

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

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In Reply Refer To:
1741/4120/8550 (931) P

October 23, 2003

EMS
Instruction Memorandum No. ID-2004-009

To: ICT/IMF

From: State Director

Subject: Clarification of the Range Improvement Program

Program Areas: Range Improvements

Purpose: The purpose of this Instruction Memorandum (IM) is to provide guidance on the construction, maintenance, and reconstruction of range improvements on public land in Idaho, including Wilderness Study Areas (WSAs).

Policy/Action: The attachment supplements guidance to Manual Handbooks H-4120, H-1741-1 and 2, and H-8550-1, to eliminate inconsistencies and to clarify the range improvement program in Idaho.

Timeframe: Effective immediately.

Background: Concerns have been expressed over inconsistencies in the state regarding the range improvement program. These concerns range from what can be done in WSAs to the kind of troughs and bird ladders that are allowed on public land. The attached guidance will provide field offices clarification on these issues.

Manual/Handbook Sections Affected: This IM serves as supplemental guidance to Idaho BLM Manual Handbooks H-4120, H-1741-1 and 2, and H-8550-1, until they are issued.

Coordination: All Idaho Bureau of Land Management (BLM) field offices were provided opportunities to review and comment on the proposed guidance. Additionally, an interdisciplinary review was conducted within the Branch of Resources and Science (ID-931), as well as coordination with the WO program staffs.

Contact: For questions regarding this policy contact Tom Miles at (208) 373-3804.

Lower Snake River District with Union: No Union notification or negotiation is required.

Signed
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Authenticated
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Attachment
Range Improvement Guidance (11 pp)

Range Improvement Guidance

GENERAL

The intent of this guidance is to supplement, not replace, existing guidance in our manuals, memos, technical bulletins, etc. You will still need to be familiar with Manual Handbooks, H-4120, H-1741-1 and 2, and H-8550-1.

Range improvements shall be consistent with Land Use Plans (LUPs) and be covered under Cooperative Agreement (Form 4120-6) or Range Improvement Permit (Form 4120-7) prior to construction. All range improvements shall be covered under the National Environmental Policy Act (NEPA) and surveyed and cleared for Threatened and Endangered (T&E) species and cultural values prior to construction or prior to any modification or action that creates disturbance that has not been analyzed through the NEPA process and inventoried and cleared for T&E species and cultural values. This includes ground disturbing activities on existing projects that have not been covered by NEPA, T&E, and cultural surveys and clearances. Proposed range improvements, new construction, modifications and major maintenance activities should be reviewed by field office cultural resource staff for consistency with Idaho BLM's Protocol agreement with the Idaho State Historic Preservation Office and their potential to affect cultural resources. All reconstruction involving 8100 funds must have NEPA. Coordinate with Idaho State Office (ISO) water rights staff if you are in doubt of water rights requirements. Remember that all range improvement decisions must follow 43 CFR 4160 procedures.

Temporary troughs and corrals may qualify for categorical exclusion if they are in use for one month or less and there is no new road construction. Consult Department Manual Part 516, Chapter 6, Appendix 5.4 and your NEPA coordinator for information on categorical exclusions.

Permittee or cooperator installed range improvements must be authorized on one of two forms. Cooperative Agreements are for permanent range improvements such as, fences, wells, pipelines, and reservoirs. They are usually funded by more than one contributor, normally BLM and the cooperator (e.g., BLM supplies materials, cooperator supplies labor). Range Improvement Permits are for removable range improvements for livestock handling such as corrals and loading chutes. These improvements are always totally funded and maintained by the cooperator.

Information regarding maintenance contributions, specifications, quality of materials, etc., needs to be documented in the appropriate agreement or permit. This eliminates misunderstandings, establishes improvement standards, and covers the issue of maintenance. Special conditions regarding the construction or maintenance of projects in sensitive areas (Wilderness Study Areas (WSAs), T&E, cultural) need to be clearly stated in the agreement or permit. If these values are not readily apparent to the cooperator (i.e., unclear boundaries of cultural values) then a field trip by BLM personnel and the cooperator may be needed to identify the boundaries of such areas to ensure avoidance of the value when constructing or maintaining an improvement.

