Monitoring Question - Are forest management actions maintaining or restoring the processes and functions that regulate stream flows and ground water character?

This question focuses on the processes that regulate stream flows and ground water. Actual stream flows and ground water character are affected by such a variety and number of variables that forest management actions play only a partial role. Even if reliable data for stream flow existed, a cause and effect relationship between the two would be difficult to establish. However, we can look at the processes that regulate flows and ground water and what effect management actions have on those processes.

The general concept of this question relates to the "sponge" analogy. The more the landscape is able to soak up precipitation the more it will slowly release it over time. If precipitation soaks into the ground it is stored within the soil and shallow aquifers, and is released slowly over dry periods to maintain stream flows. If precipitation does not infiltrate the soil profile, runoff occurs quickly, resulting in higher peak flows, less storage of runoff in soil and shallow aquifers, and a subsequent lower amount of available water in streams and aquifers during dry periods. The "sponge" condition is primarily determined by infiltration of precipitation to upland soils, and the infiltration of storm runoff into floodplain soils. In short, the path of precipitation upon reaching the ground is determined by soil and riparian conditions. Forest management actions play an important part in soil and riparian conditions.

The Sawtooth National Forest has authority over land management actions within its administrative boundaries. The Forest can issue special use permits to any diversion facility (i.e. headgates, screens, ditches, etc.) that may occur on national forest administered lands. The Federal Land Policy and Management Act (FLPMA) and Organic Act and the Multiple Use Sustained Yield Act (MUSY) provides the Forest the authority to condition these special use permits in a manner that minimizes damage to the environment. The (MUSY) and (FLPMA) statue requirements, however, must be harmonized with State law. The Forest must recognize state water rights and provide applicants reasonable access to obtain their allocated water. The water right dictates where the water can be taken (the point of diversion), how the water can be used (the purpose of use), where the water can be used (the place of use), and when the water can be used (the season of use). This use is under the jurisdiction of the states of Idaho and Utah and diversion of water for any use by the Forest Service requires application to and permitting by the appropriate state agency (Idaho Department of Water Resources and Utah Division of Water Rights). Water rights and consumptive uses are important with respect to this question since the magnitude of water diversions can override the influence of land management on stream flow and ground water character. In other words, even with the very best of land management and watershed conditions, stream drainages can be dewatered by legal and permitted water withdrawals and leave a dry channel or lowered water table.
To better focus on forest management actions on soil and riparian conditions, they can be separated into two categories:

Category 1:

Actions that can negatively affect soil and/or riparian conditions as a result of another main objective (timber sale, grazing, road or trail construction).

Category 2:

Actions that improve soil or riparian conditions or have that improvement as a main objective (road or trail decommissioning or reroute, vegetation treatment, campsite rehabilitation, stream channel restoration, etc).

The negative effects of category 1 are addressed with a variety of Best Management Practices (BMPs) that have been developed at both the state and federal level. BMPs are found in a variety of documents, including the Idaho Forest Practices Act, the Idaho Non Point SourceManagement Plan, the Idaho Agricultural Pollution Abatement Plan, FSH 2509.18 – Soil ManagementHandbook, and FSH 2509.22 – Soil and Water Conservation Practices Handbook. The Sawtooth National Forest Land and Resource Management Plan incorporates many of those BMPs into management direction within the plan and federal and state policy generally requires use of hydrologic BMPs in project design. Federal laws specific to water quality (Clean Water Act, IDAPA 58, and FSM 2532) are applicable to this question as well since many hydrologic BMPs target the same processes and BMPs that minimize water quality impairment also tend to improve soil and riparian conditions, thereby improving stream flow levels and groundwater character.

Projects in category 2 may have soil and/or riparian improvements as a main objective, but can still have short term negative effects. BMPs are applicable and required for these types of projects as well to address the potential short term negative effects of these actions.
The following questions for the 2 types of categories summarize the monitoring question and help focus the analysis for forest management actions implemented from 2004-2008:

Question 1 – Category 1:

Were appropriate BMPs recommended, implemented, and effective at reducing the negative effects on soil and riparian conditions by all forest management actions?

Question 2 – Category 2:

Were sufficient restorative actions (actions with soil and riparian condition improvement as a main objective) implemented to improve soil and riparian processes?

Other monitoring questions have significant overlap with this question. Similar hydrologic processes are affected by BMPs aimed at improving water quality and fish and wildlife habitat. Review of projects for monitoring questions regarding restoration and conservation activities, water quality and beneficial use support, and aquatic species habitat and abundance will have overlap with this question since many hydrologic processes are benefitted by individual projects. Summaries and results from other monitoring questions are referenced below.

