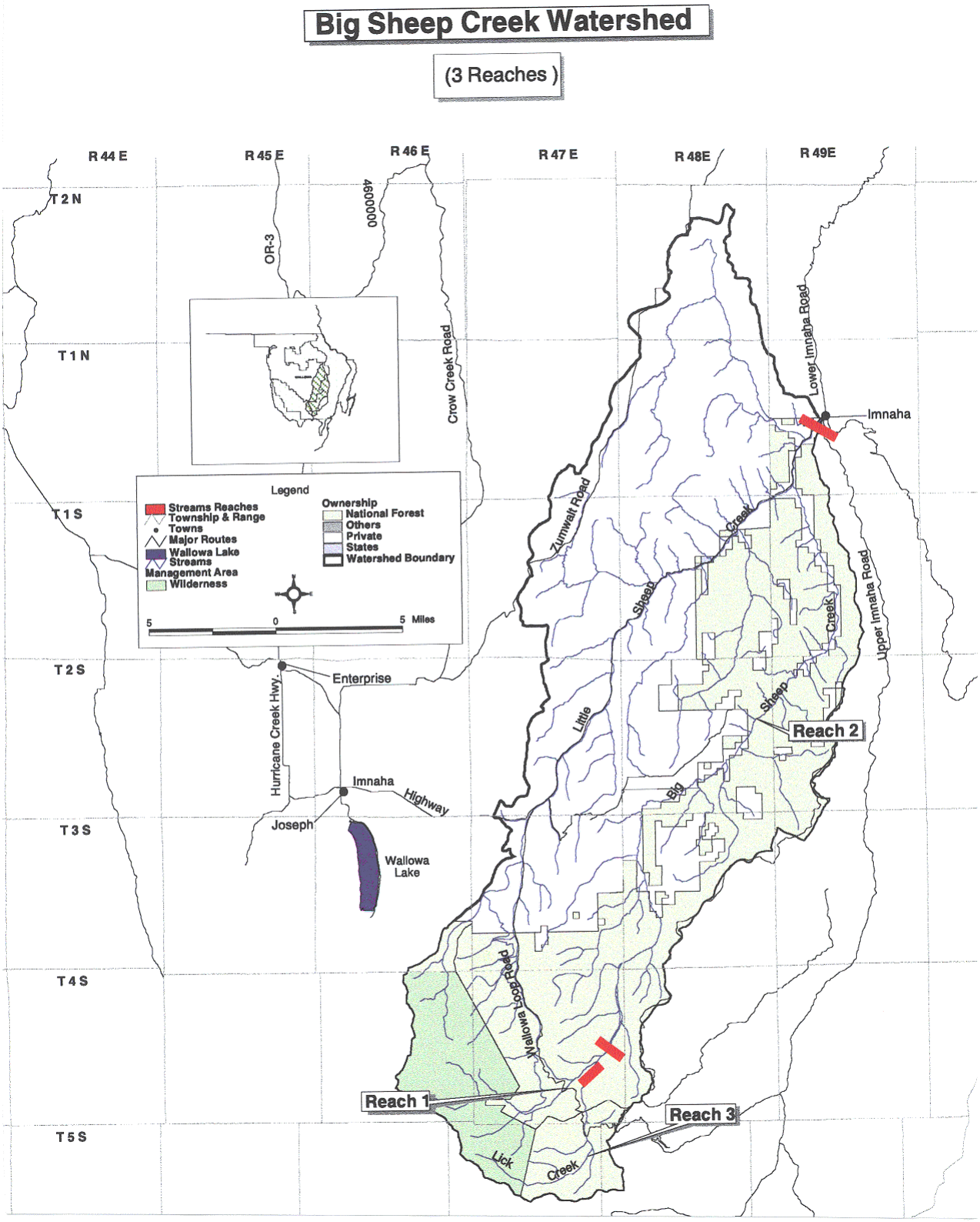
Big Sheep Creek Watershed
(3 Reaches)
R 44 E
R 45 E
R 46 E
R 47 E
R 48E
R 49E
T 2 N
T 1 N
T 1 S
T 2 S
T 3 S
T 4 S
T 5 S
OR-3
460000
Crow Creek Road
Lower Imnaha Road
Upper Imnaha Road
Zumwalt Road
Imnaha
Enterprise
Hurricane Creek Hwy.
Imnaha Highway
Joseph
Wallowa Lake
Wallowa Loop Road
Little Sheep Creek
Big Sheep Creek
Lick Creek
Reach 1
Reach 2
Reach 3
Legend
Streams Reaches
Township & Range
Towns
Major Routes
Wallowa Lake Streams
Management Area
Wilderness
Ownership
National Forest
Others
Private
States
Watershed Boundary
5 0 5 Miles

