

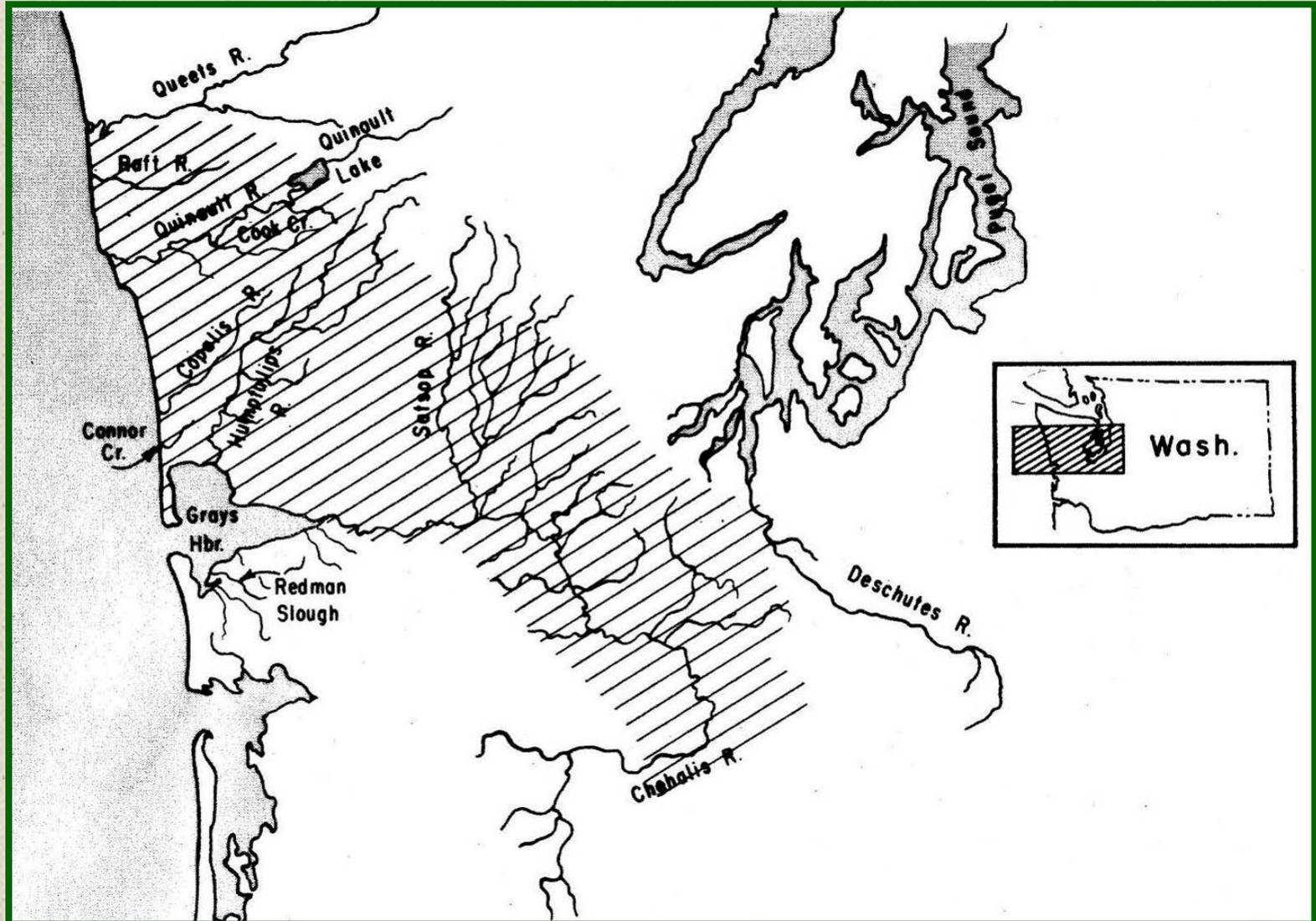
HABITAT SUITABILITY AND PREFERENCES OF THE OLYMPIC MUDMINNOW, *NOVUMBRA HUBBSI*



BY

JOHN W. MELDRIM

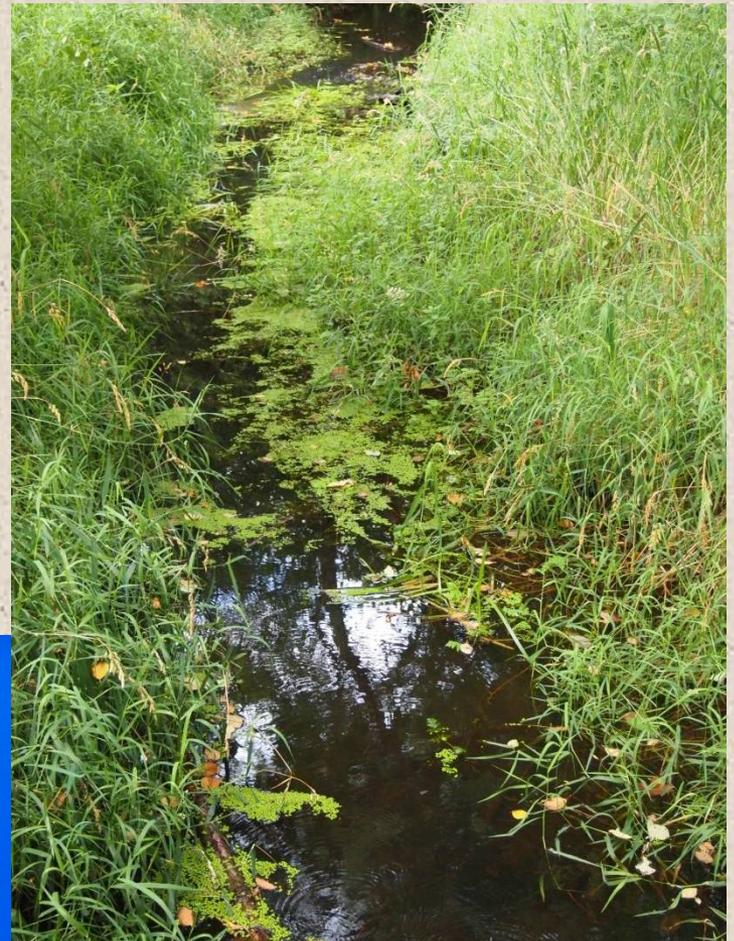
KNOWN DISTRIBUTION - 1968



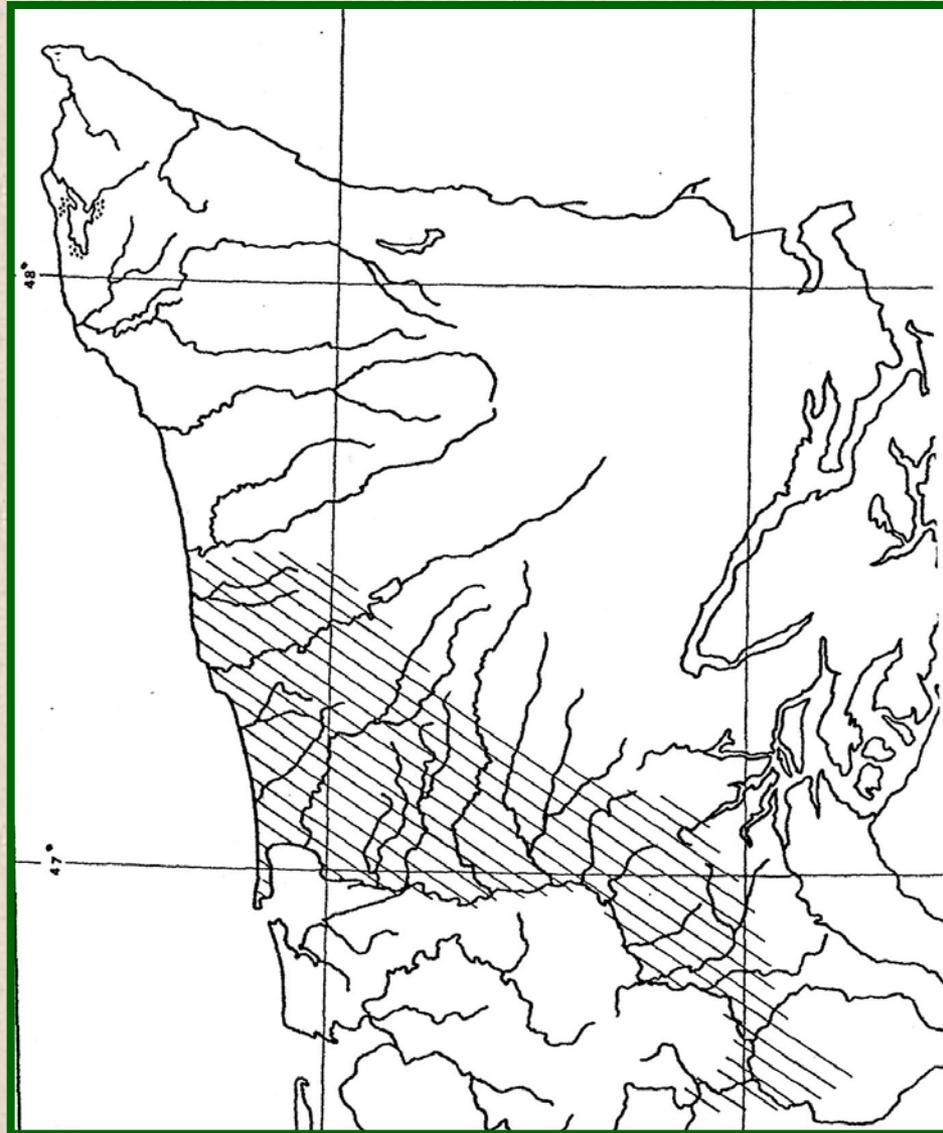
HABITAT CHARACTERISTICS

**Type Locality: Drainage ditch, Satsop, WA
(February 24, 1929; From Schultz, 1929)**

- **2-ft to 3-ft water depth**
- **Clear, quiet water**
- **3-in deep soft mud/ dead vegetation bottom**
- **Aquatic vegetation to 4-in height**



HARRIS SURVEY AREA AND DISTRIBUTION - 1974



FREQUENCY OF OCCURRENCE BY HABITAT CATEGORY (HARRIS 1974)

Habitat Type	N Sampled	N with Novumbra
Marshy Stream	21	12
Meadow Stream	10	4
Beaver-dammed Stream	8	1
Gravel-bottomed Stream	12	0
Marshes, Swamps, Sloughs	10	5
Lakes, Ponds, Lagoons	9	3
Estuary	1	0
TOTAL:	71	25

