of excavation and surface erosion and mass-wasting potential.
 - c. Locate landings to minimize the amount of road construction required while meeting yarding objectives and obtaining the required deflection, suspension, and yarding distance to minimize soil disturbance.
 - d. Locate landings, to minimize the impact to stream channels, riparian areas, wetlands, and sink holes. If yarding across protected streams or designated riparian areas, wetlands, and sensitive karst features such as sinkholes is necessary, locate landings so that log suspension is possible over these areas.
 - e. Locate landings to minimize the number of skid roads consistent with equipment capability and safety needs, and where side cast and logging debris will neither enter drainages nor sink holes nor damage other sensitive areas. If necessary, excavation materials and logging debris will be end-hauled to designated disposal sites.
 - f. Locate landings outside designated Tongass Timber Reform Act (TTRA) buffers and a sufficient distance from streams or channels so logging slash and sediment does not degrade the stream courses. Landing may be located within the buffer only if interdisciplinary analysis shows this to be the most reasonable location for overall resources protection.
 - g. Locate and shape landings to drain in a planned direction and manner to minimize erosion and prevent sediment delivery to stream courses and sink holes.
 - h. Where slopes have a grade greater than 67 percent, are unstable, or are in a slide-prone area, fill material used in construction of a landing must be free from loose stumps and excessive accumulations of slash, and must be mechanically compacted in layers if necessary to prevent soil erosion and mass wasting.
3. **IMPLEMENTATION.** The Contracting Officer must approve landing locations. Acceptable landings should meet the above criteria. Stabilization concerns will be assessed as needed.
4. **REFERENCES.** Timber Sale Contract Provisions B(T)6.6, B(T)6.63, B(T)6.422, C(T)6.621, C(T)6.6, and C(T)6.62; FSH 2409.15, and 2409.23; Tongass Timber Reform Act of 1990 (Public Law 101-626);

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13.11 – PRACTICE: Scheduling and Enforcement of Erosion Control Measures During Timber Sale Operations

1. OBJECTIVE. To ensure that the Purchaser's operations are conducted according to the Timber Sale Contract with respect to soil and water resource protection.

2. EXPLANATION. This is an administrative and preventive practice. Purchasers must adhere to prescribed soil and water resource protection measures. This is accomplished by administration of erosion control measures in the Timber Sale Contract.

Contract Provision B(T)6.6 requires the Purchaser to observe all practicable precautions for minimizing soil erosion. Equipment will not be operated when ground conditions are such that excessive damage will result. Erosion control work will be kept current immediately preceding expected seasonal periods of precipitation or runoff.

Contract Provision B(T)6.65 requires the Purchaser, unless agreed otherwise, to perform erosion control work prior to seasonal shutdown where logging or road construction is in progress but not complete. When weather allows operations after the normal operating season, the Purchaser will keep such work as up-to-date as practicable.

Contract Provision B(T)6.66 requires Purchaser to maintain erosion control structures until they become stabilized, but not for more than one year after construction (during the period of the contract).

3. IMPLEMENTATION. The Contracting Officer ensures that the Purchaser conducts operations according to the Timber Sale Contract. If the Purchaser fails to do necessary erosion control work, the Forest Service may temporarily assume responsibility for the work and the cost will be charged against the Purchaser's bond.

4. REFERENCES. Timber Sale Contract Provisions B(T)4.225, B(T)6.6, B(T)6.65, B(T)6.66 B6.63, B6.42.2, C(T)6.3, C(T)6.313 (opt. 1 & 2), C(T)6.314, C(T)6.6, C(T)6.61#, and C(T)6.62; R-10-C6.64, R-10-C6.62; FSM 2451, 2453.2, and 2522; FSH 2409.15.

13.12 – PRACTICE: Site Preparation

1. OBJECTIVE. Maintain sufficient ground cover to minimize soil erosion.

2. EXPLANATION. This is an administrative and preventive practice. Site preparation is not used within the coastal rainforest that comprises all of the commercial economical land within the Tongass and much of the Chugach National Forests. For forests of white spruce and birch, site preparation may be needed to reduce fire hazard and insect buildup potentials, and to provide a more favorable growing site. Soil erosion, increases exponentially with decreases in ground cover. This BMP can also be applied to Special Use Permits and Mine Operating Plans that include site preparation. Also see BMPs 12.1 and 12.17.

