State ofUtah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF FORESTRY, FIRE AND STATE LANDS

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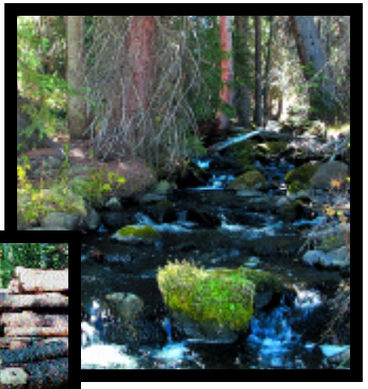
UTAH'S FOREST WATER QUALITY GUIDELINES

A PRACTICAL USER'S GUIDE

FOR LANDOWNERS, LOGGERS

& RESOURCE MANAGERS



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It is with heartfelt thanks and appreciation that we dedicate this publication to

Rick Summers whose tireless devotion to protecting Utah's waters is unsurpassed.

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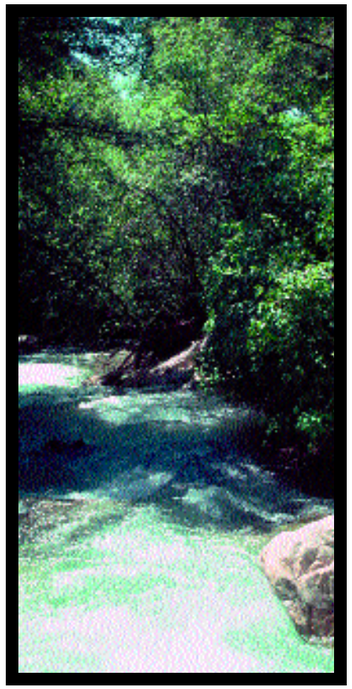


Utah is primarily an arid state. However, those lands which lie at higher elevations, where precipitation is generous enough to allow trees to grow, are covered with coniferous and deciduous forests. Forests make an important contribution to Utah's way and quality of life by providing abundant resource benefits including wood products, fish & wildlife habitat, recreational opportunities and clean air and water. Utah's high elevation forests are the principal source of surface water and are critical recharge areas for most ground water sources in the state. From this perspective, forested lands are an important natural resource.

Forest types found in Utah include pine, Douglas-fir, spruce-fir, and aspen. About 20 percent of the timberland in Utah is privately owned. While the majority of the states' forestlands are in federal ownership, Utah's private forestlands are of great importance contributing numerous benefits to the state's economy and society at large. If these non-federal lands are well managed, they have the potential to provide continuing benefits over the long-term. The protection and sound management of Utah's private forestlands is critical for the protection of water quality in Utah.

Impaired water quality is costly for humans, wildlife and the environment. This book is designed to help landowners, loggers and resource managers better understand the dynamic nature of these vital areas and their role in protecting water quality. This book illustrates the use of Utah's Forest Water Quality Guidelines (FWQGs). The FWQGs are voluntary measures landowners, loggers and resource managers can use to provide for the protection of our state's water quality. The photographs and illustrations show applied practices and how they look when applied on the ground.

How To Use This Book

These first few pages contain general information and answers to the most commonly asked questions about nonpoint source pollution and the Forest Water Quality Guidelines. The remainder of the book is divided into eight sections that deal specifically with each of the guidelines:

■ Pre-harvest Planning ■ Streamside Management Zone ■ Roads, Skid Trails, Landings & Stream Crossings ■ Timber Harvesting ■ Site Preparation, Regeneration & Revegetation ■ Chemical Management ■ Prescribed Fire ■ Forested Wetlands

Each section describes a particular Forest Water Quality Guideline, or FWQG, and begins with a helpful "Checklist for Success." The descriptions that follow provide guidance, illustrations and photographs in the text, and offers the user a moderate level of information on the application of the guidelines. The ⃠ symbol indicates examples of practices or situations to avoid. Most importantly, the book attempts to emphasize the protection of water resources above all else when conducting forest management activities. At the end of the book, you will find supplemental information including a glossary of terms commonly used in forestry, and sources of assistance designed to help landowners manage their forest and water resources.

We hope you will find this publication useful as you plan and carry out your forestry operations. We welcome suggestions on how this book can be improved. To submit comments about this publication or request additional copies, please direct your inquiry to:

Utah Department of Natural Resources
Division of Forestry, Fire & State Lands
1594 W. North Temple, Suite 3520
Salt Lake City, UT 84114

WHAT IS A WATERSHED?

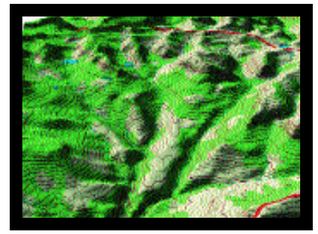
A watershed is an area of land that drains water to a common outlet, such as a river, lake, reservoir or ocean. The land, vegetation and stream network within the watershed work through a variety of natural processes which serve to regulate the quality and quantity of water delivered to the outlet. Changes within the watershed that disrupt these natural processes, such as soil disturbance associated with road construction, can negatively affect the quality of water on which we all depend.

We all depend on clean water for drinking, bathing and other residential uses; for irrigation and industry; and for the health of natural ecosystems. Throughout Utah, forestlands act as collectors of pure water. Much of Utah's water supply originates in the state's high elevation forested watersheds. For this reason, special care must be taken to protect the water supply when conducting forest management activities in these areas. Protecting the water supplied by our watersheds is everyone's responsibility.

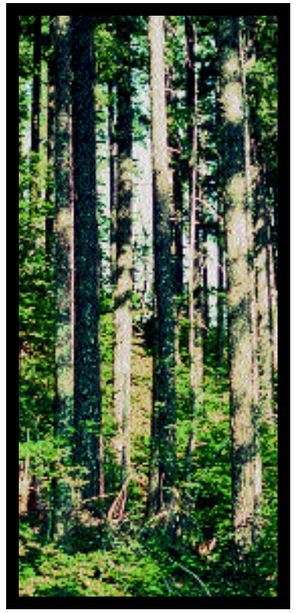
When properly conducted, forest management activities have minimal impacts on these natural processes, and the quality and quantity of water discharged from a watershed. Because impacts from forest management activities can extend beyond property boundaries, landowners, loggers and resource managers must conduct these activities with care.

VALUE OF USE & APPLICATION OF THE FWQGS

The most practical and cost-effective way to assure forest management activities do not adversely impact water quality is through the application of Utah's voluntary Forest Water Quality Guidelines. These guidelines are designed to provide the best protection for water quality and other resources during the management of forest resources, including timber harvesting. Through proper planning, your timber harvest can be positive for our watersheds while providing the sustained goods and services our society demands.



A watershed is an area from which all streams flow to a common point or outlet.



Q: What are forest practices?

A: Forest practices are those activities related to growing, harvesting or processing forest products, including, but not limited to, road construction and maintenance, thinning, salvage harvest, reforestation, brush control, and using fertilizers or pesticides to achieve desired objectives and benefits.

Q: Who can assist me with the application of the Forest Water Quality Guidelines?

A: The Utah Division of Forestry, Fire & State Lands emphasizes one-on-one contact with landowners, loggers and resource professionals on the use and installation of the Forest Water Quality Guidelines. The Division also offers technical assistance to landowners to help them protect the value of their land and resources to meet present and future land management objectives. Technical assistance includes development of logging and management plans, inventories, contract development and design of site specific silvicultural prescriptions.

Q: What is nonpoint source pollution?

A: Nonpoint source pollution is defined as diffuse sources of water pollution that originate from indefinable sources, and normally include agricultural and urban runoff. In practical terms, nonpoint sources of pollution do not discharge from a specific, single location. Nonpoint sources of pollution are generally carried over or through the soil and ground cover via stormflow processes.

Q: What are the Forest Water Quality Guidelines?

A: Utah's Forest Water Quality Guidelines are a collection of *voluntary* measures that landowners, loggers and resource managers can utilize for the conservation of Utah's forest and water resources.

Q: Are the Forest Water Quality Guidelines an infringement on my private property rights?

A: No. The Forest Water Quality Guidelines are entirely *voluntary*. Actual implementation of these guidelines will be the landowner's choice and responsibility.

Q: Are there other requirements or permits necessary to conduct forestry activities?

A: Yes. Certain permits and licenses related to forest management and protection of water quality exist at the state and federal level. Permits include stream alteration, burning, commercial road use and Section 404. In addition, state law requires those transporting forest products within, into or out of the state must have proof of product ownership.

Q: Why does Utah have Forest Water Quality Guidelines?

A: Silviculture or forest management activities has been identified as a possible source of nonpoint pollution to the state's water bodies and courses. Timber harvesting can cause negative impacts including land degradation and poor water quality if conducted improperly.

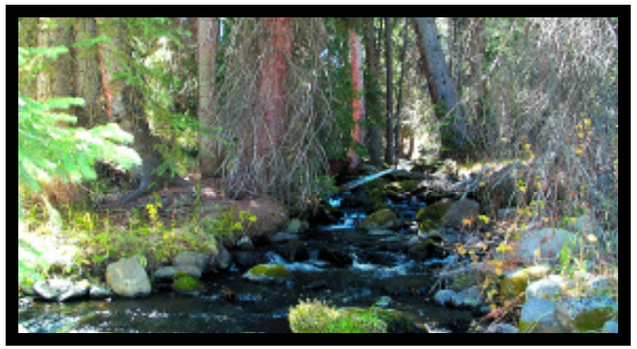
CHECKLIST FOR SUCCESS

The following is a partial list of practices that may be applicable to pre-harvest planning during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Quality Guidelines for a more complete list of practices.