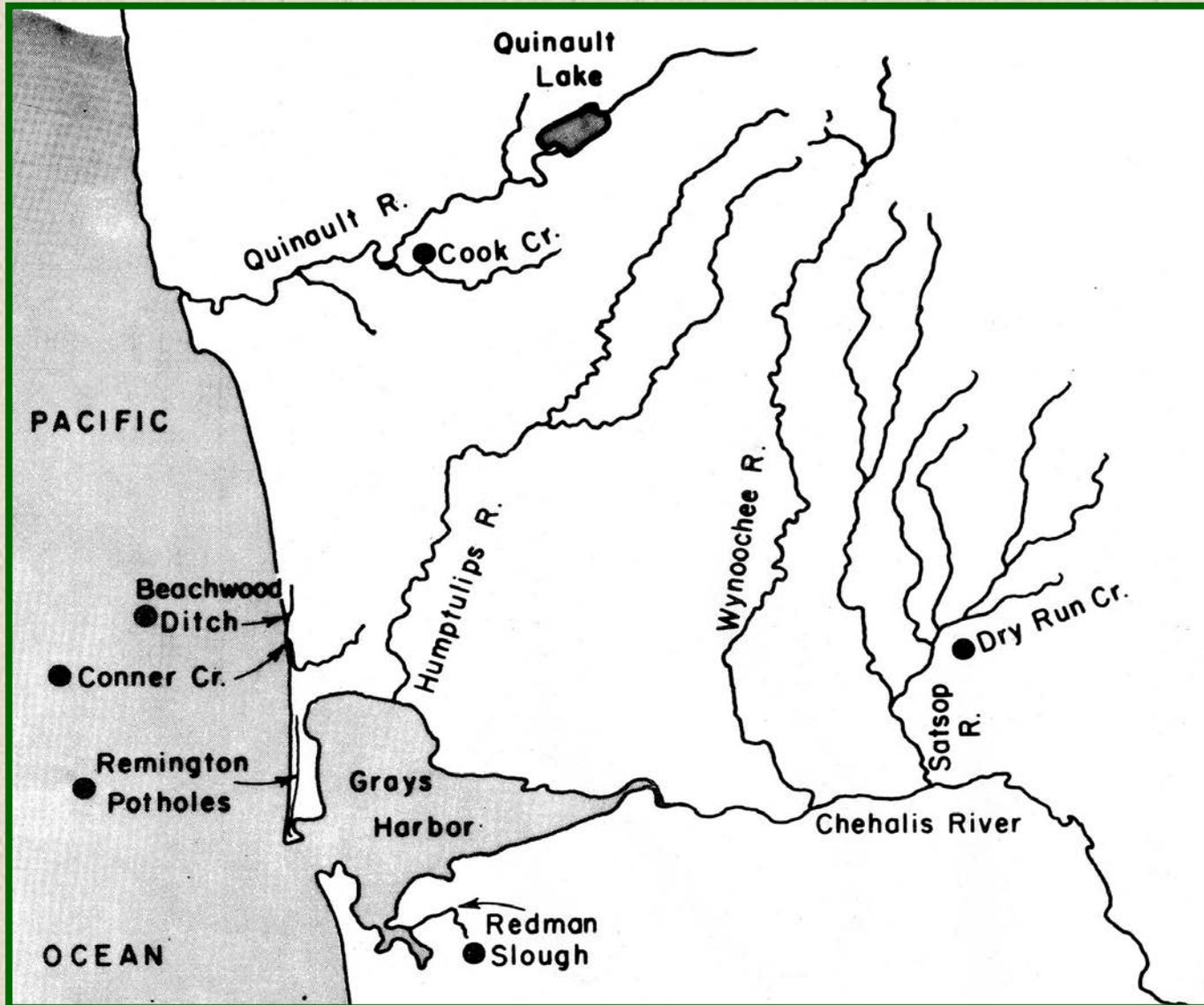
COMMON HABITAT FEATURES

(HARRIS, 1974)

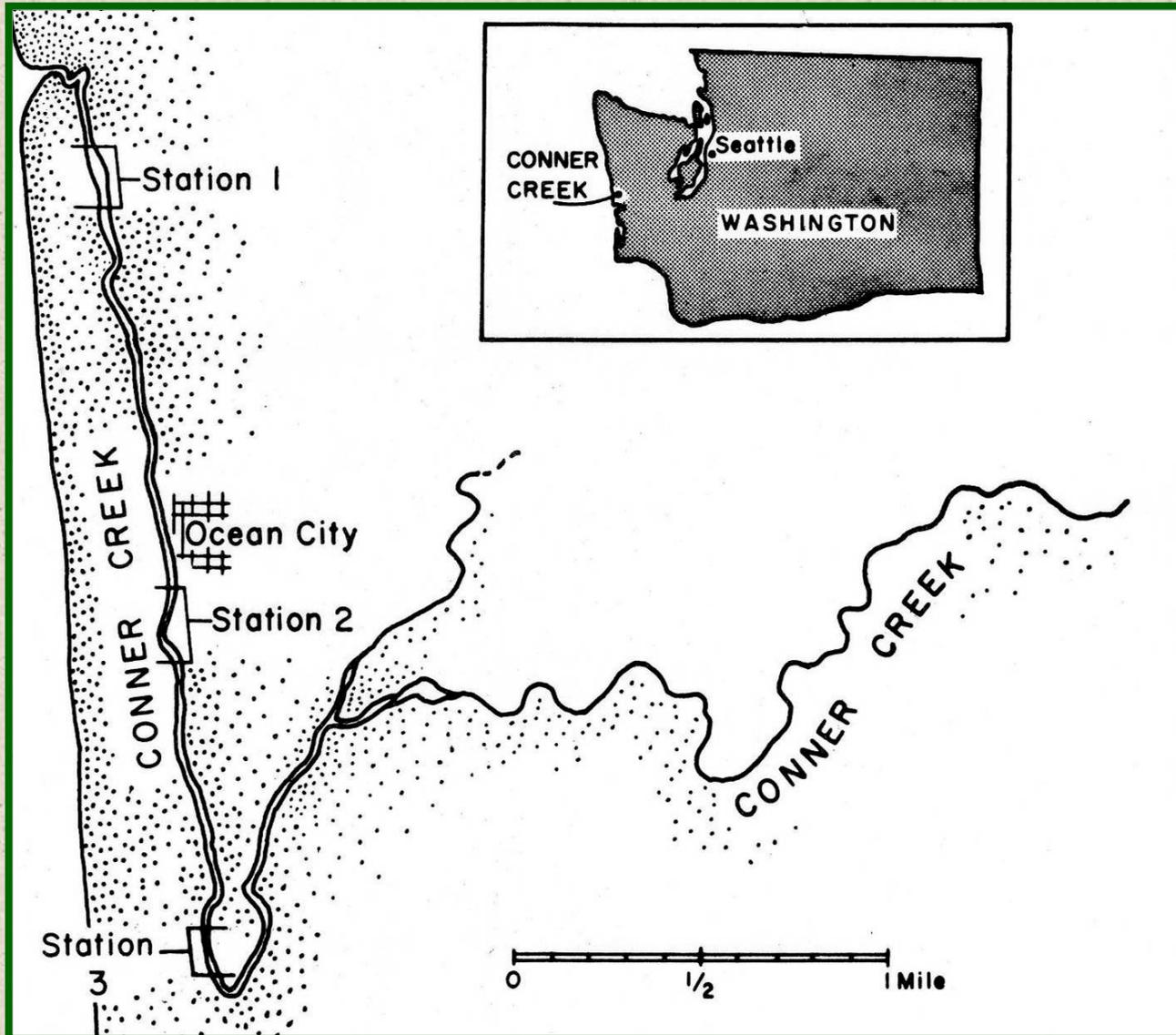
- **Several-inch depth of soft mud substrate**
- **Little or no flow**
- **Dense ("choking") aquatic vegetation**



