KOOTENAI NATIONAL FOREST

FOREST PLAN

APPENDIX EIGHTEEN

GUIDELINES FOR CALCULATING WATER YIELD INCREASES

APPENDIX 18

5/79

GUIDELINES FOR CALCULATING WATER YIELD INCREASES

Introduction

Manipulation of forest vegetation produces complex changes in natural functioning of the forest system. Among the expected effects is an increase in water yield from areas of forest canopy removal. In northwestern Montana, this increase is due primarily to modifications in snow accumulation and snowmelt runoff and to changes in evapo-transpiration. Runoff increases may cause resource damage in the form of aggravated channel scour, sedimentation, and an increased potential for flooding.

The Kootenai National Forest's water yield model is based on measured increases in snowpack accumulation and soil moisture in Forest openings. These increases are the result of changes in interception, transpiration, and the energy budget of openings. The model is designed to estimate increases in spring runoff (April, May, June), because this is the time when the majority of the runoff is known to occur and the potential for stream channel damage is the greatest. The calculated peak flow increase from activity in the basin is compared to an allowable peak flow increase to assess the hydrologic status of the watershed. The allowable peak flow increase is a management decision based on the R-1 channel stability rating method in conjunction with consideration for in-stream resource values.

In the model, the peak flow increase from affected lands is varied by elevation and precipitation zones, aspect, slope, and type of management activity. The increase is initially expressed as a percentage per unit area of clearcut equivalent. Runoff increases from logged lands vary from 26 percent to 50 percent; sites with less soil disturbance and gentler slopes represent the smaller increases with the reverse being true for greater increases. Increases from roads vary from 51 percent to 74 percent. The higher figures for roads reflect a more rapid contribution to runoff in addition to snow accumulation increases.
The magnitude of peak flow increases vary also with the amount of area disturbed in a drainage. This area is expressed as a clearcut equivalent (CCE), where 100 percent canopy removal represents 100 percent CCE and lesser removals result in smaller CCE's. A distinction is made between CCE area from existing cutting units and those proposed for the future. The CCE area from existing units is adjusted downward as vegetation reoccupies sites after logging.

In normal applications there are three primary outputs to the water yield model:

1. Potential Equivalent Clearcut Area (PECA).

2. Additional Allowable Clearcut Equivalent (ACE).

3. Increase in Peak Flow (IPF).

PECA is the area (in acres) in the watershed which is allowed to be in a clearcut equivalent condition at any given time. It is varied according to the percent peak flow increase to be expected per CCE acre and the allowable increase as determined from channel stability and instream resource value. The allowable peak flow increase varies from ten percent to 20 percent.

ACE is the area (in acres) which may be added to the existing clearcut equivalent area in the watershed at the time to which the analysis is projected. To determine this, it is necessary to calculate the existing CCE area in roads and in each existing stand. Vegetative recovery since initial cutting is taken into consideration.

IPF is the percent runoff increase to be expected during the spring months. It may be calculated as an existing increase if only past cutting is considered or as a projected increase including both existing and proposed cutting. It is the IPF which is compared to the percent allowable peak flow increase to determine if coordinating requirements are being met.

The focus upon peak flow increases, in contrast to annual water yield increases, represents a more hydrophysically sound approach to this analysis because channel scour and transport are most active during peak flows. The change is not at variance with the Forest coordinating requirements, however. The coordinating requirements address both "annual discharge" increases and "annual peak discharges," with the intent of protecting instream values from flood damage.

WATER YIELD INCREASES

Instructions

The water yield analysis procedure as usually applied, involves five primary steps;

1. Watershed characterization
2. Potential equivalent clearcut area (PECA)
3. Existing clearcut equivalent
4. Additional allowable clearcut equivalent (ACE)
5. Increase in peak flow (IPF)

When these steps are completed, the land manager has an indication of how much area in the watershed may be in clearcut equivalent condition, how much area will be in a clearcut condition prior to additional activity, how much additional clearcut area is available, and how much peak flows have been increased by the existing situation. An extension of the procedure allows calculation of total proposed and existing clearcut equivalency and peak flow increases if additional treatment areas have been determined.

The following instructions are intended to guide the user through the water yield analysis procedure step-by-step. A standard format to be used follows the instruction section. Necessary charts and graphs are provided in the appendix.

I. Watershed Characterization

The first step in the analysis is to determine the analysis point. This is a distinct point on the stream channel above which the analysis is to be carried out. In most cases it will be at the outlet of the drainage. In some situations, the point may be located on a reach of stream which has been singled out for reasons such as channel stability, fisheries habitat, critical road crossing location, etc. The point may also be located higher on a drainage if there is concern that the upper portion of a watershed requires separate analysis.