Ensure that all cooperators are informed that they must have authorization (Cooperative Agreement/Range Improvement Permit) to install, use, modify, and/or remove range improvements. Failure to obtain authorization is a prohibited act and a violation of grazing regulation 43 CFR 4140.1(b) (2). This has been a problem in the past that can have adverse impacts to resource values such as the removal of bird ladders from troughs or replacing troughs or pipelines with smaller capacity materials.

All projects in disrepair need to be assessed for their usefulness and either maintained, reconstructed, or properly abandoned, and if needed, the site rehabilitated. These projects may cause safety concerns (i.e., downed fences with barb wire strung out) and are an “eye sore” to the recreating public. We should make a concerted effort to correct these problems. It is suggested that project inspections be conducted during field assessments for standards and guides. Following assessments, during the evaluation, recommendations that include the future of projects in disrepair can be staffed out and hopefully implemented in a proposed action. It makes sense to address these range improvement issues when we are addressing rangeland health issues and especially when we are addressing the solutions to livestock grazing issues which almost always involve range improvement discussions.

MAINTENANCE

Usually, maintenance of range improvements is assigned to the permittee or cooperator. Historically, exceptions have been wildlife or study exclosures, riparian fences, and similar projects where permittees did not feel they received a benefit from their construction and resisted assignment of maintenance responsibilities. However, there are many miles of exclosure fencing throughout the West that BLM has been unable to adequately maintain. As a result, many of these exclosure fences are down and in disrepair. We must ensure that exclosure fencing, riparian fencing, and similar projects are absolutely necessary and that maintenance is covered prior to construction. In many cases, riparian fencing can be eliminated by adopting riparian grazing systems. Prior to fencing we must ensure that fencing is the best alternative to meet our objectives. Therefore, consider reasonable alternatives such as adjusting grazing systems or seasons prior to committing to fencing and adding maintenance responsibilities to BLM or cooperators.

We encourage consulting with permittees/cooperators on entering into a cooperative agreement to maintain exclosure type of improvements (both existing and prior to them being built). In most cases, exclosures protect areas from livestock grazing. It may be in the best interest of the permittee to properly maintain these projects so that he or she can continue to graze the pasture without adverse impacts to protected areas. In addition, it may be easier for the permittee to do maintenance of these projects while they are maintaining other projects in the allotment/pasture than it would be for BLM. Occasionally, supplying fencing materials to help out the effort is acceptable as long as the materials are accounted for on the project through project inspections. If it is determined that it is in the best interest of BLM to maintain a project, maintenance should

be covered by base funding levels and permanent employees. Reliance on seasonals or “add-on” monies will eventually lead to the project not being maintained when funding levels are tight.

The components of the original improvement should be mentioned in the Cooperative Agreement/Range Improvement Permit to ensure there are no misunderstandings on what is to be maintained in the future. We must ensure that documentation exists on what components must be maintained by the cooperator and the type of material the components are made of. For example, if a cooperative agreement states the cooperator will maintain all troughs on a pipeline system, we must be sure that it is clear that maintenance includes float valves and bird ladders/ramps. Over the years, many troughs have been modified without the knowledge of BLM, then once BLM inspects the trough many years down the road, bird ladders/ramps or float valves may have been removed. Not knowing for sure whether these components were part of the trough in the first place causes maintenance responsibility issues. Another issue is the replacement of project parts with less than original materials or just removing parts. Replacing steel pipe with plastic, removing float valves, or air valves that stop working is not acceptable. We must maintain the original quality standard of the project, which means all replacement parts must be of the same standard as the originals. We need to clarify maintenance responsibility so there is no confusion for cooperators or those who follow us in the years to come on what is expected. In addition, it is important that good, complete records are kept in the project files. These include but are not limited to, materials list, cooperative agreements, Environmental Assessment (EA) and supporting documentation such as Cultural and T&E surveys, written records of the project planning, drawings, pictures, maps, correspondence, and maintenance inspections. BLM Manual Supplement from the Idaho State Office 1732.41 Step 6a describes the project file and what needs to be part of that file. All offices needs to be checking and making sure their project files are current and have the information as stated in Manual Supplement 1732.41 Step 6a.

Permittees/cooperators need to be able to maintain projects without the presence of BLM. Special stipulations in the cooperative agreement should address sensitive areas or issues that require extra caution when maintaining a range improvement so that the permittee/cooperator is able to maintain the improvement without the presence of BLM. An onsite discussion with the permittee/cooperator on the sensitivity of the area and proper maintenance procedures may be required so everyone is on the same page. Identifying these areas up front should minimize the need for cooperators to notify BLM every time they do ground disturbing maintenance.

