WATER QUALITY RULES AND REGULATIONS

Chapter 1

DRAFT

WYOMING SURFACE WATER QUALITY STANDARDS

Proposed Rules
1st Draft
(Public Notice Date)

exceeded. In all Class 2B, 2C and 2D waters, the human health values for "Fish Only" (consumption of aquatic organisms) shall not be exceeded.

In certain waters, the criteria listed in Appendix B of these regulations may not be appropriate due to unique physical or chemical conditions. In such cases, human health values may be determined by use of the site-specific procedures outlined in the references listed in Appendix E of these regulations.

Section 19. **Industrial Water Supply**. All Wyoming surface waters which have the natural water quality potential for use as an industrial water supply shall be maintained at a quality which allows continued use of such waters for industrial purposes.

Degradation of such waters shall not be of such an extent to cause a measurable increase in raw water treatment costs to the industrial user(s).

Unless otherwise demonstrated, all Wyoming surface waters have the natural water quality potential for use as an industrial water supply.

Section 20. **Agricultural Water Supply**. All Wyoming surface waters which have the natural water quality potential for use as an agricultural water supply shall be maintained at a quality which allows continued use of such waters for agricultural purposes.

Degradation of such waters shall not be of such an extent to cause a measurable decrease in crop or livestock production.

Unless otherwise demonstrated, all Wyoming surface waters have the natural water quality potential for use as an agricultural water supply.

The procedures used to implement this section are described in Appendix H, "Agricultural Use Protection."

Section 21. **Protection of Aquatic Life**.

(a) Ammonia.

(i) The toxicity of ammonia varies with pH and temperature and the applicable limitations are included in the charts in Appendix C of these regulations. The numeric ammonia criteria in Appendix C apply to all Class 1, 2A, 2B, 2AB and 2C waters.

(ii) In all Class 3 waters, concentrations of ammonia attributable to or influenced by human activities shall not be present in concentrations which could result in harmful acute or chronic effects to aquatic life, or which would not fully support existing and designated uses.

Appendix H

Agricultural Use Protection

(a) Purpose. All surface waters in Wyoming are protected to some extent for agricultural uses. "Agricultural uses" are described in Section 3 as being either stock watering or irrigation.

The purpose of this Appendix is to provide the criteria and procedures to be used by the Water Quality Division when translating the narrative goals expressed in the Section 20 standard into appropriate WYPDES permit limits where maintaining agricultural use of the receiving waters is an issue.

"Measurable Decrease". The first task in translating the standard is defining what is meant by *"measurable decrease in crop or livestock production"*. The phrase implies that there is a pre-existing agricultural use of a stream or drainage prior to an application for a WYPDES discharge permit. For livestock watering purposes, a pre-existing use will always be assumed. For irrigation purposes, there needs to be either a current irrigation structure or mechanism in place for diverting water from the stream channel, or a substantial acreage of naturally sub-irrigated pasture within a stream floodplain. Where neither of these conditions exist, there can be no irrigation use, nor loss in crop production attributable to water quality.

Where there are pre-existing agricultural uses, it may often be impossible to measure a loss in crops or livestock that can be attributed to water quality because of the many other factors that will affect actual production. It is also important to be able to predict the probability of a measurable decrease in production rather than relying solely on after-the-fact measurements. Therefore, the implementation of the narrative criteria through WYPDES permits will always involve making reasonable judgments and assumptions.

Effluent limits ~~on~~ in discharge~~s~~ permits ~~that began~~issued prior to January 1, 1998 will not be affected by this Appendix in relation to the protection of agricultural uses. Such permits may be modified or renewed and still receive the same permit limits and conditions. Where discharges have been occurring prior to ~~that date~~January 1, 1998, it will be assumed that the ~~discharge has had no adverse effect on~~ permit limits have been protective of agricultural production. Therefore, it is not necessary to modify those ~~discharges~~ permit limits in order to achieve the goal of "no measurable decrease" in crop or livestock production. ~~It would only be necessary to maintain the existing quality of the discharge.~~ New discharges to these drainages will receive the same effluent limitations and conditions as the pre January 1, 1998 permits. It is important to note~~, however,~~ that more stringent effluent limits ~~on historic discharges~~ and/or permit conditions may be ~~made~~ added to permits where the quality of the discharge(s) is shown to constitute a threat to any other designated uses described in ~~Chapter 1 of the Wyoming Water Quality Rules and Regulations~~these regulations.

