6) Withdraw from further appropriation, except for domestic, municipal and statutorily exempt uses, ground water within a 5 mile radius of a municipal well. Permit other uses if approved by affected city(ies) or if it is documented that a barrier to ground water movement separates a proposed well from municipal wells.

* RECOMMENDATION:

1) The preferred alternatives are 2, 3, and 6.

2) Staff recommends continuing with critical ground water area proceedings in the Stage Gulch area. A withdrawal of unappropriated ground water from further appropriation, while accomplishing essentially the same thing as far as allowing future beneficial uses, does not grant the Commission the flexibility needed to restrict pumpage that designating Stage Gulch a Critical Ground Water Area gives it.

   Pumpage in Stage Gulch is about 35,000 acre-feet per year. Some estimates place annual pumpage in the entire Umatilla Structural Basin at about 90,000 acre-feet. Given these estimates of pumpage, Stage Gulch pumpage is nearly 40 percent of the entire structural basin's pumpage. Staff feels the Commission should reserve its ability to regulate ground water pumpage as stated in ORS 537.735.

3) Classify the ground water resources of the proposed Ella Butte Critical Ground Water Area for the following beneficial uses: livestock, domestic lawn and garden not to exceed 1/2 acre in size, domestic and group domestic (quasi-municipal) purposes not to exceed 15,000 gallons per day, industrial purposes not to exceed 5,000 gallons per day, commercial purposes not to exceed 5,000 gallons per day, and heat exchange.

   Ground water pumpage in the Ella Butte area has decreased from an estimated 5,000 acre-feet per year to about 1,100 acre-feet per year. Although there still may be overdrafting of the ground water resource, some well water levels are showing moderate increases.

   The intent of designating an area a critical ground water area is to restrict pumpage to a specified quantity of ground water. This does not appear necessary in Ella Butte because of the voluntary decline in pumping. It seems appropriate to classify the ground water resources of the Ella Butte area, as identified and described in the critical ground water area proceedings, rather than continue with critical ground water area proceedings.

4) The Water Resources Commission reserves the right to re-initiate critical ground water area proceedings in the Ella Butte area should pumpage increase dramatically.

5) Classify the ground water resources of the Walla Walla subbasin for domestic, livestock, municipal, irrigation, industrial, power development, mining, fish and wildlife, recreation and pollution abatement.

   The shallow gravel aquifers are the most used ground water resource in the Walla Walla. These shallow aquifers are recharged annually, both naturally and artificially by irrigation. It does not appear as if the shallow aquifers are being over used. However, water levels are declining in the Milton-Freewater municipal wells which tap the deep basalt aquifers. This does not imply that pumping from deep basalt aquifers should be restricted, but indicates that it is a possibility in the future.

6) Classify the ground water resources of the Wildhorse Creek, Upper Umatilla River, and Birch and McKay Creeks subbasins for domestic, livestock, municipal, industrial, irrigation, power development, mining, fish and wildlife, recreation and pollution abatement.

7) Classify the ground water resources of the Columbia-Umatilla Plateau, Butter Creek and Willow Creek subbasins outside of the Ordnance and Butter Creek Critical Ground Water Areas and the Ella Butte and Stage Gulch Critical Ground Water Study Areas for domestic, livestock, municipal, industrial, irrigation, power development, mining, fish and wildlife, recreation and pollution abatement.

8) Subject ground water documented by the Department to be in direct connection with a surface water source to the same restrictions and conditions on use as the surface water source.

9) Establish a 5 mile buffer to protect the municipal well(s) from water level declines caused by pumping from another well. The buffer is not linked to size of the municipality, or demand. Limit appropriations within the 5 mile buffer to domestic, municipal and statutorily exempt uses. Permit other uses if it is documented that a barrier to ground water movement separates a proposed well from a municipal well.

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WATER QUALITY

A. PROBLEM STATEMENT

Water quality is a concern in the Umatilla Basin. The Water Resources Commission has no authority in the water quality arena. This section explores policies and strategies to protect surface and ground water quality.

B. BACKGROUND

1. WATER QUALITY STANDARDS

a. Surface Water

Oregon water quality standards are established to protect key beneficial water uses. These standards are designed to protect sensitive uses such as drinking water supply, recreation, fish and other aquatic life. However, they serve generally to protect all other uses as well. The Oregon Department of Environmental Quality (DEQ) has developed water quality standards for surface water for each river basin in the state. Water quality standards for the Umatilla Basin are included in Appendix C.

b. Ground Water

Specific ground water quality standards have not been developed. Currently, nondegradation and impairment of natural quality are the management guidelines for ground water quality. DEQ is developing new administrative rules which set ground water standards. The proposed rules tentatively were presented to the Environmental Quality Commission in for review and authorization for public hearings.

A statewide ground water protection policy was established by DEQ in 1981 and amended in 1984. The policy contains five important preventive measures:

* Regulate and control waste sources so that impairment of natural quality of ground water is minimized to assure beneficial uses of these resources by future generations;

* Require the use of highest and best practicable treatment and control of sewage, industrial waste and land fill leachates, in order to minimize pollutant loading to ground water;

* Environmental Quality Commission may establish less stringent or more stringent controls for a specific area;

* Require the use of best management by activities associated with land and animal management, chemical applications and handling, and spill prevention in order to minimize ground water quality degradation; and

* Establish an areawide solution where ground water may be degraded by on-site sewage disposal practices.

2. FEDERAL AUTHORITY

The U.S. Environmental Protection Agency (EPA) generally has authority over federal water quality programs such as the Clean Water Act. At the state level, most EPA programs are carried out by designated state agencies. In Oregon, the DEQ is the primary agent for the EPA. In the case of drinking water, both DEQ and the state Health Division are responsible for maintaining federally mandated standards. Essentially, the EPA acts directly only to protect and develop sole source aquifers. Sole source aquifers are defined as the only aquifer in an area capable of providing a public drinking water supply.

3. MONITORING

a. Surface Water

Oregon's surface water resources include about 112,000 miles of rivers and streams. Limited resources prevent DEQ from monitoring water quality conditions on all streams and rivers. DEQ's monitoring efforts concentrate on streams of "significant interest". These are streams that are the largest in terms of flow and drainage area, those to which the public has greatest access, and those designated as state or national scenic waterways. Only about four percent of the state's river miles are regularly monitored. However, these stream segments receive an estimated 90 percent of the point source pollution load.

Water quality agencies have concentrated on point source control of pollution. In 1984, the Oregon Status Assessment Report identified nonpoint waste sources as a major contributor to water quality problems. Statewide, approximately 60 percent of known surface water quality concerns are associated with nonpoint sources of waste. Increased recognition of nonpoint source pollution is leading to development of a nonpoint source control strategy.

Surface water quality is monitored at four sites in the Umatilla Basin, all on the mainstem Umatilla River. No regular monitoring of surface water is performed in the Walla Walla Sub-basin.

b. Ground Water

Shallow, unconfined aquifers, generally less than 200 feet deep, supply the bulk of ground water to households that rely on ground water for domestic supply. There is no statewide ground water quality monitoring network. Monitoring is conducted in site specific areas where a problem is suspected or has been identified. A special reconnaissance study testing for pesticide and nitrate levels in ground water at various points throughout the state was completed in 1987.

Ground water quality monitoring also is carried out in conjunction with Water Resources Department (WRD) ground water reservoir assessment studies. These are detailed research studies which characterize the geohydrology of an area. Most recently, monitoring has been carried out in conjunction with ground water assessments in the Mosier Creek area between The Dalles and Hood River, and in Clackamas and east Multnomah Counties.

Ground water is monitored at a couple of sites in the Umatilla Subbasin, but no monitoring is carried out on a regular basis in the Walla Walla Subbasin.

4. QUALITY CONCERNS

a. Umatilla Drainage

1) Surface Water

The water quality of the Umatilla River and its tributaries is adequate to serve most beneficial uses. In headwater streams, the water generally is cool, clear, low in pollutants, and high in dissolved oxygen. As water moves downstream, its character changes and is degraded by point and nonpoint source discharges and land management practices. At times, streams carry heavy sediment loads and can contain high bacterial levels, low dissolved oxygen levels, and some algal growths.

Water quality in the lower 57 miles of the Umatilla River are of concern to DEQ. High levels of suspended solids and fecal coliform are present. Most cities that discharge effluent into the river comply with the conditions of their discharge permits. Periodically, City of Pendleton effluent discharge exceeds mixing zone standards. Feedlots, irrigation return flows and other nonpoint sources contribute nutrients and bacteria to the river. Quality standards are exceeded most often in summer months when low streamflows concentrate pollutants.

The Umatilla River is a relatively shallow and fast moving stream. This means the river has a large capacity for accepting oxygen. In the past, waste loads have not lowered dissolved oxygen levels excessively.

Summer water temperatures in basin streams, especially in lower reaches, reach 70 degrees Fahrenheit and more. High temperatures not only affect fish, but also lower dissolved oxygen content of water and allow bacteria to flourish.

The Umatilla River and tributaries yield large amounts of sediment. Most sediment comes from land lying outside the forest zone. Agricultural lands produce large quantities of sediment even when operators employ conservation farming practices. Much of the sediment originates from cropland that undergoes spring tillage, summer fallowing, and late fall seeding to a winter grain crop. Late fall seeding provides little opportunity for the developing grain crop to attain the growth needed to prevent or retard sediment producing erosion. Peak sedimentation occurs during freeze/thaw periods accompanied by rainstorms or rapid snowmelt. The Wildhorse Creek drainage is a major sediment producer.

2) Ground Water

There is not much data on ground water quality in the Umatilla Basin. Nonetheless, evidence suggests there are extensive ground water quality problems associated with the shallow alluvial aquifers. Nitrates, which affect domestic supplies, are the primary concern. Nitrate contamination has been identified at eight times the allowable drinking water standard. Contamination of shallow alluvial aquifers will eventually affect the deep basalt aquifers.

a) Columbia-Umatilla Plateau Subbasin

In 1986, ground water in the Boardman and Port of Morrow area was tested for pesticides. Sampling of 10 - 12 wells detected low levels of pesticides in the shallow, unconfined aquifer down gradient from agricultural lands. More significantly, high levels of nitrates were detected.

Nitrate contamination has been detected in the area of the Simplot Corporation potato processing facility at Hinkle and the Lamb-Weston plant at Hermiston. In addition, total dissolved solids (TDS) and chemical oxygen demand (COD) exceed acceptable levels in the alluvial aquifer in the vicinity of the Simplot facility.

Significant levels of nitrates, pesticides and TNT have been found at the Umatilla Ordnance Depot. Ground water cleanup operations at the Ordnance Depot are likely to be undertaken using federal Superfund (SARA) and Resource Conservation and Recovery Act (RCRA) programs.

The City of Irrigon will be initiating construction of a new sewerage system in June 1988. According to DEQ, this system is an innovative/alternative pilot project. It will test the feasibility of rapid infiltration beds as a sewage treatment and control system. Discharge from the pilot treatment facility will be monitored closely to determine impact on ground water. High levels of nitrates have been found in domestic wells near Irrigon.

b) Wildhorse Subbasin

Gasoline has seeped into the alluvial aquifer in the vicinity of the City of Adams. The chemical constituents benzene and xylene have contaminated the alluvial aquifer.

b. Walla Walla Subbasin

1) Surface Water

The Walla Walla River and tributaries are not monitored for water quality. There are no point discharges to surface streams in the subbasin. Effluent from the Milton-Freewater sewage treatment facility is applied to agricultural lands near Umapine. Smith Frozen Foods in Weston treats effluent in holding ponds. Treated effluent is used for irrigation. Although treated effluent is not discharged directly to Pine Creek, it may seep into the creek and augment streamflow.

2) Ground Water

As with the rest of the Umatilla Basin, there is little data on ground water quality in the Walla Walla Subbasin. Porous gravels make up much of the Walla Walla Valley floor. Numerous domestic wells tap these shallow gravels. The gravel's porosity, and the ability of contaminants to leach into and through the shallow gravel aquifer, predisposes the area to bacterial contamination. Outmoded or improperly constructed septic systems, leaking sewers, and animal wastes are likely sources of contamination. Fecal coliform contamination from poorly constructed septic systems has occurred.

Geologic conditions coupled with current land use practices also presents opportunities for pesticide and nitrate pollution. DEQ thinks nitrate contamination is a widespread problem in the shallow alluvial aquifer. An estimated 250,000 pounds of actual nitrogen fertilizer is applied annually to orchard land in the subbasin. Pesticides, both herbicides and insecticides, are applied regularly to upland farms and to orchards and farmlands on the valley floor.

The City of Milton-Freewater regularly monitors ground water quality in its own wells. It also samples ground water around its landfill site near Umapine.

Nitrates, TDS and COD exceed acceptable levels in the shallow aquifer in the vicinity of the Smith Frozen Foods processing plant at Weston.

C. DISCUSSION

Surface water quality standards are designed to support beneficial water uses. Water quality in the Umatilla River below river mile 57, does not always meet standards for contact recreation such as swimming, and aquatic life. Nonpoint source pollution appears to be the major contributor to elevated levels of fecal coliform bacteria and suspended solids affecting beneficial water uses. No data is available for the Walla Walla River. It is assumed beneficial water uses are supported from the headwaters to the Little Walla Walla Diversion at Milton-Freewater. During the summer months, extreme low flows below the Little Walla Walla Diversion probably do not meet standards benefiting aquatic life.

In 1979, a Dryland Wheat, 208, Water Quality Management Plan was initiated in the Umatilla River drainage to reduce nonpoint source pollution. Agricultural Stabilization and Conservation Service cost share funds have been used to introduce best management farming practices to reduce erosion, stabilize streambanks, and implement irrigation conservation practices. Soil Conservation Service personnel provide technical assistance to operators participating in the program.

The 1987 Oregon Legislature considered a joint WRD/DEQ/Health Division/Agriculture Department decision package for intensive ground water monitoring in the Milton-Freewater, Vale/Ontario and east Multnomah County areas. The budget package, which was not approved, included funding for ground water monitoring, geologic/geohydrologic characterization of aquifer units, development of aquifer management plans, and implementation of one plan.

The package was submitted because preliminary investigations of ground water quality in the Vale/Ontario area revealed nitrate levels five times above the allowable drinking water standard. Pesticide levels were just under the allowable standard. The Milton-Freewater area was included in the budget decision package because of aquifer characteristics, agricultural land use patterns, and a similar reliance on shallow aquifers for domestic water supplies.

A monitoring program, as proposed for the Milton-Freewater area, generally contains the following elements:

* Identification of aquifer units,
* Selection of representative sampling points (30-40 existing wells),
* Sampling of wells for at least 1 year on a monthly basis,
* Examination of basic quality parameters such as dissolved ions, pesticides, nitrates, turbidity, bacteria, etc, and
* Development of an expanded list of quality parameters based on materials generally used in the area which may pose quality concerns.

An aquifer management plan can take various forms. Once management needs are identified, strategies can be developed to improve conditions. Plan implementation might include up-grading technology, demonstration projects, a change in the method and timing of fertil-izer/pesticide applications, and voluntary and regulatory protection of aquifer units. Similar programs in other states have been examined for effectiveness and elements contained in those programs may be integrated into DEQ plans.

D. STRATEGIES, POLICIES AND RECOMMENDATIONS

1. SURFACE WATER

a. Adjust Water Quality Standards

POLICY: Support surface water quality standards to satisfy selected beneficial water uses.

* RECOMMENDATION:

1) If WRD changes beneficial use classifications for specific streams or stream segments, DEQ could adjust water quality standards accordingly. If for example, DEQ were managing water quality for contact recreation and fish life which have stringent standards, and recreation or fish life use is not a classified beneficial use, DEQ could lower standards and not manage for as high a quality water. This would simplify DEQ's management responsibilities.

2) Increase surface water monitoring to ensure standards are being met.

b. Control Nonpoint and Point Source Pollution

POLICY: Control nonpoint and point source pollution to improve surface water quality in the basin.

* RECOMMENDATION:

1) Continue and expand Dryland Wheat, 208, Water Quality Plan to support beneficial water uses in the Umatilla River below river mile 57.

2) Employ best management practices (BMPs) for specific site conditions to reduce erosion, overland runoff and water quality impairment from nonpoint sources.

3) Ensure all point sources meet discharge permit conditions.

4) Emphasize planning and prevention programs to control nonpoint pollution.

5) Control fecal coliform bacteria by identifying sources. Where necessary, form sewer districts or develop programs to prevent fecal coliform contamination.

2. GROUND WATER

a. Develop Ground Water Monitoring Program

To ensure that ground water quality is maintained, develop a Umatilla Basin monitoring program made up of representative, or key indicator wells.

POLICY: Ensure safe municipal and domestic ground water supplies through a formal ground water quality monitoring program. Develop monitoring program to document changes in quality and provide data for aquifers management.

* ALTERNATIVES

1) Maintain current levels of ground water monitoring.

2) Develop basinwide ground water monitoring network of both alluvial and basalt wells.

* RECOMMENDATION:

1) Acceptance of alternative 2 will be necessary to fulfill nondegradation ground water policies. A monitoring program is a prevention tool that will allow state resource agencies to identify problems as they arise, before the problems grow unmanageable.

2) Budget constraints may prevent DEQ from establishing a permanent, large scale, ground water monitoring system in the basin. Nonetheless, DEQ should budget for and perform regular monitoring of indicator wells in the basin for maintenance of

b. Develop Aquifer Management Plans

Aquifer management plans depend upon a solid understanding of an area's geohydrology. There can be no realistic management plan without a thorough understanding of aquifer units, geology, and movement of water into and out of the aquifer units.

POLICY: Develop aquifer management plans for aquifer units susceptible to contamination.

