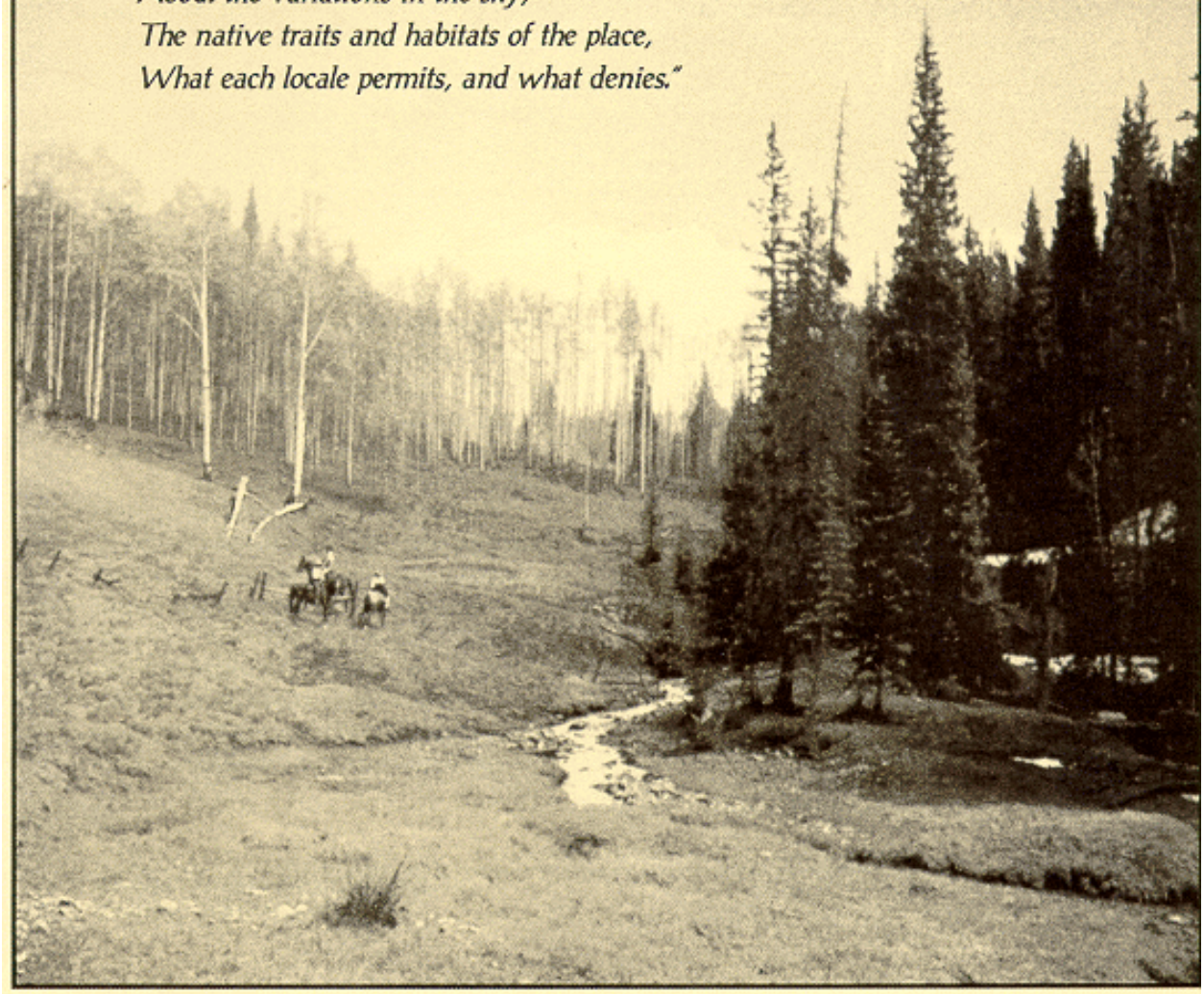
STRAWBERRY VALLEY ASSESSMENT

Executive Summary • November 1997

A Cooperative Project Between the Mitigation Commission & the U.S. Forest Service

"It is well to be informed about the winds,
About the variations in the sky,
The native traits and habitats of the place,
What each locale permits, and what denies."



STRAWBERRY VALLEY AREA ASSESSMENT EXECUTIVE SUMMARY AND RECOMMENDATIONS

BACKGROUND

Who Developed the Area Assessment?
The Heber Ranger District of the Uinta National Forest together with the Utah Reclamation Mitigation and Conservation Commission developed the Area Assessment. The Forest Service is the responsible land manager for the Strawberry Valley. The Commission is involved in this project because of its federally mandated responsibility to mitigate fish and wildlife impacts caused by the Central Utah Project.

Why We Conducted an Area Assessment
Strawberry Valley has been the site of water development projects since the early 1900's. Strawberry Reservoir was a federal reclamation project. Since its construction Strawberry Valley became the hub of the Central Utah Project's Bonneville Unit. As a feature of the Bonneville Unit, Soldier Creek Dam was constructed a few miles downstream of the original Strawberry Dam, filled to the level of the old Strawberry Reservoir and the reservoirs were equalized. To bring additional water to the enlarged Strawberry reservoir, the Strawberry Aqueduct and Collection System (SACS) was developed to intercept water from a total of ten mountain streams in the Duchesne River watershed. Construction of these facilities and management of the surrounding areas dramatically altered Strawberry Valley's natural landscapes and ecosystems.

Over the past 15 to 20 years substantial investments have been made to mitigate the effects of these CUP water developments. Now, by reviewing watershed conditions - what they had been in the past, current conditions and where they are headed - the District and Commission will be better prepared to determine priorities for watershed conservation and restoration.

What is Contained in this Summary? The summary contains a brief synopsis of each chapter of the Assessment. Recommendations for potential projects follow the chapter summary. These Recommendations were not included in the Draft Area Assessment because the Recommendations are based on the Assessment findings. It was important to assure that the Assessment was sound (having gone through a public review) before Recommendations - based on the Assessment- were developed.

CHAPTER 1

Chapter 1 provides a brief introduction to the Assessment chapters. They are organized progressively. Chapter 2 establishes the "properly functioning condition" [1](PFC) for Strawberry Valley natural resources and relates historic events that disrupted the PFC. (*Note that the PFC is a term used repeatedly throught the Assessment.*) Chapter 3 builds on Chapter 2 by identifying those resources that are functioning outside of a PFC, what caused the dysfunction, and the consequences of this change. Chapter 4 then builds on Chapter 3 by looking at the resources identified in Chapter 3 determining whether their trend is towards or away from a PFC, and at what rate. Chapter 4 also identifies which of these resources are most important to the ecosystem, and building on the two previous findings, which key resources are most at risk.