The second step is to measure watershed area, mean elevation, and mean slope. The area is that portion of the watershed above the analysis point. The mean elevation and slope are normally sampled throughout those areas of the basin allocated to timber management. This data is used for PECA and IPF calculations and therefore should reflect conditions where timber management takes place. In certain situations such as when disease or fire results in disturbances to other allocation units, sampling should be extended into these units. For basin runoff estimates, elevation must be sampled over the entire basin.

The next step is to determine the predicted peak flow increase per clearcut equivalent. This increase factor is expressed as a percentage and varies with elevation zone, landslope, type of treatment, and aspect. The increase factors are contained in Table 1 in the appendix. In nearly all cases, this factor will be applied to an entire basin to determine PECA and IPF. The first determination will be elevation zone, followed by aspect. In nearly all cases, a variety of aspects are represented in a basin and the "Basin Average" factors are used. The mean slope and treatment type are next considered to get the final predicted increase factor. Increase factors for roads are used only when more detailed stand-by-stand runoff calculations are desired.

The allowable peak flow increase is the next consideration. Peak flow is defined as the total water yield during the months of April, May, and June. The range of allowable peak flow increases due to management practices is ten percent to 20 percent. The determination of allowable peak flow increase is done using the R-1 channel stability rating and identified instream values such as fisheries or water supply. For any given channel stability, the allowable increase may be adjusted ± 2 percent based on these instream values.

Channel Stability	Mean Allowable Peak Flow Increase	Range of Allowable Increase
Poor = 100 - 125	12%	10% to 14%
Fair = 75 - 100	14%	12% to 16%
Good = 50 - 75	16%	14% to 18%
Excellent = <50	18%	16% to 20%

NOTE: Ten percent allowable increase is used for all channels rated very poor (>125).

II. Potential Equivalent Clearcut Area (PECA)

PECA is calculated using the following formula:

$$PECA = \frac{(\text{Basin Area in Acres})(\text{Allowable \% Increase})}{(\text{Predicted \% Increase per CCE})}$$

PECA is in units of acres.

III. Existing Clearcut Equivalent

The existing clearcut equivalent (CCE) in the watershed is calculated based on initial area cut, crown removal, and vegetative recovery since cutting. It is necessary to determine the date to which recovery is to be calculated. This should be the date when the next entry to the watershed is scheduled. Clearcut equivalency calculations are done on a stand-by-stand basis with roads being considered as stands with no recovery taking place. The following data are needed to calculate CCE:

Instructions

1. Stand number
2. Area of the stand
3. Habitat type of the stand
4. Year in which regeneration began
5. Original crown removal and clearcut equivalency.

With this information it is possible to calculate the CCE of each stand as a percent and as acre equivalents projected to the next entry of the watershed. The recovery calculation is done using habitat type and two graphs entitled "Crown Removal vs. Clearcut Equivalent" and "Clearcut Equivalent vs. Years of Recovery" which are found in the appendix.

First, one must determine the initial clearcut equivalency of the stand using the graph entitled "Crown Removal vs. Clearcut Equivalent." For example, the 40 percent crown removal corresponds to a 25 percent clearcut equivalency, a 70 percent crown removal to a 77 percent clearcut equivalency, etc. Anything below 15 percent crown removal is considered to be 0 percent clearcut equivalency.

Next, the regeneration year must be determined. It is best to use information available from the stand atlas or ground knowledge. In the absence of such information, five years from time of cutting may be used to approximate initiation of recovery for clearcuts. For partial cuts (< 100 percent crown removal) three years is used on fast recovery habitat types, four years on medium, and five years on slow. Table 2 in the appendix lists habitat types by hydrologic recovery class.

Finally, recovery is calculated using the graph entitled "Clearcut Equavilancy vs. Years of Recovery". The graph consists of three recovery curves for fast, medium, and slow habitat types. The years of recovery are known and clearcut equivalent is read from the Y-axis. For partial cuts, the recovery starts at the initial clearcut equivalent, rather than at 100 percent clearcut equivalent as for complete crown removals. The partially recovered clearcut equivalent is expressed as a percent. This percentage is multiplied by the area of the stand to get clearcut equivalent acres. For roads, no recovery is assumed and a clearcut equivalent factor of 1.3 is used to account for greater hydrological disturbance. Thus, a watershed with ten acres of roads has 13 equivalent clearcut acres of roads. The total existing clearcut equivalent is obtained by summing the stands and roads.

IIIa. Proposed Additional Clearcut Equivalent

This calculation is done only when additional treatment areas have already been proposed. The procedure is identical to that for existing stands except that recovery need not be considered.

