Appendix F: Risk Value Assessment Table

Risk to forest resources resulting from road maintenance, construction and decommissioning remain relatively constant. In 2003, a Forest level roads analysis was completed and the risk value assessment from the analysis provided in this appendix. This risk value assessment table came from the Forest Level Roads Analysis (2003).

FOREST LEVEL ROADS ANALYSIS
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ANALYSIS SCOPE AND METHOD APPROVED BY:

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APPENDIX B
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Ecological, Social and Economic Considerations
Ecosystem Functions and Processes (EF)
EF(1): What ecological attributes, particularly those unique to the region, would be affected by roading of current unroaded areas? There are no plans to build any roads within inventoried roadless or unroaded areas. The Forest Plan calls for the ecological attributes of these areas to be protected.
EF(2): To what degree do the presence, type and location of roads increase the introduction and spread of exotic plant and animal species, insects, diseases and parasites? What are the potential effects of such introductions to plant and animal species and ecosystem function in the area? The presence of roads increases the risk of spread of existing and new noxious weeds and invasive plants and establishment of new noxious weeds. Road maintenance may also play a part in spreading or maintaining noxious weeds and invasive plants that do well in early successional stages or disturbed areas. Recreational use of roads, such as transportation of horses and hay, may also increase the chance of noxious weed introduction. Livestock transportation and movement facilitated by roads also provide opportunities for the spread of noxious weeds and invasive plants. Noxious weeds and other introduced invasive plant species may spread over time and dramatically change ecosystem health and susceptibility to catastrophic events.
EF(3): To what degree do the presence, type and location of roads contribute to the control of insects, diseases and parasites? The presence, type and location of roads contribute little to the control of insects, diseases and parasites. Management activities, such as timber harvest, prescribed burning, and integrated vegetation management may also reduce the number of infected individuals.
EF(4): How does the road system affect ecological disturbance regimes in the area? The effect of roads on ecological disturbance varies. Road access increases the risk of wildfire caused by forest users, but also provides access for suppression of both man-caused and lightning-caused fires. Roads increase the ability to manage the forest through harvest preparation and prescribed burns. Areas without road access have few or none of these disturbance activities. Livestock grazing is the most significant disturbance factor forestwide and livestock management can be facilitated or hampered by road access. Cattle may be trucked to and from an allotment using roads. Roads also provide access to rangelands to facilitate management of livestock. Finally, livestock often use roads as easier access to other portions of a pasture or allotment. Roads require cattleguards or gates to maintain proper use on pastures or the allotment and restrict movement of livestock to adjacent allotments. Without cattleguards or

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gates, cattle can overgraze areas within a pasture because of the ease of travel along a road.
EF5: What are the adverse effects of noise caused by developing, using, and maintaining roads? No studies have been conducted on the Tonto National Forest to determine the effects of noise on wildlife or people. Studies conducted elsewhere indicate some effects on nesting raptors and other species, such as elk.
Aquatic, Riparian Zone, and Water Quality (AQ)
AQ(1): How and where does the road system modify the surface and subsurface hydrology of the area.? The road system modifies the surface hydrology by directly intercepting precipitation that falls on road, and cut and fill surfaces. The road system may also modify surface hydrology by intercepting and concentrating upslope runoff and by routing stream channels through culverts, bridges or other road crossing features, and by rerouting, confining, or channelizing portions of stream channels or their floodplains, or by intercepting channels at cut slopes. Road systems can modify subsurface hydrology by intercepting groundwater in cut slopes, by reducing infiltration on compacted road surfaces and by causing gully erosion. Road surfaces are typically more compacted than undisturbed ground consequently there is less infiltration and more runoff from these surfaces. Intercepted rainfall is typically concentrated in roadside ditches and routed to streams more quickly and in greater quantities than from undisturbed lands. Upslope runoff intercepted by roads is also concentrated and routed to stream channels more quickly than from undisturbed surfaces. Streams routed through improperly designed culverts, bridges, low water crossings or other features that modify the natural shape of the channel can cause backwater effects and trigger deposition and erosion of channel beds and banks. Ephemeral channels terminating at the top of cut slopes can cause head cutting and gully erosion. Rerouting of portions of stream channels can shorten flow paths, overwhelm channels with unnatural volumes of water, and increase the gradient of channels also resulting in accelerated erosion. Proper design can reduce or eliminate these problems Ground water may be intercepted in road cuts and routed to streams more quickly than in the absence of this disturbance. Interception of ground water can lower water table elevations and increase surface aridity, sometimes converting portions of wet meadows to more arid upland vegetation communities. The cumulative affect of these impacts generally increases with increasing road density but the net effect is a change in the hydrograph, both in its timing and magnitude. Roads normally result in a flashier flow system (quicker runoff response time and increased peak flow magnitude) than occurs in undisturbed watersheds. These effects are more noticeable on small watersheds than on large ones.