BIG SHEEP CREEK[5]

Big Sheep Creek was analyzed in three reaches:

1. Big Sheep Creek from headwaters to Lick Creek
2. Big Sheep Creek from Lick Creek to Imnaha River (including Little Sheep Creek)
3. Lick Creek, a tributary of Big Sheep Creek

Big Sheep Creek, the major tributary of the Imnaha River, rises in the Eagle Cap Wilderness and flows 7 miles before being joined by Lick Creek and then flows 31.6 miles to join the Imnaha River near the town of Imnaha. Lick Creek rises in the Eagle Cap Wilderness. The major tributary of Big Sheep Creek is Little Sheep Creek, which joins Big Sheep Creek 3.2 miles above the town of Imnaha.

A large portion of the watershed of Big Sheep Creek above Lick Creek burned in the 22,370-acre Canal Fire of 1989 causing increased sedimentation, turbidity, and nutrient levels in the stream. Loss of tree cover has resulted in increased surface runoffs. Higher peak flows will potentially increase bank erosion and sedimentation. Excess algal growth has been noted in reaches below the fire and is attributed, by some fish biologists, to nutrient runoff from the burned area.

Water is diverted from the drainage via the Wallowa Valley Improvement Canal which contributes to low flow problems in low water years. A biologist doing an index area count of redds in 1992 noted that more of the spawning gravel was above the water than in previous years.

Resource uses include grazing and logging below the wilderness boundary.

Spring Chinook spawn in Big Sheep Creek from at least Muley Creek to the USFS 140 road bridge, a distance of 23.5 miles. The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen because the majority of spawning occurs in the index reach. The index area is from the USFS 140 road bridge downstream to Echo Canyon, a distance of 4 miles. The average redd count from 1964 to 1973 was 39.4 redds. The average redd count from 1979 to 1988 was 6.7 redds. The average redd count in the index area from 1989 to 1998 was 1.3 redds. In 1997, "surplus" adults from the Imnaha River spring chinook hatchery program were outplanted in Lick Creek, and some of them may have strayed downstream into Big Sheep Creek. In 1998, "surplus" hatchery fish were outplanted into Big Sheep Creek.

Spring Chinook spawn in Lick Creek from at least one-third mile above the USFS 39 road bridge to the confluence with Big Sheep Creek, a distance of 4.3 miles. The run size has declined significantly since the mid-1960's when index surveys were standardized as to length, location, and time of year. Index areas were chosen

[5]See also Watershed Management - Approaches to Implementing Solutions

because the majority of spawning occurs in the index reach. The index area is from the USFS 39 road bridge downstream to the confluence with Big Sheep Creek, a distance of 4 miles. The average redd count from 1964 to 1973 was 26.0 redds. The average redd count in the index area from 1979 to 1988 was 1.7 redds. The average redd count from 1989 to 1998 was 3.4 redds. In 1993, “surplus” adults from the Imnaha River spring chinook hatchery program were outplanted in Lick Creek after the index survey and are not included in the 1989-1998 counts. In 1997 and 1998, “surplus” adults from the Imnaha River spring chinook hatchery program were again outplanted in Lick Creek and are included in the 1989-1998 counts.

