

The Major Range Problems and Their Solution

Résumé of a Report Prepared in Response to
Senate Resolution 289, Together With Letters
of Transmittal, Table of Contents, Etc.

From

“THE WESTERN RANGE, A GREAT
BUT NEGLECTED NATURAL
RESOURCE”

By

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LETTERS OF TRANSMITTAL

DEPARTMENT OF AGRICULTURE,
Washington, April 28, 1936.

THE PRESIDENT OF THE UNITED STATES SENATE.

SIR: In compliance with the request in Senate Resolution 289 (74th Cong., 2d sess.), introduced by Senator Norris, I have the honor to submit herewith a report on the range problem of the western United States prepared by the Forest Service of this Department.

The resolution reads:

Whereas large parts of the western range have been subject to unrestricted use since settlement and are commonly believed to be more or less seriously depleted; and

Whereas the range resource constitutes one of the major sources of wealth to the Nation; and

Whereas the Department of Agriculture has through many years of research and of administration of the national forests accumulated a large amount of information on the original and present condition of the range resource, the factors which have led to the present condition, and the social and economic importance of the range and its conservation to the West and to the entire United States: Therefore be it

Resolved, That the Secretary of Agriculture be, and hereby is, requested to transmit to the Senate at his earliest convenience a report incorporating this information, together with recommendations as to constructive measures.

In transmitting this report I shall resist the temptation, despite my great personal interest in the range question, to comment at length on its findings and recommendations, and instead merely emphasize three of the most important phases of the discussion.

1. The first of these is the astonishing degree to which the western range resource has been neglected, despite its magnitude and importance.

One indication of this neglect is the lack of public knowledge. The general public knows less of the range resource, and as a result has been and is less concerned about its condition and conservation than of any other of our important natural resources. This is true in spite of the fact that the range occupies about two-fifths of the total land area of the United States and three-fourths of that of the range country; that the range territory produces about 75 percent of the national output of wool and mohair, and in pounds about 55 percent of the sheep and lambs, and nearly one-third of the cattle and calves. In fact, this report represents the first attempt, although much of the range has been grazed for 50 years at least, to make an all-inclusive survey of the range resource, its original and present condition, the causes and effects of changes, the social and economic function which it does and should render to the West and to the Nation, and, finally, to outline practical solutions for at least the more important problems.

III

The entire history of public-land disposal under both Federal and State laws reflects this neglect. These laws have with few exceptions been framed and administered without regard to range conditions and requirements. The result is an ownership pattern so complex that satisfactory handling of the range is seriously handicapped. In this pattern is intermingled an enormous area that all of the available information indicates is submarginal for private ownership.

Further evidence of neglect is failure to regulate the use of range lands in such a way as to maintain the resource. This failure has been so general under all classes of ownership that in contrast examples of good management are decidedly conspicuous. The result is serious and practically universal range and soil depletion, which already has gone far toward the creation of a permanent desert over enormous areas. An even more serious result has been an appalling waste of the human resource. And three-fourths of the range area is still on the down grade.

The commonly accepted theory that private ownership in itself is enough of an incentive to insure the satisfactory handling of range lands has proved to be true only in the case of exceptional ranches.

State range lands have been leased without provision for the management of the resource or its perpetuation. Federal holdings are scattered among many bureaus in several departments. The national forests, which afford an example of large-scale range conservation, are administered by the Department of Agriculture. The grazing districts, which are only now being placed under administration after a half century or more of neglect, and the public domain, which is still subject to unrestricted use, fall under the Department of the Interior. These three classes of land make up the bulk of Federal holdings.

Neglect is further shown by the meager scale of research by both the Federal and State Governments. A reasonable program of research might have prevented many serious mistakes and maladjustments. Extension to carry research findings in better range practices to private owners has been practically nonexistent.

2. The second phase of the situation to which I wish to call attention is the fundamental character both of the range resource and of its use.

They have to do with land; with the production on that land of forage crops, with the utilization of the crops in livestock and, in a lesser degree, wildlife production; with the management of land and its forage cover to obtain watershed protection and the services needed primarily by agriculture for irrigation. Effectiveness in all of these things depends upon the biological and agricultural sciences. In short, they are a part, and in the West one of the most important parts, of agriculture.

Furthermore, through the free play of economic forces, range livestock production—once almost wholly an independent pastoral enterprise—and cropland agriculture have become closely integrated, inseparable parts of the agricultural structure of the West. Except for specialty farms, a high percentage of the hundreds of thousands of western farm or ranch units represent widely varying combinations of range and crop agriculture. More than one-third of the feed for range livestock now comes from croplands or irrigated pastures. Problems of one part have become problems of both. Major maladjustments in either—of which there are far too many—now inevitably

affect the other. No comprehensive program can be prepared for either which does not take the other definitely into account.

3. The third phase of the range situation to which I wish to call attention is a limited number of remedial measures of outstanding importance among the many that are required. The range problem as a whole has been allowed to drift for so long that its difficulties have been accentuated. It has become exceedingly broad and complex, beginning with the basic soil resource at the one extreme, and extending through a wide range of overlapping interrelated problems to human welfare at the other. No single measure offers hope of more than a partial solution.

One of the most important of the measures required is to place all range lands under management that will stop depletion and restore and thereafter maintain the resource in perpetuity, while at the same time permitting its use. This will involve many difficult operations such, for example, as drastic reductions of stock on overgrazed ranges. It will involve various forms of use such as livestock grazing, watershed services, wildlife production, etc., which should be so correlated as to obtain the maximum private and public benefits.

A second line of action involves the return to public ownership of lands so low in productivity, or so seriously devastated, or requiring such large expenditures to protect high public values, that private owners can hold them only at a loss. Closely related are a far-reaching series of adjustments in size of ownership units to make both private and public ownership feasible and effective, each in its proper sphere.

A third line of action is to put jurisdiction over publicly owned range lands on a sound basis. Unquestionably the only plan which can be defended is to concentrate responsibility for the administration of Federal lands in a single department to avoid unnecessary duplications, excessive expenditures, and fundamental differences in policies, and to obtain the highest efficiency in administration and the maximum of service to users. Since the administration of the range resource and its use is agriculture, and since the administration of federally owned ranges can and should be used as an affirmative means in the rehabilitation of western agriculture, the grazing districts and the public domain should be transferred to the Department of Agriculture.

Furthermore, the concentration of jurisdiction over federally owned range lands is a vitally important step toward the concentration in a single department of the still more inclusive functions, including aid and services to private owners of range lands, which should be exercised by the Federal Government on the entire range problem. Such a concentration is a fundamental principle of good organization if the Federal Government is to redeem its full responsibility in the restoration and care of this much-neglected resource.

The States have similar jurisdictional problems which demand attention.

A fourth measure which should be emphasized is the wide scope of research necessary to put range use for all purposes on a sound footing. Closely related is extension, which will carry the information obtained to the private owner and help him constructively in its application.

With these and other recommendations of the Forest Service, I am in general accord, and I hope that in carrying them out there need not be too serious a delay, since further delay will merely serve to accentuate difficulties and increase costs.

The solution of the range problem can be made an important contribution to the conservation of our natural resources. It can be made an important contribution to the rehabilitation of western agriculture. Finally, and most important, it can be made an important contribution to social and economic security and human welfare. Public neglect is partly responsible for the aggravated character of the range problem, and this makes all the more urgent and necessary public action toward its solution.

Respectfully,

H. A. WALLACE, *Secretary.*

UNITED STATES DEPARTMENT OF AGRICULTURE,
FOREST SERVICE,
Washington, April 28, 1936.

The SECRETARY OF AGRICULTURE.

DEAR MR. SECRETARY: I am transmitting herewith the report requested in Senate Resolution 289. This incorporates information obtained by many years of research on the range and watershed problems, by special surveys which have been under way for several years, and by 30 years' administration of the national forests. It includes the pertinent information now available in the Forest Service and that which could be obtained from other Federal and State agencies. It necessarily has the limitations inherent in the first attempt to treat the range resource as a whole, but it is believed that its findings are essentially sound.

One of the primary reasons for the neglect, and hence the serious depletion of the range resource and a series of major maladjustments in land use, has been a division of responsibility among public agencies. No one Federal agency has been responsible for an all-inclusive, affirmative handling of the entire range problem. A similar situation obtains for every western State in which the range is an important factor.

If the Federal Government is to redeem its responsibilities, one of the first and most important needs is, therefore, the concentration of responsibility in a single Federal department. This should include responsibility for whatever additional and feasible action is required to put privately owned range lands in a satisfactory status. Such concentration affords the only effective way to stop the depletion of ranges under way for 50 years, and to start them on the upgrade. Furthermore, such concentration affords the only effective means to integrate range use soundly with the other forms of western agriculture of which it is an essential part. Since the problem is wholly agricultural, concentration must be in the Department of Agriculture.

To redeem their obligations, the States must face and meet similar problems of jurisdiction and responsibility.

Sincerely yours,

F. A. SILCOX,
Chief, Forest Service.

HIGH LIGHTS

1. The range area of 728 million acres is nearly 40 percent of the total land area of the continental United States; more than 99 percent is available for livestock grazing.

2. About half the range area, or 376 million acres, is in private ownership. One-third, or 239 million acres, is Federal range, divided among national forests, grazing districts, public domain, and other withdrawals and reservations.

3. Forage depletion for the entire range area averages more than half; the result of a few decades of livestock grazing.

4. Range depletion on the public domain and grazing districts averages 67 percent, on private, Indian, and State and county lands about half, and on national forests 30 percent.

5. Three-fourths of the entire range area has declined during the last 30 years, and only 16 percent has improved.

6. During the same period 95 percent of the public domain and grazing districts has gone downgrade and only 2 percent has improved. For other forms of ownership and control corresponding figures are: Private lands 85 and 10, State and county lands 88 and 7, Indian lands 75 and 10, national forests 5 and 77.

7. Only about 95 million acres of the entire range area is in reasonably satisfactory condition. Nearly half of the national forest range and 12 percent of private ownership falls in this category. The reasonably satisfactory areas in other ownerships are inconsequential. Probably not much over 5 percent of the entire range area is in a thoroughly satisfactory condition.

8. An outstanding cause of range depletion has been excessive stocking. Some 17.3 million animal units are now grazed on ranges which it is estimated can carry only 10.8 million. The removal of the surplus is the most effective way to stop depletion and start the range on the upgrade.

9. About seven-tenths, or 523 million acres, of the range area is still subject to practically unrestricted grazing.

10. Precipitation in the range country averages less than one-third that of the Middle West and East. One to 4 drought years out of 10 characterize practically all of the range area. The failure to recognize in stocking the wide and direct fluctuation of forage production with precipitation has been one primary cause of depletion.

11. Among financial handicaps to the range livestock producer, possibly the most serious, is the marketing differential, mainly freight, which for Idaho is nearly \$8.50 for an 1,100-pound steer in the Chicago market as compared with Illinois.

12. The one best answer to this and other financial handicaps is cheap range feed, which costs only one-fifth to one-tenth as much as hay or other supplemental feed. But serious depletion of range feed has been practically universal, and heavy supplemental feeding has been necessary.

13. Unsuitable land laws and policies have made the range a bewildering mosaic of different kinds of ownerships and of uneconomic units, which together constitute a serious obstacle to range management and profitable livestock production.

14. Range livestock production was once almost wholly pastoral. Thirty-five percent of the feed for western livestock is now supplemental feeds raised on croplands or irrigated pastures—a threefold increase in 45 years. Except for highly specialized crop farming, mostly on irrigated land, western agriculture is now primarily an integration of range livestock grazing and crop farming.

15. Excluding irrigation improvements, the 1930 census values farm lands and buildings, privately owned range lands, and farm and range livestock, etc., at nearly 12.9 billion dollars.

16. Most spectacular among the maladjustments of range-land use has been the attempt to use more than 50 million acres for dry-land farming. About half, ruined for forage production for years to come, has already been abandoned for cultivation, much of it even before going to patent.

17. A more serious but much less spectacular maladjustment has been the private acquisition of many million acres, either submarginal for private ownership as shown by high tax delinquency and relief rolls, abandonment, etc., or having high public values for watershed protection which private owners cannot maintain, or both.

18. Four-fifths of the 232 million acres which yield 85 percent of the water of the major western streams is range land, and low precipitation makes water the limiting factor in nearly all western development.

19. No less than 589 million acres of range land is eroding more or less seriously, reducing soil productivity and impairing watershed services. Three-fifths of this area is adding to the silt load of major western streams.

20. It will probably require more than 50 years of management to restore the depleted range sufficiently to carry even the 17.3 million livestock units now grazed, and probably an additional 50 years to restore it to the nearest possible approach to its original grazing capacity of 22.5 million units.

21. Action of greatest immediate urgency and importance is to—

Stop soil and forage depletion, and start both on the upgrade;

Reduce excessive stocking, place all range lands under management, and restore cheap range feed;

Rectify land ownership and use maladjustments, and obtain a sound distribution of ownership between private and public agencies;

Build up economic private and public units;

Balance and integrate crop and range use;

Correlate the livestock, watershed, forest, wildlife, and recreation forms of range-land uses and services;

Obtain a recognition of the responsibility of stewardship by private owners;

Minimize or remove various financial handicaps of stock producers;

Reconcile range conservation and the financial needs of State institutions;

Solve the tax delinquency problem;

Place public lands under the supervision of agricultural agencies as a step toward unification of public responsibility for the entire range problem. Provide on such lands for a sound distribution of grazing privileges, and prevent the establishment of prescriptive rights;

Obtain and apply the information necessary for the conservation and wise use of the range resource;

Prevent human wastage and insure social and economic security.

ACKNOWLEDGMENT

The preparation of this report has largely been a group effort in which a large number of Forest Service employees have participated. Authorship credited under the various titles only partially indicates the contribution made by these authors, who for the most part have also given a large amount of time and effort to the technical review and constructive criticism of sections other than their own.

The following employees whose names do not appear as authors contributed in such ways as the compilation of data and the preparation of material for the report, or in the critical review of manuscripts, or in an advisory capacity:

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A still larger group at the western forest and range experiment stations, regional offices, and on the national forests has over a period of several years collected the large volume of data which has constituted the main basis for the report.

In addition, a considerable number of Government units, both within and without the Department of Agriculture, have cooperated generously in supplying needed information; among these, acknowledgment is due especially to the Agricultural Adjustment Administration, the Bureau of Agricultural Economics, the Bureau of Biological Survey, the Farm Credit Administration, the Rural Resettlement Administration, the Weather Bureau, and the Bureau of the Census. The ready cooperation of the State agricultural experiment stations in a number of the Western States was also of great assistance.

THE WESTERN RANGE

A GREAT BUT NEGLECTED NATURAL RESOURCE

TABLE OF CONTENTS

	Page
I. The major range problems and their solution—A résumé.....	1
Major findings.....	3
Serious range depletion practically universal.....	3
Depletion resulted from a few outstanding causes.....	9
Range use an integral part of western agriculture.....	16
Serious social and economic losses.....	19
Range conservation the exception.....	29
Resilience of range livestock production.....	35
Drastic remedial action required.....	37
To restore and maintain the range.....	41
For private lands and livestock.....	45
In public land administration.....	51
In research and extension.....	59
In legislation.....	61
Costs and returns.....	63
The key to remedial action.....	66
Is remedial action worth while?.....	67
If no action is taken.....	67
The benefits from restoration.....	68
II. The virgin range.....	71
A detailed picture of virgin range types.....	72
What the range resource offered a growing Nation.....	80
III. The white man's toll.....	81
Forage depletion in the principal range types.....	84
A century's toll in "free use" of the range.....	108
IV. How and why.....	117
History of range use.....	119
The great boom in range cattle, 1880-85.....	119
Genesis of the boom.....	120
The collapse of the boom.....	122
Recovery—striving for security on the cattle range.....	123
Increase in sheep accentuated bitter struggle for range.....	125
Settlement intensifies tendency to range depletion.....	127
Establishment of public-land control a stabilizing factor.....	129
World War boom and post-war depression bring heavy demands on range.....	130
Drought added to excess stocking works havoc on range ..	131
Issues growing out of range-use history.....	132
Climatic fluctuations.....	135
Climatic fluctuations on western ranges.....	135
Seasonal fluctuations.....	136
Drought years.....	138
The menace in a recurrence of dry years.....	139
Progressive deficiencies.....	141
Corresponding fluctuations in range vegetation.....	142
Range forage production declines in dry years.....	143
Effect of dry seasons on grazing use.....	145
Vegetative stand decreases after drought.....	145
Cyclic fluctuations in vegetative growth.....	147
Climatic guides to permanent range use.....	148
Excessive stocking.....	151
Evidence of excessive stocking.....	152
Numbers of livestock within range area.....	153
Numbers of livestock on range and other feed.....	154
Evidence afforded by range deterioration itself.....	161
Evidence afforded by present stocking and estimated grazing capacity.....	164
Evidence afforded by serious losses and unsatisfactory production.....	165

	Page
IV. How and why—Continued.	
Excessive stocking—Continued.	
Causes of excessive stocking.....	168
Competition for range.....	168
Stockmen believe profits depend on numbers.....	168
Permitting ranges to suffer to reduce expenses.....	169
Stocking on basis of better years.....	169
Restocking too soon after drought.....	169
Pressure on public range officials.....	169
Some agencies have not faced their conservation re- sponsibility.....	170
Lack of realization of consequences.....	170
Overcoming excessive stocking not insurmountable.....	171
Rule-of-thumb management.....	173
Harmful practices evolved by rule-of-thumb.....	173
Too many animals on the range.....	173
Faulty distribution of livestock.....	174
Improper season of use injures the range.....	177
Poor balance between classes of animals and type of range.....	178
The effect of burning on forage production.....	179
Combined effects of unsound rule-of-thumb practices.....	180
Reasons for development of rule-of-thumb practices.....	182
The lag in research and extension.....	185
Appraisal of range research and extension.....	185
Duration of the work.....	185
Character of investigations.....	186
Expenditures.....	187
Number of workers.....	188
Range extension.....	188
Examples of neglected unsolved problems of range restora- tion and management.....	189
Problems of grazing capacity.....	189
The role of vegetation in watershed protection.....	190
Key forage plants.....	190
Artificial revegetation.....	191
Interplay of animal factors in their effect on range.....	191
Need for simple usable measures of range condition.....	192
Many other unsolved problems.....	192
The net result—a concluding appraisal.....	192
Financial handicaps.....	193
The relation of capital investments to profits and range depletion.....	193
The relation of production costs to profits and range deple- tion.....	197
Credit facilities and their relation to profits and range depletion.....	201
The bankers' viewpoint.....	203
Marketing and its relationship to profits and range deple- tion.....	205
Profits.....	208
Key financial problems.....	209
Markets.....	209
Credits.....	210
Erroneous financial philosophy.....	210
High land values.....	211
Unsuitable land policy.....	213
Introduction.....	213
The period of disposal.....	215
The homestead laws.....	216
Enlarged homestead acts.....	220
The grazing homestead law.....	221
Land script, mineral laws, and other acts.....	226
Railroad and other internal improvement grants.....	226
Status of lands remaining in public ownership.....	230
Texas lands.....	230
State grants.....	231
Indian lands.....	234
Remaining public domain.....	235

TABLE OF CONTENTS

XIII

	Page
IV. How and why—Continued.	
Unsuitable land policy—Continued.	
Reasons for delay in adopting a constructive range-land policy.....	236
The effects of past land policy.....	238
Effect on present range-land ownership.....	238
Effect on the range resource.....	245
The problems which arise from land ownership.....	246
Simplification of ownership pattern.....	246
Division into economic units.....	247
Taxation.....	247
Responsibility for restoration.....	248
Range conservation the exception.....	249
The national forests.....	249
Establishment of the national forests.....	251
Aims and objectives in administration.....	253
Multiple use of resources.....	254
Administration of range use.....	255
Development and application of range management.....	258
Obstacles and problems in range management.....	264
Range distribution policy.....	267
Net results of 30 years of range administration.....	274
Indian lands.....	278
Indian range resources.....	278
Administration of Indian range.....	280
Special handicaps in administration.....	282
Wheeler-Howard Act.....	283
Problems.....	284
The grazing districts.....	285
Favorable features of the Grazing Act.....	286
Shortcomings of the Grazing Act.....	286
Conservation on privately owned range.....	294
West of the Great Plains.....	295
The Great Plains.....	297
The sandhills of Nebraska.....	299
Privately owned range lands in and adjacent to national forests.....	299
Factors which have favored range conservation.....	300
V. Its social and economic function.....	301
In watershed protection.....	303
Watersheds of the virgin range.....	303
The flood and erosion menace of recent years.....	305
Floods.....	306
Erosion.....	308
Causes of accelerated erosion and floods.....	314
Climate.....	314
Soils.....	315
Topography.....	315
Vegetation.....	316
Ownership or control of land as a contributing factor in accelerating run-off and erosion.....	325
The economic and social consequence of accelerated run-off erosion.....	326
Soil fertility destroyed.....	327
Irrigation water supply and improvements threatened.....	328
Costly floods.....	335
Municipal watersheds.....	335
Water power depends on continuous stream flow.....	336
Recreation and wildlife resources imperiled.....	336
"Black blizzards" of the plains spread destruction.....	336
Contrasting watershed and grazing values.....	337
The way out—restoration.....	338
As a home for wildlife.....	341
The wildlife problem.....	341
Wildlife a product of environment.....	341
How reduction in range area and its depletion reduced wildlife.....	342
Restriction of area available for wildlife.....	343

V. Its social and economic function—Continued.	
As a home for wildlife—Continued	Page
Range depletion.....	344
Other changes in habitat.....	346
Effect of environmental changes intensified by overutiliza- tion of wildlife resource.....	348
Reduced wildlife presents an important and neglected problem.....	349
Defects in theories adopted in wildlife conservation.....	351
Wildlife not regarded as a crop.....	351
Wildlife treated apart from environment.....	352
Wildlife refuges not universal solution.....	353
Transplanting of wildlife.....	354
Lack of basic knowledge of wildlife a handicap.....	355
Wildlife administration not handled as a biological problem.....	355
Wildlife management under legal pattern self-defeat- ing.....	355
Vital importance of environment proved by national- forest experiment.....	355
Major problems in wildlife management.....	360
In supplying areas for recreation.....	363
The social need.....	363
Economic considerations.....	365
The elements of recreational value in the western range States.....	368
The lesson of the national parks and national forests.....	371
Future requirements.....	376
As an integrated part of western agriculture.....	377
Introduction.....	377
The magnitude of western agriculture.....	378
Diverse patterns of western agriculture.....	379
Specialized crop farming.....	379
Crop farming and range livestock grazing.....	379
Regional characteristics of crop- and range-land agri- culture.....	386
Dependent population.....	391
Metropolitan business centers.....	393
Bonds between western agriculture and the Middle West and South.....	393
Effects of maladjusted land uses and of range depletion.....	394
Dry farming or range husbandry.....	394
Other maladjustments.....	398
Effects of range depletion on integrated western agri- culture.....	400
Range land submarginal for private ownership.....	411
Naturally low productive capacity of the range.....	411
Drought or other climatic hazards.....	412
Accessibility to market.....	412
Taxes and tax delinquency.....	413
Cost of restoration and rehabilitation.....	414
Use of public range concealed submarginality.....	414
Unsatisfactory social conditions.....	415
Other considerations.....	415
Greater security possible from balanced agriculture.....	415
The problem of integration of western agriculture.....	418
VI. Program.....	419
The probable future use and ownership of range lands.....	421
The problems of use.....	421
The background.....	421
The problem of uneconomically cropped land.....	422
The problem of coordinating range use with the national agricultural-adjustment and land-use programs.....	423
Other use adjustment problems.....	423
The problems of private ownership.....	424
Ownership pattern—causes, effects, and responsibility.....	424
Why should the public be interested?.....	425
The solution must be a joint undertaking of private and public ownership.....	427

VI. Program—Continued.

The probable future use and ownership of range lands—Continued.	
The problems of private ownership—Continued.	Page
The possible means of public assistance to strengthen private range-land ownership.....	427
Inadequacy of data prevents accurate determination of size of problems.....	432
Estimated shifts in range lands submarginal for private ownership.....	433
The basis for estimating needed shifts from private to public ownership.....	433
Rating of opportunity for private management in different forage types.....	436
Prospective public acquisition.....	438
Estimated shifts in private range lands with high public values.....	440
To restore and conserve watershed values.....	440
To protect wildlife.....	444
To round out national forests and grazing districts.....	445
The net area to be acquired.....	445
Change in usable range area.....	446
Problems of public ownership.....	447
The problem of unreserved Federal range lands.....	447
The problem of State-owned range lands.....	447
The problem of tax-reverted lands.....	447
Division of responsibility between States and Federal Government in range-land ownership.....	448
The process of solution of ownership and use problems.....	449
The administration of public range lands.....	451
National forests and grazing-district lands.....	452
Multiple use of resources.....	453
Range management.....	455
Integration of public range lands with agriculture.....	457
Intermingled lands and isolated tracts.....	460
Boundary adjustments.....	462
Machinery of administration.....	462
Costs and returns.....	465
Unification of range administration in one department.....	467
Correlation in administration.....	467
Why the Forest Service is in the Department of Agriculture.....	467
Relation of Federal range to other agricultural resources.....	468
Forest and range land management a function of agriculture.....	469
Functions of the Department of Agriculture.....	470
Functions of the Department of the Interior.....	471
Department of Agriculture best fitted to administer Federal forest and range lands.....	471
Program for Indian range land.....	473
Range conservation.....	474
Machinery of range administration.....	475
Multiple use.....	475
Range improvements.....	476
Net results of program.....	477
State, county, and municipal range lands.....	477
Legislation needed.....	481
Private ownership—land and livestock.....	483
Present condition of private lands.....	483
What private and public agencies can do to stabilize private ownership.....	483
Stewardship of land.....	484
Submarginal lands.....	485
Development of sound economic units.....	487
Inflationary land values.....	491
Range management, animal husbandry, and game management.....	492
Control of production.....	495

	Page
VI. Program—Continued.	
Private ownership—land and livestock—Continued.	
What private and public agencies can do to stabilize private ownership—Continued.	
Markets.....	496
Credits.....	496
Taxation.....	497
Research and extension.....	498
Improving rural social and economic conditions.....	498
The management of range lands.....	501
A program for domestic livestock production.....	503
Systems of grazing.....	503
Range rehabilitation.....	504
Pests, diseases, and poisonous plant eradication.....	506
Grazing capacity.....	507
Proper season of use.....	510
Class of stock.....	511
Distribution of stock.....	511
Need for management plans.....	513
Potential contribution from the range.....	514
A program for watershed protection.....	515
Restoration during grazing use usually sufficient.....	515
Artificial erosion control needed in some cases.....	516
Responsibility for watershed protection.....	517
A program for wildlife.....	518
Jurisdictional problems.....	519
Refuges and sanctuaries.....	519
A program for recreation.....	521
A program for forest ranges.....	522
Additional information—A basic need.....	522
Research and extension program.....	523
Why range research and extension?.....	523
Major lines of research required.....	524
Range management.....	524
Artificial revegetation.....	527
Watershed management.....	528
Range economics.....	529
Wildlife.....	529
Animal husbandry.....	530
Entomology.....	530
Coordinated research.....	530
Extension.....	531
Responsibility for and cost of research and extension required.....	531
Present expenditures.....	532
Proposed expenditures.....	533
Legislation and costs.....	535
Problems requiring Federal legislative action.....	535
Problems affecting public domain and grazing districts.....	535
Problems of transferring private lands to Federal ownership.....	538
Simplification of boundary changes.....	541
Problems in Federal assistance to private owners.....	542
The problem of managing wildlife on Federal lands.....	544
Problems requiring State legislative action.....	544
The joint problem of State and Federal Governments to work cooperatively.....	548
Costs.....	548
The job on Federal lands.....	549
The job on State and county lands.....	552
The job on private lands.....	553
Research and extension.....	554
Literature cited.....	557
Appendix.....	567
Southern forest ranges.....	567
Alaska.....	581
Range types.....	599
Range species referred to in the report.....	600
Index.....	605

I. THE MAJOR RANGE PROBLEMS AND THEIR SOLUTION

A RÉSUMÉ

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The western range has never been fully and clearly recognized as one of our great natural resources along with forests, soil, wildlife, coal, oil, iron, and other minerals.

