ESTABLISHMENT REPORT

FLYNN CREEK RESEARCH NATURAL AREA

SIUSLAW NATIONAL FOREST

Prepared by: Art McKee, Dept. of Botany and Plant Pathology,
Oregon State University, Corvallis

Edited by: Jerry Franklin, PNW, Corvallis

Final Draft: Siuslaw National Forest

Recommendation

It is recommended that the Flynn Creek Research Natural Area be established on the lands described in this report.

12/16/75
Date

Submitted: John A. Lindner
Land Use Planning staff

12/19/75
Date

Recommended: F. Dale Robertson
Forest Supervisor
Siuslaw National Forest

6/15/76
Date

Recommended: Robert F. Jaenicke
Director
PNW Experiment Station

6-15-76
Date

Recommended: Robert H. Torheim
for Regional Forester
Region 6

5/23/77
Date

Approved: James G. Smith Jr.
Director
Division of Recreation

5/25/77
Date

Approved: Robert E. Buckman
Deputy Chief
Research

5/26/77
Date

Approved: John R. McGuire
Chief

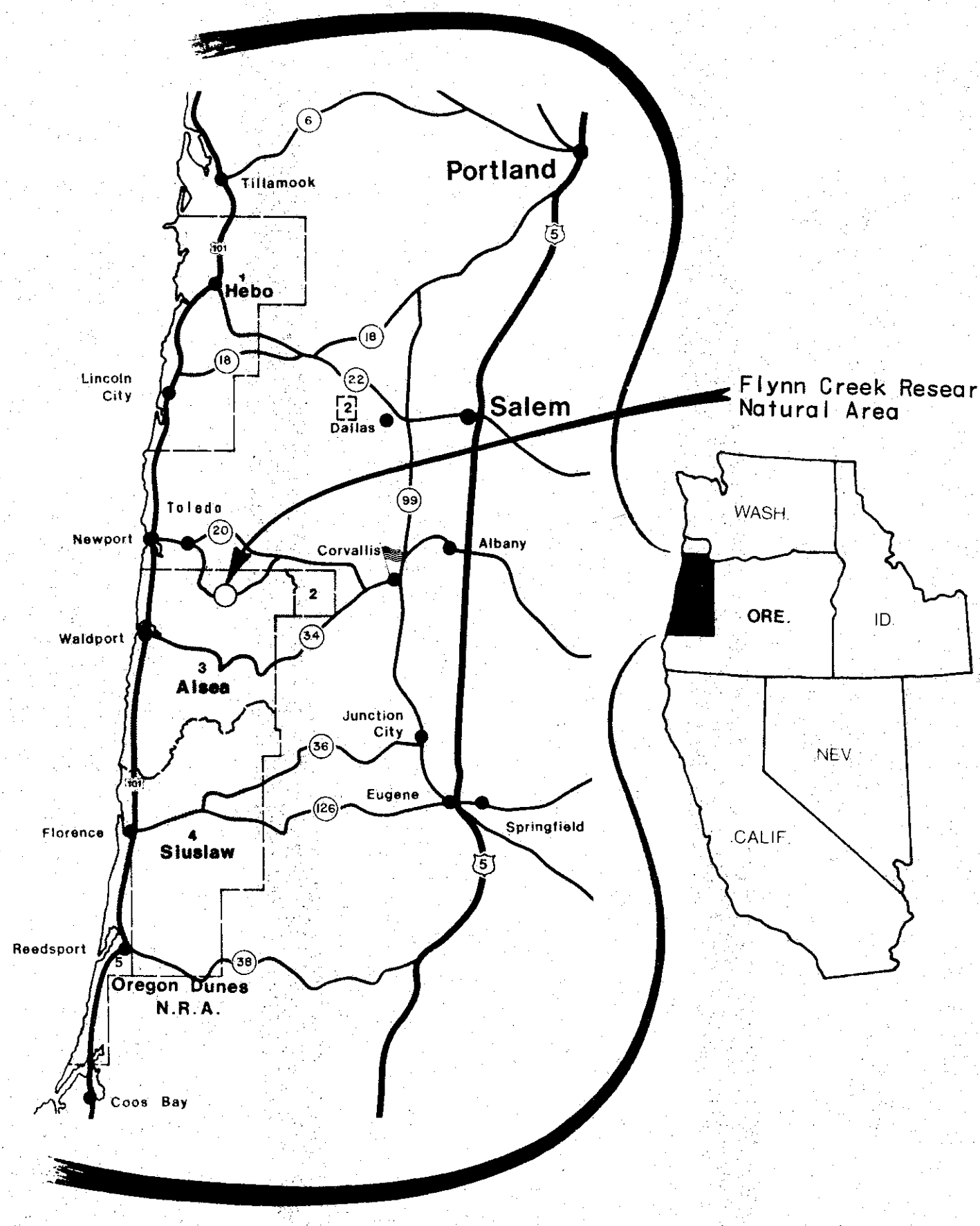
Designation Order

By virtue of the authority vested in me by the Secretary of Agriculture under regulation 36 CFR 251.23, I hereby designate as the Flynn Creek Research Natural Area the lands described in the preceding report by Art McKee, dated November 21, 1975: Said lands shall hereafter be administered as a research natural area subject to the said regulations and instructions thereunder.

June 3, 1977
Date

John R. McGuire
Chief

Orientation Map



ESTABLISHMENT REPORT

FLYNN CREEK RESEARCH NATURAL AREA

SIUSLAW NATIONAL FOREST

Principal Distinguishing Features

Flynn Creek Research Natural Area is a 670-acre tract located on the Western edge of the Oregon Cost Ranges, and includes the entire 560-acre drainage of Flynn Creek. Low elevations (700 to 1,400 feet) and coastal proximity (10 to 12 miles) result in a mild, humid environment on the natural area, and the highly productive stream and forest ecosystems which are present.

The outstanding distinguishing feature of the RNA is the aquatic ecosystem which is a stream that (1) supports good populations of two anadromous fishes (Coho salmon and Coastal cutthroat trout), and (2) is biologically and hydrologically extremely well documented as the control stream for the Alsea Watershed Study. Baseline data from the Flynn Creek drainage now cover 17 years and are reported in the over 85 publications, and theses produced from the study.

The terrestrial communities are distinguished by relatively youthful (125-year old) forests of Douglas-fir (Pseudotsuga menziesii (Mirbel) Franco.) and red alder (Alnus rubra Bong.) which occur in pure stands and in varying mixtures.

Justification

The Flynn Creek Research Natural Area was selected for three reasons: (1) It contains a major, undisturbed inland stream drainage, with an anadromous fish population; (2) it is, and has been, the subject of intensive scientific study; and (3) it contains forests of "second-growth" Douglas-fir. The need for a Research Natural Area representing these aquatic and terrestrial ecosystems is identified in the inter-agency Research Natural Area plan for the Pacific Northwest. 1/ Specifically, Flynn Creek will fill a major aquatic cell -- "Major stream drainage in Douglas-fir, with anadromous fish." 2/ -- and a terrestial cell -- "Douglas-fir/sword fern community, 100-150 years old" -- in the Oregon Coast Ranges. Three rare or endangered animals (red and white-footed voles, and spotted owl) may also be present.

1/ Dyrness, C.T. et. al. 1975. Research Natural Area needs in the Pacific Northwest. U.S. Dept. Agr. For. Service General Tech. Report PNW-38, 231 p.

2/ Cell 2 in Table 42 and Cell 13 in Table 41 of Dyrness et. al., 1975. See also RNA need 2 in Table 46.

There should be little question of the need for natural areas representative of commonly occurring aquatic and terrestrial systems in the Oregon Coast Range. Both fishing and logging are major components of the economic base for the Oregon coastal area. Coho salmon (Oncorhynchus kisutch Walbaum) and cutthroat trout (Salmo clarki Richardson) are important members of the anadromous fish runs of the Coast Range. Douglas-fir is the most important timber species. Presently, there are no natural areas in the Coast Ranges which provide a site for study of the ecology of these two fish species, or of mature Douglas-fir forests under natural conditions. Flynn Creek Research Natural Area contains a watershed with both productive young Douglas-fir forests, and anadromous fish populations, typical of much of the Oregon Coast Range. As such, the Research Natural Area can continue to provide a benchmark against which the short and long-term effects of human activities in similar environments can be evaluated economically and biologically.

The natural area is one of three watersheds in the Drift Creek basin selected for the Alsea Watershed Study. In 1957, following the recommendation by the Governor's Committee on Natural Resources that a study be conducted of the effects of logging on fish habitat, funding was approved. Research began in 1958. The watersheds were: Flynn Creek (560 acres), Deer Creek (750 acres) and Needle Branch Creek (175 acres) (Figure 1). Flynn Creek was left in its natural state as the control watershed. In 1966, 25% of the Deer Creek watershed was clearcut in 3 patch units, and 100% of the Needle Branch Creek watershed was clearcut. The sampling continued until 1973, producing over 85 publications and theses as of October 1975 (Table 1).

In 1973, Dr. James Hall, Professor of Fisheries Science at Oregon State University proposed that the Flynn Creek watershed be considered for Research Natural Area status to ensure inclusion in the system of an undisturbed watershed in the Oregon Coast Range with an anadromous fish population. In December of 1973, the Pacific Northwest Natural Area Committee reviewed the Flynn Creek proposal to prepare a position statement. The Forest examined the positive and negative impacts of the proposed area and recommended establishment of the Flynn Creek Research Natural Area. At the same time the site was evaluated by representatives of the Pacific Northwest Natural Area Committee for suitability to meet terrestrial needs, who concluded that it was representative of coastal Douglas-fir stands 100 to 150 years of age. No alternative areas of equal or superior value for filling either terrestrial or aquatic needs compare, particularly in view of the intensive documented research at Flynn Creek.

The substantial research investment in the Alsea Watershed Study has produced a data base which contributes immeasurably to the value of the Flynn Creek Research Natural Area. A functioning gauging station and fish trap are research installations of continuing value. Accessibility is excellent, with all-weather gravel roads connecting the south, northwest, and northeast boundaries.