IV. Additional Allowable Clearcut Equivalent (ACE)

ACE is calculated using the following formula:

$$ACE_{(\text{at some date})} = \text{PECA} - \text{Existing CCE}$$

V. Increase in Peak Flow (IPF)

IPF is calculated using the following formula:

$$IPF_{(\text{at some date})} = \frac{(\text{CCE Area})(\text{Predicted \% Increase per CCE})}{(\text{Basin Area})}$$

NOTE that IPF can be calculated using either existing clearcut equivalent acres or both existing and proposed acres depending upon the output desired.

Appendix - Table 1

PREDICTED PEAK FLOW INCREASES (% per CCE)

LOW ELEVATION < 3500'

ASPECT	SLOPE	CABLE	TRACTOR	ROADS
LOW ENERGY NW, N, NE, E, SE	0 - 10	-	.31	.61
	11 - 20	-	.35	.63
	21 - 30	.35	.40	.65
	31 - 40	.40	.46	.67
	41 - 50	.46	.51	.69
	51 - 60	.46	-	.71
	61 - 70	.40	-	.73
	71 - 80	.35	-	.76
HIGH ENERGY W, SW, S	0 - 10	-	.26	.51
	11 - 20	-	.29	.53
	21 - 30	.29	.34	.54
	31 - 40	.34	.38	.56
	41 - 50	.38	.43	.58
	51 - 60	.38	-	.60
	61 - 70	.34	-	.62
	71 - 80	.29	-	.63
BASIN AVERAGE	0 - 10	-	.29	.57
	11 - 20	-	.33	.59
	21 - 30	.33	.38	.61
	31 - 40	.38	.43	.63
	41 - 50	.43	.48	.65
	51 - 60	.43	-	.67
	61 - 70	.38	-	.69
	71 - 80	.38	-	.71

Predicted Peak Flow Increases (% per CCE)

MID-ELEVATION 3500-4500

ASPECT	SLOPE	CABLE	TRACTOR	ROADS
	0 - 10	-	.31	.62
LOW	11 - 20	-	.36	.64
ENERGY	21 - 30	.36	.41	.66
	31 - 40	.41	.47	.68
NW, N, NE,	41 - 50	.47	.52	.70
E, SE	51 - 60	.47	-	.72
	61 - 70	.41	-	.75
	71 - 80	.36	-	.77
	0 - 10	-	.28	.56
HIGH	11 - 20	-	.33	.58
ENERGY	21 - 30	.33	.38	.60
	31 - 40	.38	.42	.62
W, SW, S	41 - 50	.42	.47	.64
	51 - 60	.42	-	.66
	61 - 70	.38	-	.68
	71 - 80	.33	-	.70
	0 - 10	-	.30	.60
BASIN	11 - 20	-	.35	.62
AVERAGE	21 - 30	.35	.40	.64
	31 - 40	.40	.45	.66
	41 - 50	.45	.50	.68
	51 - 60	.45	-	.70
	61 - 70	.40	-	.72
	71 - 80	.35	-	.74