(b) Livestock Watering. The following limits apply to discharges that will be used for livestock watering. Each limit must be achieved at the end-of-pipe prior to mixing with the receiving stream:

5,000 mg/L TDS;
3,000 mg/L Sulfate;
2,000 mg/L Chloride

An exception to the limits above may be made whenever the background water quality of the receiving water is of poorer quality than that listed or when the livestock producer requests use of the water and thereby accepts any potential risk to his livestock. Waivers provided to livestock producers must be approved by all potentially affected livestock producers and landowners.

In addition to the basic effluent limitations above, the Agricultural Use Protection Policy includes additional limits for livestock protection which may be incorporated into WYPDES permits when there is reason to believe they may be associated with a discharge.

(c) Irrigation. Electrical conductivity (EC) and sodium adsorption ratio (SAR) limits will be derived in permits where effluent discharges may reach irrigated lands.

(i) For the purposes of this rule, irrigated lands include the following:

(A) "Artificially Irrigated Lands" means the artificially irrigated lands where water is intentionally applied for agricultural purposes. Artificially irrigated lands will be identified by the presence of canals, ditches, spreader dikes, spray irrigation systems or any other constructed mechanism intended to divert water from a stream channel for application on adjacent lands.

(B) "Naturally Irrigated Lands" means lands along stream channels that have enhanced vegetative production due to periodic natural flooding or sub-irrigation. Naturally irrigated lands are those lands where a stream channel ~~is underlain by unconsolidated material and on which the combination of stream flow and channel geometry~~ provides for enhanced productivity of plants used for agricultural purposes. Naturally irrigated lands may be identified by an evaluation of infra-red aerial imagery, surficial geologic maps, wetland mapping, landowner testimony, site-specific assessment, any combination of that information, or other types of evaluations.

(ii) Appropriate effluent limits for EC and SAR will be calculated and applied to WYPDES discharge permits in all instances where the produced water discharge may reach any artificially irrigated lands.

(iii) EC and SAR limits will be applied to WYPDES permits where the produced water discharge may reach stream segments containing single parcels of naturally

irrigated land greater than 20 acres in size or multiple parcels in near proximity that total more than 20 acres. In making this estimation, small drainage bottoms may be excluded from consideration. Two specific criteria which may be used to exclude lands include lack of a persistent active channel and unconsolidated floodplain deposits which are generally less than 50 feet in width.

(iv) If there are no pre–existing diversions or naturally irrigated lands within reach of a discharge, if the water will be impounded or managed so as not to reach a diversion or naturally irrigated lands during the irrigation season, or if the discharge will not reach an irrigated field, either because of natural conditions or water management techniques, then permit limits will be established to protect other relevant water uses (e.g. livestock watering, wildlife, aquatic life, etc.).

(v) Data and Information. A minimum amount of data must be collected to identify existing irrigation uses and to appropriately set effluent limits on discharges that may affect those uses. At a minimum, the following information must be obtained:

(A) Location(s) of irrigation diversions and/or naturally irrigated acreage;
(B) Crops grown under irrigation;
(C) Published tolerance values for the most sensitive crop;
(D) Season of use.

Additional information may be required of the applicant to ensure that appropriate effluent limits are set to protect the receiving water.

(vi) Establishing Effluent Limits. A 3-tiered decision making process will be used to establish appropriate effluent limits for EC and SAR whenever a proposed discharge will likely reach irrigated lands.