CHAPTER 2

Introduction Chapter 2 provides the foundational material for the Assessment. The physical domain (stream channels, aquatic environment and soils), the biological domain (vegetation and wildlife) and social domain (human uses) are described. Each domain is considered under pre-settlement, historic and present conditions. The objective behind this description over time is to reach an understanding of what a properly functioning condition is for the Strawberry Valley, where its natural systems are dynamic and resilient to disturbance. It was assumed that the Valley was in a properly functioning condition in pre-settlement times. Where historical records were available, they were used to establish this properly functioning condition baseline. Where historical records were not available, a properly functioning condition was developed based on necessary conditions for a healthy system.

Chapter 2 also identified those soils in the assessment area most sensitive or disturbed, they are: Red Ledges, Co-op Creek, Little Grand Canyon, Devils Notch, Indian Creek, Strawberry River above Mill B corral, Bjorkman Hollow headcut and other areas identified on Map 4 as impacted by human activities.

Properly Functioning Conditions The PFC is a key concept in the Assessment. It sets the baseline against which current conditions are measured and ultimately sets a standard for any futue restoration activities. (See "resource objectives" in the Recommendations.)

The properly functioning conditions for stream channels and the aquatic environment, vegetation, and wildlife are identified in Chapter 2 and described in the next pages of this summary as Figure S-1, Table S-1 and Figure S-2, respectively.

[1] An ecosystem that is "properly functioning" is one that is dynamic and resilient to disturbance to its biological or physical structure, composition and processes.

FIGURE S-1 STREAM CHANNEL AND AQUATIC ENVIRONMENT PFC

UPPER ELEVATIONS STREAM CHANNELS

Banks There are some small areas of raw bank, especially where the banks curve and areas where the channel narrows, but there are no large areas of raw bank.
Bottom The bottom is dominated by stable materials, large and medium size rocks and large gravel that is partially embedded, some sediment is settling out in pools, there are occasional new gravel bars forming and there is an occasional small downcut.
Confinement Flow deflection is by relatively firm obstructions (partially embedded logs and rocks) that do not move with high water and by an occasional beaver dam. The channel is confined by the side slopes of the drainage, so meandering is limited to those areas where the Valley bottom opens up.
Aquatic Environment Water quality is adequate to support sediment intolerant macroinvertebrates.
Vegetation There is a mixture of riparian vegetation within a narrow band along the stream edge. Sedges (Carex spp.) are the dominant understory and are made up of a variety of age classes. Willows (Salix spp.) are a mixture of age classes in scattered, small, isolated clumps. There is an occasional small area of bare ground and/or upland vegetation.
Water Table There is an occasional beaver dam and the water table is the same as that in the stream and fluctuates the same as that in the stream. Water is not retained from the spring run-off to be released into the streams in the late summer.
Sediment Vegetation filters out some sediment from upland flows and somewhat slows overland flows so that there is only an occasional area of scouring outside the channel.

MID-ELEVATION STREAM CHANNELS

Banks There are some raw banks at curves and where the stream channel narrows but there are no large areas of raw bank.
Bottoms Bottom materials consist of mostly small rocks and medium size gravel that are generally considered to be embedded. Some pools are being partially filled with sediment. There is an occasional new gravel bar forming and an occasional downcut is present.
Confinement Flow deflection is mostly by embedded large material. There are frequent active beaver dams. The channel is moderately confined by side slopes, but the bottom is wide enough for some meandering.
Aquatic Environment Water quality is adequate to support sediment intolerant macroinvertebrates.
Vegetation There is a mixture of riparian vegetation that extends some distance back away from the stream and often extends from side slope to side slope. Seges (Carex spp.) are the dominant understory and are made up of a variety of age classes. Willows (Salix spp.) are a mixture of age classes in stands that are nearly continuous. There is an occasional small area of bare ground and/or upland vegetation.
Water Table There are frequent beaver dams and the water table is near the surface. Some water is retained from the spring run-off to be released into the streams in the late summer.
Sediment Vegetation filters out most of the sediment from most upland flows and slows overland flows so there is only an occasional area of scouring outside of the channel.

LOWER ELEVATION STREAM CHANNELS

Banks There are some to several small raw banks on curves, depending on the amount of meandering and some small raw banks where the stream narrows and where beaver ponds have broken. There are no large areas of raw bank.
Bottoms Bottom materials consist of medium and small size gravel. Some pools are partially filled with sediment. An occasional small gravel bar and an occasional small down cut occur.
Confinement Flow deflection is by an occasional, large embedded material and the frequent beaver dams. The stream channel is unconfined and has several meanders throughout its length.
Aquatic Environment Water quality is adequate to support sediment intolerant macroinvertebrates.
Vegetation There is a mixture of riparian vegetation that extends a long distance back away from the stream and the size is limited by the height of the water table and not the side slopes. Sedges (Carex spp.) are the dominant understory and are made up of a variety of age classes. Willows (Salix spp.) are a mixture of age classes in dense stands that are nearly continuous. There is an occasional small area of bare ground and/or upland vegetation.
Water Table There are frequent beaver dams and the water table is near the surface. Water is retained from the spring run-off to be released into the streams in the late summer.
Sediment Vegetation filters out sediment from most upland flows and slows overland flows so there is only an occasional area of scouring outside the channel.

Table S-1 Vegetative Properly Functioning Condition

VEGETATIVE TYPE	PROPERLY FUNCTIONING CONDITION STRUCTURAL STAGE (PERCENTAGES)			
	Seedling/Sapling	Poletimber	Mature Sawtimber	Older/Decadent Sawtimber
Spruce / Fir	20	40	20	20
Lodgepole Pine	20	40	20	20
Mixed Conifer	20	40	20	20
Aspen / Conifer	40	15	15	30

VEGETATIVE TYPE	PROPERLY FUNCTIONING CONDITION STRUCTURAL STAGE (PERCENTAGES)			
	Young	Early Mature	Mature	Late Mature
Oak	25	25	25	25
Mountain Shrub	25	25	25	25
Sage / Grass	10	40	30	20
Grass	10	20	65	5
Riparian	30	30	30	10

Note also that Chapter 3 describes the role of disturbance, e.g., fires, insects, etc., in creating the vegetative condition.