It is not surprising, therefore, that the intrinsic value and importance of the range resource to the West and to the entire country has been seriously underestimated or entirely overlooked. Neither is it surprising that the general public, many conservationists, and even many western stockmen have no real appreciation of the extent to which the range has been neglected and abused, what the consequences have been, and how these consequences have already affected and will in the future continue to affect human welfare.

Outside of the range country the general public and even many conservationists have gained much of what they know from fiction. They have a hazy, distorted picture of the glamour of the cattle country, of something far removed, unique, and picturesque which they recognize as having colored all western thought and life.

The western stockman has been too close and too much a part of all that has happened fully to grasp results, trends, and causes. The changes in the resource, ordinarily deterioration, have often been too insidious and too obscure to divert attention from what seemed to be the immediate and compelling problems of livelihood under strenuous competition which all too often in the early days became open warfare. If he has known and cared, he has often been the victim of circumstances over which, regardless of how he struggled, he had little control. Or he has coupled his recognition with an incorrigible optimism which counted on plentiful rains in the season to come, or a turn in the market to make everything right in his livestock business and also with the range itself.

Under such circumstances only the inspired leadership which has stirred the public to action on some other resources could have been effective, and such leadership has been conspicuously absent.

Piecemeal attacks on the range problem have been made in the past, but this report has been prepared in the belief that only a comprehensive attack on the entire range problem will suffice. Many conditions, forces, and problems are common to the entire western range country. Only through consideration of the whole is it possible to obtain a background and a grasp which will permit sound and lasting remedial action.¹

¹The report is based on a large amount of information already available in the Forest Service, together with that which could be obtained readily from State, Federal, and other agencies, and, where time permitted, by special surveys. Where exact information was not available the best approximations possible under the circumstances have been made. While great accuracy cannot be claimed for these it is believed that the findings are substantially correct.

Furthermore, such consideration must begin with the forage and soil which constitute the range resource itself, take into account their original and present condition, and how they have been and should be used. It should extend into the now closely related crop agriculture and devote at least passing notice to dependent or closely related services and activities. It must, however, have human beings and their permanent welfare as its chief concern and end objective.

Obviously no attempt could be made to cover all American agriculture of which western range and crop lands are a part. As the broader problems of American agriculture are worked out, the solutions will undoubtedly reflect into and modify in greater or less degree the conclusions reached in this survey.

The western range is largely open and unfenced, with control of stock by herding; where fenced, relatively large units are enclosed.

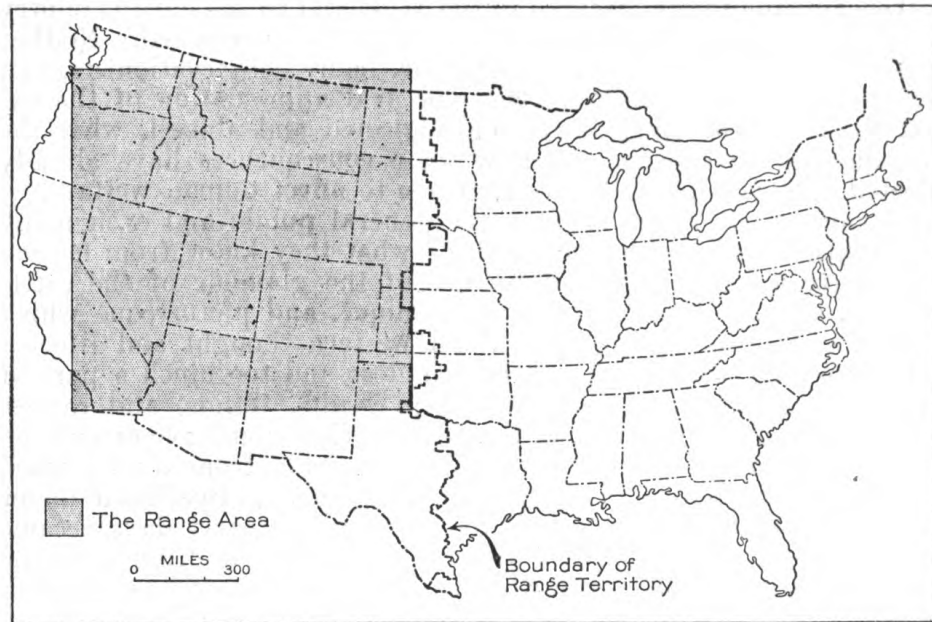


FIGURE 1.—THE RANGE AREA.

The 728 million-acre range area discussed in this report, roughly three-fourths of the land area west of an irregular line extending south through the Dakotas to Mexico and nearly 40 percent of the total land area of the United States, is an indication of the magnitude of the range problem.

It supports with few exceptions only native grasses and other forage plants, is never fertilized or cultivated, and can in the main be restored and maintained only through control of grazing. It consists almost exclusively of lands which, because of relatively meager precipitation or other adverse climatic conditions, or rough topography, or the lack of water for irrigation, cannot successfully be used for any other form of agriculture.

In contrast, the improved pastures of the East and Middle West receive an abundant precipitation, are ordinarily fenced, utilize introduced forage species, follow cultivation for other crops, are often fertilized to increase productivity, and are renewed following deterioration.

The range area covered in this report lies to the west of an irregular north and south line which cuts through the Dakotas, Nebraska, Kansas, Oklahoma, and Texas (fig. 1). The range area aggregates some 728 million acres out of a total land area of 975 million acres. Discussions of the southern and Alaskan ranges are included in the appendix.

The Forest Service is charged with the responsibility for the administration of some 88 million acres of grazable land within the western national forests, of which 94 percent is available for livestock. The national forest ranges are a much more important link in the western range problem than their acreage alone indicates. The impact upon their administration of a group of increasingly serious problems growing out of other range lands in the public domain, in the grazing districts now being formed under the provisions of the Taylor Grazing Act, and in private and in State or other public ownerships, as well as problems in the closely related crop agriculture, has forced the survey which has resulted in this report. Such action has been essential in order to safeguard the fundamental conservation principles which underlie national forest administration and even the integrity of the national forests themselves.

MAJOR FINDINGS

There is perhaps no darker chapter nor greater tragedy in the history of land occupancy and use in the United States than the story of the western range. First it was "the Great American Desert", a vast and trackless waste, a barrier to the gold fields. Unexpectedly and almost overnight it became the potential source of great wealth from livestock grazing. And therein lies the key to the story. All of the major findings which constitute the first part of this discussion have their origin in the effort to capitalize this wealth and convert it to human use.

SERIOUS RANGE DEPLETION PRACTICALLY UNIVERSAL

The major finding of this report—at once the most obvious and obscure—is range depletion so nearly universal under all conditions of climate, topography, and ownership that the exceptions serve only to prove the rule.

The existing range area has been depleted no less than 52 percent from its virgin condition, using depletion in the sense of reduction in grazing capacity for domestic livestock. Practically this means that a range once capable of supporting 22.5 million animal units² can now carry only 10.8 million.

On nearly 55 percent of the entire range area, forage values have been reduced by more than half.

² 1 animal unit as used in the report is 1 cow, horse, or mule, or 5 sheep, goats, or swine.

Of the four classes used in evaluating the degree of depletion, material (26-50 percent) and severe (51-75 percent) are most extensive, as shown by fig. 2 and table 3, each covering more than one-third of the total range area. Extreme (76-100 percent) covers a little more than 15 percent, and moderate (0-25 percent) somewhat less.

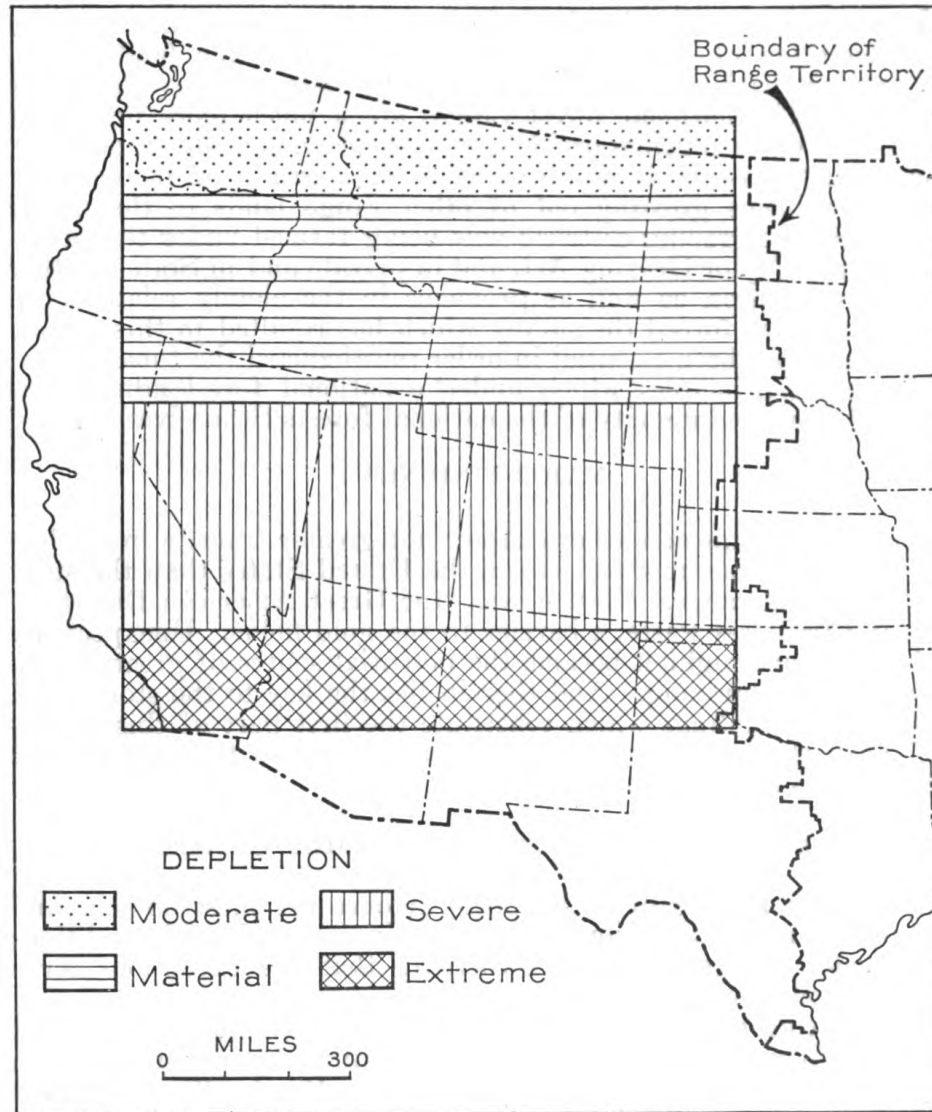


FIGURE 2.—RANGE DEPLETION CLASSES.

Of the depletion classes, material (26-50 percent) and severe (51-75 percent) cover more than seven-tenths of the entire range area. Nearly 120 million acres is in the extreme (76-100 percent) depletion class, and of the 95 million acres in the moderate (0-25 percent) depletion class probably not more than half is in a thoroughly satisfactory condition.

The depletion consists of the disappearance largely or altogether from many parts of the range of such valuable forage plants as the bluebunch wheatgrass, the giant wild-rye, ricegrass, dropseed, sacaton, and California oatgrass. It consists of the replacement of palatable and nutritious plants such as prairie beardgrass and sand-

grass by the unpalatable sand sagebrush and yucca, wild-rye by greasewood, winterfat by shadscale and rabbitbrush. It consists also of the replacement of perennial grasses by much less nutritious annual grasses and weeds. It consists of the invasion of foreign plants, such as the worthless star thistle in California, the nearly worthless Russian thistle now found everywhere, the poisonous Klamath weed, and only a few of limited value, such as cheatgrass for

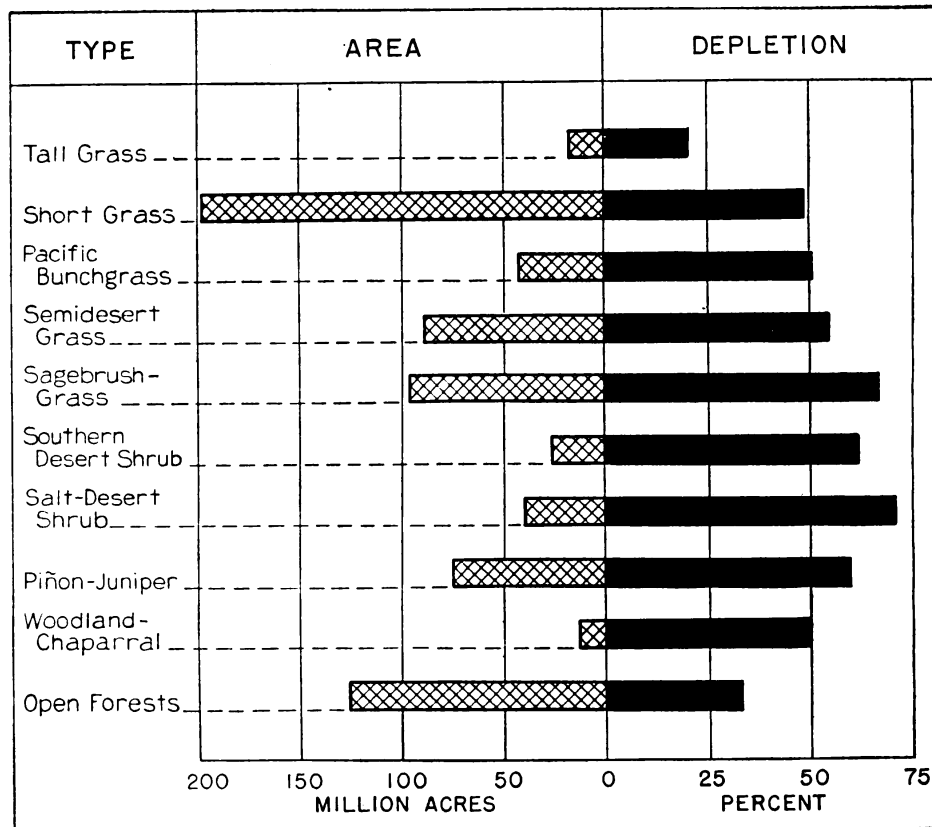


FIGURE 3.—AREA AND DEPLETION OF THE RANGE TYPES.

All range types except two are depleted by half or more. Of the two, tall grass is small in area and reflects especially favorable conditions, and the open forest benefits from a large area under national forest management.

only a few weeks each year, and the alfileria of southern Arizona and California, for a few weeks in wet years.

Still further, depletion consists of marked reduction in density of the better forage plants, with the perennial grammas and fescues as an example. The ordinarily desirable thickening of forests by reproduction and the expansion of brush areas has to some extent also reduced the space for forage plants.

What is true of the range as a whole is also true of the 10 broad types (figs. 25, 30, and 34) into which it has been divided for the purposes of this report, as shown in table 1 and figure 3.

TABLE 1.—Area of range types and forage depletion

Types	Areas	Depletion
	1,000 acres	Percent
Tall grass.....	18, 513	21
Short grass.....	198, 092	49
Pacific bunchgrass.....	42, 534	51
Semidesert grass.....	89, 274	55
Sagebrush grass.....	96, 528	67
Southern desert shrub.....	26, 898	62
Salt-desert shrub.....	40, 853	71
Piñon-juniper.....	75, 728	60
Woodland-chaparral.....	13, 406	50
Open forest.....	126, 367	33
Total.....	1 728, 196	52

¹ Does not include 1,217,000 acres in national parks.

The salt-desert shrub type, reduced by 71 percent, and the tall grass, by 21 percent, constitute the extremes. Furthermore, nearly three-fourths of the tall-grass type is in the moderate depletion class, and nine-tenths of the area of the salt-desert shrub is in the

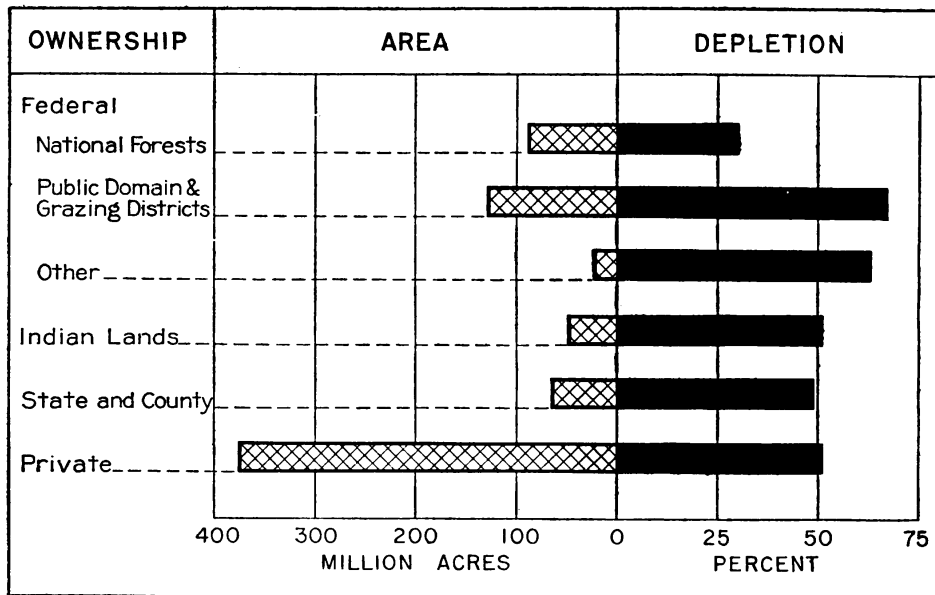


FIGURE 4.—AREA AND DEPLETION BY OWNERSHIPS.

Ranges of all ownerships and forms of control except the national forests have been depleted by half or more. The national forests 30 years ago were probably in even worse condition than the public domain then was because of the comparative abundance of water on the national forests and of the general shortage of summer range.

severe- and extreme-depletion classes. The salt-desert shrub, sagebrush grass, southern-desert shrub, and piñon-juniper ranges now rate about a third of the virgin range.

The reductions in productivity are all the more staggering because of the magnitude of the areas involved.

Ownership, first nearly all Federal, has become more than half private (table 2 and fig. 4).

TABLE 2.—Range areas and depletion by ownerships

Ownership or control	Range area		Depletion	Area available for range use
	1,000 acres	Percent	Percent	1,000 acres
Federal:				
National forests.....	87,964	12	30	82,538
Public domain, grazing districts.....	127,792	17	67	127,792
Indian lands.....	48,391	7	51	48,391
Other.....	22,997	3	63	21,599
State and county.....	65,516	9	49	65,084
Private.....	375,546	52	51	375,546
Total.....	728,196	100	52	720,950

As might be expected, both ownership, and the form of control within ownership, have had a marked influence on depletion. The

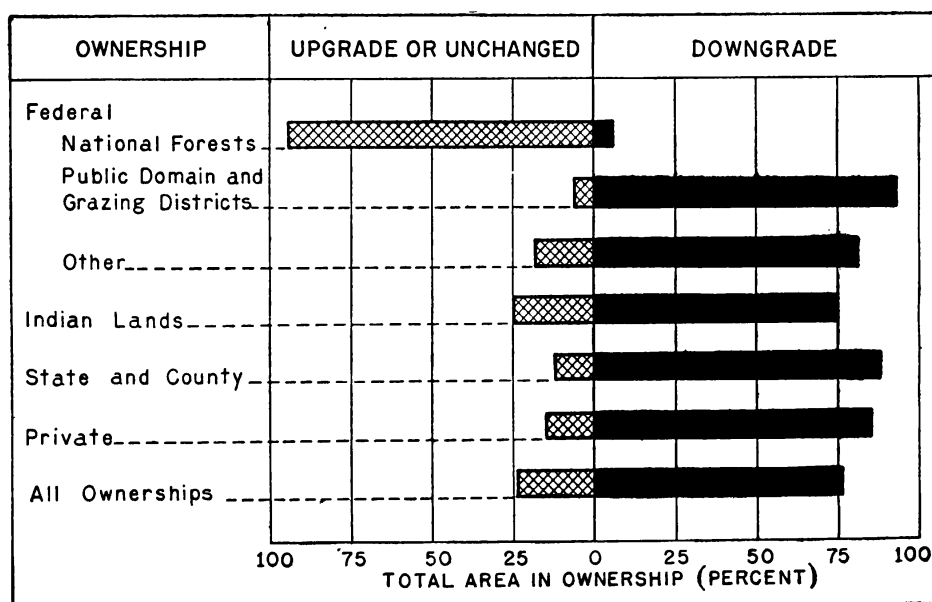


FIGURE 5.—DEPLETION TRENDS OF THE LAST 30 YEARS.

The contrast between the national forests and other forms of ownership or control is in essence a contrast between an attempt at range conservation and practically unrestricted use.

Federal public domain, a no man's land without management prior to the creation of the grazing districts, is in the worst condition, with depletion of 67 percent. Very surprisingly, fee-simple private ownership has been so little of an incentive to the preservation of the range resource that depletion stands at 51 percent. Indian, State, and county holdings have fared no better than private lands. National-forest ranges make the best showing, but despite 30 years' management are still 30 percent below virgin conditions.

Whether range conditions are on the up or down grade may be even more significant than the extent of present depletion. Here also the public domain has the blackest record, with nearly 95 percent of the total area depreciating during the last 30 years and only 2 percent improving (fig. 5). Over three-fourths of the national-

forest range has improved during the same period and only 5 percent has declined. For all other ownerships, largely private lands, from 75 to 88 percent have declined and 7 to 10 percent improved in value. Of all classes of ownership and forms of control only the national forests show any appreciable gain in range conditions.

In a nutshell, the white man's toll of the western range for 50 years, or for less than 100 at the outside, is reduced grazing capacity of more than half. Still further, 76 percent of the entire range has declined appreciably during the last 30 years and only 16 percent has improved (fig. 6).