- ❑ Consult with a professional resource manager for assistance.
- ❑ Develop a forest management plan that reflects your resource management objectives. Include a list of applicable Forest Water Quality Guidelines, recommended treatments and schedule of activities.
- ❑ Develop a legally binding contractual agreement that specifies the type and amount to be harvested, and includes requirements for slash disposal, site rehabilitation and all applicable Forest Water Quality Guidelines.
- ❑ Locate environmentally sensitive areas such as:
  - streams, wetlands, lakes, ponds, steep slopes and erosive soils
- ❑ Locate and mark streamside management zones (SMZs)
- ❑ Consider the physical features such as:
  - topography, soils, slope and aspect
- ❑ Identify the appropriate harvesting system for the site. Consider:
  - ground-based, cable or aerial
- ❑ Choose the appropriate harvest prescription such as thinning, shelterwood, seedtree, clearcut, etc. to achieve objectives and provide for desired future conditions
- ❑ Plan for the treatment of slash, site preparation, regeneration and revegetation prior to harvesting.
- ❑ Carefully plan road layout along with landings and skid trails that best suit the harvest system and physical features of the land. Also identify which roads will be closed after the forest activity is completed. Consider the following:
  - follow natural contour of the land
  - minimize the number of landings and skid trails
  - minimize cuts, fills and stream crossings
  - construct roads to adequately support harvest and hauling needs
- ❑ Carefully plan and locate drainage structures and stream crossings. Consider:
  - culverts, water bars, cross drains, dips, diversion structures
- ❑ Obtain all necessary permits and/or approval requirements before beginning the operation.

Proper planning is an essential part of timber harvesting. Pre-harvest planning is the design of timber harvest operations to meet landowner objectives. A pre-harvest plan using the Forest Water Quality Guidelines removes forest products efficiently, promotes sustainable forest growth, and protects water quality. Pre-harvest planning is recommended for timber sales and similar forest management activities.

Roads produce up to 90% of all sediment from forest management activities. Proper road location and design are key to the success of your timber harvesting operation. Minimize the number and length of roads to reduce sedimentation and minimize visual impacts.



Riparian vegetation adjacent to this stream make up the streamside management zone (SMZ). The vegetation provides shade which helps maintain water temperature for healthy fish populations. The SMZ also provides filtering of surface runoff and sediment. Disturbance within the SMZ should be minimized.

Trees left for future harvest should be of sufficient vigor and desirable species to ensure continuous growing and harvesting. Choose the appropriate harvest prescription to achieve your management objectives and to provide for a desired future stand condition.

NEED ASSISTANCE?

Forestry, Fire & State Lands foresters will help you develop management plans, assist with timber sales, provide advice on timber sale contracts and market your timber. For more information, contact your local FFSL office in Salt Lake City, Logan, Vernal, Richfield, Moab or Cedar City.

CHECKLIST FOR SUCCESS

The following is a partial list of practices which may be applicable to your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is complete. Refer to the Forest Water Quality Guidelines for a more complete list of practices.

- ❑ Designate the Streamside Management Zone (SMZ) using recommended distances.
- ❑ Establish an undisturbed strip of 15 feet along each side of water bodies to filter runoff.
- ❑ Leave sufficient trees to provide bank stabilization, shade and a future source of large woody debris.
- ❑ Leave enough trees and shrubs to provide adequate shade for stream.
- ❑ Before logging, clearly mark the SMZ with paint, flagging or signs.
- ❑ Minimize disturbances that expose mineral soil in the SMZ.
- ❑ Mark only those trees to be cut in the SMZ. Avoid clearcutting in the SMZ.
- ❑ Retain a diversity of tree species and age classes in the SMZ. Keep enough mature trees to avoid potential regeneration problems.
- ❑ Maintain sufficient ground cover within the SMZ to trap sediment before it enters any watercourse.
- ❑ Avoid use of heavy equipment in the SMZ to minimize ground disturbance. Use winching or end-lining skidding techniques to remove logs from the SMZ.
- ❑ Use directional felling in the SMZ. A boom feller-buncher can also minimize disturbance.
- ❑ Limbing of trees should always be done above the high water mark.
- ❑ Avoid felling trees into streams and keep slash out of all water bodies.

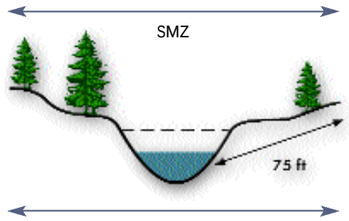
CHECKLIST FOR SUCCESS CONTINUED

- ❑ Plan stream crossings carefully. Streams should be crossed at a right angle to the channel.
- ❑ Minimize the number of stream crossings.
- ❑ Do not sidecast soil or gravel into streams or wetlands when constructing or maintaining roads.
- ❑ Keep slash out of the SMZ. If slash does occur in the SMZ, do not machine-pile or burn.
- ❑ When crossing Class I and Class II streams, structures should be the appropriate size to allow full surface flow of the stream for the entire life of the structure.
- ❑ Deposit and stabilize excavated material on stable sites outside of the SMZ.
- ❑ Remove material which adversely affects the natural flow of water. Remove in a manner which causes the least disturbance.
- ❑ Control skidding to prevent stream channel damage and to preclude build-up of destructive run-off flows or erosion in sensitive areas such as the SMZ , wetlands or meadows.
- ❑ Avoid broadcast burning in the SMZ unless it is identified as the proper management treatment.
- ❑ Do not use, mix, store or handle hazardous or toxic materials in the SMZ. Limit pesticide use in the SMZ. Do not clean equipment or containers of fuels, pesticides or herbicides in or near streams or in the SMZ.

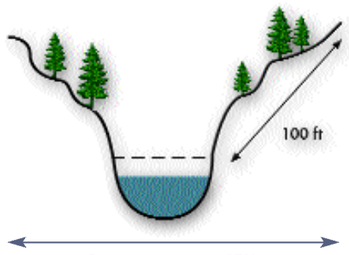
The Streamside Management Zone (SMZ) is an area or strip of land adjacent to a stream or other body of water where management practices such as harvesting of timber, road construction or prescribed burning are planned and implemented in a way to protect water quality, aquatic wildlife and wildlife habitat. Trees and vegetation within the SMZ serve as a natural filter to keep sediment out of a stream, reduce soil erosion and act as a buffer to protect the stream from degradation caused by nearby activities. The SMZ is not a zone of exclusion where all silvicultural activities are precluded but, because of the need to protect water quality and other values, the SMZ is an area where silvicultural activities should be closely managed.

Class I Stream

Streams or other bodies of water used for domestic water supply and/or the spawning, rearing, migration of fish, including impacted streams with recovery potential for a fishery. Also included are perennial streams that contribute significant flow to downstream fisheries. 75 feet is the recommended minimum slope distance for the Streamside Management Zone on slopes of less than 35 percent.



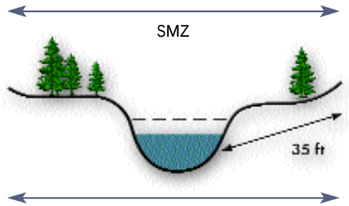
Slopes less than 35%



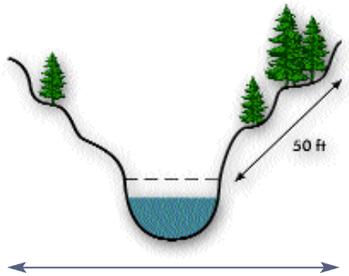
Slopes greater than 35%

Class II Stream

All streams that do not meet the Class I definition and are identifiable in the field as having a defined channel of bed rock, sand, gravel, or rocky material, definite banks, generally having an ordinary high water mark and confines and conducts continuously or intermittently flowing water. Also included are reservoirs, lakes, and ponds greater than 1/10 acre that do not support fish or provide domestic water supply. 35 feet is the recommended minimum slope distance for the Streamside Management Zone on slopes of less than 35 percent.



Slopes less than 35%

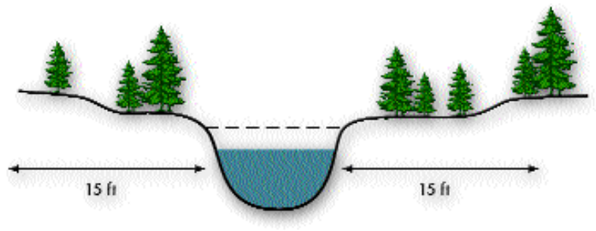


Slopes greater than 35%

Temporary flagging is one way to clearly mark the streamside management zone prior to logging

Streamside Management Zones should be clearly marked before logging begins. This allows the logger to know which areas require special considerations during timber harvest. Special provisions can be written into the timber contract to protect water quality. These provisions may not be applicable to the remainder of the sale area.

Needles, leaves, small twigs and other vegetative matter are collectively called forest litter. The forest floor is covered with litter and an underlying layer of duff. The duff, litter, grass and other plants growing there are very efficient in filtering sediment from surface runoff. A filter strip of undisturbed litter, duff, grass and vegetation is recommended to protect water quality. This undisturbed area is called a leave strip and should be at least 15 feet slope distance on either side of the stream or water body.