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AQ(2): How and where does the road system generate surface erosion? Surface erosion can be generated on all disturbed surfaces. For road systems these include unpaved road surfaces, cut and fill slopes, roadside ditches, and embankments. Erosion rates from roads are greatest immediately after construction. Erosion rates can drop rapidly as exposed slopes revegetate and stabilize. Erosion rate reductions of 90 percent or more are common as a road ages. Unstabilized road surfaces, however, will likely continue to be a source of sediment as long as traffic or maintenance prevents the establishment of vegetation. Gully erosion can occur up and downstream of road stream crossings where culverts may be set below the natural gradient of a channel or where they increase discharge velocities above those naturally occurring in a stream channel. Gully erosion can occur where cut slopes intercept stream channels. Gully erosion can also occur where roadside ditches discharge water onto fill slopes or erodible undisturbed areas. Gully erosion may also occur where roadside ditches discharge storm water runoff onto the contact between fills and natural ground surfaces. Channel bank erosion may occur where changes in the direction of stream flow occur at road stream crossings, where stream channels are channelized or constricted, or where channels are subjected to greater than natural flow volumes.
AQ(3): How and where does the road system affect mass wasting? Mass wasting is uncommon on the Tonto NF. The few incidents of mass wasting that have been observed have occurred on road cuts in the Supai Formation and on Diabase formations. Accelerated erosion leading to small scale mass wasting can occur where cut slopes are too steep to stabilize. Ephemeral channels that have been cut off along the top side of cut slopes can trigger gully erosion as can culverts whose inlets have been set below the natural grade of their channels. Culverts that concentrate flow and discharge water at greater than normal channel velocities can also trigger gully erosion. These conditions are most evident in decomposed granite watersheds.
AQ(4): How and where do road-stream crossings influence local stream channels and water quality? Road stream crossings influence local channels by affecting channel morphology, gradient and the delivery of water and sediments. Crossings that constrict stream channels can cause backwater effects that result in sediment deposition upstream of the crossing that can trigger other morphological effects both up and down stream. These crossings can also cause increases in velocity of flows through and downstream of the crossing that can trigger bed and bank erosion and subsequently other changes to stream morphology below the crossing. Road crossings that change the gradient of streams channels can cause aggradation and scouring up and down stream of the crossing. Crossings that cut off ephemeral channels on cut slopes can trigger headcutting up the channel and delivery of large volumes of sediment to roadside ditches and ultimately to stream channels.

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Roadside ditches that discharge directly to streams at road crossings can convey road and ditch derived sediments directly to stream channels. These ditches also discharge intercepted runoff directly to stream channels.

The primary affect of roads on water quality is the sediment they deliver to stream channels. Sediment affects turbidity, fish and aquatic invertebrate habitat, and the morphology of stream channels. These affects can extend both up and downstream of a road crossing.

AQ(5): How and where does the road system create potential for pollutants, such as chemical spills, oils, de-icing salts or herbicides, to enter surface waters?

Potential for pollutants such as chemical spills and oils to enter surface waters from the road system exists at road stream crossings, where roadside ditches discharge directly into channels or where an inadequate buffer exists between the outlet of these ditches and stream channels, and where the road is in close proximity to stream channels.

De-icing salts and herbicides are not currently used along any of the Forest's Level 3-5 Roads.

AQ(6): How and where is the road system "hydrologically connected" to the stream system? How do the connections affect water quality and quantity (such as, the delivery of sediments and chemicals, thermal increases, elevated peak flows)?

The road system is "hydrologically connected" to the stream system at road-stream crossings, where roadside ditches discharge directly to stream channels, and where inadequate buffer distances or filter strips exist below roads or ditch outlets. Inadequate buffer distances or filter strips exist where they do not provide for capture of road derived sediments and infiltration of surface and ground waters intercepted and concentrated by the road prism.

These connections affect water quality and quantity by delivering road derived sediments and pollutants directly to stream channels and by extending the stream network so that increased volumes of water are delivered to stream channels more quickly than they would be in undisturbed watersheds. Flashier flows(shorter time to peak and increased magnitude of the peak) result. These flows can accelerate bed and bank erosion and result in reduced base flows.

Road systems in close proximity to stream channels that remove stream side vegetation and thereby reduce shading of water surfaces can increase stream temperatures. Stream temperatures can also be increased by the affect of sediments on stream morphology. Large volumes of sediment can trigger increased bank erosion and bar formation that result in wider shallower channels that expose more of the water surface to solar radiation and result in increased temperatures and perhaps reduced dissolved oxygen.

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AQ(7): What downstream beneficial uses of water exist in the area? What changes in uses and demands are expected over time? How are they affected or put at risk by road derived pollutants?

The majority of the Tonto National Forest lies within the Verde and Salt River watersheds. These watersheds drain into a series of reservoirs operated by the Salt River Project that provide water for municipal, agricultural, and industrial uses in the Phoenix Metropolitan area and Salt River Valley. The Forest is used heavily for recreation purposes, much of which is water based, (eg boating on the Chain of Lakes, tubing on the Lower Salt River, rafting on the Upper Salt River, and camping and fishing along streams and rivers throughout the Forest). Water within the Forest is also used for domestic, irrigation, mining, grazing and hydropower purposes by private entities on both public and private lands within the Forest boundaries. The Forest appropriates water for domestic, livestock grazing, wildlife including fish, and recreation purposes. Water is also important for maintaining riparian and aquatic habitat on the Forest.

Population growth in the Phoenix Metropolitan area is expected to result in conversion of water from agricultural uses to municipal uses. Growth of communities within the external boundaries of the Tonto National Forest (eg Payson, Pine, Strawberry, Globe) is already resulting in an increased demand for water to supply these communities. Growing populations in and around the Forest are expected to increase the demand for water based recreation on the Forest. Increased use of the Forests' road system will be necessary to provide access to the Forests recreational resources. Hydropower production is expected to decrease with the closing of the Childs-Irving Project anticipated in 2005. This water is expected to return to Fossil Creek and benefit native fisheries and riparian habitat as well as providing for increased recreational use of the area. The Forest is working to improve the condition of its riparian and aquatic resources. Maintenance of the quality and quantity of water provided for these resources is important for the continued improvement of these resources.

Sediments and other pollutants derived from roads can adversely affect water based recreation, and riparian and aquatic habitat. Large increases in sediment delivered to a stream channel can greatly impair, or even eliminate, fish and aquatic invertebrate habitat, and alter the structure and width of the streambanks and adjacent riparian zone. The amount of sediment can affect channel shape, sinuosity, and the relative balance between pools and riffles. Changes in the sediment load also will affect the bed material size, which can in turn affect the quantity and quality of habitat for fish and benthic invertebrates. Fine sediment can impair the use of water for municipal or agricultural purposes.

AQ(8): How and where does the road system affect wetlands?

