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In Reply Refer To:
7240 (RS-140) P

Information Bulletin No. RS-99-123

To: State Director, Arizona, Colorado, Nevada, New Mexico, Utah, Wyoming
Attn: Salinity Control Coordinators

From: Director, National Applied Resource Sciences Center

Subject: Estimating Salinity Retention and Cost Effectiveness for Reporting to the Colorado River Basin Salinity Control Forum

The purpose of this IB is to provide guidance on making numerical estimates of salinity retention and cost effectiveness (dollars per ton of salt retained) associated with BLM management actions in the Colorado River Basin. These numerical estimates are requested each year by the Colorado River Basin Salinity Control Forum (Forum) in order to track progress toward meeting the Forum's salt reduction goals. The Forum's goal is to reduce the salt load of the Colorado River by 1,477,000 tons per year by 2015. BLM's allocation is 89,000 tons per year by 2015. In order to achieve that goal, BLM must achieve an annual average retention of 3,000 tons. Table 1 shows BLM's reported salt retention for the 3-year period of 1996-1998. Note that Table 1 shows a current deficit of about 3,000 tons.

TABLE 1. CUMULATIVE SALT RETAINED, ROUNDED TO NEAREST 10 TONS

	1995	1996	1997	1998	1999
SALT SAVED		1,610	2,000	2,330	
TARGET[1]		3,000	3,000	3,000	3,000
NET		(1,390)	(2,390)	(3,060)	
CUMULATIVE	33,400	35,010	37,010	39,340	

1. FORUM TARGET OF 3,000 TONS/YEAR

The current deficit is thought to be due to under reporting rather than a reflection of BLM's inability to meet the annual target. A major purpose of this IB is to provide information that will allow States to fully report salt retention.

Previous guidance on the subject was contained in IM RS-96-003. This IB expands the previous guidance based on discussions held at the BLM Salinity Coordinators meeting in February 1999 and the Interagency Technical Policy Coordination Committee Meeting in March 1999. The methods presented in this guidance provide estimates of salt retention and cost effectiveness that are consistent with procedures used by United States Department of Agriculture (USDA) and Bureau of Reclamation (BOR). The uncertainties associated with the estimated values have not been quantified. With respect to estimates of salt retained from nonpoint sources, these uncertainties may be very large.

If you have any questions, please contact Bill Carey at 303-236-0103.

1 Attachment
1 - Assumptions and Guidelines for Salt Retention Estimates (6 pp)

Distribution
WO-200, MIB, Rm 5650
RS-150A, BLM Library
NI-100, Reading File
RS-140:BC:lap:8-30-99:6x0103:h:\l30porte\bc\retenti2.ib

ASSUMPTIONS AND GUIDELINES FOR SALT RETENTION ESTIMATES

ASSUMPTIONS

A-1. Any BLM field action which can partially or fully prevent the movement of dissolved solids from a saline area will reduce salt movement towards the Colorado River system.

A-2. A ton of salt retained is of equal value anywhere in the Colorado River Basin. It is not the responsibility of the BLM to translate on-site salt retention into salt load or concentration reductions in the Colorado River. It is the responsibility of the BOR to evaluate where the salt load or concentration reductions occur and what delivery correction factors need to be applied. If needed, BLM will provide additional site-specific information to BOR to make necessary delivery adjustments.

A-3. Salt retention calculations from BLM field actions are best estimated by the resources management and operations/engineering personnel closely involved with the project. These are professional estimates and as such, are always subject to revision based upon updated soils, geology or engineering information, land tenure, or resource management objectives.

A-4. The uncertainties associated with the estimated values have not been quantified. With respect to estimates of salt retention from nonpoint sources, these uncertainties may be very large.

GUIDELINES

The guidelines presented in this section are a result of discussions from the BLM Salinity Coordinators meeting in February 1999 and the Interagency Technical Policy Coordination Committee Meeting in March 1999.

G-1. Hierarchy of Sources and Methods for Nonpoint Sources:

The following sources and methods should be used to estimate salt retention resulting from BLM nonpoint source management actions. They are arranged in increasing order of rigor. No attempt has been made to estimate the uncertainties associated with these sources and methods.

1. In lieu of any other information, select values from the ranges given in G-2 based on local conditions and professional judgement.

2. Use published data from other agencies (i.e., USDA) or BLM studies (i.e., Bentley et al., 1978).

3. For project level analysis use:

a. The procedures shown in Bentley et al., 1978, or
b. The Pacific Southwest Inter-Agency Committee (PIASC) method for estimating sediment yield. NARSC can provide information on the PIASC method, or

4. Any other appropriate method of computing or modeling runoff and sediment delivery. A published reference for the method or model should be provided.

G-2. Salt Yield of Saline Watersheds Without Management and With Active Management:

The average annual sediment yield of unmanaged Colorado Plateau saline landscapes ranges from 1 to 18 tons per acre. On such soils, salt yield can be from 0.02 tons/acre/year on the flatter more sandy soils, to as high as 1-2 tons/acre/year on the steepest, strongly dissected badland topography in which fresh unleached subsoil is being constantly exposed.