RECONSTRUCTION

Reconstruction is normally borne by the owner of the project whenever costs to maintain a project exceed 50 percent of the cost to replace the project. However, anytime it is determined by BLM that reconstruction is needed as a result of the lack of or improper maintenance, reconstruction should be borne totally by the cooperator. The cooperator should be given a reasonable timeframe to comply with reconstructing a project. Make sure that whenever there is

reconstruction by any cooperator that the contributed cost for labor, materials, and equipment is updated on the cooperative agreement to reflect their investment in the improvement.

Even though most range improvements are owned by the BLM, BLM cannot afford to reconstruct projects on a timely basis in every case. Decisions on covering the costs of reconstruction need to be tied to the availability of funds, personnel to do the work, and existing priorities. In many cases, a major project may need reconstruction when there is no funding or personnel available to cover the work, yet the project is necessary for turnout on an allotment. In these cases, the permittee has no choice but to fix the project himself. If BLM can assist in reconstruction, we will; but all permittees need to be prepared to cover reconstruction costs so that their grazing activities are not impacted. This is especially true in cases of wells and major pipeline systems. Resource values will not be compromised as a result of failure of an important range improvement such as a well. For example, if a major well caves in and is non-functional, then the area served by that well should be monitored and adjustments made as appropriate until water is made available. In the future, cooperative agreements should make this fact very clear. It is recommended that field offices contact all permittees/lessees that have existing cooperative agreements and inform them of this policy.

The useful life of an improvement has always been an issue regarding reconstruction. This is an illusive figure that has a lot to do with proper maintenance and the selection of materials. Pumps wear out, troughs rust out, pipelines deteriorate, and wells sometimes cave in or go dry. Ensuring proper maintenance and selecting materials that are long lasting (i.e., tire troughs vs. metal troughs; heavy duty pipe vs. light duty pipe; larger, more adequate pumps vs. small, marginal pumps) will go a long way toward ensuring a long useful life for a project. BLM should not establish an expected useful life in our cooperative agreements. The need for reconstruction should be based on maintenance history and the condition of the project at the time of inspection.

SPECIFIC FACILITIES AND PROJECTS

Troughs – troughs must provide the water necessary to properly distribute and water the number of cattle in the pasture or allotment for the time period used. Therefore, all replacement troughs must at least meet the capacity of the troughs they are replacing. Exceptions would be in those cases where water demand has been reduced due to permanent changes in numbers or Animal Unit Months (AUMs). Troughs can be of any suitable material that will meet the need and other resource values. Historically, troughs have been made out of wood, steel, fiberglass, concrete, or aluminum. More recently, troughs made out of huge tires from mining equipment have been used in some areas of eastern Oregon and western Idaho. Advantages of these tire troughs include the extreme durability (a bullet cannot shoot through them) and they virtually last forever. However, they are extremely heavy, requiring heavy equipment to move them and they require cement, bentonite, or some other method to seal the bottom. In some cases the tire troughs blend in better with the environment than traditional troughs. These tire troughs are acceptable on public land as long as they meet the water requirements and fit in with other

values such as visual. To our knowledge, there are no hazardous materials or other environmental issues using these troughs.

All troughs, including temporary troughs, must have animal escape ladders/ramps installed. These ladders/ramps must be of a design that provides a reasonable chance of escape if an animal falls into the trough. The placement of the trough and materials used are both important considerations for effective ladders/ramps. An example of a suitable bird ladder design is provided at the end of this guidance.

Struggling animals will move to the sides of the trough and search for escape moving along the sides. Therefore, ladders/ramps must be designed to effectively intercept these animals as they search for an escape. For example, rectangular-type troughs can have ladders that extend the entire length of one end of the trough. If there is a space, then animals can get trapped behind the ladder. For circular or oval-shaped troughs, a ladder/ramp must be designed that can intercept the animals from either direction. Any other designs that do not allow for effectively intercepting animals in their attempt to escape are unacceptable. This includes using only floating boards in the middle of the troughs.

