

SATSOP MANAGEMENT UNIT

SATSOP RIVER

Description:

The Satsop River basin is one of the largest tributaries to the Chehalis River that drains over 192,000 acres. The main drainages that comprise the Satsop basin are the West Fork Satsop, Middle Fork Satsop, and East Fork Satsop. These three main forks drain from the Olympic Mountains, with the East Fork Satsop considered a continuation of the mainstem (Smith Wenger 2001). Mean annual precipitation ranges from over 160 inches in the headwaters to about 80 inches in the lower reaches (Weyerhaeuser and Simpson Timber Co 1995).

Currently, the lower reaches flow mainly through agricultural land and the middle and upper watersheds are still predominantly managed for timber harvest. The East Fork Satsop River flows through low hills and flat valleys, and has several major tributaries, such as Decker Creek, Dry Run Creek, and Bingham Creek, each supporting salmon populations (Smith Wenger 2001).

The Middle Fork Satsop River joins the East Fork Satsop River at RM 11. Its headwaters are located in the foothills of the Olympic Mountains, and it flows southerly through steep valleys and canyons until about RM 23.8. The surrounding land then changes to prairie and valleys. Most of the land has been under active forest management (Smith Wenger 2001).

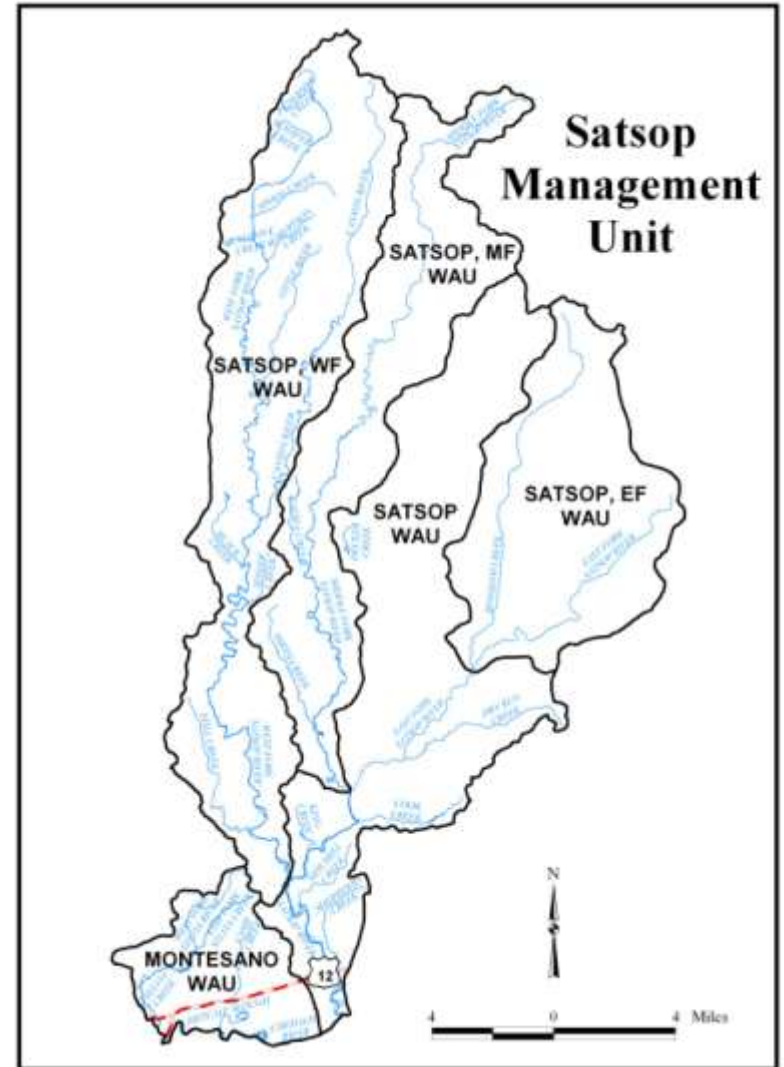
The West Fork Satsop empties into the Mainstem Satsop at RM 6.3, and is a glacial stream with flow patterns and turbidity that differ from the remaining Satsop subbasin. Its headwaters are in the steep foothills of the Olympic Mountains. In the Middle West Fork, the landform changes to moderate and low relief with short, steep tributaries. The geology changes to materials that break down quickly to gravels, sands, silts, and clays (Smith Wenger 2001).