HIGH ELEVATION > 4500

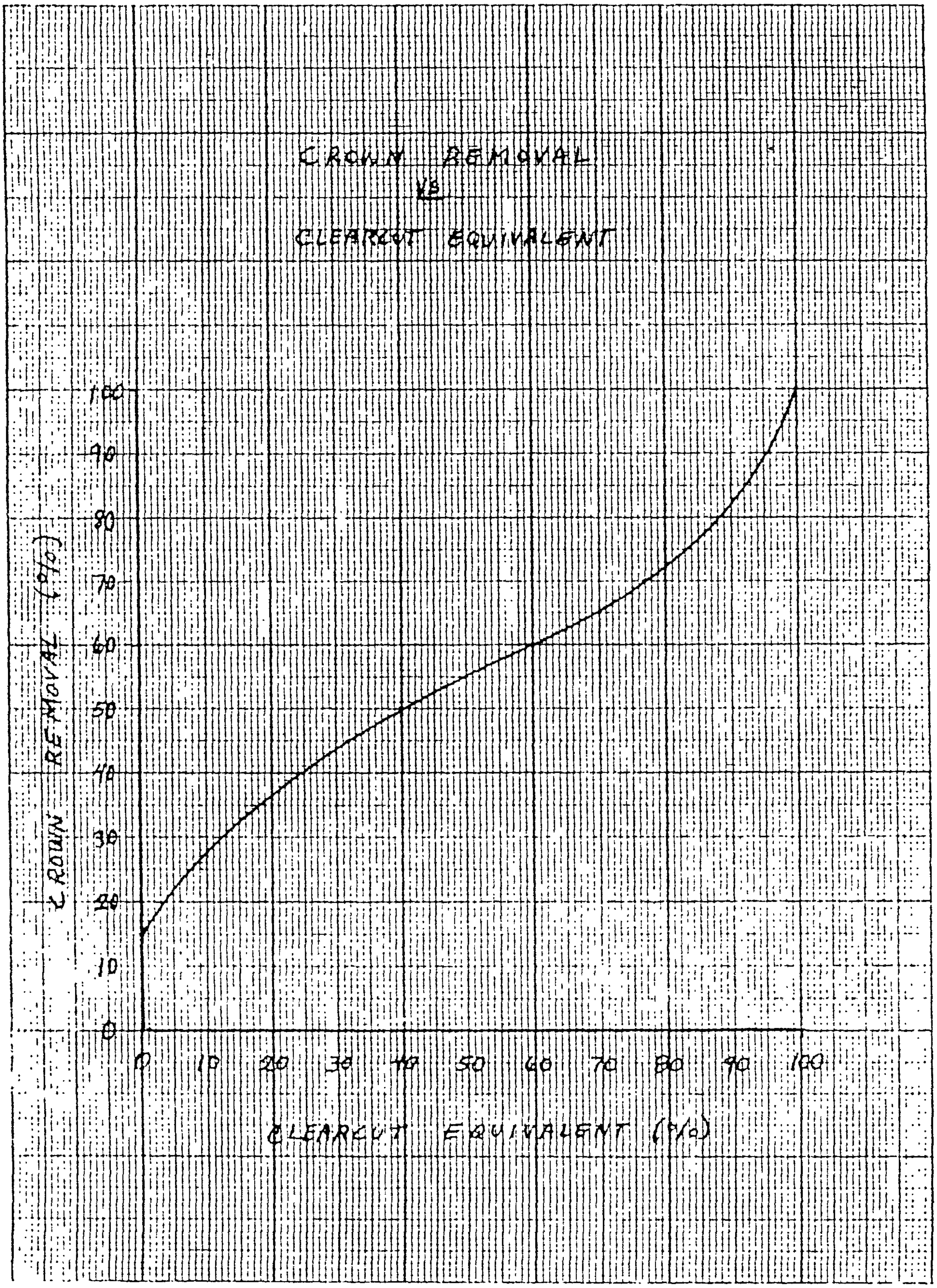
ASPECT	SLOPE	CABLE	TRACTOR	ROADS
	0 - 10	-	.30	.60
	11 - 20	-	.35	.62
ALL	21 - 30	.35	.40	.64
ASPECTS	31 - 40	.40	.45	.66
	41 - 50	.45	.50	.68
	51 - 60	.45	-	.70
	61 - 70	.40	-	.72
	71 - 80	.35	-	.74