The single Douglas-fir stand presently protected in a Research Natural Area in the Coast Range (Cherry Creek Research Natural Area) is old-growth. Flynn Creek Research Natural Area will add a badly needed young Douglas-fir stand, representative soils, and landform to the system.

The Natural Area contains other features which contribute to its value. A substantial portion of the area contains red alder, and mixed alder-conifer stands, which are another important feature of the present coastal forests. The mountain beaver (Aplodontia rufa Rafineque), which is sometimes a troublesome pest in reforestation, is known to occur in substantial numbers on the watershed, especially in the mid-elevation stands of mixed red alder and Douglas-fir. The area will thus provide sites for the study of natural processes in an undisturbed ecosystem which contains several species of commercial importance and an acknowledged pest.

Intense storms strike the Oregon Coast Ranges and are accompanied by southwest winds of gale force. A wind buffer of 110 acres has been incorporated into the Research Natural Area to provide protection for the main Flynn Creek drainage (560 acres) (Figure 2). This protective strip on the southwest, or windward edge of the Research Natural Area is considered essential; if the forest were cut up along the southwest dividing ridge of Flynn Creek, the forests within Flynn Creek could suffer excessive loss to wind throw. Inclusion of the buffer is considered prudent to ensure the integrity of the main drainage. It provides additional Douglas-fir representation as well. Since this stand is on a windward ridgeslope, it should be quite windfirm.

Location

Flynn Creek Research Natural Area lies about 10 air miles from the Oregon coast, southeast of the town of Toledo (Latitude 43°33' North; Longitude 123°55' West) (Figure 1). It includes portions of Sections 1, 2, 11 and 12, T. 12 S., R. 10 W., Willamette Meridian, and lies entirely in lands administered by the Alsea Ranger District, Siuslaw National Forest (Figure 2). The total area covers about 670 acres and contains the complete Flynn Creek watershed (approximately 560 acres). Flynn Creek is one of the tributaries of Drift Creek in the Alsea River basin. There is excellent access to the area on Forest Service roads 128, 1283, and 1291 (Figure 2).

Boundaries

The boundary of Flynn Creek Research Natural Area follows the natural topographic boundaries of the Flynn Creek drainage upstream from its confluence with Meadow Creek. Figure 3 shows the boundary on a contour map. Beginning at the southeast corner of the fish trap, the line extends east to a northward trending ridge, and then ascends the ridge; from there, it extends northeast to a point marking the divide between Flynn and Meadow Creek. From that point, the line proceeds north along the ridge to the northest corner of the watershed. From this point, the line extends west - northwesterly along the ridge which forms the headwall of the watershed to the northwest corner. The line then proceeds south about one kilometer along the ridge separating the Deer Creek and Flynn Creek watersheds to the point at which they diverge.

From the southwest corner of the Flynn Creek Watershed, the line drops down the slope to a tributary of Deer Creek at a bearing of S27°W where a monument is located. Monuments are unpainted reinforced concrete, 3 inches square by 2 feet high. The line then runs over a saddle to the southeast at a bearing of S55°E and descends to an unnamed creek where a monument is located. The boundary follows the stream for approximately 400 m to a major confluence at which a monument is placed. The line then passes over a saddle to the east at a bearing of N75°E, and descends to Meadow Creek where a monument is located. The line then follows the east bank of Meadow Creek north to the fish trap on Flynn Creek.

Physical and Climatic Conditions

The Natural Area occupies the watershed of a southerly flowing stream (Figure 2). Elevations range from 600 to 1400 feet, with the west ridge being about 200 feet higher in elevation than the east (Figure 3). The area is dissected by many small intermittent and perennial streams, as indicated in Figure 3. The relief east of the main stream tends to be steeper than on the west side, although both west and east aspects contain a high proportion of areas with slopes greater than 35 percent (Figure 4).

The climate is mild and humid. Corliss (1973) includes it in the tidewater climatic subarea, which he calls the wettest in the Alsea River basin. Precipitation ranges from 80 to 120 inches per year. Ninety percent of this precipitation occurs from October through May, when 2.5 inches per day is not uncommon. There is little snowfall and no persistent snow. From June through September, the region is generally clear, being too far inland to be affected by coastal fog. Mean daily temperatures range from the mid-sixties in summer to the low forties in the winter. Ocean proximity and high humidity limit diurnal ranges in temperatures to about 15°F in winter and 30°F in summer.

The Natural Area is located entirely on sandstones of the Tyee formation which were deposited under marine conditions in the Eocene. The soils on the site are of the Bohannon - Slickrock association. As Figure 4 shows, the soils in the western portion of the area (east aspect) tend to be Slickrock gravelly loams. The soils on the eastern portion (west aspect) tend to be Bohannon gravelly loams. The Bahonnon series tends to occur on the sites with the severest relief.

The Siuslaw National Forest has rated the soils in the area for stability following road construction and timber cutting. The ratings range from moderate to severe risk of slumping associated with road construction over the entire area (Figure 5). The Slickrock series is particularly unstable on steeper slopes (Corliss, 1973). Although unstable, these soils are reasonably fertile and contribute to the relatively high plant productivity of the site which ranges from high III to high II fir Douglas-fir.

The Aquatic System

The Alsea Watershed Study was established to determine the effects of different logging practices on fish habitat in the Oregon Coast Range. The fifteen years of research on the watersheds for which the Flynn Creek watershed was the control has provided a fine data base for describing the aquatic system.

It is the past research and existing data base which make the Flynn Creek Research Natural Area so outstanding. Table 1 lists all the publications and theses which have resulted from this research (up to October 1975). A quick examination of the titles reveals the diversity of subject matters addressed: effects of logging on coastal stream hydrographic pattern; water quality; stream temperature; dissolved oxygen; sediment production; nutrient losses; aquatic primary production; aquatic insect ecology; and anadromous fish ecology. These papers are categorized by subject matter in Table 2. Given this base, Flynn Creek Research Natural Area should prove particularly valuable as a baseline area, against which the effects of different management practices in the central Oregon Coast Range can be measured.

The Flynn Creek watershed is about 560 acres in size. Mean annual discharge is 4.46 cubic feet per second, with a recorded maximum of 78 cubic feet per second and recorded minima of about 0.1 cubic feet per second. Water temperature varies from the low 40's to the low 60's throughout the year. Total annual sediment yields in tons per square mile vary from 59 to 1,237, with values of 120 to 250 being the most common. There is obviously a great deal of variation in sediment production which is related to winter storm intensities and frequencies.

Three species of fish occur in the natural area. Coho salmon (*Onchorhynchus kisutch* Walbaum) and coastal cutthroat trout (*Salmo clarki* Richardson) are anadromous while the reticulate sculpin (*Cottus perplexus*) tends to remain within the watershed. Representative values for annual production and mean monthly biomass (grams per meter square) for the three species in the Flynn Creek Research Natural Area are:

Species	Annual Production	Mean Monthly Biomass
Reticulate sculpin	2.8 g/m2	3.1 g/m2
Coho salmon	9.8	4.1
Cutthroat trout	4.9	4.8
	17.5	12.0

The reticulate sculpin achieves its maximum biomass in June, its minimum in September. While known to prey on coho salmon fry, it does not appear to exert a major influence on the salmon population. Unlike other sculpins its does not appear to migrate downstream to spawn, but rather tends to remain in a relatively short section of the stream.

The cutthroat trout grows to much larger size than the reticulate sculpin. The population includes both resident and anadromous forms and some which probably are intermediate. Gravid females only 15 centimeters in length and which never left the study area have been observed over redds in the Flynn Creek tributaries. Sea-run females return to spawn between November and January, with the maximum upstream migration generally occurring in December. The cutthroat migrate downstream after one to two years, during the period from February to May. The peak downstream migration occurs during April and May. It appears that the cutthroat redds tend to be in the tributaries of the main stream. No coho salmon juveniles have been observed in the tributaries with the greatest concentration of cutthroat trout fry.

The spawning populations of coho salmon are quite variable. The ratio of males to females remains about 2 to 1, however. The outmigration of smolts is somewhat less variable, but there is some indication that smolt numbers have declined in recent years. The timing of upstream migration coincides with, or lags slightly behind, the cutthroat trout. Some population statistics for coho salmon in Flynn Creek are given below for the period 1959 - 1973.

Category	Mean	Range
Spawning females	17	2-55
Spawning males (including jacks)	37	3-80
Smolts	660	140-1413
Outmigrant fry	8,314	65-30,002

For the year that the juvenile coho remain in Flynn Creek, the population decline follows a reversed J-shaped curved. It appears that the mortality is density dependent, for the smolt output is less variable than the other categories. The coho salmon fry are aggressive and exhibit territorial behavior which would enhance other density dependent mechanisms.

The Terrestrial System

The terrestrial plant communities are dominated by Douglas-fir (Pseudotsuga menziesii [Mirbel] Franco.) and red alder (Alnus rubra Bong.) which vary in mixture from virtually pure stands of one to virtually pure stands of the other. There is a continuous intergradation of communities dominated by one species or the other, making boundary lines between types difficult to map.

In the vegetation type map presented (Figure 6) this intergradation is obscured. Types are defined by overstory dominance (greater than 60% overstory cover). In fact, each of the two major vegetation types contain islands of up to 5 acres in size which would be categorized as the other type with greater sampling resolution. The northwest portion of the tract is more than 80% dominated by Douglas-fir, while the east-central part is predominantly red alder. Along the tributary in the southeastern portion of the natural area, the red alder stands are particularly well developed.

The understory is dominated by salmonberry (Rubus spectabilis Pursh) on the wettest sites and sword fern (Polystichum munitum [Kaulf] Presl) on the upland sites. Vine maple (Acer circinatum Pursh) is distributed relatively evenly over the watershed. Shrub cover varies inversely with overstory density, with the densest shrub cover in the most open red alder stands.