The Satsop drainages contain 237.6 miles of anadromous fish habitat.

Major Tributaries: Bingham, Cook, Dry Run, Decker, Baker, Rabbit, Smith, Black, and Still Creeks; Middle Fork Satsop, West Fork Satsop, East Fork Satsop Rivers

Land Uses: Forestry, Agriculture, and Rural Residences

Anadromous Fish Stocks: Fall Chinook, summer Chinook*, coho, cutthroat, winter steelhead*, chum, and bull trout (* denotes depressed stocks, SaSI)



Satsop River Mainstem Tier 1 Concerns

| Satsop River Mainstem Tier 1 FLOODPLAIN | | |
|---|---|---|
| Symptom | Cause | General Actions |
| <p>➔ Recently, the mainstem has seen more degradation, resulting in channel incision.</p> | <p>➔ Partially attributed to gravel harvesting; more information needed.</p> <p>➔ An estimated 10,000 cubic yards of gravel moves through the mainstem annually. In the past, this amount of material had contributed to aggradation.</p> <p>➔ Timber harvest and development within the riparian zone have altered the physical characteristics and connectivity of many off-channel features.</p> <p>➔ The former gravel pit site, located off Keys Road, has a perimeter dike and stockpiled soil that prohibit flooding of approximately 40 acres.</p> <p>➔ Extensive amounts of riprap occur in the lower reach of the mainstem.</p> | <p>➔ Protect, fee simple or easement, key properties to facilitate natural channel migration and reconnection to the floodplain</p> <p>➔ Reconnect, enhance, and/or restore potential off-channel, floodplain, and wetland habitat.</p> <ul style="list-style-type: none"> • Projects identified in the report prepared by Ralph et al. 1995 • Five locations along the lower 6 miles of the mainstem have been identified as potential off-channel restoration projects. The quality and accessibility of these sites has been negatively impacted. <p>➔ Remove hard armoring (riprap) or implement bioengineering techniques in place of hard armoring</p> <p>➔ Relocate gravel mining/harvesting away from shorelines, 100-year floodplains, and stream channels.</p> <ul style="list-style-type: none"> • Restore former gravel pit site located along Keys Road in the lower reach of the Satsop mainstem |
| <p>➔ The floodplain in the lower reach of the Satsop mainstem does not accommodate natural channel migration patterns or flood storage.</p> | <p>➔ Extensive amounts of riprap in lower reach of the mainstem.</p> <p>➔ The former gravel pit site, located off Keys Road, has a perimeter dike and stockpiled soil that prohibit flooding of approximately 40 acres.</p> | <p>➔ Reconnect, enhance, and/or restore potential off-channel, floodplain, and wetland habitat</p> <ul style="list-style-type: none"> • Projects identified in the report by Ralph et al. 1995 <p>➔ Protect, fee simple / easement, key properties to facilitate natural channel migration and floodplain reconnection.</p> <p>➔ Relocate gravel mining/harvesting away from shorelines, 100-year floodplains, and stream channels.</p> <p>➔ Remove hard armoring (riprap) or implement bioengineering techniques in place of hard armoring</p> <p>➔ Restore former gravel pit site located along Keys Road in the lower reach of the Satsop mainstem</p> |