Recommended leave strip of undisturbed litter and duff

Checklist for Success

The following is a partial list of practices that may be applicable to road construction during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Qualilty Guidelines for a more complete list of practices.

Planning:

- ❑ Use the minimum number of roads to meet transportation needs.
- ❑ Design roads for safety, the intended purpose and the specific site.
- ❑ Avoid wetlands unless impractical. Keep wetland constraints in mind.
- ❑ Design roads to fit the natural terrain.
- ❑ Locate and construct road surfaces to drain naturally.
- ❑ Don't make roads too steep.
- ❑ Plan enough drainage features at suitable locations.
- ❑ Place excavated materials in stable areas.
- ❑ Use stream crossings only when necessary, and when used, be sure they will accommodate peak water flows.

During construction:

- ❑ Start work timely to avoid wet and winter seasons, if possible.
- ❑ Install drainage features at time of road construction.
- ❑ Compact all fill material.
- ❑ Allow adequate drainage from road surface.
- ❑ Use live vegetation or slash to prevent erosion of fill material and to prevent surface runoff from entering live streams.
- ❑ Stablize disturbed areas as soon as practical.
- ❑ Consider surfacing to prevent road surface erosion or excessive maintenance.

Road Maintenance:

- ❑ Maintain drainage of road surface. Avoid leaving a berm which might cause standing water or channel surface runoff down the road.
- ❑ Grade roads only when necessary. Avoid cutting toe slopes and creating excess material.
- ❑ Surface road if appropriate to reduce erosion and rutting if road is used in all types of weather.

Any construction activities affecting the bed or banks of streams may require a permit from the Division of Water Rights. A stream alteration permit is required before such work may begin. Contact the local office or their state office at:
801 538-7375

CHECKLIST FOR SUCCESS CONTINUED

Stream Crossings:

- ❑ Install crossings during appropriate season to minimize effects on water quality.
- ❑ Consider low flow periods and impact to fish populations.
- ❑ Identify appropriate type of stream crossing.
- ❑ Install stream crossing appropriately whether ford, culvert or bridge.
- ❑ Protect integrity of existing stream channel.
- ❑ Place rock, gravel, slash or other material along streamsides to protect the fill material, culvert inlet and outlet and bridge abutments from erosion.

Skid Trails:

- ❑ Use fewest number of skid trails possible to limit soil disturbance.
- ❑ Use appropriate skidding systems for terrain, i.e. rubber-tired skidders, tractors, cable, etc.
- ❑ Avoid skidding patterns that might concentrate or channel runoff.
- ❑ When skidding is terminated, consider water bars and seeding if erosion might become a problem.

Landings:

- ❑ Avoid landings in Streamside Management Zones.
- ❑ Minimize number and size of landings.
- ❑ Locate landings away from natural drainages and divert runoff away from streams.
- ❑ Construct landings to allow for natural drainage to occur.
- ❑ Locate landings to preclude skidding through drainages and streams.
- ❑ At the end of operations, restore landings and reseed if necessary.

Winter Operations:

- ❑ Use winter season for low-impact logging of sensitive areas.
- ❑ Construct roads during summer or fall months to insure compaction of fill material.
- ❑ Provide adequate drainage for winter operations as well as other seasons .
- ❑ Use cold weather to solidify roads and prevent damage to moist areas.
- ❑ Suspend operations during periods of alternate freezing and thawing.

When roads, streams crossings, landings,skid trails or winter operations have ended, consider the closing of such facilities. Rehabilitation of the area and revegetation is strongly recommended to prevent erosion and subsequent impact to water bodies in the area.

ROADS, SKID TRAILS, LANDINGS & STREAM CROSSINGS

PLANNING

Road erosion is a primary cause of stream sedimentation associated with forest harvesting. Mass movement associated with road construction also causes sedimentation. Water quality of streams and lakes can be protected by careful planning, designing and proper construction of roads after they have been appropriately located. Proper planning can be helpful to a landowner by reducing the number, width and length of roads, decreasing the amount of maintenance required and limiting the visual and physical impact to the land. A reduction in the amount of roads to be constructed can also save a landower money.

Planning decisions affect the cost of a road system, long-term maintenance needs, life expectancy and the amount of nonpoint source pollution it may cause. The type, location and design of any road should be based on:

- future uses of the road system,
- site specifics such as soils, slopes, geology, vegetation, storm runoff, etc.
- coordination with adjacent landowners, if possible, and
- use of temporary roads whenever practical.

Additional points to consider when planning for road construction include the following:

- Locate roads on well-drained soils wherever possible.
- Avoid unstable slopes which may be evidenced by slumps, uneven topography, pistol-butted or J-shaped trees, dips, cracks or previous slides.
- Identify optimum stream crossing locations first, then locate roads to accommodate these crossings.
- Roads should be located outside of stream management zones.
- Locate roads to follow natural contours as much as possible. This will minimize cuts and fills and reduce need for fill material or removal of excess material. It will also decrease the amount of disturbed area which may then need to be revegetated.
- Keep road grades below 10%, if possible. Roads may exceed 10% for short distances but, if so, install road drainage features and take measures to prevent erosion.

*

PLANNING

Existing Road *

Upgrade of Existing Road *

Temporary roads are designed and constructed for short-term use. They are narrow and rough. When no longer needed, they are closed and reclaimed by natural or artificial regeneration. These roads are the most common type of forest road.

NEW VS. OLD

Sometimes, existing roads can be used. Construction of new roads may be more costly and damaging than upgrading existing roads. Any roads already present should be evaluated to determine if they are properly located for long-term needs, have adequate drainage, are suited for the expected use and meet maintenance requirements. Many times, existing roads are in inappropriate locations. Roads may closely parallel streams, have little or no vegetation between the road bank and a stream or go straight up a draw or gully. Roads in these locations probably should be relocated. Other considerations are grade, curves or switchbacks and safety concerns such as blind corners.

Permanent roads can be seasonal or all-season. Seasonal are usually not surfaced, are more narrow and are used when the surface is solid or frozen. All-season roads are usually designed for year-round use but may have some restrictions.

Roads can be built to landowners specifications which may vary from temporary roads to roads built for more permanent use.

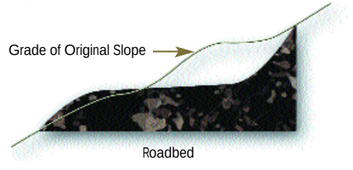
DRAINAGE

The most critical problem regarding road construction and maintenance is drainage of the surface water from the road surface. Traffic causes ruts when standing water is present. Running water erodes the surface of the road or embankments and deposits the sediment in streams and lakes. Design roads to address these important issues.

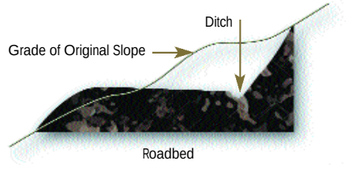
*

SOLUTIONS

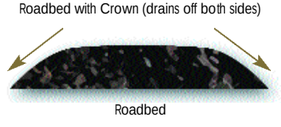
Outsloped roads are less-expensive to construct and maintain. They should be used on moderate slopes with stable soils.



Insloped roads with ditches are used on steep terrain, side slopes or when runoff can be diverted away from road fills. This may reduce erosion of the fill and prevent sedimentation.



Crowned roads are elevated roadbeds that drain to each side and are used in situations such as poorly-drained soils or for a more permanent road subjected to heavier loads.



Road Construction

There are a number of important issues to remember as roads are constructed. Some of these are illustrated in the drawing below.

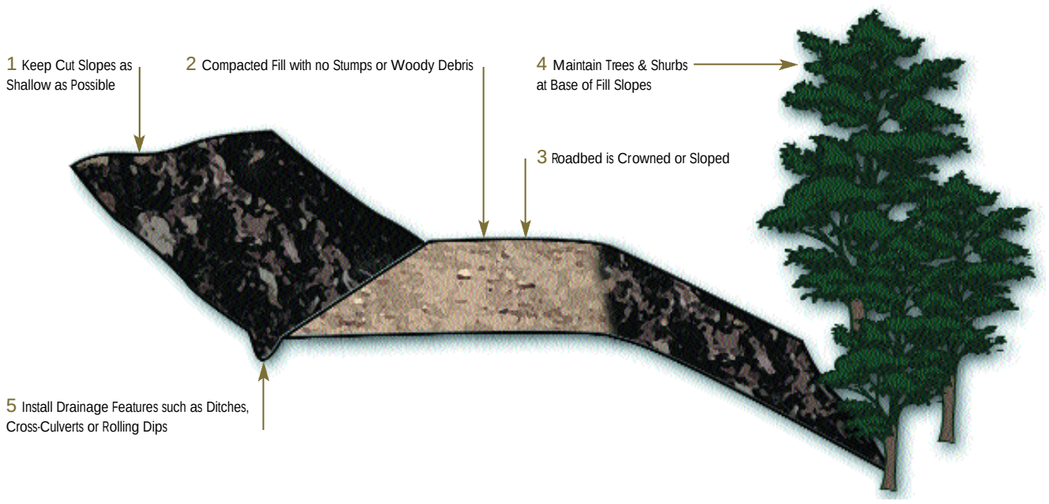
1 The angle of the cut slope should be kept as low as practical to reduce the possibility of sloughing or slipping.

2 As the road base is being formed, the fill material should be compacted as construction occurs. Keep stumps and woody debris out of the road base. This type of material will deteriorate and leave voids in the fill which will subsequently collapse and damage the road.