STUDY SITES - 1965-1968



CONNER CREEK STUDY SITES – 1966 - 1968



CONNER CREEK- STATION 1 (1967)



CONNER CREEK- STATION 2 (1967)



CONNER CREEK- STATION 3 (1967)



CONNER CREEK- STATION 3 (2012)



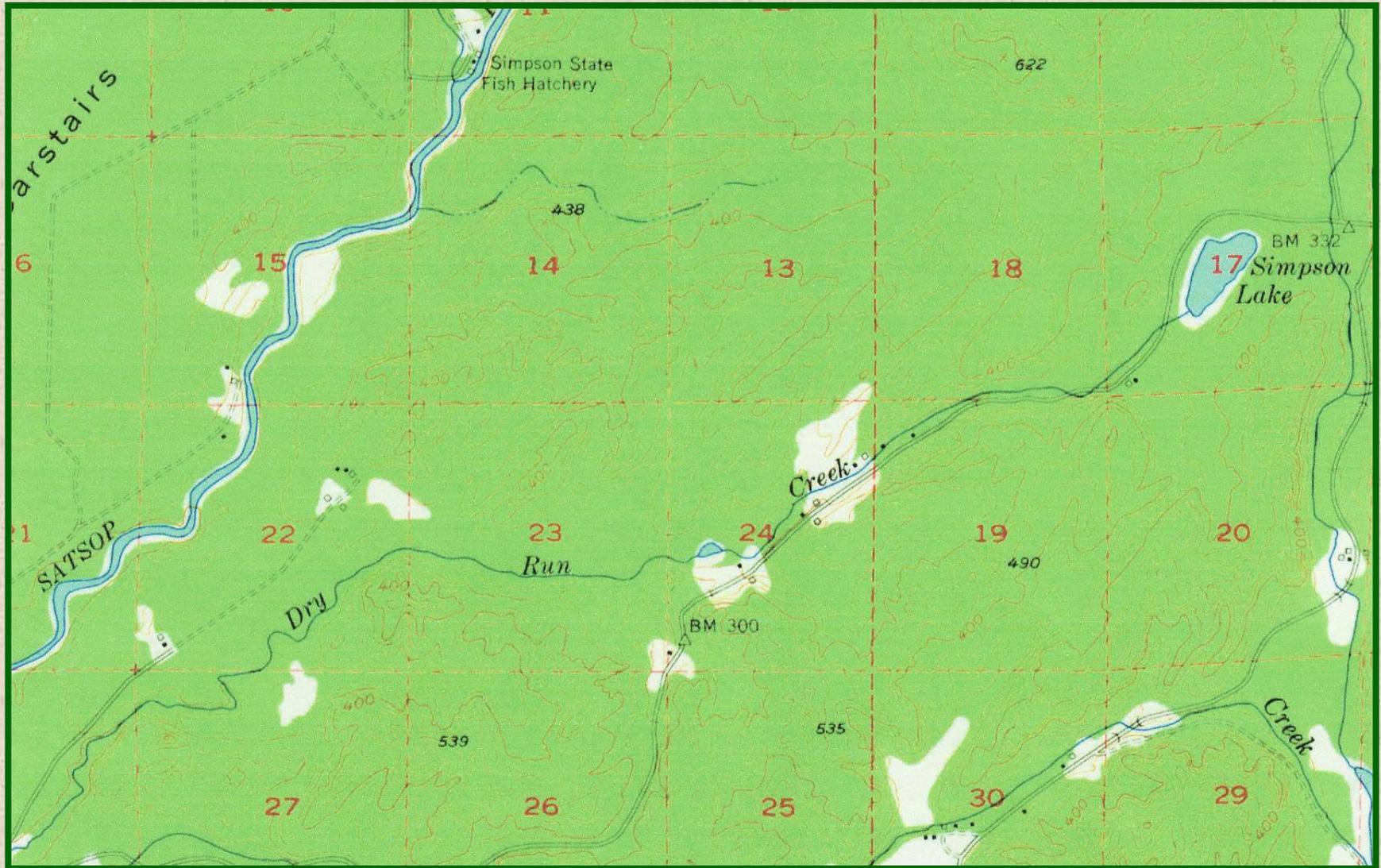
DRY RUN CREEK SWAMP HABITAT - 1966