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3. IMPLEMENTATION. Forest Service Silviculturists will develop site preparation plans in conjunction with soil and water specialists. The contractor or permittee will take appropriate measures to maintain adequate ground cover to prevent accelerated soil erosion. The following guidelines are designed to prevent significant surface erosion from occurring:

- a. Maintain at least 40 percent ground cover on soils with a low erosion hazard.
- b. Maintain at least 50 percent ground cover on soils with a moderate erosion hazard.
- c. Maintain at least 60 percent ground cover on soils with a high or very high erosion hazard.

When operating within Class I, II, or III streamside management zones, increase ground cover by 30 percent or maintain at natural levels.

In addition to ground cover constraints, determine the allowable level of cumulative disturbance in order to protect against adverse downstream watershed impacts. No more than 25 percent of a watershed (1,000 acres or larger) should have less than 70 percent good ground cover following site disturbance. The disturbed area is considered fully recovered when the ground cover density exceeds 80 percent and no active rill or gully erosion is present).

4. REFERENCES. 11 AAC 95.390

13.14 – PRACTICE: Completion of Erosion Control for Unit Acceptance and Sale Closure

1. OBJECTIVE. To assure that the required erosion control work is completed before unit acceptance.

2. EXPLANATION. This is an administrative and preventive practice. Periodic inspections of erosion control measures are performed throughout the duration of the timber sale, but particularly as the sale nears completion, to assure compliance with contract requirements.

Upon written request by the Purchaser, and with assurance that the work is completed, the Contracting Officer will inspect the unit and notify the Purchaser of acceptance of all or portions of the required work. Where acceptance is given for only some of the requirements, notice must clarify the accepted requirements and work remaining on those items not accepted. Erosion control work is not accepted until the terms of Contract Provision B(T)6.66 are met.

Erosion control will be completed in a timely manner according to the Purchasers operation schedule (BMP 13.11). Final inspection will include the following items where applicable:

- a. Removal of temporary drainage structures (BMP 14.16 and 14.24).
- b. Erosion control measures on landings, temporary roads, and skid trails (BMP 13.11 and 14.24).

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- c. Debris removal from protected stream courses (BMP 13.16).
- d. Revegetation of areas disturbed during operations (BMP 12.17).
- e. Appropriate road maintenance (BMP 14.20).

3. IMPLEMENTATION. The Contracting Officer ensures that erosion control measures are in compliance with contract requirements before acceptance.

4. REFERENCES. FSM 2451, 2452, 2453, and 2456; Timber Sale Contract Provisions B(T)6.6, B6.61, B(T)6.63, B(T)6.64, B(T)6.65, B(T)6.66, C6.61#, C(T)6.66, and C(T)6.6; FSH 2409.15.

13.16 – PRACTICE: Stream Channel Protection (Implementation and Enforcement)

1. OBJECTIVES. To provide site-specific stream protection prescriptions consistent with objectives identified under BMPs 12.6 and 12.6a. Objectives may include the following: (1) maintain the natural flow regime; (2) provide for unobstructed passage of storm flows; (3) maintain integrity of the riparian buffer to filter sediment and other pollutants; (4) restore the natural course of any stream that has been diverted as soon as practicable; (5) maintain natural channel integrity to protect aquatic habitat and other beneficial uses; and (6) prevent adverse changes to the natural stream temperature regime.

2. EXPLANATION. This is an administrative, preventive, and corrective practice. This practice applies to all stream courses designated on the Sale Area or Unit Release Maps (see BMP 13.3).