3 The roadbed should be formed for the appropriate design as the cut or fill is being made. Inslope, outslope or crown will allow the road surface to shed water. Remember, standing water causes most maintenance problems with road surfaces.

4 Trees and shrubs should be maintained at the base of the slope. This vegetation acts as a filter to absorb the sediments from storm runoff. The vegetation also serves to stabililze the bottom of a fill slope.

5 Drainage features include ditches, cross culverts and rolling dips. These features abate the problem of excess runoff on the uphill side of a road.



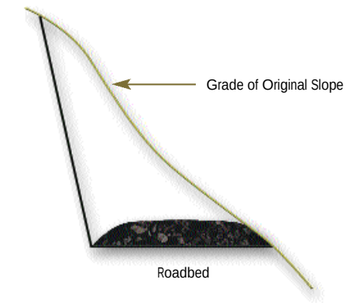
Cuts & Fills

When a road is cut along a steep hillside, the embankment is excavated in such a manner that the roadbed rests on the original material of the hillside. This is called a full-bench road. There is no fill material used in this construction other than perhaps gravel for the surfacing of the road itself. All excess material should be hauled away. Any material pushed down the slope will become a major contributor of sedimentation. The terrain is usually steep enough to require special provisions for surface drainage. A ditch is usually constructed on the inside or next to the excavated bank to handle surface runoff.

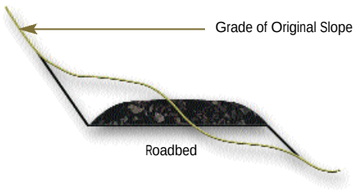
However, when the slope is more moderate, the side-cast method of road construction can be used. This type of road uses the excavated material as fill for the lower portion of the road. If planned correctly and constructed appropriately, there will be no excess material which would need to be removed from the site. As described on the previous page, vegetation left at the bottom of the fill slope will help stabilize the fill.

When either of these construction methods is used, the issue of surface runoff still needs to be addressed. In addition, the side-cast road creates cutbanks and raw fill slopes. The full-bench method exposes cutbanks only but they are usually much larger.

Full-bench Road



Side-cast Road



Road Construction

Surface Drainage

There are a number of features that can be built during road construction to contend with the issue of surface drainage. Three of the most commonly used features are the rolling dip, the spreader ditch and a cross culvert.

Rolling Dip

A rolling dip is much like a hump constructed in the road bed itself. The purpose is to divert any water from the road surface or the inside ditch off the road into the adjacent terrain. The rolling dip is constructed at a gentle angle to the direction of the road so the dip may be easily traveled. The bottom of the dip is sloped to the outside to carry water away from the road. The dip should be 120º to 140º to the direction of travel.

Spreader Ditch

A spreader ditch diverts water from the road onto an adjacent area where vegetation, a decrease in velocity or the spreading out of the stream of water will allow the sediment to settle out and the water to be absorbed into the ground. The spreader ditch can be successfully used wherever excessive amounts of water may collect on the road surface or in drainage ditches. The spreader ditch works particularly well when used in conjuction with a rolling dip. But it can work equally well with an inside ditch or cross culvert.

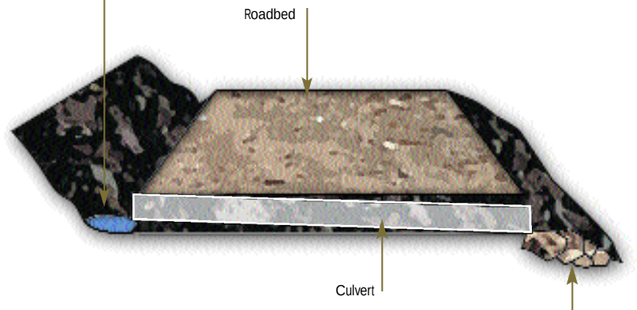
Cross Culvert

During road construction, a cross culvert should be installed to drain water from either the inside ditch or from natural water sources such as seeps or small springs uncovered by road excavation. These culverts are used to transport water to areas where infiltration can occur or the natural flow will be resumed.

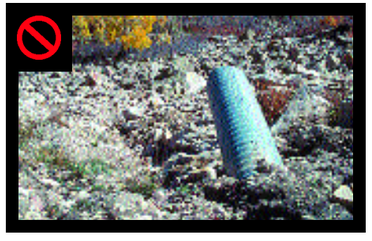
Rolling dips, spreader ditches or cross culverts can each be used to suit a specific situation on any particular road. The combination of two or more are even more effective to control the movement of water away from the road surface, cut slopes and fill embankments. Other features of more limited utililty can be used. Some of these are the open-top culverts, water bars and box or log culverts.

When ditches are used with insloped roads, drain runoff through culverts or into adjacent vegetation to filter sediment.

Construct catch basin to divert water through the culvert.
Catch basin should be lined with rock, masonry or other material to prevent erosion. This type of protection is called armor.



Outfall of culvert should also be armored to prevent erosion and damage to slope. End of pipe should not be elevated above fill material.



Maintenance needs can be substantially reduced if road travel during wet condtions can be avoided. Place gates at strategic points to limit access.

Road Maintenance

Grading is usually done by a road patrol or road grader and should only be done as needed to maintain the surface of the road, repair ruts, restore drainage of the road surface or to maintain the ditches for proper drainage and flow of water. Grading creates a newly-disturbed surface which is prone to erosion so grade only those sections of the road and ditches that require maintenance. When grading, lift the blade where no grading is necessary.

Apply gravel to improve the surface, reduce the maintenance needs and extend the season of use.

Avoid creating berms that channel all runoff water onto and down a road surface. Retain the natural drainage of the road surface.

Keep ditches and culverts free of debris and clean catch basins periodically, particularly after severe storms.

When grading, avoid cutting the toe of a slope. This causes slope instability and can lead to mass movement of upslope areas.

Skid Trails

Ground-based skidding creates skid trails which are paths used to drag logs to an area where the logs are collected into a log deck for loading onto trucks. Limit the number and length of skid trails to minimize the total amount of area disturbed by skidding. In most instances, the disturbance by skidding will aid natural regeneration of the forest. However, care must be used to prevent excessive erosion of skid trails or sedimentation of streams.

Directional felling is one way to minimize the number of skid trails or amount of area disturbed by skid trails. The roads or skid trails are laid out before the trees are cut. The trees are then cut for the most efficient access.

Note the additional length and number of skid trails to access the same number of trees in the diagrams. Foresight is needed to facilitate skidding with the minimum amount of skid trails.

Excessive skidding on the same trail.

Directional Felling

VS.

Unplanned Felling

Landings

Landings are cleared areas where logs are collected for loading on trucks. Logs are usually stacked or decked for loading and may also be limbed and cut to length at a landing. This concentration of activities may cause compaction, erosion or sedimentation. To avoid these problems, landings and decks should be made larger than necessary to safely conduct the operations. The number of landings should be kept to a minimum as well. Adequate drainage for the landing is essential but excessive slope can cause erosion.

Avoid perched landings which may fail and cause substantial erosion problems.

Decking logs along a road is one way to minimize the number of landings needed

When no longer needed, reclaim landings by recontouring or reshaping and reseeding the area.

Roads, Skid Trails, Landings & Stream Crossings

Stream Crossings

Select a site for a stream crossing before the rest of the road system is laid out or planned. This will allow the road system to be designed for the best approach to the stream crossings. The profile of a streambed should not be changed when constructing crossings. Alteration of the stream banks should be minimized and a permit is required prior to any work being done. All stream crossings should be done at right angles to the stream channel to minimize disturbance to vegetation, banks and streambed. Fords, culverts or bridges are most commonly used for stream crossings

Fords

A ford is simply a crossing of a stream without a structure or culvert. They can be used where stream banks are low and firm, the streambed is firm and the stream is shallow. Fords should not be used if significant alteration of the stream bank is required. Rock and gravel may be used to stabilize the streambed and approaches. Concrete may be placed in streambeds or flow areas of intermittent watercourses when warranted to protect the streambed under all weather conditions.

Bridges

Bridges can be used for temporary or permanent crossings of streams. Usually, permanent bridges are used for larger streams or for more permanent roads. Temporary bridges are used for smaller streams, infrequent or one-time access and can be made of other suitable materials or devices. Use care to minimize disturbance to stream banks and approaches. A permit is required for any stream bank alteration.

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STREAM CROSSINGS

Culverts

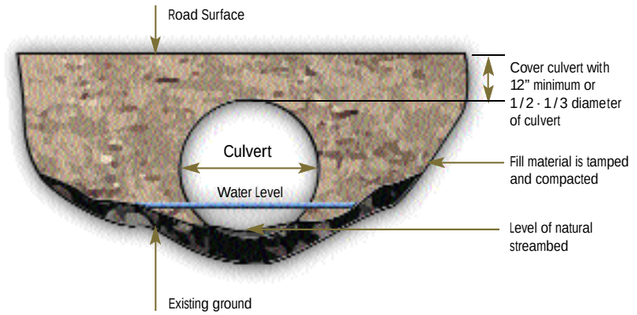
Culverts are the most commonly-used form of stream crossing. A culvert is easily placed, functions well and can be reused upon removal when no longer needed. There are several important considerations when using culverts for stream crossings.