Four very general communities are mapped in Figure 6. These communities are:

Fig. 6 Code	SAF TYPE No. & Name	Dominant Species	Mean Basal Area Ft^2/acre
1.	SAF 229 Pacific Douglas-fir	Douglas-fir	190
2.	SAF 221 Red Alder	Red Alder	140
3.	SAF 221 Red Alder	Red Alder	110

[Meadow-forest mosaic - no data]

Because of the intergradation of overstory dominants over much of the area and the extensive shrub cover, the range in basal area within each type is quite great. Plots in the Douglas-fir type ranged from 80 to 340 square feet per acre. Plots in the red alder dominant type ranged from 40 to 180 square feet per acre. The pure red alder type was more uniform at 80-130 square feet per acre. There are 3 to 5 acre patches scattered along the tributaries with nearly 100 percent salmonberry cover, and overstory basal areas of about 40 square feet per acre. These patches are not mapped. The Douglas-fir vary in height from 140-200 feet, the red alder from 40 to 70 feet tall.

The diameter distribution of the red alder is much more uniform than the Douglas-fir. Overstory red alder diameters generally range from 10 to 30 inches while Douglas-fir diameters range from 10 to 65 inches. The largest red alder stems are found near the tributary bottoms, the largest Douglas-fir occur on upland sites, at about mid-slope.

Shrub cover varies inversely with overstory density. Shrub species composition also shifts with overstory type. The densest shrub cover occurs in open red alder communities on the lower slopes where salmonberry and vine maple form a nearly continuous cover. On upland slopes under a denser overstory canopy, salmonberry cover is about 25% and sword fern (Polystichum munitum [Kaulf] Presl) becomes more important (coverage of 70 to 80 percent). Salmonberry is absent on the driest sites and under the densest Douglas-fir canopies. Red huckleberry (Vaccinium parvifolium Smith) and hazel (Corylus cornuta var. californica Marsh) appear under the upland stands of Douglas-fir and have coverages of 5 to 20 percent.

The herbaceous layer is well developed and composed of species commonly found in Coast Range forests. Wood sorrel (Oxalis oregona Nutt.) and lady fern (Athyrium filix-femina [L.] Roth) are common in the bottoms. Major upland herbs are: twisted stalk (Streptopus amplexifolius [L.] DC.), mianthemum (Maianthemum dilatatum [Wood] Nels. and Mach.), western spring-beauty (Montia siberica [L.] Howell), fragrant bedstraw (Galium

triflorum Michx.), spring queen (Synthyris reniformis [Dougl.] Beath.), bracken (Pteridium aquilinum [L.] Kuhn), and foxglove (Digitalis purpurea L. Robust). Moss cover varies considerably due to microsite differences within each of the different types, but seldom exceeds 20 percent in any area.

Terrestrial Animals

The tentative list of vertebrate species (excluding fish) (Table 3) compiled from observations and from lists made for similar areas in the Oregon Coast Range. For that reason it may include too many species or include species which are extremely rare visitors to the natural area.

There are three mammals which are quite abundant: Roosevelt elk, black-tail deer and mountain beaver. The grazing pressure from these three species is locally quite heavy. The mosaic of meadow and forest on the benchy western portion of the watershed seems particularly heavily grazed by deer and elk. Since the two species selectively avoid bracken (Pteridium aquilinum [L.] Kuhn) and foxglove (Digitalis purpurea L. Robust), the plant species composition of the meadow communities could be shifted in favor of those two species in the future.

Mountain beaver (Aplodontia rufa) are extremely numerous in portions of the natural area. Their burrows are most dense in lush swordfern sites, and are obviously contributing significantly to downslope soil movement on the steeper slopes. The natural area should prove to be ideal for studies of the population dynamics of this species in an undisturbed habitat. The value of such a study should prove to be great, as the species frequently achieves pest status in reforestation projects in the Coast Range.

The terrestrial vertebrates were not studied during the Alsea Watershed Study. The opportunity exists here to describe an entire ecosystem in a more detailed manner than is generally possible. It seems apparent that terrestrial animal studies on the area should be given high priority.

Determination of whether red- and white-footed voles and spotted owls are present in the area will receive high priority due to their rare and endangered status.

Impact on Other Resource Values

The establishment of the Flynn Creek Research Natural Area will have some costs. Adverse impacts from establishment include:

1. Loss of an estimated 27,000 MBF of timber to the economy (total current inventory).

2. Loss of opportunity to increase blacktail deer population due to lack of clearcutting.

3. Increase in logging costs in adjacent areas because of necessary changes in logging methods.

4. Increase in management costs in adjacent areas due to lack of ease of access.

The loss of the timber should have a negligible effect as it represents an extremely small portion of the Siuslaw National Forest resources. The loss in blacktail deer population is offset by the benefits to the elk herd by the maintenance of high quality elk habitat.

Additional benefits accruing from the establishment of the natural area are:

1. The maintenance of optimum quality anadromous fish habitat.

2. The maintenance of high water quality.

3. The minimization of mass soil movement.

The long-term benefits to society by establishment of a benchmark ecosystem in the highly productive coastal forests are manifold. Primarily, it will allow a firmer basis for managerial decisions in the future. This will have significant benefits which can presently only be guessed at.

The chief recreational use of the area in the past has been for hunting. This will not be changed by the alteration in classification.

No mineral explorations are known to have occurred in the natural area. No mineralized bodies are known to exist there. The area will be withdrawn from mineral entry after Research Natural Area establishment.

Protection and Management

The management objective within the research natural area will be to maintain natural conditions for scientific study.

1. Roadside strips. In accordance with Regional Policy, salvage of dead, down or dangerous trees will be allowed along the adjacent roads for 100 feet on either side of the road center line. Only these types of trees will be logged. Logging will be entirely by cable methods using the roads as the landing.

2. The spur (road 1283) along the west ridge will be closed, except for traffic necessary for the management of the Deer Creek Watershed.

3. Maps. The area boundary will be shown on the Planning Unit map for the Alsea Ranger District.

4. Signs. In accordance with R-6 standards, permanent boundary markers (metal signs) will be posted along the boundary of the natural area. The project will be the responsibility of the Alsea Ranger District, and funds for this operation will be requested after formal establishment of the natural area.

5. Public use. No effort will be made to prohibit recreational use unless this conflicts with the research objectives, or its maintenance in a natural state. No commercial ~~use~~ TRAPPING of the area will be allowed, however.

6. Management and Protection. Normal management and protective activity will be the responsibility of the Forest Supervisor. Scientific and educational uses of the area are the responsibilities of the Director of the Pacific Northwest Forest and Range Experiment Station.

TABLE I: PUBLICATIONS AND THESES FROM THE ALSEA WATERSHED STUDY 1/

1960-1975

Publications

1. Brazier, J. R., and G. W. Brown. 1973. Buffer Strips for Stream Temperature Control. Research Paper 15. Forest Res. Laboratory, Oregon State Univ. 9pp.

2. Brown, G. W. 1969. Predicting Temperatures of Small Streams. Water Resources Res. 5(1):68-75.

3. Brown, G. W. 1970. Predicting the Effect of Clearcutting on Stream Temperature. J. Soil and Water Cons. 25(1):11-13.

4. Brown, G. W. 1971. Water Temperature in Small Streams as Influenced by Environmental Factors and Logging. pp 175-181. In: J. T. Krygier and J. D. Hall (eds.), Forest Land Uses and Stream Environment. Oregon State Univ.

5. Brown, G. W. 1972. Effects of Forest Management on Stream Temperature. pp 93-105. In: Proceedings of a Symposium on Interdisciplinary Aspects of Watershed Management. August 3-6, 1970. Montana State Univ. and Amer. Soc. Civil Eng.

6. Brown, G. W. 1972. Logging and Water Quality in the Pacific Northwest. pp 330-334. In: Proceedings of a Symposium on Watersheds in Transition. Colorado State Univ. and Amer. Water Res. Assoc.

7. Brown, G. W. 1972. The Alsea Watershed Study. Loggers Handbook 32:13-15, 127-130.

8. Brown, G. W. 1973. The Impact of Timber Harvest on Soil and Water Resources. Ext. Bull. No. 827. Oregon State Univ. 17 pp.

9. Brown, G. W. 1974. Fish Habitat. pp E1-E15. In: Residue Management in the Pacific Northwest. U.S.D.A. Forest Service, Pac. Northwest Forest and Range Exp. Sta.

10. Brown, G. W., and J. T. Krygier. 1967. Changing Water Temperatures in Small Mountain Streams. J. Soil and Water Cons. 22(6):242-244.

11. Brown, G. W., and J. T. Krygier. 1970. Effects of Clearcutting on Stream Temperature. Water Resources Res. 6(4);1133-1139.

12. Brown, G. W., and J. T. Krygier. 1971. Clearcut Logging and Sediment Production in the Oregon Coast Range. Water Resources Res. 7(5):1189-1198.

13. Brown, G. W., A. R. Gahler, and R. B. Marston. 1973. Nutrient Losses after Clearcut Logging and Slash Burning in the Oregon Coast Range. Water Resources Res. 9(5):1450-1453.

1/ Underlined numbers denote publications with significant information about Flynn Creek Research Natural Area.

14. Campbell, H. J. 1970. Alsea Watershed Study - A Progress Report. pp 172-181. In: Proceedings of the 50th Annual Conf., West. Assn. State Game and Fish Comm.

15. Campbell, H. J. 1971. Economic and Social Significance of Upstream Aquatic Resources on the West Coast. pp 11-19. In: J. T. Krygier and J. D. Hall (eds.), Forest Land Uses and Stream Environment. Oregon State Univ.

16. Chapman, D. W. 1962. Effects of Logging upon Fish Resources of the West Coast. J. Forestry. 60(8):533-537.

17. Chapman, D. W. 1962. Aggressive Behavior in Juvenile Coho Salmon as a cause of Emigration. J. Fish Res. Bd. Canada. 19:1047-1080.

18. Chapman, D. W. 1965. Net Production of Juvenile Coho Salmon in three Oregon Streams. Trans. Am. Fish. Soc. 94(1):40-52.

19. Chapman, D. W. 1966. The Relative Contributions of Aquatic and Terrestrial Primary Producers to the Trophic Relations of Stream Organisms. pp 116-130. In: Pymatuning Laboratory Symposia in Ecology. Univ. of Pittsburgh. Spec. Publ. No. 4.

20. Chapman, D. W., J. F. Corliss, R. W. Phillips, and R. L. Demory. 1961. Alsea Watershed Study - Summary Report. Oregon State Univ. Agric. Exp. Sta. Misc. paper 110. 52 pp.