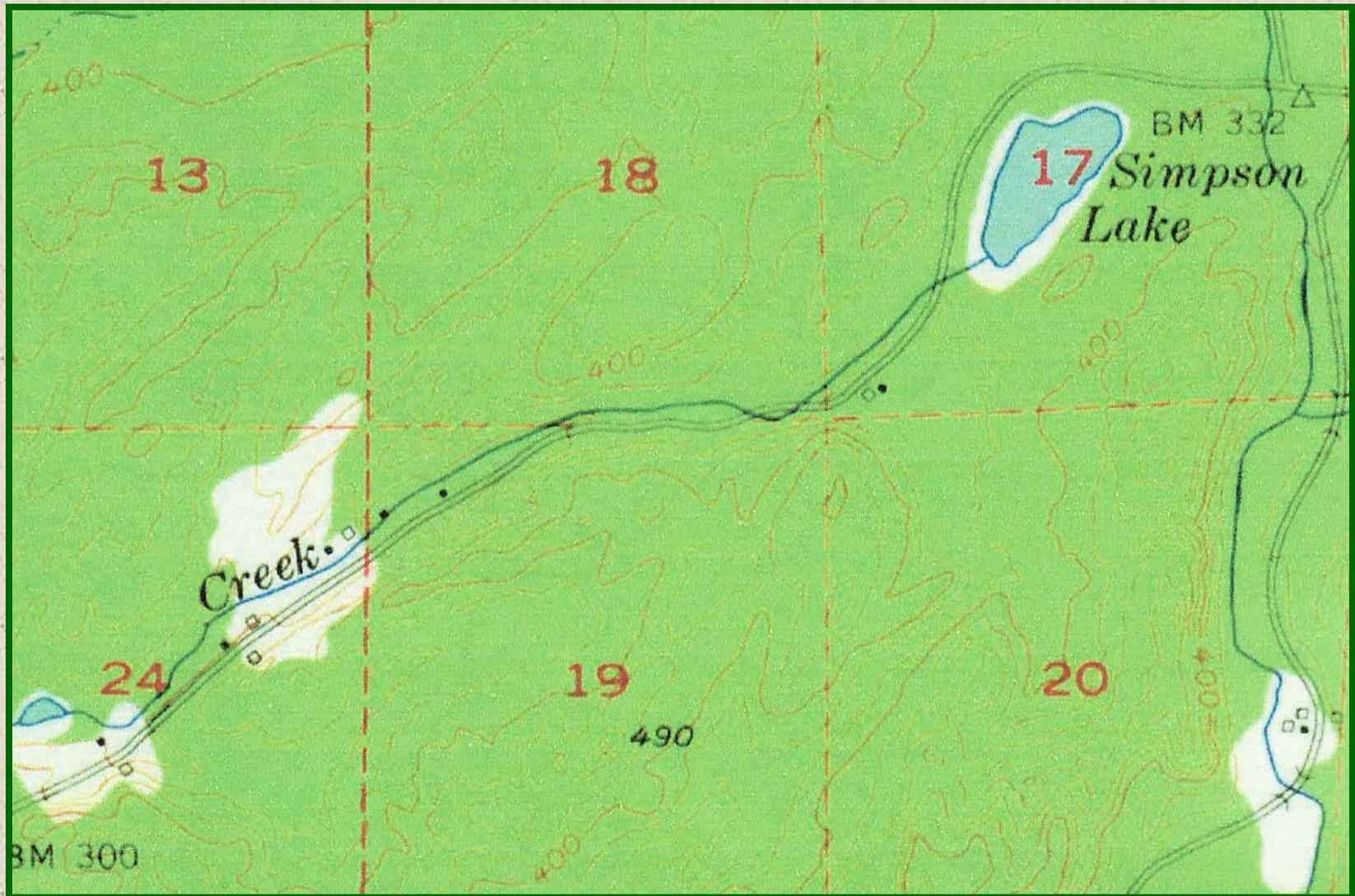
DRY RUN CREEK SUMMMER HABITAT - 1966



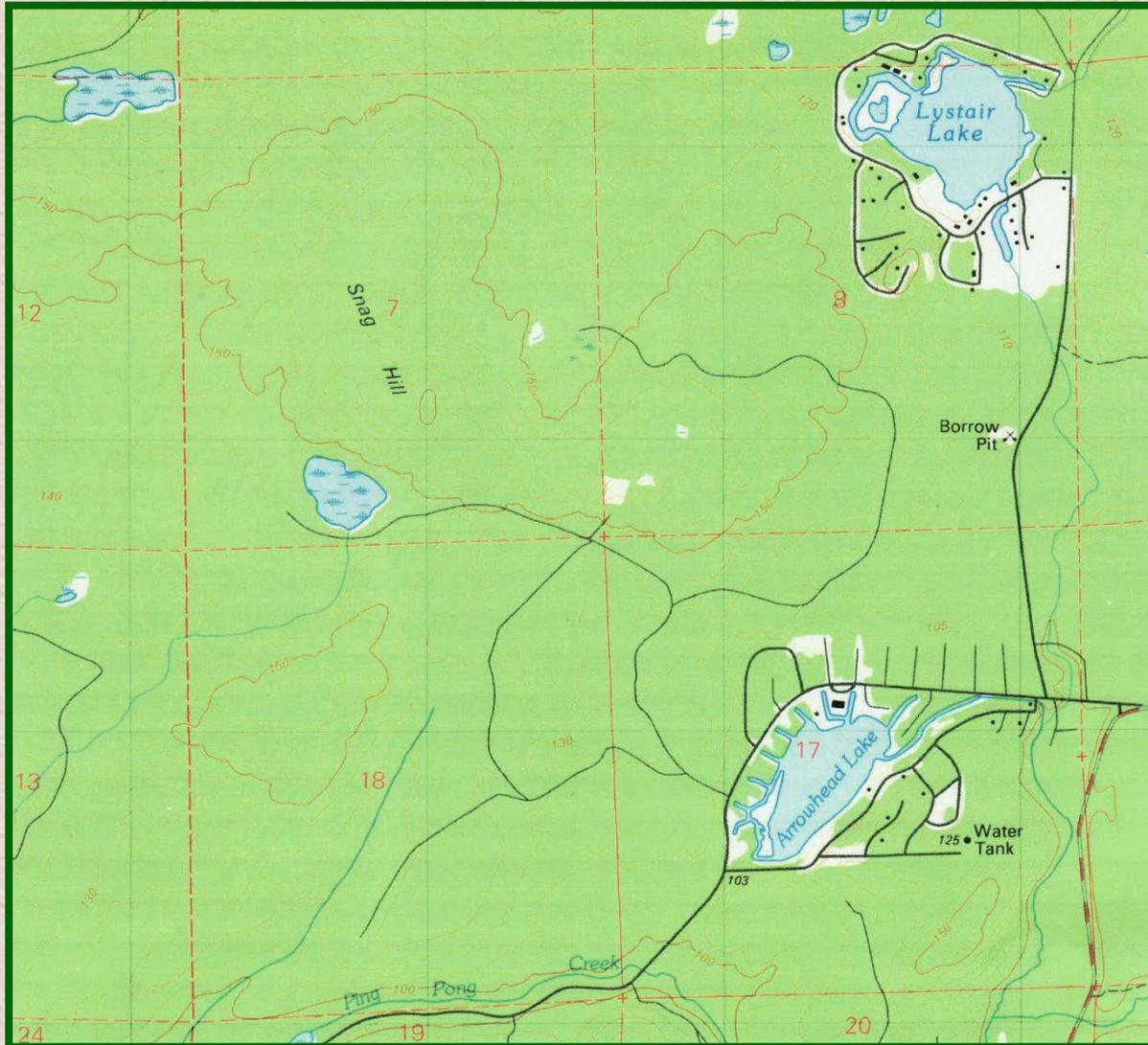
DRY RUN CREEK- USGS TOPO MAP (1953)