Big Sheep Creek--Headwaters to Lick Creek

Water Quantity

Tree Density (High Priority).--*Large numbers (2000-3000 per acre) of lodgepole pine have been naturally reseeded in areas of this drainage following the Canal Fire of 1989 (22,370 acres).*

> Early precommercial thinning of the lodgepole will avoid future fire hazard, reduce precipitation interception and transpiration, and avoid overall forest health problems. The first thinning should be followed by later precommercial and commercial thinning. Individual thinnings should not be drastic. Thinning, as opposed to prescribed burning, is suggested for this reach because of the current stocking level. Prescribed burning would probably reestablish dense lodgepole pine stands and perpetuate the current situation.

Irrigation Withdrawals (Study).--*Irrigation diversions out of the basin to the Wallowa Valley Improvement District remove water from the drainage which could help supplement flushing flows and minimum flows.*

> Snowpack shading should be preserved through appropriate tree density to release the water as late as possible in the season. This benefits both fish and irrigators. If minimum flow is a problem during spawning season, water could be leased from the irrigators and small hydropower projects for instream use. Providing more efficient methods of irrigation might help keep water in the creek. Study building upstream impoundment(s) to supply late season irrigation water and keep the natural, cooler water in the creek. Study canal leakage and find ways to mitigate it if there is a problem.

Minimum Flow (Study).--*Low flow can decrease spawning habitat and allow higher temperatures.*

> See mitigation/enhancement measures discussed under "Irrigation Withdrawals." The watershed vegetation should be protected to avoid quick surface runoff and promote infiltration to recharge the groundwater system. Groundwater release into springs provides most of the flow during low flow times.

Flushing Flow (Study).--*Lack of high flows to trigger migration instinct in smolt and flush*

fine sediment from the spawning gravel could be a problem.

See mitigation/enhancement measures under "Irrigation Withdrawals." In some areas, tree spacing could be used to limit precipitation intercept. This could reduce evaporation/sublimation and increase snowpack and water flows. Flushing flow could be released from an upstream impoundment if one were constructed.

Water Quality

Temperature (Possible Future Problem).--*Temperature on this reach is a concern.*

Study temperature and make it a high priority if there is a problem. Preserve existing riparian shading and plant if necessary. Plant or protect conifers in the riparian area to provide thermal cover in the winter.
NOTE: Since the original plan was completed in 1993, this issue was addressed in the CRMP and USFS watershed analysis.

Excess Fine Sediment (Low Priority).--*Excess fine sediment is detrimental to water quality and can cause problems with the stream substrate.*

There are several possible ways to reduce sediment input into the stream. One way would be to limit sediment input from roads. Grazing and logging should be managed to avoid excess sediment input to the stream. Use of roads, trails, and campgrounds should be managed to avoid sediment input, and overall maintain and enhance salmon habitat. Bank erosion and destruction by livestock could be reduced by physical or electric fencing of the creek and providing a water corridor or alternate water source.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis

Fuel Density (Low Priority).--*Fires may destroy vegetative cover and consequently result in sediment input to the river.*

Precommercial and commercial thinning and prescribed burning (in the Eagle Cap Wilderness) can be used to reduce the potential for catastrophic fire. Fuel rearrangement and/or piling could also be used to reduce the risk of uncontrollable fire. Well managed grazing may help to reduce light and medium "flash" fuels.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

Woody Debris (Low Priority).--*There is a continuing input of skeletal trees from the Canal Fire. After those trees are rotted away, there will be no replacements for a few years.*

There may be an excess of trees blown into the creek; if these become a problem, some could be removed. Preserve woody debris and add woody debris in the future if necessary.