1 Use adequate size for stream and runoff flow. Anticipate storm peak flows and size culverts accordingly

2 Stream gradients should not be changed when installing culverts..

3 Protect fill over culvert by armoring upstream end of culvert.

4 Provide armor of some type to prevent erosion at discharge end of culvert.



Culvert Installation

Culverts should be placed slightly below the natural stream bed to preclude culvert outfall barriers.

Culverts should be installed with the same slope of the natural stream bed. A pitch of 2-3 percent will cause the culvert to be self-cleaning.

Culverts should be extended at least one foot beyond the fill at both the inlet and outlet ends.

Culverts need to be inspected regularly and cleaned out as necessary.

WINTER OPERATIONS

Winter provides an opportunity to conduct harvest operations in areas which might be sensitive during warmer drier times. One example is wetland areas which are particularly suited to being logged during winter. The snow pack can provide support across wet areas which would be deeply rutted if logged during the summer months. Freezing of some wetland areas can also extend operating periods and reduce impact from logging. Operations conducted during cold weather months have different maintenance requirements. Roads are vulnerable to heavy damage and erosion if not maintained correctly. However, if properly maintained during winter months, road usage can extend the logging season without creating excessive impacts. Some of the issues of winter operation are:

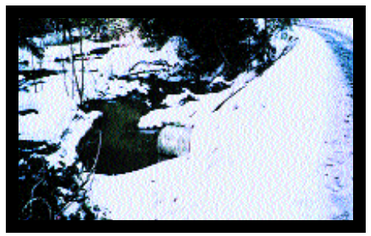
Remove snow from roads initially to allow deep freezing which will increase stability of the road base.

After roads have frozen solidly, maintain packed snow on the road to insulate the frozen road base.

Berms of snow along road edges can keep melted snow on the road surface from entering streams.

During times of alternative freezing and thawing, suspend operations if deeply frozen road base begins to thaw.

Use water bar to divert snow melt from frozen road.



Use snow berms to keep streams clean.

Roads may need to be ripped before they are closed. This will allow vegetation to grow more easily on the abandoned road.

Road Closures

After harvesting operations, the future need for a road should be considered. If plans have changed since the planning of the harvest, the road may need to be kept open for other uses. However, most roads can be closed when logging operations cease. The closure and rehabilitation of roads can do much to prevent sedimentation of streams and lakes.

Roads should be ripped or loosened so vegetation can grow. If necessary, the roadbed should also be contoured to the original slope of the land. Stream courses and natural drainages should be restored to their natural channels. These rehabilitated roads should be barricaded to prevent use by vehicles while revegetation occurs. Some ways of barricading roads are shown below.

*

Checklist for Success

The following is a partial list of practices that may be applicable to timber harvesting during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Quality Guidelines for a more complete list of practices.

Harvesting Equipment Considerations

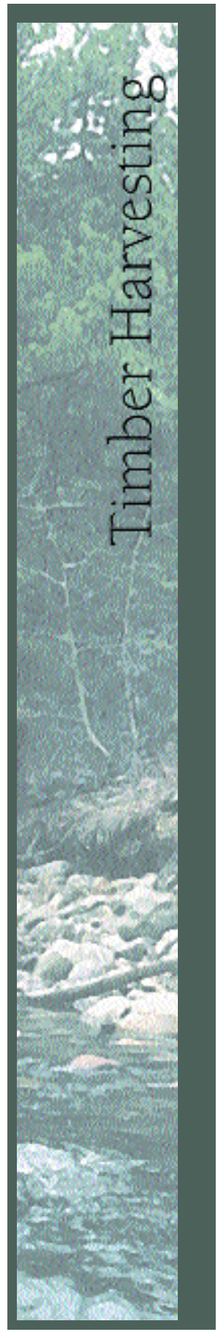
- ❑ Choose the appropriate size and type of equipment to adequately perform the operation, and will minimize soil compaction and damage to the residual stand.
- ❑ Plan and layout skid trails prior to harvesting.
- ❑ Use directional felling techniques.
- ❑ Avoid skidding in drainages and stream channels to prevent excessive soil displacement.
- ❑ Exclude operation of ground based machinery within streamside management zones.
- ❑ Consider the use of low ground pressure equipment in wetlands.
- ❑ Avoid the use of skidder blades for braking when descending steep slopes.

Winter Logging Considerations

- ❑ Consider harvesting wetlands and other sensitive areas during winter months.
- ❑ Conduct winter logging operations when the ground is frozen or adequate snow cover exists to minimize disturbance.
- ❑ Install adequate road or skid trail drainage prior to the start of harvesting activities.
- ❑ Compact skid trails in snow prior to harvesting.
- ❑ Clearly mark culverts and other drainage structures making them visible in deep snow.
- ❑ Keep all drainage structures clear and ensure culverts remain free of debris.
- ❑ Avoid road construction during winter months.

Slash Management Considerations

- ❑ Lopping and scattering, crushing, or chipping slash material, as opposed to burning, aids nutrient cycling, protects reproduction, reduces potential insect infestations and impedes surface water flow.
- ❑ Use brush blades for piling slash to reduce soil disturbance.
- ❑ Ensure the best possible utilization of wood to prevent excessive slash accumulations.



CHECKLIST FOR SUCCESS CONTINUED

Regeneration Considerations

- ❑ Retain a sufficient number of healthy trees with adequate crowns and good form for seed trees or retention trees.
- ❑ Restrict equipment to designated trails to limit soil compaction. Treat excessively compacted areas to obtain adequate regeneration or revegetation.
- ❑ Scarify the soil only to the extent necessary to meet regeneration objectives.

FOREST PRODUCTS TRANSPORTATION ACT

Transportation of forest products within, into or out of the State of Utah requires compliance with the Utah Forest Products Transportation Act (Utah Code 78-38-4.5). This law requires proof of product ownership to harvest or transport forest products from state, private and federal lands in Utah. The Act:

- **protects the rights of private landowners**
- **assures forest products are obtained legally**
- **promotes fair market value for products harvested**
- **prevents theft**

Proof of ownership may include a timber sale contract, permit, bill of sale or lading, receipt, or other legal instrument which provides the following information:

- **date of sale**
- **purchaser, transporter, landowner, agency and vendor name & address**
- **legal or other description of sale area**
- **product, species and quantity being harvested or removed**
- **delivery point**

Timber harvesting is the cutting and removal of trees. Harvesting activities should be conducted to ensure long-term maintenance of water quality. Using the Forest Water Quality Guidelines in a timber sale contract protects your property and helps ensure availability of forest resources for future generations.

HARVESTING SYSTEMS

Generally, harvesting systems fall into three categories: ground-based, cable and aerial. Choose the harvesting system best suited to site conditions, cost-effectiveness and your management objectives.

Ground-based

Ground-based harvesting systems are typically used on gentle terrain, stable soils and in areas with adequate access. Ground based systems are generally used on slopes less than 40% and skidding distances less than 600 feet for tracked machines and 1200 feet for rubber tired equipment

Although used infrequently, harvesting by horses can be used in smaller timber. Best suited for relatively flat, level ground.

Rubber tired grapple skidder: The most commonly used and least expensive system. Skidders may cause excessive soil damage (i.e. compaction) if operating in wet conditions.

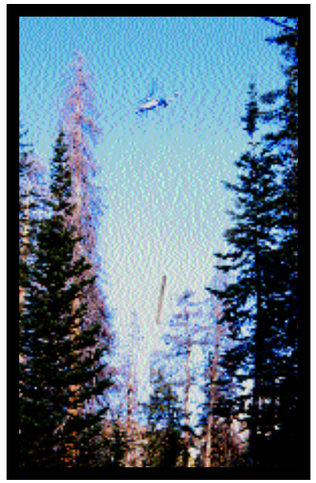
Tracked grapple dozer: Suitable for use on moderate slopes. May cause less damage than rubber tired skidders when soils are wet.

Feller-buncher: Mechanical harvesters can minimize damage to residual trees, water & soil.

Delimber/Processor: This equipment begins the manufacturing process in the forest by cutting trees to exact lengths.

HARVESTING SYSTEMS

A high-lead or skyline logging system.



Spruce salvage sale using helicopter to haul the logs to a landing. Aerial harvesting systems are the most expensive.

Cable

Cable harvesting systems are generally used on steep slopes, broken topography or where ground-based equipment cannot operate. Cable harvesting systems are typically used on slopes in excess of 40% and yarding distances of 1000 feet. They lift logs off the ground and move them to a landing where they are loaded and hauled away.

Aerial

Where road construction, unstable terrain and steep slopes preclude standard harvest methods, aerial harvesting systems can be effective. Aerial harvesting systems are also used for high-value selective logging and in areas where aesthetics are important.

Cable harvesting system using a tower and drum assembly.

Winter Logging Considerations

Sometimes the best time to harvest timber is during the winter. With the onset of winter comes the opportunity for low-impact logging. With proper precautions, timber harvesting in sensitive areas can be done without impacting water quality. Consider winter harvesting when logging sites are characterized by soil erosion and compaction hazards, high water tables or wetlands.

A mechanical harvester operating on snow covered ground. Winter harvesting provides for low impact logging.

A rubber-tired grapple skidder skidding logs over frozen surface

HARVESTING SYSTEMS

Untreated slash: Reduction of slash to decrease fire hazard is recommended. This photo shows unacceptable slash treatment.

Slash produced from timber harvesting activities should never be cast, piled or burned in the streamside management zone (SMZ).