(A) Tier 1- Default EC and SAR Limits. Default limits for EC and SAR may be used where the quality of the discharge water is relatively good or the irrigated crops are salt-tolerant. The default values shall be based upon the published soil EC tolerance values for the most sensitive crop and shall be calculated as follows:

(I) Default EC limits will be based upon 100 percent yield threshold values for soil EC as reported by the USDA Agriculture Research Service (ARS) Salt Tolerance Database. In the event that the species of interest is not included in the ARS Salt Tolerant Database, then the following alternative references can be consulted:

(1.) Hanson et al. ~~1999~~2006. Agricultural Salinity and Drainage. DANR Pub. 3375, Univ. of Calif. Davis;

(2.) Ayers and Westcot. 1985. Water Quality for Agriculture. UN FAO Irrigation and Drainage Paper 29 (revised); and

(3.) CPHA. 2002. Western Fertilizer Handbook. 9th

Edition. Interstate Pub., Inc., Danville, IL.

(II) The relationship between soil EC values and irrigation water EC values will be: EC (soil) = 1.5 EC (water), i.e., the published soil EC threshold obtained from the appropriate reference will be divided by the soil concentration factor of 1.5 to establish the discharge EC limit.

However, in circumstances where the background water quality of the receiving water(s) is known to be significantly better than would otherwise be required based on a theoretical 100% yield, effluent limits may be set to maintain that higher quality.

(III) Default limits will be set to ensure the relationship between SAR and EC remains within the designated zone of "no reduction in rate of infiltration" as depicted in Figure 1 at the end of this appendix. The following equation will be used to determine the default SAR limit: SAR = (~~7.10~~6.67 x EC dS/m) – ~~2.48~~3.33. If the actual EC concentration of the discharge is observed to be of higher quality than the published default concentration then the SAR limit may be adjusted to actual EC concentrations depending on site specific conditions. When the calculated default SAR value exceeds 10, the limit will be set at 10 as the maximum default limit. The maximum default limit is only intended to apply to calculating Tier 1 limits and may be modified according to the provisions of Section (B) and Section (C) below.

(IV) At a minimum, the EC and SAR limits will apply during the irrigation season and when flows are sufficient to support the use. For sub-irrigated lands and passively irrigated lands such as those under spreader dike systems, EC and SAR limits will generally apply year-round.

(B) Tier 2 - Background Water Quality. If sufficient data is available to demonstrate or calculate that the pre-existing background water quality at the point(s) of diversion is worse than the effluent quality, EC and SAR effluent limits may be based upon those background conditions rather than tolerance values for the most sensitive crop. Where Tier 2 is used to determine EC and SAR limits, EC will be based on background water quality as described below, and SAR will be based on the equation: SAR = (6.67 x EC dS/m) – 3.33.

(I) Measured Data. Background water quality may be established based upon published pre-discharge historic data. Generally, this data only exists on larger, perennial, mainstem stream channels where historic gauging has taken place. Actual measured data is the most reliable means of establishing background and must be considered on those waters where it is available.

(II) Calculated Background. On intermittent and ephemeral stream channels, pre-discharge water quality data is usually scarce or non-existent and very difficult to collect. In these circumstances, background water quality can be estimated by conducting soil surveys on land that has been historically irrigated from the subject stream. The relationship between soil EC values and irrigation water EC values will be: EC (water) = EC (soil)/1.5.

In the event that soil studies are used as a means to estimate baseline water quality for a given drainage, the following requirements apply:

(1.) Sample Site Selection. Soil samples shall be taken at semi-random sites within each contiguous irrigated segment downstream of the proposed discharge. "Semi-random" in this case is intended to mean that the applicant will identify the various major distinguishing terrain zones within each irrigated segment and select sample sites randomly within each terrain zone. For example, the channel bottom may constitute one terrain zone, the first small terrace above the channel bottom may be another terrain zone, and the adjacent meadow or field may be a single remaining terrain zone, or that meadow / field may actually be comprised of several other known zones such as discharge-affected soils vs. non-affected soils, sub-irrigated reaches vs. non-sub-irrigated reaches, etc.