* RECOMMENDATION:

1) Develop aquifer management plans after detailed characterization of aquifer units, especially for aquifer units susceptible to contamination.

c. Prevent Degradation and Impairment of Alluvial and Deep Basalt Aquifers Water Quality

Attempt to maintain quality of deep basalt aquifers at present water quality standards. Prevent degradation of ground water quality from point and nonpoint sources.

POLICY: Protect the alluvial and basalt aquifers from quality degradation and impairment.

* ALTERNATIVES

1) Minimize degradation and impairment of alluvial and basalt aquifer water quality in accordance with standards. Ground water quality standards may change with Environmental Quality Commission adoption of new ground water standards.

2) Conduct site specific studies of ground water quality in conjunction with WRD ground water reservoir assessment studies, and as a result of impairment and degradation prevention planning.

3) Respond to ground water quality degradation on a complaint basis.

4) Ensure proper well construction for wells tapping deep basalt ground water and prevent intermixing of aquifer units.

   Since many of the municipalities rely on deep basalt aquifers for municipal supplies, its important to prevent contamination. In the Umatilla Basin this takes on added significance since many municipalities do not have alternative surface sources should the ground water supply be made unusable. Improperly constructed deep wells can introduce contaminated ground water from one aquifer unit into another aquifer unit. Improperly constructed wells have been found in the basin.

5) Prevent injection of untreated water into deep basalt aquifers. Artificial recharge of deep basalt municipal aquifers, as proposed by the City of Hermiston, will increase the potential for inadvertent contamination.

* RECOMMENDATION:

1) Alternatives 1, 2, 4 and 5 are the preferred alternatives.

   Alternative 3 does not allow for preventive action on the part of resource management agencies. Rather, this places agencies in a reactive mode. It generally is easier to prevent problems than it is to correct ground water contamination after the fact.

   Ground water reservoir assessments and prevention planning allows for detailed aquifer characterization to accompany results of ground water monitoring. If quality concerns arise, substantial information exists from which to develop aquifer management plans to alleviate concerns. However, reservoir assessment is not tied to basin planning at this time, and would have no impact in the area of the Umatilla Basin.

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WATERSHED MANAGEMENT

A. PROBLEM STATEMENT

On an annual basis, the main stems and many of the tributaries of the Umatilla and Walla Walla Rivers and Willow Creek go dry or nearly so in the late spring and early summer. These regular shortages impact the entire range of beneficial water uses. Out-of-stream, consumptive uses for irrigation, industrial, and municipal supply must be curtailed or supplemented. In-stream uses for fish and wildlife, water quality, and recreation are adversely impacted, often to the point of being seriously degraded or even eliminated.

In places, these seasonal surface water shortages are related to and reflect similar conditions in shallow ground water aquifers.

During the winter and early spring, flooding on these same streams is a common occurrence. High flows and rapid runoff erode stream banks and beds, destroy instream structures, deposit debris, damage property, and cause livestock and other losses.

Storm runoff, rapid snow melt, wind and freeze-thaw cycles also cause overland soil erosion. The soil is carried to stream channels where it causes high turbidity, silts in streambeds, covers fish spawning gravels, or is carried downstream to be deposited behind diversion structures, in reservoirs or dumped into the Columbia River.

The factors that contribute to these problems are multitude. Some of them occur naturally; wind, rain, seasonal low and high flows. But these elements are part of nature's landscape. They existed in the Umatilla Basin thousands of years before European culture arrived. And they were in balance with the land. It is mankind's many and diverse activities upon the land that have disrupted this balance and aggravated the adverse impacts of these natural events.

B. BACKGROUND

A watershed may be defined as the land area drained by a stream or a network of streams. The area of a watershed may be only a few acres or thousands of square miles.

Watersheds share three characteristic areas; stream channels, riparian zones and uplands. The stream channels are the outward reflection of conditions elsewhere in the watershed. The width, depth, slope, bed material, flow, water quality and other factors are determined by what is happening upstream in the watershed.

Riparian zones are transition areas between stream channels and upland portions of a watershed. They form narrow corridors or buffers along the banks of streams, lakes, marshes, bogs and other water bodies. They are distinguished by water reliant and water tolerant vegetation and are favorite habitat for a large variety of aquatic and terrestrial wildlife. Riparian zones are often delicate and easily impacted but can be surprisingly resilient. Their condition is also a direct reflection of management activities practiced in the watershed.

The upland portions of a watershed are the farmlands, range, and forestlands lying up-gradient and beyond the riparian buffers. Uplands make up most of the area in a watershed. They are valuable resource areas in themselves. It is the management of these areas that so greatly affect the health of the overall watershed.

Farmlands and range comprise the major share of upland areas in the Umatilla Basin. Historically, these areas have been a primary source of watershed problems in the basin. Better management of these lands has been evolving for decades and continues today. The Soil Conservation Service (SCS), Agricultural Stabilization and Conservation Service (ASCS), State Soil and Water Conservation Commission (SSWCC), and local soil and water conservation districts make improved farming practices a major focus.

In cooperation with individual farm owners and operators, these agencies are largely to credit for improved farm and rangeland management in the Umatilla Basin. Examples of their work include the Sediment Reduction Project in 1976, the Little Greasewood Creek Demonstration Project in 1981 and the Stage Gulch Watershed Land Treatment Project currently underway.

The Sediment Reduction Project was funded through the 208 Nonpoint Source Pollution Control Program. The project area included the Columbia Plateau counties of Wasco, Sherman, Gilliam, Morrow and Umatilla. The program focused on best management practices (BMPs) to reduce nonpoint source pollution due to wind and water erosion from fields, rangelands, streambanks and channels, roadways and other nonconfined areas. Appendix D lists a variety of BMPs.

The Little Greasewood Creek and Stage Gulch Projects are follow ups to the Sediment Reduction Project. They use BMPs identified in the earlier study to correct problem areas identified by that study.

Nearly all of the crop and rangelands in the basin are privately owned. The individual land owner is the key to improved watershed management in the Umatilla Basin. More and more farm owners are adopting BMPs on their lands. From July 1986 to June 1987 alone, thousands of privately farmed acres in the basin were entered into programs receiving such BMPs as terraces, conservation cropping, grass planting, contour farming, conservation tillage and other measures.

However, private ownership makes implementation of better management techniques more difficult. It is not simply a matter of legislating change on federal land by congressional mandate or setting industry standards as with the Oregon Forest Practices Act. Individual farm owners/operators must be convinced to make changes that may have little tangible benefit for them. Some choose not to change their practices for economic or other reasons, and so problems remain.

Management practices on forestlands can have major adverse impacts on a watershed. In the Umatilla basin, forestlands make up a relatively small percentage of the upland watershed area. Much of the basin's forestland is federally managed under restrictive classes. These factors along with strict new forest practice laws have probably reduced adverse watershed impacts directly due to forestland management.

Perhaps the program with the most potential benefit for watershed improvement is the new Conservation Reserve Program (CRP). The program is being administered by the ASCS. Conservation reserve is one of four provisions of the Food Security Act (FSA) of 1985. The other elements of the Act are Conservation Compliance, Sodbuster and Swampbuster.

The CRP is designed to retire highly erodible cropland from production. The program allows up to 25% of the cropland in a given county to be placed in the program if the land qualifies as highly erodible. The ASCS will share up to half the cost of planting permanent grasses, legumes, windbreaks, trees, or wildlife plantings on highly erodible cropland.

Annual payments will be made to participating farmers for the ten year contract period. Annual payments are established through a bidding process. By bidding, farmers can influence the payments they will accept for retiring their land from production. In Umatilla County, bids accepted for CRP have averaged about $50.00 per acre per year.

Other conservation programs of the FSA use economic incentives to control erosion on production lands. Conservation compliance applies to annually tilled, highly erodible lands. To remain eligible for U.S. Department of Agriculture (USDA) program benefits, an approved conservation plan for highly erodible fields must be developed and implemented by January 1, 1995.

Sodbuster applies if highly erodible land not used from 1981-85 is placed into production. Again, an approved conservation plan must be implemented to remain eligible for USDA program benefits.

Swampbuster discourages conversion of natural wetlands to cropland. In most cases, USDA program benefits will be withheld from farmers converting natural wetlands to production.

The following discussion will consider the condition of watersheds in the Umatilla Basin, factors contributing to their deterioration and possible solutions to these problems.

C. WALLA WALLA SUBBASIN

Major portions of the forestlands in the Walla Walla subbasin are within the Umatilla and Wallowa-Whitman National Forests. Current management of these forestlands is not believed to be a major contributing factor to watershed problems in the Walla Walla subbasin. Problem causing activities like road building and clear cutting are limited.

The Mill Creek drainage in Oregon is managed as a municipal watershed for the City of Walla Walla, Washington. Nearly all of the watershed is on national forest land. Access to the watershed is restricted by an early 1900's agreement between the Mayor of Walla Walla and the Secretary of Agriculture. Timber harvest is not currently practiced in the drainage.

Only minimal logging is done in the uppermost portions of the North Fork Walla Walla drainage. No significant timber harvest is done in the South Fork Walla Walla drainage. The forested portions of both drainages provide good quality water. Streamflow in the South Fork is fairly constant in the summer when other streams are dry. Both the North and South Forks have good quality steelhead spawning and rearing habitat. Good quality fish habitat is one indicator, though not a guarantee, that upstream watershed conditions are in good shape.

The U.S. Forest Service is currently preparing the Umatilla National Forest Management Plan. Elements of the plan are being tailored to reflect the interests of citizens in the Walla Walla Valley. Options being considered include no scheduled harvest in the Mill Creek watershed and limited timber harvest for the Walla Walla drainage. A draft forest plan will be available about November 1987.

Croplands in the Walla Walla subbasin are a major source of watershed problems. Much of the watershed east of Weston and Milton-Freewater is classified as having high to severe water erosion potential. This higher elevation land has steeper slopes and receives more rain and snow fall which cause increased erosion. Cropping practices and conventional tillage methods add to the problem.

Stream bottoms and riparian areas are heavily used for cattle grazing and wintering. These are desirable areas for cattle because they provide water and forage in the spring and early summer and protection from the elements in the winter. However, the practice is damaging to riparian vegetation and streambanks.

In developing rural areas, hobby farms and small acreages that border streams often cause problems. Owners frequently keep more horses or livestock than the land can support. Small pasture areas are easily overgrazed. Where animal access to streams is uncontrolled, vegetation is destroyed and streambanks and adjacent areas erode.

Steams that would benefit from in-channel improvements and riparian rehabilitation include the North and South Forks Walla Walla River, Couse, Pine and Dry Creeks. The Milton-Freewater Steelhead Club has already begun improvement work on Couse Creek.

D. WILDHORSE CREEK SUBBASIN

The Wildhorse Creek subbasin is nearly all farmland. Only a small finger of the watershed extends into forested canyons on the lower slopes of the Blue Mountains. Traditionally, the area has been dry-farmed for wheat and peas. In recent years, pivot irrigation has been developed on lands near Adams and Athena.

Wildhorse Creek carries heavy silt loads in the winter. During summer, the creek is dry throughout much of its length. In its lower 20 miles, Wildhorse Creek is gullied with vertical banks up to ten feet deep.

The creek flows through both tilled and pasture land. In both areas the riparian zone has been eliminated. Croplands are tilled up to the edge of the bank though some brush and vegetation has been left within the streambanks. In pasture areas, the stream corridor and banks are nearly devoid of vegetation.

Farmlands draining into Wildhorse Creek from the east occupy the steep foothills of the Blue Mountains. Steep slopes and the continued use of conventional cropping and tillage methods by some farmers make these soils highly erodible. Some of these lands have recently been removed from production and placed in the CRP.

Much of the eastern Wildhorse Creek drainage is within the Umatilla Indian Reservation but is farmed by non-Indians. The Tribes consider the cropland erosion problems here and else where on the reservation to be severe.

Lands draining into Wildhorse Creek from the west are less steep but still dump enormous loads of sediment into the stream. Because of the reduced slope and thick soils, much of this area does not meet the current CRP definition for highly erodible land. However, these lands may be eligible for CRP under other criteria. In some cases, lands that do qualify for CRP continue to be farmed because it is more profitable than the subsidy offered by the CRP.

Recently, the erosion problem was studied in a small section of the Wildhorse Creek subbasin. The Little Greasewood Creek watershed project focused on farming practices to reduce soil erosion. Techniques used included conservation tillage (stubble mulch, no-till, minimum till, etc.), crop residue use, streamside buffer strips, vegetated channels, subsoiling, and terraces. These methods reduced erosion, maintained or improved crop yields and reduced some farming costs. Much of the rest of the Wildhorse subbasin needs similar treatment.

E. UPPER UMATILLA RIVER SUBBASIN

The Upper Umatilla River subbasin includes a substantial acreage of forestland. Much of this is within the Umatilla National Forest. Since the late 1960's, the U.S. Forest Service has been conducting the Umatilla Barometer Watershed study. The Umatilla Barometer Watershed is in the upper Buck Creek drainage, a tributary to the South Fork Umatilla. The purpose of the study is to determine the effects of timber harvest on streamflow.

Study results suggest that in this watershed, and perhaps others like it, various logging techniques have less impact on the amount and timing of runoff than generally thought. Naturally, increases in runoff do occur and the timing of runoff may be advanced but the changes are small. More noticeable increases occur in sediment and debris in streams draining logged areas.

Despite the study findings, logging in the upper Umatilla watershed is limited. The entire North Fork Umatilla River drainage is designated a wilderness area. No logging is allowed. In the South Fork Umatilla drainage, steep terrain and a limited road network combine to make logging a minor activity.

As in the Walla Walla Subbasin, good quality fish habitat in the Umatilla headwaters suggest that watershed conditions are in good shape. Currently, the U.S. Forest Service in cooperation with the Confederated Tribes and the BPA are making in-channel improvements for fish habitat in Thomas Creek a tributary of the South Fork Umatilla. Similar improvements are planned in the Meacham Creek watershed and on Squaw Creek.

Nearly the entire lower portion of the subbasin is Umatilla Indian Reservation land. Condtions in this portion of the subbasin are not so good. On either side of the river, the upland plateau areas are dry-farmed almost exclusively in a wheat fallow rotation. These wheat lands are deeply incised by numerous gulches and small streams tributary to the Umatilla.

As in the Wildhorse subbasin, much of the land is farmed by non-Indian land owners. While conservation practices are employed in many cases, the wheat fallow rotation system, field gradient and increased precipitation along the Blue Mountains combine to produce high erosion potential and substantial sedimentation. Again, this is considered to be a severe erosion area by the Tribes.

The river channel and riparian zone also undergo changes in this portion of the subbasin. As the Umatilla emerges from the Blue Mountains the channel widens and the water velocity slows. Gravel is deposited causing the river to meander seeking new routes. During annual high flows and flood flows the river causes serious bank erosion, undercuts bank-side trees, becomes clogged with debris and causes general flood damage.

F. BIRCH AND MCKAY CREEKS SUBBASIN

Nearly all of the Birch and McKay Creeks subbasin is classified as having high to severe erosion potential. The southern portions of both the McKay and Birch Creek watersheds are steep rocky areas with shallow soils and sparse vegetation. Forested areas are confined mainly to the stream canyons. The upland plateaus are often grassy meadow areas. Some cultivation occurs on the lower elevation plateaus with deeper soils.

Much of the higher elevation watershed is used as range. Cattle grazing aggravates the natural erosion potential by depleting vegetative cover, degrading riparian areas, and breaking down streambanks.

The lower watersheds of both streams are primarily cropland. Irrigation is practiced along the stream channels but the upland areas are dry-farmed. Wheat is the predominant dry-farmed crop. Field erosion and gullying is common on these wheat lands. Much of this silt and sediment in the McKay watershed is deposited in McKay Reservoir, reducing its capacity and affecting wildlife habitat around the reservoir.

G. COLUMBIA-UMATILLA PLATEAU SUBBASIN

The Columbia-Umatilla Plateau subbasin is the largest of the seven Umatilla subbasins. It is primarily a low-elevation area. A major portion of the irrigated land in the basin is concentrated here. The subbasin supports a substantial amount of dry land wheat farming as well. The subbasin contains no forest areas. The Umatilla River from Pendleton to the mouth is the major stream in the subbasin.

This subbasin experiences severe erosion from wind as well as water. The major wind erosion area cuts a ten to 20 mile wide swath across the subbasin next to the Columbia River. It extends from the western edge of the basin to the Washington border. Conventional tillage practices and light sandy soils contribute to the wind erosion in this area.

Stage Gulch, north of the Umatilla River, is an area of frequent flooding and heavy erosion. The watershed is comprised of rolling hills dry land farmed for wheat. Soil and runoff from the upper reaches of the drainage near Pendleton regularly flood the City of Stanfield with mud and debris in the winter time.

The Umatilla County Soil and Water Conservation District is now cooperating with the Soil Conservation Service on a project to control erosion and runoff from the upper Stage Gulch watershed. The project focuses on farming practices designed to reduce erosion and runoff from the watershed's wheat lands.

Despain Gulch and Cold Springs Canyon which drain into Cold Springs Reservoir also carry heavy sediment loads from surrounding croplands. Again, these croplands are primarily dry-farmed wheat lands. Cold Springs has lost 23 percent of its original 50,000 acre-foot capacity to siltation. It is projected to be about 54 percent silted in by the year 2050.

In the western portion of the subbasin, irrigated lands are subject to erosion. In the Sand Hollow and Juniper Canyon drainages, soils are extremely sandy. For the most part, the stream courses are dry much of the year. In recent years pivot irrigation has been developed on these sandy soils. Fields have been planted in the drainage bottoms. Cloudbursts and heavy runoff cut the fields up and erode deep gullies. Attempts to dam the streams and divert the channels have failed to solve the problem.