Ladders/ramps must be made of materials that will resist erosion and wear associated with water troughs, (i.e., a material such as galvanized steel which will last the life of the trough). In addition, the surface must be rough with perforations so animals can easily get a drink of water or get out of the water if they are struggling.

Ladders/ramps must remain in all troughs as it is a violation of the grazing regulations (43CFR 4140.1(b)(2)) if they are removed. Seasonal maintenance is needed to keep access open to animals. For example, algae will often block access to bird ladders if it is not routinely removed from the trough during the summer months when animals are most susceptible to getting trapped in a trough. This basic maintenance should be discussed with the permittees and included as part of their range improvement maintenance program.

Water should be left in troughs following the removal of livestock to provide water for wildlife until they gradually dry up (similar to a water hole). Holding tanks should be kept full for the fire season to provide water for fire fighting.

Pipelines - Materials for pipeline maintenance or reconstruction must maintain at least the same standards as the original project. Therefore, the replacement pipe must be at least the same diameter as the original pipe. It is highly advisable that future expansion is considered when replacing existing pipe (e.g., consider replacing 1.5" or smaller pipe with 2" pipe (consult with an engineer), in cases where extensions are being considered). Patches to the pipe must be made with the proper materials as recommended by the manufacturer. Duct tape, radiator hoses, etc. are not acceptable for long term fixes. Pipeline depths depend on the season of use or if the system is free flowing. Pipelines used during the late fall, winter, or early spring need to be either buried below the frost line or be free flowing to prevent freezing. All other pipelines

should be buried deep enough to prevent damage from vehicles but easily reached for maintenance (about one foot). No set depth is required. All pipelines should be blown out at the end of the season if winter conditions can freeze the pipe.

Reservoirs - Generally, reservoirs do not need maintenance as frequently as other projects. In some cases original access routes to reservoirs have grown over with vegetation and are not easily found by the permittee/cooperator for accessing the reservoir with heavy equipment. In these cases, access must be provided so that maintenance can be conducted if the project is deemed necessary to meet management needs and the project is under cooperative agreement to be maintained. BLM may have to help the permittee/cooperator locate the old route into the reservoir or agree on a new one. All maintenance must be limited to the existing disturbance. Dam/spill way repair or digging out sediment shall not increase the capacity of the reservoir beyond the original size without NEPA analysis (including cultural and T&E surveys), securing applicable water rights, and approval by BLM.

Spring Developments - Spring developments need to consider the health of the spring area and the associated riparian values. Historically, springs were developed to collect most of the available water and then the water was piped to a trough that was located in the riparian area. This practice has adversely impacted riparian areas. Existing and future springs should provide for the maintenance or improvement of the spring and associated riparian area. Collection devices must not take most of the water out of the system. All efforts should allow for enough water to remain in the system so that riparian areas are maintained. Troughs should be placed offsite in upland areas outside of the riparian areas (preferably areas already impacted or areas that are armored (rocky), if feasible. Fencing of the riparian area may be needed to give the area a “jump start” toward Proper Functioning Condition (PFC) or Desired Future Condition (DFC). If, after obtaining PFC or DFC, a grazing system is implemented that will meet riparian objectives, then the riparian enclosure may or should be taken out. Enclosure fencing, especially around springs and wet meadows, needs to be built with consideration of impacts to sage-grouse as wood fence posts and stretch panels provide sites for raptors to hunt from.

Cattleguards – Cattleguards benefit permittees by preventing open gates and the subsequent drifting of cattle into unauthorized allotments/pastures. Also, they benefit the recreating public who do not want to open gates to get to their desired recreation area. Generally, cattleguards on minor roads, such as two tracks, should be maintained by permittees. If the permittee does not have the necessary equipment to pull cattleguards to clean out bases, then assistance from BLM may be needed. On major roads (regularly maintained) where public use causes a higher maintenance workload, BLM should assist the permittee with the maintenance, do the maintenance of cattleguards, or pursue county road crews or other maintenance opportunities. In many cases, major roads are county roads and the road and cattleguards are already maintained by the county.