Project Reviews

Category 1

This type of project has the potential to negatively affect hydrologic resources. Forest Plan standards and guidelines have numerous requirements for maximum disturbances levels (SWST02, SWST03), BMPs (STGU05, STGU08, SWGU09), and other requirements specific to the type of disturbance (TRST04, TRST07, RAST01, RAST03, RAST04, RAGU09). These BMPs and requirements are designed to minimize the negative effects of management actions to

hydrologic resources. The key is whether project design includes applicable BMPs, whether they are implemented properly, and whether the BMPs were effective.

Forest Project Implementation Reviews: In the Forest's response to the water quality monitoring question, 25 project implementation reviews conducted on the forest between 2004 and 2008 are referenced. With a few exceptions (Bally Mountain Burn, Dove Creek quarry) most projects successfully planned and implemented BMPs to limit soil disturbance and protect water quality. The monitoring question for "Project Implementation" addresses whether actions have been "implemented as designed and in compliance with the forest plan".

Timber Forest Practices Audit: A timber forest practices water quality audit was conducted in 2008 on the Iron Creek Parking Lot sale (see Forest's water quality report). Conducted by Idaho Department of Environmental Quality and Department of Lands to assess compliance with applicable requirements under the Idaho Forest Practices Act and Clean Water Act, he review found that applicable requirements were followed, including those that specifically relate to soil disturbance, soil condition, and stream crossings and riparian condition.

Category 2

This type of project has soil and/or riparian condition and productivity as main objectives and is typically restorative in nature. This type of project is like those reviewed in the Forest's "Restoration and Conservation Activity", "Water Quality", and Aquatic Ecosystem" monitoring question summaries and is very applicable to this question. Numerous examples from those reports improved soil and riparian conditions and could be used in this discussion as well. To avoid duplicate examples, others are reviewed below. As discussed previously, hydrologic processes governing stream flow also influence water quality, fish habitat, and wildlife habitat. The criteria used to select projects in other summaries include those that "focused on maintaining or restoring soil productivity, quality and quantity of surface water resources". These processes are the very processes that regulate stream flow and ground water character.

Between 2004 and 2008 the Sawtooth National Forest had 119 projects completed with main objectives to benefit soil and riparian conditions. The table below summarizes the miles of stream improved, acres of lakes and watershed improved, and miles of decommissioned roads and trails.

Table 1. Restoration Project Results (2004-2008)

Stream Improved (miles)	62.2
Lake Improved (acres)	15.0
Watershed Improved (acres)	4951
Road/Trail Decommissioned (miles)	39.3

One of the most significant projects implemented during the monitoring period with substantial soil and riparian benefits was the Travel Planning Management EA signed in Feb 2008. The plan eliminated motorized cross-country travel and established a system of designated roads and trails on the Fairfield, Ketchum, and Minidoka Ranger Districts. Prior to the plan much of the forest was open to cross country motorized travel and significant erosion and stream crossing issues were occurring from motorized vehicles and the increased popularity of ATVs. The

decision eliminated cross country travel and closed over 995 miles of routes to motorized travel on three districts. This had two major benefits to soil and riparian conditions. First, 995 miles of route were closed and over time many of the problems associated with these routes (soil compaction, soil erosion, increased runoff) will be reduced as vegetation on the routes grows in. Second, the creation of new user created routes is greatly reduced with the elimination of cross-country travel.

While these changes did not immediately remove all soil and vegetation concerns, recovery will occur naturally and decommissioning work will speed the process on priority routes. Significant work prior to and since 2008 has focused on physical closure and rehabilitation of the non system routes. The Bear Hollow Road Decommissioning (described below) is one example of a road that was closed as part of the travel plan and decommissioned in 2008.

Other projects are prioritized and planned based on Forest priorities as established in the Watershed Aquatic Recovery Strategy (WARS), Forest Plan, and by TMDL listing. Among this type of project was the Trout Creek channel stabilization and road relocation project, also implemented in 2008.

Bear Hollow Road Decommissioning

The Bear Hollow was among the user created routes that were not adopted as system roads in the travel plan process. Its 0.85 mile length was almost entirely within the riparian corridor, was eroding and steep, captured the stream flow for 100 yards, and had a plugged culvert stream crossing in very poor condition (Figure 1). Bear Hollow is 303(d) listed and in a forest priority subwatershed. Decommissioning occurred in July 2008 and photos from Oct 2009 show much improved soil function and appropriate riparian and upland plants species growing within the former roadbed (Figure 2).