| Satsop River Mainstem Tier 1 | | | WATER QUALITY | | |
|--|--|--|---------------|---|--|
| Symptom | | Cause | | General Actions | |
| <p>➔ Listed as threatened by DOE for siltation and suspended solids.</p> | | <p>➔ The source of siltation and suspended solids is identified as unspecified non point sources.</p> <p>➔ See the Sediment section above for the effects of high levels of siltation and sedimentation.</p> | | <p>➔ Address sediment input sources in WF, MF, EF Satsop</p> <p>➔ Reduce road densities to reduce sediment loading</p> <p>➔ Reduce exposed soils by improved logging practices.</p> | |

| Satsop River Mainstem Tier 1 | | | RIPARIAN | | |
|---|--|---|----------|--|--|
| Symptom | | Cause | | General Actions | |
| <p>➔ The riparian condition for the mainstem Satsop is considered to be in poor condition and will not significantly contribute LWD. See Grays Harbor County 2002 Riparian Assessment for additional information.</p> | | <p>➔ 79% of the mainstem Satsop riparian corridor is lacking vegetation or is dominated by hardwoods. These impacts are attributed to past land use practices associated with agriculture and forestry.</p> | | <p>➔ Control invasive species. See Section 5.</p> <p>➔ Protect by fee simple or easement key properties of riparian habitat; use Chehalis Basin Lead Entity's Riparian Assessment report (2003) to identify specific locations</p> <p>➔ Revegetate open riparian areas with native plants; use Chehalis Basin Lead Entity's Riparian Assessment report (2003) to identify specific locations</p> | |

Satsop River Mainstem Tier 2 Concerns

| Satsop River Mainstem Tier 2 | | |
|---|---|--|
| FISH PASSAGE | | |
| Symptom | Cause | General Actions |
| <p>➔ Numerous road crossings are undersized and do not allow adequate fish passage upstream because of water velocity or perched outfall. These undersized structures also inhibit the movement of streambed material downstream and usually contribute to channel scour directly downstream.</p> | <p>➔ Placement of undersized stream crossing structures (see Mason Conservation District 2004 Fish Passage Inventory for detailed information).</p> | <p>➔ Correct barrier culverts. See Section 4 for guidelines.</p> |

| Satsop River Mainstem Tier 2 | | |
|--|---|--|
| LARGE WOODY DEBRIS (LWD) | | |
| Symptom | Cause | General Actions |
| <p>➔ Estimated low levels of LWD in the mainstem Satsop.</p> | <p>➔ Low levels of LWD are estimated in the mainstem Satsop because of past splash damming activities, LWD removal from channel, and poor riparian recruitment potential.</p> | <p>➔ Determine LWD levels in the Satsop mainstem.</p> <p>➔ Develop LWD supplementation plan that will install logjams to improve instream channel structure and habitat diversity</p> <p>➔ Educate landowners on the importance of leaving LWD</p> |

Satsop River Mainstem Tier 3 Concerns

| Satsop River Mainstem Tier 3 | | |
|---|--|--|
| SEDIMENT | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ The mainstem is considered incised, however, it is also the largest contributor of sediment to the Chehalis River. ➔ According to the EDT model, sediment is one of the main problems. | <ul style="list-style-type: none"> ➔ High road densities in the Satsop WAU (4.1 miles of road per square mile of drainage). ➔ WF, MF, and EF contribute high amounts of sediment to the Satsop mainstem. ➔ Extensive logging of watershed causes high peak flows. | <ul style="list-style-type: none"> ➔ Address sediment input sources in WF, MF, EF Satsop ➔ Reduce road densities by abandoning and/or decommissioning roads to reduce sediment loading. ➔ Reduce exposed soils by improved logging practices. |

| Satsop River Mainstem Tier 3 | | |
|--|--|---|
| WATER QUANTITY | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ In recent years, the Satsop River has not met established base flows for an average of 63 days per year. ➔ The increase in peak flows shows a higher average-month-per-year flow in recent years. | <ul style="list-style-type: none"> ➔ Both summer low flows and high peak flows are likely attributed to land use practices since precipitation correlations have been ruled out. However, further data is needed to determine actual cause. | <ul style="list-style-type: none"> ➔ Determine if water withdrawals are being followed in accordance with current water rights. ➔ Implement activities that lead for natural aquifer recharge ➔ Implement forest and fish rules pertaining to logging. ➔ Increase hydrologic continuity – reduce impervious surfaces. ➔ Obtain data needed to determine cause. Investigate current agricultural practices. ➔ Reduce stormwater discharge directly to streams ➔ Restore wetlands for water storage. |