FIGURE S-2 PROPERLY FUNCTIONING CONDITION FOR WILDLIFE SPECIES

FISH IN THE STREAMS Under a properly functioning condition for *food*, fish require a diverse and abundant supply of macroinvertebrates. For *cover,* fish require greater than 40 percent stream cover including overhanging banks and pools. For *reproduction*, clean gravel substrates are needed, spawner access should be unobstructed and a 50/50 pool/riffle ratio present - with pools used for cover and riffles used for nests (redds). Mean velocity should vary approximately .3-2.4 feet per second. For *water*, annual stream flow should vary no more than 40 percent between spring runoff and summer base flow and water temperatures should vary between 32 and 70 degrees Fahrenheit.

FISH IN THE RESERVOIR For *food,* an abundance of Daphnia midge, scud (Gammarus spp.) and aquatic invertebrates are present. There is a low density of nongame species as they deplete the macroinvertebrates and zooplankton. For *cover*, there are well-developed shoreline shallows with abundant rooted aquatic vegetation for refuge from predation. For *reproduction*, there are adequate open channels for adult cutthroat and kokanee spawners to access tributary spawning habitat; there is adequate cover for juvenile salmonids in shoreline weed beds and shallow bays; and, there are shoreline gravel bars with well-oxygenated gravel and rubble suitable for in-reservoir spawning by kokanee salmon. For *water,* maximum summer temperature should not exceed 70 degrees Fahrenheit with minimum dissolved oxygen concentrations of 5 parts per million and a pH range between 6.0 and 9.4. Phosphorus loading from tributaries does not contribute to late summer algae blooms, which can cause high pH and localized depletion of oxygen that can kill fish.

BEAVER For *food*, beaver require woody and herbaceous plants; for *cover*, they require sticks and mud to build dams and lodges (homes); for *water*, they require streams where water can be trapped and stored; for *reproduction*, they require conditions that will enable them to construct their lodges.

SAGE GROUSE For *food*, sage grouse require sagebrush leaves, herbaceous broad-leaved plants and forbs. Fledglings especially need insects, which can be abundant in riparian areas. For *cover*, sage grouse require a variety of sagebrush structural stages. This includes having some sagebrush stands in late mature stages and having some open areas in young stages. These diverse stages of plant succession should exhibit various levels of vertical as well as canopy cover. Sage grouse also benefit from a healthy forb and grass component inside the sagebrush community that will also augment the visual cover for nesting. For cover in the winter, sage grouse travel outside the assessment area. However, a sage grouse can use wind-blown hillsides if available. For *reproduction*, sage grouse require open areas for common leks (strutting grounds), sagebrush with a healthy component of forbs and grasses for nesting hens and egg cover. For *water*, sage grouse obtain moisture from condensation from sagebrush and other vegetation. The young get their water from condensation and an insect diet.

DEER For *food*, deer consume a variety of plants, primarily shrubs (browse) and forbs. For *cover*, deer can use several types of habitat including coniferous forest and grassland with shrubs. For *reproduction*, deer require steep slopes, boulders, ledges, brush, dead fall, etc., that place obstacles between themselves and predators. For *water*, deer require succulent forage or dew.

ELK For *food*, elk require grass and grass-like forbs and leaves of browse. For *cover*, they require semi-open forest and mountain meadows. For *reproduction*, elk require interspersion of cover to open areas, sagebrush or other shrubs or taller vegetation to be used by newborn calves to hide under. For *water*, elk are very mobile in locating water, muddy areas are used for wallowing.

NORTHERN GOSHAWK For *food*, goshawks require large to medium-sized birds and mammals, such as squirrels and chipmunks. For *cover*, goshawks require small openings, and woody debris, different forest ages with some large mature trees and large diameter dead trees with cavities. For *reproduction*, goshawks require one or more stands of large, old trees with dense canopy cover (need approximately 30 acres), and northerly aspects in drainages, often near streams. For *water*, goshawks require open water areas.

NORTHERN THREE-TOED WOODPECKER For *food*, woodpeckers require insects. For *cover* they require mixed forest types up to 9,000 feet. For *reproduction*, they require a nest cavity in a dead tree or occasionally in a live tree. For *water*, woodpeckers need open water sources.

BOREAL OWL For *food*, owls require small mammal prey. For *cover* they require high elevation spruce-fir forests. For *reproduction*, they require old woodpecker cavities in mixed coniferous, aspen, and fir stands. For *water*, owls need open water sources.

FLAMMULATED OWLS For *food*, flammulated owls require insects. For *cover*, they use mixed pine forests and prefer mature ponderosa pine-Douglas-fir forests with open canopies and large diameter dead trees with cavities. For *reproduction* they require natural or woodpecker excavated cavities. For *water*, they require open water.

Historic Activities that Effected Change in Strawberry Valley In the late 1800's and early 1900's irrigation companies were formed to take water from Strawberry Valley to the lower valleys to the west. These diversions and canals changed the function of almost all the major streams within the Strawberry Valley. Along with the change in water came a change in vegetation associated with the streams.

The reduced water in some areas stressed the riparian vegetation. This stress along with heavy livestock grazing caused many riparian areas to become dysfunctional and some to disappear. The vegetative communities were changed even more as the willows were sprayed with herbicides to facilitate livestock grazing. With the killing of the willows even more of the vegetation communities were lost, the riparian areas decreased and were replaced by terrestrial (upland) types. The result was more runoff water going into the irrigation systems in the early part of the year with less water retained for summer flows. Because of these changes 1) many of the streambanks became less stable due to the lack of soil holding vegetation; 2) riparian plant communities were not available to retain water, filter sediment and stabilize streambanks; and, 3) water tables lowered as beaver declined.

One of the most significant impacts to the Strawberry Valley was the creation of Strawberry Reservoir. Prior to 1916 the Strawberry River flowed uninterrupted from its headwaters at Strawberry ridge to the confluence of the Duchesne River and down to the Green River watershed. Before it was impounded the river had a long section of low gradient channel that was dense with willow stands and cottonwood trees along the banks. However, by 1922 the river was contained by Strawberry Dam. Soldier Creek Dam was completed in 1973 and the Strawberry Dam and Indian Creek Dike were removed to form the enlarged Strawberry Reservoir with 17,160 surface acres and 57 miles of shoreline. The enlarged reservoir flooded 8,800 acres of land. As a consequence of these changes to the environment, wildlife habitats were lost or altered.

People in the System While the focus of the Assessment is primarily on the physical and biologic environment, there is a section in Chapter 2 that focuses on the social domain. That section describes historic and present human uses of the Valley. In the early 1900's use of the Valley was primarily commercial: for livestock production, water capture and diversion, and logging. By the 1940's recreational uses of the Valley were increasing, particularly fishing at Strawberry Reservoir. Today commercial livestock production and limited logging still ocurr. Recreation is becoming the dominant use with 1,189,900 recreation visits for 1996.