This discussion will include riparian areas as well as wetlands. Riparian areas and wetlands occupy approximately one percent of the Tonto National Forest. These areas are typically associated with perennial and intermittent streams, and springs. Roads can impact these systems through direct displacement of riparian and wetland vegetation, through impacts to the flow of surface and ground waters through these areas and by water quality impacts. Roads located in riparian and wetland areas prevent riparian and wetland vegetation from expanding through

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their full potential range. Roads that are constructed in areas that cause streams to be channelized or that occupy floodprone surfaces may prevent expansion of riparian and wetland areas. Roads that cause changes to surface water hydrology may affect wetland and riparian areas through flashier flows that cause erosion of and deposition in wetland and riparian zones and through reduction in base flows that provide water essential for maintenance of these areas during low flow seasons. Ground water intercepted by road cuts and road derived gullies can lower water table elevations necessary for maintaining wetland and riparian vegetation. Delivery of large volumes of road system derived sediments to stream systems can cause accelerated erosion and deposition in stream channels that reduces the area available for wetland and riparian vegetation.
AQ(9): How does the road system alter physical channel dynamics, including isolation of floodplains: constraints on channel migration; and the movement of large wood, fine organic matter, and sediment? Roads affect channel and floodplain dynamics in a variety of ways. Accelerated erosion from the road prism and from direct impacts of roads on channels delivers sediment to channels that can cause morphological changes to the channel through sediment deposition and scouring. Roads can physically constrain the channel and floodplain through their location in the valley bottom and can prevent meandering, and spreading of flood flows. Roads can also result in channelization of stream channels. Roads can extend the stream network through the hydrologic connectivity of road ditches with stream channels. Hydrologic connectivity was discussed in AQ(6). Road stream crossings can interrupt movement of large wood, although the importance of large wood to the streams on the Tonto NF is uncertain. The affect of roads on riparian and wetland areas can reduce the quantity of fine organic matter delivered to channels. The affect of roads on sediment is discussed in AQ(4), (6), (7), and WP(2).
AQ(10): How and where does the road system restrict the migration and movement of aquatic organisms? What aquatic species are affected and to what extent? Roads can effect the migration of aquatic organism whenever they bisect a stream segment. Stream crossings can have the following effects on the movement of aquatic organisms depending on what type of stream crossing is used: No Effect, Partial Effect - limit movement for certain taxa of aquatic fauna, limit movement of certain age classes, limit migration seasonally, Major Effect - preclude immigration, emigration, or movement of aquatic organisms completely. Inland species of fishes often have life history requirements that include local/diel instream movement, seasonal/spawning migrations adfluvial migration, movement from lake to river/river to lake to complete their life cycle requirements. Movement often occurs when critical events such as drought, fire, or earth movement affect normal stream conditions. If movement is restricted during these periods entire populations may be lost. Road crossings that restrict movement or preclude fish movement into other stream segments in

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the watershed may negatively impact population viability by decreasing stream connectivity within a watershed. Loss of connectivity among drainages limits gene flow among populations, deceases effective habitat size, and may preclude access to critical spawning or refugia habitats (winter/drought habitat).

Currently, it is not know how stream crossings on the affect the movement of fishes, amphibians, and invertebrates in the waters of the Tonto National Forest. A systematic inventory of road crossings per stream and types crossing structures is needed for the Tonto National Forest. Data generated should be compatible with USFS INFR and NRIS databases. Standardization of inventory methodologies should be consider for all Southwestern Region Forests.

AQ(11): How does the road system affect shading, litterfall, and riparian plant communities?

The Tonto National Forest Road system is well developed and affords access to much of the forest. Fishing access is good, in turn access also allows for non-desirable or illegal activities that may impact all categories of forest resources. Forest road access presents problems for aquatic resources and watershed health. Increased sedimentation due to roads and road crossing, while not quantified, is sure to occur. Potential for illegal take T/E fish species, USFS Sensitive fish species, native fish and other aquatic fauna exists.

Riparian habitats have been negatively impacted due to road access. Road access into watersheds and along waterways occurs on the Tonto. Dispersed camping along streams is facilitated by roads that allow vehicular and pedestrian access to stream riparian zones. While not quantified, it is likely that increased sediment transport into nearby streams occurs. Direct loss of riparian vegetation occurs through trampling and cutting by resource users. Loss and degradation of riparian areas, which are highly valued on the Tonto because of its southern location and low elevation resources, decreases allochthonous inputs into Tonto watersheds thereby decreasing watershed productivity. Riparian loss also contributes to elevated water temperatures and increase risk to photosensitive aquatic flora and fauna.

Terrestrial Wildlife (TW)

TW(1): What are the direct affects of the road system on terrestrial species habitat?

The road system has physically removed terrestrial habitat. Other effects include sediment transport that may affect aquatic prey species for terrestrial species.

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TW(2): How does the road system facilitate human activities that affect habitat?

Collection of plants and animals, such as the desert tortoise, or mortality from vehicle strikes are examples of human activities that occur along roads. Removal of tortoises is a serious problem in some areas, while placement of captive tortoises back into the wild can cause additional impacts to wild tortoise populations. Disturbance from recreational activities, logging, firewood cutting can affect nesting raptors, elk and other wildlife. Other road use related effects on wildlife habitat include: a significant increase in wildfires (cigarettes, brakes, car fires, campfires) directly associated with road use; the opening of areas to off-road vehicle use; wet season use of unsurfaced roads which can result in greatly increased sedimentation of aquatic environments.

Roads also facilitate Forest management activities. Logging, livestock grazing, mining, fuel treatment and other activities would not take place or would take place at a far different level without roads.

TW(3): How does the road system affect legal and illegal human activities (including trapping, hunting, poaching, harassment, road kill, or illegal kill levels)? What are the affects on wildlife species?

Roads evaluated in this analysis are the primary reason for both legal and illegal activities in the areas accessed by these roads. Most hunting, both legal and illegal, occurs near roads; even backcountry trips use these roads to access trailheads or other entry points. All offroad use is dependent on some form of road access. Areas closed to human entry to protect nesting bald eagles have roads which access or terminate at these closures, increasing the chance of illegal entry.