- a. Some protection measures may be required in addition to those described under BMPs 12.6 and BMP 12.6a. Protection measures may include: leaving an unmanaged streamside buffer, selective harvest of merchantable trees, or other silvicultural prescription designed to meet water quality and riparian objectives.
- b. Stream courses to be protected subject to Timber Sale Contract provision C6.51(T) include 3 categories of streams:

(1) Class I streams and Class II streams that "flow directly into" (see definitions.)
Class I streams. Class I streams are those with anadromous or adfluvial fish habitat; or high quality resident fish waters listed in Appendix 68.1, Region 10 Aquatic Habitat Management Handbook (FSH 2609.24), June 1986; or habitat above fish migration barriers known to provide reasonable enhancement opportunities for anadromous fish. Class II streams are those with resident fish populations and generally steep (6-15 percent) gradient where no anadromous fish occur, and otherwise not meeting Class I criteria. Class II streams have limited fisheries value and generally occur upstream of migration barriers, or have other habitat features that preclude anadromous or adfluvial fish use.

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(2) Class II streams which do not flow directly into Class I streams, and Class III streams having characteristics of instability and sediment production. Class III streams are perennial, intermittent, and ephemeral streams with no fish populations, but which have sufficient flow or transport sufficient sediment and debris to have a direct influence on downstream water quality or fish habitat capability.

(3) Class IV streams are all other intermittent, ephemeral, and small perennial channels with insufficient flow or sediment transport capabilities to have an immediate influence on downstream water quality or fish habitat capability. Rills and other watercourses, generally intermittent and less than 1 foot bank full width, with little or no incisement into the surrounding hill slope, and with little or no evidence of scour are defined as "non-streams" and are not subject to this provision.

c. The following measures shall be observed to protect these stream courses:

(1) Class I streams and Class II streams that flow directly into (See definitions for "flow directly into".) Class I streams are marked with blue and white striped flagging, and will be protected in the following manner:

As provided for in Section 103 of the Tongass Timber Reform Act, timber harvest units shall not be within 100 feet on either side of Class I streams and Class II stream that flow directly into Class I streams. (See BMP 12.6 and 12.6a.)

Prior to any operations within a buffer, a Stream course Protection Plan will be developed for that buffer. This plan will incorporate provisions for implementing Section 103 of the Tongass Timber Reform Act and will specify which timber, if any, may be removed within the buffer and become Included Timber.

(2) Class III streams and Class II streams that do not flow directly into Class I streams are marked with orange and white striped flagging. Field-level professional judgment may be a basis for prescribing variable-width buffers for individual streams minimum buffers required by TTRA section 103(a) to meet fish habitat and water quality goals consistent with this Handbook and the Regional Aquatic Habitat Management Handbook (FSH 2609.24). Resource staffs consider the alternative impacts of logging and wind throw to water quality when determining whether to leave or remove trees within or adjacent to protected Stream courses. Factors to consider in unit design include:

(a) Channel incision depth and width (V-notch size)

(b) Channel side slope angle and soil stability

(c) Riparian species composition and canopy structure (tree height relative to channel incision depth)

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- (d) Local winds (direction and intensity of wind vectors)
- (e) Logging system feasibility considerations
- (f) Significant karst features
- (g) Soil texture, parent material, and stream substrate
- (h) Sediment and woody debris transport capability
- (i) Evidence of recent erosion or channel scour
- (j) Distance to nearest fish habitat
- (k) Distance to nearest road below the site

These stream courses will be protected in the following manner unless agreed otherwise in writing:

Trees shall be felled in such a manner so that the direction of fall is away from Stream courses. These trees may be wedged, jacked, lined, or otherwise pulled when necessary to meet this requirement. Unless the Forest Service provides a written waiver, felled trees that inadvertently enter or cross Stream courses shall not be bucked or limbed until clear of Stream courses, unless limbing or bucking would reduce damage to the riparian vegetation or stream banks. Trees or products shall not be hauled or yarded across Stream courses unless fully suspended.

Debris in Stream courses resulting from falling or yarding Included Timber shall be removed immediately to a stable location above high water mark. Existing natural stable debris will be left undisturbed. The Forest Service may require individual felled, or portions of felled trees that have entered Stream courses, to be left unyarded. Trees or portions of trees to be left will be clearly marked by the Forest Service prior to yarding.

When ground skidding systems are employed, logs will be end-lined out of riparian areas. Equipment is allowed to enter streams and riparian areas only at locations and times authorized by the Contracting Officer. Yarding settings should be split on streams where IDT field review deems it appropriate.