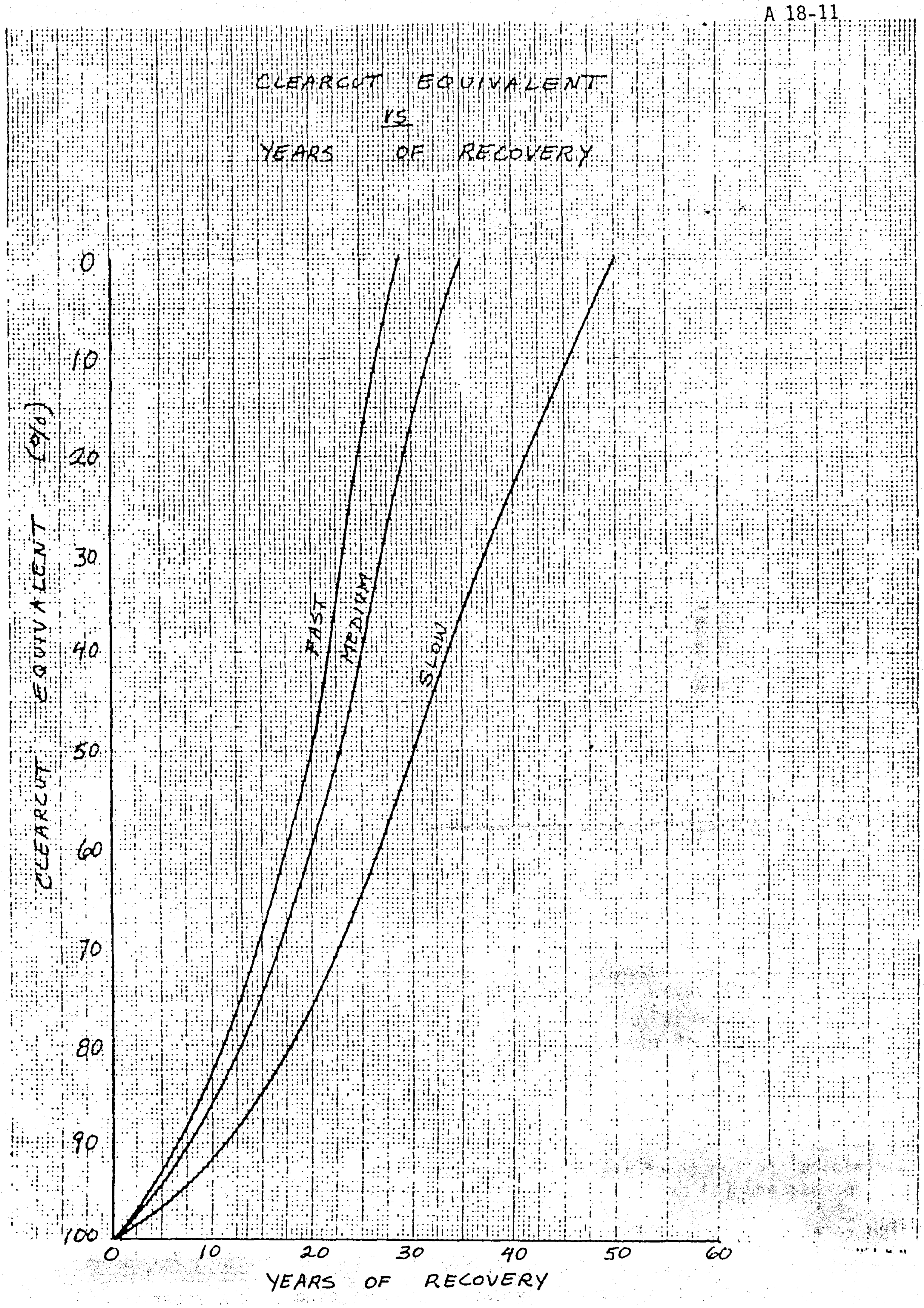
Appendix - Table 2

HYDROLOGIC RECOVERY CLASSES

FAST	MEDIUM	SLOW
WRC/Clun	GF/Xete	AF/Mete
WH/Clun	DF/Syal	MH/Mete
WH/Oplo	DF/Vaca	AF/Lugl
AF/Oplo	DF/Xete	MH/Xete
AF/Clun	DF/Arur	WRP/AF
GF/Clun	DF/Caru	AL/AF
S/Libo	AF/Vase	DF/Agsp
DF/Libo	AF/Xete	PP/Putr
DF/Phma	AF/Vaca	PP/Agsp
	AF/Alsi	
	AF/Libo	

DEPARTMENT OF AGRICULTURE
FOREST SERVICE




CLEARCUT EQUIVALENT
VS
YEARS OF RECOVERY
CLEARCUT EQUIVALENT (%)
0
10
20
30
40
50
60
70
80
90
100
0
10
20
30
40
50
60
YEARS OF RECOVERY
FAST
MEDIUM
SLOW

United States Department of Agriculture Forest Service SO

Reply to: 2520 Watershed Protection and Management Date: March 5, 1982

Subject: Hydrologic Recommendations for Timber Harvest

To: District Rangers

Several times in the past few months we have been asked to provide hydrology-specific guidelines for timber harvest. In effect, we were being asked to delineate the aspects, elevations, and harvest patterns which would result in the smallest water yield increase while still allowing harvest in critical areas.

With this as our intention, we collected research information and generated the following writeup. We feel the document would be valuable to all Districts and thus provide the following.

The goal of minimizing the water yield increase impacts while harvesting timber involves the following objectives:

1. Limit increases in spring peak runoff volumes to the capability of stream channels to safely handle this increase, based on channel condition and stability;

2. Desynchronize snowmelt runoff from the components of a watershed by maximizing the natural diversity in the quantity and timing of snowpack accumulations and melt.

Following these objectives will at the same time result in:

1. Broadening the base of the spring flood hydrograph to reduce peak spring flows and possibly increase late summer flows.

2. Maintenance of stream channel stability.

3. Holding sedimentation to a minimum.

The amount of snowmelt runoff depends largely on the amount of water in the snowpack, the rate of snowmelt, and the capacity of the soil to absorb and store water (Packer, 1962). Snowmelt runoff losses are integrated values of transmission, evaporation, and ground losses, and are largely a function of the length of time of the snowmelt period. On the basis of these factors, investigators primarily interested in minimizing increases in water yield state that this may be achieved by (a) maximizing the diversity of snowmelt; (b) reducing snowmelt rates; (c) maximizing the length of the snowmelt period; (d) maximizing the length of water flow paths; and (e) maintaining high use of water by vegetation (Anderson, 1966).