The specific effects of human activities have not been fully documented. Bald eagle closure areas along the Verde River have frequent human disturbances due to road access (FR 160 and others) to the area. Nesting failures or loss of young has been documented from disturbance or other factors, such as monofilament line, which is directly related to human access and use in or near these closures. Studies have demonstrated that poaching can be a significant factor affecting big game and other populations, but the degree of poaching on the Tonto has not been fully documented. Collection of reptiles has been discussed under TW2.

Habitat loss in the Sonoran desert due to offroad use is significant. Large portions of desert and riparian habitat near Road 403 and 160 have been lost due to offroad use. These and other roads in this lower desert area provide easy access to offroad users and are the primary reasons for the high loss of habitat. Fires have also altered thousands of acres in the lower Sonoran desert on the Forest. Many of these fires are started along roads during years of high annual grass and forb production. If alteration continues at current levels, much of the lower Sonoran desert will have been affected or altered within a few decades.
Roads and recreation use also affect riparian habitat throughout the forest. Many of the campgrounds and dispersed recreation sites are located in riparian areas associated with streams, ponds or reservoirs. Unregulated or high use in these areas significantly reduces the

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amount of vegetation, alters streambanks and creates sedimentation and water quality problems.

Communal bat roosts or nurseries have been significantly affected by human use related to road access. Numbers of bats have declined as human use increased due to road access. Roosts in inaccessible areas have remained stable except for natural fluctuations or population fluctuations not related to human disturbance.

TW(4): How does the road system directly affect unique communities or special features in the area?

Because of desert conditions on the Tonto and the loss of much riparian vegetation, riparian areas and aquatic habitats are unique/special communities. Riparian areas and aquatic habitats are directly affected by road locations within the floodplain, along the streambed or crossing the streambed and riparian area. These roads further reduce the acres of total riparian habitat. These roads as well as the entire transportation system change the timing and duration of runoff that causes flash floods or extreme runoff events. These events remove or substantially alter riparian vegetation.

Construction and maintenance of roads can also reduce or eliminate unique communities such as snags. These features are often considered hazards and are removed during maintenance operations or construction.

Economics (EC)

EC(1): How does the road system affect the agency's direct costs and revenues? What, if any, changes in the road system will increase net revenue to the agency by reducing cost, increasing revenue, or both?

At the Forest scale, this question can be answered in broad terms as a detailed cost/benefit economic assessment is not feasible. The IDT for the Tonto National Forest RAP addressed this question by developing the Road Value versus Risk matrix and used this tool to determine what roads fell into which Road Management Category. The IDT identified four road management categories for this forest scale roads analysis.

The Tonto National Forest RAP only considered maintenance level 3, 4, 5, and a few level 2 roads. The IDT determined early in the process that an assumption that most of these roads would always be kept open for obvious reasons—they access private property, or are arterial or collector roads. Most of these roads were developed over the years for a variety of access needs, and considerable capital investments were incurred to construct these roads. Most of these roads were analyzed in some form, which likely included use needs, construction design standards, environmental considerations, and economic assessment.

The IDT's challenge was to develop a process to sort out those level 2, 3, 4, and 5 roads that might not be meeting current and future access and land management needs, at least not at their current maintenance levels. This process helps identify opportunities to reduce road maintenance costs on some roads. The IDT also determined that even if funding was shifted

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from low value to high value roads, the annual road maintenance funding for this forest was still significantly less than needed for the entire forest.
EC(2): How does the road system affect the priced and non-priced consequences included in economic efficiency analysis used to assess net benefits to society? This is a project-level question, not a forest scale question.
EC(3): How does the road system affect the distribution of benefits and costs among affected people? This is a project-level questions, not a forest scale question.
Commodity Production
Timber Management (TM)
Minerals Management (MM)
MM(1): How does the road system affect access to locatable, leasable, and salable minerals? The maintenance level 3, 4 5nd 5 roads in this analysis serve as access to general areas and provide adequate access. Most exploratory operations easily occur on maintenance level 1 or 2 roads. Roads are generally maintained to a maintenace level 3 or 4 during high volume mineral extraction.
Range Management (RM)
RM(1): How does the road system affect access to range allotments? The road system is vital for efficient administration and management of permitted grazing allotments. Forest Service personnel must be able to monitor, inspect and evaluate range conditions on a regular basis to effectively administer existing grazing permits. The current road system allows for rapid access to allotments to react to the numerous public issues challenging the range program today. Grazing permittees need reasonable vehicular access within allotments to maintain existing range improvements and to manage and care for permitted livestock. Care for livestock often includes transporting large trailers and truck loads of cattle and sheep on Forest Service roads.

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As the road network on the Tonto National Forest has advanced from a few maintained roads to many miles of good roads, so has the dependency on those roads for the commercial and recreational activities on the forest. Range management and livestock grazing activities are certainly one of the many uses of the Tonto National Forest that have grown dependant on the current road system to manage livestock operations to the intensity that is required today. Without these roads there is no doubt the cost of managing the range allotments and the cost to permittees would skyrocket.

Water Production (WP)

WP(2): How does road development and use affect water quality in municipal watersheds?

Sediment is the primary pollutant derived from roads. Roads have been identified as a major source of sediment in otherwise relatively undisturbed watersheds. Erosion rates from roads are greatest immediately after construction. Erosion rate reductions of 90 percent or more are common as a road ages. Road surfaces, however, will likely continue to be a source of sediment as long as traffic or maintenance prevents the establishment of vegetation.

Sediment can adversely impact water quality by increasing turbidity, prematurely plugging filters and other components of treatment systems. Suspended sediment can also carry undesirable chemical pollutants, such as phosphates, pesticides, and other hydrocarbons into surface water and ground water.

There are no designated municipal watersheds on the Tonto NF, although much of the flow in the Salt and Verde Rivers is stored in a series of reservoirs on the Forest that is then released for municipal uses in the Phoenix metropolitan area. Small surface water diversions occur for domestic use in subdivisions within the Tonto NF on the East Verde River and Bonita Creek. Most of the watershed runoff eventually providing a source of municipal supply to the Phoenix area is stored in 4 reservoirs on the Salt River and 2 reservoirs on the Verde River. Much of the road derived sediments would settle out in these reservoirs before being diverted for municipal use. No Level 3-5 roads exist above the Bonita Creek Diversion. The Washington Park and Washington Park Trailhead roads exist upstream of the domestic water supply diversion from the East Verde River.