Figure 1. Bear Hollow Nov 2007

Figure 2. Bear Hollow Oct 2009

Trout Creek Channel Stabilization and Road Relocation
This project was necessary to relocate an 800 feet section FR 264 that had captured the main channel of Trout Creek. The result was a headcutting and incising channel, lowering of the water table, and a degrading and often impassable road (Figure 3). The work relocated the road upslope and away from Trout Creek, decommissioned the old roadbed, replanted vegetation along the channel, constructed 3 rock drop structures in the channel, and expanded and rebuilt an ineffective livestock exclosure fence along the riparian corridor. The work was done in July 2008 and conditions in 2010 showed a higher water table, increased water depth, decreased channel velocities, increased obligate riparian species along the channel, appropriate upland grass species along the drier portions of the former roadbed, and little advancement of the headcut (Figure 4). All of these results contribute to an increased ability of the valley bottom to capture and store high flows, contribute to subsurface water storage, reduce peak flows, and maintain higher base flows.

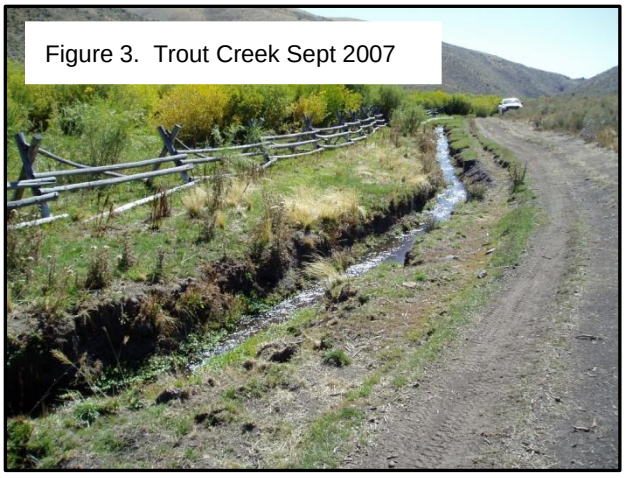
Figure 3. Trout Creek Sept 2007


Figure 4. Trout Creek June 2010

Other types of monitoring conducted by the forest were not project specific but instead evaluated conditions in general. Riparian (stream) monitoring and spring/seep assessments were conducted in 2008 to determine soil and riparian conditions. The monitoring was not designed to determine compliance during specific project implementation but instead to determine if forest management actions in general are improving soil and riparian conditions.

Forest Riparian Trend Report: This report summarized monitoring at 51 sites on cattle allotments from the Minidoka and Fairfield Ranger Districts and the Sawtooth National Recreation Area. Photos from 1988-1994 were compared with photos of the same sites in 2008 to determine how these sites had changed. Results showed that 55% of sites showed visible improvements, 27% appeared unchanged, 8% had declining conditions. In addition to the effects from grazing, a variety of effects were attributed to the conditions at those sites with declining conditions. These included water developments, ineffective fences, drought, and recreational impacts. The majority of sites were improving or unchanged. While this relative change may be important with regards to the trend, it does not describe the condition on an absolute scale. A site in fair condition that remains unchanged is still in fair condition and may not be functioning properly. While grazing is allowing most streams to improve, it remains a factor is those streams that are not improving and many that have remained unchanged.

Seeps and Springs Monitoring

While Forest Plan direction developed for Soil, Water, Aquatic and Riparian Resources was designed to maintain or restore all wetlands, no desired condition statement specific to seeps and springs was developed. Seeps and springs are extremely important with regards to maintaining streams flows and ground water character, both in how precipitation is stored upon reaching the ground and in how groundwater reemerges at the surface. Subsurface and surface flow are closely linked at these sites and negative effects from management activities can reduce water storage, alter flow patterns, speed the runoff process, negatively affect water table levels at the site, and reduce stream flow downstream. Utilizing Forest Plan direction and the Army Corps of Engineers Wetlands Delineation Manual (1987 p. 17), the Forest drafted the following desired condition statement for seeps and springs (Ririe, 2010):

> "Isolated wetlands, developed or undeveloped, should be managed to retain enough of their soil, vegetation and hydrologic characteristics to conserve feature-appropriate ecological function."