(3) Class IV streams and all other intermittent, ephemeral, and small perennial channels and V notches designated for soil and water quality protection are marked with green and white striped flagging and will be protected in the following manner unless agreed otherwise in writing:

In so far as practicable, trees will be felled and yarded away from stream courses. The trees that cannot be felled away from stream courses will be felled to bridge the stream providing these trees will be yarded during the same operating season. Trees

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felled to bridge stream courses will be bucked, limbed, and topped clear of stream course and its banks. Debris consisting of large unmerchantable pieces, root wads, or large accumulations of slash resulting from falling or yarding, including timber, which restrict natural water flow, adversely affect water quality or have potential for debris flow, will be removed to a stable location above high water mark before the yarder leaves the unit or upon completion of seasonal logging activities in the unit, whichever comes first.

d. Stream courses that are in the categories of a, b, and c are designated by the Forest Service, shown on Sale Area Map and marked on the ground in conjunction with marking of units and related roads.

e. A Stream course Protection Plan will be developed for any buffer that will be entered under guidelines provided in FSH 2509.22 and FSH 2609.24.

f. Location and method of stream crossings must be agreed to prior to construction. Crossings are authorized after the location of skid trails, tractor roads, and the Forest Service and the Purchaser agree to temporary roads. Temporary crossings shall not impede fish passage, or result in significant degradation of water quality. (see BMP 14.17)

g. Material from temporary road and skid trail stream crossings will be removed from the stream channel and the stream banks will be restored to an acceptable condition upon completion of Purchaser's use or prior to the next seasonal high runoff period, unless otherwise agreed (see MBMPs 13.11, 13.14, 14.17, and 14.24)

h. Purchaser shall repair all damage to a stream course caused by Purchaser's operations, including damage to banks and channel, as designated by the Forest Service. Revegetation may be required on disturbed stream banks, V-notch sidelopes, and adjacent floodplains. (see BMP 12.17)

i. Water bars, windrowed slash, and other erosion control structures will be properly located to prevent water and sediment from being channeled into stream courses, and to dissipate concentrated flows.

j. In addition, the following measures shall be observed to protect stream courses, unless otherwise agreed in writing:

Purchaser's operations will be conducted to prevent debris from entering stream courses. When removing debris Purchaser will remove such debris in an agreed manner that will cause the least disturbance to stream courses. Debris will be removed from stream courses before the yarder leaves the site. Naturally occurring large woody debris should not be disturbed. (see BMP 14.12)

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Wheeled or track-laying equipment will not be operated in stream courses unless approved by Forest Service except at crossing designated by Forest Service, or as essential to construction or removal of culverts and bridges. (see BMP 14.14)

Flow in stream courses may be temporarily diverted only if such diversion is necessary for Purchaser's planned construction and Forest Service gives written authorization. Temporary diversions of stream courses will be located on the ground by the Forest Service prior to construction. Such flow will be restored to the natural stream course as soon as practicable and in any event prior to a major storm runoff period or runoff season. (see BMP 14.15)

Culverts, fords, or bridges will be required on temporary roads at all points where it is necessary to cross stream courses. Such facilities will be of sufficient size to pass a bankfull flow event and designed and installed in a manner to provide unobstructed flow of water and migration of fish and to minimize damage to stream courses.

On all Class III streams, class IV streams, non-streams, and Class II streams or segments which do not flow directly into a Class I stream, other provisions in this Handbook, as well as provisions of the Regional Aquatic Habitat Management Handbook (FSH 2609.24), also apply to ensure riparian protection.

3. **IMPLEMENTATION.** The Contracting Officer works with the Purchaser's representative to ensure that the Timber Sale Contract Provisions covering the above items are carried out on the ground. Technical resource staffs can be consulted to help the Contracting Officer with decisions. In the case of long-term sales, unit release cards will undergo IDT review.

4. **REFERENCES.** FSM 2404, 2409, 2542, 2603, and R10 Supp. to 5460.1; FSH 2409.15), FSH 2409.23, 2509.11, and 2509.12; Timber Sale Contract Provisions, C(T)6.6. AHMU 2609.24; State of Alaska (18 ACC 70.020). B(T)6.5, B6.6, B6.66, B4.225, C(T)6.51(480).