WP(3): How does the Road system affect access to hydroelectric power generation?

Hydroelectric power is generated at the reservoirs on the Salt River, at two small generating plants that divert water from Fossil Creek (both facilities are located on the Coconino NF but one access route comes through the Tonto NF), and at the end of the diversion pipeline from Blue Ridge Reservoir to the East Verde River. The hydroelectric facilities on Fossil Creek are proposed for decommissioning and are expected to cease power generation in 2005. The diversion from Blue Ridge Reservoir is owned by Phelps Dodge and is used to mitigate the

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impacts of stream diversions elsewhere in the Salt River system. Phelps Dodge has recently developed alternative mitigation arrangements. Phelps Dodge is not currently diverting water from Blue Ridge Reservoir and is consequently not generating hydroelectric power. Whether this facility will generate power in the future is not known. Access to this facility is via the Washington Park Road. The hydroelectric facilities at the dams on the Salt River are accessed via various roads including state highways, Forest Roads and permitted roads.

Special Forest Products (SP)

SP(1): How does the road system affect access for collecting special forest products?
The current maintenance level 3 and 4 road system provides adequate access for collecting special forest products such as mushrooms, seed cones, transplants, Christmas trees, firewood, etc. If road closure or seasonal closure is considered in a project or watershed analysis, access for special forest products will be considered.

Special-Use Permits (SU)

SU(1): How does the road system affect managing special-use permit sites (concessionaires, communications sites, utility corridors, and so on)?

The maintenance level 3, 4 and 5 roads in this analysis serve as general access which usually lead to maintenance level 1 and 2 roads, some of which are adequate for management and administration of special use permits.

General Public Transportation (GT)

GT(1): How does the road system connect to public roads and provide primary access to communities?

County roads, U.S. and State highways give communities, tourists, and industries access to the National Forest. These roads connect to arterial, collector, and some local FS roads, where traffic is dispersed into the Forest for a variety of uses. Some county roads and state highways traverse into or through the National Forest, as shown on the maps, and listed in the tables.

National Forest system roads connect to numerous public roads managed and operated by the U.S. DOT, State of Arizona, and county governments. Forest Service jurisdiction roads create the sole or primary access to many parcels of private land within the Forest Boundary and to bordering tribal land. No Forest Service jurisdiction roads serve as the primary through-routes that connect the larger communities, with the exception of the Young Highway. The Young Highway is the primary access to Young, Arizona.

Cooperative maintenance agreements between the Counties and FS help to address our combined road maintenance needs. XXX miles of FS jurisdiction roads are included in cooperative maintenance agreements with the four counties that the TNF lies in. When larger

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developments or subdivisions occur and private land inholding traffic is expected to exceed that generated by the users of the National Forest, agency policy is to pursue turning jurisdiction of the Forest road over to another public road authority such as the county or state. As population increases, recreation and commercial use of the road system is also expected to increase. These roads and others are important to and used by smaller communities around the Forest. Many people in these communities rely on access to the Forest for their livelihood as well as for recreation. The Forest is important for recreation, timber, ranching, and mining.
GT(2): How does the road system connect large blocks of land in other ownership to public roads (ad hoc communities, subdivisions, inholdings and so on)? The amount of private and other ownership lands is limited within the Forest. Private lands are widely interspersed with National Forest land. Much of the private or tribal lands are accessed by arterial and collector public roads, however some are accessed by lower standard local FS roads. Access needs to inholdings are addressed on an individual basis as requests are received. Forest Service policy is that access will be provided to a level that is reasonable and suitable for Forest Service needs. This is often at a maintenance level 2. If the subdivision needs a higher level of maintenance, it is their responsibility to get a special use permit and pay for the maintenance, or pursue turning jurisdiction of the Forest road over to a public road authority such as the county or state.
GT(3): How does the road system affect managing roads with shared ownership or with limited jurisdiction? (RS 2477, cost-share, prescriptive rights, FLPMA easements, FRTA easements, or DOT easements The amount of private land inside or bordering the TNF and pattern of population growth indicate a need to increase road management cooperation, and refine road jurisdictions and maintenance responsibilities. Many roads on the TNF call for a higher level of maintenance and construction for the private lands that they access. Use and management of the TNF often requires only access by high clearance vehicle, while access to private lands may dictate a need for passenger car access. Numerous roads crossing the National Forest fall under the jurisdiction of State, County or private organizations. When desirable, cooperative agreements should be established to share road improvement and maintenance responsibilities when all partners can benefit. The Forest Service, Federal Highway Administration and the Arizona State Department of Transportation have Memorandum of Understanding (MOU). This document set forth general procedures for planning, programming, environmental studies, design, construction and maintenance of highways.

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The Tonto National Forest has cooperative road maintenance agreements with two of the four counties that it lies in.

Rights of access by law, reciprocal rights, or easements are recorded in Forest files and county courthouse documents. The Forest recognizes these rights and works with the owners to preserve access while protecting the natural resources and facilities on adjacent National Forest Lands. There is also an understanding by the Forest Service that individuals or entities may have established valid rights, unknown to the Forest Service at this time, to occupy and use National Forest lands and roads. The courts have established that such valid outstanding rights may be subject to some federal regulation. See *Sierra Club v. Hodel,* 848 F 2d. 1068 (10 th Circuit, 1988). This analysis recognizes that such valid outstanding rights may exist and the Forest Service will certainly honor such rights when it is subsequently determined that the specific facts surrounding any claim to such rights meet the criteria set forth in any respective statute granting such occupancy and use (see *Washington County v. The United States,* 903 F. Supp. 40 [D. Utah, 1955]).

GT(4): How does the road system address the safety of road users?