(2.) Number of Sample Sites. Listed below are the minimum number of soil sample sites required for each of the identified terrain zones (based on zone area) within a contiguous irrigated segment:

Zone Area	**Minimum Number of Sample Sites**
0 – 5 acres	**3**
5 - 10 acres	**5**
10 + acres	**7**

(3.) Sample Collection. Sample sites must be located a minimum of 50 feet apart from one another. Each sample site shall be sampled at a minimum of four depths (0-12", 13-24", 25-36", 37-48"). If alfalfa is present within the terrain zone, each sample site within that terrain zone must be sampled at a total of 6 depths (at the above-noted depths, plus 49-60" and 61-72"). Each twelve inch sample increment must be analyzed either individually or combined (composited) with other corresponding depth samples from the other sample sites within the same terrain zone (e.g., all 0-12" samples from a given terrain zone bulked together and analyzed as a single composite sample). Sample results from each of the depths will be averaged, in conjunction with a confidence interval calculation, and used to derive the permit effluent limit for EC.

(4.) Sample Analysis. At a minimum, a saturated paste extract for each sample shall be analyzed for EC. Though not necessary for the estimation of background water conductivity, it is advisable to also analyze the soil samples for pH, SAR, soil texture and exchangeable sodium percentage (ESP) to avoid having to duplicate the sampling if the results indicate that a "no harm analysis" *(Section (C) below)* needs to be completed. Percent organic matter shall be analyzed in the surface 0-12" samples only. In addition, analyses to identify the clay mineralogy types present in the soils may also be warranted.

(III) Soil Report Preparation. At a minimum the applicant shall

submit:

(1.) A map or diagram identifying where each of the soil sample sites is located. At a minimum, the map or diagram must show the basic topography and stream course, irrigation structures *(if present - such as spreader dams or head gates)*, estimated boundaries of the irrigated acreage, surface ownership of the irrigated acreage *(including downstream irrigated areas)* and section / township / range identification. This map must also show any delineated terrain zones, plus elevations of the terrain zones;

(2.) An accompanying location table which includes the quarter / quarter, section, township, range, and latitude / longitude for each sample site;

(3.) Summary data table showing the analytical results for each of the soil parameters listed above, for each depth, at each sample site;

(4.) All associated lab sheets.

(C) Tier 3 - No Harm Analysis. The actual effects of EC and SAR on crop production are variable based upon soil type and chemistry and may be mitigated to some extent by managing irrigation practices. EC and SAR effluent limits may also be established based upon a scientifically defensible site specific study that examines local soil characteristics, natural water quality, expected crop yield, irrigation practices and/or other relevant factors related to crop production.