Bank Form (Low Priority).--*Heavy livestock use and road fords can result in river bank destruction. High peak flows (freshets) can cause bank unraveling/erosion.*

Prevent bank erosion and destruction by livestock through physical or electric fencing. Provide a water corridor or alternate water for livestock. Protect bank in livestock water corridor or road ford with rock of appropriate size. Avoid excess peak flows by keeping enough watershed vegetation to slow the runoff (and let some of it recharge the groundwater system). Good vegetation cover in riparian areas will also stabilize banks and reduce erosion.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Substrate

Excess Fine Sediment (High Priority).--*Sediment from a fire was washed into this drainage, and the last several drought years have not produced sufficient flushing flow.*

This problem is mainly related to the fire and should resolve itself. Other ways to reduce sediment input are listed above in the "Water Quality" section under "Excess Fine Sediment."
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Physical Barriers (Low Priority).--*There is a possibility that skeletal trees left by the fire will create log jams, physical barriers.*

The creek should be monitored, and if log jams actually become impassable, portions (not necessarily all of the jam) could be removed to allow fish passage.

Habitat Requirements

Predation and Competition (Low Priority).--*Predation and competition may adversely affect salmon in this reach.*

Trout that will prey on juvenile salmon or compete for food should not be stocked. Bull trout in this stretch prey on juvenile salmon, but since the bull trout is listed as threatened under ESA, no action is suggested.

Diversion Screening (Study):.--*Diversion(s) should be screened to prevent loss of fish.*

Make sure that diversions and irrigation returns are screened, monitored, and maintained (this is currently done by the ODFW).
All diversions that are accessible to anadromous fish have been screened.

Big Sheep Creek--Lick Creek to Imnaha River

Water Quantity

Tree Density (Medium Priority).--*Too few trees will result in increased, earlier surface runoff. Too many trees will result in forest health problems, increased risk of fire, and loss of moisture (that never reaches the ground because of interception, evaporation, and sublimation) to the drainage.*

> See the "Tree Density" in the Forest Management section of the "Watershed Management" chapter.

Irrigation Withdrawals (Study).--*Irrigation diversions out of the basin to the Wallowa Valley Improvement District remove water from the drainage which could help supplement flushing flows and minimum flows.*

> See "Big Sheep Creek--Headwaters to Lick Creek."

Flushing Flow (Low Priority).--*Lack of high flows to trigger migration instinct in smolt and flushing fine sediment from the spawning gravel could be a problem.*

> See "Big Sheep Creek--Headwaters to Lick Creek."

Water Quality

Temperature (Study).--*There are reports of warm springs in this area which affect temperatures. Lack of riparian vegetation and shade allows temperature to increase.*

> Provide riparian shading by planting new shrubs and trees, as well as protecting existing shade. Protect (and possibly increase) flow from springs by enhancing groundwater recharge (limit surface runoff from roads, etc). The temperature of springs is generally ground temperature (around 45-50^{0}F). Plant and/or protect conifers in riparian area to provide thermal cover in winter. (See suggestions under "Feedlots.")
> NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Septic (Study).--*Study effects of leakage from septic systems on water quality and salmon habitat.*

> If there is a problem with septic systems, limit future development in the County comprehensive land use plan and improve current systems (ODEQ has information on improving septic systems).

Feedlots (Study).--*Runoff from feedlots on this reach may affect water quality.*

> Prevent bank erosion and destruction (as well as loss of shade vegetation) by livestock though fencing and supplying water corridors or alternate water sources. Protect water corridors and road fords with rock of appropriate size. Provide wetlands, settling ponds, and/or filter strips for feedlot runoff.

NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Herbicides/Pesticides (High Priority).—See Countywide Issues

Excess Nutrients.--*Excess nutrient runoff from the Canal Fire has resulted in excessive algal growth which is indicative of poor water quality. Feedlots also contribute to excess nutrients in the lower 3 miles of Big Sheep Creek.*

See "Feedlots" above. Excess nutrient runoff from the fire is dissipating naturally as revegetation occurs.

Stream Structure

Channelization (Low Priority).--*Channelization limits diversity of stream structure.*
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Do not permit any channelization and restore natural stream structure where possible.