21. Chapman, D. W., and R. L. Demory. 1963. Seasonal Changes in the Food Ingested by Aquatic Insect Larvae and Nymphs in two Oregon Streams. Ecology 44(1):140-146.

22. Claire, E. W., and R. W. Phillips. 1968. The Stonefly Acroneuria pacifica as a Potential Predator on Salmonid Embryos. Trans. Am. Fish. Soc. 97:50-52.

23. Coble, D. W. 1961. Influence of water exchange and dissolved oxygen in Redds on Survival of Steelhead Trout Embryos. Trans. Am. Fish. Soc. 90(4):469-474.

24. Corliss, J. F. 1973. Soil Survey - Alsea Area, Oregon. U.S.D.A. Soil Convervation Service and Forest Service; U.S.D.I. Bureau of Land Management; Oregon Board of Natural Resources; Oregon Agricultural Experiment Station. A joint publication for sale by the Superintendent of Documents, U.S. Government Printing Office, Wash., D.C.

25. Corliss, J. F., and C. T. Dyrness. 1964. Soil and vegetation survey Alsea Area, Oregon. U.S.D.A. Soils Cons. Service, in cooperation with Oregon State Univ., U.S.D.I. Bureau of Land Management, and U.S.D.A. Forest Service. On file at U.S.F.S. Forestry Sciences Lab. Corvallis, 730 pp.

26. Corliss, J. F., and C. T. Dyrness. 1965. A Detailed Soil-Vegetation Survey of the Alsea Area in the Oregon Coast Range. pp 457-483. In: C. T. Youngberg (ed.) Forest-soil relationships in North America. Oregon State Univ. Press.

27. Hall, J. D. 1968. Effects of Logging on Fish Resources. pp 24-27. In: The Loggers Handbook, Vol. 28. Proceedings of the 58th Pacific Logging Congress.

28. Hall, J. D. 1970. Timber and Fish: Collision or Coexistence? Oregon's Agr. Progr. 16(3):3-12.

29. Hall, J. D., and J. T. Krygier. 1967. Progress Report: Studies on Effects of Watershed Practices on Streams. Report to Federal Water Pollution Control Administration on Research Grant WP-423. Oregon State Univ., Corvallis. 95 pp.

30. Hall, J. D., and H. J. Campbell. 1968. The Effects of Logging on the Habitat of Coho Salmon and Cutthroat Trout in Coastal Streams. pp 5-37. In: Logging and Salmon, the Proceedings of a Forum. Sponsored by the American Institute of Fishery Research Biologists, Alaska District, Juneau, Alaska.

31. Hall, J. D., and R. L. Lantz. 1969. Effects of Logging on the Habitat of Coho Salmon and Cutthroat Trout in Coastal Streams, pp 355-375. In: T. G. Northcote (ed.) H. R. MacMillan Lecture Series - Symposium on Salmon and Trout in Streams. Univ. of British Columbia, Vancouver.

32. Hall, J. D., and T. G. Scott. 1969. Recreational and Esthetic Values of Wildlife in Relation to Forest Management. pp 22-25. In: H. C. Black (ed.). Wildlife and Reforestation in the Pacific Northwest. Oregon State Univ. School of Forestry.

33. Hansmann, E. W., C. B. Lane, and J. D. Hall. 1971. A direct Method of Measuring Benthic Primary Production in Streams. Limnol. Oceanog. 16:822-826.

34. Hansmann, E. W., and H. K. Phinney. 1973. Effects of Logging on Periphyton in Coastal Streams of Oregon. Ecology 54:194-199.

35. Harr, R. D., and J. T. Krygier. 1972. Clearcut Logging and low Flows in Oregon Coastal Watersheds. Research Note 54. School of Forestry, Oregon State Univ. 3 pp.

36. Harr, R. D., w. C. Harper, J. T. Krygier, and F. S. Hsieh. 1975. Changes in Storm Hydrographs after Road Building and Clearcutting in the Oregon Coast Range. Water Resources Res. 11(3):437-444.

37. Harris, D. D., and R. C. Williams. 1971. Streamflow, Sediment Transport, and Water Temperature Characteristics of Three Small Watersheds in the Alsea River Basin, Oregon. Geological Survey Circular 642. 21pp.

38. Harris, D. D. 1973. Hydrologic Changes After Clear-cut Logging in a Small Oregon Coastal Watershed. J. Research U.S. Geol. Survey 1(4):487-491.

39. Iwanaga, P. M., and J. D. Hall. 1973. Effects of Logging on Growth of Juvenile Coho Salmon. Report EPA-R3-73-006 Ecological Research Series, U.S. Environmental Protection Agency. 35 pp.

40. Krygier, J. T., and J. D. Hall (eds.). 1971. Forest Land Uses and Stream Environment. Proceedings of a Symposium, October 1970. Oregon State Univ. Continuing Education Public. 252pp.

41. Lantz, R. L. 1967. An ecological Study of the Effects of Logging on Salmonids. Proceedings 47th Annual Conference, Western Assn. State Game and Fish Commissioners, Honolulu, Hawaii. pp 323-335.

42. Lantz, R. L. 1970. Effects of Logging on Aquatic Resources. pp 13-16. In: H. J. Rayner, H. J. Campbell, and W. C. Lightfoot (eds.). Progress in Game and Sport Fishery Research ... 1964-69. Oregon State Game Commission, Research Division, Corvallis.

43. Lantz, R. L. 1971. Guidelines for Stream Protection in Logging operations. Oregon State Game Commission, Research Division. 29 pp.

44. Lantz, R. L. 1971. Influence of Water Temperature on Fish Survival, Growth and Behavior. pp 182-193. In: J. T. Krygier and J. D. Hall (eds.). Forest Land Uses and Stream Environment. Oregon State Univ.

45. Lowry, G. R. 1964. Some Ways of Increasing the Utility of a Back-pan Fish Shocker. Prog. Fish-Cult. 26:127-130.

46. Lowry, G. R. 1965. Movement of Cutthroat Trout, Samo clarki clarki (Richardson), in Three Oregon Coastal Streams. Trans. Am. Fish. Soc. 94:334-338.

47. Lowry, G. R. 1966. Production and Food of Cutthroat Trout in Three Oregon Coastal Streams. J. wildl. Manage. 30:754-767.

48. Marston, R. B., R. M. Tyo, and S. C. Middendorff. 1969. Endrin in Water from Treated Douglas-fir Seed. Pesticides Monitoring Journal 2(4):167-171.

49. Mason, J. C., and J. L. Fessler. 1966. A Simple Apparatus for the Incubation of Salmonid Embryos at Controlled Levels of Temperature, Water Flow and Dissolved oxygen. Prog. Fish. Cult. 28 (3):171-174.

50. Moore, D. G., J. D. Hall, and W. L. Hug. 1974. Endrin in Forest Streams after Aerial Seeding with Endring-coated Douglas-fir Seed. U.S.D.A. For. Serv. Res. Note PNW-219. Pac. Northwest For. and Range Exp. Stn., Portland, Oregon. 14 pp.

51. Moring, J. R., and R. L. Lantz. 1974. Immediate Effects of Logging on the Freshwater Environment of Salmonids. Final Report AFS 58. Oregon Wildlife Comm., Portland. 101 pp.

52. Moring, J. R., and R. L. Lantz. 1975. The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon. Part 1 - Biological Studies. Oregon Dept. Fish and Wildl., Fish. Red. Rept. No. 9 (part 1): in press.

53. Moring, J. R. 1975. The Alsea Watershed Study: Effects of Logging on the Aquatic Resources of Three Headwater Streams of the Alsea River, Oregon. Part II - Changes in Environmental Conditions. Oregon Dept. Fish and Wildl., Fish. Res. Rept. No. 9 (part 2): in press.

54. Moring, J. R. 1975. the Alsea Watershed Study: Effects of logging on the Aquatic Resources of Three Headwaters of the Alsea River, Oregon. Part III - Discussion and recommendations. Oregon Dept. Fish and Wildl., Fish. Res. Dept. No. 9 (part 3): in press.

55. Oregon State Game Commission. 1963. Annual Report. Division of Wildlife Research, Portland. pp 105-122.

56. Phillips, R. W. 1964. The Influence of Gravel Size on Survival to Emergence of Coho Salmon and Steelhead Trout. In: Proceedings of the Fifteenth Northwest Fish Culture Conference, Oregon State Univ., Corvallis, Oregon.

57. Phillips, R. W. 1965. Effects of Fine Materials on Salmon and Trout Redds. pp 59-61. In: Proceedings of Meeting on Erosion and Sedimentation in the Northwest, 1964-65 Flood Season. U.S. Dept. of Agric., soil Conservation Service, Portland, Oregon.

58. Phillips, R. W. 1966. A Trap for Capturing Salmonids Emerging from Spawning Gravel. Progressive Fish Culturist. 28(2):107.

59. Phillips, R. W., and H. J. Campbell. 1962. The Embryonic Survival of Coho Salmon and Steelhead Trout as Influenced by some Environmental Conditions in Gravel Beds. Fourteenth Annual Report of the Pacific Marine Fisheries Commission for the year 1961. pp 60-73.

60. Phillips, R. W., and E. W. Claire. 1966. Intragravel Movement of the Reticulate Sculpin (Cottus perplexus) and its Potential as a Predator on Salmonid Eggs. Trans. Amer. Fish. Soc. 95(2):210-212.

61. Phillips, R. W., H. J. Campbell, W. L. Hug, and E. W. Claire. 1966. A study of the Effects of Logging on Aquatic Resources, a Progress Report, 1960-66. Progress Memorandum, Fisheries No. 3. Oregon State Game Comm., Res. Division. 28 pp.

62. Phillips, R. W., and K. V. Koski. 1969. A Fly Trap Method for Estimating Salmonid Survival from Egg Deposition to Fry Emergence. J. Fish. Res. Bd. Canada. 26(1):133-141.

63. Phillips, R. W., R. L. Lantz, E. W. Claire, and J. R. Moring. 1975. Some Effects of Gravel Mixtures on Emergence of Coho Salmon and Steelhead Trout. Trans. Amer. Fish. Soc. 104(3): (in press).