Fences – Fences should comply with the direction found in BLM Manual Handbook H1741-1. Fences must comply with wildlife specifications which differ for the species of big game animals

(see H1741-1). Specifications change depending on the combination of big game animals in the area. It is a good idea to mark new fences with highly visible material to prevent big game, as well as other wildlife, from being harmed by the fence. New fences should be at least 1/4 mile from established grouse (sage or Columbian sharp-tailed) leks and placed so they are not a hazard for grouse flying into or out of the lek. Let-down fences can be used where no rerouting alternative exists. Existing fences in these areas can be marked with highly visible material to make them visible to flying grouse. Coordination with Idaho Fish and Game and wildlife biologists during the proposal phase will eliminate problems down the road with wildlife species.

Generally, most allotment boundary fences will be four-wire with pasture fences three-wire. However, the number of wires and stays will ultimately be decided by the amount of pressure a fence is anticipated to receive from livestock. Special attention needs to be given to enclosures to ensure cattle do not squeeze between the wires or jump over them to get into desirable areas such as riparian areas. Since riparian areas are highly desirable by cattle, especially during the summer, fences need to be stout enough to do the job. In many cases traditional four-wire fences may not meet the need. In many areas the challenge is to make the fence “cattle proof” without excluding wildlife. Sometimes more than four wires are needed to do the job. However, wildlife specifications regarding the height of the top two wires and the bottom wire still need to be followed. Again, close coordination will go a long way toward resolving these issues.

It is highly recommended that in areas of heavy snow, major big game migration or use areas, let down fences be used if existing fences are a constant maintenance issue. If a fence needs significant repair every year as a result of the above, then it is far easier to have a let down fence. However, a let down fence has to have a cleared off area (brush or trees removed) adjacent to the fence to be able to lay it down flat on the ground so that it does not become a hazard to wildlife or recreating public. Therefore, remember to include the clearing of brush and/or trees in the analysis if a let down fence is being considered.

Depending on needs, electric, high tensile or other type fences may be used to accomplish management objectives on public land. The fence you use is dependant on the issues and concerns in the area of the proposal. For example, electric fences may not be the best choice in areas of high use by the recreating public or in dense, highly volatile fuel areas.

RANGE DEVELOPMENT MAINTENANCE, RECONSTRUCTION, AND CONSTRUCTION IN WSAs

The preservation of wilderness values within a WSA are paramount and should be the primary consideration when evaluating any proposed action or use that may conflict with or be adverse to those wilderness values. Until Congress acts on the Secretary of Interior's recommendations, range uses on land under wilderness review may continue in the same manner and degree as existed on the date the Federal Land Policy and Management Act (FLPMA) was approved (October 21, 1976), as long as they do not cause unnecessary or undue degradation of the land and resources. The manner and degree of a grazing use refers to the nature of physical and visual impacts the use caused as of October 21, 1976, including the condition of the range and the authorized livestock developments installed or under construction at that time.

New facilities and modifications of livestock developments that may exceed the manner and degree must be analyzed using the nonimpairment criteria through a NEPA analysis by applying the procedures outlined in Chapter II.B., Procedures for Evaluation of Proposed Actions, and Chapter III.D., Rangeland Management, found in the Interim Management Policy (IMP) for Land under Wilderness Review Handbook (H-8550-1).

Pre-FLPMA Livestock Developments: Range developments that existed as of October 21, 1976, and have not been abandoned through proper procedures, may continue to be maintained and used as they were at that time. For example:

1. Maintenance routes or ways may continue to be used in the same manner and maintained with the same type of equipment used as of October 21, 1976.
2. Reservoirs, spring developments, cattleguards, and other range developments may be maintained in the same manner and degree that existed prior to October 21, 1976, unless they have been abandoned. In most cases, permittees/cooperators should be allowed to conduct routine maintenance of these facilities with minimal or no BLM involvement. However, the permittee/cooperator must notify BLM of major maintenance activities, (e.g., dam or spillway repair or sediment removal prior to conducting the work). Special maintenance or other requirements should be a part of the cooperative agreement and may be a term and condition of the grazing permit/lease. In all cases, no maintenance activity beyond the disturbed area as of October 21, 1976, will be allowed without NEPA analysis and analysis of the proposed action using the nonimpairment criteria under H-8550-1.
3. If a route to a range development that existed as of October 21, 1976, no longer exists or is not visible, BLM must provide the permittee/cooperator access for the same kind of equipment that was used to maintain or build the development as of October 21, 1976. This may require BLM to identify the original or most non-impairing route to the reservoir so that

surface disturbance is minimized. In these situations, the “minimum tool” concept as described in H-8550-1 should be evaluated.