Slash Management

Timber harvesting is only one step toward managing your resources. Upon completion of harvest, you may need to take steps to prevent soil erosion, reduce fire risk and insect & disease problems. Leaving logging debris on the ground provides many benefits. However, excessive slash can cause many problems. Treating slash can be accomplished by hand, mechanical or burning treatments. Proper slash treatment should allow for:

- adequate regeneration/reforestation
- nutrient cycling
- soil stabilization
- fire hazard reduction
- insect & disease risk reduction
- recreation & aesthetics

Ensure adequate slash disposal and treatment through the use of fire and/or mechanical means. Here, the slash has been lopped and scattered leaving branches and foliage within a foot or two of the ground. Slash treated in this manner can be left to aid in nutrient cycling and provide protection for regeneration.

CHECKLIST FOR SUCCESS

The following is a partial list of practices that may be applicable to site preparation, regeneration and revegetation during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Quality Guidelines for a more complete list of practices.

Site Preparation

- ❑ Dispose and treat slash with fire and/or other mechanical means.
- ❑ If needed, mechanically scarify soil to create optimal conditions for regeneration.
- ❑ Plan prescribed burning to accomplish management objectives without causing excessive damage to the soil or residual stand.
- ❑ Consider chemical site preparation where practical to minimize soil disturbance.

Regeneration

- ❑ Retain a sufficient number of healthy trees with adequate crowns and good form for seed trees to provide quality regeneration from genetically superior seed sources.
- ❑ Retain stocking levels suited to moisture conditions of the site. Dry sites may require retention of additional trees.
- ❑ When using artificial regeneration, plant species best suited to the soil and site conditions.
- ❑ Monitor survival of regeneration to ensure management objectives and protection of water quality are being met.

Revegetation

- ❑ Roads, skid trails and landings should be revegetated using natural or artificial means as soon as practical.
- ❑ Exposed sites or other areas should be stabilized using proper seed mixtures adapted to soil and site conditions.
- ❑ On steep slopes, the use of mulch or slash material may be used to stabilize soil and slow surface water flow until vegetation becomes established.
- ❑ Utilize native herbaceous seed mixtures best suited to the soil and site conditions.
- ❑ Avoid seeding where tree seedling establishment is desired unless conditions warrant.

In most cases, site preparation is necessary to reduce logging debris or to control other vegetation prior to planting. Site preparation practices include many different methods. Here, site scarification using a brush blade is being demonstrated to effectively prepare the site for planting. In some cases, site scarification to expose mineral soil is necessary to improve seed germination and seedling establishment.

Sensitive areas such as this bog require special care during harvesting activities.

Site preparation is the use of mechanical, chemical or other means to prepare a site for regeneration of a forest. Regeneration is the re-establishment of a forest stand. Revegetation may include regeneration, but should also address the need for soil stabilization on sites such as landings, skid trails, roads and SMZs. Site preparation, regeneration and revegetation is recommended for all timber harvesting activities.

General

Choose appropriate equipment for harvest on sensitive areas, including wetlands, bogs, slide areas and steep slopes. Equipment selection should consider the effects of erosion, compaction, sedimentation of water bodies, soil displacement and minimization of soil disturbance.

Site Preparation

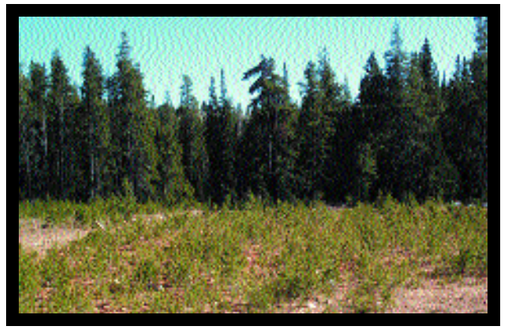
Proper site preparation provides adequate planting space to ensure the survival and growth of newly planted or established seedlings. Without proper site preparation, harvested sites can be overtaken by undesirable brush and weed species and remain unstocked for long periods of time.

Protect Soil from Compaction

Take special precautions when using heavy equipment to prepare the site for planting. Because trees need water and air for growth, compacting the soil can delay or even eliminate the start of the next forest. Soil may look and feel solid, but much of it is actually empty pore space. Use of heavy equipment can squeeze pore space which reduces space for water and air and nutrient uptake through the roots of the newly planted seedlings.

Regeneration

Plan for a new forest. There are two primary ways to regenerate your new forest: natural and artificial regeneration. Choose the best option suited to your specific management goals and needs.



Artificial regeneration: A newly planted stand of trees. Planting aids in rapid reforestation with healthy, vigorous seedlings at the proper spacing.

Natural regeneration: Retention of healthy and desirable species with sufficient crowns and growth form provides for the establishment of seedlings from genetically superior seed sources.

Advanced natural regeneration in the understory. The mature trees left from previous harvesting provide adequate shading for the establishment of a new forest.

A vigorous, well-stocked forest on its way to maturity. With proper management, your forest can continue to provide economic and environmental benefits.

Upon termination of forestry activities, temporary roads should be closed to reduce maintenance costs. Here, this road has been closed and properly seeded to reduce erosion and sedimentation.

A well established grass understory shown in this photo is the result of proper planning. Note proper harvesting method and slash treatment shown as well. In addition to protecting the soil, vegetative cover can enhance wildlife habitat and provide forage for livestock.

REVEGETATION

Areas such as road cuts and fills, landings, skid trails and drainage structures should be revegetated and/or stabilized as soon as practical. Natural revegetation may be adequate. If not, revegetation should be complimented by seeding, mulching or other means.

OTHER POINTS TO CONSIDER

- **Upon termination of operations, landings should be recontoured to the extent practical and revegetated.**
- **Stabilize exposed soil (including firelines) with proper seed mixture for soil and site conditions. Minimize the use of fertilizers to amend the soil.**
- **On steep slopes, the use of straw mulch or logging slash may be needed to stabilize soil until grasses and other ground cover become established.**
- **Following removal of temporary culverts and bridges, establish earth or straw dikes on stream banks and seed with proper seed mixtures.**
- **Utilize a native herbaceous seed mixture suited to site conditions. Avoid seeding herbaceous vegetation where tree seedlings establishment is desired unless erosive conditions warrant. Slash may be used to reduce erosion.**

CHECKLIST FOR SUCCESS

The following is a partial list of practices that may be applicable to chemical management during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Quality Guidelines for a more complete list of practices.

General

- ❑ Have a contingency plan to follow in the event of a chemical spill. The plan should include who to contact in the event of a spill, and may include having absorbent or neutralizing materials on hand with literature that describes spill cleanup or containment procedures.
- ❑ Follow all label instructions, EPA guidelines and state laws when using chemicals.
- ❑ Transport, store and apply chemicals in leak-proof, labeled containers. Dispose of chemical containers in an approved landfill or according to label instructions.
- ❑ Chemical storage containers and facilities should be located away from Streamside Management Zones (SMZs).
- ❑ When possible, mix chemicals and clean equipment only in areas that are part of the application site. Avoid streams, waterbodies and Streamside Management Zones (SMZs).

Pesticides

- ❑ Apply chemicals during appropriate weather and season.
- ❑ Avoid aerial or broadcast application of pesticides in SMZs unless the chemical is specifically labeled for applicatrion over or near water.
- ❑ Consider chemical site preparation instead of mechanical where possible to reduce sedimentation and other adverse impacts to water quality.
- ❑ Mix only the appropriate amount of pesticide needed. Dispose of excess pesticides according to label instructions and existing regulations.
- ❑ Keep and maintain records of the type of chemical, amount and dates applied, weather conditions and results.

Petrochemicals and Antifreeze

- ❑ Avoid draining used oil, fuel or antifreeze onto the ground.
- ❑ Fuel and service equipment away from SMZs and avoid spillage.
- ❑ Keep all fuel, oil and antifreeze away from surface waters and areas where spilled material may enter or be washed into water.

Be sure to remove all empty chemical containers from the site for proper disposal.

Use of chemicals during forestry activities can have considerable benefit. Chemical management refers to the use of chemicals such as pesticides (herbicides, rodenticides, insecticides, fungicides, etc.), petrochemicals (oil, gasoline, diesel), antifreeze, fire retardants and fertilizers for forest management.

In some cases, the use of chemicals is nearly unavoidable, such as the use of petrochemicals and antifreeze in vehicles and machinery. However, most chemicals have a potentially great impact on water quality and aquatic organisms if they are misused, misapplied or spilled.

OTHER POINTS TO CONSIDER

Forest chemicals, when applied correctly, can be a useful management tool for landowners. Chemicals are sometimes used in the forest to:

- **control insects and diseases**
- **control noxious weeds**
- **prepare sites for planting**
- **control competing vegetation**
- **fertilize trees to improve growth**
- **minimize wildlife damage**
- **maintain forest road rights-of-way**

Many chemicals can be toxic and must be handled carefully. Properly applied forest chemicals can help you achieve desired benefits without putting water, soil, fish, wildlife or humans at risk.

READ AND FOLLOW LABEL DIRECTIONS:

By following a few straightforward guidelines, you can use chemicals in an environmentally sensitive manner. Chemical labels are often updated from year to year, so it is important to always read the label carefully. In fact, the law requires you to read and follow label directions for:

- Storage
- Loading and mixing
- Cleaning
- Emergency spills
- Worker protection standards
- Transportation
- Application
- Removal of containers
- Disposal

When is it Too Windy to Apply Chemicals

It is recommended that chemicals be applied when wind speed is less than 5 mph. Also, use drift control agents as directed by label instructions. The following chart is provided to assist you with estimating wind speed:

Wind Speed & Observable Features

Less than 1 mph
Smoke rises vertically; no foliage movement.