West Fork Satsop River Tier 1 Concerns

| West Fork Satsop River Tier 1 | | | FISH PASSAGE |
|---|--|---|--------------|
| Symptom | Cause | General Actions | |
| <p>➔ Numerous road crossings are undersized and do not allow adequate fish passage upstream because of water velocity or perched outfall. These undersized structures also inhibit the movement of streambed material downstream and usually contribute to channel scour directly downstream.</p> | <p>➔ Placement of undersized stream crossing structures (see Mason Conservation District 2004 Fish Passage Inventory).</p> | <p>➔ Correct barrier culverts. See Section 4.</p> | |

| West Fork Satsop River Tier 1 | | | WATER QUANTITY |
|---|--|--|----------------|
| Symptom | Cause | General Actions | |
| <p>➔ In recent years, the Satsop River has not met established base flows for an average of 63 days per year.</p> | <p>➔ Both low summer flows and high peak flows are likely attributed to land use practices since precipitation correlations have been ruled out. However, more data is needed to determine actual cause.</p> | <p>➔ Determine if water withdrawals are being followed in accordance with current water rights</p> <p>➔ Protect wetlands and springs in WF Satsop drainage</p> | |
| <p>➔ The increase in peak flows shows a higher average-month-per-year flow in recent years.</p> | <p>➔ Data needed.</p> | <p>➔ Determine cause of higher average-month-per-year flow.</p> | |

| West Fork Satsop River Tier 1 | | | SEDIMENT |
|--|--|---|----------|
| Symptom | Cause | General Actions | |
| <p>➔ High sediment delivery rate and low level of quality spawning habitat.</p> | <p>➔ The West Fork Satsop has a high level of sediment input from landslides and road surfaces. It also lacks sufficient LWD to retain and sort substrate materials.</p> | <p>➔ Upgrade all logging roads to comply with Forest and Fish Agreement (1999) on Swinging Bridge Creek, middle and upper Canyon River, Lower Little River, Save Creek and Robertson Creek</p> | |
| <p>➔ WF Satsop is also listed as threatened by DOE for siltation and suspended solids.</p> | <p>➔ Most landslide contribution originates from the upper 1/3 of the basin and most of the road surface contribution originates from Swinging Bridge Creek, middle and upper Canyon River, Lower Little River, Save Creek and Robertson Creek (Clark 1995).</p> | <p>➔ Upgrade all logging roads to comply with Forest and Fish Agreement (1999) on:</p> <ul style="list-style-type: none"> Swinging Bridge Creek, middle and upper Canyon River, Lower Little River, Save Creek and Robertson Creek | |

West Fork Satsop River Tier 2 Concerns

| West Fork Satsop River Tier 2 | | |
|---|--|---|
| LARGE WOODY DEBRIS (LWD) | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Low level of LWD does not allow for the retention of courser substrate materials suitable for spawning or provide instream structure in WF Satsop. ➔ Low levels of LWD contribute to predicted channel incision. | <ul style="list-style-type: none"> ➔ In the lower reach of the WF, near-term LWD recruitment is low to moderate and long-term potential is low. ➔ In the middle reach of the WF, near-term LWD recruitment varies from low to high and long-term LWD recruitment potential is low. ➔ Widespread conversion of the riparian zone from conifer to deciduous, particularly in the middle and lower West Fork Satsop watershed (Smith Wenger 2001). | <ul style="list-style-type: none"> ➔ Develop LWD supplementation plan that will install logjams in key places to improve instream channel structure and habitat diversity ➔ Interplant conifers in deciduous dominant areas where appropriate. ➔ Protect by fee simple or easement key properties of riparian habitat (use the 2003 Lead Entity Riparian Assessment to identify specific locations). ➔ Restore riparian corridors in the WF Satsop drainage (use the 2003 Lead Entity Riparian Assessment to identify specific locations). ➔ Revegetate open riparian areas with native plants |