However, with management, by means of improved plant cover and through wise management of surface disturbance of marine-derived soils, salt retention from 0.003 to 0.06 tons/acre/year is possible. Resources staff can refine estimates based on local surface water records, agricultural statistics, or county extension advice.

G-3. Allocating Salt Retention During Project Implementation:

Where a salt retaining action (project) requires N years to take full effect, assume 1/Nth of the total salt retention is achieved each year. For example, assume a project is implemented over a 10-year period and will prevent 1,000 tons/year of salt from moving off site at full implementation. The 1,000 tons of salt retained at full implementation should be credited as 100 tons/year during the 10-year implementation period. NOTE: Individual States will not have to make these allocation calculations. These calculations will be done at NARSC using data provided by the States.

G-4. Computations for Point Sources:

For estimating the salt retained from closing off flowing saline wells or any point source controls, the gallons per day flow multiplied by the total dissolved solids concentration of the water in milligrams per liter, all divided by 656,093, will give the tons of salt retained per year.

Attachment 1-2

References

Bentley, R.G.Jr., Eggleston, K.O., Price, D., Frandsen, E.R., and Dickerman, A.R., 1978, The effects of surface disturbance (primarily livestock use) on the salinity of public lands in the upper Colorado River Basin -- 1977 Status Report: U.S. Department of the Interior, Bureau of Land Management, Report No. BLM/YA/TR-78/01, 208 p.

CONSIDERATIONS FOR INDIVIDUAL PROGRAMS

Range and Wildlife Management Effects on Diffuse Sources of Salt Yield:

Most range and wildlife projects, in part, support the goals of improving watershed conditions, reducing accelerated erosion, and keeping water on site for plant growth. Improvements to plant cover, whether enhanced by a change in scheduling of grazing use, rangeland mechanical treatment, or livestock redistribution by water development, generally improve soil infiltration and reduce runoff and soil loss. On saline soils, these actions also reduce the amount of dissolved solids (salt) from moving off site.

Recreation Management/Operations:

Improved distribution and management of Off-Road Vehicle use (such as stream crossing improvements, culvert installations, partial area closures, and keeping use away from existing watershed improvements or seedings) can potentially reduce pickup and transport of salts.

Oil and Gas Operations and Compliance:

The potential migration of salts off site or into ground water systems can be reduced as a result of the effective control of produced water, proper reserve pit construction/abandonment practices (vulnerable area protection), corrective measures on flowing/abandoned wells, and upgraded road construction, maintenance standards, and implementation (including road removal and rehabilitation).

COST EFFECTIVENESS ESTIMATION

Cost effectiveness computations will be done at NARSC using data provided by the States. The following method for computing cost effectiveness is consistent with USDA and BOR. Cost effectiveness is estimated by;

$$CE = \left(\frac{P}{S}\right)\left(\frac{I}{1-(I+1)^{-N}}\right)$$

where CE is the estimated cost effectiveness in dollars per ton,
P is the estimated project cost in dollars,
I is the interest rate = 0.08,
N is the estimated useful life of the project, starting with the first year that the project reaches full implementation, and
S is the estimated annual salt retention in tons when the project is fully implemented.

This is the most basic form of the computation. Adjustments can be made for operation, maintenance, and replacement costs, but these are not always applicable to BLM projects. If a given project has these types of costs, then they should be reported, and NARSC will factor them into the cost effectiveness estimate.

BLM should strive to keep cost effectiveness below $50/ton. The attached graph can be used to screen projects for cost effectiveness. If the point determined by the project cost and the salt retained lies above the appropriate useful life line, then the cost effectiveness is less than $50/ton. If the point is below the line, then the cost effectiveness is greater than $50/ton. Projects with useful life times greater than 30 years should use the 30-year line. Projects with cost effectiveness in excess of $50/ton should reexamine their salt retention estimate and project cost. If only a portion of the project cost is responsible for salt retention, then only that portion should be reported.

REPORTING REQUIREMENTS

The following information is the minimum necessary for NARSC to prepare an annual numerical report of accomplishments for the Forum. Short narrative statements are also needed so that NARSC can prepare narrative text reports and oral reports.

NONPOINT SOURCE PROJECTS

1. State
2. Project name
3. Field office
4. Type of project
5. Units treated (acres or miles for roads and trails)
6. Estimated salt retention at full implementation
7. Method used for salt retention estimate
   - Values from this IB
   - Published values, give reference
   - Runoff/sediment delivery calculation, name of method, reference
   - Runoff/sediment delivery model, name of method, reference
   - Other, brief description, reference
8. Begin year
9. Full implementation year
10. Useful life, starting at the year of full implementation
11. Project cost
12. Operation costs if applicable.
13. Maintenance costs if applicable
14. Replacement costs if applicable

POINT SOURCE PROJECTS

1. State
2. Project name
3. Field office
4. Type of point source (usually this will be a well)
5. Measured flow in gallons per day
6. Measured total dissolved solids concentration in mg/l
7. Estimated salt retention
8. Project year (assumes full implementation when project is completed)
9. Useful life
10. Project cost
11. Operation costs if applicable.
12. Maintenance costs if applicable
13. Replacement costs if applicable

Attachment 1-5