CHAPTER 3

Chapter 3 summarizes Chapter 2 information and adds to it. Those resources functioning outside a properly functioning condition are identified, as well as the cause for the change (why is it out?). In addition, “resources at risk” from the system being outside a properly functioning condition are displayed. For example, in some instances unnaturally high levels of sediment are going into the streams, which negatively affects fish. The following series of tables identify those resources found through the Assessment to be operating outside the PFC.

Table S-2 Stream Channels and Riparian Vegetation Outside of a Properly Functioning Condition[2]

UPPER ELEVATION STREAMS		
RESOURCES	**OUTSIDE OF PFC**	**PERCENT**
Stream Vegetation	Poa spp. dominant near streams	85
Stream Vegetation	Uplands where riparian was dominant	30
	Willows lacking	8
Stream Banks	Raw banks	38
Stream Bottom	Fines dominant	38
	Pools being filled with fines	61
Stream Bottom	Gravel bars forming	15
	Downcutting	15
Stream Confinement	Obstructions are small and unstable or lacking	8
Stream Confinement	Beaver lacking	46
Water Table		46
Sediment	Filtering not taking place	69
Stream Sediment	Scouring	15

[2] Percentages are based on the number of streams in the elevation that are considered to be out of PFC in relation to the number of streams being considered (streams considered are those major streams for which information, data, and professional judgement was available). Refer to Appendix A in the Assessment for more information on each major stream.

MID-ELEVATION STREAMS		
RESOURCES	**OUTSIDE OF PFC**	**PERCENT**
Stream Vegetation	Poa spp. dominant near streams	33
	Uplands where riparian was dominant	26
Stream Vegetation	Willows lacking	40
Stream Banks	Raw banks	7
Stream Bottom	Fines dominant	13
	Pools being filled with fines	40
Stream Bottom	Gravel bars forming	7
	Downcutting	20
Stream Confinement	Obstructions are small and unstable or lacking	27
Stream Confinement	Beaver lacking	67
Water Table	Beaver lacking	67
Stream Confinement	Meandering	20
	Confinement	20
Water Table	Low water table	53
	Summer flows	27
Sediment	Filtering not taking place	20

LOWER ELEVATION STREAMS		
RESOURCES	**OUTSIDE OF PFC**	**%**
Stream Vegetation	Poa spp. dominant near streams	18
Stream Vegetation	Uplands where riparian was dominant	53
	Willows lacking	88
Stream Banks	Raw banks	18
Stream Bottom	Fines dominant	12
	Pools being filled with fines	41
	Gravel bars forming	12
Stream Confinement	Obstructions are small and unstable or lacking	53
	Beaver lacking	82
Water Table	Beaver lacking	82
Stream Confinement	Meandering	47
	Confinement	47
Water Table	Low water table	47
	Summer flows	53
Sediment	Filtering not taking place	11

In general, ***causes*** for stream channel and riparian vegetative resources to be outside of PFC include: water diversions, past livestock grazing and current livestock and wildlife use not yet meeting vegetative standards and guidelines, dispersed recreation, spraying of willows, channelization, road locations, and a decrease in the beaver population. The ***resources at risk*** include: fish and wildlife habitat, water quality, macroinvertebrates and soil stability. For a more complete explanation of these cause and effect relationships see Chapter 3.

Table S-3 Soil Resources Outside of PFC

OUTSIDE OF PFC	WHERE
Highly eroded uplands with low surface organic material and low productivity	Devil's Notch, Indian Creek, Upper Strawberry River area
Extensive headcutting, loss of topsoil and vegetation	Trail Hollow, Co-op Creek, Upper Strawberry River
Extensive soil compaction and loss of organic material	Heavy recreation use sites

Table S-4 Vegetative Conditions Outside of PFC

COVER TYPE	OUTSIDE OF PFC
Riparians and Wetlands	In general, riparians on the landscape level are still outside of PFC. Isolated areas are in good to excellent condition, but as a whole, woody vegetation (willows), and hydric species are still lacking on many streambanks.
Sagebrush/ Grass	Structural stages in the early mature, late mature, and decadent stages are out of balance.
Lodgepole Pine	No seedling/sapling or older/decadent structural stages,100% in poletimber and mature stages
Aspen/ Subalpine-Fir Mix	Lack of acres in seedling/sapling and poletimber stages; ninety percent in mature and older stages; foliage disease epidemic
Oakbrush	All four rangeland structual stages are out of balance. There is a lack of young and early mature stages, and an over abundance of late mature and decadent oak.
Grass	Native grass stands are lacking, forbs are lacking, Poa spp. and other introduced species are still the dominant grasses.
Engelmann Spruce / Sub-Alpine Fir	Lack of acres in seedling/sapling and poletimber stages, 92% in mature and older stages
Mixed Conifer	Lack of acres in seedling/sapling and poletimber stages, 95% in mature and older stages

In general, ***causes*** for the vegetative resources to be outside of PFC include: the lack of fire and other disturbance, past livestock overgrazing and current livestock and wildlife use not yet meeting vegetative standards and guidelines, reduction/elimination of sagebrush through spraying. The primary ***resource at risk*** is wildlife habitat.

Table S-5 Fish in the Streams - Conditions Outside of PFC

RESOURCE	OUTSIDE OF PFC	WHERE
Food[3]	Inadequate variety and numbers of aquatic insects (diversity index)	Indian Creek Streeper Creek Trail Hollow Creek Trout Creek
	Biotic Condition Index (measurement of aquatic insect communities related to the disturbances in the ecosystem)	*Poor:* Clyde Creek, Co-op Creek, Indian Creek, Strawberry River (above fish trap), Streeper Creek, Trail Hollow, Trout Creek; *poor-fair:* Strawberry River (below Willow Creek); *fair:* Strawberry River (Wide Hollow); *fair-good:* Strawberry River (above Daniels diversion)
Cover	Excessive riffles; cover below 40%	Selected reaches of lower Strawberry River, mid-Trout Creek, lower Streeper Creek, lower Hobble Creek and lower Co-op Creek
Water	Annual streamflow variation; ratio of spring runoff maximum flow to summer base flow	Strawberry River, Hobble Creek, Co-op Creek
	Temperatures excessive	Strawberry River below Hwy 40 (high temps)
Reproduction	Percent fines excessive	Strawberry River, Indian Creek, Trout Creek
	Lack of useable riffles	Selected reaches of the lower Strawberry River and Streeper Creek
	Low percent spawning gravels	Valley-wide

The habitat condition for stream fish is directly related to the condition of the stream channels. For activities that have caused fish habitat to be outside of PFC, see causes above under stream channel on page S-9.