| West Fork Satsop River Tier 2 | | |
|--|---|---|
| RIPARIAN | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ The riparian condition for the WF Satsop is considered to be in poor condition and will not significantly contribute LWD. Poor riparian conditions exist in approximately 52% of the WF Satsop. <ul style="list-style-type: none"> • The lower reaches of the WF Satsop have a “poor” LWD recruitment potential because of hardwood dominated species composition and poor riparian conditions (lack of vegetation). • The middle reaches of the WF have a “poor” long term LWD recruitment potential because 40% of the riparian corridor consists of mature alder. • The upper reaches of the WF Satsop have a “good” rating for long term LWD recruitment because of the conifer dominated riparian corridor. | <ul style="list-style-type: none"> ➔ Widespread conversion of the riparian zone from conifer to deciduous, particularly in the middle and lower West Fork Satsop watershed (Smith Wenger 2001). <ul style="list-style-type: none"> • The lower WF has naturally low levels of shade and the land uses are agriculture, rural residence, and commercial forestry with riparian corridors dominated by red alder. • The middle reaches of the WF are primarily dominated by dense hardwood and mixed stands. • The upper reaches of the WF are conifer dominated. These impacts are attributed to past land use practices. | <ul style="list-style-type: none"> ➔ Control invasive species. See Section 5. ➔ Interplant conifers in deciduous dominant areas where appropriate. ➔ Protect by fee simple or easement key properties of riparian habitat (use the 2003 Lead Entity Riparian Assessment to identify specific locations). ➔ Restore riparian corridors in the WF Satsop drainage (use the 2003 Lead Entity Riparian Assessment to identify specific locations). ➔ Revegetate open riparian areas with native plants |

West Fork Satsop River Tier 3 Concerns

| West Fork Satsop River Tier 3 | | | FLOODPLAIN | | |
|--|--|--|------------|---|--|
| Symptom | | Cause | | General Actions | |
| <ul style="list-style-type: none"> ➔ Low drainage density that indicates off-channel habitat may be limited. ➔ The West Fork Satsop is considered likely to have a disconnected floodplain based on past land use practices implemented in this basin. | | <ul style="list-style-type: none"> ➔ Natural geomorphology in basin. ➔ Channel incision is likely to occur due to the estimated low levels of LWD and past splash damming activities on Canyon Creek, Still Creek, and Robertson Creek | | <ul style="list-style-type: none"> ➔ Off-channel habitat enhancement. ➔ Assess floodplain conditions and identify impacts ➔ See LWD section. | |

| West Fork Satsop River Tier 3 | | | WATER QUALITY | | |
|---|--|--|---------------|--|--|
| Symptom | | Cause | | General Actions | |
| <ul style="list-style-type: none"> ➔ Listed as threatened by DOE for siltation and suspended solids. | | <ul style="list-style-type: none"> ➔ The source of siltation and suspended solids is identified as unspecified non point sources. ➔ The West Fork Satsop has a high level of sediment input from landslides and road surfaces. It also lacks sufficient LWD to retain and sort substrate materials. ➔ Most landslide contribution originates from upper 1/3 of the basin and road surface contribution originates from Swinging Bridge Creek, middle and upper Canyon River, Lower Little River, Save Creek and Robertson Creek (Clark 1995). | | <ul style="list-style-type: none"> ➔ Upgrade all logging roads to comply with Forest and Fish Agreement (1999) on: <ul style="list-style-type: none"> • Swinging Bridge Creek, middle and upper Canyon River, Lower Little River, Save Creek and Robertson Creek. | |