The main stem Umatilla River, from Pendleton downstream to Echo, experiences serious bank erosion. During high flow times the river erodes into farm fields, undercuts banks and floods low-lying areas where it deposits silt and debris. The Soil Conservation Service has prepared streambank erosion control plans for individual farmers along the Umatilla River. For the most part these plans have not been implemented for economic reasons.

H. BUTTER CREEK SUBBASIN

In its upper reaches, the Butter Creek drainage is similar to neighboring Birch Creek. Higher elevation areas are used mainly for grazing cattle. Slopes are steep, vegetation sparse and soils are thin. Livestock use of stream bottoms has eliminated vegetation necessary to stabilize streambanks. Where soils are thick, streams have cut deep, vertical sided channels. Winter runoff and intense storm events wash soil from the hillsides,and cut up stream bottom pasturelands.

In the lower reaches of the drainage, irrigated fields border the stream. The channel in these areas is well vegetated. But low water holding capacity in the upper basin and numerous irrigation diversions leave the stream dry in the summer.

Bench lands on either side of Butter Creek are generally dry-farmed. As in other dry-farmed areas, water erosion on conventionally tilled fields causes gullying and high sediment loads in the receiving streams. The wheat lands in the upper drainage have been classified as highly erodible. Nearly all of these lands in the Morrow County portion of the subbasin have been placed in the CRP and seeded to grass.

I. WILLOW CREEK SUBBASIN

The Willow Creek watershed is little different from other Umatilla subbasins. Irrigation is practiced in the stream bottoms. The bench lands above stream courses in the lower watershed are dry-farmed. The higher elevation uplands are used largely for livestock grazing. Forest cover is scattered in the headwaters area. Hillsides are steep, sparsely vegetated and soil cover is thin.

The entire upper Willow Creek drainage is in Morrow County. As in the Butter Creek sub-basin, nearly all of the wheat lands upstream from Heppner have been placed in the CRP and seeded to grass.

Stream channels and riparian areas are in generally poor shape. Riparian plants have been over grazed, trampled out or removed for cropland. Willow Creek has cut a deep channel through farmlands downstream from Heppner. Streambank erosion is a continual battle for farmers along the creek. Similar conditions exist along Rhea Creek.

The watershed above Heppner has experienced a number of flash floods in past years. Lack of adequate ground cover and riparian vegetation contribute to the flashy, high volume nature of runoff in this portion of the watershed.

The Soil Conservation Service is using several methods to control streambank erosion in cooperation with individual farmers. In the Rhea Creek drainage, methods being used to control streambank erosion include fencing, planting willows, seeding grass, and rock placement and riprap.

J. STRATEGIES, POLICIES AND RECOMMENDATIONS

Soil and water conservation are cornerstones of watershed management. Management activities that conserve soil and water resources will also improve and maintain watersheds in healthy working order. Soil and water conservation have been the subjects of study and experiment for decades. Entire agencies, special districts, and organizations are dedicated to this effort. Assistance programs are already in place. New ones are being developed all the time. While new conservation methods continue to be developed, the existing arsenal of techniques can be used for watershed management now.

In Oregon, the Soil Conservation Service (SCS), Agricultural Stabilization and Conservation Service (ASCS), state Soil and Water Conservation Commission, and local soil and water conservation districts and other private organizations exist to promote wise use of soil and water resources. The 1987 Legislature created a new board, the Governor's Watershed Enhancement Board, to further promote and assist in restoring and maintaining the state's watersheds. The aforementioned agencies and organizations are important members of the new Governor's Watershed Enhancement Board.

Following are some strategies that can be used to improve watershed conditions in the Umatilla Basin.

1. COOPERATION-EDUCATION

Sharing of information, expertise, and goals among federal, state, and local resource and conservation agencies and organizations can improve the success of funding and developing conservation and watershed enhancement projects.

Public education will make individuals more aware and concerned about the value of healthy watersheds. An educated public will be more active in preventing poor watershed management and restoring mismanaged areas.

POLICY: To improve water quality, quantity and related resources through agency-public cooperation and education about the benefits of watershed management.

* RECOMMENDATION:

1) The Governor's Watershed Enhancement Board should provide a forum for other agencies and groups to exchange data, identify problem areas, set priorities, and select projects.

2) Conservation and natural resource agencies like the Soil Conservation Service, and the Governor's Watershed Enhancement Board should cooperate with conservation districts, and natural resource organizations in developing such things as:

   - Informational materials
   - Presentations (slide shows, videos)
   - Demonstration projects
   - School curriculum (all grade levels)
   - Field trips

- Class or club projects
- Publications repository
- Awards program
- Student scholarship fund

2. BEST MANAGEMENT PRACTICES (BMPS)

Practices like conservation tillage, stream channel filter strips, grassed waterways, terracing and crop residue use employed in the Little Greasewood Creek watershed have shown good results in reducing soil erosion on dry-farmed wheat lands. Similar techniques are being proposed for the Upper Stage Gulch erosion control project. Other BMPs have been developed for use on range and forestlands.

POLICY: To encourage landowners and managers to employ best management practices to benefit water quality and quantity.

* RECOMMENDATION:

1) Owner/operators of dry-land wheat farms throughout the basin should be encouraged to implement appropriate BMPs to reduce wind and water caused soil erosion.

2) Grazing practices on federal lands should be reviewed for impacts on watershed values.

3) Regulatory and supporting agencies should work with farm organizations and cattlemen to increase awareness of benefits of good grazing practices.

3. CONSERVATION RESERVE PROGRAM (CRP)

Under the CRP counties are allowed to put up to 25% of their cropland into conservation reserve. Umatilla County's 25% allotment is about 185,000 acres. To date, only about 80,000 acres have been placed in the program. Remaining highly erodible acres are more than sufficient to use up the quota.

However, continued farming of highly erodible lands is often more profitable than the current average $50 per acre annual payment from the program. Lands enrolled in the program in Gilliam and Morrow Counties have nearly reached the 25% limit.

POLICY: To support the retirement of highly erodible cropland as a means to enhance water quality and improve runoff patterns.

* RECOMMENDATION:

1) Encourage owner/operators of highly erodible cropland to enroll in the CRP until the quota is reached in Umatilla County.

2) The SCS, Umatilla SWCD, Soil and Water Conservation Division and owner/operators should seek additional funding through the Governor's Watershed

Enhancement Board, other grant program, or private donation to supplement the ASCS per acre rental payment and enhance the CRP program.

3) The SCS should assist owner/operators of land with heavy soil losses but not meeting slope requirements, to qualify for the CRP under other criteria.

4. RIPARIAN / CHANNEL ENHANCEMENT

Planting riparian areas and streambanks with grasses, sedges, willows and other shrubs will help hold moisture, trap silt, slow water velocity, and provide shade and cover for aquatic life and wildlife and organic food matter for insects.

Placing logs, rocks, gabions, or other materials in stream channels will help slow water velocity, build up eroded streambeds, deflect currents from eroding banks, create pools for fish habitat, and collect spawning gravels.

POLICY: To support riparian and stream channel enhancement as a means of improving flow distribution, water quality and related resource values.

* RECOMMENDATION:

1) ODFW, the Tribes, USFS, SCS, fishing organizations and landowners should cooperate in restoring vegetation to riparian areas along the following streams:

Walla Walla subbasin:
North Fork Walla Walla River
Couse Creek
Pine Creek
Dry Creek

Wildhorse Creek subbasin:
Wildhorse Creek

Upper Umatilla River subbasin:
Meacham Creek
Squaw Creek
Umatilla River (from Meacham Creek to Pendleton)

McKay and Birch Creeks subbasin:
Birch Creek

Butter Creek subbasin:
Butter Creek

Willow Creek subbasin:
Willow Creek
Rhea Creek

2) Agencies, the Tribes, private organizations, and landowners should apply to the Governor's Watershed Enhancement Board for funding assistance on riparian zone planting projects.

3) State and federal fishery agencies, the Tribes, and private organizations should cooperate and coordinate in funding and building instream improvements in the following streams:

<u>Walla Walla River subbasin:</u>
Couse Creek

<u>Wildhorse Creek subbasin:</u>
Wildhorse Creek

<u>Upper Umatilla River subbasin:</u>
North Fork Umatilla River
South Fork Umatilla River
Meacham Creek
North Fork Meacham Creek
Thomas Creek
Squaw Creek
Ryan Creek

<u>McKay and Birch Creeks subbasin:</u>
Birch Creek
East Fork Birch Creek
West Fork Birch Creek

<u>Willow Creek subbasin:</u>
Willow Creek
Rhea Creek

4) State and federal fishery agencies, the Tribes, and private organizations should cooperate in applying to the Governor's Watershed Enhancement Board for funds to build instream improvements.

5) The county soil and water conservation districts, Soil and Water Conservation Division and SCS should coordinate with other local, state, and federal agencies and private landowners in identifying areas of severe streambank erosion and preparing streambank erosion control plans.

6) Existing streambank erosion plans for the Umatilla River, prepared by the SCS, should be implemented as soon as possible.

7) The SCS, Umatilla County Soil and Water Conservation District, local flood or water control district and private landowners should cooperate in applying for funding for the streambank erosion control projects from the Governor's Watershed Enhancement Board or other funding source.

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APPENDIX A

SUPPORTING DATA AND RATIONALE FOR ODFW RECOMMENDED MINIMUM PERENNIAL STREAMFLOWS

RECOMMENDED UMATILLA BASIN MINIMUM STREAMFLOWS

Applicant

The Oregon Department of Fish and Wildlife (ODFW) is requesting minimum streamflows (MSF) on 17 streams within the Umatilla River Basin. The 17 streams are scattered in three subbasins, Upper Umatilla, Birch, and McKay Creeks and Walla Walla.

Stream Name and Location of MSF

See Table A-1.

The Body of Water Which the Stream is a Tributary

See Table A-1.

Name of Sub-river Basin

See Table A-1.

Map with Flow Location

Figures A-1, A-2, and A-3 outline the flow locations and the streams requested for MSF in the Upper Umatilla, Birch Creek, and Walla Walla subbasins, respectively.

Purpose of MSF Recommendations

The Department's main objective in recommending a MSF is to preserve an amount of water necessary to: (1) support populations of fish species, or additionally, to (2) aid in the up-stream and downstream migrations of anadromous fish adults and juveniles.

Recommended Flows in Cubic Feet per Second (CFS)

See Table A-2.

Method of Assessing MSF

Recommendations on minimum flows are based on studies completed by the Oregon Game Commission in 1970. In the field studies, flows were measured at critical points throughout the Upper Umatilla, Walla Walla and Birch-McKay subbasins. Attachment 1 outlines the methods considered when developing MSF for fish. Additional supporting data is from recent physical stream surveys completed by ODFW crews, USFS, and Umatilla Tribe representatives.

Long-range Methods to Achieve MSF

Suggested long-range methods to increase streamflows in the Umatilla Basin include the following:

1. Improve riparian area shading by underplanting.

2. Riparian fencing to exclude cattle grazing.

3. Beaver enhancement to augment slow water release.

4. Instream habitat projects to enhance pools and stream meander.

5. Purchase of senior water rights or purchase water from irrigation districts.

6. Retirement of water rights no longer needed.

7. Headwater storage dams with water dedicated for fish use.

8. Pumping water from the Columbia River to augment flow.

9. Establish minimum streamflow.

10. Lower river channel modifications.

11. Increase irrigation ditch efficiency with excess to be available for fish use.

A number of above objectives are currently being implemented for flow enhancement in the lower Umatilla River.

Species of Fish Life Used to Determined Flow Requirements

In 1970, summer steelhead and rainbow trout were the target species used to develop recommended MSF in the Umatilla Basin.

At that time steelhead were the only significant anadromous fish with the basin; however, in the 1980's three additional anadromous fish species (coho, fall, and spring chinook) have been reintroduced. Table A-3 outlines fish species (includes non-gamefish) in the basin and their general distribution.

The introduction of Pacific salmon into the basin heightens the concern of establishing MSF's, especially in the lower river where adults are currently held up by lack of water. Once salmon enter freshwater their biological clock begins to tick and will only permit a set life span. Delays in migrating upstream results in either the fish being too weak to survive the rigors of spawning, or possibly die before reaching spawning grounds. Figure A-4 outlines the migratory routes, spawning, and rearing areas for all four anadromous fish in the Umatilla Basin.

Historical and Current Fish Stocking Information by Subbasin

The Umatilla River currently supports four anadromous fish runs; coho, fall chinook, spring chinook (Pacific salmon), and summer steelhead. With the exception of summer steelhead, all other anadromous fish had disappeared from the Umatilla Basin. An aggressive hatchery program has resulted in reestablishing coho, fall chinook and spring chinook. The Umatilla Basin once supported strong runs of chinook and coho; however, by the 1920's water-dependent agriculture began removing large amounts of water, preventing Pacific salmon from reaching spawning areas. The wild summer steelhead were able to adapt to low water flows by remaining in the mainstem Columbia until flows increased in the Umatilla River in late winter.

Listed is a species-by-species summary of the current status of fish stocking programs in the Umatilla Basin.

UPPER UMATILLA SUBBASIN

A. COHO

Hatchery-reared coho smolts were released into the Umatilla in 1986 with an annual release averaging 100,000 smolts. The management objective is to establish a run of this commercially important stock. Jack returns have been encouraging with unusually bright fish migrating upstream in early fall. The final decision to maintain a hatchery coho program in the Umatilla is part of ongoing negotiations with U.S. vs Oregon. The negotiations are dealing with the reprogramming of Mitchell Act hatcheries in providing hatchery fish for upriver releases.

B. FALL CHINOOK

Upriver bright fall chinook juveniles were initially stocked in 1983. The first release totaled 100,000 smolts, projected releases in 1994 include 2.9 million fingerling and 225,000 smolts (Table A-4). Adult returns from the 1983 release were predicted at 283. Approximately 400 adults were counted from the 1983 stocking effort; however since that time adult returns have been disappointing with 7, 27, and 128 adults inventoried from 1985-1987. At peak hatchery production, adult returns are estimated at 10,000. Approximately 11,000 naturally produced adults are also predicted. Lack of adequate water below Three-Mile Dam Diversion continues to be the primary limiting factor for adults returning in October through November.

C. SPRING CHINOOK

Spring chinook smolts were released in 1986 with the first adult returns expected in 1989. By 1994 hatchery releases will total 1.6 million smolts with an estimated number of returning adults at 10,000 (Table A-4). An estimated 11,000 adults from wild spawning activity will also be produced.

D. SUMMER STEELHEAD

Summer steelhead adult support an important recreational fishery, with an average yearly catch of 326 fish from 1980-1985. Management of the steelhead in the Umatilla Basin has been a major Department management activity with extensive efforts being made to provide and improve upstream migration of adults and downstream movement of smolts past irrigation diversions. The Department's steelhead management goal in the Umatilla Basin is for wild/hatchery mix. Under a wild/hatchery management strategy, the department supplements the wild stocks with hatchery-reared smolts. Each winter wild and hatchery steelhead adults are collected at Three-Mile Dam, held on the Indian Reservation, spawned and reared at Irrigon Hatchery. Smolts are then released back into the Umatilla River each spring. Wild steelhead are maintained by passing adults upstream of Three-Mile Dam to spawn in the upper reaches of the Umatilla and Birch Creek drainages.

Stocking of juvenile steelhead began on a regular basis in 1981, with approximately 60,000 smolts released annually. The initial releases of hatchery smolts were not fin-clip marked to assess survival to adults; however, when collecting adults at Three-Mile Diversion in 1983-84 for eggs, scale samples revealed over 50% of the adults spawned were of hatchery origin, indicating a high survival of smolts from the hatchery program. In 1988 and 1989 steelhead juveniles are being marked to accurately determine adult returns. The URFRIC report projects smolt releases in the Umatilla to reach 200,000 by 1990. The estimated adult returns are projected at 5,400 by 1990, with 5,299 available for harvest (Table A-4).

E. TROUT

Releases of hatchery-reared legal-sized rainbow trout date back to 1946. Currently, trout stocking averages 7,800 annually. The catchable trout program supplements local angling pressure during the spring and early summer. Random creel census of trout anglers indicates a high percentage of the stocked fish are caught.

F. SUMMARY

Considering the four anadromous fish species (coho, fall chinook, spring chinook and steelhead) in the Umatilla River, adult returns from hatchery releases by 1994 are estimated at 25,400, provided the problems associated with juvenile and adult migrations up and downstream are addressed. Naturally produced fish are anticipated to provide another 20-25,000 adults. The main problem affecting adult returns are the five Umatilla River diversion dams (Three-Mile is the highest diversion on the Umatilla presenting a 24-foot barrier. When water spills over the crest it creates a false attraction away from the fish ladder entrance. In 1982-83 the false attraction resulted in a loss of 20% of the steelhead run. Additionally, below Three-Mile Dam, water is dispersed in a braided bedrock channel preventing fish migrations. When flows are less than 200 cfs, adult migrations are greatly compromised. In 1986, an effort to channelize the existing water below Three-Mile has yet to prove successful in attracting adults during low flows.

BIRCH CREEK SUBBASIN

The Birch Creek drainage is currently undergoing review for habitat restoration. Planned projects include improvement of pool/riffle ratios, placing instream habitat structures, screening irrigation diversions, and riparian fencing.

Stocking of hatchery fish is not anticipated to augment wild stocks.

WALLA WALLA SUBBASIN

North and South Fork Walla Walla

A. Salmon and Steelhead

By 1990 the Walla Walla Basin will be stocked with both summer steelhead and spring chinook smolts. Target numbers for adult returns and smolt release were unavailable at the writing of this report.

B. Trout

The South and North Fork Walla Walla rivers are stocked annually with 9,000 catchable trout. Trout anglers catch a high percentage of the hatchery trout. Bull trout are also occasionally caught in headwater areas.