[3] Thirteen station sites are monitored for macroinvertebrates and water quality: one in Trout Creek, four in Strawberry River, two in Indian Creek, one in Trail Hollow, two in Clyde Creek, one in Streeper Creek, two in Co-op Creek.

Table S-6 Fish in the Reservoir Outside of PFC

RESOURCE	OUTSIDE PFC	WHERE
Food	Forage fish (juvenile kokanee)	Reservoir-wide
Cover	Rooted aquatic vegetation (weed beds)	Reservoir-wide; edges of reservoir in shallow water
Water	Temperature too high, oxygen depletion below thermocline (transition layer in a body of water which separate zones of highly different temperatures)	Reservoir-wide
Reproduction	Access to tributaries for spawning fish during high and low reservoir levels	Reservoir-wide along tributary openings to the reservoir

In general, ***causes*** for reservoir fish habitat to be outside of PFC include: natural stream reproduction short of full potential (reduces numbers of forage fish for fish in the reservoir) and a fluctuating reservoir.

Table S-7 Condition for Beaver Outside of PFC

RESOURCE	OUTSIDE PFC	WHERE
Food	Aspen stands; willows	Area wide

Causes for beaver habitat to be outside of PFC include a lack of aspen and willows. ***Resources at risk*** include: stream confinement, the level of the water table, riparian and wetland areas, and stream and reservoir fish.

Table S-8 Conditions for Sage Grouse Outside of PFC

RESOURCE	OUTSIDE PFC	WHERE
Food	Not enough forbs	Nesting and brood rearing habitat
Cover	Various age classes and canopy coverage levels of sagebrush stands	Nesting and brood rearing areas
Reproduction	Lack of vertical structure and adequate canopy cover between 20-40% in critical areas	Nesting and brooding areas

Causes for sage grouse habitat to be outside of PFC include: past grazing and reduction of disturbance (fire).

CHAPTER 4

Chapter 4 builds on Chapter 3. The resources identified in Chapter 3 as operating outside a properly functioning condition are evaluated for their trends: is the resource heading away from or towards a properly functioning condition, and at what rate? When determining what resources to "fix" it will be important to know whether the resource can heal itself with time (headed toward PFC) or whether intervention is needed (headed away from PFC at a high rate). An "overall score" (the trend multiplied by the rate) was given each resource found outside a properly functioning condition. The overall score for each resource is identified in the table below. See Chapter 4, page 4-1, for the more complete table which includes the trend and rate score.

Table S-9 Overall Direction for Resources Outside a Properly Functioning Condition

RESOURCE OUTSIDE OF PFC	OVERALL SCORE (TREND X RATE)
Vegetation	
Riparian and Wetlands	[+2] Moving towards PFC at a medium rate
Sagebrush/Grass	[-2] Moving away from PFC at a moderate rate
Lodgepole Pine	[-2] Moving away from PFC at a moderate rate
Aspen/Conifer	[-3] Moving away from PFC at a high rate
Oakbrush	[0] Outside of PFC but stable
Grass	[-1] Moving away from PFC at a low rate
Alpine Fir/Spruce	[0] Outside of PFC but stable
Mixed Conifer	[-2] Moving away from PFC at a moderate rate

RESOURCE OUTSIDE OF PFC	OVERALL SCORE (TREND X RATE)
Low Elevation Streams	
Vegetation	[+2] Moving towards PFC at a medium rate
Banks	[+2] Moving towards PFC at a medium rate
Bottom	[-1] Moving away from PFC at a low rate
Confinement	[0] Outside of PFC but stable
Water Table	[-1] Moving away from PFC at a low rate
Sediment	[+2] Moving towards PFC at a medium rate
Mid-Elevation Streams	
Vegetation	[+1] Moving towards PFC at a low rate
Banks	[0] Outside of PFC but stable
Bottom	[0] Outside of PFC but stable
Confinement	[+1] Moving towards PFC at a low rate
Water Table	[0] Outside of PFC but stable
Sediment	[+1] Moving towards PFC at a low rate
Upper Elevation Streams	
Vegetation	[0] Outside of PFC but stable
Banks	[-1] Moving away from PFC at a low rate
Bottom	[-1] Moving away from PFC at a low rate
Confinement	[+2] Moving towards PFC at a medium rate
Water Table	[+2] Moving towards PFC at a medium rate
Sediment	[-1] Moving away from PFC at a low rate
Fish in the Streams	
Food	[0] Outside of PFC but stable
Cover	[+1] Moving towards PFC at a low rate
Water	[0] Outside of PFC but stable
Reproduction	[0] Outside of PFC but stable
Fish in the Reservoir	
Food	[0] Outside of PFC but stable
Cover	[+1] Moving towards PFC at a low rate

RESOURCE OUTSIDE OF PFC	OVERALL SCORE (TREND X RATE)
Water	[-1] Moving away from PFC at a low rate
Aquatic Environment	
Reservoir	[0] Outside of PFC but stable
Streams	[+1] Moving towards PFC at a low rate
Sensitive Soils Areas	
All Areas	[0] Outside of PFC but stable
Sage Grouse	
Food	[-1] Moving away from PFC at a low rate
Cover	[-2] Moving away from PFC at a medium rate
Reproduction	[0] Outside of PFC but stable
Beaver	
Food, Cover, Water, Reproduction	[+1] Moving towards PFC at a low rate

Key Resources Chapter 4 also identifies "key resources", which other resources depend on to function. For example, fish depend on healthy stream bottoms and fishermen depend on fish. The reason for identifying key resource was to help in developing restoration priorities, i.e., in determining priorities it may be important to "fix" those resources that have the most dependent resources. In conducting this evaluation, stream, vegetative and wildlife resources were given one point for each resource or human use that directly depends on their healthy functioning. The key resource chart that displays this process can be found in Appendix E of the Assessment. The summary of the findings is as follows:

Table S-10 Key Resource Summary

KEY RESOURCE	SCORE	KEY RESOURCE	SCORE
Riparian/Wetlands	23	Stream Vegetation	18
Aspen/Conifer	16	Stream Banks	15
Water Table	13	Sagebrush/Grass	12
Spruce/Fir	12	Mixed Conifer	11
Stream Confinement	11	Stream Bottom	10
Stream Sediment	9	Reservoir Fish	8
Beaver	8	Stream Fish	7
Lodgepole	6	Big Game	4
Aquatic Environment	4	Sensitive Species	1
Sage Grouse	0		

Risk Assessment The final step in the process was to take into consideration the two factors evaluated above - PFC trend and resource dependence - to determine those key resources at greatest risk of moving away from PFC. The resources were divided into three categories depending on their overall score for trend and key resources. These categories are red, yellow and orange:

Red Those resources with a negative overall score for trend, i.e., those resources continuing to move away from PFC.