13.17 – PRACTICE: Nonrecurring "C" Provisions For Soil and Water Quality Protection

1. **OBJECTIVE.** To insert nonrecurring (Special) "C" provisions into the Timber Sale Contract to protect soil and water resources, where standard "B" or "C" provisions do not apply or are inadequate to protect watershed values.

2. **EXPLANATION.** This is an administrative practice. Nonrecurring "C" provisions are sometimes needed to meet management objectives on a particular sale area. They require Regional Forester approval and may only be included in the sale for which approval was given. This practice can be used for a variety of special situations that may occur on any timber sale. There are no standard or set provisions that can be referenced since each Special "C" provision is designed to meet a unique situation and is specific to one sale.

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3. IMPLEMENTATION. The need for nonrecurring "C" provisions is identified during the NEPA process by the interdisciplinary team. The nonrecurring "C" provision is prepared and submitted to the Regional Forester for approval. The Regional Forester ensures that the wording complements the Timber Sale Contract and returns it to the Forest Supervisor with approval. The Contracting Officer applies the nonrecurring "C" provision in the same manner as any other contract provision.

4. REFERENCE. FSH 2409.18, B6.6, B6.63, B6.64, B6.65, B4.225, C6.3, C6.312, R-10-C6.313 (opt. 1 & 2), R-10-C6.314, R-10-C6.6, WO-C6.61, R-10-C6.62.

13.18 – PRACTICE: Modification of the Timber Sale Contract

1. OBJECTIVE. To seek an Environmental Modification of the Timber Sale Contract if new circumstances or conditions indicate that the timber sale will cause irreparable damage to soil, water, or watershed values.

2. EXPLANATION. This is a corrective practice. Once timber sales are sold, they are harvested as described in the Timber Sale Contract. Occasionally, it may be necessary to modify a Timber Sale Contract after harvesting has begun because of changed or unanticipated conditions within the Sale that adversely affect the soil and water resources.

3. IMPLEMENTATION. If monitoring results or other evidence indicates that planned activities on an existing timber sale will produce unacceptable impacts to soil and water resources, the Forest Service Representative will request, that the Contracting Officer approve an Environmental Modification. Once the decision to take action is approved by the Regional Forester, the appropriate Line Officer will assign an interdisciplinary team to make recommendations for implementation. The Purchaser may agree to the Environmental Modification. The Contracting Officer can approve Environmental modifications per FSM 2453.23.

4. REFERENCES. Timber Sale Contract Provisions B(T)8.3 and C(T)8.3.

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13 – Exhibit01

Timber Sale Contract Clauses and Standard Road Specifications that Pertain to BMPs

Keywords	BMP Number	T.S. Contract Provision	Road Specifications
<i>Riparian Designation</i>	12.6	B(T)6.5 C(T)6.5, C(T)5.421	1985 FS Specs EM 7720-100B, 100R
<i>Maps</i>	13.3	B1.1, B(T)6.5, B6.6, B(T)6.65, C6.42#, C6.51, C6.61#, C(T)6.65	
<i>Schedule</i>	13.4	B6.3, B6.31, B6.312(LTC), B6.65, B6.6, C6.3, C(T)6.6, C(T)6.314#	
<i>Yarding</i>	13.9	B6.42, B(T)6.422, B(T)6.424, C(T)6.42#, C(T)6.6, R-10-C6.42	
<i>Landings</i>	13.10	B(T)6.6, B(T)6.63, B6.422, C(T)6.621, C(T)6.6, C(T)6.62	
<i>Erosion Control</i>	13.11	B4.225, B6.6, B(T)6.65, B(T)6.66, B6.63, B6.422, C(T)6.63, C(T)6.313(opt. 1&2), C(T)6.314, C(T)6.6, C(T)6.61#, C(T)6.62, R-10-C6.64, R-10-C6.62	
<i>Acceptance</i>	13.14	B6.61, B(T)6.6, B(T)6.63, B(T)6.64 B(T)6.65, B(T)6.66, C6.61#, C(T)6.66	
<i>Streams</i>	13.16	B(T)6.65, B6.6, B6.66, B4.225, C(T)6.51(480), C(T)6.6	
<i>“C” Clauses</i>	13.17	B6.6, B6.63, B6.64, B6.65, B4.225, C6.3, C6.312, R-10-C6.313 (opt 1&2), R-10-C6.314, R-10-C6.6, WO-C6.61, R-10-C6.62	
<i>Modification</i>	13.18	B(T)8.3, C(T)8.3	
<i>Road Location</i>	14.2		1985 FS Specs EM 7720-100B, -100R
<i>LTF’s</i>	14.4		1985 FS Specs EM 7720-100B, -100R
<i>Erosion Plan</i>	14.5	B6.31, B6.5, B6.6 C6.3, C(T)6.51	1985 FS Specs EM 7720-100B, -100R, Public Works Specs. 50.2 & 100.42
<i>Timing</i>	14.6	B6.3, B6.31, C6.36, C(T)6.3	1985 FS Specs EM 7720-100B, -100R, FAR 52.236-15
<i>Mass Failure</i>	14.7	B6.31, B6.62, C5.2, C5.4, C6.36#	1985 FS Specs EM 7720-100B, -100R Std. Specs 50.4, 203, 212, 605, 613, 619, 631
<i>Surface Erosion</i>	14.8	B6.31, B6.6, B6.62, B6.65, B6.66, C5.2, C5.4, C5.441#, C5.46, C5.23, C(T)5.412, C(T)6.6, C(T)6.62	1985 FS Specs EM 7720-100B, -100R Std. Specs 50.4, 203, 204, 206A, 210, 212, 412, 619, 625, 626, 629, 630