64. Ponce, S. L. 1974. The Biochemical Oxygen Demand of Finely Divided Logging Debris in Stream Water. Water Resources Res. 10:983-988.

65. Ponce, S. L., and G. W. Brown. 1974. Demand for Dissolved Oxygen Exerted by Finely Divided Logging Debris in Streams. Forest Research Lab., Oregon State Univ. Res. Pap. Forest Research Lab., Oregon State Unive. Res. Pap. 19. 10 pp.

66. Ringler, N. H., and J. D. Hall. 1975. Effects of Logging on Water Temperature and Dissolved Oxygen in Spawning Beds. Trans. Am. Fish. Soc. 103:111-121.

67. Williams, R. C. 1964. Sedimentation in three small Forested Drainage Basins in the Alsea River Basin, Oregon. U.S. Geological Survey. Circular 490. 16 pp.

Theses

68. Au, D. W. K. 1972. Population Dynamics of the Coho Salmon and its Response to Logging in Three Coastal Streams. Ph.D. Thesis, Oregon State Univ. 245 pp. (Dept. of Fisheries & Wildlife).

69. Berry, J. D. 1975. Modeling the Impact of Logging Debris on the Dissolved Oxygen Balance of Small Mountain Streams. M. S. Thesis. Oregon State Univ. 163 pp. (Dept. of Forest Engineering).

70. Brazier, Jon R. 1973. Controlling Water Temperatures with Buffer Strips. M. S. Thesis. Oregon State Univ. 65 pp. (Dept. of Forest Engineering).

71. Brown, George W. 1967. Temperature Prediction Using Energy Techniques on Small Mountain Streams. Ph.D. Thesis, Oregon State Univ. 120 pp. (Dept. of Forest Management).

72. Chapman, Donald W. 1961. Factors Determining Production of Coho Salmon, Onchorhynchus kisutch, in Three Oregon Streams. Ph.D. Thesis, Oregon State Univ. 214 pp. (Dept. of Fisheries & Wildlife).

73. Coble, Daniel W. 1960. The Influence of Environmental Conditions in Redds on the Survival of Salmonid Embryos. M.S. Thesis, Oregon State Univ. 37 pp. (Dept. of Fisheries & Wildlife).

74. Demory, Robert L. 1961. Foods of Juvenile Coho Salmon and two Insect Groups in the Coho Diet in three Tributaries of the Alsea River, Oregon. M.S. Thesis, Oregon State Univ. 68 pp. (Dept. of Fisheries & Wildlife).

75. Garvin, W. F. 1975. The Intrusion of Logging Debris in Artificial Streambeds. M.S. Thesis. Oregon State Univ. 79 pp. (Dept of Forest Engineering).

76. Gilleran, Dennis J. 1968. Rapid Calibration of Coastal Streams to Detect Effects of Road Building. M.S. Thesis, Oregon State Univ. 51 pp. (Dept. of Forest Management).

77. Hansmann, Eugene W. 1969. The Effects of Logging on Periphyton Communities of Coastal Streams. Ph.D. Thesis, Oregon State Univ. 120 pp. (Dept. of Botany).

78. Harper, Warren C. 1969. Changes in Storm Hydrographs due to Clear-cut Logging of Coastal Watersheds. M.S. Thesis, Oregon State Univ. 116 pp. (Dept. of Forest Management).

79. Holtje, R. K. 1971. Reaeration in Small Mountain Streams. Ph.D. Thesis. Oregon State Univ. (Dept. of Forest Engineering).

80. Hsieh, F. S. 1970. Storm Runoff Response from Roadbuilding and Logging on Small watersheds in the Oregon Coast Range. M.S. Thesis Oregon State Univ. 147 pp. (Dept. of Civil Engineering).

81. Iwanaga, Paul M. 1971. Effects of Logging on the Growth of Juvenile Coho Salmon. M.S. Thesis, Oregon State Univ. 44 pp. (Dept of Fisheries and Wildlife).

82. Kelly, Gerald D. 1968. A Comparison of Several Methods for Erosion Measurement on cut and Fill Slopes of a Logging Road in the Oregon Coast Range. M.S. Thesis, Oregon State Univ. 114 pp. (Dept. of Forest Management).

83. Koski, K. Victor. 1966. The Survival of Coho Salmon (Oncorhynchus kisutch) from Egg Deposition to Emergence in Three Oregon Coastal Streams. M.S. Thesis, Oregon State Univ. 84 pp. (Dept. of Fisheries and Wildlife).

84. Krohn, David C. 1968. Production of the Reticulate Sculpin (Cottus perplexus) and its Predation on Salmon Fry in Three Oregon Streams. M.S. Thesis, Oregon State Univ. 78 pp. (Dept. of Fisheries and Wildlife).

85. Lane, Charles B. 1965. Metabolism of Periphyton Communities in two Small Streams. M.C. Thesis, Oregon State Univ. 57 pp. (Dept of Fisheries and Wildlife).

86. Lindsay, Robert B. 1975. Distribution and Survival of Coho Salmon Fry after Emigration from Natal Streams. M.S. Thesis, Oregon State Univ, 41 pp. (Dept. of Fisheries and Widlife).

87. Lowry, Gerald R. 1964. Net production, movement, and food of Cutthroat Trout (Salmo clarki clarki, Richardson) in Three Oregon Coastal Streams. M.S. Thesis, Oregon State Univ. 72 pp. (Dept. of Fisheries and Wildlife).

88. Ponce, S. L. 1974. The Biochemical Oxygen Demand of Douglas-fir Needles and Twigs, Western Hemlock Needles, and red Alder Leaves in Stream Water. M.S. Thesis, Oregon State Univ. 141 pp. (Dept. of Forest Engineering).

89. Ringler, Neil H. 1970. Effects of Logging on the Spawning bed Environment in two Oregon Coastal Streams. M.S. Thesis, Oregon State Univ. 96 pp. (Dept. of Fisheries and Wildlife).

Table 2

Publications and Theses from the Alsea Watershed Study
for which the Flynn Creek Basin was the Control Watershed

(Categorized according to general subject matter. Generally, these deal with the effects of logging and other management practices. The numbers refer to the order listed in Table 1).

Hydrographic Patterns

35, 36, 37, 38, 76, 78, 80

Water Quality (General)

6, 7, 8, 14, 15, 20, 28, 29, 40, 42, 43, 51, 52, 53, 54, 61, 75, 89

Stream Temperatures

1, 2, 3, 4, 5, 10, 11, 37, 44, 49, 53, 66, 70, 71

Dissolved Oxygen

23, 48, 53, 64, 65, 66, 69, 79, 88

Sediment Production/Load

12, 13, 37, 56, 57, 67, 75, 82

Nutrient Losses

13

Pesticide Distribution

48, 50

Aquatic Primary Production

19, 33, 34, 47, 77, 85

Aquatic Insect Ecology

19, 21, 22, 47, 74, 87

Anadromous Fish Ecology

9, 15, 16, 17, 18, 19, 23, 27, 28, 29 30, 31, 39, 41, 42, 44, 45, 46, 47, 49, 51, 52, 54, 56, 57, 58, 59, 60, 61, 62, 63, 68, 72, 73, 74, 75, 81, 83, 84, 86, 87, 89

TABLE 3

Tentative List of Vertebrate Species for the Flynn Creek Research Area
(Compiled from lists given for similar habitats in the Oregon Coast Range.)

AMPHIBIANS 1/	
Northwestern salamander	(Ambystoma gracile [Baird])
Pacific giant salamander	(Dicamptodon ensatus [Eschscholtz])
Rough-skinned newt	(Taricha granulosa [Skilton])
Dunn salamander	(Plethodon dunni [Bishop])
Western red-backed salamander	(Plethodon vehiculum [Cooper])
Oregon salamander	(Ensatina eschsoltzi [Gray])
Tailed frog	(Ascaphus truei [Steineger])
Pacific tree frog	(Hyla regilla [Baird & Girard])
Red-legged frog	(Rana aurora [Baird & Girard])
REPTILES 1/	
Northwestern garter snake	(Thamnophis ordinoides [Baird & Girard])
Common garter snake	(Thamnophis sirtalis [Hallowell])
BIRDS 2/	
Great blue heron	(Ardea herodias [Linnaeus])
Green heron	(Butorides virescens [Linnaeus])
Turkey vulture	(Cathartes aura [Linnaeus])
Wood duck	(Aix sponsa [Linnaeus])
Goshawk	(Accipiter gentilis [Linnaeus])
Sharp-shinned hawk	(Accipiter striatus [Vieillot])
Red-tailed hawk	(Buteo jamaicensis [Gmelin])
Blue grouse	(Dendragapus obscurus [Say])
Ruffed grouse	(Bonasa umbellus [Linnaeus])
Band-tailed pigeon	(Columba fasciata [Say])
Barn owl	(Tyto alba [Scopoli])
Great horned owl	(Bubo virginianus [Gmelin])
Long-eared owl	(Asio otus [Linnaeus])
Saw-whet owl	(Aegolius acadicus [Gmelin])
Screech owl	(Otus asio [Linnaeus])
Pygmy owl	(Glaucidium gnoma [Wagler])
Rufous hummingbird	(Selasphorus rufus [Gmelin])
Common nighthawk	(Chordeiles minor [Forster])
Vaux's swift	(Chaetura vauxi [J. K. Townsend])
Downy woodpecker	(Dendrocopos pubescens [Linnaeus])
Red-shafted flicker	(Colaptes cafer [Gmelin])
Pileated woodpecker	(Dryocopus pileatus [Linnaeus])
Lewis' woodpecker	(Asyndesmus lewis [Gray])
Red-breasted sapsucker	(Sphyrapicus varius [Linnaeus])
Hairy woodpecker	(Dendrocopos villosus [Linnaeus])
Traill's flycatcher	(Empidonax traillii [Audubon])
Hammond's flycatcher	(Empidonax hammondii [Xantus])
Western flycatcher	(Empidonax difficilis [Baird])
Western wood pewee	(Contopus sordidulus [Swainson])
Olive-sided flycatcher	(Nuttallornis borealis [Swainson])
Tree swallow	(Iridoprocne bicolor [Vieillat])
Common crow	(Corvus brachyrhynchos [Brehm])
Common raven	(Corvus corax [Linnaeus])