Yellow Those resources with high "key resource" ratings (10 or more dependent resources) that are stable or improving.

Orange Those resources with a low key resource role (fewer than 10 dependent resources) that are stable or improving.

This categorization appears in this summary in the next section on recommendations.

CHAPTER 5

Chapter 5 contains responses to public comments received on the Draft Area Assessment. The District and Commission consulted with the public in the initial project stages in the fall of 1996. Appendix G addresses public comments received at that time.

RECOMMENDATIONS

Based on the Strawberry Valley Area Assessment, the following were identified as those resources in the Strawberry Valley for which action should be taken to improve their condition. All resources included were found to be operating outside a properly functioning condition (PFC). ***The goal of the following recommendations is to bring these systems back into a PFC -*** *identified in the following charts as "resource objectives."* Those resources that are continuing to move away from PFC are identified as "Red" and are the highest priority. Other resources that are in a stable or improving condition but were identified as those most fundamental to the functioning of the system (key resources) were identified as "Yellow" or of a secondary priority. Those resources identified as having a low key resource role and that are stable or improving fall into the "Orange" category. They merit identification and watching to assure the trend stays positive but are not a priority at the present time. The resources that fall into this category are listed but no recommendations are included at this time.

Note the format of the Recommendations. The description of the existing condition, which includes a listing of the causes of the condition and the resources at risk (or why we care) are based on Chapter 3 of the Assessment. The resource objective is a restatement of the PFC for that resource. The proposed "recommendations" are possible project ideas based on methods to address the causes of the problem. These recommendations will form the basis of proposals that will then be reviewed through the environmental analysis (NEPA) process. During the environmental review process there will be an opportunity for public review on each specific project. Projects must be consistent with direction in the Uinta National Forest Land and Resource Management Plan or a Plan amendment will be required.

RED

RESOURCE	RECOMMENDATION
Aspen	**Existing Condition:** There is a lack of acres in seedling/sapling and poletimber stages. Ninety percent of the aspen stands are in mature and older stages. Foliage disease is epidemic. *Causes for* the existing condition include: grazing on young sprouts by livestock and wildlife, lack of disturbance and clone regeneration, excessive acreage with heavy fir reproduction and lack of fire. The *resources at risk* include elk calving, cover and feed; watershed protection; important visual resources; forage production in the understory; local community fuelwood gathering, camping and hunting, and Christmas tree cutting; aspen in the upper drainages are needed for beaver. **Resource Objective:** Forty percent of the aspen in the seedling/sapling stage, 15 percent in each of the poletimber and mature sawtimber stages, and 30 percent in the older/decadent sawtimber. **Recommendation:** Treat an average of 409 acres/year. Total acreage to be treated over time is 49,135.[4] Fire [5]or mechanical treatments are currently the most feasible alternatives for treating this amount of acreage. Timber quality and market conditions would prevent timber harvest from being a viable option. Other options include personal use fuelwood harvesting and chemical treatments; and, compliance with the Division of Wildlife Resources' Big Game Management Plan and the Uinta National Forest Resource Management Plan's vegetative standards and guidelines to address overgrazing.

[4] It is assumed that if the total acreage for a cover type were treated in equal annual blocks over the average life span of the type, the result would be a structural stage distribution equal to the PFC distribution for that type. For example, the life span of aspen is 20 years. If 10 acres were cut per year for 120 years you would end with a structural stage distribution of 100% of the PFC for 1,200 acres. In practice however this would not occur because of project feasibility and budget constraints - treatments will need to be grouped. The result over time however will be the same - the PFC will be reached within one life span. This assumption is applicable to recommendations for aspen/sub-alpine fir, lodgepole pine, mixed conifer and spruce/fir. Life spans used are: aspen-120 years; mixed conifer and lodgepole-150 years; spruce/fir-200 years.

[5] A comprehensive fire management plan should be developed for all of the vegetation types in the Strawberry Assessment Area.

RESOURCE	RECOMMENDATION
Sage/Grass	**Existing Condition:** The structural stages in the early mature and mature stages are out of balance. *Causes* for the existing condition include a lack of fire and disturbance in the sagebrush type and concentrated spraying in the past that has created even aged stands and less vertical structure than is normally desired. The *resources at risk* include loosing the forb and grass understory, valuable wildlife habitat and creating a larger fire intensity hazard that may threaten sage grouse and other wildlife habitat. **Resource Objective:** Ten percent of sagebrush in a young stage; 30 percent in an early mature stage; 40 percent in a mature stage; and 20 percent in a late mature stage. It is desirable to keep the percentages balanced for a proper mosaic of vegetation types, which creates a variety of cover classes for wildlife and is more visually acceptable. **Recommendation:** Introduce disturbance to convert 10-20 percent of late mature and mature sagebrush to an early mature and young structural stage. Mechanical treatment is the most practical and feasible for treating patches and creating mosaics in the sagebrush. Some fire or herbicide treatment may be feasible for small areas. Continued monitoring of stand densities should occur to keep a balanced mix of types.
Mixed Conifer	**Existing Condition:** There is a lack of seedling/sapling and poletimber stages. Ninety-five percent of the stands are in mature and older stages. *Causes* for this condition include: lack of fire or other disturbance, stand or partial stand replacement. *Resources at risk* include: wildlife habitat, visual resources, fuelwood gathering, conifer species diversity, camping and hunting. **Resource Objective:** Twenty percent of the mixed conifer stands would be in the seedling/sapling structural stage, 40 percent in the poletimber, and 20 percent in each of the mature sawtimber and older/decadent sawtimber stages. **Recommendation:** Treat an average of 16 acres/year. Total acreage to be treated over time is 2,359. No current treatments are scheduled or planned. Options include fire and timber harvest. Timber quality, market conditions, and access will be barriers to fully using the timber harvest option.