Bank Form (Low Priority).--*Heavy livestock use (e.g. feedlots) and road fords can result in river bank destruction. High peak flows can cause bank unravelling/erosion. Recreational use of roads, trails, and campgrounds may also lead to bank stability problems.*

See "Big Sheep Creek--Headwaters to Lick Creek," also "Channelization" in this section.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Steep Gradient (Low Priority).--*Stream structure in this reach is limited by a steep gradient.*

Work with the inherent possibilities of the stream. Anchoring large woody debris or providing other structures (e.g., rock) could provide pools with slower water for the fish.

Substrate

Cobble embeddedness (Study).--*There may be a problem with cobble embeddedness in this reach (sediment input from the fire, etc.).*

See "Big Sheep Creek--Headwaters to Lick Creek." Work on reducing sediment input from roads, skid trails, grazing, and recreational use (see "Watershed Management" chapter).

Habitat Requirements

Riparian Vegetation (Low Priority).--*Riparian vegetation on this reach could be improved.*

Preserve existing riparian vegetation and restore riparian vegetation where needed to preserve cooler water temperatures. Plant and/or protect conifers in the riparian area to provide shade in summer and thermal cover in winter (allow for diversity and do not plant/favor conifers exclusively).
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Harassment (Low Priority).--*Activities on this reach may result in harassment of spawning salmon.*

Manage recreational use of roads, trails, and campgrounds to avoid harassment. Planting thorn bushes in riparian areas of spawning beds could discourage harassment. Alternate places could be provided for sport fishing. There could be seasonal sport fishery closures during spawning season.
NOTE: Since the original plan was completed in 1993, this was addressed in the CRMP and USFS watershed analysis.

Predation and Competition (Low Priority).--*Predation and competition adversely affect salmon in this reach.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Diversion Screening (Study).--*Diversion(s) should be screened to prevent loss of fish.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Big Sheep Creek--Lick Creek

Water Quantity
Tree Density (Medium Priority).--*Too few trees will result in increased, earlier surface runoff. Too many trees will result in forest health problems, increased risk of fire, and loss of moisture (that never reaches the ground because of interception, evaporation, and sublimation) to the drainage.*

See the "Density" in "Watershed Management" chapter.

Water Quality
Temperature (Possible Future Problem).--*There is a concern about temperature on this reach.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Fuel Density (Medium Priority).--*Catastrophic fires may destroy vegetative cover and consequently result in sediment input to the river.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Herbicides/Pesticides (High Priority).—See Countywide Issues

Stream Structure

Woody Debris (Low Priority).—*There is a continual input of skeletal trees from the Canal Fire in last mile of stream. After those trees are rotted away, there will be no replacements for a few years.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Bank Form (in meadow) (Study).—*Allow the improving condition of the bank to continue.*

Study the cause. Recreational and livestock trails on the bank should be managed to maintain and enhance fisheries habitat. If bank erosion is being caused by livestock, fence riparian areas and provide water corridors or alternate water source.

Substrate

Excess Fine Sediment (Low Priority).--*The last several drought years have not produced sufficient flushing flow.*

See "Big Sheep Creek--Headwaters to Lick Creek." Work on reducing sediment input from roads, logging, and grazing.

Physical Barriers (Low Priority).--*There is a possibility of log jams, from the skeletal trees left by the fire, creating physical barriers. Rock dams have been built near the campgrounds to provide swimming holes. Some of these dams create fish passage problems.*

See "Big Sheep Creek--Headwaters to Lick Creek." Campers should be educated about the effects of their dams on fish and how to provide passage for fish through their dams.

Habitat Requirements

Harassment (Low Priority).--*Activities on this reach result in harassment of spawning salmon.*

See "Big Sheep Creek--Headwaters to Lick Creek."

Predation and Competition (Low Priority).--*Predation and competition adversely affect salmon in this reach.*

See "Big Sheep Creek--Headwaters to Lick Creek."