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Timber Sale Contract Clauses and Standard Road Specifications that Pertain to BMPs

Keywords	BMP Number	T.S. Contract Provision	Road Specifications
<i>Drainage</i>	14.9	B6.6, B6.66, C6.3, C6.6, C6.61	1985 FS specs
<i>Timely</i>	14.11	B6.31, B6.6, B6.65, C6.6	1985 FS specs Std. Specs 206, FAR52.213-3, 52.236-15, 4G52.236-107
<i>Excavation</i>	14.12	C6.221, C5.4	1985 FS specs Std. Spec 203.11, FAR 52.236-09
<i>In-Channel</i>	14.14	B6.5, B6.61,	1985 FS specs EM 7720-100R, -100B Std. Spec 203.11, FAR 52.236-15, 4G-52.236-107
<i>Diversions</i>	14.15	B6.5, B6.5(d), C6.3, C6.51, C6.5, C(T)6.52, C(T)6.6	1985 FS specs Std. Spec 100-42, FAR 532.213-3, 52.236- 15, 4G-52.236-107
<i>Bridges</i>	14.17	B6.5, B6.5(b), B6.62, B6.65, C6.3, C6.51, C6.52, C6.6	Std. Specs 504c, 100.42, 206.04, 206A.04, 603.03, FAR 52.213-3, 52.236-15, 4G52.236-107
<i>Quarries</i>	14.18	B(T)6.31, B(T)6.6, B(T)6.62, B(T)6.65, B(T)6.66, C(T)5.2, C(T)5.23, C(T)6.36#, C(T)6.5, C(T)6.6, C(T)6.61#, C(T)6.62	Std. Specs 206, 206A, 210, 611, 624, 625, 626, 629, 1985 FS spec EM 7720-100R, -100B, FAR52.236-09
<i>Disposal</i>	14.19	B6.31, B6.6, B6.62, B6.65, B6.66, C5.2, C5.23, C5.4, C6.36, C6.51, C6.6, C6.601, C6.622	Std. Specs 201.05, 201.03, 203, 210, 611, 624, 626, 629
<i>Maintenance</i>	14.20	C(T)5.4	1985 FS spec EM 7720-100R, -100B, Std. Specs 201.05, 201.03, 306.02
<i>Access</i>	14.22	B(T)5.12, B(T)6.22, B(T)5.12#	1985 FS spec EM 7720-100R, -100B
<i>Snow</i>	14.23	B(T)5.4, C(T)5.46	1985 FS spec EM 7720-100R, -100B
<i>Obliteration</i>	14.24	C5.122, C5.46	Std. Spec 203.09
<i>Facilities</i>	14.25	B6.62, B6.65, C6.6, C(T)6.61#	Std spec 210.02