In 1975, the Forest Service developed a Memorandum of Understanding with the Federal Highway Administration that required the Forest Service to apply the requirements of the National Highway safety program, established by the Highway Safety Act, to all roads open to public travel. In 1982, this agreement was modified to define "open to public travel" as "those roads passable by four-wheeled standard passenger cars and open to general public use without restrictive gates, prohibitive signs…" Most roads maintained at level 3, 4, and 5 meet this definition. Design, maintenance, and traffic control on these roads emphasizes user safety and economic efficiency.

The largest proportion of road maintenance and improvement funds allocated to the Forest is spent on these higher standard roads. Safety work such as surface maintenance, roadside clearing and installation and maintenance of warning and regulatory signs are performed on an annual basis. Traffic control signing follows standards set forth in the Manual on Uniform Traffic Control Devices (MUTCD). Funding for road maintenance is not adequate to address safety needs on all roads. Road condition surveys conducted in 1999 and 2000 reveal a total maintenance backlog of **XXX** million, **XXX** million (**XXX%**) of that is critical health and safety items. The condition surveys document a need of about **$XXX** million annually to maintain all roads in the TNF system, of this **$XXXXX** is safety related (about **XX%**). Annual funding for road maintenance on the TNF ranges from about **$XXXXXX**to **$XXXXXX**.

When accidents occur on Forest roads, often the Forest Service may not be immediately informed. Accidents are usually reported to the local sheriff or state patrol, if reported at all. When the Forest becomes aware of an accident, an investigation is initiated to attempt to identify the cause. If a feature of the road is found to be unsafe, addressing the condition becomes a high priority. Presently, there is no comprehensive program on the Tonto National Forest for identifying or tracking accident locations and for maintaining surveillance of those

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locations having high accident rates or losses as is required by Highway Safety Act. The Forest needs to address this area of non-compliance.

With increased use by more urbanized visitors, expectations have changed. Forest users expect to be safe, to have ready access to emergency medical services and evacuation routes.

Administrative Use (AU)

AU(1): How does the road system affect access needed for research, inventory, and monitoring?

Generally, the location of research, inventory, and monitoring plots is too fine a scale for forest planning unless identified as an issue during scoping.

AU(2): How does the road system affect investigative or enforcement activities?

The level 3, 4, and 5 road system on the Tonto Forest generally provides good access for investigative and enforcement activities. These roads provide access to developed and dispersed recreation sites where many violations occur. These roads also provide access to the many developed trailhead-parking areas for the trail system that provides backcountry access. While the road system provides access to perform investigative and enforcement activities, it also provided access for increasing public use of the National Forest System lands, hence, the Forest is experiencing an increase of criminal activities.

Protection (PT)

PT(1): How does the road system affect fuels management?

The maintenance level 3, 4 and 5 roads in this analysis provide adequate access to the general areas where fuels management activities occur. Most fuels management project activities need only maintenance level 2 access.

PT(2): How does the road system affect the capacity of the Forest Service and cooperators to suppress wildfires?

In current, drought, conditions, minimizing response time to suppress wildfires is very important to keeping the size of the burned area down. Road condition affects the response time to wildfires.

There are areas of the TNF and bordering private lands that have only one main access route (dead end road). It is possible that a wildfire burning close to these single access routes could delay response to the area or prevent a more aggressive response, allowing the fire to burn longer.

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PT(3): How does the road system affect risk to firefighters and to public safety?

The road system affects risk by its ability to provide evacuation routes and by its level of safety for the vehicles using the road.

TNF jurisdiction roads provide the main access to several occupied private lands. Location, rate and direction of travel of a fire and inadequate road conditions could combine to create a dangerous situation for the life safety of occupants of these private lands and the firefighters responding to suppress the wildfire or protect the structures in it's path.

Driver safety can be affected by the road construction/design and by its condition, including those drivers who are firefighters responding to suppress a fire. See GT(4) for a discussion of the safety of road users.

PT(4): How does the road system contribute to airborne dust emissions resulting in reduced visibility and human health concerns?

Unpaved roads whether native soil or graveled can contribute airborne dust during times of dry weather conditions, especially during extended drought periods. Dust emissions also increase with traffic and vehicle weight. Winds can pick up fine dust from unpaved roads and release them whenever winds die out. Winds can also transport fine dust at appreciable distances close to active road use areas such as nearby resident houses or campgrounds affecting those who are particularly sensitive to the fine dust. Reduced visibility may result from unpaved roads, especially graveled roads. Higher traffic volume on most graveled roads have the potential to reduce visibility and, in some cases, increase health concerns in localized areas.
Some FS jurisdiction roads on the TNF also provide primary access to private land. With subdivision of these lands, traffic may increase significantly on these Forest roads, increasing the dust emissions. Dust emissions can be reduced with dust abatement, or paving unpaved roads.

Recreation

Unroaded Recreation (RR)

UR(1): I s there now or will there be in the future excess supply or excess demand for unroaded recreation opportunities?

Being immediately adjacent to the sixth largest metropolitan area in the United States, most forms of recreation are expected to experience excess demand within the Tonto National Forest for the foreseeable future. The most notable exceptions would be winter sports such as ice fishing, snow skiing, snowmobiling and general snow play since opportunities for these activities are very limited or non-existent.

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UR(2): Is developing new roads into unroaded areas, decommissioning of existing roads, or changing the maintenance of existing roads causing substantial changes in the quantity, quality, or type of unroaded recreation opportunities?

Developing new roads would increase the opportunities for some recreation activities such as hunting and primitive camping. Increased maintenance levels would have a similar effect. Decommissioning roads and lower maintenance levels would reduce opportunities for recreation activities that typically occur in areas that are accessed by roads and that are subject to these management activities.

UR(3): What are the adverse effects of noise and other disturbances caused by developing, using, and maintaining roads, on the quantity, quality, and type of unroaded recreation opportunities?

Road development and maintenance would have temporary minor adverse effects on these recreation opportunities. Road use would have a more continuous effect but would also be minor in most cases.