New Livestock Developments: Construction of new range developments in WSA’s must clearly show that they meet the nonimpairment criteria or address the permitted exception to the nonimpairment mandate of clearly protecting or enhancing wilderness values of the land. To meet the nonimpairment criteria, facilities must be temporary. In addition, when the facility is removed, the wilderness values must not have been degraded so as to significantly constrain Congress’ prerogative to designate the area as wilderness. Temporary facilities are those that can easily and immediately be removed upon wilderness designation and do not create any new disruption of the soil or vegetation that would require reclamation.

If the improvement will not meet the nonimpairment standard, the original wilderness inventory must be analyzed in order to determine if a proposed improvement enhances wilderness values. If the proposed action results in a net positive or beneficial change in the state or condition of the wilderness value(s) as described, assessed, or calculated in the inventory, then the wilderness value would be enhanced by the proposed action. Determining if there is a net beneficial change to wilderness values requires that the effects of an action on **all** wilderness values identified in the inventory be considered.

For example, a series of gap fences designed to protect the supplemental wilderness value of redband trout identified in the inventory may have a clearly beneficial effect on trout populations by denying livestock access to a creek, and thereby enhancing crucial fish habitat elements like water quality, stream temperature, and stream channel depth. However, the amount of fencing and its location may have a negative effect on the wilderness values of naturalness and opportunities for unconfined and primitive recreation experience by being obvious to wilderness visitors and by impeding hiker access to the creek. In this case, even though one value would clearly be enhanced, a careful evaluation of effects on all identified wilderness values may determine that the proposed action would have a net negative effect on wilderness values. Wilderness values are those identified in Section 2(c) of the Wilderness Act of 1964 and FLPMA.

Construction of new, permanent livestock developments must satisfy two additional conditions. Permanent range developments must: 1) be substantially unnoticeable and 2) not require motorized access if the area is designated as wilderness. Substantially unnoticeable means that the improvement is only a very minor feature or is not distinctly recognizable by the average visitor as being human-made because of age, weathering, or biological change. Lastly, it should be clearly understood that motorized vehicles, including helicopters, will not be allowed for maintenance, repair, or replacement of livestock developments after designation as wilderness.

Specific Guidelines for Livestock Developments: For additional guidance on salting, supplemental feeding, fences, water developments, and insect and disease control; refer to Chapter III.D.4 of the IMP.

The IMP requires the evaluation of specific information in any EA. Special consideration should be given to the following items:

1. Examining alternate sites outside the WSA;
2. Describing how the project will/will not meet the nonimpairment criteria;
3. Describing how the project is substantially unnoticeable;
4. Describing the wilderness values within the WSA as documented in the intensive inventory report and evaluating how the project will affect these values (see Appendix D in H-8550-1);
5. Addressing the cumulative effects of the project to determine whether numerous minor impacts have accumulated to a point that the impacts are noticeable or degrading to wilderness values; and
6. Exploring alternate methods or approaches using the “minimum tool” concept.

Some minimum tool alternatives to consider include but are not limited to:

- a. Changing the season(s) of use;
- b. Locating proposed developments outside WSA boundaries or on “cherry-stemmed” roads;
- c. Requiring the operator to herd livestock;
- d. Installing temporary, portable, single-wire electric fences in areas not frequented by WSA visitors;
- e. Hauling water to a site outside WSA boundaries;
- f. Restoring existing springs and seeps that have been altered by livestock grazing;
- g. Constructing one or more small slick-rock catchments or dams; and
- h. Upgrading potholes for greater water-holding capacity by using native stone and tinted concrete.

There is no “one size fits all” approach; however, the IMP provides limited opportunity to construct new range developments in WSAs, particularly permanent facilities. For most proposals, the decision will ultimately rest on the determination of whether or not the project truly enhances wilderness values. The only way to determine if a project is consistent with the IMP and FLPMA is through a systematic evaluation of the proposed action (see Procedures for Evaluation of Proposed Actions in H-8550-1).

BIRD LADDER EXAMPLE

Bird Ladder example that works with most round, rectangular and square troughs. See Idaho BLM Technical Bulletin 89-4 "Wildlife Watering and Escape Ramps on Livestock Water Developments: Suggestions and Recommendations" for more information regarding wildlife escape ramps or bird ladders.