Mill Creek

Currently there are no plans to stock trout, steelhead, or chinook in the Mill Creek watershed.

SUMMARY OF STREAMS RECOMMENDED FOR MSF

A stream-by-stream assessment is included, outlining general landownership, angling pressure, stocking activity, and importance of establishing a MSF.

UMATILLA RIVER BELOW FORKS

The Umatilla River originates on the west slope Blue Mountains and flows north and west nearly 100 miles to meet the Columbia River at the town of Umatilla.

This section of the river is mostly privately owned, however the U.S. Forest Service owns a majority of land near the forks. USFS maintains a campground and picnic area at the forks. The upper end of the main stem is stocked annually with catchable rainbow trout to increase angling opportunity. The area is popular for anglers because of public ownership. Some bull trout are also taken from this area. Summer steelhead use this area heavily for spawning and rearing, and it is anticipated that spring and fall chinook will utilize the area also.

The water temperature and volume in this section of stream are adequate year-round to hold all species of salmonids.

NORTH FORK UMATILLA RIVER BELOW COYOTE CREEK

The North Fork Umatilla River drains an area owned primarily by the USFS, most of which is wilderness. All of this section of stream is publicly owned. The access is limited to hiking only.

Legal-sized rainbow trout stocked near the mouth occasionally move upstream into the area. Resident rainbow and bull trout are present in good numbers. Summer steelhead use the area heavily for spawning and rearing. Spring chinook are also expected to use the area for summer holding of adults, and spawning and rearing. The water temperatures and flows are among the best in the basin.

Trout angling pressure is heavy near the access point at the lower end of the area, but steadily drops as you get further from the road.

SOUTH FORK UMATILLA RIVER BELOW THOMAS CREEK

The South Fork Umatilla River drains an area that is nearly all U.S. Forest Service lands. The stream has an adjacent USFS road throughout this area. The entire length of the South Fork is readily accessible with a campground at the lower end of the area, a day use area at the upper end, and several well used informal camping sites throughout the length of the area.

This stream section is stocked with legal-sized rainbow trout annually and is heavily used by anglers. It is less than one hour from Pendleton, the home of the majority of anglers found here. Some bull trout and wild rainbow trout are taken in addition to the stocked rainbow.

Summer steelhead currently use the area in good numbers for spawning and rearing. Spring chinook are also anticipated to use the area for adult holding, spawning, and rearing.

Several rock gabions were installed in 1971 to help improve the pool habitat through this area. Additional habitat work is planned in the near future.

The water volume and temperature is good where it enters the area, but received excessive exposure to the sun because of lack of adequate shade. Future habitat work is planned to improve this situation.

BUCK CREEK

Buck Creek is a very important tributary of the South Fork Umatilla River. The drainage is located within the North Fork Wilderness Area. The Kiwanis cabins and outdoor school area is located at its mouth.

This stream supports summer steelhead, native rainbow, and bull trout. Buck Creek is an excellent source of cool water throughout the summer, due to its excellent riparian vegetation. The area provides excellent steelhead and trout spawning and rearing habitat. A trail up the bottom provides easy access, but receives little angler use except near the mouth, where use is moderate to heavy.

This stream makes an important contribution of cool water to downstream areas of the South Fork and mainstem Umatilla River.

THOMAS CREEK BELOW SPRING CREEK

Thomas Creek is adjacent to the North Fork Wilderness Area and has a USFS road along its length. The stream is entirely in federal ownership.

Wild rainbow trout, bull trout, and summer steelhead use the area for spawning. Spring chinook are also expected to use the area when they become reestablished in the basin. Spring Creek, a major tributary, is an important source of cool water during summer flow. The USFS just completed extensive habitat restoration in this area, with emphasis on increasing pool habitat to increase juvenile rearing potential.

NORTH FORK MEACHAM CREEK BELOW BEAR CREEK

North Fork Meacham Creek is mostly in private ownership below Bear Creek. The owner does not exclude fishermen. The upper portion of the drainage is mostly U.S. Forest Service ownership. Some cattle are grazed in this area, but intensity has been light.

The North Fork has excellent flow and water temperatures, except right at its mouth where it occasionally flows subsurface (flow is still present, but it is below the surface of the gravel).

Good numbers of summer steelhead utilize the area for spawning and rearing. Native rainbow and bull trout are also present in good numbers. Recently introduced spring chinook will utilize this area for adult holding, spawning, and rearing. North Fork Meacham has been considered for the best site in the basin for upstream storage. About 30,000 acre-feet of water is available and could be stored.

CAMP CREEK

Camp Creek enters Meacham Creek from the east, nearly all under USFS ownership. The only access to Camp Creek is from the railroad access road near its mouth, or by hiking from USFS roads around its headwaters.

Camp Creek supports native rainbow and bull trout, and summer steelhead. This area becomes important in drought years when Meacham Creek subs out, which forces the fish to migrate up into Camp Creek.

SQUAW CREEK BELOW LITTLE SQUAW CREEK

Squaw Creek enters the Umatilla River from the south at river mile 78.5, between Thorn Hollow and Gibbon. Squaw Creek is primarily privately owned and is on the Umatilla Indian Reservation.

Squaw Creek contains native rainbow trout and steelhead. Some bull trout may also be present. Log sill structures were installed in the stream about two years ago by tribal fishery staff. These were put in to increase the pool area to augment juvenile fish rearing. More habitat work is planned within the next five years.

Road access is available along this section of stream, but angler use is only moderate. A tribal permit must be purchased for non-Indians to fish on the reservation.

RYAN CREEK

Ryan Creek enters the Umatilla River at rive mile 83.5, just off the Umatilla Indian Reservation. The upper end of Ryan Creek is on USFS property, while the lower end is privately owned. Access is limited to a jeep road (private) in the lower end, and hike-in from the top on USFS.

Good numbers of steelhead, native rainbow, and bull trout spawn and rear here. There is very little angling pressure due to the private access. The private ownership from the mouth upstream approximately two miles was heavily damaged about 20 to 30 years ago by logging and overgrazing. Recently, grazing has not been allowed in the area and it has begun to recover. The area has a good, cool summer flow. Some additional habitat work is planned here in the future to take advantage of additional potential for rearing salmonids.

WEST FORK BIRCH CREEK BELOW OWINGS CREEK

West Fork Birch Creek enters Birch Creek at Pilot Rock. Birch Creek itself enters the Umatilla River at Reith (RM 49.5). Most of the basin is privately owned; however, some of the upper basin is owned by the U.S. Forest Service. Road access is by public road through the area.

Native rainbow and summer steelhead are present. This stream subs out in the lower end during late summer. Future habitat work is planned in this basin. This should help to increase flows through the area. A MSF will protect additional flows that become available from improving riparian habitat. The angling pressure is low and controlled by private owners.

BRIDGE CREEK

Bridge Creek enters West Birch Creek from the south at river mile 7.5. Bridge Creek is mostly privately owned; however, the upper basin has some public ownership.

Bridge Creek contains native rainbow trout and summer steelhead. The flows and temperatures are both good for spawning and rearing conditions. Habitat work is anticipated over the next five years. Access is limited to a public road in the lower end, and private roads upstream. Angling pressure is low and limited by private owners.

STANLEY CREEK

Stanley Creek enters West Birch Creek from the east, near RM 10. The stream area is privately owned.

Stanley Creek contains native rainbow and summer steelhead. Habitat work is anticipated here in the next few years. Angling is limited. Private ownership controls the access.

PEARSON CREEK

Pearson Creek enters East Birch Creek at river mile 11, east of Pilot Rock. The upper end of Pearson Creek is on USFS, while the lower end is private.

Pearson Creek contains good numbers of summer steelhead and native rainbow. Summer flows and temperatures are good through most of the area. Habitat work is anticipated in the next few years. This should improve the area for additional fish to spawn and rear.

Pearson Creek has public road access, but angling pressure is light. A few legal trout are present.

NORTH FORK WALLA WALLA RIVER BELOW LITTLE MEADOW CREEK

The North Fork Walla Walla River enters the Walla Walla River at about river mile 48, southeast of Milton-Freewater. The North Fork is mostly private ownership, with some USFS land in the headwaters.

The North Fork contains good numbers of steelhead, native rainbow, and bull trout. Angler access to the stream is limited due to private ownership. Habitat improvement is planned in 1989. Improvements should increase rearing habitat for all species. Additional steelhead reared in this area will contribute to Oregon and Washington fisheries downstream.

Flows in this area are low, but temperatures usually do not exceed tolerance levels of salmonids. Summer rearing habitat is the limiting factor.

SOUTH FORK WALLA WALLA RIVER BEDLOW ELBOW CREEK

The South Fork Walla Walla River enters the Walla Walla River at about river mile 48, southeast of Milton-Freewater. Stream adjacent areas are predominantly in private ownership from the forks upstream to the county park, at about river mile 8. From there on to the headwaters, public access is not limited. The headwaters are mostly on USFS, with some limited private forest ownership. Logging has been curtailed in the basin to protect the flows for downstream agricultural use.

The South Fork contains most of the spawning and rearing area in the Walla Walla Basin for summer steelhead, native rainbow, and bull trout. The public areas are stocked with legal rainbow to improve angler success. Heavy angling pressure is experienced. Many nonresident anglers (from Washington) use this area.

Flows and temperatures are good. Habitat work is anticipated which will further increase juvenile rearing potential.

MILL CREEK

Mill Creek enters the Walla Walla River in Washington, west of the town of Walla Walla. The Oregon portion of Mill Creek is split between private and USFS ownership. The Forest Service ownership is the Mill Creek Watershed, an area set aside by the USFS for the City of Walla Walla water supply.

Mill Creek contains good numbers of summer steelhead, native rainbow, and bull trout. An agreement to improve summer flows has been reached with the City of Walla Walla. These enhanced flows should be protected.

Angling pressure is moderate, and many of the anglers are nonresident and catch-and-release the majority of the fish caught.

Access to the watershed itself is limited to permit holders only.

COUSE CREEK

Couse Creek enters the Walla Walla River about two miles above Milton-Freewater. The basin is mostly private ownership. A public road extends upstream for much of its length.

Couse Creek contains a fair population of summer steelhead and native rainbow, with some bull trout also present. Low summer flows and lack of rearing pools limit production in Couse Creek. Lack of a fish screen at a major irrigation ditch near the mouth has also reduced the steelhead production. Habitat work to increase rearing potential, and a new fish screen are both planned for 1988.

Angling pressure is light to moderate and controlled somewhat by private ownership.

CURRENT MANAGEMENT PLANS

In 1985, a report by Umatilla Basin Fish Resource Improvement Committee (UBFRIC) was adopted, outlining a comprehensive plan for rehabilitation of anadromous stock. Funding is being provided by the Bonneville Power Administration (BPA). The Oregon Department of Fish and Wildlife developed the plan with cooperation from the Confederated Tribes of the Umatilla Indian Reservation, the National Marine Fisheries Service, the Fish and Wildlife Service, the Bureau of Reclamation, and the Forest Service.

The rehabilitation plan includes instream habitat improvement (pool construction; streambank stabilization, boulder weirs, etc.), improving fish passage at irrigation diversion dams, riparian fencing, flow enhancement by supplemental pumping water from the Columbia River and headwater dam construction dedicated to fisheries use. BPA is committee to funding projects outlined in the UBFRIC report starting in 1988 through 1993.

The UBFRIC report lists factors limiting fish production including: low streamflows, high water temperatures, adult passage at irrigation diversions, inadequate fish screens at irrigation diversions, lack of adequate riparian zones (future hydropower development) (lack of instream habitat).

Low streamflow is the chief factor limiting production of anadromous salmonids within the Umatilla Basin. Summer flows are extremely low due to naturally low streamflow and numerous irrigation diversions in the lower river. Water withdrawals during summer and fall months often cause dewatering of some reaches in the mainstem which eliminates rearing area and prevents adult passage. Water temperatures in the lower mainstem typically exceed 80 degrees Fahrenheit which is above upper lethal temperatures of anadromous salmonids.

Low streamflows can hinder upstream passage of adults. Umatilla flows are generally inadequate (<150 cfs) before November for passage of summer steelhead and fall chinook. Low streamflows can also inhibit downstream passage of juveniles. During years of low runoff, most flow during April-June is diverted for irrigation or stored in reservoirs. When these low flow conditions occur (approximately 1 in 10 years), all steelhead smolts (up to 110,000/year) are trapped at Westland and hauled to the Columbia River. Without trucking, it is estimated that survival of wild and hatchery juveniles in the lower Umatilla under present flow conditions would average 86-90% for summer steelhead, 70-90% for fall chinook, and 90% for spring chinook. It is likely that in low flow years, survival of migrating smolts would be considerably less than average (Boyce 1985).

The Umatilla Tribe, in cooperation with the Department, is currently developing a Umatilla Subbasin Fishery Management Plan. Highlights of the plan covers issues involving habitat improvement, stocking rates, projects adult returns, water conservation, angling opportunities, improvement of adult passage and improvement of angler access. The plan also establishes management priorities and directs attention to the most critical problems affecting fisheries in the Umatilla Basin.

OREGON DEPARTMENT OF FISH AND WILDLIFE APPROVED SPECIES PLANS

The Department currently has three species plans (coho, steelhead, and trout) that support establishment of MSF's in the Umatilla Basin. All three plans underwent extensive public review and were approved by the Commission. A chinook planning team is currently developing a comprehensive document outlining chinook management in Oregon waters. The three adopted plans contain extensive narratives that recognize the importance of high quality fishery habitat. A basic component of habitat is adequate waterflows to sustain salmonid populations. In addition to species plans, listed are ORS's and in-house policies that support approval of MSF.

Species Plan

Coho Plan adopted by Commission	1980
Steelhead Plan adopted by Commission	1986
Trout Plan adopted by Commission	1987
Chinook Plan tentative adoption year	1988

Oregon Revised Statutes

ORS 469.012 Wildlife Policy
ORS 469.435 Policy to Restore Native Stocks

Policies (in-house)

No. 1, page 3 Fish Resources, pursue protection and improvement of fish habitat.

No. 1, page 4 Wild Fish; aquatic and terrestrial habitat will be protected, rehabilitated and enhanced.

No. 1, page 5 Fish and Wildlife Protection Policy; Department will cooperate with others (agencies and private) to implement laws and coordinate resource programs to protect fish and wildlife habitat, also will implement Department habitat protection statutes.

Literature Cited

Boyce, R.R. 1986. A Comprehensive Plan for Rehabilitation of Anadromous Fish Stocks in the Umatilla River Basin. DE-A179-84BP18008. Portland, Oregon

Table A-1

SUMMARY OF MSF'S IN THE UMATILLA BASIN, 1988.

Stream Name	Location	Tributary of	Subbasin
Umatilla River	Above Meacham Cr.	Columbia River	Umatilla River
NF Umatilla River	Below Coyote Cr.	Umatilla River	Upper Umatilla
SF Umatilla River	Below Thomas Cr.	Umatilla River	Upper Umatilla
Buck Creek	Mouth	SF Umatilla River	Upper Umatilla
Thomas Creek	Mouth	Meacham Creek	Upper Umatilla
NF Meacham Creek	Below Bear Cr.	Meacham Creek	Upper Umatilla
Camp Creek	Mouth	Umatilla River	Upper Umatilla
Squaw Creek	Below L. Squaw Cr.		Upper Umatilla
Ryan Creek	Mouth	Umatilla River	Upper Umatilla
W. Fk Birch Creek	Below Owings Cr.	Birch Creek	Birch & McKay
Bridge Creek	Mouth	W. Fk. Birch Creek	Birch & McKay
Stanley Creek	Mouth	W. Fk. Birch Creek	Birch & McKay
Pearson Creek	Mouth	E. Fk. Birch Creek	Birch & McKay
NF Walla Walla R	Mouth	Walla Walla River	Walla Walla
SF Walla Walla R	Mouth	Walla Walla River	Walla Walla
Mill Creek	State line to city	Walla Walla River	Walla Walla
Couse Creek	Mouth	Walla Walla River	Walla Walla

Table A-2

**RECOMMENDED MINIMUM STREAMFLOWS (CFS)
BY MONTH FOR THE UMATILLA BASIN, 1988.**

Stream Name	Location	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Priority One													
Umatilla River	Above Meacham Ceek	60	97	97	97	97	60	40	40	40	25	25	60
NF Umatilla River	Below Coyote Creek	25	40	40	40	40	25	25	25	25	12	12	25
SF Umatilla River	Below Thomas Creek	30	58	58	58	58	30	30	30	30	15	15	30
Buck Creek	Mouth	16	16	16	16	16	15	5	5	5	5	5	10
Thomas Creek	Mouth	15	25	25	25	25	15	8	3	3	3	3	15
NF Meacham Creek	Below Bear Creek	40	70	70	70	70	40	25	10	10	10	10	40
Camp Creek	Mouth	11	11	11	11	11	5	5	5	5	5	5	11
Squaw Creek	Below L. Squaw Creek	20	27	27	27	27	20	12	4	4	4	4	20
Ryan Creek	Mouth	15	15	15	15	15	15	10	5	5	5	10	15
WF Birch Creek	Below Owings Creek	20	24	24	24	24	20	10	5	5	5	5	20
Bridge Creek	Mouth	7	7	7	7	7	2	2	2	2	2	2	5
Stanley Creek	Mouth	6	6	6	6	6	2	2	2	2	2	2	5
Pearson Creek	Mouth	18	18	18	18	18	10	5	2	2	2	2	5
NF Walla Walla R	Mouth	25	36	36	36	36	25	15	15	15	5	5	25
SF Walla Walla R	Mouth	60	80	80	80	80	60	40	40	40	25	25	60
Mill Creek	State line to city	44	53	63	86	64	39	32	31	31	32	35	37
Couse Creek	Mouth	25	25	25	25	25	10	5	5	2	5	10	25

Table A-3

FISH SPECIES AND GENERAL DISTRIBUTION IN THE UMATILLA BASIN, 1988.