RESOURCE	RECOMMENDATION
Stream Bottoms	**Existing Condition:** Higher levels of sediment than desired are entering streams and filling pools. *Causes* for this condition include: lack of vegetative ground cover, raw streambanks, dispersed recreation use, current levels of grazing by livestock and wildlife not yet meeting vegetative standards and guidelines, natural erosive soil types, and road locations. Dewatering due to irrigation diversions aggravates the condition by decreasing the ability of the stream to flush the sediment out. *Resources at risk* include: fish habitat, which is impacted when sediments cover spawning beds, water quality, which is degraded by high nutrient loading, and aquatic insects (which serve as fish food), which can be negatively affected by degraded water quality. **Resource Objective:** In upper elevations streams, some sediment is settling out in pools and in lower and mid-elevation streams some pools are partially filled with sediment. **Recommendation:** Target streams with high sediment loads. Focus on highly productive fish streams, including Strawberry River, Indian Creek, Streeper Creek and Trout Creek. ■ Control sediment by increasing the native vegetation along the streams and banks and upland, e.g., planting or seeding projects. ■ Raise the water table to support the vegetation, e.g., gully plugs/check dams in Co-op Creek, develop beaver strategy. ■ Mechanically stabilized banks, e.g., juniper or rock placement, shaping streambanks. ■ Reduce concentrated impacts from ungulates and recreation through compliance with standards and guidelines, e.g., in headwaters of Willow Creek and Mill B dispersed sites along stream corridors up Strawberry River to Wide Hollow. Compliance techniques may include developing water away from the streams for ungulates, fencing, adjustments of grazing systems and pasture design. ■ Improve road maintenance, e.g., move the road away from upper Strawberry and Trout Creek.
Lodgepole Pine	**Existing Condition:** There are no seedling/sapling or older/decadent structural stages. One hundred percent of the stands are in poletimber and mature stages. In this condition there is a risk that the pines could be lost to mountain pine beetle. The *causes* of this condition are lack of fire and other disturbance. The *resource at risk* is wildlife habitat. **Resource Objective:** Twenty percent of the stand in seedling/sapling, 40 percent in poletimber, and 20 percent in both the mature sawtimber and older/decadent sawtimber stages. **Recommendation:** Treat an average of 5 acres/year. Total acreage to be treated over time is 680 acres. One timber sale is currently scheduled in this type and will treat 26 acres. However this thinning will not immediately change the structural stage composition. Successive (and planned) treatments will need to be accomplished to actually convert this stand to a seedling/sapling stage. Other treatments will be need to be planned including fire, selective thinning and other logging practices. Timber quality and market conditions will be barriers to the use of harvesting to accomplish treatments.

RESOURCE	RECOMMENDATION
Sage Grouse	**Existing Condition:** Population (300 estimate) is below the minimum viable population (500 estimate). There are a number of possible *causes* that are suppressing the sage grouse including introduced non-native predators, habitat inadequacies, the fact that they are a poor pioneering species, and some winter range problems outside of the assessment area. **Resource Objective:** A population of 500 to 1,000 birds supported by a variety of sagebrush structural stages including young and late mature, as well as a healthy forb and grass component inside the sagebrush community. These diverse stages of plant succession should exhibit various levels of vertical as well as canopy cover. Open areas for common leks (strutting grounds). **Recommendation:** The Sage Grouse Recovery Team will ■ Identify suppression factors as noted in the existing condition and minimize those factors. ■ Identify ranges that the existing grouse population is using and identify use patterns in relation to habitat. ■ Gain a better understanding of sage grouse population dynamics. ■ Continue to pursue acquisition of private lands within sage grouse critical habitat. In addition, the Sage Grouse Recovery Team should explore options of creating nesting and brooding cover and some additional lek areas. Treatment for creating lek areas could include mechanical treatments for small patches and fire and herbicide treatments as options for larger areas.

YELLOW

RESOURCE	RECOMMENDATION
Riparian Vegetation	Riparian vegetation is addressed under "Stream Vegetation - Uplands Where Riparian Was Dominant" in the following third block.
Stream Vegetation	**Existing Condition: Poa spp. dominant near streams** Poa spp. are out competing riparian species. *Causes* for this condition include: past overgrazing and current use by recreationists, wildlife and livestock use not yet meeting established vegetative standards and guidelines, limited seed sources for some riparian species and lowered water tables. *Resources at risk* include fish habitat as Poa spp. do not provide the same bank protection as riparian vegetation, which results in little if any sediment being filtered out, nor do Poa spp.have a deep-rooted system to hold banks together. This sediment can cover spawning beds and degrade water quality. Degraded water quality will negatively affect some aquatic insects that the fish use for food. **Resource Objective:** There is a mixture of riparian vegetation within a narrow band along the stream edge at upper elevations. This riparian vegetation extends some distance back away from the stream and often extends from side-slope to side-slope at mid-elevations. At lower elevations the riparian vegetation extends a long distance back away from the stream and is limited only by the height of the water table and not the side-slopes. At all elevations sedges (Carex spp.) are the dominant understory, made up of a variety of age classes. There is an occasional small area of bare ground and/or upland vegetation. **Recommendation:** ■ Re-establish riparian vegetation by planting. ■ Provide adequate beaver habitat, use gully plugs and check dams to raise the water table. ■ Meet vegetative standards and guidelines; compliance techniques may include developing water away from the streams for ungulates, fencing, adjustments of grazing systems and pasture design.

Stream Vegetation	**Existing Condition: Willow is lacking** There is a dominance of younger age classes in scattered, small, isolated clumps at all elevations. *Causes* include elimination of willows through the past use of herbicide along the lower mid-elevation streams. At upper elevations willows were reduced due to overgrazing. In the upper and mid-elevation reaches, additional obstacles to willow recovery include: roads in the riparian areas; current levels of recreation, livestock and wildlife use not yet meeting vegetative standards and guidelines; lack of seed source and gravel bars. At low elevations major causes include competition with Poa spp. and no sources for willow reproduction. Additionally, willow trying to re-establish must contend with a low water table. *Resources at risk* include food and cover for wildlife and fish, bank stability, water and visual quality. **Resource Objective:** Willows (Salix spp.) are a mixture of age classes in scattered, small, isolated clumps at upper elevations, they are a nearly continuous overstory at lower and mid-elevations. **Recommendations:** ■ Plant native willows. ■ Create gravel bars to provide an open site for willows to establish. ■ Move the roads out of riparian areas that are interfering with willow establishment. ■ Provide adequate beaver habitat, use gully plugs and check dams to raise the water table. ■ Meet vegetative standards and guidelines; compliance techniques may include developing water away from the streams for ungulates, fencing, adjustments of grazing systems and pasture design.