The virgin range was characterized by wide differences in its vegetation because of marked climatic, soil, topographic, and other variations to be expected in an area of such size. The vegetation ranged all the way from the dense sod of the tall-grass prairies with grass under the most favorable conditions as high as a horse's back, to the

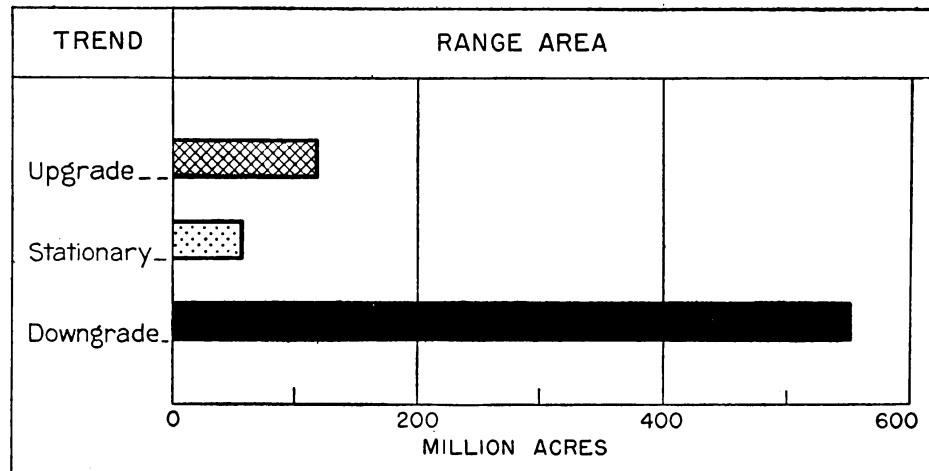


FIGURE 6.—THIRTY-YEAR TRENDS IN RANGE CONDITION.

Range resource history of the last 30 years may be summed up in continuing depletion of more than three-fourths of the entire area, but improvement on less than one-sixth.

low, sparse, scattered clumps of the southern desert shrub. But nearly all ranges produced an abundance of palatable and nutritious plants suitable for pasturage, many of which held their values in curing on the stem.

Before white settlement, the range was used only by game, the great numbers of which are attested by the reports of all the early explorers. Despite these numbers and climatic cycles, and drought periods which were undoubtedly as severe as any of recent years, the range did maintain itself, except for natural variation and for localized and temporary overgrazing, and would have continued to do so if the white man had not upset its natural and fairly stable equilibrium. Truly, man has shown less wisdom and vision in the use of the range resource than did uncontrolled nature. His greatest achievement seems to have been the removal of the natural checks and balances which had maintained the virgin range over thousands of years.

DEPLETION RESULTED FROM A FEW OUTSTANDING CAUSES

FROM THE TRADITIONAL AMERICAN ATTITUDE

A second major finding is a clarification of the causes of the deterioration and destruction of the range. Outstanding among the causes has been the traditional American attitude toward all natural resources. The exuberance of the American spirit has manifested itself, among other ways, in the lavish use of all the great natural resources with which the United States has been so richly endowed. The philosophy of inexhaustibility and its corollary that no provision need be made for either wise use or perpetuation has been almost universal, and as a result all have been wasted or destroyed with all the resourcefulness and ingenuity of a virile people. Other peoples have destroyed their natural resources but none have shown greater efficiency in the process. Like most other resources, the range seemed limitless. For years it was free and an enormous area still is. To a greater or less extent livestock grazing was once regarded as a transitional phase of land use which would lead to a more intensive development, and this minimized the need for care of the resource. To the western stockman livestock production has been very largely a business in which for one reason or another profit has been the compelling motive. Immediate profit loomed so large that care and restraint seemed far-fetched and visionary.

For such reasons as these the conservation of the forage and soil resource has been largely in the background. It should be recognized that most of the other causes of depletion outlined hereafter go back fundamentally to this traditional attitude.

FROM RULE-OF-THUMB MANAGEMENT

The American immigrant brought with him a traditional knowledge of crop agriculture worked out over many centuries under comparable European conditions. The western pioneer frequently had the background of adaptations of this knowledge to American conditions following years of trial in the East and Middle West.

To the western pioneer, however, the grazing of the western range was an entirely new form of agriculture. Its use by two or three generations of stockmen has afforded far too short a time to develop satisfactory management by large-scale trial and error. The complex biological relationships between plants themselves, between plants, climate, and soils, and between forage and grazing animals were beyond the ken of the range user.

Despite this, however, the resourceful and self-reliant stockman felt absolute confidence in his own ability to meet all requirements, and he neither asked for nor, except in a minor degree, received the benefits of research into range-management problems, the only other means of acquiring the necessary information. Research in consequence has been meager, has among Federal agencies been concentrated largely in three bureaus of the Department of Agriculture, has at the State agricultural experiment stations dealt largely with animal husbandry and range economics, and has in general lagged far behind requirements.

In the complex problem which we are more and more recognizing range use to be, and without the benefits of technical knowledge, the stockman has inevitably gone seriously wrong.

Lacking a sound basis for judging grazing capacity he has overstocked the range almost from the start. How else explain the depletion of the range as a whole by more than half? Climate is the only other possible explanation, and there is more evidence that the western climate has not changed than that it has. Furthermore, there are many specific examples of well-managed ranges on which forage conditions have improved, while adjacent overstocked ranges with identical climate have deteriorated.

After taking into account supplemental feeds and irrigated pastures, which supported 17 percent of the range livestock in 1900 and 38 percent in 1935, the number on range lands reached peaks of approximately 19.9 and 20.7 million animal units in 1900 and 1920, respectively. Since 1920 there has been a declining tendency, with a sharp drop to about 17.3 million animal units in 1935, a reduction of about 17 percent since 1920.

The range portion of the Plains States, the 11 far Western States as a group, and most of them separately, show similar downward trends from different peak years.

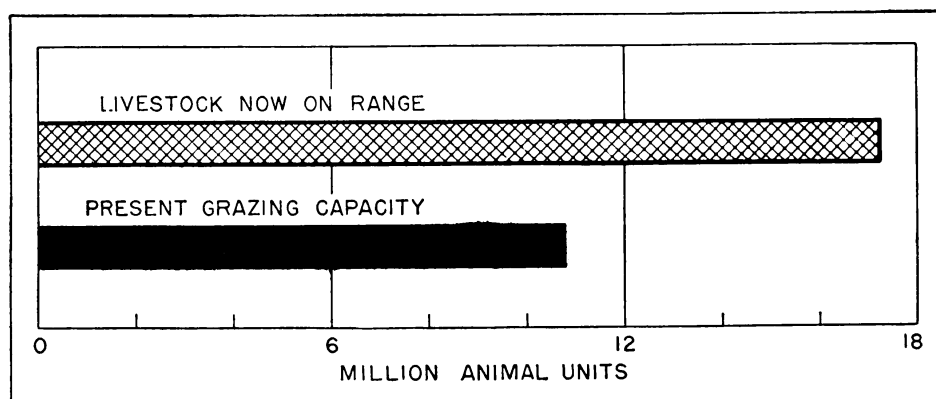


FIGURE 7.—EXCESSIVE STOCKING

Excessive stocking has been one of the prime factors in range depletion, and until about 6.5 million animal units of surplus stock are removed the range will continue on the downgrade.

The downward trends do not in themselves tell the whole story, because many herds are being carried on a bare maintenance basis by subsisting chiefly on low-value plants. Overgrazing for an extended period destroys the choicest range species first, and the livestock turn progressively to the poorer and poorer plants which, although grazed, are not as nutritious as the original vegetation. Accordingly the full extent of damage to the range often has not been fully reflected in decreased grazing capacity. Overgrazing has left its earmarks in the scarcity of the choicest range plants and the predominance of low-value and worthless plants, in dead or partly dead stumps or stubby branches of shrubs, in noticeable damage to tree reproduction, and in erosion and barren soil. Such earmarks are now conspicuous on several hundred million acres of range lands and particularly on those depleted in excess of 50 percent.

If any other evidence of excessive stocking is required it is necessary only to compare the 17.3 million animal units dependent on the range in 1935 with the estimated grazing capacity of 10.8 million animal units (fig. 7). In other words, it would be necessary to

reduce present stocking by nearly 38 percent to meet the actual grazing capacity. Even humid pastures could not stand up under such abuse; it is far too much to expect of semiarid ranges.

But the evidence of overstocking does not stop even here. Average annual death losses on overstocked and overgrazed ranges of as much as 9 percent among sheep and 5 to 7 percent among cattle are practically double the losses under conservative grazing and good feed. Calf crops on overstocked, overgrazed ranges are often only a half or two-thirds of what they are under good conditions. Other specific evidence, historical and otherwise, of overstocking and depletion, could be multiplied almost indefinitely.

And overstocking is only one, and the most serious, of the defective rule-of-thumb forms of management which have hastened and accentuated depletion. Poor distribution of livestock, concentration on key areas such as mountain meadows and around watering places, grazing at the wrong time of year, faulty balance between classes of animals and type of range, grazing two or more classes on ranges already overstocked with one, have contributed in varying degree and very largely in the aggregate.

When the stockman realized what rule-of-thumb practices were doing to the range, he often was, or thought he was, under the compulsion of other causes which stayed his hand.

FROM AN UNSOUND LAND POLICY

A national land policy unsuited to the semiarid and mountain grazing lands of the West has been still another major cause in the depletion of the range forage. This policy has grown out of such factors as:

1. Belief in universal private ownership of land and the attempt to pass as much land as possible to private ownership regardless of its character.

2. In this attempt, the practically unmodified application to the radically different semiarid West of land laws suited to the humid East and Middle West.

3. The failure to classify land as a basis for alienation according to the economic suitability for private ownership or to its highest form of use.

4. The character of the interpretation and administration of the land laws.

The first alienation to private ownership occurred in the Southwest before American acquisition, as Spanish and Mexican land grants, and amounted to more than 45 million acres. These grants were based on the philosophy of a landed aristocracy rather than that of democratic equality, which was one fundamental basis of American land disposal. Although averaging several thousand acres each, they have not generally resulted in good range management and are depleted almost as badly as the surrounding lands.

Homesteading in the West dates back largely to the homestead law of 1862. More liberal amendments and new laws have included the enlarged homestead law of 1909, the Kinkaid Act of 1904, and finally the stockraising homestead law of 1916.

Neither the maximum of 640 acres available under the stockraising law nor the 160 acres under the original Homestead Act offered the

remotest possibility of supporting a family under range use. The attempt at classification, made under the Stockraising Act, finally listed practically everything short of absolute desert. The ineffectiveness of the classification has been partly responsible for abandonment before the passage of title of some 28 million acres out of the 68 million acres entered. Under the Homestead Acts up to 1935, 1.4 million entries were made for nearly 240 million acres, a substantial part of which was in the range country and more than half of the western homestead area was range land.

Railroad and wagon-road grants, totaling more than 101 million acres of odd-numbered sections of range and other lands, checkerboarded wide strips across the West and further complicated range use and contributed to depletion. The railroad land policy has been to cash in as fast as possible by sale, and about 65 million acres of range land, mostly in small tracts, has gone into other private ownership, leaving more than 19 million acres of the poorest grant land unsold, most of it range, and in the original checkerboard pattern. For this their policy has generally been to get the maximum current revenue through leasing. Most of the railroads have recently reversed this policy, however, and are working toward some stable and orderly use of the range resource which they still retain.

Texas retained its public lands and has based its land-disposal policy on that of the Federal Government, except that considerably larger areas have gone to single owners. Depletion has, however, been much the same as on smaller private holdings.

Federal grants to the other western States were for common schools, institutions, and internal improvements. Through selection under institutional grants and by use of the various lieu-selection laws there has been considerable consolidation. Most State land was, however, in scattered sections. It has been sold where the legal price could be obtained, and the remaining area leased for the maximum current revenue. These lands have been handled by agencies whose primary function was disposal and revenue collection, and in no instance by agricultural agencies. A total of about 33 million acres has gone into private ownership. Since stockmen have followed their own inclinations in the handling of leased State lands, the extent of depletion is practically identical with that on lands in private ownership.

The 149.4 million acres of range land available for grazing left in the public domain, grazing districts, and other withdrawals is the poorest west of the Mississippi. It is the land which for its surface rights no one would take as a gift or purchase under the homestead or other land laws. Much of it is badly scattered. Open without restriction or restraint to all or to any who could take or hold, no other class of range land has suffered more seriously. Along with nearly three-fourths of the forage has often gone the top soil on which future recovery must depend.

The sum total of the effects of past land policy on range land has been:

1. A crazy-quilt ownership pattern, such as that shown in figures 63 and 64, made up of several hundred thousand small farm or ranch units, widely scattered State holdings and railroad lands, the foreclosures of insurance and investment companies, banks, etc., isolated Federal public domain tracts, and State and county tax-

delinquent lands—all of this almost impossible to handle effectively because of size or surrounding holdings and leading inevitably to overgrazing, depletion, and social and economic instability of the dependent population.

2. The passage to private ownership of an enormous area of land, the size of which is not yet accurately known, that is either submarginal even for range use by private operators because of low productivity, etc., or has high public values such as watershed protection which are difficult or impossible for private owners to maintain.

3. The passage to private ownership and encouragement of dry and other farming of some 50 million acres of relatively good range land that is submarginal for crops. Nearly 25 million acres have already been abandoned for cultivation and at least 11 million acres additional constitute acute problem areas. On all of this area the range has been destroyed and will be of little use for years to come unless reseeded.

4. The passage to private ownership of key areas, such as water holes, giving control of very much larger areas of public land, and as spring range of which there is a serious shortage.

5. Tax delinquency on the ranges submarginal for private ownership, and delinquency on and abandonment of the dry-farming areas which the meager data available indicates to be excessive.

6. Depletion so serious that decades of time and enormous expenditures will be required for restoration, not only of the range which has passed to private ownership but also of that outside of the national forests which has remained in public ownership.

Among the favorable features of Federal-land policy from the standpoint of range depletion has been the creation of the national forests, and the belated provision for a better handling of the Indian lands and a part of the public domain.

FROM FINANCIAL HANDICAPS

One of the greatest financial handicaps of the western stockman in comparison with his middle-western competitor is a serious freight and marketing differential. On an 1,100-pound steer, for example, Illinois has an advantage in the Chicago market over Idaho of nearly \$8.50, and over Nebraska of about \$2.85 (fig. 8). The outstanding competitive opportunity which the western stockman has to offset this handicap is cheap feed from natural ranges. On the average range feed worth \$1 or less will support an animal satisfactorily as long as hay or other supplemental feed costing \$5 to \$10 or even more (fig. 9).

Instead of maintaining fully this natural advantage of cheap range feed, however, the western stockman has ordinarily followed one, or usually more, of three other courses which have actually increased his handicap. In all of these he has tried to carry too many stock. Hoping to reduce costs of production he has overgrazed and destroyed his cheap range feed. He has bought crop lands and grown and used excessive amounts of high-cost hay and other supplemental feeds. He has purchased range lands often under competitive conditions which have inflated values, increased his capital investments, and hence the costs of production.

The investment in land in the livestock industry is so high in many cases that the livestock or converting part of the enterprise cannot earn a profit. Overcapitalization in land supplemented by the leasing of land in competition, the purchase or growing of relatively costly supplemental feed, and exorbitant interest on borrowed funds have all contributed to high production costs. In Montana, for example, the ratio of investment in land, improvements, etc., to the ewe value per head was 0.5 to 1 in 1890, but had increased to 4.7 to 1 in 1932. In an attempt to restore the balance between land and herd investments and to reduce production costs, stockmen have ordinarily increased their herds and overstocked and depleted their ranges.

Unfavorable credit facilities have added to the financial difficulties of the livestock producer. Boom credit has been so easy that it has almost been forced on him and has contributed to overexpansion in both land and herds. During depressions when he has most needed credit it was difficult or impossible to obtain, and he has had to dump stock on glutted markets or frequently to hold them on ranges already seriously overstocked.

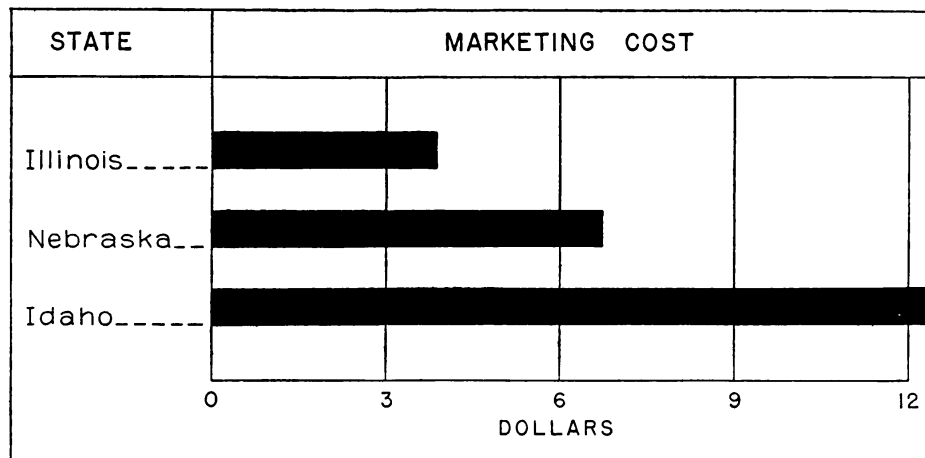


FIGURE 8.—THE MARKETING DIFFERENTIAL.

Marketing costs, mainly freight, are one of the most serious financial handicaps of nearly all the range country. Idaho's handicap over Illinois in the Chicago market of nearly \$8.50 on an 1,100-pound steer, can be met successfully only by some decided compensatory advantage.

Beyond this, loans have been predicated almost entirely on livestock as the basic resource without taking into account the range upon which they fed, and this again has contributed to overstocking and range deterioration. Short-term loans at interest rates often as high as $9\frac{1}{2}$ or 10 percent have increased costs, reduced profits, and added to the hazards of the enterprise and its disregard of the basic range.

Widely fluctuating markets from year to year and almost from week to week, have capped the climax of their financial difficulties. Depressed and glutted markets in particular have helped to keep stock on the range where already numbers were far in excess of what it could support.

Accordingly the financial and market set-up of the stockman has always been difficult and sometimes almost impossible. That this

situation has always borne hardest on the holder of land submarginal for private ownership, the user of badly depleted range, and the unit which was uneconomic because it was too large or too small, or was poorly balanced between range and crop land, and between land and herd, requires no proof.

With the financial cards stacked against him to a greater or less extent the range user has made the fatal mistake of trying to break even by crowding more stock on the range. As a result the range deteriorated still more rapidly and this in turn accentuated his financial handicap.

In this involved and ordinarily adverse situation the stockman has not been entirely a free agent. His course of action may not have been sufficiently aggressive and constructive and he undoubtedly failed to appreciate or may have seriously underestimated the bearing of it all on his basic resource and what the end result would be. However, in part at least, he has been the victim of circumstances far beyond his own control.

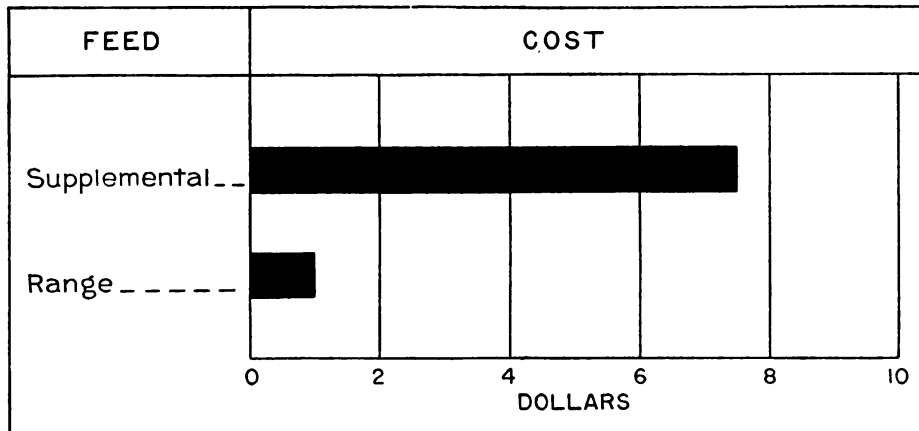


FIGURE 9.—CHEAP RANGE FEED THE ANSWER.

Cheap range feed, the one best answer to the marketing differential, has unfortunately been largely lost under unrestricted grazing, practically universal depletion, and excessive use of the several times more expensive supplemental feeds.

FROM THE CLIMATE

Last, but not least, among the primary causes of depletion is the climate.

Precipitation in the western range country averages less than 15 inches, or only about one-third that of the East. Excepting the higher mountain areas, it varies from about 15 inches in the short-grass plains to less than 5 inches in the southern-desert shrub type of the Mohave-Gila Desert of the Southwest.

For single years or, often, for groups of years it falls below the average. An extreme of 2 to 4 years out of 10 are drought years over much of the Southwest. Severe droughts often lasting several years have occurred over much of the West in every decade since 1880.

The volume of range forage produced depends upon climate and especially upon the amount of precipitation. At the extreme, the reduction in forage production in very dry as compared with favorable years may reach over 90 percent in the semidesert grass and southern desert shrub types in New Mexico and Arizona. Over large areas the fluctuation may be as much as 80 percent in successive years. Under even the most favorable climatic conditions the recovery in production is not complete in a single year, and under average conditions probably requires from 3 to 5 years. Under adverse conditions it requires still longer.

Neither the climate nor the amount of precipitation can be controlled by man, but the numbers of stock on the range can. The almost universal failure to vary the numbers of stock with such fluctuations in the amount of forage produced, or to stock below production in average years, has been one of the primary causes of depletion. For example, from 3 to 10 times as many valuable forage plants died during the 1931-35 drought on heavily grazed as on adjoining lightly grazed areas in western Utah and southwestern Wyoming. The records show steadily increasing numbers of livestock on the range over entire States during periods of declining precipitation and hence decreasing forage stand, until the severity of the drought and the scarcity of the feed compelled drastic reductions in numbers by forced sales or by high starvation losses. Such catastrophes have occurred in most Western States during every severe drought period of the last 50 years, including that of 1934, when the distress was alleviated only by Federal livestock purchases which reached the staggering total of more than 11 million head of cattle, sheep, and goats, at a cost exceeding \$100,000,000. This was more than one-sixth of the total number of beef cattle, sheep, and goats in the 17 Western States on January 1, 1934.

RANGE USE AN INTEGRAL PART OF WESTERN AGRICULTURE

The growing of domestic livestock on open ranges, their production on fenced pastures, and the production of farm products on cultivated land are merely different phases of agriculture. But the extent to which range use is related to and, in fact, an integral part of western agriculture is another major finding of this report.

Range use by domestic livestock in the West probably began in New Mexico about 20 years before the Pilgrims landed at Plymouth. It was not until nearly 280 years later, with the cattle boom of the eighties, that heavy use over large territories became a major factor in range depletion. Cattle and sheep had increased to an early peak in California about 1875. From 1870 to 1880 all the other Western and, especially, the Plains States showed exceedingly rapid increases in number of cattle. Texas chiefly, with more than 4.5 million cattle during the seventies, supplied the other Plains States. Sheep spread rapidly over the western ranges between 1890 and 1910.

Irrigated crops as an adjunct to range use were grown along the Rio Grande from about 1700 on. Even in the 1850's during the early stages of the range livestock industry, which at first was almost wholly pastoral, crop farming began in California and Utah. The first homestead patent was granted in 1869 in Nebraska. The cut-

ting of native hay began in the seventies. In parts of Idaho range livestock grazing proved very difficult until crop agriculture produced the feed needed to carry stock through the winter.

Beginning in 1910 large irrigation projects have been an important factor in furnishing supplemental feed and concentrates for feeding and fattening range livestock. The 242,908 farm units and 93,797,000 acres of land in farms in the 11 far Western States in 1900 had by 1930 more than doubled in number of units and in acreage.

In sum, grazing, which at the beginning was largely an independent and pastoral enterprise, and which after a long, slow start expanded ahead of and more rapidly than crop agriculture, has now become vitally dependent upon crop production. The latter also started early but has grown more slowly, and reached large proportions several decades later.

The combined range and crop agriculture now constitutes a substantial part of the total wealth of the West. The 1930 census values western farm lands and buildings, and farm and range livestock, machinery, etc. (including privately owned range and excluding irrigation improvements), at more than 12.9 billion dollars, or 23 percent of the comparable total for the United States. Western crop products for the same year were worth over 1.5 billion dollars and livestock products nearly 480 million dollars. In addition to beef and mutton, hides, etc., the range territory produced 75 percent of the 1930 national production of wool and mohair, or more than 276 million pounds, valued at more than 82 million dollars.

Except for the highly specialized crop farming, mostly on irrigated land, and producing such products as fruits and nuts, the agriculture of the West is primarily an integration of range livestock grazing and crop farming.

Out of several hundred thousand separate enterprises no two perhaps are quite alike. They vary from the one extreme of operations consisting entirely of range lands used for livestock production, which purchase from crop farmers the supplemental and fattening feeds they use, to the other extreme of units devoted exclusively to crop farming for the production of grain or other cash crops, where the direct tie with the range is confined to sales of supplemental feed or the leasing of irrigated pasture. In between are innumerable combinations and variations of range lands used for livestock grazing and crop lands used to provide supplemental feed for range livestock and for many different kinds of cash crops.