Middle Fork Satsop River Tier 1 Concerns

| Middle Fork Satsop River Tier 1 | | |
|---|---|---|
| FISH PASSAGE | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Numerous road crossings are undersized and do not allow adequate fish passage upstream. These structures inhibit the movement of streambed material downstream and usually contribute to channel scour directly downstream. | <ul style="list-style-type: none"> ➔ Placement of undersized stream crossing structures (see Mason Conservation District 2004 Fish Passage Inventory). | <ul style="list-style-type: none"> ➔ Correct barrier culverts. See Section 4 for guidelines. |

| Middle Fork Satsop River Tier 1 | | |
|--|--|---|
| WATER QUANTITY | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ In recent years, the Satsop River has not met established base flows for an average of 63 days per year. ➔ The increase in peak flows shows a higher average-month-per-year flow in recent years. | <ul style="list-style-type: none"> ➔ Both low summer flows and high peak flows are likely attributed to land use practices since precipitation correlations have been ruled out. However, further data is needed to determine actual cause. | <ul style="list-style-type: none"> ➔ Determine if water withdrawals are being followed in accordance with current water rights ➔ Implement activities that lead to natural aquifer recharge ➔ Implement forest and fish rules pertaining to logging. ➔ Increase hydrologic continuity– reduce impervious surfaces. ➔ Obtain data needed to determine cause of flow problems. ➔ Reduce stormwater discharge directly to streams ➔ Restore wetlands for water storage. |

| Middle Fork Satsop River Tier 1 | | |
|---|---|--|
| RIPARIAN | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ The riparian condition is considered to be in poor condition and will not significantly contribute LWD (See Grays Harbor County 2002 riparian assessment for additional information). | <ul style="list-style-type: none"> ➔ Overall, 61% of the Middle Fork Satsop riparian reaches are either lacking in trees or dominated by hardwoods. Primary riparian loss is identified in the lower and middle reaches of the MF and Rabbit Creek. These impacts are attributed to past land use practices. | <ul style="list-style-type: none"> ➔ Control invasive species. See Section 5. ➔ Interplant conifers in deciduous dominant areas where appropriate. ➔ Protect by fee simple or easement key properties of riparian habitat ➔ Restore riparian corridors in the MF Satsop drainage (use the 2002 Lead Entity Riparian Assessment to identify specific locations). ➔ Revegetate open riparian areas with native plants |

Middle Fork Satsop River Tier 2 Concerns

| Middle Fork Satsop River Tier 2 | | | SEDIMENT | | |
|--|--|--|----------|--|--|
| Symptom | | Cause | | General Actions | |
| <ul style="list-style-type: none"> ➔ Estimated high amount of sediment delivery. ➔ More data needed on high sediment delivery. | | <ul style="list-style-type: none"> ➔ High number of debris torrents (9) located in the upper reaches of the Middle Fork. ➔ A high road density of 4.4-road miles/square mile contributes high amounts of sediment to the MF Satsop. ➔ Instream vehicle activity in the stream channel is also a noted problem in the MF Satsop. | | <ul style="list-style-type: none"> ➔ Abandon roads on steep geologically sensitive areas ➔ Educate public about driving in streams ➔ Eliminate motor vehicle access to streams. ➔ Fill data gaps by identifying all sources of input. ➔ Reduce road densities by abandoning and/or decommissioning roads to reduce sediment loading | |

| Middle Fork Satsop River Tier 2 | | | WATER QUALITY | | |
|---|--|--|---------------|---|--|
| Symptom | | Cause | | General Actions | |
| <ul style="list-style-type: none"> ➔ Rabbit Creek is on the 303d List for water temperature. | | <ul style="list-style-type: none"> ➔ High water temperatures in Rabbit Creek are likely associated to riparian conditions. ➔ See Riparian section for information pertaining to riparian conditions. | | <ul style="list-style-type: none"> ➔ Reduce water temperatures – use riparian assessment to identify specific locations in Rabbit Creek. | |