The following indicators which represent ecological function were selected for evaluating current condition of seeps and springs at the site-specific, project level:

1. Indicator: Of the vegetative cover 50% or more of the species present are in combination facultative wetland (FACW), facultative (FAC), and/or obligate (OBL) to wetlands species
2. Presence/Absence of active erosional features

In general, past riparian monitoring has focused on stream systems and has not examined small wetland sites. In 2008, the Forest began an initial attempt at assessing soil and vegetation conditions at springs/seeps and isolated wetlands. While the forest riparian trend report referenced above focused on lotic systems (streams), this assessment was aimed at lentic systems (springs, seeps, wet meadows).

Minidoka Ranger District Spring/Seep Inventory: The Minidoka Ranger District includes a large number (900+) of indentified springs. Livestock grazing is the primary Forest management action occurring at these sites and can affect these sites directly through livestock grazing at the site, and from water diversions for livestock watering.

In 2008, a sample of 84 lentic sites (less than 10% of the known sites) were assessed. This data was collected to identify springs in sage grouse habitat where BMPs could be implemented through ongoing allotment NEPA analysis. Of those 84 sites, 57 were rated as having "moderate" or "high" disturbance levels, while 27 were either undisturbed or with "slight" disturbance . Livestock was noted as a disturbance source at all 57 sites rated as moderate or high and water diversion was noted at 18 of them. In short, 68% of the spring/seeps assessed were at least moderately disturbed and grazing was a contributing factor at all sites. Livestock use at these sites tends to reduce infiltration capacity of soils (compaction and disturbance – Figures 5 and 6), increase bare ground (grazing of vegetation – Figure 7), increase the rate at which subsurface flow reemerges as surface flow, and increase the rate of evaporation from the site, (hummock development – Figures 8 and 9). Negative effects from water diversions include drying of surface soil surrounding the headbox or diversion box (Figure 10), and reducing the quantity of water at the spring.

Figure 5. Crockett Spring

Figure 6. Coal Pit Spring

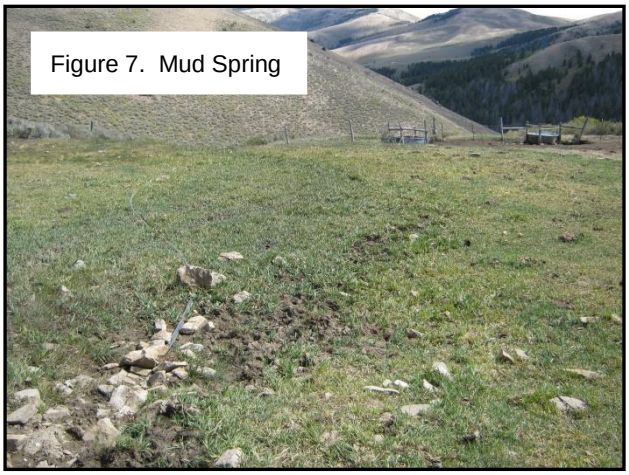

Figure 7. Mud Spring

Figure 8. Unnamed Spring; Dove Creek Drainage

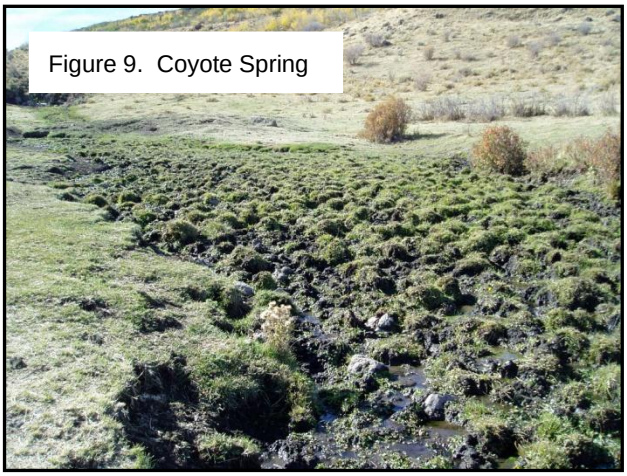

Figure 9. Coyote Spring

Figure 10. Unnamed Spring, Dove Creek

Fairfield Ranger District Spring/Seep Inventory:

Photo monitoring was conducted on 32 seeps and springs on the Willow/Wardrop and Soldier Creek allotments on the Fairfield Ranger District. Data from the photo monitoring was used as a baseline for seep and spring conditions on the allotments. Photos were taken of each of the 32

seeps and springs evaluated. The photos were analyzed to determine if the % FACW, FAC, and/or OBL wetland species vegetative cover level on average was greater than 50% (as directed by indicator). Springs and seeps in photos were then evaluated to verify presence/absence of active erosional features. Photos displaying 50% FACW, FAC, and/or OBL wetland species vegetative cover and lack of active erosional features were determined to be meeting the desired condition sufficient to conserve feature-appropriate ecological function.