Land tenure differs fully as much, from the rapidly vanishing tramp sheepman who owns no range and leases little, to the baronial operator who owns outright the range and crop lands which support his stock throughout the year. In size, ownership may be as small as 5 or 10 acres of crop land, or as large as the 500,000-acre ranch, largely range, but with some crop land.

Cattle, sheep, horses, and other livestock and the meat, wool, and other materials of which they are the source, are clearly, therefore, the products of range lands only in part. The diversified products of croplands—various cereals, corn, sugar beets, cotton, flax, sorghums, hay, pasturage, etc.—return cash income only in part. Whether sold or used directly in feeding they now constitute no less

than 35 percent of the feed required for western range livestock (fig. 10).

Each major region of the West has its distinctive agricultural pattern and form of integration of range and croplands, dominated mainly by climate and topography, but partly also by economic conditions and tradition. These are described in detail in the report and repetition here would only serve to illustrate still further the tie between range and cropland use which is already apparent.

Western agriculture is the direct source of livelihood for over 1 million farm and ranch families, the principal support for another million families in rural towns, and the indirect support for a large part of the remaining population of the West. Its contributions extend from the farms and ranches through the small and exclusively agricultural communities to the larger supply towns and the metro-

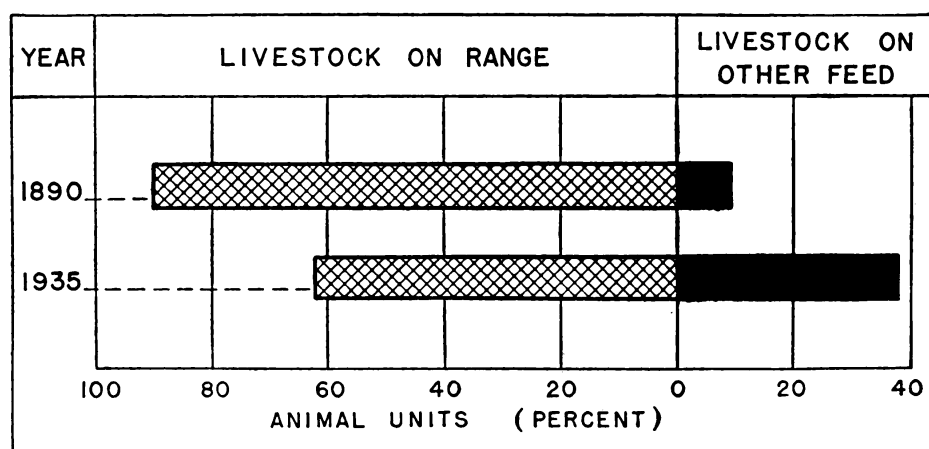


FIGURE 10.—INCREASING INTEGRATION OF RANGE AND CROP AGRICULTURE

A threefold 45-year increase in the percentage of numbers of livestock on supplemental feeds and irrigated pastures is a salient point in the increasing integration of western range and cropland agriculture.

politan centers. The grocer, druggist, miner, mechanic, lumberman, and banker, the stockyards, the railroads, and other transportation services, in fact every western activity which forms a part of the complex, interrelated, interdependent structure of modern civilization has its stake in a permanently prosperous and stable agriculture.

The somewhat arbitrary eastern boundary of the range country is no limitation, however, on the tie of its agriculture with the agricultural and other industries and activities of the remainder of the United States. The western ranges furnish feeder and stocker cattle in large numbers to the Midwest, thereby offering the opportunity for diversification of farm products and for turning slack time into cash. Both the Midwest and the South sell large quantities of shelled corn, other grains, and cottonseed meal and cake to the West. The range country and the Middle West compete in supplying the eastern consumer with various livestock products. And these are only a few obvious forms of the tie between the West and the East in which western range and cropland and their products play so conspicuous a part.

SERIOUS SOCIAL AND ECONOMIC LOSSES

The only way to measure the value of the range is by the social and economic yardstick, the losses from mismanagement and abuse, and the contrasting benefits from wise use. The character and extent of such losses and benefits constitute another major finding of this report.

Close integration of range and cropland use carries with it an equally close dependence. Maladjustments or deterioration or destruction in either one inescapably reacts upon the other. The problems of one are inevitably the problems of the other. What benefits one benefits both. The free play of economic forces has gone so far in the welding process that it is impossible to escape the fundamental soundness of this relationship.

IN LIVESTOCK PRODUCTION AND RELATED CROP AGRICULTURE

Most spectacular among the maladjustments in range land use, because of both the originality and daring of the attempt and the completeness of the failure, has been the effort to use it in dry-land farming. As indicated, the attempt has covered a total of over 50 million acres, about half of which has been abandoned for cultivation, much of it even before going to patent. Many of the remaining occupants are on relief rolls. During favorable crop years it added greatly to American and world surpluses of such crops as wheat.

Dry-land farming utilized some of the finest range lands and crowded the livestock onto lands already overstocked. It occupied large areas of spring ranges already too small to meet requirements and forced stockmen to hold their herds on pastures and hayfields so late in the spring that these also were more or less seriously damaged. The reoccupation of the abandoned lands by valuable forage plants is very slow. At least 15 million acres will have to be reseeded artificially at a cost so high that it probably can be borne only by the public.

A more serious but less spectacular maladjustment has been the passage to private holders of many millions of acres of range land submarginal for such ownership. The fact that some 150 million acres of range lands in the public domain, grazing districts, and other withdrawals, and most of the additional 58 million in State ownership has not been transferred to private ownership has been a clear-cut recognition that some range lands are submarginal for private holding.

But for range lands once transferred an entirely different psychology has held. It has taken several decades of private ownership, waves of failures following repeated efforts culminating in a combination of one of the worst depressions and worst droughts which the West has ever experienced, even to raise the question seriously.

The question has not arisen earlier in acute form because the private owner has been living on a range and soil capital built up by natural processes over thousands of years which has only now become so largely dissipated that he must face realities; because he could to some extent supplement the deficiencies in his own hold-

ings from a free public domain now passing out of the picture; and because of the tenacity with which the average American has held to the belief that he could in some way work out his own salvation on almost any land however unproductive.

Two classes of range land fall into the submarginal class for private ownership: Those (1) with a very low grazing capacity because of poor soil or adverse climate or both, or because of severe depletion under conditions so adverse that many years of light stocking will be required for rehabilitation; those (2) on which the range has been destroyed by cultivation and must be restored artificially at high cost.

Most of the southern desert shrub type, which has a grazing capacity of only four to five cows per section of land, illustrates the extreme of the first class. This poorly watered land may require the excessively high investments for water and fencing alone of \$50 to \$75 per cow.

A drought expectancy of 2 to 4 years in 10 in most of the semiarid Southwest, as compared with 1 to 2 years or less in the sandhills of Nebraska, is reflected in forage production so low in the drought years that the only alternatives are heavy starvation losses or high supplemental feeding costs.

When on many millions of acres grazing capacity has been reduced by 50 or 75 percent or more, and 5 to 10 acres are required to carry one cow for a month, the costs of production are correspondingly increased, and if to this is added the long period of very low stocking required for restoration, the possibilities of profit under private ownership may be removed for years to come.

The vegetation destroyed by cultivation on lands of the second class can be restored artificially at a cost of \$50 to \$100 for enough range to carry a cow a year, and this cost may be no higher than that of carrying the land for the time required for natural restoration of the forage. Whether private owners can carry this burden on top of other production costs, except on the very best lands, is questionable.

The adverse marketing differential already discussed holds for both classes of land in all of the far-western States except California, and accentuates low inherent productivity and depletion, or both combined—especially because of the need for cheap range feed to meet midwestern competition.

So also does taxation, which bears most heavily on the poor and most seriously depleted lands. The operator whose range will support only one animal per 100 acres year long and who pays a tax of 5 cents per acre, which amounts to \$5 per animal unit, labors under a handicap so serious that again serious question of the feasibility of private ownership is raised.

High tax delinquency in many parts of the range country is at least a symptom of something so seriously wrong that it will not be cured by returning the lands to private ownership. And to all of this evidence must be added the low standards of living and high relief rolls in some range country.

The information now available does not permit any exact determination of the area of range land submarginal for private ownership, but it probably runs into scores of millions of acres.

The Federal and State land legislation and policies already described transferred to private owners hundreds of thousands of range-land units too small for the support of a family. The result has been a long, slow, and painful adjustment in which both owners and the range have suffered. Between 1910 and 1930 alone the number of ranches in the 100- to 174-acre class in the 11 western States decreased by more than one-third, and the number of units over 1,000 acres more than doubled.

The availability of small units encouraged oversettlement, and this coupled with the effort to build up units of favorable economic size and the growing shortage of feed led to competition for land, inflated values, higher costs, and lower profits. It was a part of the vicious circle of more cattle in the effort to meet higher costs, and of more land to carry more cattle. The already depleted range lost the little chance it had.

Land policies also made possible the acquisition of key areas such as lambing grounds, water holes, beef pastures, and holding grounds, so that frequently the ownership of very small tracts permitted the control of large areas of range. The smaller and weaker stockmen were at the mercy of the stronger key-area owners.

Range depletion has had a long series of adverse effects on both crop and livestock growers.

Depleted ranges and abandoned farms serve as a breeding ground for the beet leafhopper. In six counties in Idaho in 1934 alone this pest reduced the beet crop by 90 percent. Two beet-sugar factories did not open and 500 people were thrown out of employment for the manufacturing season.

Range depletion, among other causes, has forced stockmen to the excessive use of supplemental crop feeds which may cost from 5 to 10 times more than range feed. Supplemental feed has its proper place in finishing for the market and for winter use. And supplemental feeding induced by overgrazing has in turn been one of the causes of depletion by keeping many more livestock on the range than it could carry.

Range depletion and at times the lack of home-grown supplemental feed or its relatively high cost has been responsible for shipments of poor or half-fat beef and lambs, and this cuts heavily into possible profits.

The benefit of long years of effort to build up good breeding herds has been lost in part through lack of feed. At Miles City, Mont., calves from good range were 48 pounds heavier at weaning than those from overgrazed ranges. In New Mexico there was a difference between rehabilitated and heavily grazed ranges of about 200 pounds in cow weights.

Both calf and lamb crops are decreased and annual losses are increased when there is too little range forage. Chronic emergencies and forced sales, which are commonly due to drought and depressions, could often be minimized by ample forage and commensurate crop land.

Federal feed and crop loans have been necessary on a large scale in part because of maladjustments and depletion. That the November 1935 percentage of repayment in the western range country is about 44 percent as compared with 62 for the country as a whole is significant.

Maladjustments and depletion have caused serious decreases in population with correspondingly bad effects on the social and economic life of the communities. Fifteen representative dry-farm counties in six States, for example, lost from 4 to over 40 percent of their population in the single decade ending in 1930.

More than enough examples have been given to show that a wide diversity of economic and social losses results from range depletion and crop- and range-land maladjustments. The greatest possible security should conversely result from ranges restored and maintained in high productivity, from privately owned units of economic size with a proper balance in area and productivity of range- and crop-land, and from a proper distribution of land between private and public ownership.

FROM EROSION AND FLOODS

In a region of meager precipitation such as most of the West, the availability of water for irrigation, municipal purposes, power, etc.,

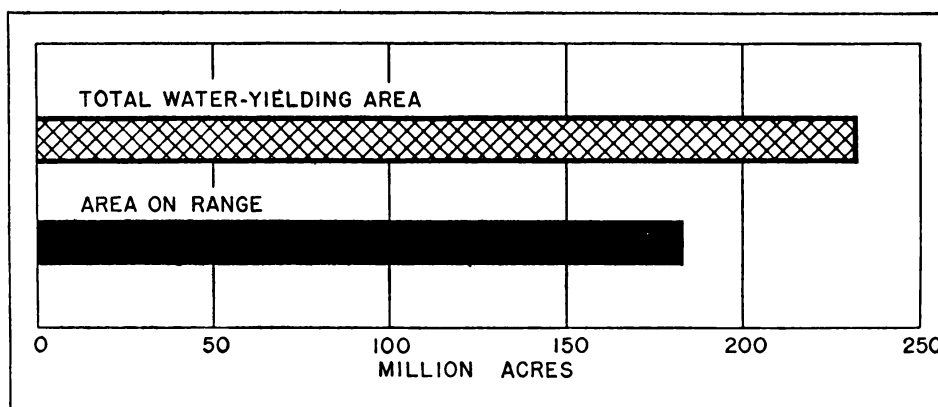


FIGURE 11.—WATER-YIELDING AREAS

Four-fifths of the 232 million acres which produce 85 percent of the water in the major western streams comes from range lands, and low precipitation makes water the limiting factor in nearly all western development.

is in most cases the factor which limits development. All plans for agricultural and municipal security as well as for most other industries must take this definitely into account.

Approximately 85 percent of the water of the principal watersheds of the West is derived from an area of about 232 million acres. Of the utmost significance is the fact that four-fifths of this important water-producing area is made up of range lands (fig. 11).

An additional reason for consideration is the fact that no less than 589 million acres of range lands, according to the best available information, is eroding so seriously that the destruction which it causes compels attention. Still further, 352 million acres of this area is contributing an appreciable amount of silt to major streams (fig. 12).

Watershed values have been most seriously impaired on the public domain and on private lands. Approximately 149 million acres, or 98 percent of the available public domain and minor reservations, is eroding more or less seriously, and 67 million acres is contributing

silt to major streams (figs. 13 and 14). Over 80 percent of private land is eroding and 195 million acres is contributing silt. While not so extensive, erosion on State and Indian lands is also critical.

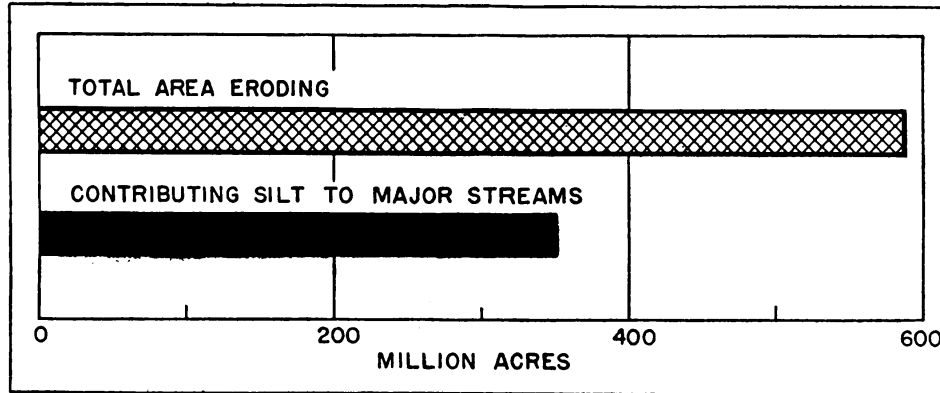


FIGURE 12.—EROSION AND SILTING OF STREAMS.

Eighty percent of the entire range area is eroding more or less seriously, and hence reducing the productive capacity of the soil. Nearly half is contributing silt in disturbing quantities to major western streams, and hence impairing their value for irrigation, power, and municipal water supplies.

Even on the national forests, which have a watershed objective in administration, 32 million acres is eroding and will require additional attention.

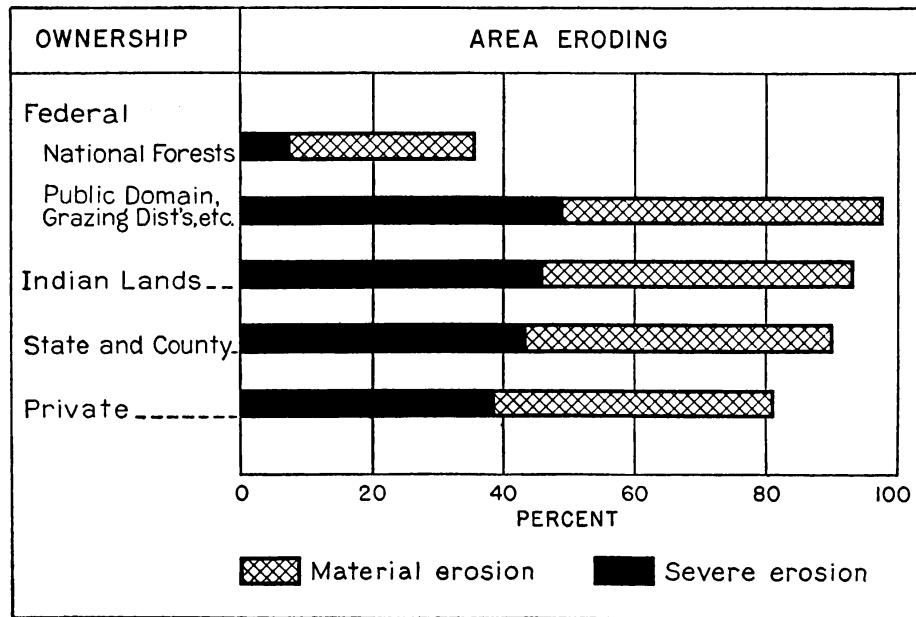


FIGURE 13.—EROSION BY RANGE OWNERSHIPS.

Erosion is most serious on the public domain and grazing districts, and Indian, State and county, and private lands are little better. Even 30 years' management has fallen far short of curing erosion on the national forests.

Scientific investigations have proved beyond a doubt that the plant cover minimizes and often prevents erosion and floods, and conversely, that depletion is a primary cause of both.

Studies in Utah to ascertain the effects of range vegetation on run-off and erosion have shown that by increasing plant density from 16 to 40 percent, surface run-off from summer rains is reduced by two-thirds and erosion by more than half its former volume.

In Idaho investigations of the effectiveness of different range types on surface run-off and erosion show that a plant cover of the most desirable forage species yielded practically no surface run-off or sediment, while the poorest cover yielded more than 60 percent of the precipitation in surface run-off and an equivalent of more than three-fourths of a ton of sediment per acre.

From a barren area in Missouri over a 6-year period 123 times as much soil was eroded as from a sod-covered area. Denudation by fire near Los Angeles increased flood run-off fortyfold and erosion approximately a thousandfold.

Geologic evidence in Utah has shown that recent destruction of plant cover has accelerated erosion and increased the number of

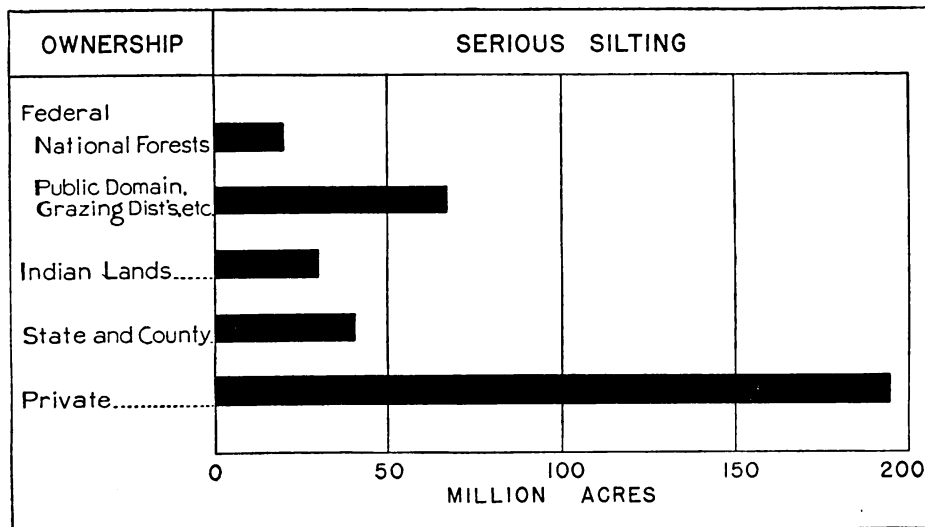


FIGURE 14.—SILTING OF MAJOR STREAMS BY RANGE OWNERSHIPS.

While the area in private ownership contributing silt to major streams exceeds that in all other ownerships combined, several other ownerships or forms of control urgently need attention.

floods beyond anything that had taken place in the preceding 20,000 years. These random examples are merely representative of similar results obtained throughout the West.

Floods are now increasing in frequency and severity from depleted western ranges, until scarcely a summer day passes when newspapers do not carry an account of loss of property or life. In Utah 27 important watersheds flooded in 1932 alone, and investigation showed their source to have been largely on range lands eaten down to the bare soil, while in New Mexico and Arizona historical evidence shows that floods are more frequent and destructive than anything which occurred in the past.

In 1922 the Palo Verde flood caused \$1,000,000 damage. A Rio Grande flood in 1932 practically destroyed flood-protection improvements worth \$5,000,000 and did more than \$1,000,000 damage to other property. Floods in Davis County, Utah, have caused

\$1,000,000 damage since 1923. The La Crescenta flood of 1934 took a toll of 30 lives and did \$5,000,000 damage.

The loss of almost irreplaceable soil on the western range is as widespread as range depletion itself. In the mountains of all the western States accelerated sheet and gully erosion are stripping and cutting slopes and channeling meadows. Southwestern valleys are being trenched with great arroyos often 100 feet in depth and 300 or more feet wide, and both mesa lands and mountain meadows are being ruined. The silt loads of the rivers of the Great Plains and the "black blizzards" of the last few years, with their threat to farm and industrial values and health, bear testimony to ravaged lands.

Silt deposits filled the small Austin Dam Reservoir in Texas in 13 years. The Elephant Butte Dam is filling at the rate of about 20,000 acre-feet annually. The McMillan Dam in New Mexico is now valuable only for diversion. The same thing is happening in greater or less degree in most of the reservoirs throughout the West.

The grazing value of range watershed lands may not often exceed \$3 per acre. The watershed value is much more difficult to determine. Some indication of relative values may be gained, however, from a consideration of dependent investments. More than 5.8 billion dollars is invested in irrigated land and improvements, as compared with about 4.1 billion dollars in range livestock and related ranch properties. Each of the 475 million acres of range land yielding water or contributing silt to streams supports an investment of \$12.27 in irrigation works, lands, and facilities, and this figure would be still higher if the investments for power and municipal water supplies were added.

Another measure of the value of the range cover can be obtained by considering the loss in the productive capacity of the soil from erosion as a result of depletion. The fertile top layers go first. Several hundred million acres have already lost 1 to several inches, and the productive capacity may have been reduced by one-fourth or one-half or more. These layers can be replaced only very slowly, as shown by investigations under the more favorable conditions in the East which indicate a rate of about 1 inch per 1,000 years.

Fortunately, man is not helpless in this situation, black as the picture now is. On many of the protected municipal watersheds of the West and on the managed watersheds of the national forests are examples of arrested erosion and controlled floods which are the direct result of range restoration. Not only has the production of forage been increased but the services which watersheds should render in maximum flows of usable water for dependent crop agriculture, in municipal water supplies, in power, in clear fishing streams, and in greater security to life and property have followed as a matter of course.

IN WILDLIFE

Wildlife is one of the natural products of the range. Its present annual economic value is estimated at more than \$90,000,000. To evaluate its economic significance, however, expenditures exceeding \$40,000,000 by hunters and fishermen should be added, and, in part also, those by recreationists of over \$155,000,000, because one of the

intangible but chief values of wildlife is the increased recreational attraction and enjoyment which it affords.

No one familiar with wildlife requirements will question the statement that the range with little or no impairment in its value for other uses could support a vastly larger wildlife population. So far, in fact, have numbers been reduced that any recital of what remains is in itself an indication of both tangible and intangible social and economic losses.

A few outstanding examples will suffice. The former millions of buffalo have declined to the few thousand on reservations; the thirty or forty million antelope to about 65,000; the few mountain sheep, goats, moose, and grizzly bear left are barely holding their own; the scattered remnants of upland game birds and fur bearers are still declining; the reduction of waterfowl has become a matter of national concern. Most of the big-game animals have been crowded off their original range into much less favorable conditions.

The chief factors and causes which are responsible for the present situation, discussed in detail later, need only be listed here:

1. The deterioration of the habitat through range depletion which has destroyed both food supplies and cover for land animals and birds and silted fishing streams.

2. Complications growing out of the passage of large areas of land to private ownership under a policy which offers no incentive to the owner to protect and maintain wildlife.

3. Maladjustments in land use, such as swamp drainage, that have attempted but failed to use for agricultural crop production land which would render its highest social and economic return in wildlife production.

4. Unrestricted or poorly controlled hunting and fishing.

5. A series of ill-advised or poorly handled constructive measures such, for example, as game preserves, transplanting, buck laws, etc., which have created almost as many problems as they have solved.

6. Protection alone defeating its own purpose by leading to overpopulation.

7. Wildlife agencies recruited on the basis of political rather than technical qualifications.

8. The lack of adequate technical knowledge.

9. The belated development of the basic concept that game management is required, having for its purpose production as a crop with provision for the annual harvesting of the production or surplus, this in proper correlation with other legitimate uses of the range.

The fundamental cause, however, is again the typical American philosophy of prodigal destruction rather than the conservation of natural resources.

Public interest in wildlife has increased very rapidly during the last few years, the direct result of the efforts of many sportsmen's and other associations and of State and Federal agencies. Although many of these activities have not reached the fundamental problems, nearly all have constructive aspects. Through them, for example, State agencies have contributed toward the rehabilitation of the wildlife resource. The Biological Survey has established a number of migratory bird and other reservations, controlled predatory animals injurious both to wildlife and domestic livestock, controlled range-

destroying rodents, and conducted research necessary as a basis for wildlife management. The Bureau of Fisheries and numerous State agencies have stocked many western streams and cooperated in their improvement.