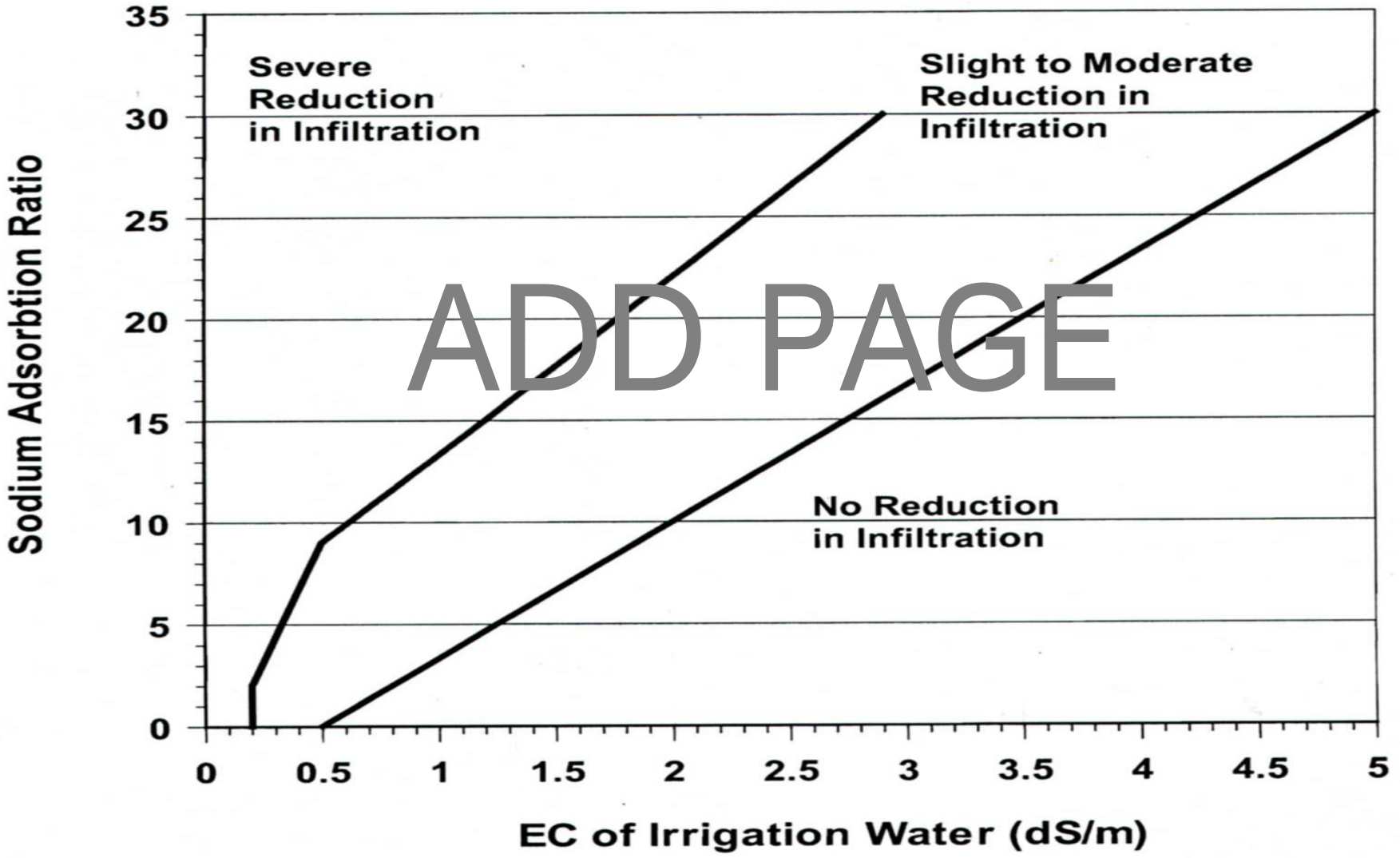
Because of the site-specific nature of this approach and the number and complexity of variables that may need to be considered, there is a burden of proof placed upon the applicant to demonstrate through a comprehensive study that levels of EC and/or SAR, higher than either the default values or estimated background water quality, would most likely not measurably harm an existing irrigation use. Refined limits for EC and SAR resulting from a "no harm" analysis should incorporate a reasonable margin of safety to account for variables that cannot be precisely measured or modeled.

(vii) Irrigation Waiver. An exception to EC or SAR limits established under the Tier 1, 2 or 3 procedures may be made when affected landowners request use of the water and thereby accept any potential risk to crop production on their lands. Irrigation waivers will only be granted in association with an irrigation management plan that provides reasonable assurance that the lower quality water will be confined to the targeted lands.

Reasonable Access Requirement. In circumstances where a landowner chooses to deny access for the purpose of developing a Section 20 analysis, EC and SAR limits will be based upon the best information that can be reasonably obtained for developing permit limits. This circumstance may involve utilizing alternate sampling locations where conditions are expected to be similar in nature to the inaccessible area.