Of the 32 springs and seeps surveyed on the Willow/Wardrop and Solider Creek Allotments, all were found to be within desired condition (Figures 11 and 12).

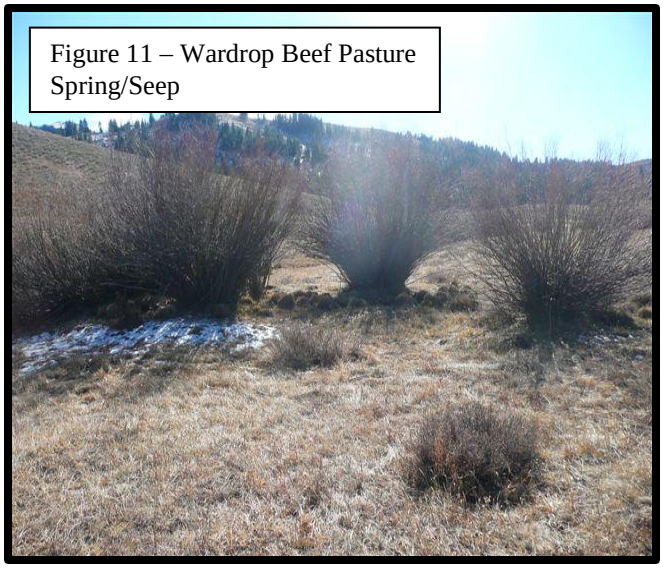

Figure 11 – Wardrop Beef Pasture Spring/Seep

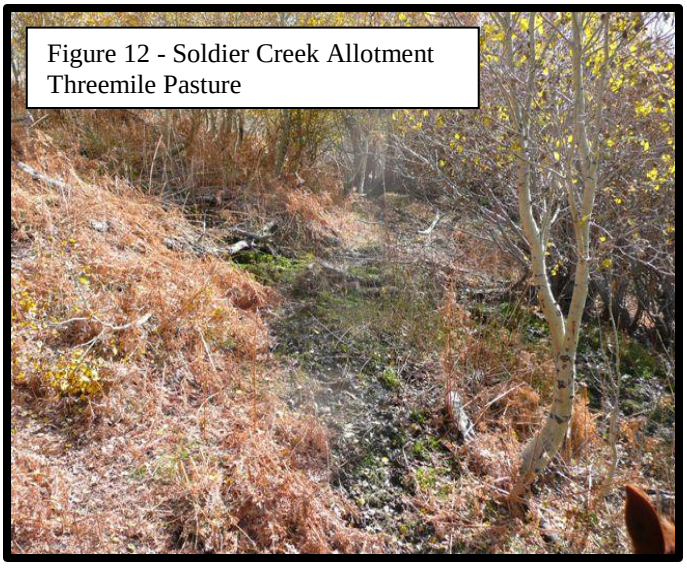

Figure 12 - Soldier Creek Allotment Threemile Pasture

Summary: As shown through several monitoring and review processes, the majority of forest management actions are designing and implementing appropriate and sufficient BMPs to minimize the negative effects of disturbance activities and to maintain soil and riparian conditions that directly affect stream flows and ground water character. There are also significant numbers of restorative actions implemented that enhance soil and riparian conditions. There remain a few streams below functioning condition and in static or declining condition. These streams appear to be the exception and districts seem to be implementing new strategies and BMPs when they occur.

The condition of springs and seeps varies considerably across the Forest. Where surveyed on the Fairfield Ranger District, they appear to be meeting desired conditions, thus retaining the features that may help maintain flows downstream. However, a significant percentage of springs/seeps assessed on the Minidoka Ranger District so far appear to have excessive levels of disturbance on soil and vegetative conditions and grazing is the primary disturbance factor to these systems.

Generally, BMPs involving trough location, water development design, and fencing are incorporated into allotment management plans when allotment permit renewal requires NEPA analysis or when water developments are rebuilt. While forest plan direction has been followed, there remain a number of lentic systems with unacceptable levels of disturbance.

Implementation of BMPs at lentic sites has been inconsistent and it appears that additional BMPs may be necessary to protect these resources in some locations.

At this time the spring and seep surveys only represent a point in time sample. They do not establish a trend nor do they represent conditions of springs and seeps across the Forest. Clearly, additional trend monitoring of select spring and seeps on each ranger district needs to occur to determine how widespread management impacts have been.