The national forests have had a more important effect on the rehabilitation of wildlife in the range country than any other measure so far adopted, and are a concrete, although far from perfect, indication of the possibilities. National forest increases, which for big game animals alone are about 75 percent in the last decade, have been brought about with very little reduction in other forms of use, such as livestock grazing. The reappearance of wildlife has undoubtedly been one of the factors responsible for over 38 million visitors in the national forests in 1934 as compared with 3 million in 1917. These increases have not come without difficulties growing out of rigid State laws which stood in the way of reducing surpluses regardless of whether feed was available to keep the game from starving, or of the legitimate requirements for livestock or other forms of use, nor without other difficulties in working out effective cooperation between State and Federal agencies.

IN RECREATION

During the past half century public opinion regarding the social necessity of outdoor recreation, not alone for the favored few but for all, has undergone as radical a change as that regarding bathtubs and night air. People generally have learned that modern life makes demands for which the most practical remedy is periodic association with nature. The needs and the benefits are both physical and mental.

If increased opportunity for wholesome outdoor activities is not provided, existing play areas will be so crowded that only partial returns for expenditures of time and money can be obtained, and greater leisure time may not as it should contribute to health and happiness. The American people have developed a mobility which dwarfs into insignificance the outdoor spaces that can be dedicated exclusively to recreation.

Range lands, as well as others, possessing the qualities sought by outdoor recreationists have thus acquired economic values which often exceed those for other services. They are capital assets of their communities. They draw large sums of money that otherwise would not be received; money which contributes as fully to economic security as that from any other source.

People do not as a rule pay directly for the privilege of enjoying scenic charm or other recreational values, but they do pay indirectly through purchases of commodities and services for which there otherwise would be no local market. The recreational use of lands means that the market is brought to the resource without cost of transportation.

The serious depletion of most range areas, the reduction in wildlife, the erosion and silting of streams, have all been reflected in impaired recreational values. Where originally the mind was inspired by views of grass-covered and flower-studded slopes, it is now depressed by the sight of a terrain scored and dissected by

erosion and only thinly covered by plants. Healthful recreation from hunting and fishing have also been greatly curtailed.

Recreational use may entail changes in grazing, farming, etc., against which objections may be made. All members of a community share in its prosperity. In communities which make full use of all natural advantages, local demands establish good markets and prices, property values are increased, and local institutions are maintained at higher standards. Thus the entire community, including the industrialists, benefit from the multiple use management of natural resources to a degree which frequently offsets or exceeds possible losses from restriction in grazing or other forms of use.

These facts are amply confirmed by a quarter century of national forest administration. The traditional purposes of the national forests were primarily utilitarian, timber production, watershed protection, and forage for game and domestic livestock.

But the recreational use of the national forests has grown amazingly, as shown by the elevenfold increase in the estimated number of visitors to over 38 million in the 17 years ending in 1934. Some changes in the use of timber and ranges have been necessary on the one hand and some acceptance by recreationists of less than primeval conditions on the other. Actually all interests are better off.

In the light of national-forest experience it seems inevitable that the administration of other publicly owned range lands, both Federal and State, having recreational value will, if they are to serve the highest public interest, have to take recreational needs into account along with those for grazing, watershed protection, and wildlife. That recreational use has a place on privately owned range lands as well is clearly shown by the present status of dude ranching.

IN DEPENDENT COMMUNITIES

The small agricultural communities throughout the range country suffer both directly and indirectly from any and all the factors which reduce the prosperity of, or otherwise adversely affect, either crop or range agriculture, as the mere listing of a few of the connections will show. The local merchants who depend largely upon rural trade; the mechanics and laborers; the professions such as medicine and law; the semipublic organizations such as churches; the public institutions such as schools and the public activities such as highway construction and maintenance, all of which are dependent upon taxation; the well-being of all of these and many more fluctuates immediately and directly with that of their agricultural constituency.

It is equally obvious that the small agricultural community is merely the stepping stone to the larger supply centers which serve the agricultural regions, and these in turn to the larger western cities. Directly and indirectly involved also are the railroads and other transportation facilities, the banks, and industries such as lumbering which at first thought seem remote but which actually depend in part for the sale of their products upon the ability of agriculture to purchase.

In the complex present-day civilization with its high degree of specialization, maladjustments in any one important part extends directly or indirectly into most or all of the rest, locally, regionally,

and even nationally. It is a delicately balanced mechanism exceedingly sensitive throughout its entire working to a disturbance affecting any one part.

IN HUMAN WASTAGE

By far the most serious result is human wastage. What sum total of human wastage has grown directly and indirectly out of the depletion of the western ranges and the maladjustments in the use of range and interrelated croplands will never be known. That it has been very large there can be no doubt. Neither can there be any doubt that the struggle has served to develop a strong, resourceful, self-reliant group of survivors who form a most desirable addition to American citizenship.

Much of the wastage has been so insidious and obscure that it is never traced back to its fundamental causes. Successive waves of failures under the more adverse conditions, such as the lands submarginal for private ownership, the wrecking of high hopes and aspirations, and the hopelessness and despair and the lowering of initiative and self-reliance that grow out of failure, the melting away of lifetime savings, the casting adrift of thousands of families to become a floating instead of a stable population, reduced standards of living, uncompleted education, and other lost opportunities, all of these and many more are the barest indication of what unrestrained exploitation and destruction mean in terms of human happiness and well-being.

In part the human wastage was the price which had to be paid in a pioneering enterprise. But in much larger part it is the price of glaring and unnecessary mistakes. Any conclusion to the contrary is the saddest kind of a commentary on American efficiency. Certainly the possibility of eliminating or reducing human wastage in the future is the most compelling justification for the restoration of the range resource and the permanent maintenance of its productivity for the highest forms of use.

RANGE CONSERVATION THE EXCEPTION

The black range cloud like all others has its silver lining. Some pitifully small areas have been spared, and what is even more significant, other much larger areas have been rehabilitated. On the latter primarily, range management having a partially scientific basis has been developed and successfully applied. The exceptions, which have not been entirely confined to any one form of land ownership or control, emphasize the general situation by contrast, demonstrate the value of good stewardship, and point the way to the solution of the range problem (figs. 15 and 16). Their existence and the reasons for them constitute one of the major findings of the report.

PRIVATE LANDS

Approximately 376 million acres, or 51 percent of the range land of the West, is in private ownership. Theoretically the incentive of ownership should have kept large areas in good condition, but actually it has been so ineffective that the original grazing capacity

has been reduced by more than half. Only on scattered ranges and individual ranches is the range in good condition.

One wool growers' association in Idaho has maintained most of its forage in far above average condition, numbers of stock and grazing seasons have been limited, and reasonably satisfactory management has been established. A cooperative association in Montana has been equally successful. Individual ranches which have maintained their ranges through management might be cited in all States. In California a number of ranges which have been grazed continuously for over 50 years have been managed on a sustained forage yield basis. One badly depleted ranch in Marin County has been virtually

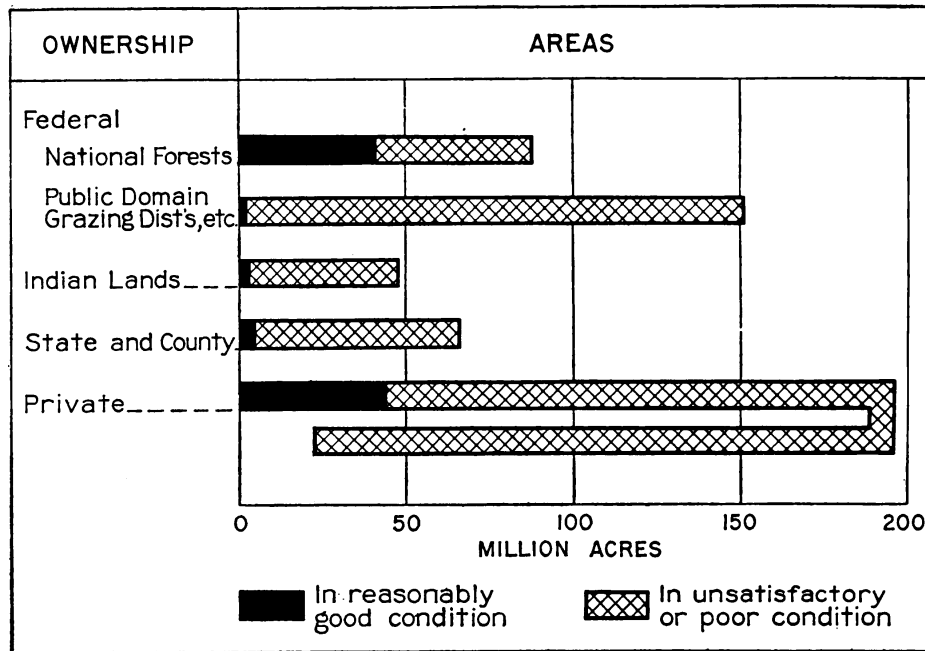


FIGURE 15.—RANGE AREAS IN REASONABLY GOOD AND IN POOR CONDITION.

Only about 95 million acres of the total range area is now in reasonably good condition, and nearly 90 percent of this is on the national forests and private lands. The reasonably good areas in other ownerships and forms of control are insignificant. Even more impressive is the size of the areas in unsatisfactory or poor condition.

restored, and a 40,000-acre ranch in Humboldt County still supports a maximum stand of the valuable California oatgrass. A 12 million-acre area in the sandhills of Nebraska, where the blowing of the soil following depletion early taught the stockmen the need for conservative grazing, has largely been maintained in good condition. This area as a whole constitutes an outstanding example of satisfactory management of privately owned range lands.

The explanation of these exceptional cases lies in various combinations of favorable natural and economic conditions—better than average growing conditions; highly resistant and recuperative forage plants; good soils; good grazing capacity; conditions which favor good stock distribution; low purchase, carrying, and production costs; balanced economic units; favorable location to markets;

the influence of national-forest management; and finally, good business and range management. Such factors as these are responsible for roughly the 44 million acres or 12 percent of privately owned range that is in good or fairly good condition.

INDIAN LANDS

More than 48 million acres of grazing land chiefly within western reservations fall into the Indian land category (fig. 17). The present condition of this range varies from reasonably satisfactory in Oregon, Washington, a portion of Idaho, and the northern Great Plains, to serious depletion on most of the area in the Southwest.

Indian lands as a whole have been depleted 51 percent, and during

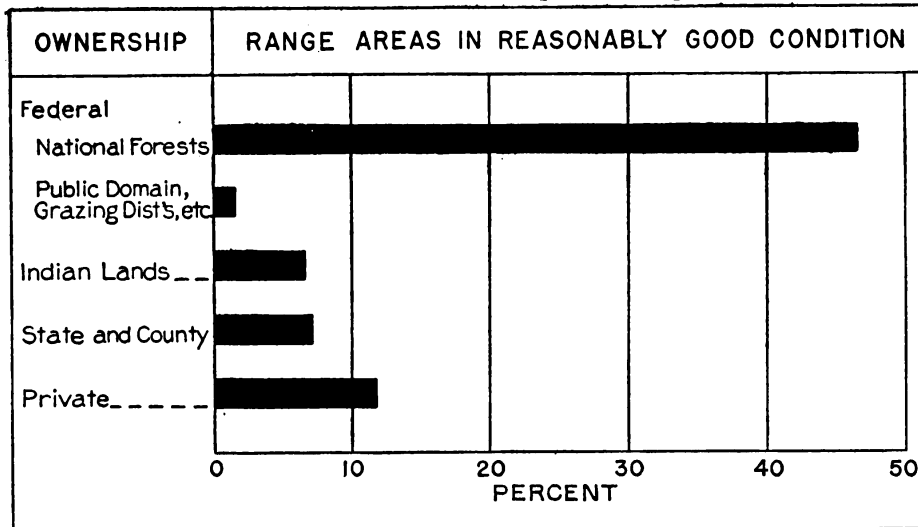


FIGURE 16.—PERCENTAGE OF RANGE OWNERSHIPS IN REASONABLY GOOD CONDITION.

When the percentage of total range areas in reasonably good condition is taken into account, the story is markedly different from that in figure 15. The national forests have the best record, but this is creditable only in the light of the condition of the ranges when management began 30 years ago.

the last 30 years the trend on three-fourths of the area has been downward, while improvement has been confined to 10 percent.

What lifts the Indian lands into the exceptional classification, however, is the extension of a definite program of management over all range lands in 1930 with the delegation of grazing supervision to the Forestry Branch in the Bureau of Indian Affairs. On the northwestern reservations, where earlier progress had been made, the program was readily put into effect. Elsewhere the major provisions of the program have been applied to the grazing of white-owned livestock. Progress has been slow, however, on ranges used by the Indians themselves, especially in the Southwest. It is hoped that through persistent effort and extension work the overstocking can be reduced. The recent Wheeler-Howard Act provides among other things for the stabilization of land status and authorizes consolidation for management purposes. All in all, while difficult problems remain unsolved, the stage has been set for satisfactory range conservation on Indian land.

GRAZING DISTRICTS

The Taylor Grazing Act (June 1934) authorizing grazing districts of 80 million acres consummates many years' effort to place the open public domain under administration. Sixty-one million acres of range lands have been included in grazing districts. More than 67 million acres of Federal lands in the unreserved public domain and

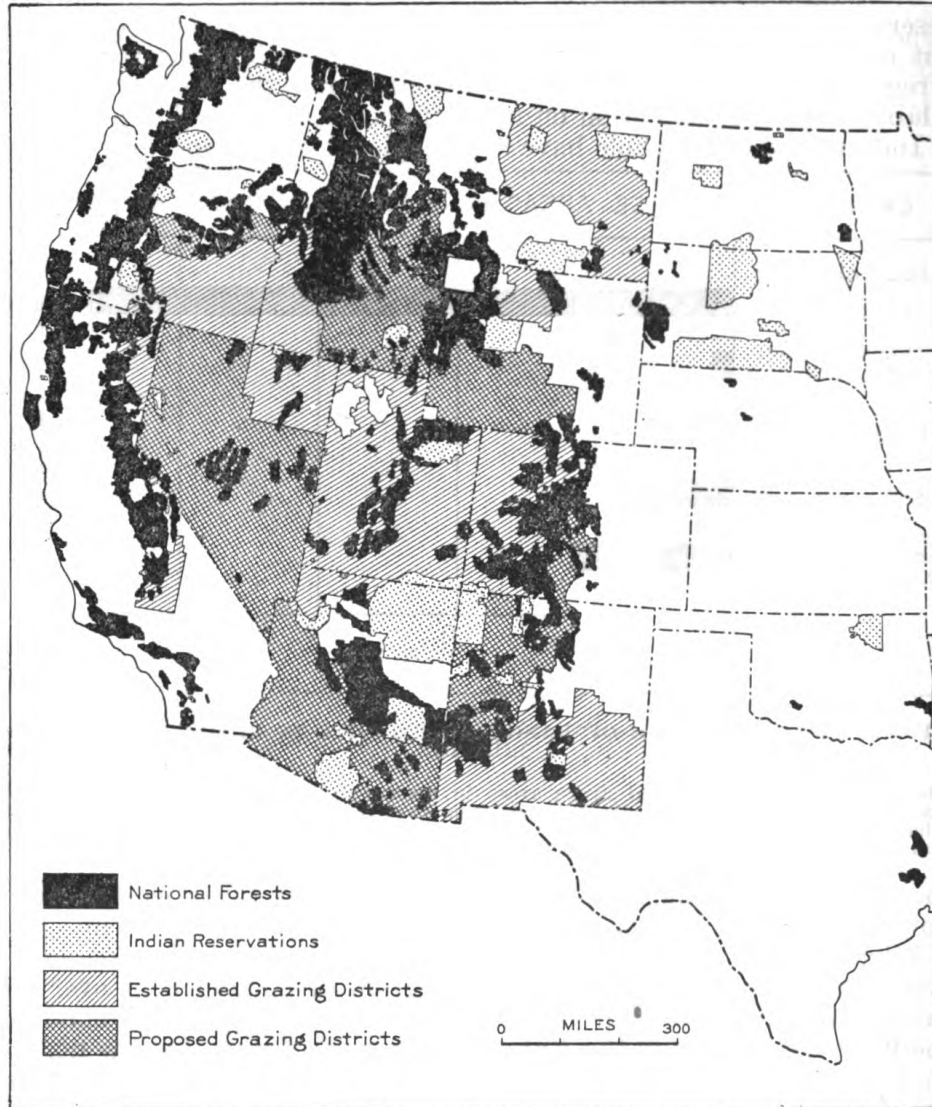


FIGURE 17.—The national forests, Indian reservations, and established and proposed grazing districts.

approximately 23 million acres in various reservations and withdrawals still lack any provision for grazing management. With average deterioration on the public domain of nearly 70 percent, which crowns a downward trend for nine-tenths of the whole for the last 30 years, this is the most seriously overgrazed and depleted range land in the United States. More than 95 percent of the available range on the public domain grazing districts and other reserva-

tions is eroding, one-half materially and one-half severely; nearly 45 percent of the area is contributing silt to important streams, wildlife values have been greatly reduced, and the utter lack of conservation measures has led to serious social and economic maladjustments.

The title of the Grazing Act lists as its purposes:

To stop injury to the public grazing lands by preventing overgrazing and soil deterioration; to provide for their orderly use, improvement, and development; to stabilize the livestock industry dependent upon the public range; and for other purposes.

The Secretary of the Interior is directed to—

make provision for the protection, administration, regulation, and improvement of such grazing districts as may be created.

The general purpose of the act and many of its provisions are admirable, but its administration may be greatly hampered, or even defeated, by restrictive clauses. Much depends upon the administrative policies adopted under its broad discretionary powers. A clause in the first sentence, "pending its final disposal", that is of the range land, weakens the entire structure and discourages far-sighted objectives by implying a transitional status. Inadequate provision is made for special watershed protection and for the conservation of resources other than grazing, such as wildlife, forests, and recreation. The emphasis is primarily on grazing utilization.

The provisions of the act making the grazing privilege an adjunctive right in proportion to land and range-water ownership, perpetuate and enhance existing monopolies in land use with a public resource and may even encourage further monopolies. Adjustments needed to make the grazing privilege more fully supplement crop and other range lands, and contribute to the maximum number of satisfactory economic home units are hampered and may be blocked. Some provisions of the act may make grazing privileges practically vested rights and prevent reductions needed for range protection.

Cooperation with local associations of stockmen and appropriate State agencies is provided. It is doubtful, however, whether this desirable feature should be made the main instrument of administration. Present indications are that local control will be largely by advisers elected by the stockmen except for supervision and basic technical criteria for conservation of the natural resources by Government personnel. The danger is that because of economic pressure stockmen will not impose sufficient restrictions upon themselves and their neighbors to rehabilitate the range and manage it satisfactorily, and that they may not amply safeguard other resources such as watersheds, recreation, and game, in which the general public is vitally interested. It is questionable whether the incentive for good management will be greater than under complete private ownership.

THE NATIONAL FORESTS

The examples of even fairly satisfactory range management are so much the exception that it is difficult to outline the progress made on the national forests without giving the appearance of partisanship.

Large-scale range conservation and management has pioneered and largely centered on the national forests. Eighty-two and a half million acres, or 62 percent of the total area of the western national forests are usable and available for grazing. Approximately 1,430,000 cattle and horses, and 6,161,000 sheep and goats are grazed several months of each year.

The national forests are the direct result of action by far-sighted, public-spirited leaders who recognized the widespread exploitation and depletion of our forest and watershed resources and the critical need for their conservation and wise use. They began as "Forest Reserves" in the Department of the Interior under the act of March 3, 1891, which authorized the President to withdraw and set apart by Executive order areas for timber production and for maintaining favorable conditions of water flow.

Up to February 1, 1905, only 63.3 million acres had been set apart, but very little progress had been made in the administration, protection, and management of the lands. The policy was more one of "locking up" the resources than of wise use.

On February 1, 1905, the forest reserves were transferred to what has since become the Forest Service in the Department of Agriculture, and later renamed national forests. President Theodore Roosevelt increased the area to 194.5 million acres, to prevent further exploitation and monopolistic control. Civil service became the basis for selection of personnel and the organization was decentralized to facilitate and localize administration.

The objectives in the administration of the national forest ranges have been:

1. *Conservation and use.*—Perpetuation of all of the resources through protection, development, and wise use.

2. *Multiple use.*—Correlation in management and use of all the resources to obtain the highest net public benefits. In such correlation timber production and watershed protection are necessarily given high priority.

3. *Equal opportunity.*—Protection of the settler and home builder against monopoly and unfair competition in the use of the resources.

4. *Integration with agriculture.*—Relating the use of range and other national forest resources to farm-grown forage crops, range, and other agricultural resources to obtain the highest benefits from all the land.

5. *Stability of use.*—Safeguarding livestock agriculture by affording maximum stability in range use consistent with national forest objectives.

6. *Cooperation with users.*—Provision for an advisory voice in national forest administration by stockmen and other users.

7. *Local administration.*—A businesslike and technical administration designed and organized to settle local problems expeditiously according to local conditions.

Except for an advisory voice which came later, regulations incorporating these basic policies were put into effect on July 1, 1905. Modifications have been made from time to time for clarification and better application.

Most range managers in the Forest Service now have both scientific training and practical experience in range administration, a gradual transformation from a staff made up largely of men with

practical experience only. They ascertain, by local study, the relative value for grazing of the various range plants, their ability to withstand grazing, soil, and other requirements for growth and reproduction, the best methods of use, and other factors, which together determine safe grazing capacity, proper seasons of use, adaptability of the range to different classes of stock, requirements for sustaining the forage production, and how to hold the soil and maintain its fertility.

Range management plans which apply these data are in effect on four-fifths of the area. Stock is controlled on the range by salting practice, proper herding, and the construction of watering places, drift fences, and other range improvements. The stockmen participate actively in management both individually on their respective range allotments and collectively through livestock associations and advisory boards.

Grazing capacity has been improved 19 percent since 1910. National-forest ranges today on the whole are 70 percent as good as virgin range, as contrasted with 33 percent on the public domain and 49 percent on privately owned range in the West. Real progress has been made in range restoration, considering the pioneer nature of the effort, the extent of depletion when the forests were established, the time required for rebuilding the soil, the rough topography, the necessity of grazing large numbers of livestock each year, the overload of livestock carried during the war period, the recent protracted drought, the desire to avoid undue hardships on the livestock industry through drastic reductions, and the time required to overcome human inertia. All of these factors have retarded rehabilitation. But the fact remains that the range has not been fully restored. Too many sore spots remain, and remedial action has been too slow on many of them. For the national-forest range area as a whole it is difficult to escape the conviction that progress should have been greater, although it may be too easy in retrospect to minimize the handicaps faced and overcome. Watershed services, wildlife numbers, recreational use, and timber production have been increased, although here also there is still ample room for improvement.

On the whole, the possibilities of range conservation, use, and management have been demonstrated, and public responsibility has largely been redeemed. Shortcomings exist, and important unsolved problems remain, prominent among which are full range restoration and a further improvement in range management, more equitable distribution of grazing privileges socially and economically, in which too little progress has been made, and more satisfactory relations with range permittees.

RESILIENCE OF RANGE LIVESTOCK PRODUCTION

Range livestock production has shown a remarkable persistence. It has been like a patient suffering from several diseases any one of which the doctors believe should be fatal, but who continues to live a lusty, vigorous life.

Range livestock production has been a new American venture, without traditional background. For forage production it has had to contend with a climate which at best constitutes a drought more

severe than any which the remainder of the United States has ever experienced. Western droughts have periodically wiped out the gains of years. Cheap range feed has been the one great competitive advantage of the western range country under a serious marketing handicap as compared with the Middle West. This feed, by flagrant neglect and mismanagement, has been seriously damaged and in places almost destroyed. Over many millions of acres the fertile soil, slowly built up during thousands of years, has been wasted away and with it the basis of forage production. In going the soil has often carried damage and destruction to far-distant areas and communities.

Range livestock production has built up its land tenure under land policies so unsuitable that the final result is an indiscriminate mixture of holdings large and small, individual and corporate, private and public, Federal and State. It has been encouraged by competitive forces, and by public-land laws and policies formulated for entirely different conditions and transplanted with little or no modification, to assume the burden of millions of acres of submarginal land on which the private owner never had a fighting chance.

Maladjustments in the use of millions of acres of land for crop production, which widespread failure has shown to be suitable only for range, have destroyed for years to come some of the most productive range territory. In the balance of seasonal range areas and in the balance between crop and range feed a whole series of other maladjustments have crept in.

Although purely an agricultural function, the jurisdiction over Federal range lands has been split between two departments. One, charged with the responsibility for building up and supporting all phases of agriculture for the entire country, has for the past 30 years been trying on a large scale an experiment on the publicly owned national forests in the conservation of natural resources, including range, entirely new in American history. The other, charged with the responsibility for the disposal of Federal lands, has only within the last 2 years begun the attempt to administer the ranges which private owners could and would not take from the public domain. The agricultural agencies of the States have had little voice and no responsibility in the administration of Federal grants, which have been handled by agencies charged primarily with land disposal.