High rates of water use by vegetation may be maintained by favoring timber harvest methods that produce the least increase in water yield, e.g., partial cutting or, in this case, by leaving healthy nonsusceptible stands. Length of water flow paths may be maximized by restricting logging to the upper portions of slopes, strip cutting on contours, and maintaining high soil infiltration rates and deep seepage of water. Management practices to change the length of the snowmelt period and snwomelt rates will vary on different parts of the watershed in order to maximize the diversity of snowmelt.

Maximizing the diversity of snowmelt and desynchronizing snowmelt runoff from parts of the watershed may be attained by the following management practices listed by aspects (energy slopes) and elevations:

<u>High Energy Slopes</u> - S, SW, SE, W

<u>Objectives</u>

1. Reduce maximum snow accumulation.

2. Advance time of initiation of melt.

3. Lengthen snowmelt period.

A. <u>Low-Intermediate Elevations</u> - 5000 feet

Cut moderate sized patches, 4 to 20 acres, or use heavy partial cuts (shelterwoods). A heavy seed tree cut leaving 20 percent of the stand would create the most rapid melt. Minimize shading to the south by providing a high view factor (the ratio of opening diameter to tree height) on SE, S, and SW perimeter of opening. This will include removing tall trees on the southern perimeter to permit more direct radiation into the opening and the leaving of trees on the N and NE perimeter to increase back radiation into the opening. South facing clearcuts located below the watershed mid-elevation can be considered as yielding their flows before the peak runoff period.

Sites where soil moisture and soil temperatures may become limiting for tree reestablishment with minimization of shading will need special treatment. Some shading will be beneficial on these sites for reducing water losses and soil tempertures.

B. <u>High Elevations</u> - >5000 feet

Similar to lower elevations except that opening may be larger here (up to 40 acres). Wide cuts should be avoided since the snow will be deeper and melt slower than narrow cuts.

<u>Low Energy Slopes</u> - N, NW, NE, E

<u>Objectives</u>

1. Delay or maintain time of initiation of melt.

2. Minimize increases in water yield.

3. Maintain low snowmelt rate during spring. (Even though the rate in surrounding forest will be less.)

4. Lengthen snowmelt period.

At all elevations, clearcut strips will be oriented parallel to contours and ideally would have wide leave-areas between cuttings. The steeper the slope, the wider the strip may be.

A. Low Elevations - <3500 feet

Selectively log small groups, ideally only up to 2A in size, with low view factor to SE, S, SW. Leave all trees, with dense crowns on SE, S, and SW perimeter to gain maximum shade and reduce direct radiation. A somewhat dense strip of dead or dying LPP will still be at least partially effective here. Remove tall trees on N and NE perimeter to reduce back radiation. This type of cutting will retard early melt, reduce melt rates and lengthen the snowmelt period.

B. Intermediate - 3500 to 5000 feet

Favor single tree or group selection cuttings to reduce density to around 45 to 50 percent. Clearcuts should be in small patches or very narrow strips 1 to 5 acres in size, designed to maximize snow accumulation and delay melt.

C. High Elevations - >5000 feet

Cutting units which occur in this high elevation, north aspect zone can be evaluated as contributing most of its increase after the peak discharge of the watershed.

Harvest patterns should be similar to the intermediate elevations but more acres can be harvested.

In summary, low elevation south aspect and high elevation north aspect harvests produce the smallest increase in peak flows. If the suggested harvest patterns are (or can be) followed, peak flows increases and the threat of channel damage can be minimized.

In theory, if the normal discharges from very small tributaries (first, second, and third order) to main channels (fourth and fifth order) can be disrupted using cutting strategies discussed above, the effect would be to broaden the base of the stream hydrograph in both directions from the period of peak flow, with no aggravation and possibly a reduction in peak discharge. This would result, at the same time, in perhaps increasing late summer flows, in safe-guarding the integrity of stream channels, and in holding sedimentation and other damages to water quality to a practical minimum.

Existing and planned transportation systems; timber types, conditions, and valves; and fire and disease potential will, of course, be involved in the sale area layout. Nevertheless, we hope these guidelines assist you with future sale planning.