BIRDS (Continued)

Steller's jay	(Cyanocitta stelleri [Gmelin])
Common bushtit	(Psaltriparus minimus [J. K. Townsend])
Black-capped chieckadee	(Parus atricapillus [Linnaeus])
Mountain chickadee	(Parus gambeli [Ridgway])
Chestnut-backed chickadee	(Parus rufescens [J. K. Townsend])
Brown creeper	(Certhia familiaris [Linnaeus])
White-breasted nuthatch	(Sitta carolinensis [Latham])
Red-breasted nuthatch	(Sitta canadensis [Linnaeus])
Dipper	(Cinclus mexicanus [Swainson])
Winter wren	(Troglodytes troglodytes [Linnaeus])
Townsend's solitaire	(Myadestes townsendi [Audubon])
Robin	(Turdus migratorius [Linnaeus])
Varied thrush	(Ixoreus naevius [Gmelin])
Hermit thrush	(Hylocichla guttata [Palles])
Swainson's thrush	(Hylocichla ustulata [Nuttall])
Cedar waxwing	(Bombycilla cedrorum [Vieillot])
Bohemian waxwing	(Bombycilla garrula [Reichennaw])
Hutton's vireo	(Vireo huttoni [Cassin])
Solitary vireo	(Vireo solitarius [Xantus])
Orange-crowned warbler	(Vermivora celata [Ridgway])
Myrtle warbler	(Dendroica coronata [Linnaeus])
Audubon's warbler	(Dendroica auduboni [Townsend])
Townsend's warbler	(Dendroica townsendi [Townsend])
Hermit warbler	(Dendroica occidentalis [Townsend])
MacGillivray's warbler	(Oporornis tolmiei [Townsend])
Wilson's warbler	(Wilsonia pusilla [Wilson])
Western tanager	(Piranga ludoviciana [Wilson])
Black-headed grosbeak	(Pheucticus melanocephalus [Audubon]
Evening grosbeak	(Hesperiphona vespertina [Grinnell])
Purple finch	(Carpodacus purpureus [Baird])
House finch	(Carpodacus mexicanus [Say])
Pine siskin	(Spinus pinus [Wilson])
American goldfinch	(Spinus tristis [van Rossem])
Red crossbill	(Loxia curvirostra [Brehm])
Rufous-sided towhee	(Pipilo erythrophtalmus [Bell])
Chipping sparrow	(Spizella passerina [Coves])
Golden-crowned sparrow	(Zonotrichia atricapilla [Bmelin])
Fox sparrow	(Passerella iliaca [Merrem])
Oregon junco	(Junco oreganus [Townsend])
Song sparrow	(Melospiza melodia [Wilson])

MAMMALS 3/

Yaquina shrew	(Sorex yaquinae [Jackson]
Marsh shrew	(Sorex bendirii [Merriam])
Trowbridge shrew	(Sorex trowbridgii [Baird])
Shrew-mole	(Neurotrichus gibbsi [Baird])
Coast mole	(Scapanus orarius [True])
Little brown bat	(Myotis lucifugus [LeConte])
Long-legged bat	(Myotis volans [H. Allen])

MAMMALS (Continued)

Silver-haired bat	(Lasionycteris noctivagans [Le Conte])
Big brown bat	(Eptesicus fuscus [Palisot de Beauvois])
Hoary bat	(Lasiurus cinereus [Palisot de Beauvois])
Brush rabbit	(Sylvilagus bachmani [Waterhouse])
Snowshoe hare	(Lepus americanus [Erkleben])
Mountain beaver	(Aplodontia rufa [Rafineque])
Townsend chipmunk	(Eutamias townsendi [Bachman])
Chickaree (Douglas squirrel)	(Tamiasciurus douglasi [Bachman])
Northern flying squirred	(Glaucomys sabrinus [Shaw])
Deer mouse	(Peromyscus maniculatus [Wagner])
Bushy-tailed woodrat	(Neotoma cinerea [Ord])
California red-backed vole	(Clethrionomys californicus [Merriam])
White footed vole	(Arborimus albipes [Merriam])
Red tree vole (mouse) w/Phenacomys	(Arborimus longicaudus [True])
Oregon vole	(Microtus oregoni [Bachman])
Pacific jumping mouse	(Zapus trinotatus [Rhodes])
Coyote	(Canis latrans [Say])
Black bear	(Ursus americanus [Pallas])
Raccoon	(Procyon lotor [Linnaeus])
Long-tailed weasel	(Mustela frenata [Lichtenstein])
Short-tailed weasel (ermine)	(Mustela erminea [Linnaeus])
Mink	(Mustela vison [Scherber])
Spotted skunk	(Spilogale putorius [Linnaeus])
Striped skunk	(Mephitis mephitis [Schreber])
Bobcat	(Lynx rufus [Schreber])
Blacktail deer	(Odocoileus hemionus var. columbianus [Richardson])
Roosevelt elk	(Cervus canadensis var. roosevelti [Merriam])

Sources:

1/ Schmidt, K. P. 1953. A Check List of North American Amphibians and Reptiles.

2/ Jewett, S. G., W. A. Taylor, W. T. Shaw, and J. W. Aldrich. 1953. Birds of Washington State. Univ. of Wash. Press.

Johnsgard, P. A. 1975. Waterfowl of North America. Univ. Indiana Press.

Pough, R. 1957. Audubon Western Bird Guide.

3/ Hall, E. R. and K. R. Kelson. 1959. Mammals of North America. Ronald Press Co., N.Y.

Ingles, L. G. 1967. Mammals of the Pacific States. Stanford Univ. Press. Stanford, Calif.

Maser, C. and R. M. Storm. 1970. A Key to Microtinae of the Pacific Northwest. Oregon State Univ. Bookstore.