Middle Fork Satsop River Tier 3 Concerns

| Middle Fork Satsop River Tier 3 FLOODPLAIN | | |
|---|--|--|
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Low drainage density indicates that off-channel habitat may be limited. | <ul style="list-style-type: none"> ➔ Natural geomorphology in basin. ➔ Channel incision is likely to have occurred in the Middle Fork Satsop due to the estimated low levels of LWD, and past splash damming activities. | <ul style="list-style-type: none"> ➔ Assess floodplain conditions and identify impacts. ➔ Enhance off-channel habitat |
| <ul style="list-style-type: none"> ➔ Disconnected floodplain likely. | <ul style="list-style-type: none"> ➔ This is the result of past land use practices implemented in this basin. Channel incision is likely to have occurred in the Middle Fork Satsop due to the estimated low levels of LWD, and past splash damming activities. | <ul style="list-style-type: none"> ➔ Determine LWD levels. ➔ Develop LWD supplementation plan that will install logjams to improve instream channel structure and habitat diversity. ➔ More data is needed to assess floodplain conditions and identify impacts |

| Middle Fork Satsop River Tier 3 LARGE WOODY DEBRIS (LWD) | | |
|---|---|--|
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ LWD levels estimated to be low - more data is needed. | <ul style="list-style-type: none"> ➔ Low levels of LWD may be a result of past splash damming activities, LWD removal from channel, and poor riparian recruitment potential. | <ul style="list-style-type: none"> ➔ Determine LWD levels. ➔ Develop and implement LWD supplementation plan that will install logjams in key places to improve instream channel structure and habitat diversity. |

East Fork Satsop River Tier 1 Concerns

| East Fork Satsop River Tier 1 | | |
|--|---|---|
| FISH PASSAGE | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Numerous road crossings are undersized and do not allow adequate fish passage upstream because of water velocity or perched outfall. These undersized structures also inhibit the movement of streambed material downstream and usually contribute to channel scour directly downstream. | <ul style="list-style-type: none"> ➔ Placement of undersized stream crossing structures (see Mason Conservation District 2004 Fish Passage Inventory). | <ul style="list-style-type: none"> ➔ Correct barrier culverts. See Section 4 for guidelines. |

| East Fork Satsop River Tier 1 | | |
|---|---|---|
| RIPARIAN | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ The riparian condition is considered to be in poor condition and will not significantly contribute LWD (see Grays Harbor County 2002 riparian assessment for additional information). | <ul style="list-style-type: none"> ➔ About 57% of the riparian buffers are either open or dominated by hardwoods. These impacts are attributed to past land use practices. | <ul style="list-style-type: none"> ➔ Control invasive species. See Section 5. ➔ Interplant conifers in deciduous dominant areas where appropriate. ➔ Protect by fee simple or easement key properties of riparian ➔ Protect/preserve intact habitat ➔ Restore riparian corridors in the EF Satsop drainage (2002 Lead Entity Riparian Assessment for specific locations). ➔ Revegetate open riparian areas with native plants |

| East Fork Satsop River Tier 1 | | |
|--|--|---|
| SEDIMENT | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Listed as threatened by WDOE for sediment and siltation. (More data needed). | <ul style="list-style-type: none"> ➔ High road densities (4.4 road miles /square mile) are considered to contribute high levels of sediment to the EF Satsop. ➔ Vehicle activity in the stream channel is a noted problem for Decker Creek and the lower East Fork Satsop. | <ul style="list-style-type: none"> ➔ Abandon roads on steep geologically sensitive areas. ➔ Educate landowners. ➔ Minimize motor vehicle access ➔ Reduce road densities by abandoning and/or decommissioning roads to reduce sediment loading |