LARRY H. MESHEW
Hydrologist

STEVEN R. JOHNSON
Hydrologist

Enclosure

cc: Johnson
Meshew

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APPENDIX NINETEEN

CULTURAL RESOURCES

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CULTURAL RESOURCES

The Forest will undertake a systematic program of cultural resource inventory, evaluation, and preservation aimed at the enhancement and protection of significant cultural resource values. Integration of culutral resource management concerns into the overall Forest multiple resource management effort will be emphasized, as will coordination with the public, the scientific community, and appropriate Native American groups. Standards of fieldwork, data recovery, mitigation, analysis, and personnel qualifications will reflect the most current federal guidelines, laws, and Forest Service policy direction. Implementaion of the following management prodedures will achieve this objective.

Management Procedures

a. Preservation

Cultural resource sites determined as significant under the criteria established by 36CFR800 will be preserved in place whenever possible. When such resources are threatened by another resource activity or project development, an effort to avoid or minimize adverse impact by project redesign will be made. When avoidance of an evaluated, significant cultural property or site is judged to be not prudent or feasible by the Forest Supervisor, the scientific or historic values of the site will be conserved through proper scientific excavation, recordation, analysis, and reporting.

b. Inventory

The Forest will continue to undertake cultural resource inventory surveys on all new "undertakings" as defined in 36CFR800.2, employing qualified cultural resource specialists, paraprofessionals, consultants, or researchers. The inventory will result in a formal Cultural Resource Inventory Report or documentation of former inventory submitted to the Montana State Historic Preservation Office for comments. Ongoing undertakings that had not previously been inventoried will be prioritized for inventory. For large projects, such as timber sales, a subjective sampling strategy will be used as generally outlined in the Kootenai National Forest Cultural Resource Inventory Methodology. This survey strategy will be updated to integrate new information as needed and when feasible they will be tested for it's accuracy. The Forest will seek SHPO concurrence on their survey strategy, working towards a formal Memorandum of Agreement. Each project will be given an individualized survey design as determined by the responsible specialist. Small projects such as recreation sites, and small mineral exploration sites will require survey of the entire project area. Forest inventory efforts will focus on three areas:

1. Areas where formal archaeological surveys will provide management data that are broadly applicable to ecologically similar areas and which will facilitate the development of predictive models capable of addressing issues of cultural site density, distribution, and significance

2. Areas where systematic sample surveys will provide data to test the accuracy of the Kootenai National Forest Cultural Resource Inventory Methodology.

3. Areas where specific project activities such as timber sales, road developments, range improvements, or projects administered under contract result in significant ground disturbance.

Large-scale inventory projects such as those required for surface mines, oil fields, and cost-share projects greatly exceed Forest in-Service survey capabilities and will be recommended for contracting by private consultants operating under special use permits. Consultants, universities, or museums conducting privately-sponsored, project-specific cultural resource inventories must coordinate all such activities with the appropriate District Ranger and cultural resource specialist, and they are required to meet all current federal data recovery standards and qualifications. The Forest will ensure the level of performance required through permit administration, report review, field compliance inspections, and the preparation of scope-of-work documents for more complex reconnaissance or mitigation projects. Such projects will be coordinated with the State Historic Preservation Office and the Advisory Council on Historic Preservation.

The Forest will encourage scientific research by privately-funded universities as a means of acquiring additional inventory and interpretive data. The Forest will manage cultural site locational information by means of a cultural resource site map, an historic site probability map, and a site lead file at each Ranger District. District Rangers will ensure that their respective District cultural resource files are kept current. A master cultural resource atlas and site file which sythesizes all District site locational information will be maintained at the Forest Supervisor's Office. Cultural resource site information is exempt from disclosure under the Freedom of Information Act. Site locational data may be released on a need-to-know basis to consultants, univerisities or museums holding a current special use permit for research or consulting work on the Kootenai Forest. All other disclosures of cultural site locational information require written approval of the Forest Supervisor.

c. Monitoring

Program monitoring requires the identification of mechanisms with which to evaluate achievement of stated standards.

Standard	Evaluation Mechanism	Frequency of Evaluation
Survey/Inventory of all new undertakings	Review by Archaeologist and District Personnel.	Annual
Inventory 100% of high and medium probability areas and 10% of low probability areas.	Review of project report by Forest Archaeologist, Staff Officer, and SHPO.	Per project
Adequate training and supervision of paraprofessionals.	Review by Forest Archaeologist	Ongoing
Monitoring of projects during or after project impacts as recommended in individual project reports.	Review by Forest Archaeologist and District Ranger.	Per project
Monitoring of signifisites as recommended in individual project reports.	Review by Forest Archaeologist and District Ranger.	Per project.