ALSEA WATERSHED STUDY

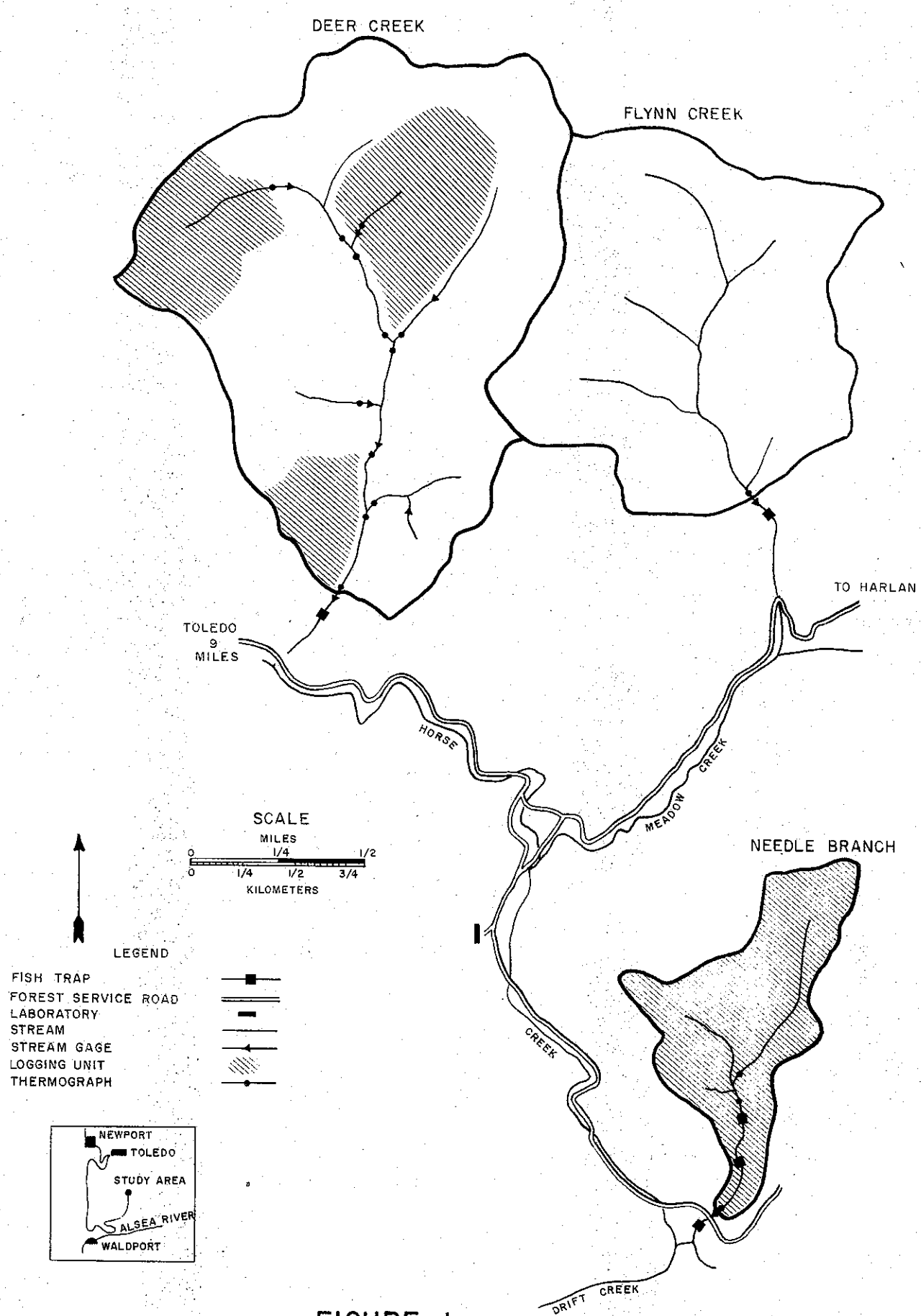


FIGURE 1

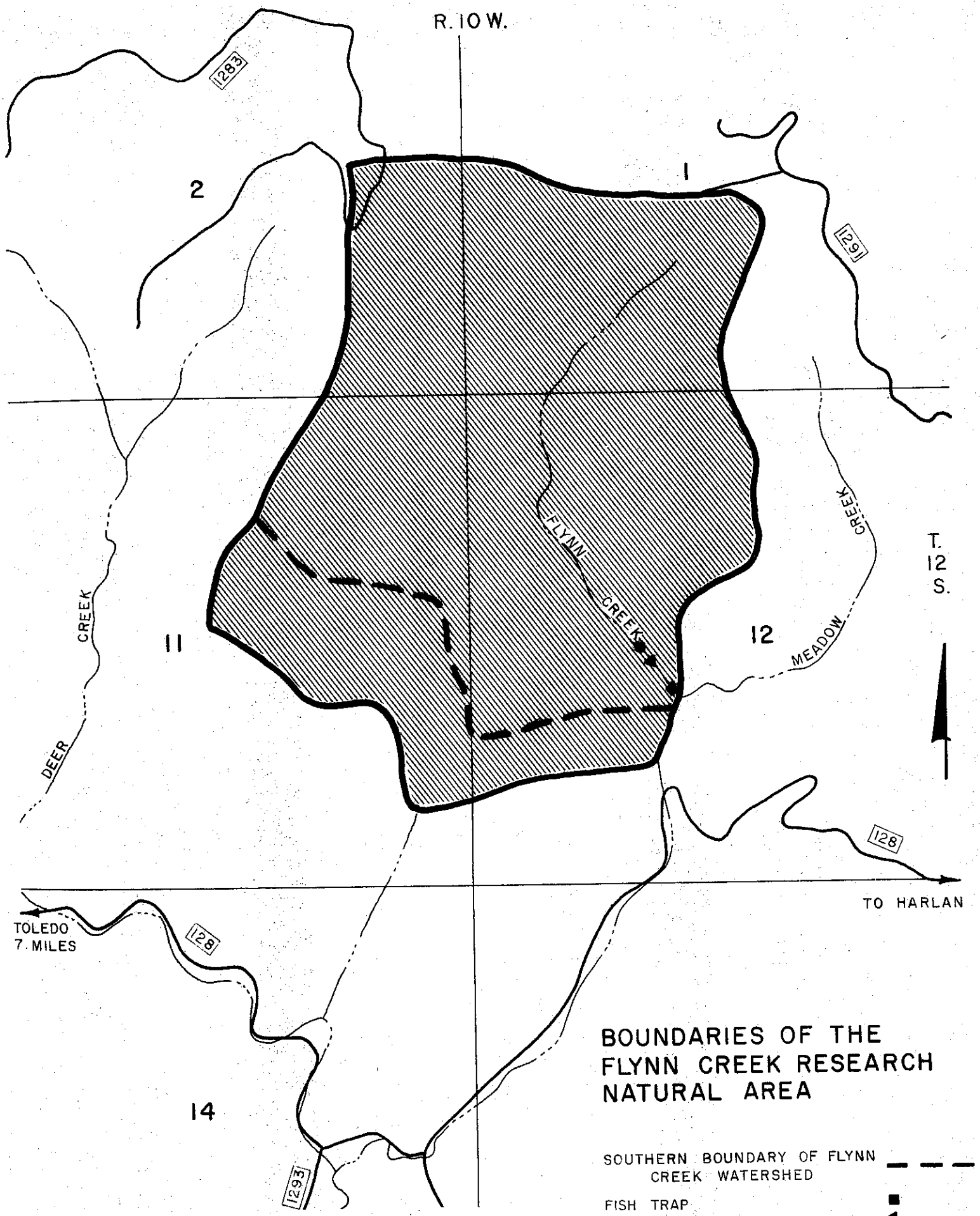
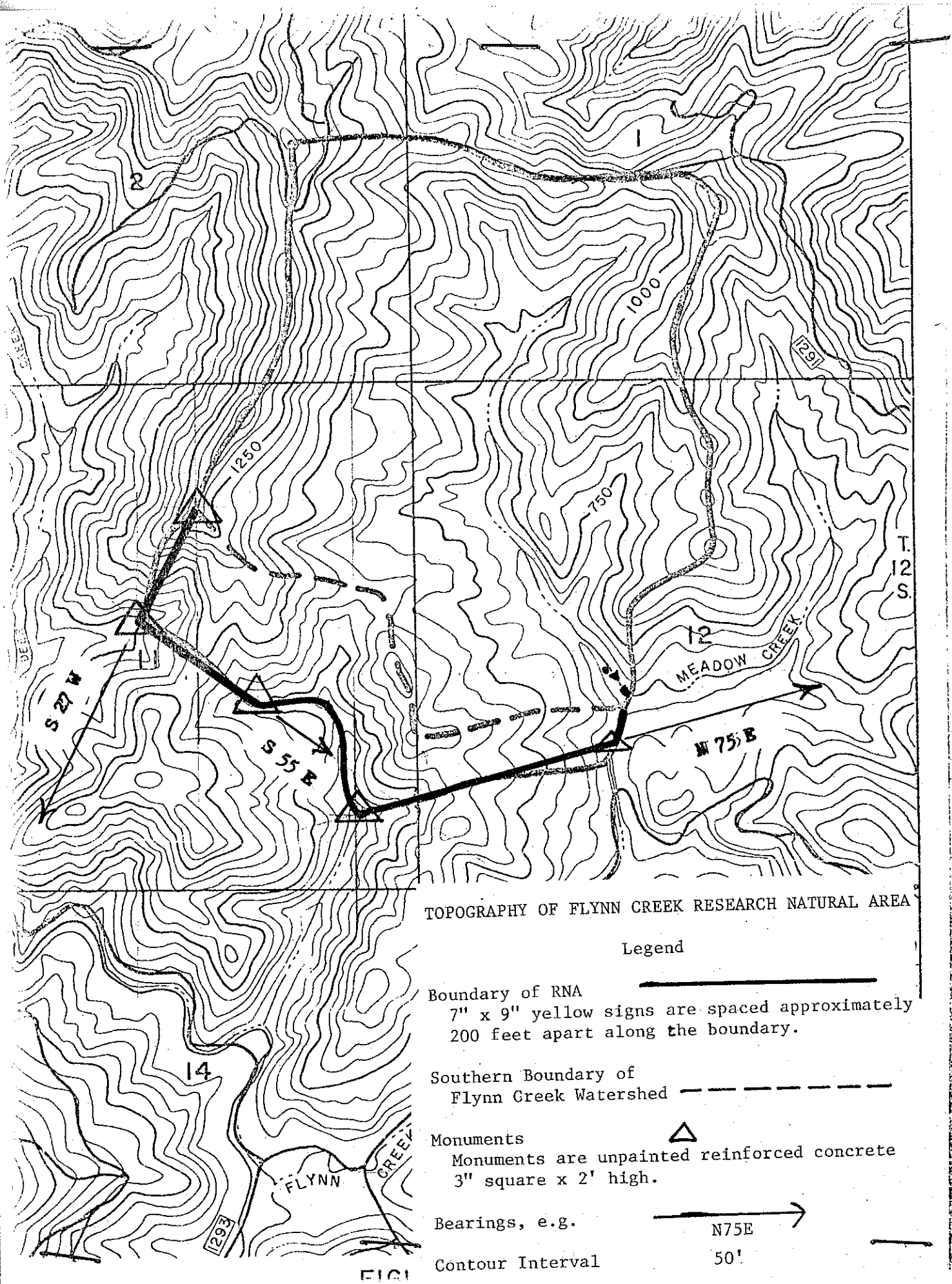

R. 10 W.
T. 12 S.
1
2
11
12
14
1283
1291
1293
128
FLYNN CREEK
DEER CREEK
MEADOW CREEK
TOLEDO 7 MILES
TO HARLAN
BOUNDARIES OF THE FLYNN CREEK RESEARCH NATURAL AREA
SOUTHERN BOUNDARY OF FLYNN CREEK WATERSHED
FISH TRAP
STREAM GAGE
THERMOGRAPH

FIGURE 2



TOPOGRAPHY OF FLYNN CREEK RESEARCH NATURAL AREA

Legend

Boundary of RNA
7" x 9" yellow signs are spaced approximately 200 feet apart along the boundary.

Southern Boundary of
Flynn Creek Watershed

Monuments
Monuments are unpainted reinforced concrete 3" square x 2' high.

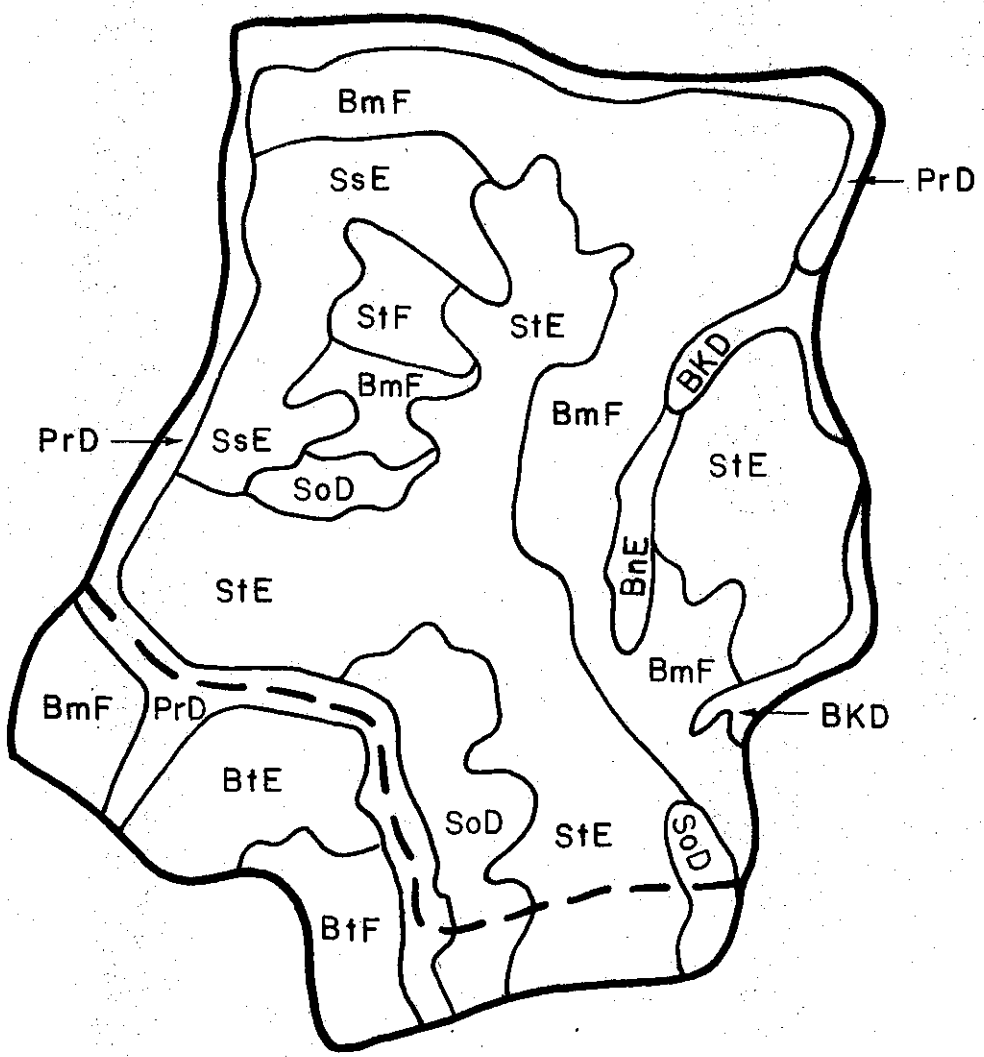
Bearings, e.g. N75E

Contour Interval 50'