1-3 mph
Foliage and small twigs sway very gently; grass and weeds sway and bend.

4-7 mph
Small trees in open sway gently; loose scraps of paper move, flags flutter; you feel a slight breeze on your face.

CONSIDER

Whether applying forest chemicals by hand, power equipment or air, precautions need to be taken to protect water.

Pesticides and fertilizers entering water can harm fish and other aquatic organisms.

Regardless of the application technique used, you should keep chemicals out of the water.

Prevent Chemicals From Entering Water

Prevent chemicals from entering water or wetlands by avoiding mixing, loading, or applying chemicals within the ordinary high water mark. Locate mixing and loading areas at least 75 feet above the ordinary high water mark or where spills will not enter water or wetlands. Remove all empty containers from the site for proper disposal.

Spill Preparedness

Be prepared for accidents. Develop a plan for chemical spills, and discuss the plan with all those who are involved in your forest operation.

A well thought out plan includes procedures for cleaning up the spill and notifying the appropriate authorities:

Utah Department of Environmental
Quality - Division of Environmental
Response and Remediation
Office: (801) 536-4100
Emergency
Hotline: (801) 536-4123
http://www.deq.state.ut.us

National Response Center
1-800-424-8802

Utah Department of Environmental
Quality - Division of Water Quality
Office: (801) 536-6146
http://www.deq.state.ut.us

Utah Poison Control
1-800-456-7707

The Utah Department of Agriculture has specific regulations regarding pesticides including registration and labeling, classification, applicator certification, licensing and transportation. For further information contact:

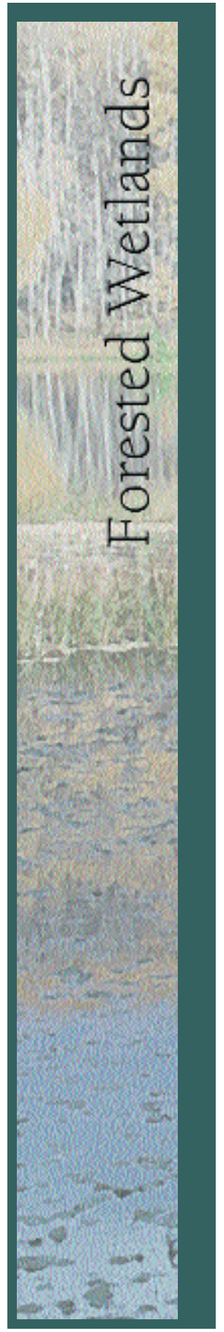
Utah Department of Agriculture
Office: (801) 538-7188
http://www.ag.state.ut.us

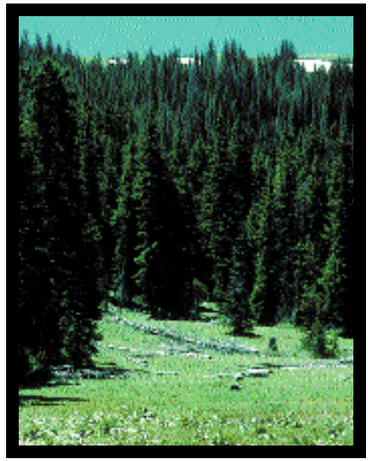
Checklist for Success

The following is a partial list of practices that may be applicable to forested wetlands during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Quality Guidelines for a more complete list of practices that might be applicable.

- ❑ Identify, locate and mark wetlands prior to the start of forest operations.
- ❑ Avoid locating roads, trails and landings in wetlands.
- ❑ Conduct harvest activities in wetlands when the ground is frozen, covered with snow or during extended dry periods.
- ❑ Keep open water free from slash and other debris.
- ❑ Use only pesticides labeled for use in wetlands.
- ❑ Avoid fueling and servicing equipment in wetlands.
- ❑ Avoid operating equipment in areas of open water, seeps and springs.
- ❑ Utilize low ground pressure equipment to minimize compaction, rutting or other site disturbance.
- ❑ Provide adequate drainage to minimize changes to natural surface and subsurface flows.
- ❑ Whenever possible, skid around or endline trees out of wetlands. Avoid skidding through open wetlands and meadows.
- ❑ Whenever possible, divert runoff from roads, trails and landings to upland areas to reduce siltation of wetland areas.

The construction and maintenance of roads for purposes other than forestry activities within wetland areas may be subject to federally required Best Management Practices (BMPs). Refer to the Nonpoint Source Management Plan for Silvicultural Activities for a complete listing of these BMPs.





Forest wetlands are nature's filter for streams and water supplies. Forest management activities and timber harvesting are compatible with the management of wetlands when done properly and in a sensitive manner.

WETLAND DEFINITION

Wetlands, as defined in federal regulations and laws are "areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." Forested wetlands are wetland areas covered by or surrounded by trees or forests.

When conducting timber harvesting and other forest management activities in or near forested wetlands, care should be taken to protect the aquatic and hydrologic functions that occur in these sensitive areas.

Minimize rutting and compaction in areas of seeps, springs and open water. Also, provide for adequate drainage and divert runoff from roads, trails and landings to reduce silting of wetland areas.

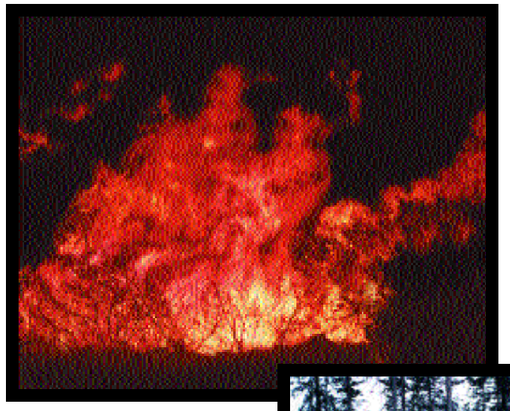
CHECKLIST FOR SUCCESS

The following is a partial list of practices that may be applicable to the use of fire during your forest management project. Implement the appropriate practices to protect water quality before, during and after the project is completed. Refer to the Forest Water Quality Guidelines for a more complete list of practices.

- ❑ Use a prescribed burn plan prepared by a qualified professional. Part of the plan should include analysis of the need to burn. Alternatives exist which may accomplish the same purpose. Some of these alternatives are chipping, crushing, lopping, utilization of substandard merchantable material or even giving away free firewood from slash areas. A minimal amount of slash can be beneficial by providing protection to regeneration, aiding nutrient recycling and impeding surface water flow.
- ❑ Do not burn within the SMZ unless specifically required by a management objective.
- ❑ Ensure control of a fire at all times to limit the risk of fire escaping the intended burn area. In the event of a wildfire, construct fire lines along contours as much as possible. If erosion could be a problem, use erosion control measures such as water bars, spreader ditches and reseeding of fire lines.
- ❑ If weather conditions are marginal for control of fire, fire suppression forces should be available to respond if needed.
- ❑ Personnel experienced and qualified in fire management techniques should plan and conduct burns, provide supervision or be asked to provide technical expertise to conduct a safe, efficient, minimal-impact burn.
- ❑ Prepare a contingency plan to identify appropriate actions to be taken if a prescribed fire exceeds control parameters (area, size, flame length or rate of spread).
- ❑ Slash which is piled for burning should be free from dirt and other noncombustible material to allow efficient burning for disposal of the slash.
- ❑ Use caution when considering burning on steep slopes. Moderately steep slopes may be more appropriately burned without the slash being piled since the use of dozers may cause erosion. Burning may not be appropriate on very steep slopes since serious erosion could result.
- ❑ A burning permit is required for burning. Local offices of the Division of Forestry, Fire and State Lands can provide information about when and where the permits may be obtained.

Keep slash pile free from dirt and other debris. This pile will burn cleanly and leave little residue.

The slash in the foreground is poorly piled and the dirt included in this pile will prevent a clean burn.



Fire can be used to remove slash and debris but must be used safely.

Slash can be safely burned when snow prevents a fire from spreading.

Fire can also be used to remove excessive slash which is widely scattered. This area might be a candidate for a broadcast burn.

GLOSSARY OF TERMS

This glossary is provided to help you understand commonly used terms that occur in this publication.

Artificial regeneration: Direct seeding or by planting seedlings or cuttings.

Best Management Practice (BMP): A practice or a combination of practices, that is determined by a State *(or designated area-wide planning agency)* after problem assessment, examination of alternative practices, and appropriate public participation to be the most effective, practical *(including technological, economic and institutional considerations)* means of preventing or reducing the amount of pollution generated by Nonpoint sources to a level compatible with water quality goals (40 CFR 130.2(q). This definition is consistent with the State of Utah definition of "Forest Water Quality Guideline."

Clean Air Act: Established in 1970 and amended in 1977 and 1990, is the federal law regulating air emissions; enforcement authority lies with the U.S. Environmental Protection Agency (EPA) who is charged with establishing National Ambient Air Quality Standards (NAAQS), these standards were to be established in every state by 1975; states were required to adopt standards that met or exceeded federal standards.