Species	General Distribution
Gamefish	
Salmonids	
Bull Trout	Both forks of Umatilla River and Walla Walla system above Milton-Freewater occasionally in mainstem Umatilla River (Figure A-5).
Brook Trout	Meacham Creek and ponds along lower Meacham Creek, springs along Umatilla River.
Rainbow Trout	Headwater areas of all streams with adequate flows (Figure A-5). Cold Springs and McKay Reservoirs.
Summer Steelhead	Most streams with adequate flows and moderate water temperatures (Figure A-6).
Spring Chinook	Reestablished in 1986 with first adult returns expected in 1989. Walla Walla will be stocked in early 1990's. Anticipated distribution is included in Figure A-7.
Upriver bright Fall Chinook	Introduced in the Umatilla in 1984. Juvenile and adults are expected to utilize the middle and lower reaches of Umatilla (Figure A-8).
Coho	Released in 1986, current plans are to collect all returning adults at Three-Mile Dam.
Whitefish	Upper Umatilla River.
Catfish	
Brown Bullhead	Umatilla River up to Mission, McKay Creek to river mile 14 and McKay Reservoir, Cold Springs Reservoir, and other small ponds.
Channel Catfish	McNary Pond.
Sunfish	
Bluegill	Lower Umatilla River, Cold Springs and McKay Reservoirs, and other small ponds.
Largemouth Bass	Lower Umatilla River, Cold Springs and McKay Reservoirs, McKay Creek, and smaller ponds.
Smallmouth Bass	Hat Rock Pond.

Table A-3 (Continued)

FISH SPECIES AND GENERAL DISTRIBUTION IN THE UMATILLA BASIN, 1988

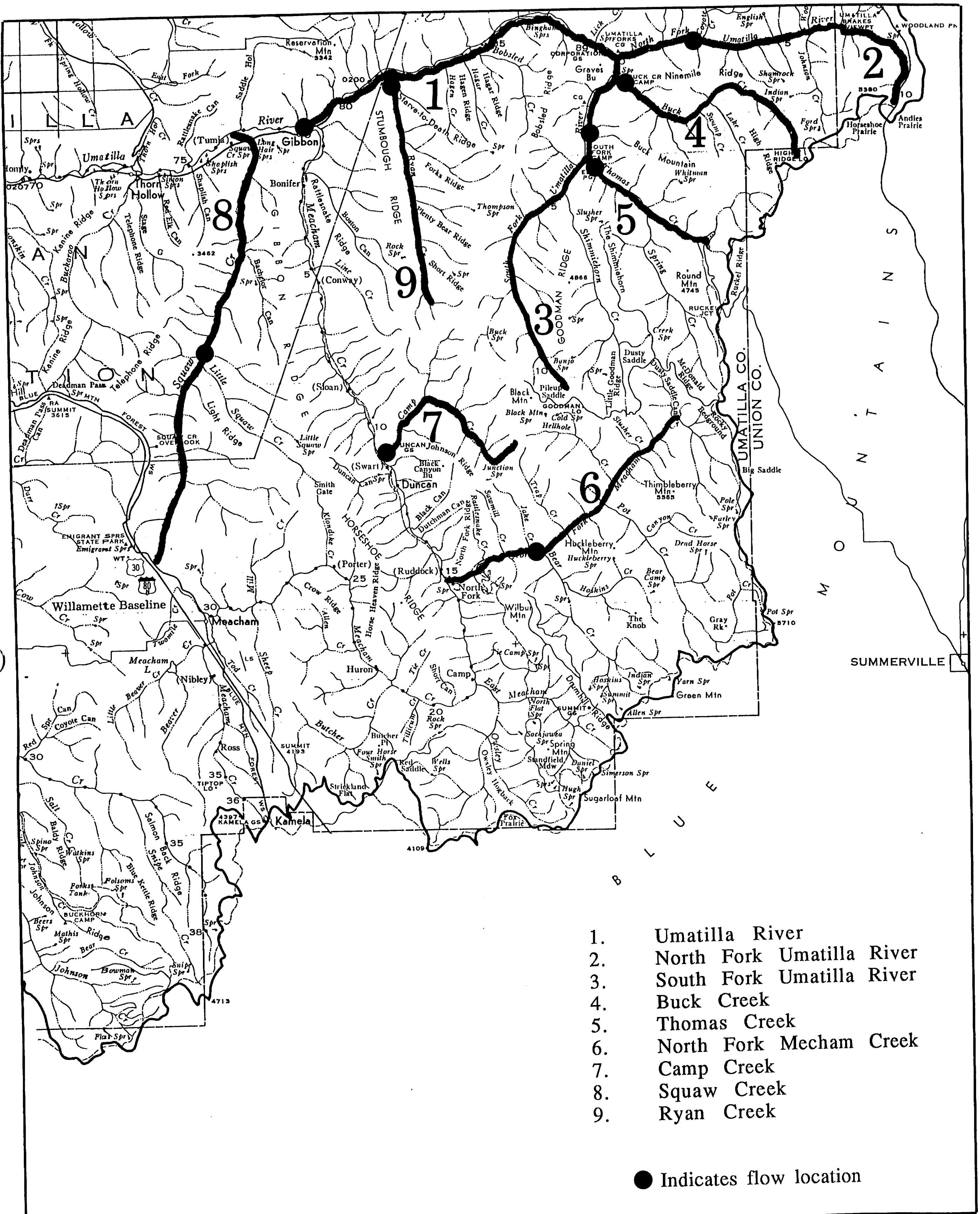
Species	General Distribution
White Crappie	Lower Umatilla River, Cold Springs Reservoir, and a few small ponds.
Black Crappie	McKay Reservoir.
Non-gamefish	
Suckers (2 species)	Willow Creek, Umatilla and Walla Walla Rivers at least to forks and McKay Creek, Cold Springs and McKay Reservoirs.
Squawfish	Willow Creek at least to Heppner, Rhea Creek, Umatilla River to forks, South Fork Umatilla River to Thomas Creek, McKay Creek, lower Meacham Creek, Walla Walla River at least to forks, Cold Springs and McKay Reservoirs.
Cottids	Throughout Umatilla and Walla Walla systems.
Lamprey, Pacific	Umatilla and Walla Walla River systems.
Minnows	
Carp	Umatilla River below Pendleton and Cold Springs Reservoir.
Chiselmouth	Umatilla River at least to McKay Creek.
Dace	Throughout Umatilla system.
Redside Shiner	Umatilla River upstream to Meacham Creek and lower Meacham Creek.

Table A-4

SMOLT RELEASES AND ESTIMATED ADULT RETURNS FOR THE UMATILLA BASIN, 1987-1995.

	Fiscal Year							
Fish Species	1987	1988	1989	1990	1991	1992	1993	1994
<u>Summer Steelhead</u>								
Smolt release	60,000	200,000	200,000	200,000	200,000	200,000	200,000	200,000
Adult return	1,620	1,620	3,510	5,400	5,400	5,400	5,400	5,400
<u>Fall Chinook</u>								
Fingerling released	0	0	1.1*	1.6*	2.9*	2.9*	2.9*	2.9*
Smolt release	225,000	225,000	225,000	225,000	225,000	225,000	225,000	225,000
Adult return	1,050	1,125	1,125	1,676	2,598	4,168	6,223	8,442
	<u>1995</u>							
Fingerling release	2.9*							
Smolt release	225,000							
Adult return	10,000							
<u>Spring Chinook</u>								
Smolt release	225,000	225,000	828,800	1.6*	1.6*	1.6*	1.6*	1.6*
Adult return	65	787	1,347	1,524	3,703	7,897	9,990	10,000

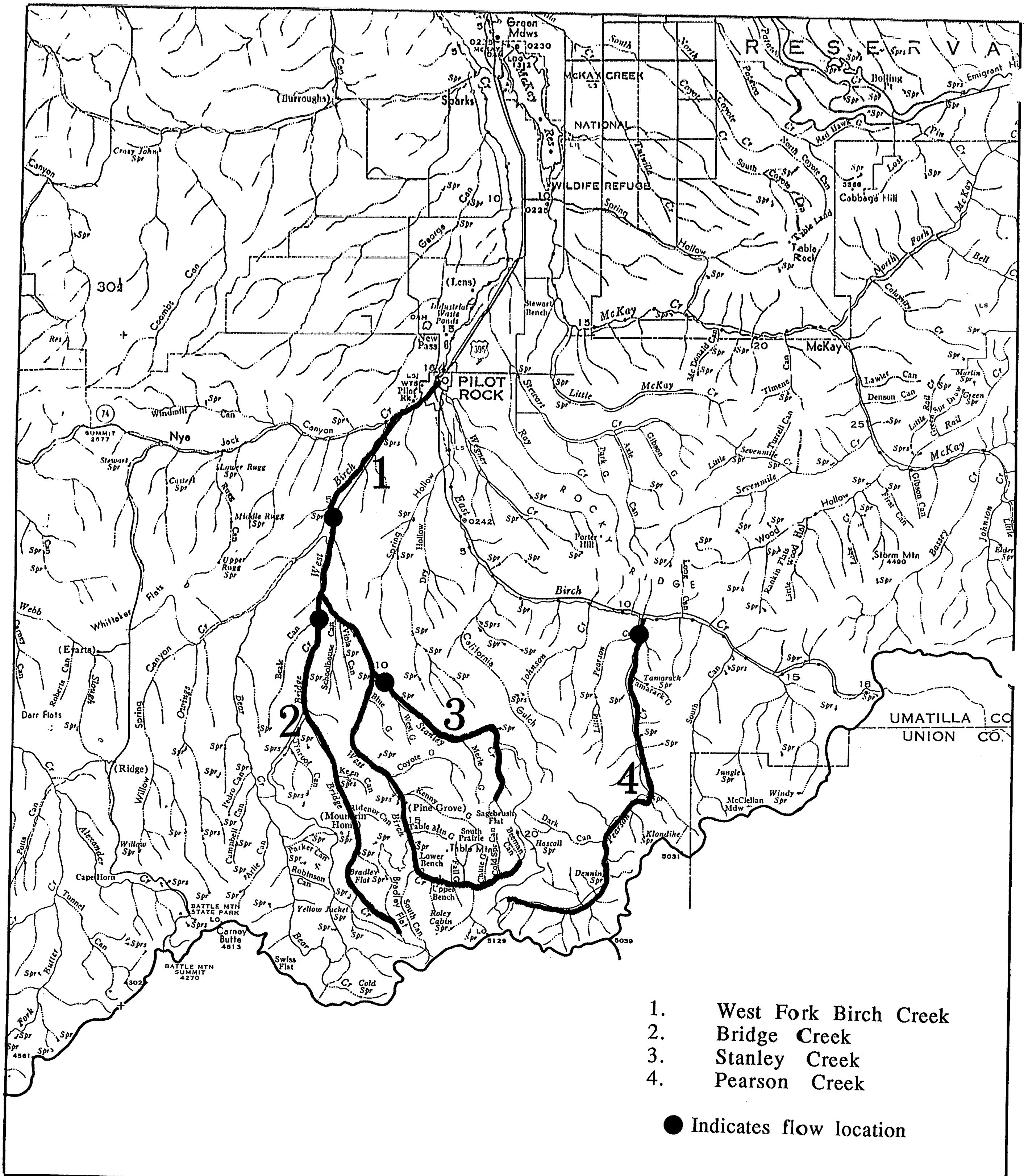
* In millions



Source: ODFW, 1988

Figure A-1

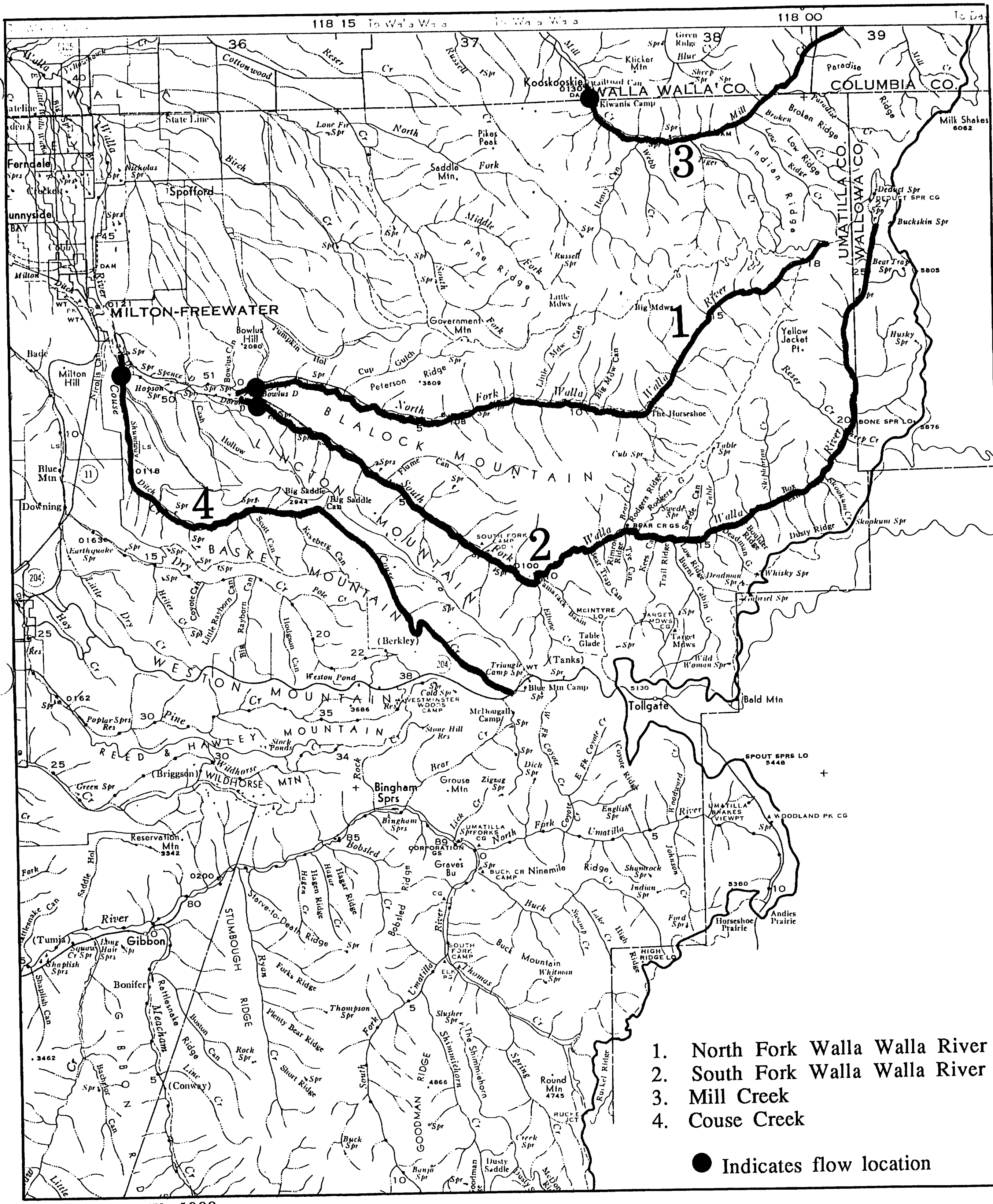
UPPER UMATILLA MSF RECOMMENDATIONS



Source: ODFW, 1988

Figure A-2

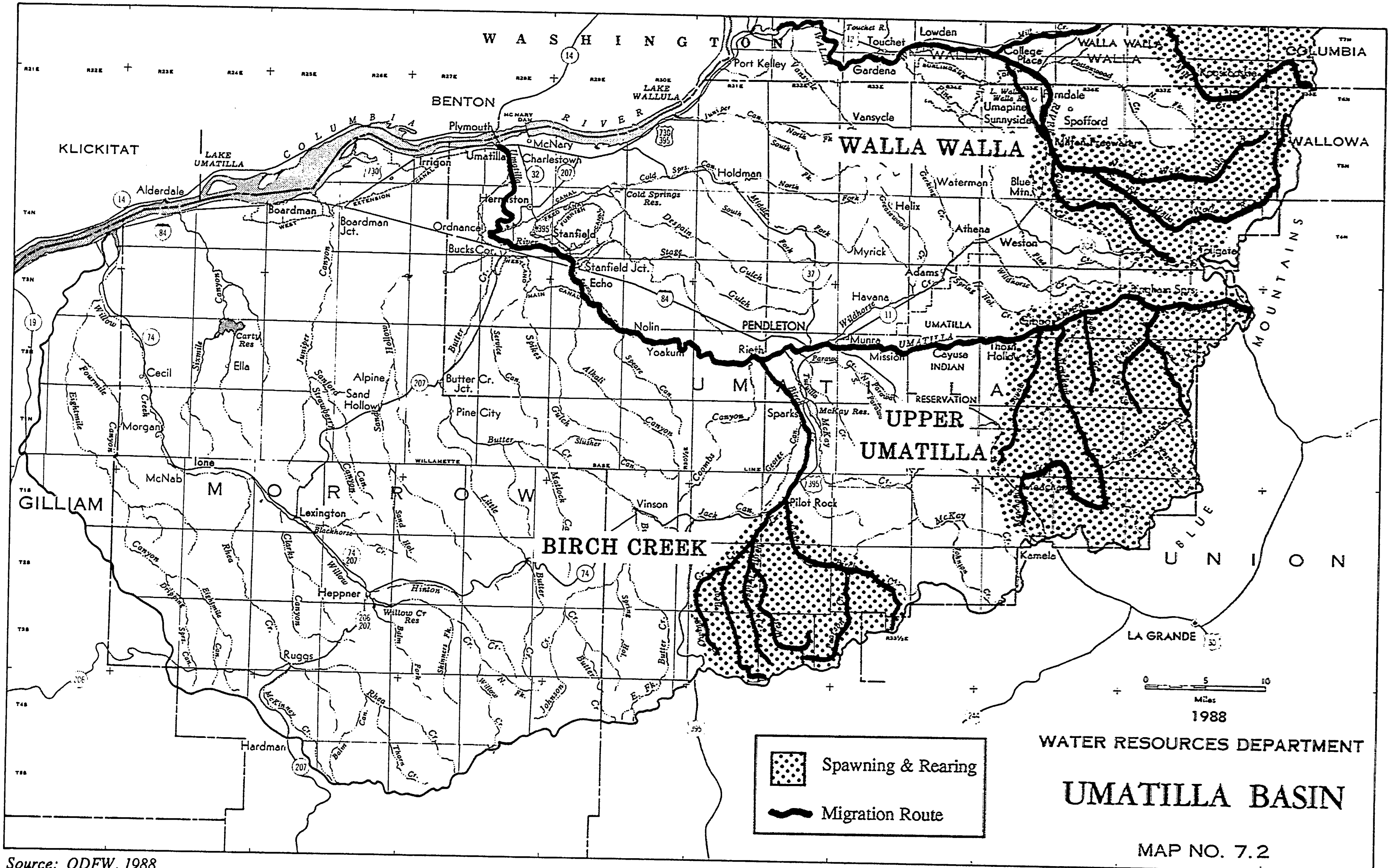
BIRCH CREEK (Trib. to Umatilla R.) MSF RECOMMENDATIONS