Range livestock production has operated under an almost impossible credit structure. It has been crushed time and again by depressions. Its markets have been controlled by outside agencies or forces, often to its detriment.

Within its own ranks it has often waged relentless war, big man against little, cattleman against sheepman. For years it fought the crop farmer, who has now become an essential part of a soundly balanced enterprise. It has all too often fought the public agencies which were attempting to maintain its resource and to solve its basic problems.

And yet possibly no other American enterprise has shown a greater resilience. None has had a greater confidence in the promise of the future or in its own ability to meet every problem which might arise. The only conclusion is a virility, an innate vitality, and something fundamentally sound in the use of range for livestock grazing

which deserves and should be given a far better opportunity in its own and in the public interest than it has ever had.

DRASTIC REMEDIAL ACTION REQUIRED

The bewilderingly complex range problem will be clarified and consideration of the program required for its solution will be facilitated by breaking it down into its component parts, many of which in themselves constitute important problems. This can be done only at the expense of some repetition of the preceding and following discussions. The reader may if he wishes skip this cataloging of problems to the point on page 40 where those of greatest immediate importance and urgency are summarized.

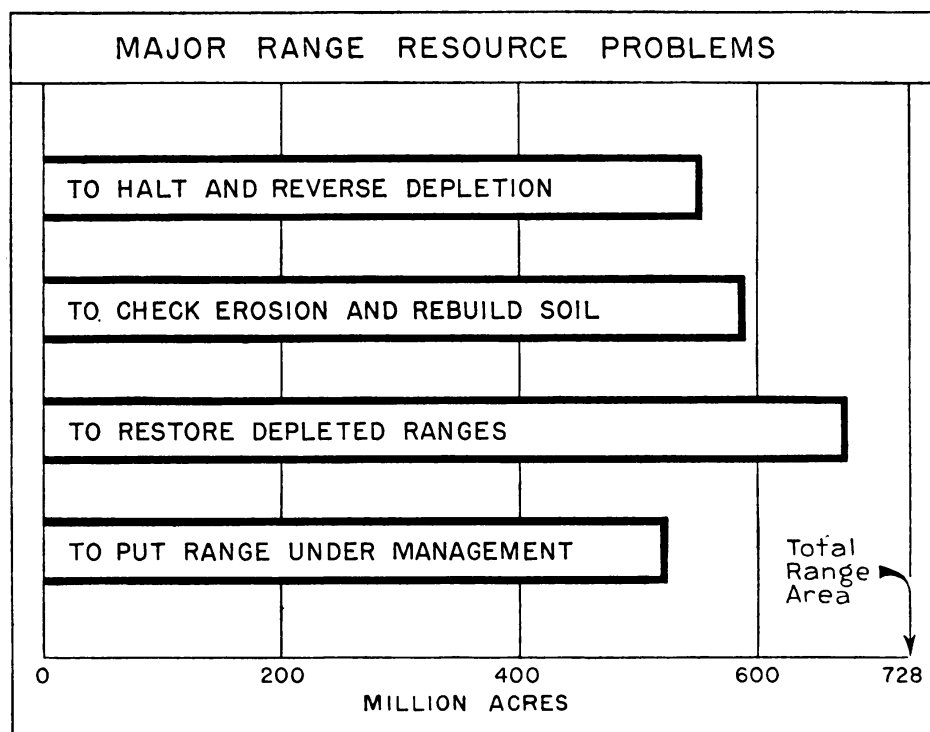


FIGURE 18.—MAJOR RANGE RESOURCE PROBLEMS IN TERMS OF AREA.

One measure of the magnitude of some of the major range resource problems is the hundreds of millions of acres on which constructive programs must be carried out. All constitute a high percentage of the total range area of 728 million acres.

The number of interrelated and overlapping problems in this break-down is so large and many of them are so crucial that no one is the key to the entire situation. They are so enmeshed in the established economic and social set-up that all solutions are fraught with extraordinary difficulties. No single feasible line of constructive action offers the remotest hope of a satisfactory solution.

1. One major group of problems centers in the range resource and its management.

(a) How stop further forage depletion on the 553 million acres, or 76 percent of the total range area still deteriorating, and start the forage on the upgrade (fig. 18).

(b) How place all range lands under management. Approximately 523 million acres is now subject to practically unrestricted grazing.

(c) How restore to the nearest possible approach to original productivity, and maintain in such productivity thereafter, the 675 million acres, or 93 percent of the range area, now depleted.

(d) How prevent further deterioration of the soil on which forage production depends on the 589 million acres now eroding more or less seriously, and start the rebuilding process.

(e) How restore the soil resource to the nearest possible approach to its original fertility, and maintain it at this level.

2. A second group of major problems centers in land and its ownership and use.

(a) How obtain the soundest distribution of ownership of range lands by curing existing maladjustments, and preventing their recurrence, first as between private and public holdings, and second, as between county, State, and Federal.

(b) How further unscramble the existing ownership mess, and obtain satisfactory livelihood units under private ownership, and units which will permit efficient administration under public ownership.

(c) How insure the use of land in the range country for the range use or crop production for which it is best suited, by rectifying existing maladjustments and preventing future recurrence; or to state much the same problem in another way, how obtain a satisfactory integration of range and crop agriculture, the best balance in private holdings, individually and collectively, and as between public range and private range and croplands.

(d) How, through the correlation of the various uses for which range lands are suited, obtain the maximum use or service consistent with the conservation of the resource, and hence the highest current public benefits. The uses involved are:

Livestock production estimated at a grazing capacity 50 years hence of at least 17.1 million animal units, instead of the present safe capacity of 10.8 million units.

Watershed services in the delivery of the maximum amount of usable water, with the minimum of erosion, silting, and destructive floods; services which on many areas will constitute the dominant requirement.

The production on forested ranges of timber crops which on the national forests will be one of the dominant uses.

Provision for such part of the rapidly growing need for recreation as the scenic and other facilities of the range country can furnish.

The sustained production of wildlife as a crop.

3. A third group of major problems centers in privately owned range lands and domestic livestock.

(a) How relieve private owners of the burden of lands submarginal for such ownership, and of lands on which the cost of maintaining high watershed or other public values is excessive for private holding, and how also prevent the passage of such lands to private ownership in the future.

(b) How care for and improve submarginal and high public value lands pending transfer to the public, which may require many years.

(c) How obtain a positive recognition of the responsibility of stewardship.

(*d*) How reduce the present 60-percent excess of 6.5 million animal units to what the range as a whole can carry and still improve. Because of livestock ownership the producer is as directly concerned on public lands as on those he holds in fee simple.

(*e*) How place private range lands under satisfactory range management.

(*f*) How restore to the western livestock producer and how maintain his one large competitive advantage of cheap range feed.

(*g*) How aid private owners to acquire economic units which will support a family under reasonable standards of living.

(*h*) How minimize or remove the other existing financial handicaps to economically justified private ownership in inflated land values, unsound credits, unsatisfactory market conditions, etc.

(*i*) How improve existing range animal husbandry.

(*j*) How furnish a reasonable incentive to the private landowner to produce and protect game on his own lands.

4. A fourth group of major problems centers in State and county range lands.

(*a*) How reconcile the need for the conservation of the range resource in the general public interest on Federal land grants with the demand for revenue from these lands by dependent institutions.

(*b*) How provide for the administration and management, for the various purposes for which they are suited, of all State and other public range lands by competent agricultural agencies.

(*c*) How bring order out of chaos in the handling of tax delinquency.

(*d*) How provide for the acquisition of the State's share of submarginal and high public value range lands.

(*e*) How provide for the consolidation of State and county ownerships into efficient administrative units.

(*f*) How carry a long-term constructive program, particularly if it cannot be made self-liquidating.

5. A fifth group of problems centers in Federal range lands.

(*a*) How, since it is a strictly agricultural activity, provide for the handling of the grazing districts by an agricultural agency.

(*b*) How place the remainder of the public domain and other Federal withdrawals and reservations under administration and management.

(*c*) How provide for a sound social and economic distribution of grazing privileges on all Federal lands; probably requiring on grazing districts the modification of organic legislation; and on the national forests, further improvement of administrative policies.

(*d*) How prevent the establishment of prescriptive rights on grazing districts.

(*e*) How prevent a conflict in Federal and State authority in the administration of the grazing districts.

(*f*) How insure an effectively correlated administration of all Federal range lands, and at the same time recognize also the fundamental distinction between the national forests and the more strictly range group of lands. This means providing on the national forests for the necessary further correlation of range use with that of timber and other national-forest resources, and on other lands providing for the further correlation with the resources involved.

(*g*) How provide for the Federal share of the responsibility for acquiring private lands submarginal for such ownership, and lands

with high public values which cannot or will not be safeguarded by private owners.

(h) How provide for the consolidation of Federal lands into workable administrative units.

(i) How reconcile the existing difference between national forests and grazing districts in the Federal contribution to States, etc., in lieu of taxes and place it on an equitable basis.

(j) How provide for an effective working relationship between the Federal Government and the States in the handling of wildlife on Federal lands.

(k) How carry a long-term affirmative program, particularly if it cannot be made self-liquidating.

6. A sixth group of major problems centers in the social and economic aspects of integrated range and crop agriculture.

How prevent further human wastage and insure reasonable standards of living and social and economic security for the maximum number of people that the combined range and cropland resource can support. The handling of all lands regardless of ownership is involved.

7. A seventh group of major problems centers in basic knowledge.

(a) How obtain the basic information needed by both private and public owners on the biological, social, and economic phases of the conservation and use of the entire range resource.

(b) How insure the application of this knowledge by private owners and public-land managers.

In briefest form the lines of action of greatest immediate urgency and importance are—

1. *For the range and soil resource.*—To stop further soil and forage depletion, start both on the upgrade, reduce excessive stocking, and place all range lands under management.

2. *For land ownership and use.*—To rectify existing maladjustments and obtain a sound distribution of ownership between private and various public agencies, build up economic private and public units, balance and integrate crop and range use, and correlate the livestock, watershed, forest, wildlife, and recreation forms of range land uses and services.

3. *For privately owned range lands and livestock.*—To relieve private owners of submarginal and high watershed and other public-value lands, obtain a recognition of the responsibility of stewardship, reduce excessive stocking, place lands under management, restore cheap range feed, build up economic units, and minimize or remove various other financial handicaps.

4. *For State and county lands.*—To reconcile range conservation and the financial needs of State institutions, place lands under administration and management by agricultural agencies, solve the tax delinquency problem, and share the acquisition of submarginal and high public-value lands.

5. *For Federal range lands.*—To transfer the grazing districts to the Department of Agriculture; place all remaining lands under administration and management; to interpret and probably amend the Taylor Grazing Act to provide for a sound distribution of grazing privileges, prevent the establishment of prescriptive rights, and provide for the correlation of various grazing uses; and share the acquisition of submarginal and high public-value lands.

6. *For social and economic security.*—To prevent further human wastage and insure social and economic security for the population dependent on the combined range-cropland resource.

7. *For basic knowledge.*—To obtain and apply the information necessary for the conservation and wise use of the range resource for public betterment.

Implicit in these problems and lines of action is the question of the desirability or necessity, if Federal obligations are to be fully redeemed, for the full concentration of responsibility for public action in a single agency. A similar question holds for the States.

TO RESTORE AND MAINTAIN THE RANGE

It is perfectly clear from the preceding discussion that the range resource—the forage and the soil on which it grows—is the key to all forms of use and hence to all the social and economic benefits which should flow from such uses.

The most urgent range resource problems are to stop further deterioration of forage and soil and start both on the upgrade. The ultimate objective is full restoration and permanent maintenance in full productivity. The means which must be employed to accomplish both purposes is to reduce excessive stocking to what the range can carry and improve, and to place all range lands under management.

If the range is to serve its greatest usefulness, plans for stopping deterioration, and for restoration and maintenance, must be formulated around the highest form or forms of use, whether for the grazing of domestic livestock, for the services which watersheds should render, for timber production, for the production of wildlife, or for recreation.

FOR LIVESTOCK PRODUCTION

One specific indication of the size of the job of halting further deterioration, of restoration, and of maintenance is the 728 million acres of range land which it must cover.

A specific indication of the size of the restoration job is the fact that the present grazing capacity of the range as a whole must be increased by about 110 percent to reach its original condition. Still further, as shown by table 3, restoration must provide for more than 633 million acres now depleted more than one-fourth, nearly 390 million acres more than half, and nearly 120 million acres more than three-fourths.

TABLE 3.—*The restoration job in terms of areas now depleted*

Depletion classes	Area depleted	
	1,000 acres	Percent
Moderate (0-25 percent).....	94, 825	13. 0
Material (26-50 percent).....	244, 997	33. 7
Severe (51-75 percent).....	270, 470	37. 1
Extreme (76-100 percent).....	117, 904	16. 2
Total	728, 196	100

In briefest form the specific lines of action required are:

1. First and by all odds most important, the reduction of stocking to the actual present grazing capacity. Since present stocking of the entire range area, now 17.3 million animal units, is 60 percent in excess of its estimated capacity, it will have to be reduced by about 6.5 million animal units.

The guiding principle should be stocking year after year with the number of animals which each unit will support each season without injury to the range. The outstanding need for restoration and the wide fluctuations of climate and hence of forage production require conservative stocking for satisfactory results, and this under most conditions should leave from 20 to 30 percent of the palatable growth of the important forage plants during average years. In addition, stocking should be low enough to prevent injury to watersheds and tree growth, and should be properly correlated with wildlife and recreational requirements.

The practical difficulties involved in such reductions are fully recognized, but the owners of private lands and managers of public lands should not overlook the possibility that actual returns will be greater in the long run from conservation than from continued overgrazing. They may be greater immediately. The reduction figures given are for the entire range. Not all ranges and individual holdings are overstocked. Many stockmen who have overstocked free public ranges in self-protection will undoubtedly welcome the opportunity to make reductions to actual grazing capacity when these ranges are placed under administration and the feed for their livestock is assured.

2. A judicious balance for range rehabilitation between natural and artificial revegetation.

The cheapest and most practical method of halting destruction and of restoration on about 635 million acres or 87 percent of the total range areas is through the control of the stocking and the use of sound grazing systems. This means in essence merely giving the native forage a chance to come back under its own marvelous recuperative powers.

On about 38 million acres, or 5 percent, of the most completely depleted areas such as abandoned farm lands and those which are most critical from the standpoint of watershed protection, the choice lies between artificial revegetation, which has a great advantage in time but will cost about \$2.85 per acre, and waiting for natural processes, which according to the best information now available would require from about 20 years as a minimum to perhaps 50 years as a maximum.

3. Putting into effect on the ground the best available systems of grazing, including deferred and rotation grazing, continual moderate grazing, and alternate grazing, which are described in more detail elsewhere in the report. The use of these systems is required in both restoration and subsequent maintenance, as are also all of the following lines of action.

Such systems are in effect on about 80 percent of the national-forest ranges, possibly 40 or 45 percent of Indian lands, and 10 to 15 percent of private and State lands.

4. Adjustments of seasons of grazing to safeguard forage plant vigor and prevent damage to the soil.

Such seasonal adjustments have been made on at least 85 percent of the national-forest ranges and seasonal use is probably satisfactory on one-third to one-half of other ownerships.

5. Insuring the use of each range unit by the class of animals for which it is best suited. Where the wrong class of stock is grazed, especial care in stocking and management will be required. On public lands, at least, the proper balance between livestock and game is necessary.

About 80 percent of the national-forest ranges are grazed with the proper class of livestock, but information on other ownerships is not available. This phase of management will be increasingly important as the need for greater efficiency in the use of available forage is recognized.

6. Employment of all practical means such as salt control, water development, herding, and in some cases fencing, to obtain the closest practical approach to even distribution of stock over the range and to reduce livestock handling costs.

Such means are in effect in varying degrees on a rather high percentage of national-forest ranges, on possibly half the private ranges, and on still lower percentages of other ownerships.

7. The preparation and use of practical range management plans, which for most private owners can be very simple. For the private owner, public assistance in their preparation should be made available through extension services.

Serviceable range management plans have been prepared for approximately 82 percent of the national-forest ranges and intensive plans for 48 million acres. Nearly 57 million acres, including intermingled lands, still need range surveys as a prerequisite for fully satisfactory plans. General plans have also been prepared or are in preparation for all Indian range lands, but 28 million acres require range surveys for intensive plans. Nearly 150 million acres of grazing districts and other Federal range lands will need surveys for management plans. Many private owners have sketchy plans for handling their ranges but only a small percentage have developed and applied plans adequate to prevent deterioration and insure rehabilitation of depleted ranges.

8. Animal husbandry is an essential part of the livestock enterprise. Despite rather marked progress, there is still room for improvement. Better practices such as the use of high-quality sires, limited breeding seasons, the culling of aged cows and ewes, supplemental feeding designed to offset mineral deficiencies in range feed, etc., should increase calf and lamb crops, improve the quality of the animals, and increase the prices received. Owners should then be able to obtain the same or greater income from smaller herds and to graze their ranges more conservatively.

FOR WATERSHED PROTECTION

For satisfactory watershed protection, a range service at least equal in value to that for livestock grazing, the following additional provisions are necessary:

1. If some necessary precautions are taken, restoration, and maintenance of plant cover adequate to meet watershed requirements satisfactorily on most ranges is possible under grazing.

2. On approximately 135 million acres of depleted range, according to the best information available, more conservative utilization or greater care in the use of grazing systems, in seasonal use, etc., than that necessary to restore and maintain forage will be required.

3. In some instances, such as seriously eroding areas on the watersheds of important streams, temporary closure to all grazing will be necessary in the public interest. Perhaps 50 million acres may be involved since this will include the 38 million acres requiring artificial revegetation.

4. Small critical range areas, perhaps not to exceed 5 percent of the total range area, will require special erosion-control measures. The exact conditions under which the cheaper and more practical means of natural revegetation must be supplemented by special measures is uncertain, and the most effective measures and what they will cost, are still in an experimental stage.

5. Limited areas, such as municipal watersheds, and those of irrigation reservoirs where the plant cover is on a hair-trigger balance because of adverse conditions, will need to be closed permanently to grazing. A total of about 11.5 million acres fall into this category.

FOR TIMBER PRODUCTION

Included in the range area is about 78 million acres of forest land capable of producing commercial timber crops. Nearly 90 percent is in national forest and private ownership. Under proper management livestock can ordinarily be grazed without jeopardizing the more profitable use for timber growing.

An additional 76 million acres classified as range lands in this report contains forests which will not grow commercial timber products. Here, ordinarily, the choice of dominant use will be between grazing and watershed protection.

FOR WILDLIFE

1. The primary requirement for wildlife is the nearest feasible approach to natural environmental conditions through halting further range deterioration, and through restoration and maintenance. Along with this must go clear-cut recognition of the fact that wildlife is a product of the land and can satisfactorily be produced only as a crop.

2. If properly managed the wildlife resource need not, except on limited areas, conflict seriously with the use of the range for other purposes. For big game animals and waterfowl, exclusive use may be required of only relatively limited areas of range land, in addition to the 2.8 million acres already reserved in the national forests, and areas acquired by the Biological Survey for migratory bird refuges and other wildlife preservation.

3. The strengthening of the basis for cooperation between the Federal Government and the States is a badly needed initial step in the handling of game on Federally owned lands.

4. Beyond this, the development of a coordinated administration of wildlife on all lands regardless of ownership is necessary.

5. The working out of some way to retain hunting and fishing privileges for the average man, which the American sportsman re-

guards as a birthright, is an increasing challenge, as is also some incentive to private landowners to produce and protect game.

6. Other considerations include—

(a) Recognition of the need for wildlife management plans and provision for actual preparation.

(b) Selection of the personnel in game administration agencies by the merit system rather than by political preference. This necessarily includes the recognition of wildlife management as a profession.

(c) Provision for needed refuges and sanctuaries.

(d) The ironing out of difficulties in licensing and law enforcement.

(e) Provision for the artificial planting of game where needed and feasible.

FOR RECREATION

1. Recognition of the inspirational, social, and economic value of recreation, taking into account its phenomenal recent and probable future growth.

2. Recognition of the fact that range lands have an important recreational function although it is seldom their dominant use.

3. Careful planning, which under most conditions will make possible full recreational use without undue restriction of either livestock use or that by wildlife.

4. Such local adjustments in grazing use as may be necessary.

5. The cash value of recreation in which livestock producers share is an important factor offsetting possible losses. The western "dude ranch" is an example of direct returns, but community returns benefit livestock producers indirectly.

FOR PRIVATE LANDS AND LIVESTOCK

Three hundred seventy-six million acres of western range land is in private ownership. During a few decades, livestock grazing has depleted this area by 51 percent; 85 percent or about 318 million acres is still going down; more than 15 million acres will require artificial revegetation; only about 12 percent or 44 million acres is in good or fairly satisfactory condition.

The magnitude of the private-land problem in area, in estimated present grazing capacity, and in potential grazing capacity 50 years hence, is shown graphically in figure 19 in comparison with public holdings.

The lines of action involving privately owned lands and livestock, which have been designated of greatest immediate urgency and importance in an affirmative program, should be repeated in order to bring the provisions which follow into sharper focus; to relieve private owners of lands which they cannot carry and redeem the responsibilities of stewardship, reverse the process of forage and soil depletion by reducing overstocking and placing all lands under management for their highest forms of use, restore cheap range feed, balance range and cropland use, and to build up economic units and minimize or remove other financial handicaps.

The private ownership of land is so ingrained in our national philosophy that the obvious action called for on range lands is to

afford to private owners the most favorable possible opportunity to hold all lands which are above the submarginal line, or which do not have a special public interest. This more specifically requires combined private and public action to remove or at least to minimize the handicaps which have served to make private ownership precarious under all but the most favorable conditions.

Range lands which, because of low inherent productivity and high ownership costs, are clearly submarginal for private ownership, or which have high public values involving expenditures beyond pri-

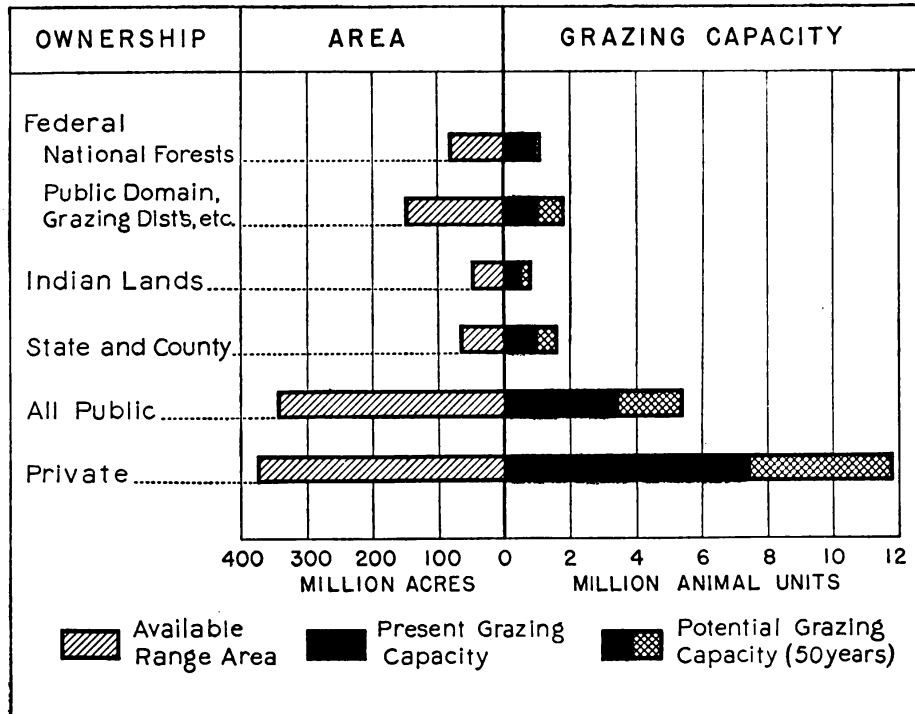


FIGURE 19.—GRAZING CAPACITIES, PRESENT AND POTENTIAL, BY OWNERSHIPS.

Privately owned lands comprise only slightly more than half the range area, but have more than double the present potential grazing capacity of public lands. Such public lands as national forests, the grazing districts, and the public domain are much more important than either acreage or grazing capacity alone indicates, the national forests because of the shortage of summer range and the grazing districts because of the shortage of winter range. Furthermore, these public holdings are the largest areas under single forms of control. Private ownership is not the simple, compact entity that the diagram indicates, but is made up of several hundred thousand ranch, corporate, and other holdings. The transfer of any such area as 125 million acres from private to public ownership will make significant changes in the relationships shown.

vate means fall into an entirely different category. The ways in which private owners may be relieved of the burden of carrying such lands, which total about one-third of those now privately held, are discussed later. Under the most favorable conditions which can now be foreseen, many years will be required for such a transfer. While nominally the following discussion covers the entire area in private ownership, it deals primarily in fact with the lands above the marginal line and without high public value which will remain permanently in such ownership. But it must be recognized that the submarginal and high public value lands will constitute a particularly acute problem prior to transfer.

The universal private ownership of domestic livestock, large numbers of which graze on public lands, broadens the problems of the stockman far beyond his own land holdings and increases the public responsibility for the welfare of the livestock industry.