UR(4): Who participates in unroaded recreation in the areas affected by constructing, maintaining, and decommissioning roads?

A wide variety of people visit the forest for many types of recreation activities. Hunters, hikers and primitive campers tend to be the dominant users in remote areas. In more accessible areas, developed campers and water-based recreationists are the most common type of visitor.

UR(5): What are these participants' attachments to the area, how strong are their feelings, and are alternative opportunities and locations available?

Participants in recreation activities such as hunting and primitive camping have multiple alternatives but they still have very strong attachments to a particular area with traditional use. Developed recreation users have fewer alternatives and tend to be more vocal when opportunities are adversely affected.

Road-Related Recreation (RR)

RR(1): Is there nor or will there be in the future excess supply or excess demand for roaded recreation opportunities?

Being immediately adjacent to the sixth largest metropolitan area in the United States, most forms of roaded recreation, especially OHV travel, are expected to experience excess demand within the Tonto National Forest for the foreseeable future.

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RR(2): Is developing new roads into unroaded areas, decommissioning of existing roads, or changing maintenance of existing roads causing substantial changes in the quantity, quality, or type of roaded recreation opportunities? Most forms of roaded recreation, especially OHV travel, are expected to experience excess demand within the Tonto National Forest for the foreseeable future.
RR(3): What are the adverse effects of noise and other disturbances caused by constructing, using, and maintaining roads on the quantity, quality, or type of roaded recreation opportunities? Developing new roads would increase the opportunities for recreation activities involving vehicle travel and related activities such as hunting and primitive camping. Increased maintenance levels would have a similar effect. Decommissioning roads and lowering maintenance levels would reduce opportunities for recreation activities that typically occur in areas that are accessed by roads that are subject to these management actions.
RR(4): Who participates in roaded recreation in the areas affected by road construction, changes in road maintenance, or road decommissioning? Primarily backcountry OHV users and to a lesser extent those driving to view scenery and wildlife.
Passive-Use Value (PV)
PV(1): Do areas planned for road constructing, closure, or decommissioning have unique physical or biological characteristics, such as unique features and threatened or endangered species? See PV(3)
PV(2): Do areas planned for road construction, closure, or decommissioning have unique cultural, traditional, symbolic, sacred, spiritual, or religious significance? See PV(3)
PV(3): What, if any, groups of people (ethnic groups, subcultures, and so on) hold cultural, symbolic, spiritual, sacred, traditional, or religious values for area planned for road entry or road closure? The forest scale Roads Analysis is an inventory of road uses and conditions, not a plan for specific road entry or road closures.

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Road building proposals in unroaded areas would likely result in substantial public controversy from passive use advocates. This situation reflects the strong feelings of some groups that any road building substantially affects their passive use advocacy of Forest management. There are no plans to build any roads within unroaded areas on the Tonto National Forest.

Local groups of roadless passive value proponents are involved with all aspects of forest- and project-level planning on this Forest. The administrative record for many NEPA projects on this Forest contain written input from these groups, and they have been actively filing appeals and litigation on forest projects, especially projects that would impact their passive use values. Those groups who hold high spiritual and religious values for the Tonto National Forest often reflect these values on a national scale. Examples of these values can be seen in the activity of national environmental groups.

To a lesser degree, there are individuals, tribes, and loosely organized user groups that hold traditional, cultural, and religious values for the Tonto. Indian tribes are historic users of the Tonto and are routinely consulted on forest and project analyses. These tribes have strong cultural and traditional ties to many parts of the Tonto.

Groups that hold symbolic, and to some degree cultural, values for projects that would result in road closure are mostly commodity advocates such as logging and mineral companies, and ranchers, and motorized recreationists. The groups and individuals who would most likely believe their passive use values are being substantially affected from road closures or decommissioning would be motorized recreationists. Many people are proponents for maintaining or increasing current levels of motorized road and trail opportunities and maintaining roads for future forest management activity. These users would feel their values threatened by any proposals to close Forest roads or trails to motorized use.

There are many passive use values to consider in forest management. Several have been highlighted above but will need to be explored in more detail at the subforest level analysis.

PV(4): Will constructing, closing, or decommissioning roads substantially affect passive-use value?

See PV(3)

Social Issues (SI)

SI(1): What are people's perceived needs and values for roads? How does road management affect people's dependence on, need for, and desire for roads?

People in Arizona are used to driving to their destinations because people and places in the state are so far apart. Roads are used to transport goods and access recreation and commercial opportunities. Well maintained roads facilitate recreation and other experiences; poorly

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maintained roads make them unpleasant, difficult or impossible. Some people would like to reduce the miles of roads, and therefore vehicles and other people in the Forest. Some people want certain roads improved. Many people hold deep and strong feelings about roads and road management. Changes in road management are often upsetting to people if it requires a change in behavior.
SI(2): What are people's perceived needs and values for access? How does road management affect people's dependence on, need for, and desire for access? Most of the major roads in the Forest were built to access a mining claim, harvest timber or a range allotment. Once people have legal access by road to an area, that area becomes somebody's favorite place. People's needs and values for access is diverse. It ranges from people who want to be able to access all areas of the National Forest on motorized vehicles to people who want no (human) access at all. Most people's needs or values fall somewhere in the middle, valueing a mix of motorized and non-motorized access. Many people hold deep and strong feelings about roads and road management.
SI(3): How does the road system affect access to paleontological, archaeological, and historical sites? The existing Tonto National Forest road system increases access to both identified and unidentified historic and palaeontological sites. Increased or improved access can result in vandalism, illegal collection activities, and possibly illegal excavation of historic or palaeontological resources. However, increased or improved access also facilitates patrols by FS Law Enforcement personnel, monitoring of heritage sites by volunteer Site Stewards, and visitation by interested members of the public, all of which result in better protection from vandalism and illegal excavation. Overall, improved accessibility has seemed to work in favor of preservation rather than against it.
SI(4): How does the road system affect cultural and traditional uses (such as plant gathering, and access to traditional and cultural sites) and American Indian treaty rights? While there are no applicable treaty rights establishing rights of tribal access to Tonto NF lands, existing roads on the Forest are utilized by tribal people to access traditional plant collecting areas and various religious sites and other places having traditional tribal significance. The present road system on the Forest is seen as generally adequate and facilitates traditional tribal activities by providing appropriate levels of access to such areas as they are currently used. However, because of the confidential nature of some of these activities, the Forest does not have specific information regarding the locations, nature, or extent of many of them.
SI(5): How are roads that constitute historic sites affected by road management? Currently, a number of roads that constitute historic sites are documented on the Tonto NF; many more are known. The forest road management program has affected these roads to varying degrees over many years by grading, surfacing, replacing bridges and culverts, etc. All