Source: ODFW, 1988

Figure A-3

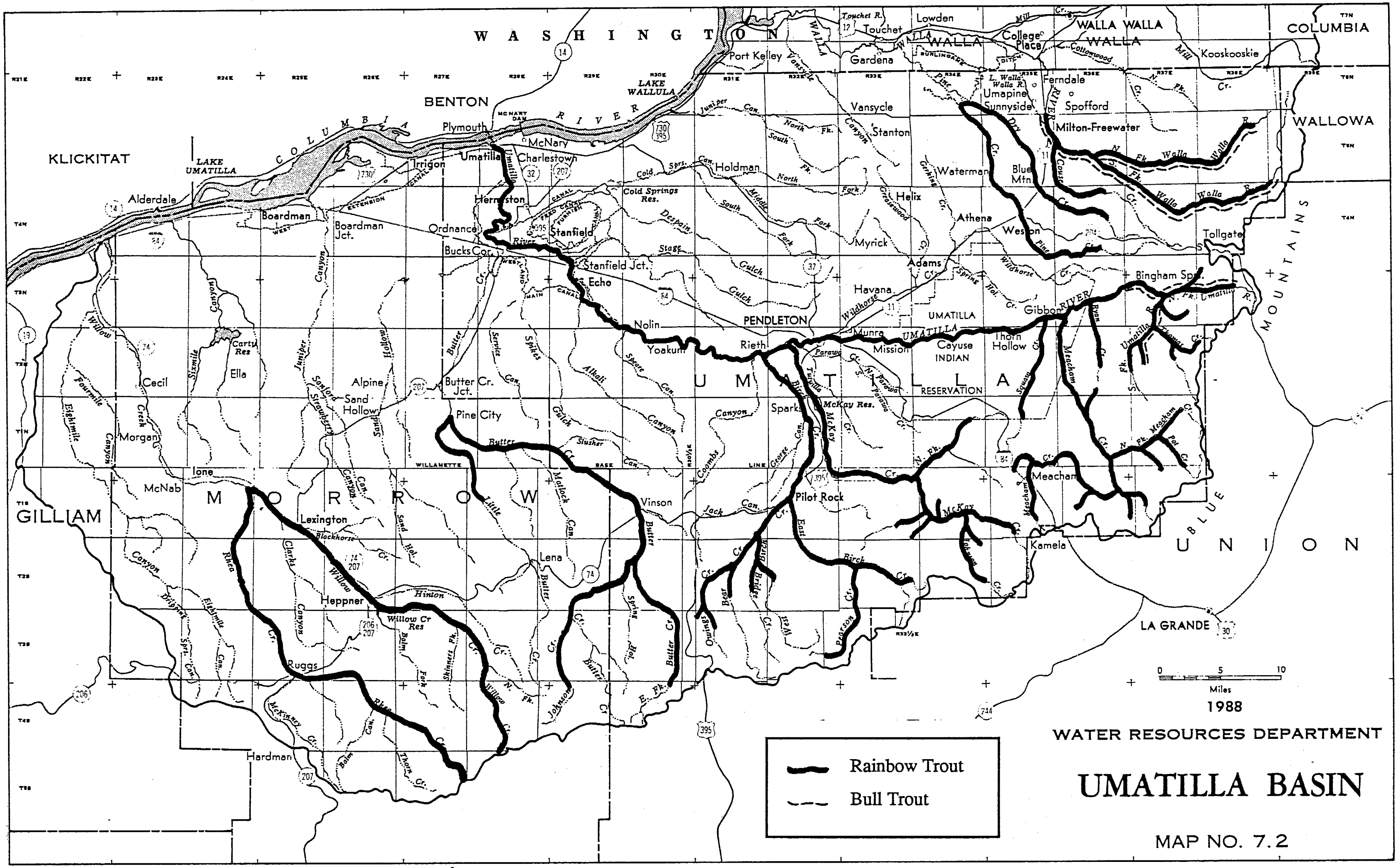
WALLA WALLA RIVER (Trib. to Columbia R.) MSF RECOMMENDATIONS



Source: ODFW, 1988

Figure A-4

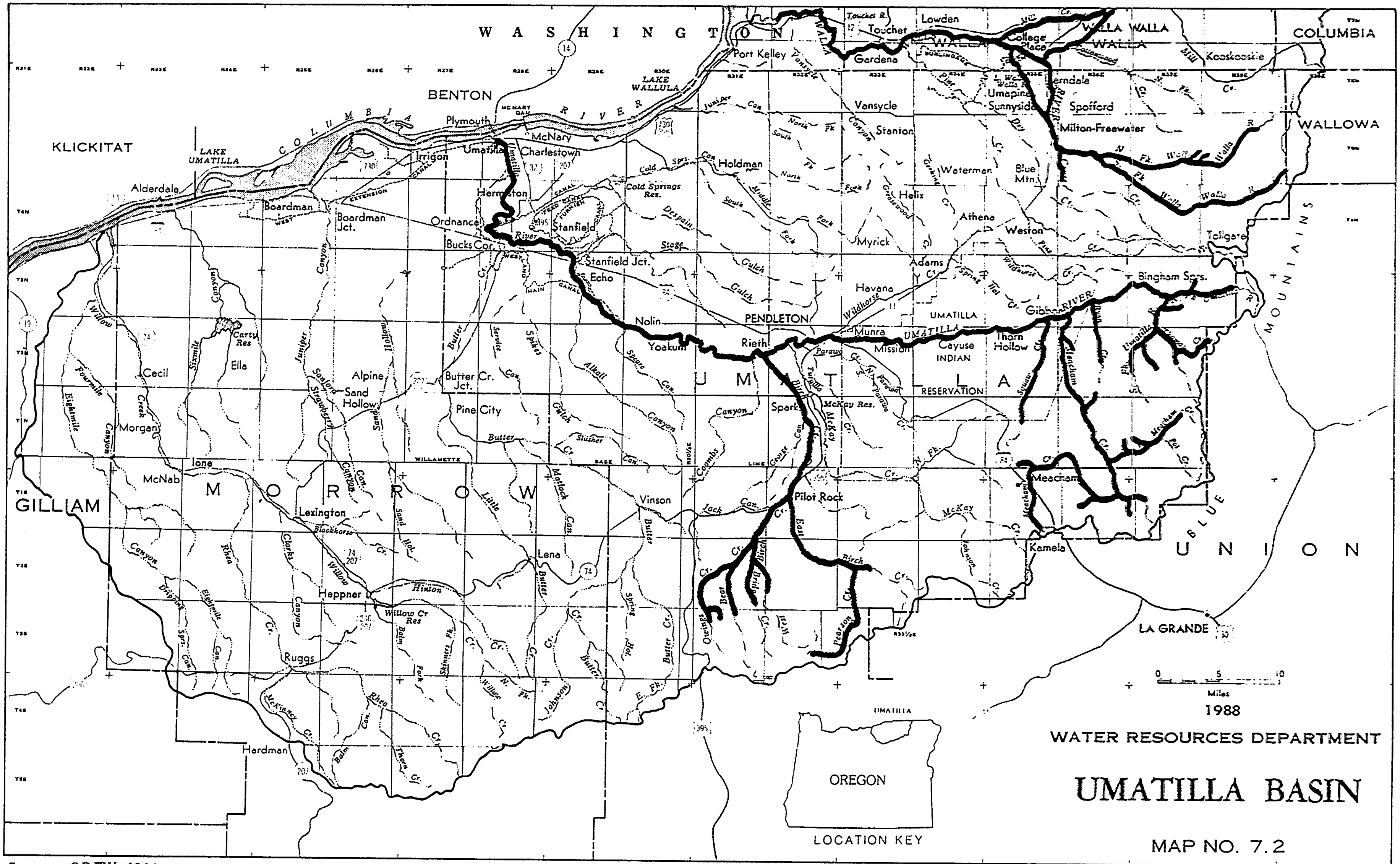
PRINCIPAL SPAWNING AND REARING AREAS FOR ANADROMOUS FISH IN THE UMATILLA RIVER BASIN



Source: ODFW, 1988

Figure A-5

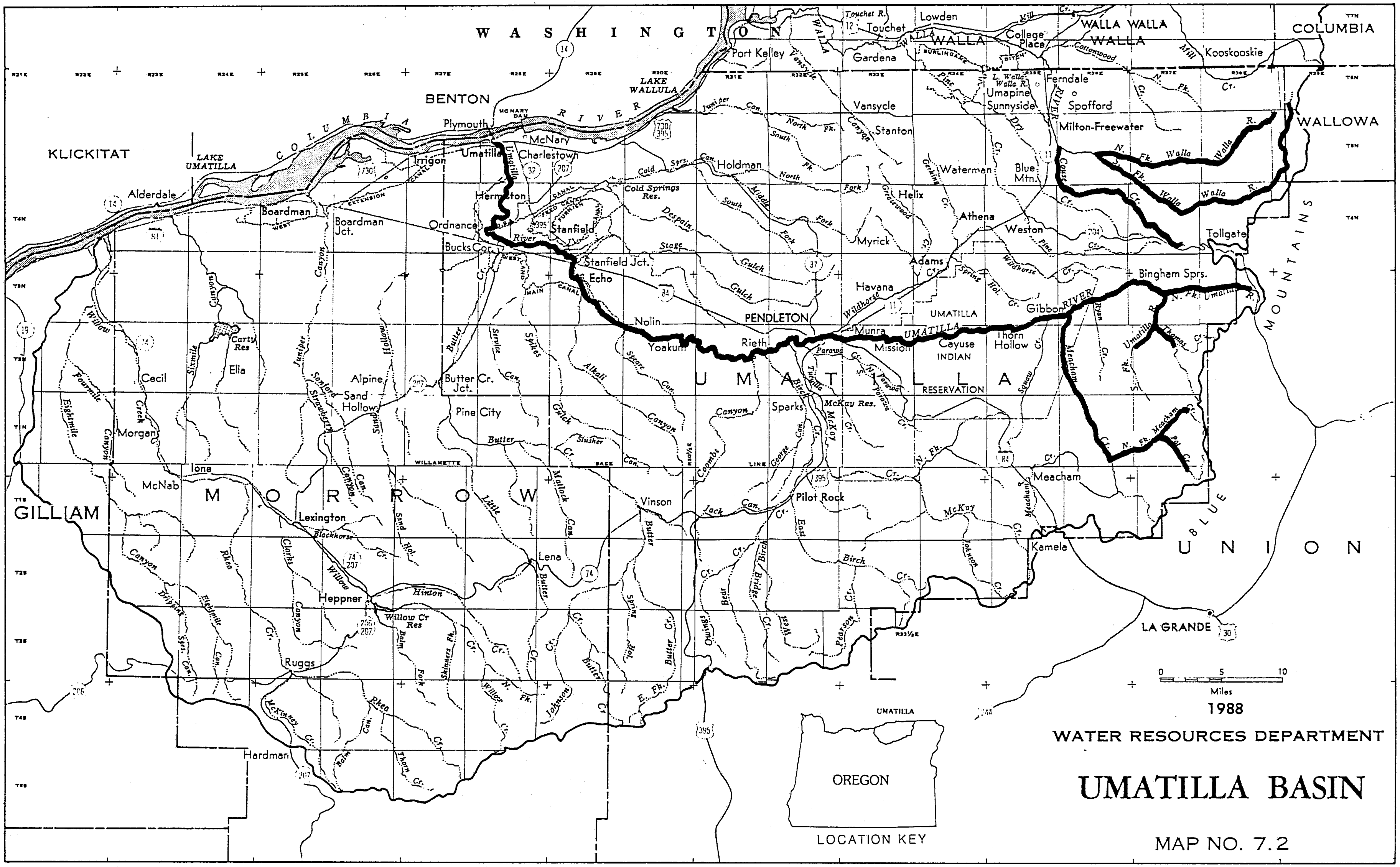
RAINBOW AND BULL TROUT DISTRIBUTION IN THE UMATILLA RIVER BASIN, 1988



Source: ODFW, 1988

Figure A-6

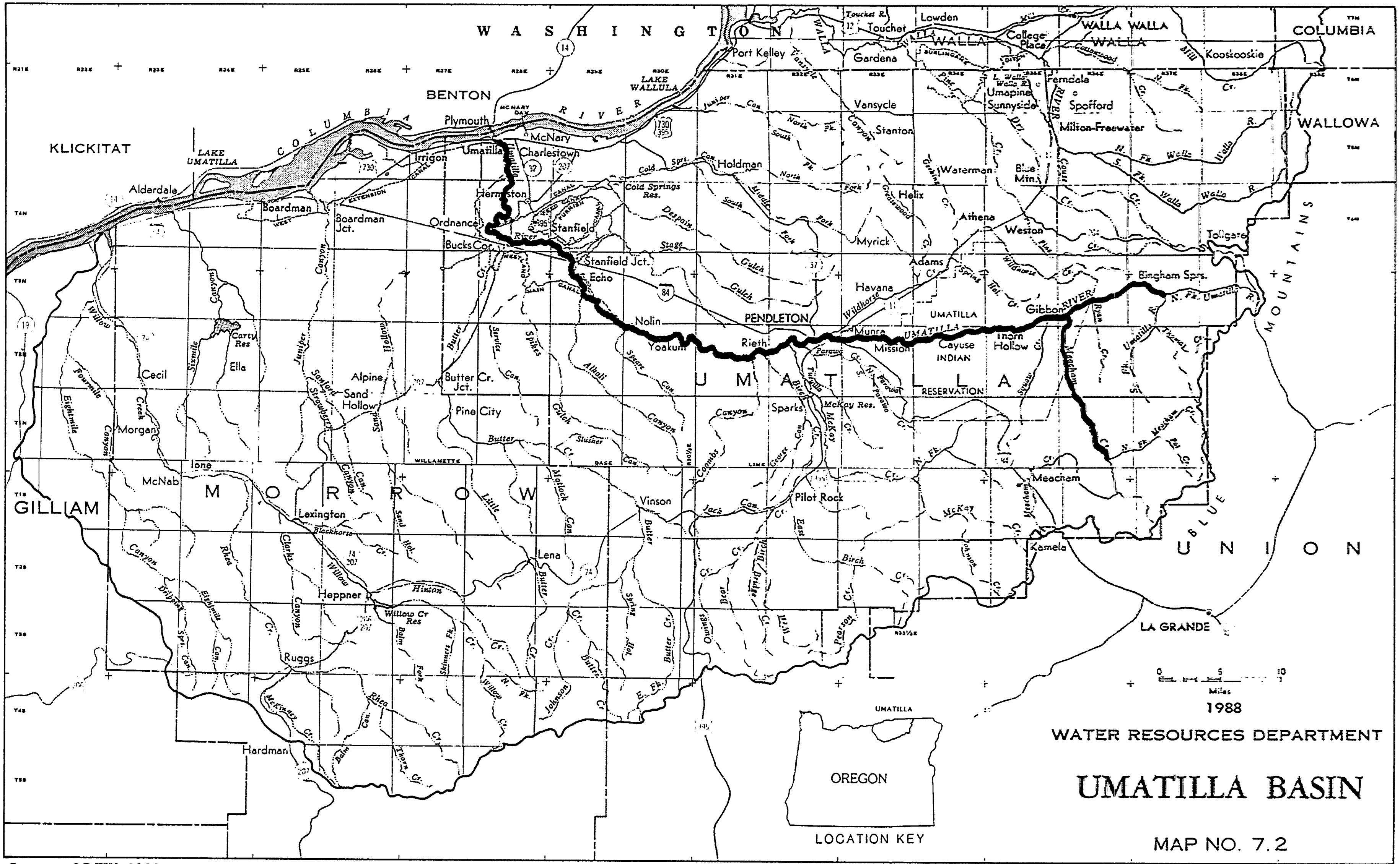
SUMMER STEELHEAD DISTRIBUTION IN THE UMATILLA RIVER BASIN, 1988



Source: ODFW, 1988

Figure A-7

DISTRIBUTION OF SPRING CHINOOK IN THE UMATILLA RIVER BASIN, 1988



Source: ODFW, 1988

Figure A-8

UPRIVER BRIGHT FALL CHINOOK DISTRIBUTION, JUVENILES AND ADULTS, IN THE UMATILLA RIVER BASIN, 1988

ATTACHMENT ONE

DETERMINING MINIMUM FLOW REQUIREMENTS FOR FISH

INTRODUCTION

Oregon was one of the first western states to study minimum streamflow requirements of salmonids. Between 1961 and 1972, Oregon Department of Fish and Wildlife maintained a crew of two to four biologists which developed methodology and made minimum flow requirement surveys throughout Oregon.