Figure 1

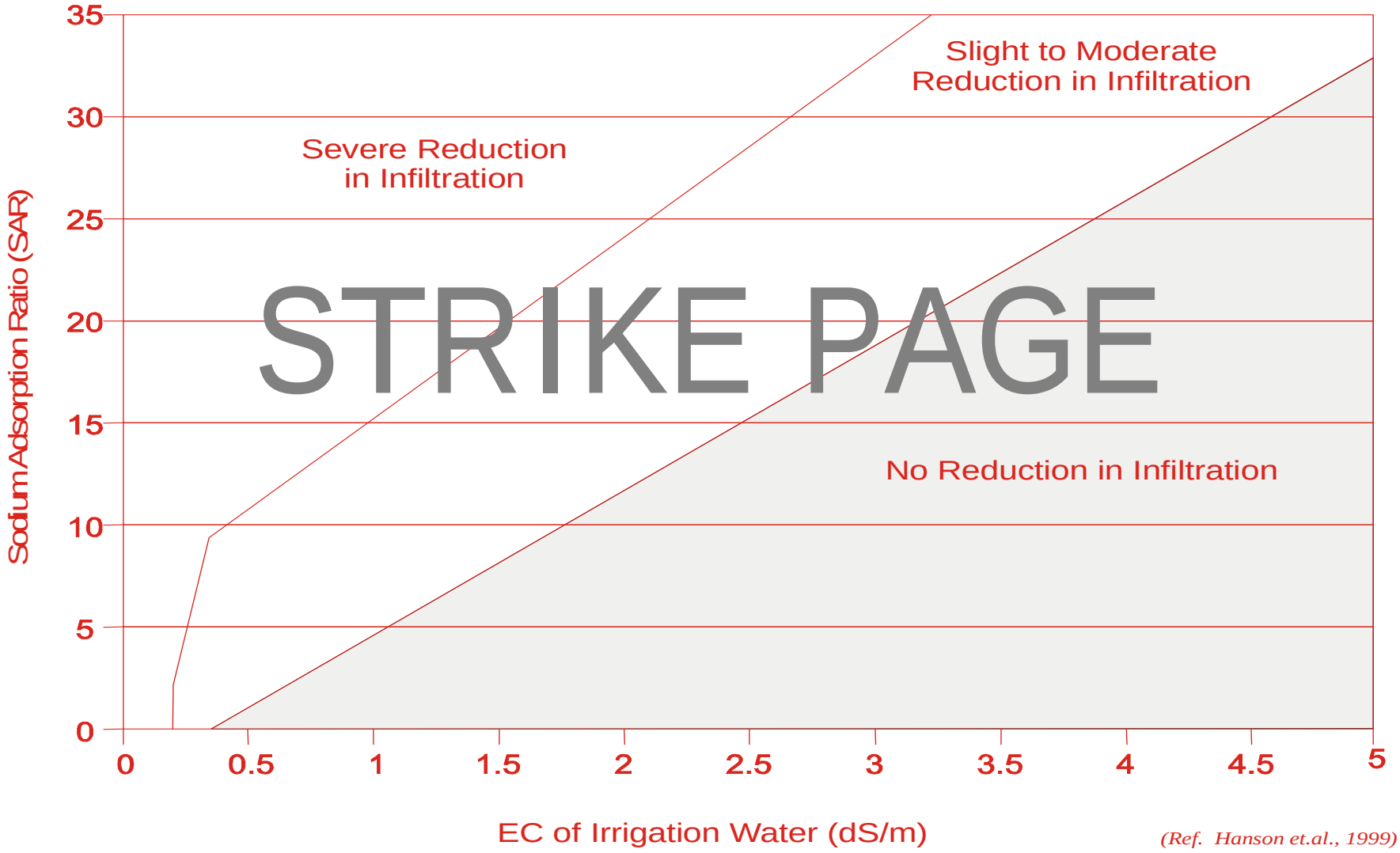
Hanson Chart



(Ref. Hanson et.al. 2006)

Figure 1

Hanson Chart



(Ref. Hanson et.al., 1999)