THE RESPONSIBILITY OF STEWARDSHIP

For reasons already outlined, the private owner's responsibility for the stewardship of land is a concept conspicuous largely by its absence in the United States. Ownership has been regarded as carrying the right of unrestricted use even though it meant destruction and even though the evil consequences of destruction did not stop with the owner but extended to the public and to posterity.

Basic to the restoration and conservation of the range resource is the recognition of an entirely different philosophy: that ownership carries with it the obligation and responsibility for preservation, which the owner owes to himself, to his descendents, and to the public.

Satisfactory recognition and practical application can be obtained only by the fullest cooperation of private and public agencies in such ways as: (1) Local regulatory laws on the use of land; (2) framing and adoption of land policies; (3) land zoning and planning; and (4) various other measures outlined in more detail in the following.

RANGE MANAGEMENT, ANIMAL HUSBANDRY, ETC.

Information is already available on simple practical systems of range management and the handling of stock on open ranges which will permit vast improvement over existing practices, and which should increase the financial returns of the stockman and at the same time restore and perpetuate his basic resource. Although animal-husbandry practices are far in advance of range management on private lands, there is still room for improvement.

Involved are:

1. The recognition of cheap range feed as the outstanding competitive advantage of the western stockman.

2. The recognition of overstocking followed by the necessary reductions, which from the information now available for privately owned ranges as a whole will have to be about 38 percent (figs. 20 and 21).

3. The application of sound systems of management and handling of livestock on the range. This and the preceding should stop depletion and start recovery on the 318 million acres which are still deteriorating.

4. Artificial revegetation on 15 million acres.

5. Water development, fencing, and other improvements, rodent control, etc., as a basis for range improvement and better use of the range.

6. Simple, practical range management plans based on actual conditions—in essence, carefully considered planwise efforts to raise the standards of handling all ranges.

7. Better animal-husbandry practices, such as breeding, culling, supplemental feeding, etc.

The private operator has both an opportunity and an obligation to put such measures into effect individually or through cooperative associations.

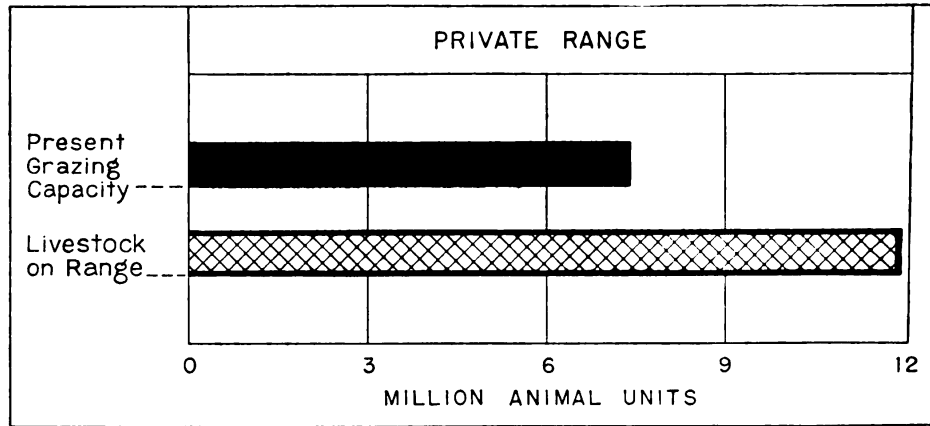


FIGURE 20.—EXCESSIVE STOCKING ON PRIVATE RANGES.

One of the most crucial and immediate problems on privately owned range lands is the reduction of excess stocking, estimated at about 4.5 million animal units. No other single form of action will do more to stop deterioration and start the ranges on the upgrade.

The public can make a large contribution by conducting research and giving advice and assistance through extension agencies in accordance with the plan followed in crop agriculture.

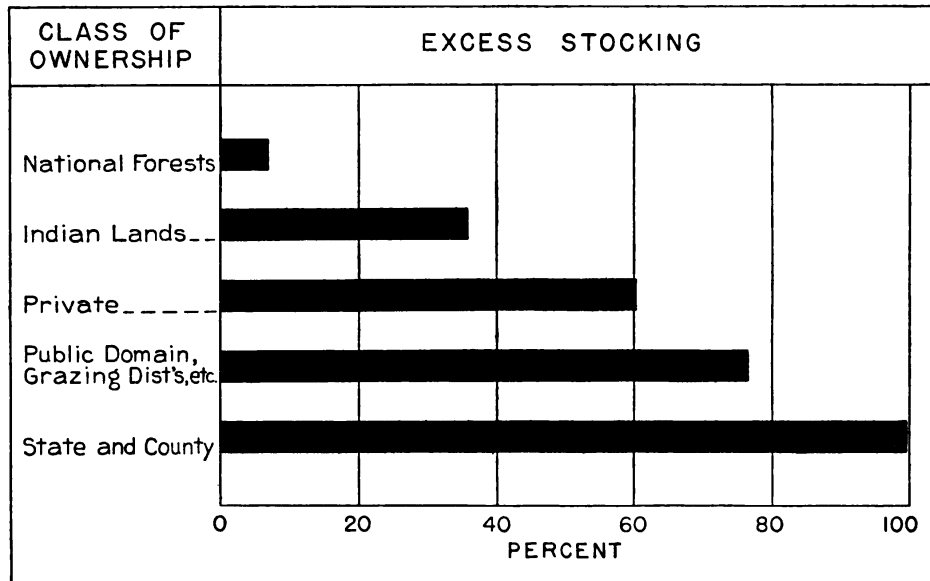


FIGURE 21.—PERCENT OF EXCESS STOCKING BY OWNERSHIPS.

Except on the national forests, the removal of excess stock is a critical problem. Even on the national forests, where the excess is relatively small, the problem will be difficult.

Where large cash outlays are required for revegetation, erosion control, range improvements, etc., public assistance might take the form of doing a part of the work or of subsidies provided, in view

of the recent A. A. A. Supreme Court decision, they can be made conditional upon requirements for improved range practices, or provided some other effective means can be worked out.

The Soil Conservation and Domestic Allotment Act may provide a means for aiding both private and public owners to restore and maintain the soil and range resource. Any payments to private owners or tenants, or to the permittees on public ranges, which may be made under this act, should among other things be conditional upon livestock reductions to the grazing capacity of the range, and upon such other requirements as satisfactory systems of range management, proper seasonal use, etc.

Among the responsibilities of stewardship carried with private ownership of land is watershed protection. The major part of watershed responsibilities for especially hazardous conditions must, however, be borne by the public.

About 25 million acres of privately owned forest land capable of growing commercial timber is valuable also and available for grazing. On such lands higher returns can ordinarily be obtained from timber growing, and consequently it will be in the self-interest of the owner to make timber growing the dominant purpose of management. Timber returns can usually, however, be supplemented by those from livestock grazing.

For the production of game some form of compensation to the private owner will be necessary, either by sportsmen's associations or the States. Precedents exist in several States.

RECONSTRUCTION OF ECONOMIC UNITS

As a result of factors already discussed, including unsuitable land policies, large numbers of land units in the West are uneconomic from the standpoint of supporting families under reasonable standards of living, and hence socially undesirable. Such units fall into three classes: (1) Undersized cash-crop livestock units; (2) undersized livestock units; (3) oversized livestock units.

Sound economic units will vary within wide limits because of radically different regional and local conditions and the differences in individual enterprises. The formulation of guiding principles for working out such units constitutes an exceedingly complex and difficult problem, and the application will be even more difficult and time consuming.

The tendency already begun to build units up to economic size should be encouraged. Provision will have to be made, however, for the resettlement on irrigation projects or otherwise of people who are eliminated.

The tendency for oversized units to break down should be encouraged and this should help to take care of excess population eliminated in building up small units.

The size of satisfactory units may under some conditions be held down by a greater diversification of crops and at the same time a more stable agriculture assured. The building up of range productivity should also be a factor in holding down the size of satisfactory range units.

The addition to the already large area of public range land of about one-third of the land now privately held will accentuate the

place which the use of public lands must fill in economic units. The availability of public lands will reduce the size for private units. It must be recognized, however, that the total area of range land is not large enough to meet all requirements, that practically all ranges are already badly overstocked, and that the soundest use of public range will be to build up economic units and not to perpetuate uneconomic units.

The availability of public ranges on the national forests, grazing districts, and State lands should afford an opportunity for labor to supplement income and hence to reduce the size of private units which would otherwise be necessary.

Despite the fact that up to the present economic units have not insured satisfactory handling of the range, they do, theoretically at least, constitute an essential basis for stabilizing private ownership and insuring economic security, and should accordingly receive corresponding attention.

INFLATED LAND VALUES

Both owners and their creditors must be prepared to accept deflation of range-land prices to actual values, and public agencies can render material aid by placing credit on a sound basis. Authoritative information on values, obtained by research, should be invaluable as a guide.

PRODUCTION CONTROL

The excess of annual exports over imports in "meat and meat products" dropped by more than 80 percent, to \$49,000,000, between the 4-year period ending June 30, 1926, and that ending June 30, 1935. Net imports of "wool and mohair" decreased by nearly 90 percent, to \$15,000,000 for the same periods.

These changes reflect both a decreasing export market and changing requirements at home. Stockmen no longer have the advantage of a continuously expanding domestic market.

Manufacturers can rather easily restrict their output to demands, but because of the nature of the enterprise similar action by livestock producers is much more difficult. Some means of avoiding unmanageable surpluses will undoubtedly be desirable in the interest of the producer and consumer alike.

MARKETS

To overcome marketing handicaps producers have in their own hands such means as cooperative associations and the uniform grading of their products. The public can continue to assist by encouraging cooperative marketing; by studying such questions as distribution, marketing differentials, the demands of the trade, etc., and making the information available; and by preventing combinations in restraint of trade and unfair practices prejudicial to the livestock producer.

CREDIT

The prime needs in the credit situation are to adapt credits to the requirements of the livestock industry, as to period of loans and

rate of interest, to base loans on the productivity of both the range resource and livestock as collateral, and to couple with loans the requirement that the range resource be maintained.

More favorable and satisfactory public credit facilities are rapidly being developed under the Farm Credit Administration.

TAXATION

Much more exact information is required before any great improvement in the taxation system can be expected. While the task of obtaining such information is a public obligation, the livestock industry can encourage such undertakings.

RESEARCH AND EXTENSION

Both research and extension are primarily public responsibilities, but should be encouraged by the livestock interests. The program needed is outlined hereafter.

IN PUBLIC LAND ADMINISTRATION

Exclusive of that proposed for Federal and State acquisition, the areas of publicly owned or controlled range land with which the following program deals are summarized in table 4.

TABLE 4.—*Area of publicly owned range lands*

Ownership or control	Range area	Available range
Federal:	<i>Acres</i>	<i>Acres</i>
National forests.....	88,000,000	82,500,000
Grazing districts.....	¹ 65,500,000	² 60,600,000
Public domain.....	196,700,000	² 67,200,000
Other.....	23,000,000	21,600,000
Indian lands.....	48,400,000	48,400,000
State, county, etc.....	65,500,000	65,100,000

¹ Gross area.

² Also total range area.

Here again, despite repetition, the action of greatest immediate urgency and importance should be restated in order to obtain the proper emphasis on the various provisions of the public range land program proposed: To transfer jurisdiction to agricultural agencies in order to obtain effective correlation and administration; place all remaining lands under administration in order to reduce excessive stocking, get ranges under management, and reverse forage and soil depletion processes; in administration and management, to follow the multiple-use principle, obtain a sound distribution of the grazing privilege, and avoid prescriptive rights; consolidate holdings into efficient administrative units; relieve private owners of the lands they cannot carry, by purchase or acceptance of gifts; rectify the chaotic tax-delinquency situation; and use public lands as an affirmative means to social and economic security.

FEDERAL RANGE LAND JURISDICTION

One of the most urgent problems confronting the administration of the Federal range lands is that of jurisdiction. The 82.5 million acres of available range in the national forests is administered by the Forest Service in the Department of Agriculture, but the 60.6 million acres already in grazing districts is administered by the Grazing Division in the Department of the Interior. The latter Department is also responsible for the 67.2 million acres in the public domain which have not been placed under administration.

Some fundamental differences in national forest, and grazing district and public-domain lands, as well as some fundamental similarities, must be recognized. The national forests contain important timber, watershed, wildlife, and recreational resources which are intermingled with and cannot be segregated from the range resource.

The grazing districts, the public domain, and various other unmanaged Federal withdrawals are largely arid or semiarid lands valuable primarily for grazing, but in part having very high watershed values and also values for wildlife and recreation.

Because of the fundamental differences, the territorial integrity of both classes of units should be maintained. But some boundary adjustments are needed to place in each the resources it is designed primarily to conserve, to round out natural topographic units, and to simplify administration.

Because of the fundamental similarities, the range administration of both classes must be closely correlated. Both must be integrated with ranch and farm lands, and in many cases with the same lands. Large numbers of livestock, and game in some instances, are dependent on the national forests for summer range and the grazing districts for winter range. The grazing districts can relieve the shortage of spring-fall range on the national forests. Some range improvements can serve both classes of land. Both can benefit by an interchange of supervisory and technical services and information.

Having to deal with two entirely distinct personnel groups in two Departments on different phases of a single problem creates an impossible situation for the user. Policies, procedure, legislation, point of view, and basic theories which should be consistent are bound to differ.

Practical experience shows conclusively that misunderstandings, conflicts, and jurisdictional disputes, all of which reduce efficiency and public service, are bound to arise. Stockmen are placed in a position in which the easiest way out may seem to be to play one department against the other, often to their own detriment and that of the resource.

Finally the ultimate cost to the public of separate departmental jurisdiction, assuming thoroughly efficient administration, and taking duplication of effort and field and overhead organizations, etc., into account, will certainly be higher. In short, there seems to be no justification whatever for splitting jurisdiction between two departments.

A decision on the most logical and effective jurisdiction should take the following factors into account:

The management of range and also of forest lands is agriculture pure and simple. It deals with the soil, the interrelation of soil and plant cover, water and climate, with plants and animals, the diseases and insects affecting both, with the maintenance of biological balances between plant and animal life, with the growing and harvesting or utilization of crops, in fact, with all of the "problems relating to the growth from the soil." It deals with the economic and social as well as the biological problems of land use in all of their phases. It must rest upon the biological and economic sciences which have to do with soil, water, climate, plants, animals, and land.

The forage on public ranges is used by livestock from the farms and ranches, which are fed increasingly on farm forage crops. Western crops are largely dependent on irrigation water from forest and range watersheds. The use of the public range and forest land and private range and farm land is interrelated in innumerable other ways.

The Department of Agriculture, as one of its major projects, is attempting to meet the Federal obligation to help agriculture develop a sound program. In this undertaking the problems of the public range and forest lands cannot be separated from those of other range and crop lands.

Nearly all the Federal bureaus charged with research and administration relating directly and vitally to forestry and range management and to the development of a land-use program are in the Department of Agriculture (fig. 84). It is the duly constituted and authorized Federal agency for dealing with the agriculturist. It works in close cooperation with the State agricultural colleges, experiment stations, and extension services.

The Department of Agriculture is, therefore, the logical and, in fact, the only well-equipped department for the administration of federally owned range and forest lands.

PRINCIPLES OF ADMINISTRATION

The principles which should govern the administration of all federally owned range lands, whether on the national forests or the grazing districts, including the public domain and other Federal withdrawals and reservations, are:

1. Management which will restore and maintain in perpetuity on a sustained yield basis, and utilize, all of the resources of the land.
2. The correlated use of all the resources to obtain the highest net public benefits.
3. The integration of the public-range resources with privately owned crop and range lands to obtain the highest benefits from all of the lands locally, regionally, and nationally.
4. An equitable distribution of the grazing privilege, based on the highest net public benefits, to those who are dependent upon and are entitled to use the range.
5. Readjustments of land ownership and use where needed and justified to facilitate economical and efficient management and administration of public range lands.
6. A decentralized administration qualified to settle local problems in accordance with local requirements, and responsive to the advice

and assistance of local users to the extent consistent with the protection of the public interest—the antithesis of bureaucracy.

The application of these principles requires a far greater development of research than has hitherto been possible, and the prompt and full use of the findings. The purpose of enhancing private opportunity on lands suitable for such ownership, and the still broader purpose of insuring the greatest possible social and economic stability of the dependent agricultural and other population, must underlie the entire administration of the public range resource.

NATIONAL FORESTS

The principles outlined, with occasional minor modifications to meet conditions, have been the basis for national forest administration for many years. The chief tasks of the future are:

1. A reduction in stocking averaging 6.5 percent to reach the present grazing capacity of the range (fig. 21). Restoration during the next 50 years should make it possible for these ranges to carry 20 percent more stock than the present grazing capacity of the range.

2. A strengthening of range management; including the preparation and use of intensive management plans on the 40 million acres not now so covered and periodical revision when necessary; seasonal adjustments not satisfactorily solved on about 12 percent of range allotments; reseeding of about 780,000 acres; other special treatment for sore spots; improvements such as water developments and fencing, rodent control, etc.

3. Improvement in the basis for the distribution of the grazing privileges to insure a more effective tie with privately owned lands and to afford greater security to the small private operation dependent on and entitled to use public ranges.

4. Occasional changes for a better correlation of range uses.

Approximately half, or 43 million acres, of the national forest range area is forest land capable of producing commercial timber. On such lands timber production will have to be the dominant use because of the provisions of organic legislation and the general purposes for which the national forests were created. Grazing use will generally be possible but will have to be made contingent upon the protection of forest growth and continuous forest production.

About 22 million acres additional is noncommercial forest in which the correlation required will be between livestock grazing and watershed protection.

Since organic national forest legislation provides for “maintaining favorable conditions of water flow” the handling of livestock grazing must insure watershed protection. On relatively limited areas special erosion-control measures are required.

GRAZING DISTRICTS, PUBLIC DOMAIN, AND OTHER FEDERAL

Practically the entire problem of placing the grazing districts and public domain under management lies ahead. The complexity and difficulty of the task is accentuated by the existing depletion of nearly 70 percent, by the fact that 93 percent is still on the down grade, by long-established traditions of use, by an extremely involved

ownership pattern in some regions, and by private holdings of key areas in others.

To carry out such an essential measure as placing the remaining half of the public domain under administration and to insure permanence will require the modification of existing legislation.

To carry out other essential measures—such as an equitable distribution of grazing privileges; the reduction of stocking, which now exceeds grazing capacity by 43 percent (fig. 21), to insure coordinated use of all the range resources; to avoid the establishment of prescriptive rights; and to avoid a conflict between Federal and State authority—will require exceptionally favorable interpretation of the Grazing Act in the public interest, and probably also its modification.

In addition to the reduction of stocking, essentials in the field of technical management include putting sound systems of range management into effect, making adjustments in seasonal use, artificial restoration on at least 18 million acres, the control of erosion on many millions of acres, surveys, preparation and putting management plans into effect for the entire area, and a large improvement program designed to aid technical management.

The measures proposed should increase the present grazing capacity of the grazing district-public domain range by 76 percent in 50 years. Or putting it in another way, 50 years' effort will be necessary to build the range up to the point where it can carry safely the livestock now being grazed.

Some provision should be made for the administration and management of the 21.6 million acres of available range on other reservations and withdrawals, preferably by the Secretary of Agriculture with the concurrence of the Secretary of primary jurisdiction.

Definite provision is necessary also to prevent further alienation of Federal lands unsuitable for private ownership. One prerequisite for transfer should be classification by the Department of Agriculture, which should appraise not only the suitability of the land for private ownership but also the size of the unit required.

INDIAN LANDS

The primary objective in range management on 48 million acres of Indian owned but federally controlled range land is the social and economic advancement and security of the Indians.

The major and most pressing task is the rehabilitation of depleted ranges. For all Indian lands an estimated reduction in stocking averaging 26 percent is required to reach grazing capacity (fig. 21), and a still higher reduction is necessary on the half of the Indian grazing land in the Southwest where the depletion is worst.

This is a difficult situation, for unless depletion is stopped the Indians face ruin through the loss of one of their most important resources, but drastic livestock reductions will create another difficult problem. Removal of white-owned livestock, more equitable distribution of grazing privileges among the Indians, the purchase of additional range, the initiation of work projects, and the development of supplemental industries are possible shock absorbers.

Reductions in stocking must be accompanied by other improvements in range management, removal of worthless horses, rodent control, special erosion control, and artificial revegetation.

The consummation of the program proposed will, it is estimated, permit the grazing of about 13 percent more livestock 50 years hence than are now grazed.

STATE AND COUNTY LANDS

State and county range lands, aggregating some 66 million acres, fall into two general classes.

The first is the remnant of Federal grants to States designed to produce revenue for schools and other institutions. In the main these lands have been leased without control to obtain maximum current revenue and as a result have been depleted by 49 percent, and 88 percent of the total area is still on the downgrade.

The difficulty of the problem that the States face in these lands should not be minimized. The policy so far followed will ultimately defeat the purpose of the grants unless ways and means are developed to restore and conserve the resources which give the lands their value. In some instances already the ranges have been depreciated so far that they can no longer be leased. While constitutional and other limitations have been a factor, the very fact that these lands have not already been sold is an indication that a substantial part is submarginal for private ownership and should be retained by the public.

The other horn of the dilemma is that the State institutions are dependent in varying degree upon the receipts, and the range cannot be restored and administered without expenditures which may equal the receipts. The soundest course in the long run will probably be to restore and maintain the resource, making what other provision may be necessary for the institutions.

The second class is made up of private lands which have reverted to the States or counties through tax delinquency. That the total area is large is certain, but its exact extent is unknown. Much tax-delinquent land is still in a twilight zone between private and public ownership. Without doubt submarginality for private ownership is a primary cause. Depletion is also a primary cause because it has reduced the productive capacity of the lands and hence the returns from them. The combined depression and drought has hit hardest the poor and depleted lands and uneconomic units.

To meet the increasingly serious problem created by this "new public domain" a revolutionary change in policy in most if not all States is required. Only those lands above the marginal line on which the private owner has a chance for success, and those without high public values, should be returned to private ownership. Those below and those with high public values should be retained under public control. A differentiation can be worked out by such means as classification or zoning. On tax-reverted lands the problems of restoration and management are identical with those on institutional lands.

Except for possible minor modifications the principles which should govern management and administration are the same as those for Federal lands. A primary consideration will necessarily have

to be, as for Federal lands, the placing of responsibility for a purely agricultural function in agricultural agencies. Widely scattered small units will require consolidations through exchanges or otherwise. Stocking should be reduced to what the range can safely carry (fig. 21). State and Federal cooperation may be helpful in some instances.

PUBLIC ACQUISITION

A program has been outlined, having as its objective the keeping of private ownership as fully in the range picture as reasonable financial returns permit, by the removal of existing handicaps and the solution of existing problems.

The swing from public to private ownership has gone so far, however, that the maximum feasible self-help by private owners supplemented by everything that the public can reasonably be expected to contribute will still leave a major problem on a part of the 376 million acres of range land now privately owned. The classes of land involved are:

1. Approximately 15 million acres of range land on which the dry-farming effort has clearly failed, and on which private ownership now seems to be at the end of its rope. Failure has led to tax delinquency, abandonment, excessive relief rolls, and a long train of other adverse social and economic consequences. Unless artificial revegetation costing from \$3 to \$3.50 per acre is resorted to, natural processes will not restore the forage cover for years or even decades. The cost of revegetation or the alternative of protracted holding of unproductive land are both beyond the capacity of the private owner. Some other constructive action is therefore called for on what was, and is potentially, some of the best or most needed western range.

2. Range lands submarginal for private ownership, because of low or uncertain forage productivity, excessive depletion and slow recovery, high ownership costs such as investments required, improvements, taxes, etc. Low productivity and high costs are both accentuated by marketing costs, which are very high for all of the far western range States except California, in comparison with those of the Middle Western States. Taking all factors into account, the tall-grass prairies and the short-grass plains east of the Rockies offer the most favorable opportunities for private ownership, and the salt-desert shrub and southern desert shrub of the Intermountain and Southwest regions the least favorable. The best approximation which can now be made places 113 million acres of this category in the problem class.

3. Coinciding closely with the submarginal land area is a large area of range lands having high public values for watershed protection. The constructive management of these lands is a critical watershed problem, and because of the cost of the range restoration, restricted grazing, and other special erosion-control measures required, from many of which the public rather than the private owner will benefit, it is difficult if not impossible to hold them under private ownership. The total area of such watershed lands is about 118 million acres. It includes about 107 million acres of more or less seriously eroding land contributing silt to important western streams.

4. In the high public-value class are also about 6 million acres of privately owned range land needed in part for wildlife. These areas are widely scattered and are required to provide for such specific wildlife needs as winter ranges for deer and elk herds which summer in the national forests. These areas fall almost entirely within the two preceding classes.

5. Within and adjacent to the national forests are about 18.9 million acres of private range land, in part forested, which are needed to round out administrative units or for other administrative purposes and which should be acquired by the Federal Government. Some of these lands are probably also submarginal for private ownership.

Except for a small part of the land area discussed above, justification for public ownership depends upon more than one consideration. Submarginality for the greater part of the area is, for example, accentuated by high public watershed values. After making the necessary adjustments for the overlapping of the various classes, the area which should be taken over by the public totals on a very conservative basis about 125 million acres, or one-third of the range land now in private ownership.