East Fork Satsop River Tier 2 Concerns

| East Fork Satsop River Tier 2 | | |
|---|---|--|
| LARGE WOODY DEBRIS (LWD) | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Estimated low levels of LWD; more data is needed. | <ul style="list-style-type: none"> ➔ Low levels of LWD because of past splash damming activities, LWD removal from channel, and poor riparian recruitment potential. ➔ More data is needed. | <ul style="list-style-type: none"> ➔ Determine LWD levels. ➔ Develop LWD supplementation plan that will install logjams in key places to improve instream channel structure and habitat diversity. ➔ Interplant conifers in deciduous dominant areas ➔ Protect by fee simple or easement key properties of riparian habitat ➔ Protect/preserve intact habitat ➔ Restore riparian corridors in the EF Satsop drainage (use the 2002 Lead Entity Riparian Assessment to identify specific locations). ➔ Revegetate open riparian areas with native plants |

| East Fork Satsop River Tier 2 | | |
|---|---|---|
| WATER QUALITY | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Listed as threatened by DOE for siltation and suspended solids. | <ul style="list-style-type: none"> ➔ The source of siltation and suspended solids is identified as "unspecified non point sources" (Smith Wenger 2001). ➔ See the Sediment section above for the effects of high levels of siltation and sedimentation. | <ul style="list-style-type: none"> ➔ Abandon roads on steep geologically sensitive areas. ➔ Determine if sedimentation is a problem. ➔ Educate landowners. ➔ Reduce road densities by abandoning and/or decommissioning roads to reduce sediment loading. |

East Fork Satsop River Tier 3 Concerns

| East Fork Satsop River Tier 3 | | |
|---|---|---|
| FLOODPLAIN | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ Natural channel migration zone inhibited, along with the ability to create new off-channel rearing habitat. However, the EF is considered to have an abundant amount of off-channel habitat because of its high drainage density. | <ul style="list-style-type: none"> ➔ Extensive amounts of riprap bank protection. | <ul style="list-style-type: none"> ➔ Protect by fee simple or easement key properties to facilitate natural channel migration and reconnection to the floodplain. ➔ Remove hard armoring (riprap) or implement bioengineering techniques in place of hard armoring (See Wampler 1993) |
| <ul style="list-style-type: none"> ➔ It is estimated that there is some channel incision, which disconnects the river channel from the floodplain within the EF Satsop. | <ul style="list-style-type: none"> ➔ Channel incision is likely to exist and may be caused from past splash damming on Decker Creek, and probable lack of instream LWD (more data needed). | <ul style="list-style-type: none"> ➔ Determine LWD levels. ➔ Develop LWD supplementation plan that will install logjams in key places to improve instream channel structure, habitat diversity, and channel connection to floodplain. ➔ Protect by fee simple or easement key properties to facilitate natural channel migration and reconnection to the floodplain. |

| East Fork Satsop River Tier 3 | | |
|--|--|--|
| WATER QUANTITY | | |
| Symptom | Cause | General Actions |
| <ul style="list-style-type: none"> ➔ In recent years, the Satsop River has not met established base flows for an average of 63 days per year. ➔ The increase in peak flows shows a higher average-month-per-year flow in recent years. | <ul style="list-style-type: none"> ➔ Both low summer flows and high peak flows are likely attributed to land use practices since precipitation correlations have been ruled out. However, further data is needed to determine actual cause. ➔ Both low summer flows and high peak flows are likely attributed to land use practices since precipitation correlations have been ruled out. However, further data is needed to determine actual cause. | <ul style="list-style-type: none"> ➔ Determine if water withdrawals are being followed in accordance with current water rights ➔ Implement activities that lead to natural recharge of aquifers: ➔ Increase hydrologic continuity, reduce impervious surfaces. ➔ Protect key wetlands, springs, groundwater fed channels and sloughs in EF Satsop ➔ Protect key wetlands, springs, groundwater fed channels and sloughs in EF Satsop. ➔ Reduce stormwater discharge directly to streams (rapid runoff). ➔ Restore wetlands for water storage. |