FIGURE 3

CONTOUR INTERVAL: 50'

SOIL TYPES - FLYNN CREEK RESEARCH NATURAL AREA
FROM CORLISS, 1973



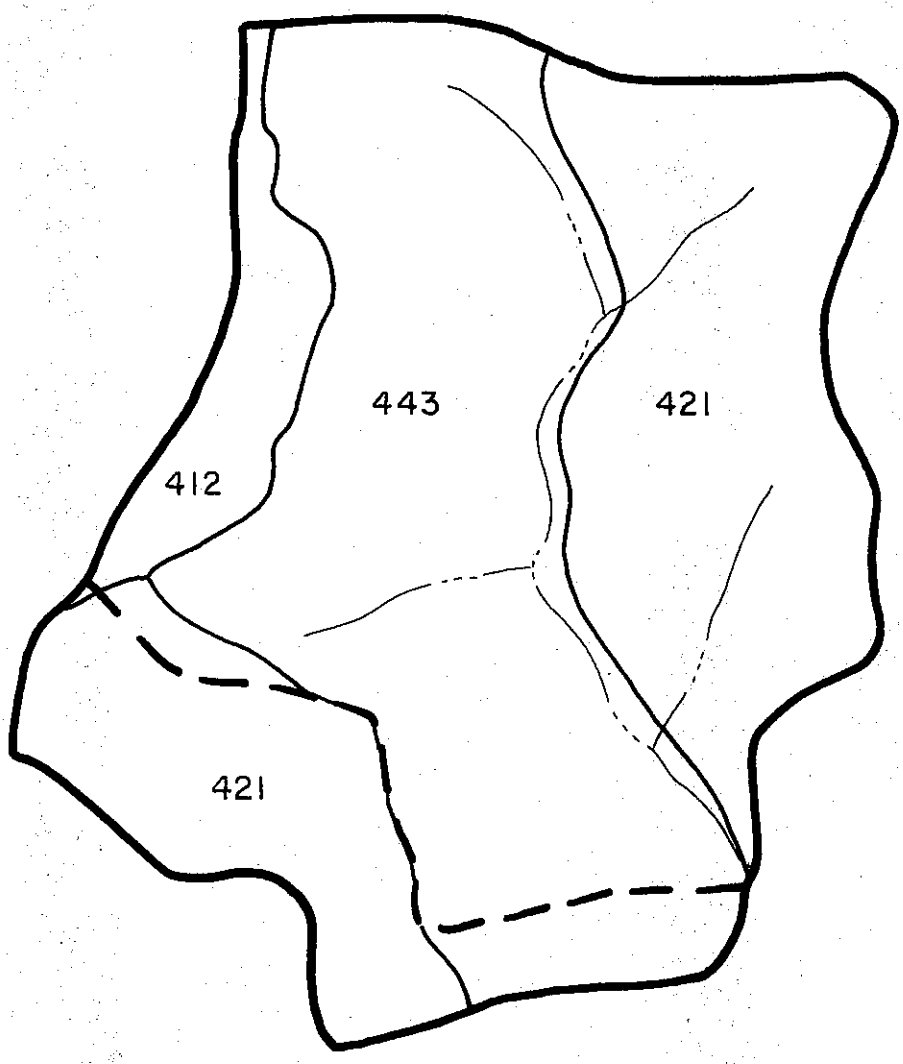
LEGEND

SYMBOL	NAME
BKD	BOHANNON LOAM, RIDGE, 5 TO 25 PERCENT SLOPES
BmF	BOHANNON GRAVELLY LOAM, DISSECTED, 37 TO 50 PERCENT SLOPES
BnE	BOHANNON GRAVELLY LOAM, RIDGE, 25 TO 37 PERCENT SLOPES
BtE	BOHANNON - SLICKROCK GRAVELLY LOAMS, DISSECTED, 25 TO 37 PERCENT SLOPES
BtF	BOHANNON - SLICKROCK GRAVELLY LOAMS, DISSECTED, 37 TO 50 PERCENT SLOPES
PrD	PREACHER CLAY LOAM, RIDGE, 0 TO 25 PERCENT SLOPES
SoD	SLICKROCK LOAM, 10 TO 25 PERCENT SLOPES
SsE	SLICKROCK GRAVELLY LOAM, 25 TO 37 PERCENT SLOPES
StE	SLICKROCK GRAVELLY LOAM, DISSECTED, 25 TO 37 PERCENT SLOPES
StF	SLICKROCK GRAVELLY LOAM, DISSECTED, 37 TO 50 PERCENT SLOPES

FIGURE 4

SOIL STABILITY CLASSES

FLYNN CREEK RESEARCH NATURAL AREA

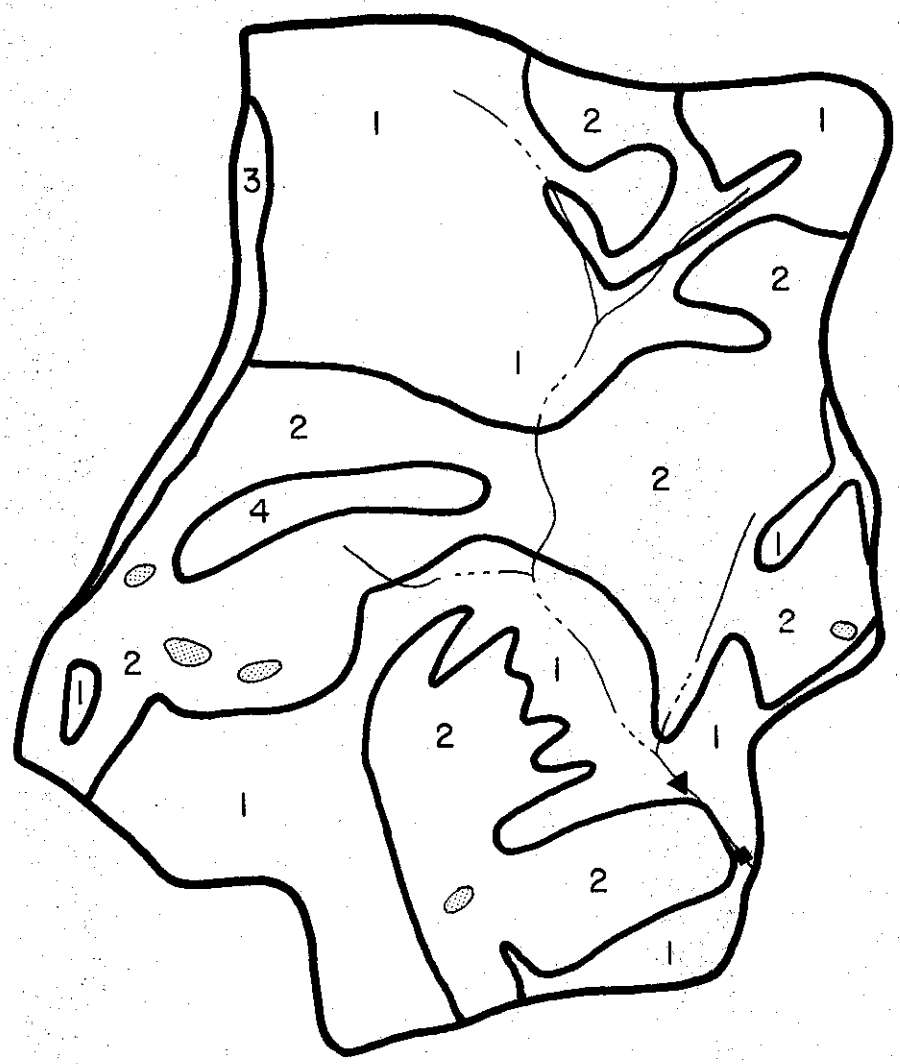


INTERPRETIVE SOIL LEGEND

SYMBOL	RATING
412	RATED SEVERE RISK FOR ROAD CONSTRUCTION. MODERATELY HIGH RISK OF DEBRIS SLIDES RESULTING FROM ROAD CONSTRUCTION.
421	RATED SEVERE RISK FOR ROAD CONSTRUCTION. HIGH RISK OF FAILURES RESULTING FROM ROAD CONSTRUCTION.
443	MODERATELY HIGH RISK FOR ROAD CONSTRUCTION AND ASSOCIATED FAILURES.

FIGURE 5

MAJOR VEGETATION TYPES AT FLYNN CREEK RESEARCH NATURAL AREA



LEGEND

MAPPING UNIT	TYPE	
1	DOUGLAS-FIR DOMINATED	(60 % +)
2	RED ALDER DOMINATED	(60 % +)
3	RED ALDER	(90 % +)
4	MOSAIC OF MEADOWS, RED ALDER & DOUGLAS-FIR	
⬭	MEADOWS	
▲	STREAM GAGE	
■	FISH TRAP	

FIGURE 6