The purpose of this attachment is to provide a brief description of techniques used in those surveys, and to document criteria used to make minimum flow recommendations presented to the Water Policy Review Board in a series of Basin Investigation Reports (Table AA-1).

BIOLOGICAL REQUIREMENTS OF SALMONIDS

The life cycle of Pacific salmon and trout can be broken into four functional periods:

1. Passage - adult and juvenile migrations to spawning areas and to ocean or freshwater rearing areas,
2. Spawning,
3. Egg incubation and larval development within the gravel environment, and
4. Rearing - the period of growth between emergence of fry from the gravel and maturation of adults.

The timing and amounts of streamflow required for each of these periods differ by species and for different streams because of their physical characteristics.

PASSAGE

Anadromous fish migrate between freshwater spawning areas and the ocean. Anadromous fish in Oregon include the Pacific salmon (chinook and coho principally), steelhead and cutthroat trout. These fish, especially steelhead, migrate as adults from the ocean into some of the smallest tributaries. Continuous flows from headwater streams to the ocean during both upstream and downstream migrations are essential if these fish are to remain abundant.

In large rivers some upstream migration and holding of anadromous fish may occur in almost any month. In smaller streams upstream migrations may be restricted to the late fall, winter or early spring periods of high flows. Also, unlike Pacific salmon, adult steelhead and sea-run cutthroat trout may survive spawning and then migrate back to the ocean and return to freshwater in subsequent spawning seasons.

Table AA-1

BASIN INVESTIGATION REPORTS PREPARED BY THE OREGON DEPARTMENT OF FISH AND WILDLIFE.

Basin	Status and Publication Date
Coastal	
Middle Coast Basin	Report transmitted to Oregon State Water Resources Board (SWRB), March 1972 (Revised).
North Coast Basin	Report transmitted to SWRB, April 1968.
North Coast Supplement	Report transmitted to SWRB, January 1972.
South Coast Basin Chetco/Coos/Coquille	Report transmitted to SWRB, April 1972 (Revised).
Deschutes River Basin	Draft - recommendations complete.
Goose & Summer Lakes Basin	Report transmitted to SWRB, November 1971.
Grande Ronde River Basin	Report transmitted to SWRB, August 1975.
Hood Basin	Report transmitted to SWRB, December 1963.
Hood Basin Supplement	Report transmitted to SWRB, April 1973.
John Day Rive Basin	Draft - recommendations complete.
Klamath Basin	Report transmitted to SWRB, April 1970.
Malheur Lake Basin	Report transmitted to SWRB March 1968.
Owyhee Basin	Report transmitted to SWRB, April 1969.
Rogue River Basin	Report transmitted to SWRB, November 1970.
Rogue River Supplement	Report transmitted to SWRB, April 1972.
Umatilla Basin	Report transmitted to SWRB, February 1973 (Revised).
Umpqua River Basin	Report transmitted to SWRB, February 1972.
Willamette	
Lower Willamette	Report transmitted to SWRB, June 1964.
Middle Willamette	Report transmitted to SWRB, February 1963.
Upper Willamette	Report transmitted to SWRB, June 1966

Freshwater populations of trout may exhibit anadromous traits, making well defined migrations between spawning and rearing areas. The best examples of such populations are found in some lakes of Eastern Oregon such as Goose Lake or Crump Lake and their tributary systems. Trout may also make spawning migrations within large rivers. A good example is the migratory population of rainbow trout of the lower Klamath River, which uses tributaries of John Boyle reservoir for spawning.

The downstream migrations of juveniles (or smolts) to the ocean occur in the late spring (April through June) in most streams, although some migrations may occur with the first fall freshets, especially in lower elevation streams.

Good flow conditions for passage allow physical movement of fish within streams. In addition, they must provide stimulus for upstream and downstream migrations. Peak migraions of both juveniles and adults are often closely associated with freshets in streams.

SPAWNING

Spawning may occur at different times of the year, depending on the species and its geographical location. Fish select spawning sites on gravel bars, usually those at the tails of pools just ahead of points where the stream breaks into riffles.

Salmon and trout lay their eggs in gravel ranging between 0.25 - 6 inches in diameter. Coho and steelhead usually select gravel from 1-4 inches in diameter. Chinook salmon use slightly larger gravel while trout prefer smaller sizes. Adequate gravel depth is necessary for redd (spawning nest) construction. Redd depth may vary from about 0.5-1.3 feet. Chinook salmon dig deeper redds than coho salmon and steehlead. Trout seldom dig a redd deeper than 0.5 foot. Gravel free of fine sediments assures good survival of eggs and fry. Excessive sand and silt reduces intra-gravel flow of water around the eggs, and blocks emergence of fry from the gravel.

Water depth and velocity at spawning sites are relatively critical. Inadequate depth blocks adult fish from occupying gravel bars. Good water velocity at spawning sites helps move gravel dislodged by the female, and washes sediments from the gravel as it settles back over eggs in the redd. If velocity is excessive, fish have difficulty holding position over spawning sites.

INCUBATION AND LARVAL DEVELOPMENT

After deposition in the gravel, salmon and trout eggs may require from two to six months to hatch, depending upon water temperature. After hatching, the larvae or alevins may spend another month or so in the gravel before their yolk sacs are absorbed and they emerge from the gravel as free-swimming fry.

Surface flows are important to survival of eggs and alevins in the gravel. Excessive flow may scour the streambed, killing spawn. Low flows reduce the exchange of water between the stream and the gravel. This exchange is necessary to provide oxygen to the eggs and alevins, and to remove accumulated metabolites. The oxygen content of groundwater circulated about eggs and alevins should be maintained at or near saturation. The continuous circulation of clean, oxygenated water around the spawn is mostly achieved by surface water drawn into the gravel. The selection of redd sites, and the physical characteristics of redds, provide hydraulic conditions for adequate exchange of water between the stream and the gravel, under favorable flows.

REARING

Except in lower elevation streams, water quality in most Oregon streams is suitable for salmon and trout throughout the year. For resident trout, the "rearing" period of growth and development covers the entire year, when both juvenile and adult fish are considered. For Pacific salmon, steelhead, and sea-run cutthroat, the rearing period extends from the time of fry emergence to the time of seaward migration of the smolts. This period varies from a month or so, in the case of most fall chinook, up to two and a half years for some steelhead. During this time, streamflow must be sufficient to provide food, space, shelter, and good water quality.

FOOD

Aquatic invertebrates provide much of the food of stream salmonids. These invertebrates are mostly produced in stream riffles, where gravel, rocks, boulders, and debris provide edge for the attachment of small organisms. Good streamflows for food production provide wetting of riffles, with sufficient turbulence and velocity to create thorough oxygenation of the stream and its organisms.

SPACE

Salmon and trout are territorial, and the amount of habitat space is important in determining their abundance in streams. Flow also determines the relative amount of pool and riffle space within a stream. This affects the relative abundance of riffle/dwelling and pool/dwelling fish. The following table shows that juvenile chinook and coho salmon, and juvenile steelhead trout, for example, have very different habitat requirements.

Table AA-2

JUVENILE REARING HABITAT*

	Habitat Type	Stream Depth	Surface Velocity
Chinook	Mid-Pool & head of pools	1.2-1.4 feet	0.2-1.2 fps
Coho	Mid-pool	1.6-2.6 feet	0.2-0.6 fps
Steelhead-rainbow	Riffle	0.7-1.0 feet	1.2-2.2 fps

*Unpublished data - Oregon Department of Fish and Wildlife

SHELTER

Salmonids require two types of shelter in streams. Boulders, submerged logs, and similar features within the stream provide fish with resting places in feeding areas where flow produces insect production and food drift. Shelter also is necessary for fish to escape predators and avoid other stress. Such shelter may be found beneath undercut banks or overhanging vegetation. Adequate flow for rearing must provide fish with access to both types of shelter.

WATER QUALITY

Good water quality characteristics for meeting all life history requirements of salmonids are high dissolved oxygen content (at or near saturation), low turbidity, slightly acidic to slightly alkaline pH, and temperatures not exceeding 65 degrees Fahrenheit. Flow volume is important in maintaining these water quality characteristics especially in areas where development has eliminated stream shading or caused pollution.

CRITERIA AND MINIMUM FLOW DETERMINATION

PRINCIPAL CRITERIA

Stream depth and velocity were the principal criteria used to determine flows for passage, spawning, incubation, and rearing. These criteria were developed after extensive review of fisheries literature, and considerable field measurement and observation of these criteria, and their influence upon fish habitat, by Department of Fish and Wildlife research personnel.

Use of measurable depth and velocity criteria allowed field work to be performed at anytime of year when a suitable range of flows (bracketing suspected minimums) could be analyzed. Minimum flow recommendations were confirmed whenever possible through field observations of fish passage, spawning, etc. The survey team was highly experienced in both application of field methods and in evaluating influences of streamflow upon fish life under a wide range of conditions throughout the state. This knowledge ensured that both the criteria and their application resulted in valid recommendations.

PASSAGE

Passage of adult fish is limited by depth of flow over shallow gravel bars, and by obstructions. Depth and velocity criteria given below allow unimpeded movement of fish across bars or ledges which limit passage at low flows.

Table AA-3

DEPTH AND VELOCITY CRITERIA FOR PASSAGE*

Species	Minimum Depth, ft.	Maximum Velocity, fps
Adult chinook	0.8	8.0
Adult coho, steelhead & large resident trout	0.6	8.0
Adult resident trout	0.4	4.0
Juvenile salmon & steelhead	0.2	----

*Unpublished data - Oregon Department of Fish and Wildlife

To determine the minimum passage flow for a stream, the survey team first located the shallow bars (usually 1-3) which would most limit passage at low flows. These bars were then marked with transects which followed the shallowest courses from bank to bank. Then, at each of several flows, depth and velocity of water along these transects were measured at frequent intervals. The percent of transect meeting depth and velocity criteria for passage was deter-mined for each flow. These results were averaged for all transects, and plotted against corresponding flows. From inspection of the graph, recommended minimum passage flow was determined as that flow which met passage criteria over 25 percent of total stream width (Figure AA-1). In addition, the recommended minimum passage flow must meet passage criteria for a continuous section of stream representing 10 percent of total stream width (Figure AA-1).

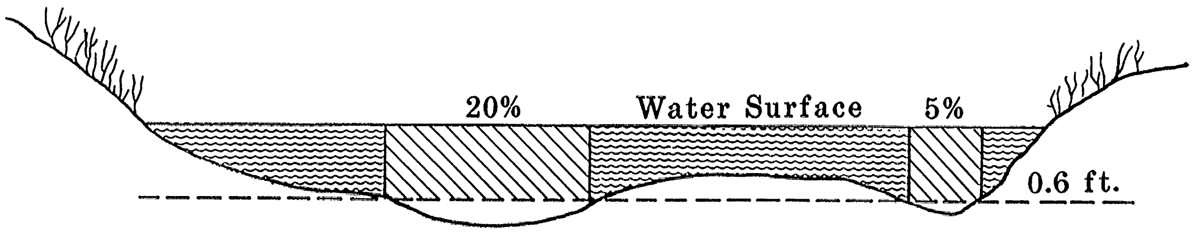


Figure AA-1

Streamflow provides 0.6 feet of water over 25% of the total stream width; and, over a continuous section of streambed representing at least 10% of streambed. Streamflow meets minimum passage criteria for adult coho.

Minimum flow requirements for adult fish obtained in the above manner only ensure that fish have physical freedom to move throughout the stream. Freshets several times greater than these flow requirements are required to stimulate and maintain upstream migrations of anadromous fish, including migratory freshwater trout. The minimum passage flow may also be greater if passage is obstructed by natural falls or man-made barriers within the stream. These considerations were not included in the minimum flow recommendations.

Flows exceeding passage criteria (provided velocity criteria is not exceeded) should facilitate passage. Protracted flows considerably less than recommended minimum passage flows; for example, 50% less, would severely restrict passage of adult fish.

Minimum passage requirements for instream movement of juvenile salmon and trout (0.2 foot depth over riffles connecting pools) are usually satisfied by minimum flow requirements for other biological activities.

Minimum passage criteria for downstream migration of smolts were not determined. Several considerations are important in this matter:

1. Artificially regulated flows should not be changed abruptly, to prevent fish from becoming stranded (left high and dry or in stagnant pools),

2. Juveniles feed on the way downstream, and flows over long stretches should be sufficient to support aquatic food for the juveniles.

3. Flows during downstream migration should be sufficient to maintain satisfactory water quality, especially temperature, and

4. Stream velocity should be adequate to transport the fish downstream quickly to avoid predation and stranding as streamflows recede.

Again, minimum flow requirements for other biological activities should satisfy requirements for juvenile downstream migration.

SPAWNING

The following criteria were used to evaluate flow conditions over gravel bars within spawning areas:

Table AA-4

DEPTH AND VELOCITY CRITERIA FOR SPAWNING

Species	Depth, ft.	Velocity, fps
Chinook	0.8	1.0-3.0
Coho	0.6	1.0-3.0
Steelhead	0.6	1.0-3.0
Resident Trout	0.4	1.0-3.0

To determine minimum spawning flow for a stream, the survey team first located three representative gravel bars. These bars were marked with transects across the most likely areas for spawning. At each of several flows, depth and velocity of water along these transects were measured at frequent intervals. The percent of transect meeting depth and velocity criteria for spawning was determined at each flow. These results were averaged for all transects, and plotted against corresponding flows. Optimum and minimum spawning flows were determined from inspection of the resulting graph.

The optimum spawning flow provides suitable depth and velocity for spawning over a maximum amount of gravel area within the stream. The minimum spawning flow is usually two-thirds to three-fourths of the optimum. It represents the break point at which increases in flow produce less than proportionate increases in spawning habitat. Conversely, reductions in flow below the minimum cause greater than proportionate decreases in spawning habitat. That is, a flow 50% less than the recommended minimum would result in greater than 50% reduction in spawning habitat.

INCUBATION

The relationship of surface flow to the subsurface flow through gravel surrounding spawn is complex. Much depends on porosity of the gravel and stream gradient. As an absolute minimum, surface flow should wet areas used by spawning fish. Therefore, the minimum incubation flow was determined as the amount required to wet spawning areas made available at the minimum spawning flow. Experience demonstrated this requirement was usually satisfied by two-thirds of the minimum spawning flow.

The recommended minimum incubation flows are the least flows needed to complement minimum spawning flows. Incubation flows to achieve best survival of spawn should be higher. Conversely, flows less than minimum incubation of flows, say 50% less, would dewater redds and cause significant mortality of eggs and larvae.

REARING

The following criteria were used to establish rearing flows:

Table AA-5

CRITERIA FOR REARING FLOWS

1. Approximately 60% of riffle areas wetted.
2. Riffle: pool ration approximately 50:50.
3. Riffle velocities 1.0-1.5 fps.
4. Pool velocities 0.3-0.8 fps.

Two approaches were used in evaluating minimum flows for rearing. Small streams with rough streambeds were examined at several different flows. From these observations, the minimum rearing flow was estimated as the flow which seems to best satisfy the above criteria. For larger streams with more uniform streambeds, transect analysis of the relationship between flow and mean velocity of water over riffle areas was employed. In these cases, the survey team located three representative riffles within the stream. Transects were established across these riffles perpendicular to the course of flow. For each of several flows, depth and velocity of water along these transects were measured at frequent intervals. The average water velocity for each flow was computed. Results were averaged for all transects, and plotted against corresponding flows. From inspection of the graph, the optimum rearing flow was determined as that flow providing an average stream velocity of 1.4 fps over riffles. The minimum rearing flow provided an average riffle velocity of 1.2 fps. The velocity criteria represent 60% confidence limits on the average riffle velocity which Department of Fish and Wildlife personnel have measured in streams providing good rearing habitat, and satisfying criteria of Table AA-5. Flows greater than the recommended optimum rearing flows would create excessive water velocity and turbulence for the best production of aquatic life. Flows less than the recommended minimum rearing flows would result in proportionate or greater than proportionate reductions in rearing habitat of fish. Flows much less than the recommended minimum rearing flows, say 50% less, would severely limit rearing habitat. An important consideration here is that flows much less than the recommended minimum, if sustained, could result in water quality impairment during hot weather.

STREAM CALENDAR

An important element for establishing minimum flow requirements is a stream calendar outlining critical time periods for passage, spawning, incubation and rearing for each species. This calendar will show temporal overlap of some biological functions. For example, upstream passage of adults, spawning, egg and alevin development in the gravel, rearing, and down-stream passage of juveniles commonly take place at the same time for summer steelhead popu-lations in Eastern Oregon tributaries. The minimum flow recommended for any month is the highest flow required to accommodate all biological functions. In the example cited above, this would be the minimum spawning flow, since satisfaction of depth and velocity criteria for spawning requires greater flow than passage, incubation or rearing.