SIMPSON LAKE OUTLET TO DRY RUN CREEK USGS TOPO MAP 1953



ARROWHEAD (SIMPSON) LAKE USGS TOPO MAP 1981



HABITAT PARAMETERS

EXPERIMENTAL STUDIES -1966-67 – UW

<u>PARAMETER</u>	<u>TOLERANCE</u>	<u>PREFERENCE</u>
• CURRENT	X	X
• SALINITY	X	X
• TEMPERATURE	X	
• DO	X	
• WATER COLOR		X

CURRENT

- **Critical Swimming Speed* = 0.8 – 1 ft/sec**
- **Current Preference = < 0.07 ft/sec**

*** = Estimated maximum swimming speed for a period of 10 minutes**

SALINITY

- **Salinity Tolerance = 13.2 ppt (24 hr);
11.5 ppt (96 hr)**
- **Salinity Preference = < 0.5 ppt**

Seawater > 32 ppt

TEMPERATURE

- **Upper Lethal Temperature (TLm_{24}) = 27°C**
- **Lower Lethal Temperature (TLm_{24}) = 0°C**
- **Preferred Temperature Range = 11°C - 14°C**
(Inferred from Habitat Preference Study)
- **Final Temperature Preferendum = Unknown**
- **Avoidance Temperatures = Unknown**

DISSOLVED OXYGEN

- **Median Lower Lethal Level (24 hrs) = 0.18 mg/L**

WATER COLOR

Stained Creek Water (400 color units)

Versus

“Clear” Creek Water (120 color units)

**Preference = Stained Creek Water
(400 color units)**

HABITAT FEATURES TESTED FOR PREFERENCE (CONSIDERED INDIVIDUALLY AND IN COMBINATION)

HABITAT FEATURE

TEST CONDITION

COVER (Shade)

PRESENCE versus ABSENCE

SUBSTRATE

MUD versus SAND

AQUATIC PLANTS (Elodea*)

PRESENCE versus ABSENCE

FIELD TEMPERATURE

WARMER versus COOLER

*= Elodea, found in many Novumbra habitats, used in the tests because no preference for any plant species found in any field study

HABITAT PREFERENCE TEST RESULTS (FEATURES CONSIDERED INDIVIDUALLY)

<u>HABITAT FEATURE</u>	<u>PREFERENCE</u>		
	<u>STRONG</u>	<u>MODERATE</u>	<u>NONE</u>
Cover (Shade)	X		
Mud Substrate		X	
Presence of Plants			X
Rising & Summer Temperature		Cooler	
Falling & Winter Temperature		Warmer	

HABITAT PREFERENCE TEST FINDINGS (FEATURES CONSIDERED IN COMBINATION)

- **No single feature determines habitat preference**
- **Statistically significant interactions ($p \leq 0.05$)**
 - **Cover (shade)**
 - **Substrate**
 - **Presence of aquatic plants**
 - **Field temperatures**
- **Plants only significant in interactions**

HABITAT PREFERENCE TEST FINDINGS (FEATURES CONSIDERED IN COMBINATION)

- **Summer Habitat Preference**
 - **Driven by temperature and light**
 - **Highest preference = Cool area and shade**

HABITAT FEATURES PREFERRED BY NOVUMBRA

- **Current Velocity = < 0.07 ft/sec**
- **Freshwater (< 0.5 ppt salinity)**
- **Cover (shade)**
- **Water Temperature = 11°C - 14°C**
- **Stained Water (400 color units)**
- **Mud Substrate**
- **Dense Aquatic Vegetation**