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of these activities have the potential to significantly alter the historic characteristics or setting of any of these roads, but all historic roads are not considered to have equivalent historic significance or eligibility for nomination to the National Register of Historic Places. Those that are of Depression Era Civilian Conservation Corps (CCC) construction, or were part of the early Forest Highway system, or those having particular significance for the original historic settlement or management of the Forest are considered to be potentially eligible, depending on their physical integrity. Roads that fall into this category are managed in such a way as to minimize impacts to their historic integrity wherever feasible. Roads that do not have these associations or which functioned merely as "driveways" to mines or homesteads are not considered to have the same significance and are not managed to the same standards regarding their historic characteristics. Generally, routine maintenance is not considered to have a significant impact on these characteristics. Reconstruction and realignments are subject to Section 106 review and consultation under the National Historic Preservation Act, but, given the acceptance by the Arizona State Historic Preservation Officer that roads are constantly evolving structures, conflicts between road management needs and preservation needs tend to be easily resolved. As a result, most of the historic roads on the Tonto NF are seen as retaining a high degree of integrity of setting and structure despite decades of maintenance and modification.
SI(6): How is community social and economic health affected by road management (for example, lifestyles, businesses, tourism industry, infrastructure maintenance)? Road management is subtle, yet necessary to forest management. Use of the Tonto National Forest is dependent on proper, timely road management. Commodity users rely on the existing road system, just as pleasure seekers do. For many communities in the West, the road system is the backbone of commerce, providing for the movement of products, services, and people through the Forest. Most of the roads on the Forest were built to facilitate log hauling or accessing homesteads. Today, recreation traffic has added to the importance of these roads. Recreation traffic includes local and non-local users, many of whom are sight seeing. Across the National Forest system, surveys have indicated that nearly 40% of Forest use is by people who never get out of their vehicles. In addition to increasing uses, the demographics in the U.S. indicate an ever-increasing urban population (NRSE 2001). These travelers expect to go long distances in short amounts of time and to be able to get through the Forest in comfort. With the exception of state highways, the only paved roads on the Forest are in association with developed recreation sites. Maintenance is increasingly important to facilitating the demands of these users, who are replacing commodity production in the overall economic health of the local communities.
SI(7): What is the perceived social and economic dependency of a community on an unroaded area versus the value of that unroaded area for its intrinsic existence and symbolic values? Unroaded areas within the Tonto National Forest have a variety of social values. Some people

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value natural resources existing in unroaded areas for the economic contribution that could be afforded by their extraction such as timber, minerals, and roaded access. Other people value roadless areas for the contributions they provide in an undeveloped state such as increased solitude, quiet, and refugia for plants and animals.
SI(8): How does road management affect wilderness attributes, including natural integrity, natural appearance, opportunities for solitude, and opportunities for primitive recreation? There are eight wilderness areas within the Tonto National Forest. The wilderness areas are located on the Cave Creek, Globe, Mesa, Payson, Pleasant Valley, and Tonto Basin Districts. Together, these areas account for 21% of the total National Forest System acreage on the Forest. Some of the boundaries are very close to maintenance level 3-5 roads, causing noise pollution. Unfortunately a few go directly to trailheads which provides access to portions of the wilderness area which are already over used, thereby exacerbating the impacts on the opportunities for solitude and primitive recreation. The other issues relevant to this question are dust and unauthorized motorized use facilitated by the road system. There is no effect by a few current maintenance level 3-5 roads.
SI(10): How does road management affect people's sense of place? People's sense of place is directly tied to the aspects of an area, including the area within a road corridor, that invoke a special feeling or attachment to the area. Factors include the area's vegetation, the amount of sunlight available, the views, the solitude, the opportunities that make it a destination, and the overall familiarity. The road itself facilitates a person's enjoyment of the area by providing for driving comfort, the amount and type of use, and any number of aesthetic attributes visible alongside the road. These attributes are directly related to road management. Any change in road management of the development of a road without taking these things into consideration will create a change in current use. Examples of these effects include those used in the discussion in recreation. If a road is managed as a Level 3 and the decision is made to upgrade it, more and different users might begin to use the area. This will change the character for users who consider the area to be special; it will change their experience and may displace current users to other areas for their recreation. Likewise, if a road is currently managed as a Level 5 and the decision is made to downgrade maintenance, the road will not be drivable, and the area becomes inaccessible for some current users. This problem is especially evident for the elderly, a group that has used the area for years. Rough roads are hard on bones, and users have to be considered in these decisions. Because a variety of different people use the existing road system, they need to be considered before changing road management. This question is best answered at the watershed scale.
SI(11): How does road location and road maintenance affect historic sites? (question

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added by the Forest) Forest roads often pass through cultural resources resulting in direct impacts to both prehistoric and historic sites. Road maintenance within the boundary of cultural sites has the potential to directly affect these resources; conversely, the lack of maintenance within site boundaries can also result in site damage due to water erosion.
Civil Rights and Environmental Justice (CR)
CR(1): How does the road system, or its management, affect certain groups of people (minority, ethnic, cultural, racial, disabled, and low-income groups)? The road system is used by all groups of people. Changes in road management, including closing or decommissioning of any of the roads would have the same effect on all groups of people, including minorities and various cultures.