d. Evaluation

Discovered cultural resources will be evaluated in relation to published Advisory Council on Historic Preservation (ACHP) criteria for eligibility to the National Register of Historic Places. The Forest will seek a concensus determination of eligibility with the Montana State Historic Preservation Office on all sites recorded from 1986 forward and will address the backlog of unevaluated sites on a priority basis. Cultural resource sites determined eligible will be nominated to the National Register on an opportunity and priority basis.

e. Integration

The Forest will effectively integrate cultural resource management into the overall, multiple-use planning process. This will be accomplished by the preparation of a detailed Forest prehistoric and historic overview. Significant cultural resource sites will require individual cultural resource management plans to be developed on a priority and opportunity basis. Furthermore program integration will be achieved by providing on-going cultural resource training opportunities for Forest personnel.

f. Site Stabalization and Enhancement

The Forest will develop a prioritized list of sites to be stabalized and will implement stabalization as the opportunity arises.

The Forest will enhance and interpret significant cultural sites for the education and enjoyment of the public when such development will not degrade the cultural property or conflict with other resource considerations. Interpretation and enhancement of significant cultural resources may include but are not necessarily restricted to the following items or activities:

1. Scientifically and historically accurate District displays.

2. Scientifically and historically accurate brochures, posters, interpretive signs, lectures, or self-guided tours.

3. Encouragement of scientific or historical research on the Forest and the distribution of the resulting reports, monographs, or books to the interested public. Archaeologists and historians conducting research on the Forest will be encouraged to present lectures, slide shows or films for the education and enjoyment of the public.

   Sites recommended for enhancement will be prioritized accordingly.

g. Protection

Known significant cultural resource sites on the Forest will be protected from inadvertent or intentional damage or destruction. Proactive measures may include: 1) physical on-site measures such as fences or gates, 2) posting of antiquities-law warning signs, 3) portection of site location information, 4) systematic monitoring of site condition, 5) public education, and 6) such law enforcement measures as patrolling and investigation of antiquities violations. Site protective measures will be employed only where their presence will not degrade a significant cultural property, and such measures will require Forest Supervisor approval prior to implementation.

h. Coordination

The Forest will make an effort to coordinate cultural resource issues and concerns with members of the public, the archaeological and historic interest communities, and with appropriate Native American groups. The Kootenai Forest is adjacent to or lies within the former range of the Kootenai Native American tribal group. Some issues of direct interest to these groups concern burial or interment sites, areas of sacred or ceremonial significance, confidentiality of site information, the disposition of Native American artifacts, and accuracy of portrayls of Native Americans in displays or at interpretive sites. In addition to aboriginal or prehistoric burial sites, many marked and unmarked historic graves are known to exist on the Kootenai Forest.

Accidental disturbance of Native American or historic graves through road development, timber harvest, range improvements, or other ground-disturbing projects is of concern to Native Americans, the public, and the Forest. Forest policy in such instances will include the following actions:

1. Evaluation by a Forest Archaeologist will be made immediately to determine if the skeletal remains are human and to what time period or ethnic group they may be related.

2. Reinterment in-place and avoidance of further disturbance by project redesign will be considered, in consultation with the associated living Native American tribal group.

3. In cases where cultural affiliations with a living Native American tribal group can be reliably ascribed and where reinterment in-place is not prudent or feasible, the appropriate tribal group will be contacted regarding proper reinterment elsewhere.

4. Human skeletal remains which cannot be accurately connected with a living Native American or historic group and where reinterment is not feasible, will be scientifically excavated, analyzed, and permanently stored at an approved curational facility.

The Forest will take into consideration in its multiple-use management process sites which are former or current ceremonial or religious sites, or sites of sacred significance to Native Americans in accordance with Regional and Forest policy. The Forest will meet the requirements of the American Indian Religious Freedom Act.

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APPENDIX TWENTY

SNOW COURSES

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SOIL CONSERVATION SERVICE SNOWCOURSES

Snowcourse Name	Ranger District	Management Area No.
Red Mountain	1	18
Hawkins Lake	2	2
Davis Creek	2	2
Garver Creek	2	14
Newton Mountain	2	2
Red Top	2	14
Friday Hill	2	14
4th of July Creek	2	15
Stahl Peak	3	8
Grave Creek	3	12
Weasel Divide	3	13
Keeler Creek	4	12
Cedar Grove	5	14
Poorman Creek	5	2
Bald Eagle Peak	5	7
Baree Creek	5	7
Baree Trail	6	2
Baree Midway	6	Private Land
Bristow Creek	6	11
Lost Soul	6	18
Banfield Mountain	6	12
Brush Creek	6	2
none existing	7	n/a

For further details refer to the 2560 casefolder for the existing Memorandum of Agreement.