OTHER CONSIDERATIONS

The Department of Fish and Wildlife recommendations did not take into account natural availability of flow or limitations on flow caused by consumptive appropriations. In cases where recommendations exceed prevailing streamflow, it may be concluded that flow limits fish production. These cases point out potentials for increasing fish production through use of stored water. They also point out areas where limitations on new consumptive uses may be required to maintain existing fishery values. On the other hand, many of the recommendations are exceeded by prevailing seasonal flows - this is particularly true during late fall, winter and spring months critical to anadromous fish migrations and reproduction. The Department relies on the staff of the Water Resources Department to make the necessary assessments of natural flows, and prior consumptive uses in the development of final recommendations to the Board on establishment of minimum streamflow requirements for fishery conservation purposes.

Case Example

The following case example, based on depth and velocity data collected near Willowdale on Trout Creek, tributary to the Deschutes River, illustrates the Oregon method for streamflow analysis.

STREAM CALENDAR

The fish species of interest in the Trout Creek watershed is steelhead trout. Their life history in Trout Creek is outlined below.

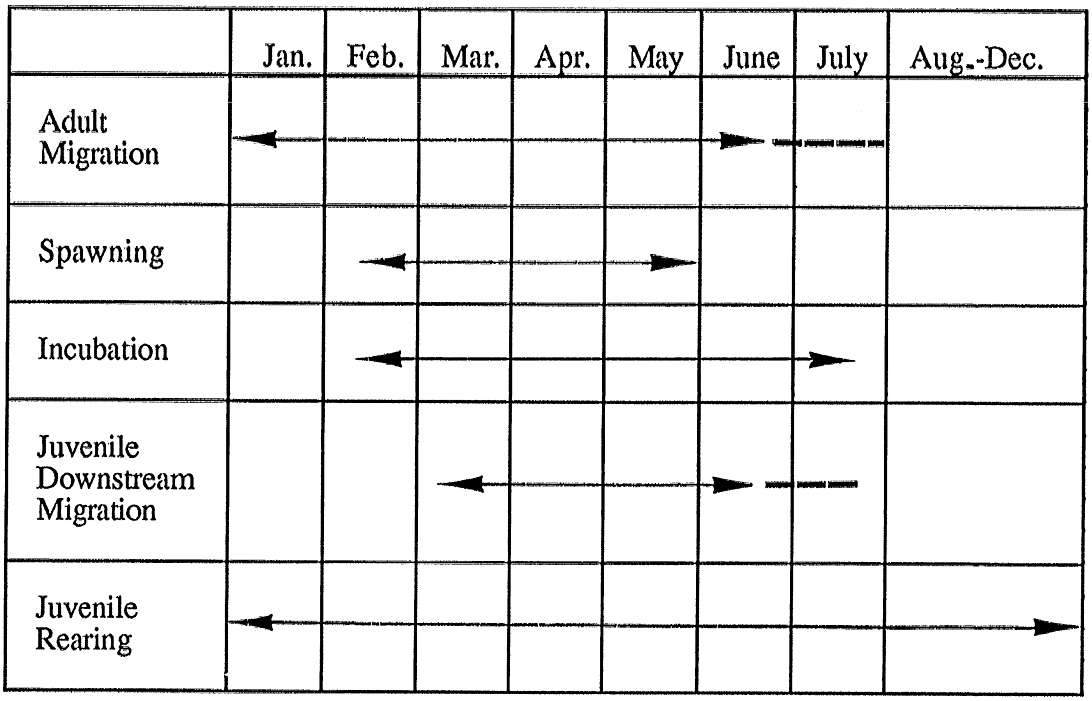


Figure AA-2

LIFE HISTORY OF STEELHEAD, TROUT CREEK

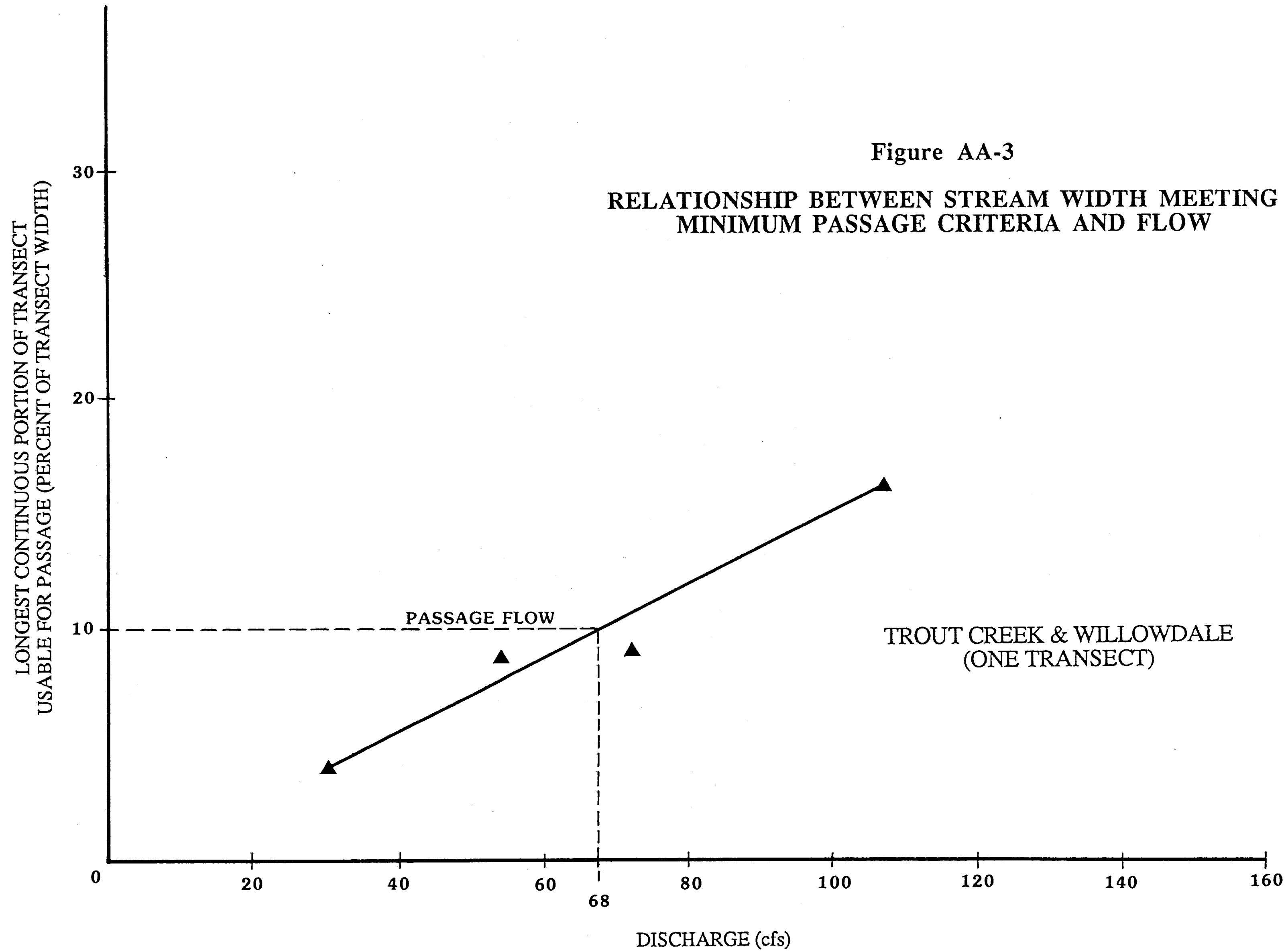
The dashed lines indicated that downstream migration of both juveniles and spent adults may protract into summer if flows permit. The stream calendar determines which biological functions must be served by minimum flow requirements for any time period.

PASSAGE

The gravel bar most limiting upstream fish passage was examined at flows ranging from approximately 30 cfs to 105 cfs. The longest continuous section of transect meeting passage criteria at each flow was measured and evaluated as percent of total stream width. These data were plotted against corresponding streamflows (Figure AA-3). The minimum passage flow (67 cfs) was determined from this relationship as the least flow which would meet passage criteria over a continuous section of streambed representing 10% of total stream width.

Figure AA-3

RELATIONSHIP BETWEEN STREAM WIDTH MEETING MINIMUM PASSAGE CRITERIA AND FLOW



SPAWNING

Three gravel bars representative of spawning habitat within the stream were selected. Transects were established across each bar, and water depth and velocity profiles were measured at these transects for twelve flows ranging from 30-140 cfs. The percent of stream width meeting depth and velocity criteria for spawning was determined for each flow. Results for the three transects were averaged. These results were plotted against flow (Figure AA-4). From this rela-tionship, the optimum spawning flow, or the flow which provides the maximum possible amount of spawning area meeting depth and velocity criteria, was estimated at 105 cfs. The minimum spawning flow was estimated from inspection of the graph as 73 cfs.

INCUBATION

Minimum incubation flow was determined at two-thirds of minimum spawning flow, or 48 cfs.

REARING

Three representative riffle areas were selected, and transects established across each riffle. The mean water velocity at each transect was determined for each of ten flows ranging from 10-100 cfs. The result for each flow were averaged for the three transects. These data were plotted against corresponding flows (FigureAA-5). The optimum (or maximum) rearing flow was estimated as that flow (33 cfs) which would provide a mean riffle velocity of 1.4 fps. The minimum rearing flow (25 cfs) was estimated as that flow which would provide a mean riffle veloc-ity of 1.2 fps.

FINAL ANALYSIS

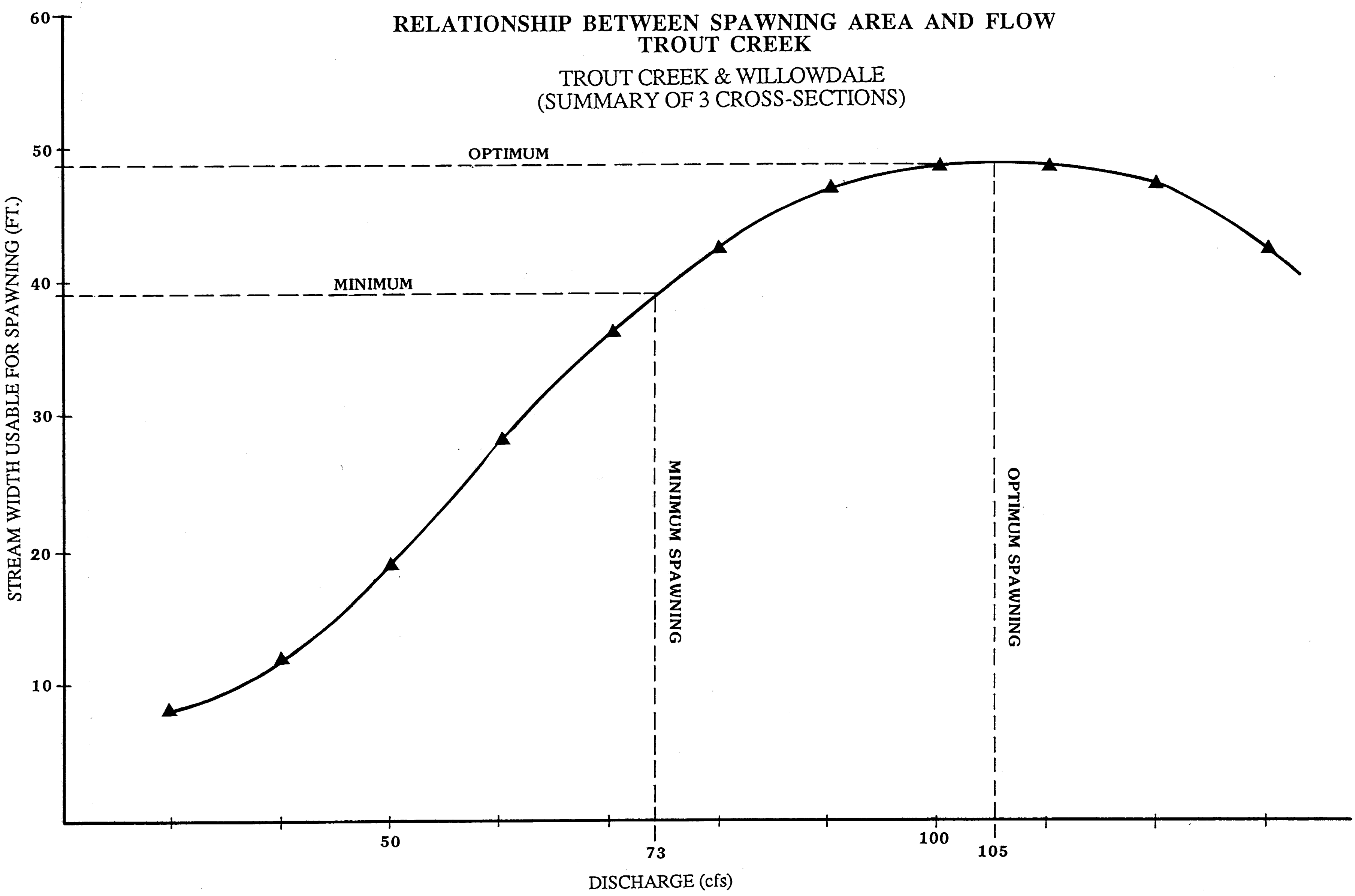
Collecting data of the stream calendar and the separate minimum flow analyses, we obtain the following recommended minimum streamflow regimen for Trout Creek at Willowdale:

Date	cfs	Purpose
Jan. 1-Feb. 15	67	Upstream steelhead migration, juvenile rearing
Feb. 16-May 31	73	Steelhead spawning, adult upstream and down-stream migration, egg incubation and intra-gravel development of fry, juvenile rearing.
June 1-July 15	67	Adult and juvenile downstream migration, egg incubation and intra-gravel development of fry, juvenile rearing.
July 16-Dec. 31		Juvenile rearing.

Figure AA-4

RELATIONSHIP BETWEEN SPAWNING AREA AND FLOW TROUT CREEK

TROUT CREEK & WILLOWDALE
(SUMMARY OF 3 CROSS-SECTIONS)



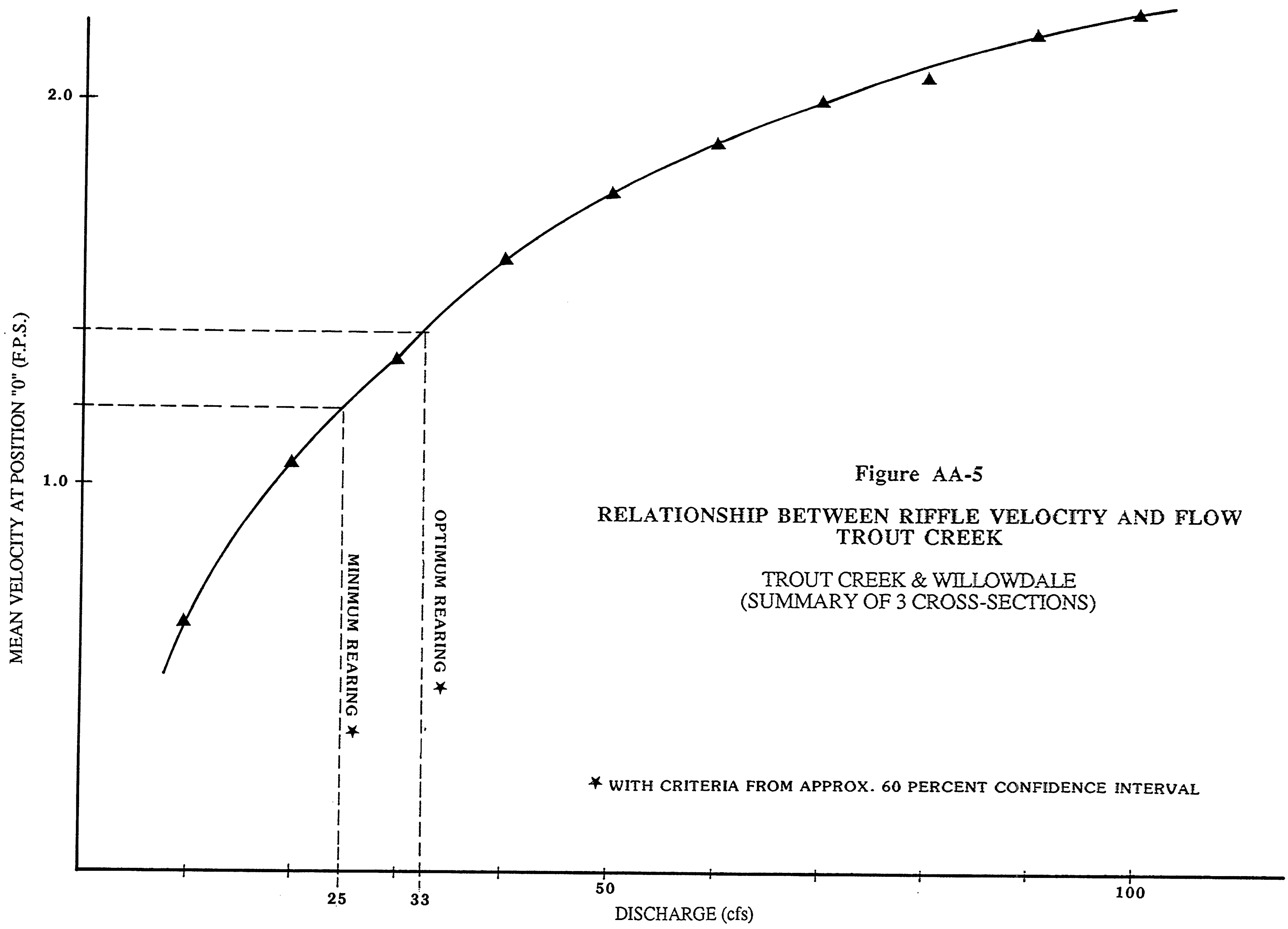


Figure AA-5

RELATIONSHIP BETWEEN RIFFLE VELOCITY AND FLOW
TROUT CREEK

TROUT CREEK & WILLOWDALE
(SUMMARY OF 3 CROSS-SECTIONS)