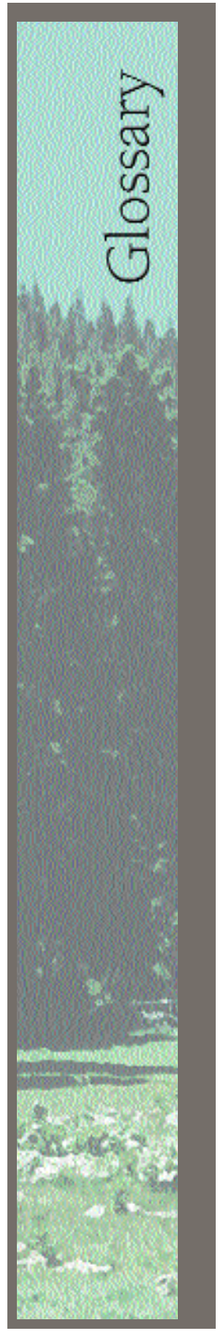
Clean Water Act: Established in 1977 as an amendment to the 1972 Federal Water Pollution Control Act; Clean Water Act makes discharging pollutants from a point source to navigable waters illegal without a permit. The amendments of 1987 provide for the management of nonpoint source pollution into the waters of the United States.

Drainage structure: Any device, excavation, berm or constructed structure used to provide stream crossings or divert runoff and/or stream channels. These structures may include bridges, culverts, waterbars, rolling dips, ditches, cross-drains, pipes, down spouts and other similar structures.

Fireline: A constructed area generally void of combustible fuels that is used to stop or direct the spread of wild or prescribed fire occurring in forest, grass, range or brush.

Fishery: Any stream, lake, river, creek, reservoir, and or other body of water that supports naturally reproducing or stocked fish populations of any life stage.

Forest: An area where the predominant vegetation is trees.



GLOSSARY OF TERMS CONTINUED

Forest Water Quality Guideline (FWQG): A collection of voluntary, field applicable practices for use during forestry activities to protect water quality adopted by the State and contained within the Nonpoint Source Management Plan.

Guideline: See Forest Water Quality Guideline (FWQG).

Hydrologic modification: Occurs whenever human activities significantly change the hydrologic function *(dynamics)* or the attendant pollutant release regime of rivers *(and streams)* and riverine systems, lakes and impoundments and ground water systems. These modifications can create nonpoint source *(NPS)* water pollution *(and impacts to related aquatic wildlife habitat).*

Insloped road: A road constructed with a surface slope graded toward the cut slope to direct water to a ditch on the cut bank side of the road.

Landing: A collection area, usually centrally located, to where logs or forest products are transported by skidders, dozers, cable systems or other means so the products may be loaded onto trucks for transport to another destination.

Landowner: An individual or group of individuals or any form of a legal entity that owns or possesses any interest in land; any government agency charged with management of public lands or any other type of group or agency that owns or manages land.

Natural Handbook of Conservation Practices: A document containing a collection of specifications on a variety of conservation practices maintained by the United States Department of Agriculture, Natural Resources Conservation Service *(NRCS).*

Nonpoint source pollution: Diffuse sources of water pollution that originate from many indefinable sources and normally include agricultural and urban runoff, runoff from construction activities, etc. In practical terms, nonpoint sources do not discharge at a specific, single location *(such as a single pipe)*. Nonpoint source pollutants are generally carried over or through the soil and ground cover via stormflow processes. Unlike point sources of pollution *(such as industrial and municipal effluent discharge pipes)*, nonpoint sources are diffuse and can come from any land area. The following silvicultural activities are considered to be nonpoint sources of pollution: nursery operations, site preparation, reforestation and subsequent cultural treatment, thinning, prescribed burning, pest and fire control, harvest operations, surface drainage and road construction and maintenance from which there is natural runoff (40CFR 122.27).

GLOSSARY OF TERMS CONTINUED

Noxious weed: Any plant the Commissioner of Agriculture determines to be especially injurious to public health, crops, livestock, land or other property.

Outsloped road: A road constructed with a surface graded toward the fill slope to direct water off the road in sheet flow.

Riparian areas: Units of land along watercourses or water bodies that product unique vegetation as a result of abundant water in the rooting zone. The species and proportional amounts of vegetation are usually in marked contrast to the more arid adjacent uplands.

Professional forester: A person who has earned a bachelor of science in forestry or masters degree in forestry from a Society of American Foresters accredited college or university or equivalent and has experience in the management of forested lands.

Scarify: To mechanically *(e.g. plowing, disking, ripping)* break up or loosen the surface of the soil, roads or other areas.

Sedimentation: The process of deposition of eroded and transported material, usually in the context of stream channel bottoms, reservoirs and lakes.

Silvicultural activities: Activities that involve controlling the establishment, growth, composition, health and quality of forests and woodlands to meet the diverse needs and values of landowners and society on a sustainable basis; these activities do not include land conversion to non-forest uses or range management activities.

Skid trail: A corridor used for the dragging or transportation of logs by logging equipment.

Slash: Any residual woody material left on the site after any type of harvest operation and usually includes tree stems, branches and foliage.

Slope distance: A distance measured parallel to or along the ground with no correction for the slope.

Soil and Water Conservation Practices (SWCP): The set of practices used by the U.S. Forest Service which, when applied during implementation of a project, ensures that soil productivity is maintained, soil loss and water quality impacts are minimized, and water-related beneficial uses are protected.

GLOSSARY OF TERMS CONTINUED

Special use permit: A permit issued by the U.S. Forest Service under established laws and regulations to an individual, organization or some company for occupancy or use of National Forest System lands for some special purpose.

Stand: A contiguous group of trees sufficiently uniform in age class distribution, composition and structure, and growing on a site of sufficiently uniform quality to be a distinguishable unit.

Stream: For purposes of SMZ application, a stream is a natural water course of perceptible extent with definite beds and banks that confine and conducts continuously or intermittently flowing water; definite beds are defined as having a sandy, gravel or rocky bottom surface that is a result of the scouring action of water flow.

Perennial stream: Streams that flow most of the year in all but the driest of climactic cycles.

Intermittent stream: Streams that flow only part of the year when they receive water from springs or runoff.

Ephemeral stream: Streams that are above the water table at all times; these streams carry water only during and immediately after precipitation or during snowmelt runoff.

Streamside management zone (SMZ):

State definition: An area of specialized management to protect water quality by limiting soil disturbance and exposure; an area of land adjacent to a waterbody where soil disturbance is minimal and vegetative disturbance is reduced to provide a buffer for the filtration of water entering the waterbody.

U.S.F.S. definition: As defined by the U.S. Forest Service, an SMZ is a designated zone that consists of the stream and an adjacent area of varying width where management practices that might affect water quality, fish or other aquatic resources are modified. The SMZ is not a zone of exclusion, but a zone of closely managed activity. It is a zone which acts as an effective filter and absorptive zone for sediment; maintains shade; protects aquatic and terrestrial riparian habitats; protects channel and streambanks; and promotes floodplain stability. The SMZ may be wider than the riparian area.

GLOSSARY OF TERMS CONTINUED

Turbidity: An optical property of water that is a measure of the ability of suspended and colloidal materials to diminish the penetration of light through the water column. Turbidity increases with increased suspended sediment concentrations.

Waterbody: Any stream, creek, river, pond, lake, reservoir or other feature that contains or seasonally contains water.

Wetland:

State & U.S. Army Corps of Engineers definition: Areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and other similar areas.

U.S. Forest Service definition: Wetlands are those areas that are inundated by surface or groundwater with a frequency sufficient to support, and under normal circumstances do or would support a prevalence of vegetation or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include swamps, marshes, bogs and similar areas such as sloughs, potholes, wet meadows, river overflows, mud flats and natural ponds.

For information or assistance, contact the Division Headquarters or your local Division of Forestry, Fire & State Lands Office listed below:

Salt Lake City Headquarters
Forest Stewardship Coordinator
1594 W. North Temple, Suite 3520
Salt Lake City, UT 84114
(801) 538-5555

Bear River Area
1780 N. Research Parkway
North Logan, UT 84321
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1594 W. North Temple, Suite 3520
Salt Lake City, UT 84114
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152 E. 100 N.
Vernal, UT 84078
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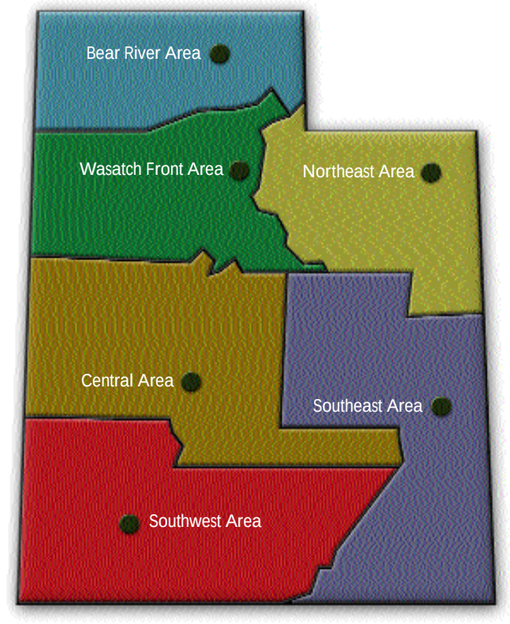
Central Area
115 E. 900 N.
Richfield, UT 84701
(435) 896-5697

Southwest Area
585 N. Main, Suite 3
Cedar City, UT 84720
(435) 586-4408

Southeast Area
1165 S. Hwy 191, Suite 6
Moab, UT 84532
(435) 259-3766



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