Stream Vegetation	**Existing Condition:** ***Uplands where riparian was dominant*** Upland species out compete riparian species. *Causes* for this condition derive from a drop in the water table due to past overgrazing, herbicide use, dewatering and channelization. With the loss of riparian vegetation noxious weeds have become established. In upper and mid-elevation areas vegetative standards are not yet being met due to curent levels of livestock and wildlife use. In the upper elevation, channelization in the Co-op Creek Little Grand Canyon has caused a loss of soil profile and there is a lack of riparian species seed source. *Resources at risk* include food and cover for wildlife. **Resource Objective:** There is a mixture of riparian vegetation within a narrow band along the stream edge at upper elevations. This riparian vegetation extends some distance back away from the stream and often extends from side-slope to side-slope at mid-elevations. At lower elevation the riparian vegetation extends a long distance back away from the stream and is limited only by the height of the water table and not the side slopes. At all elevations sedges (Carex spp.) are the dominant understory, made up of a variety of age classes. **Recommendations:** ■ Provide adequate beaver habitat, use gully plugs and check dams to raise the water table. ■ Control noxious weeds through biological/mechanical means. ■ Meet vegetative standards and guidelines; compliance techniques may include developing water away from the streams for ungulates, fencing, adjustments of grazing systems and pasture design. ■ To address impacts in the Co-op Creek Little Grand Canyon, plant pioneer species, fertilize and eliminate livestock grazing. ■ Establish native riparian seed sources.

Raw Banks	**Existing Condition*:*** The number of raw banks exceeds the properly functioning condition. *Causes* for the condition include: past herbicide use, overgrazing, dewatering and channelization caused a drop in the water table; this lowered water table could not sustain the riparian species. Without vegetation to protect the streambanks, the erosive forces of the natural stream process caused stream banks to slough off and become raw. Noxious weeds have become very well established. The raw banks are slowly becoming stable as riparian vegetation (mostly carex) becomes re-established along the stream's edge. In the upper and mid-elevation reaches, vegetative standards and guidelines are not yet being met due to current levels of use by recreation, livestock and wildlife. Additionally, broken beaver dams at upper and mid-elevations have resulted in exposed streambanks. *Resources at risk* include cover for fish and wildlife and visual quality. **Resource Objective:** There are some small areas of raw bank, especially where the banks curve and areas where the channel narrows at upper and mid-elevations. At lower elevations there are raw banks where beaver ponds have broken. At all elevations there are no large areas of raw bank. **Recommendations:** ■ Re-establish native riparian vegetation, e.g., carex spp., salix spp. ■ Provide adequate beaver habitat, use gully plugs and check dams to raise the water table. ■ Control noxious weeds through biological/mechanical/herbicidal means. ■ Meet vegetative standards and guidelines; compliance techniques may include developing water away from the streams for ungulates, fencing, adjustments of grazing systems and pasture design. ■ To address impacts in the Co-op Creek Little Grand Canyon, plant pioneer species, fertilize and eliminate livestock grazing.
Water Table	**Existing Condition:** Water tables have dropped, which has affected the existence of riparian species. *Causes* for this condition include: dewatering, downcutting and channelization; stream bottoms that either don't allow water percolation at all (silts and clays) or allow so much (gravels) that the water drops too far below the surface to be useful to riparian plants; the lack of willow and beaver; disturbance by road construction, dispersed recreation, current levels of livestock and wildlife use not yet meeting vegetative standards and guidelines. *Resources at risk* include loss of fish and wildlife habitat and diminished support for riparian vegetation. **Resource Objective:** At upper elevations there is an occasional beaver dam and the water table is the same as that in the stream and fluctuates the same as that in the stream. At lower and mid-elevations there are frequent beaver dams and the water table is near the surface. **Recommendation:** ■ Re-establish native riparian vegetation, e.g., carex spp., salix spp. ■ Provide adequate beaver habitat, use gully plugs and check dams to raise the water table. ■ Re-establish natural meanders ■ Meet vegetative standards and guidelines; compliance techniques may include developing water away from the streams for ungulates, fencing, adjustments of grazing systems and pasture design.

Spruce/Fir	**Existing Condition:** There is a lack of acres in seedling/sapling and poletimber stages. Ninety-two percent of the stands are in mature and older stages. *Causes* for this condition include lack of fire and other disturbance. *Resources at risk* include wildlife habitat, visual quality, timber production for the local logging community and fuelwood gathering, water production/snow collection, camping and hunting. **Resource Objective:** Twenty percent of the stands in seedling/saplings, 40 percent in poletimber and 20 percent in each of the mature and older/decadent sawtimber. **Recommendation:** Treat on average 24 acres/year. Total acreage to be treated over time is 4,813.[6] This type has the best potential for timber harvest as a tool. Currently scheduled are four timber sales, each covering a total of about 50 acres, over the next 4 years. Logging technology and market demand will be factors in future management of this type, as many stands are not currently logable due to local operator's limitation to tractor logging terrain. At current management levels , the treatment goal will not be met. Additional acres will need treatment. Fire is an option.
Stream Confinement	**Existing Condition:** Obstructions in the stream channel that help to develop pools and overhanging banks are small and unstable or lacking, and meandering is limited. The major *causes* for this condition are the lack of beaver and large woody material in the system; road locations, downcutting and channelization that have created high steep banks. *Resources at risk* are fish and wildlife habitat as with fewer beaver and their ponds, less sediment is trapped in the ponds. **Resource Objective:** In upper elevations, flow deflection is by relative firm obstructions (partially embedded logs and rocks) that do not move with high water and by an occasional beaver dam. In lower and mid-elevations deflection is mostly by embedded large material and there are frequent beaver dams. **Recommendation:** ■ Manage riparian areas and streambanks to provide for native willows, woody species and carex spp. ■ Develop a beaver strategy ■ Raise water tables in channelized streams (check dams, etc.) ■ Re-establish original channels and meanders ■ To address downcutting, meet vegetative standards and guidelines

[6] Unique to the spruce/fir type is that with the application of uneven aged management and selective harvesting, one treated acre actually only puts 1/3 or less of that acre into a younger structural stage. This means that in order to create 40 acres with a seedling structural stage, 120 or more acres will need to be treated.

ORANGE

Those resources identified as having a low key resource role and that are stable or improving fall into the "Orange" category. They merit identification and watching to assure the trend stays positive but are not a priority at the present time. Therefore no recommendations are included at this time.

Resource Outside of PFC	Key Resource Score	Trend Rating
Stream Sediment	9	+.6
Reservoir Fish	8	0
Beaver	8	+1
Stream Fish	7	+.25
Big Game	4	0
Aquatic Environment	4	+.3
Sensitive Species	1	+.5