Outright subsidies to hold submarginal and special public-interest lands in private ownership are very difficult to justify. For much of the area involved they would constitute a perpetual drain on the public treasuries, and for the private owner would merely postpone the day of final reckoning. Other possible alternatives which should be considered for the solution of this problem are very limited.

Legal regulation of private range lands, and particularly those of the classes described, encounters the difficulty that improvements in land conditions through better husbandry would cost money, while even with past husbandry the cards have been stacked against the private owner. Furthermore, regulation would be seriously handicapped unless it were supported by the large majority of owners, which is far from being the case.

The only additional alternatives seem to be public acquisition of the land by tax delinquency, by gift, or by purchase.

Although the record of both Federal and State management of range lands is spotty, the possibilities of constructive management have been shown on the national forests and some progress has been made on Indian lands. Even without the suggested acquisition program both the Federal Government and the States have large unsolved problems of range administration.

Since public acquisition in one form or another strikes directly at the problems of what to do with lands submarginal for private ownership and of those having high public values, it seems the only possible course, despite the problems for which public agencies still have to redeem their responsibilities, the long time which will be required for the consummation of the program, and the cost.

Acquisition by tax delinquency means letting the situation work itself out gradually through the play of economic forces. This plan has obvious advantages, and regardless of other action will have a place in the solution, but against the advantages must be weighed further depletion of the range resource, losses from the lack of watershed protection, and even more important, an appalling human wastage.

It is quite possible that considerable areas might be given outright to either the Federal Government or the States if the way were paved. Further inducements might be authority to pay an equitable proportion of accrued taxes, or the privilege of free use of the range under proper control for a limited number of years.

For much of the area, however, the only recourse will probably be outright purchase.

The transfer of large areas to Federal ownership will require suitable provision for payments to States and counties in lieu of taxes. Similar provision for counties will be necessary for lands acquired by the States.

This report is a first attempt to appraise the nature and extent of the various widespread and apparent fundamental maladjustments in ownership and in the kind of use of range lands and the remedies for them. The conclusions on the desirable or required shifts in ownership are necessarily approximations. A large amount of detailed study covering the entire range territory will be required to work out exact areas, locations, etc. Such detailed work is essential also to determine an equitable division of responsibility between the States and the Federal Government for which the data now available does not justify even an approximation.

One thing is clear, that the job of range-land acquisition is large and that it is essential in the public interest. A reasonable start is justified, even though the size of the job is not known with accuracy and though a division between the States and the Federal Government remains to be worked out. Since both public action and inaction have helped to create the problem, it is clearly up to the public to initiate efforts for its solution.

IN RESEARCH AND EXTENSION

Lack of knowledge, the inevitable outcome of the belated beginning of research and the small scale on which it has been conducted, has been one of the most important contributing factors to rule-of-thumb management of the range, and hence to practically universal range depletion and to the social and economic maladjustments and losses which have resulted. It is partly responsible for allowing problems inherently difficult to drift until they have become so acute that drastic remedial action is imperative to save a great natural resource and the population that is based on it. The high cost of the program of rehabilitation is in part the price which must now be paid for a lack of knowledge. And ironically, the knowledge must still in the main be acquired.

The only alternative choice to the long, slow, costly, and inconclusive working out of large-scale trial and error in acquiring knowledge is research. Research, in fact, offers the cheapest and the only practical basis for obtaining the information needed to bring about the fullest productive use of range lands for livestock grazing, watershed protection, forest growth, recreation, and wildlife, and for a sound correlation of these uses.

Research and the effort necessary to carry the results into application are needed by private owners and equally by the administrators of public lands. They offer one of the most effective forms of public aid to the private owner.

The major lines of research required are:

1. Range management, to improve existing systems or to develop new systems for handling each of the range types, and covering also degree of stocking, seasonal use, class of stock, methods of handling livestock under range conditions, restoration by natural revegetation and subsequent maintenance in a high state of productivity. It must include all forms of use and service.

Basic to range management is the need for detailed information on the characteristics, habits, requirements, value, etc., of individual range plants; and also information on the characteristics, behavior, competitive relationships, succession, soil, and other requirements, etc., of the associations of range plants which form types.

2. Artificial revegetation, to develop quick, low-cost reseeding and transplanting methods of restoring vegetation on the depleted ranges for grazing and watershed and other purposes. For artificial revegetation there is also the need to develop improved strains of range plants or hybrids, and also to explore the possibility of foreign introductions.

3. Watershed investigations, to determine methods of managing the plant cover of range watersheds to prevent erosion, silting, and floods, and assure the maximum supply of usable water. This involves a clear understanding of the part that the cover in varying degrees of composition, density, etc., and under different soil, topographic, climatic, grazing, and other conditions plays in erosion and run-off. Practical special-control measures should also be developed for use in arresting aggravated erosion as a preliminary to the re-establishment of plant cover.

4. Wildlife, to develop basic principles and methods for restoring environmental conditions and for managing the wildlife resource as a crop, both in proper relation to other products and services of wild lands. This necessitates also a full understanding of the life histories, requirements, etc., of the wildlife species.

5. Animal husbandry, to improve or develop livestock strains especially adapted to range conditions and to market requirements, and also better breeding and feeding methods.

6. Economics, to determine the proper place of western range livestock production in the local, regional, and national picture; the most effective integration of range and crop agriculture; costs, returns, profits, and other information needed for the determination of satisfactory economic units and for the efficient handling of individual enterprises; a sound basis for the highest use of range land for grazing or other purposes; a sound allocation between private and public ownership and between the States and the Federal Government; the basis needed for policies and administration of public lands; and, in general, the basis for sound land use and for social and economic security.

7. Additional investigations needed include climate, entomology, etc.

The range research so far done will permit vast improvements over nearly all existing practices so that there is no need for delaying initial action on a constructive program. For the full consummation of the program recommended, however, it is only a meager beginning.

The responsibility for range research rests with—

The Federal Government for work on interstate, regional, and national problems, and on local problems for the administration of Federally owned or controlled lands.

The States for work on local and State problems and on other problems where the administration of State lands or those of minor political subdivisions are concerned.

Endowed institutions have the opportunity for work on a wide range of problems, and particularly those of a fundamental character.

Private agencies, and associations in particular, have the opportunity to round out and supplement the work which other agencies can do.

Past experience has shown that the most effective application of the results of agricultural research can be obtained through extension. In the range-animal husbandry field extension activities have been partly responsible for marked improvements, but extension in range management has been almost wholly neglected. Provision for research fails in its real objective unless its results are made known through extension in such a way that they can be applied by the private owner. An essential feature is aid and advice in the preparation and carrying out of sound management plans.

IN LEGISLATION

Both Federal and State legislation will be required to carry out the program recommended. The more important provisions are:

FEDERAL

PUBLIC DOMAIN AND GRAZING DISTRICTS

1. To transfer jurisdiction of the public domain and the grazing districts from the Department of the Interior to the Department of Agriculture.

2. Necessary or desirable modifications of the Grazing Act of June 28, 1934:

To place all of the public domain under permanent Federal management.

To prevent the establishment of prescriptive rights.

To allow the distribution of grazing privileges necessary for both social and economic security to the greatest number entitled to use the range.

To authorize administration of all range resources, forage, watershed, wildlife, in accordance with the multiple-use principle and for the highest public benefits.

To clarify Federal authority in the administration of its own lands.

To authorize the leasing of isolated tracts of Federal lands of less than 640 acres.

To authorize the President, upon the recommendation of the National Forest Reservation Commission, to transfer to the national forests from the public domain or the grazing districts lands which in the judgment of the Secretary of Agriculture meet national-forest specifications.



3. Unless fully authorized, as on the Indian reservations, to provide for the administration of ranges on all other Federal reservations and withdrawals, where not inconsistent with their purposes, by the Secretary of Agriculture with the concurrence of the Secretary of primary jurisdiction.

THE TRANSFER OF PRIVATE LANDS TO FEDERAL OWNERSHIP

1. To authorize the Secretary of Agriculture to transfer to national forests or grazing districts, lands purchased by Federal agencies, if they meet the qualifications for such units.

2. To authorize the Secretary of Agriculture to purchase range lands submarginal for private ownership or needed for public benefits such as watershed protection, upon approval of the National Forest Reservation Commission, and to add them to national forests or grazing districts.

3. To broaden existing authority so that the Secretary of Agriculture could make exchanges with private or other public owners within or adjacent to national forests or grazing districts on the basis of equal land or grazing values, in order to consolidate ownerships for more efficient administration, and also to pay costs of transfer and an equitable part of unpaid taxes on donated lands.

TRANSFERS TO PRIVATE OWNERSHIP

To provide for the classification by the Secretary of Agriculture of Federal lands in the public domain as most suitable for private ownership, as a prerequisite for alienation, coupled with other provisions as to maximum size of units, etc., which will prevent a repetition of the mistakes of the past. More study will be necessary to afford a satisfactory basis for such legislation.

EXTENSION

To provide for aid to private owners through extension in cooperation with State agencies.

STATE

Legislation which will substitute for sale or other disposal to private owners the retention and sustained yield management of range lands now in State ownership or which may hereafter be acquired, which are unsuitable for private ownership. This will include:

1. Possible revision of State constitutions and Federal enabling legislation.
2. The setting up of professionally qualified administrative agencies.
3. The revision where necessary of tax-delinquency legislation.
4. Provision for consolidations through exchanges with private owners and the Federal Government.
5. Provision for classification by competent agricultural agencies as a prerequisite to passage to private ownership.
6. Provision for cooperation with the Federal Government on the administration of intermingled holdings.

7. Provision for the acquisition by gift or purchase and management of lands submarginal for private ownership or having high public values.

8. Provision for cooperative aid to private owners of range land, in research and extension.

9. Authority to form cooperative range management associations.

10. Provision for the handling of wildlife: On a sustained crop-management basis; with professionally trained organizations; under flexible laws which outline principles but delegate authority to make adjustments in administration necessary to meet rapidly changing conditions; in cooperation with the Federal Government on Federal lands; some reasonable incentive to private owners to protect and produce wildlife on their lands.

COSTS AND RETURNS

The cost of carrying out any such constructive program as that outlined for 728 million acres of range land will be high. Unfortunately, postponement will only increase the final cost, because the longer the destructive forces now in effect continue the more the ground that must be regained. The cost will fall upon the Federal Government, the States, and private owners.

The following estimates of cost are based on 30 years' experience in the handling of the national forests and on special surveys conducted on the public domain and on privately owned lands. The estimates are for the amounts believed necessary to carry out the program recommended. In the light of extended national forest experience in which the rebuilding of the range resource has been retarded by inadequate funds, it is not believed that the public ranges, at least, can be restored and maintained for less than the amounts stated. The estimates are given because of the conviction that the public should have a full understanding of probable costs before embarking on a much larger enterprise than that now under way. No estimates have been made for special erosion control because of uncertainty as to the area which should receive special treatment other than revegetation, and what such treatment would cost. Special treatments are still in an early developmental stage.

The proposed expenditures fall into four categories—capital investments in improvements, current expenditures for administration, the public acquisition of land, and research and extension.

NATIONAL FORESTS

Annual costs first 5-year period

Capital investments, including range surveys, fences, water development, revegetation, rodent control, etc.....	\$1, 140, 000
Grazing administration on 82.5 million acres at \$0.0149 per acre (present cost \$0.0089 per acre or \$734,000).....	1, 234, 000
Wildlife administration on 120 million acres at \$0.006 per acre (present cost \$0.0018 per acre or \$216,000).....	720, 000
Maintenance and replacement of improvements.....	742, 000
Total annual cost.....	3, 836, 000

For the second 5-year period annual expenditures for capital investments would be reduced to \$910,000 and for the maintenance and

replacement of improvements increased to \$986,000, making the total annual cost \$3,850,000.

GRAZING DISTRICTS, PUBLIC DOMAIN, AND OTHER FEDERAL

Annual costs first 5-year period

Capital investments, chiefly revegetation, 149.4 million acres.....	\$3, 536, 000
Grazing administration at \$0.0151 per acre.....	2, 260, 000
Wildlife administration at \$0.001 per acre.....	150, 000
Total annual cost.....	5, 946, 000

For the second 5-year period annual expenditures for capital investments would be reduced to \$3,403,000, and for maintenance and replacement of improvements would amount to \$550,000, so that the total annual cost would be \$6,363,000.

INDIAN LANDS

Annual costs first 5-year period

Capital investments, 48.4 million acres.....	\$766, 000
Grazing administration, at \$0.011 per acre (present cost \$0.005 per acre, or \$242,000).....	532, 000
Wildlife administration, at \$0.001 per acre.....	48, 000
Maintenance and replacement of improvements.....	75, 000
Total annual cost.....	1, 421, 000

For the second 5-year period annual expenditures for capital investments would be reduced to \$532,000, and for maintenance and replacement of improvements would be increased to \$232,000, so that the total annual cost would be \$1,344,000.

STATE AND COUNTY LANDS

Annual costs first 5-year period

Capital investments, 65 million acres.....	\$1, 313, 000
Administration (minimum).....	754, 000
Total annual cost.....	2, 067, 000

During the second 5-year period, maintenance and replacement of improvements would probably cost about \$150,000 annually, making the total annual cost \$2,217,000.

PRIVATE LANDS

The annual capital investments needed during the first 10-year period on the 376 million acres now in private ownership is estimated at \$6,416,000, of which the largest item is about \$4,800,000 for revegetation. Incidental labor will take care of a substantial part of this cost, and furthermore it will be reduced by the rate and extent that the public assumes the burden through acquisition of the poorer private lands where costs of restoration, etc., would be highest.

PUBLIC ACQUISITION OF PRIVATE LANDS

The acquisition of 125 million acres of submarginal watershed and other high public-value land would require at least 20 years. Taking into account gifts with or without payment of accrued taxes, tax delinquency, and direct purchase, the cost might average \$1 per acre, or about \$6,300,000 annually.

The annual cost of public administration is estimated at about \$0.015 per acre, to which should be added capital investments of about \$0.017 per acre annually during the first 10 years. The rate at which total annual costs build up will be governed by the speed of acquisition. The latter figures duplicate estimates already given and will correspondingly reduce the expenditures by private owners.

The Federal and State shares of these costs will obviously depend upon the division of the areas acquired between these agencies.

RESEARCH AND EXTENSION

To meet the requirements for all classes of range research it is estimated that expenditures by all agencies should reach an annual total of \$2,750,000 in a 10-year period, this by gradual increases over current expenditures of about \$750,000. Of the former total the Federal Government should assume the responsibility for about \$2,000,000 and the States for \$550,000, leaving a \$200,000 balance for other agencies.

The cost of range extension estimated at \$1,000,000 annually should be borne about equally by the Federal Government and the States. The estimated maximum cost should, if possible, be reached in about 10 years.

RETURNS

The high cost of rehabilitation and administration of publicly owned range lands makes the possibility of self-liquidation a question of both public and private interest.

Looking ahead, it is doubtful if the Federal Government can any more than break even on any comprehensive program of range restoration and intensive management on the national forests and the grazing districts, even though grazing fees on the national forests were ultimately increased by about 30 percent above the base fees, and those on the grazing districts were made approximately equal to the national forest base fees.

Even then, account is taken neither of the uncertain cost of special erosion-control measures nor of Federal contributions to States and counties in lieu of taxes, which in a sense are the transfer of funds from one public purse to another.

Grazing fees high enough on both the national forests and the grazing districts to enable the Federal Government to break approximately even seem fully justified. Fully productive, well-managed ranges should result in higher returns to the stockmen and justify somewhat higher fees than those now charged on the national forests and those apparently contemplated for the grazing districts.

Sight should not be lost of the fact, however, that the public receives other tangible and intangible benefits from fully produc-

tive ranges. Among the largest and most important of these are the far-reaching benefits from watershed protection. Of great importance also is the fact that range use can hardly be eliminated from western agriculture without wrecking the entire structure. Furthermore, range livestock production alone furnishes a livelihood for a large number of people. Other benefits in which both the Federal and State governments share are the sustained taxable value of related lands, income and other taxes, and direct and indirect returns from hunting, fishing, and recreational use.

Essentially the same considerations hold on State range lands as on Federal.

Despite radical readjustments and increased capital investments, the program proposed should work out to the financial advantage of the private owner. He should gradually be relieved of submarginal and high public-value lands. His financial handicaps should be reduced. He should have the advantage of an increasing volume of cheap range feed, of increased unit livestock production, of decreased production costs, and of greater profits.

THE KEY TO REMEDIAL ACTION

In the complex range pattern, with its multiplicity of interrelated overlapping problems, which require a corresponding multiplicity of interrelated overlapping remedial measures, a clear-cut focal point—a center of responsibility—among public agencies is necessary in planning, initiating, correlating, and consummating action if public obligations are to be redeemed.

This is true of privately owned range lands and livestock, in which the maximum of self-help ordinarily depends on some measure of public leadership and aid to create conditions under which self-help can be effective or even start.

It is equally true of publicly owned range lands where, as already shown, the splitting of jurisdiction of this agricultural problem between different agencies almost inevitably means working at cross purposes, inefficiency, and excessive costs. Furthermore, public lands cannot be divorced from their surroundings. Such lands have a direct and vital bearing on the ranch owner and his welfare and must be handled in full recognition of this fact. This bearing extends far beyond private range lands and livestock to private croplands, and to the entire agricultural structure.

A check of the broader groups of problems and their solution will still further illustrate and emphasize this point of view.

Take for example the broad group of problems centering in the reversal of the range and soil-depletion process, and requiring such action as the removal of large numbers of excess stock.

Or take the equally broad group of ownership and use problems requiring large shifts from private to public ownership, or range restoration on mistakenly cropped lands, or the building of units of economic size.

Or the large number of additional problems of private ownership requiring the removal of financial handicaps or the recognition of the responsibility of stewardship.

Or the problems already referred to involving lands now in public ownership or those hereafter acquired.

Or the problem of knowledge and its application, requiring range and livestock and land-use research and extension.

Or those centering in human wastage in agricultural communities requiring action to insure social and economic security.

The lack of clear-cut centralized responsibility up to the present time has undoubtedly contributed in a major way to the neglect and abuse of the range resource. In far too many instances what has been everyone's responsibility has been no one's responsibility. It seems futile to continue an arrangement which has led to such results. Centralized responsibility affords the only way in which the general public can hope to hold its agencies to a strict accountability.

Any consideration of Federal activities other than the jurisdiction over Federal range lands—research, extension, general agricultural integration, and aid in various other forms—make still more conclusive the fundamental soundness of the centralization of full Federal responsibility in the Department of Agriculture for an activity which is agriculture to the core.

Within their spheres of action the States must face and meet similar problems of responsibility and organization.

IS REMEDIAL ACTION WORTH WHILE?

The program outlined for the solution of the range problem runs into very large sums of money which will constitute a heavy drain, particularly on Federal and State treasuries. Large as they are, these expenditures are only a part of the price which must be paid for the wasteful use and destruction of a great natural resource. Still another part of the price is the time over which the reconstruction effort must continue. It has taken little more than half a century to reduce the productivity of the range by about half, and it will probably take at least as long to bring it back to a grazing capacity equivalent to present stocking. The cost will be a heavy public burden, regardless of the possibility of direct returns that in the long run may make the enterprise self-liquidating.

Is restoration worth while? This question should be raised and squarely faced before a final decision is made. Perhaps the soundest decision can be reached by contrasting what will happen if the effort is not made, with the benefits if it is.

IF NO ACTION IS TAKEN

If drastic and immediate action to restore the range resource is not taken, it seems inevitable that depletion will continue. Whether it continues more or less rapidly than in the past, the end result is bound to be the same—the Great American Desert, once only a name, will become that in fact. If anyone questions the inexorable working of the cause and effect he need only examine the history of the semiarid pastoral countries of southwestern Asia and the Mediterranean. The more precarious range types of the Southwest and Intermountain region will merely be the first to qualify, but the other and more favorable types are certain to follow sooner or later.

The gradual destruction of the basic forage and soil resource will inevitably in time reach the point where the range livestock industry can no longer exist. The range alone can furnish the cheap feed

which is the most important competitive advantage in livestock production of all except one of the 11 far-western States. With the elimination of the range must consequently go the gradual elimination of the western livestock industry itself.

Along with the industry must go its contribution to the meat, wool, and hide, and other requirements of the country. The extent to which this might make the United States dependent on foreign supplies is uncertain, but there can be no question that it will place us in a less favorable position in which to meet future emergency requirements, such, for example, as that of the World War.

No distinction can be drawn between the dependence on the range of livestock and of wildlife. The flood and erosion situation on depleted ranges is rapidly becoming more and more serious, and this tendency would certainly continue and its effect would become more and more far reaching. Not least in importance will be reduction in the effective life of the irrigation reservoirs which depend upon watershed protection.

Crop agriculture is now so closely integrated with the use of the range that it is almost certain to suffer in other ways than impaired water supplies as range problems become more and more acute.

And whatever injures either or both will extend into communities, towns, and cities dependent upon a prosperous agriculture, and affect supply services, banking, transportation, and in fact all other industries which are a part of the existing western civilization. Reduced tax returns will curtail essential public activities.

The social wastage growing out of range depletion and the various maladjustments in the use of range lands has already been very large, but is inconsequential in comparison with the wastage which will be inevitable if any large part of the range is entirely destroyed.

THE BENEFITS FROM RESTORATION

An area of 728 million acres of restored and fully productive range cannot be otherwise than a source of perpetual wealth.

The maintenance of this range area would, according to the best information now available, carry at least 17.1 million animal units of domestic livestock 50 years hence, as compared to the 17.3 million units which are now rapidly depreciating the range, and the 10.8 million units which it can now carry in safety (fig. 22). The gain in the value of livestock production between the present and potential grazing capacity would undoubtedly justify the entire annual cost of restoration several times over.

Serious depletion was one of the primary causes of the 1934 Federal expenditure of \$100,000,000 to purchase starving western-range livestock. The elimination or the drastic reduction of such expenditures, which range restoration should make possible, would make a major contribution to the cost of the program recommended. From the standpoint of broad public policy the choice lies between mere alleviation by periodic repetition, leaving the basic problem untouched, and striking directly and constructively at a primary cause in order to make such expenditures unnecessary in the future.

Erosion and destructive floods would gradually be reduced to a minimum, and the life of irrigation and other reservoirs greatly extended. The reduction in the annual flood-damage bill alone would

go a long way toward carrying the annual cost of a constructive program. Wildlife could again assume a proper place among the products of the range and make its contributions to western life.

Only by restoration is it possible to make the range contribute as it should to working out a satisfactory balanced and hence a permanently prosperous western agriculture. Sources of livelihood now so badly needed with the passing of the frontier and the replace-

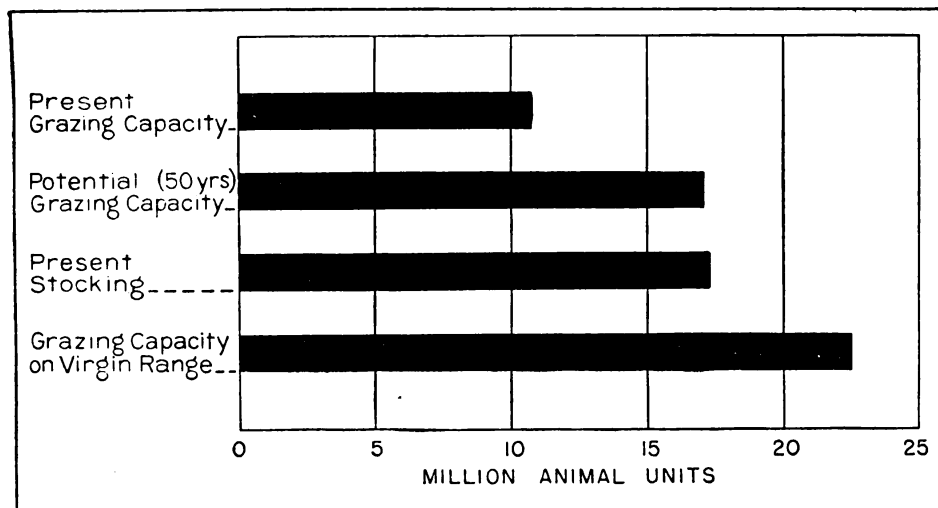


FIGURE 22.—PRESENT AND POTENTIAL GRAZING CAPACITY.

The present grazing capacity of the available range area, estimated at 10.8 million animal units could, it is conservatively estimated, be increased to 17.1 million units in 50 years if the entire range area is placed under management in the immediate future. But even this increase would fall 0.2 of a million units short of what stockmen are now trying to carry on ranges whose productive capacity has already been reduced by more than half. How much longer would be required to reach the original capacity of 22.5 million units no man can say, but it might well be another half century. Aside from human inertia, the chief retarding factor in both instances would be the long, slow process of rebuilding the soil.

ment of labor by machinery in manufacturing, high standards of living, stable communities and general social and economic well-being, reasonable prices to the ultimate consumer, all depend vitally upon the proper handling of natural resources, among which the western range must occupy a conspicuous place.

With such contrasts in probable losses and possible benefits a recommendation for affirmative action is the only one that can be made.

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