

Emerging Wildlife Issues in the Cedar River Watershed

Habitat Conservation Plan for the Red-legged frog (*Rana aurora*)



Jenifer Phipps, Anjel Wahlman
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Life history facts



- **Color**
 - light golden to dark brown on the back with irregular dark spotting or blotching
 - adults usually red on lower abdomen and underside of legs
 - **Diet**
 - Adults: beetles, caterpillars, isopods, invertebrates
 - Tadpoles: green algae, plant tissue, microorganisms
 - **Breeds March-July**
 - **Hibernation on land or water**
 - November to February, not freeze-tolerant, do not hibernate in large concentrations
 - **Size**
 - males 7 cm, females 10 cm
 - **Distribution**
 - occurs west of the Cascade Mts. British Columbia to California
 - **Life-span unknown, captivity 12-13 years**
 - **Benthic**
 - Burrowing in or using soil, fallen log/debris
 - **Vocalization**
 - quiet, low-pitched, muffled stuttering can call underwater
 - **Predators**
 - garter snakes, many birds, raccoons, introduced game-fish, bullfrogs feed on Red-legged frogs at all stages of development
- Amphibian – ANURA (Frogs and toads) – Ranidae (True frog)



Habitat requirements

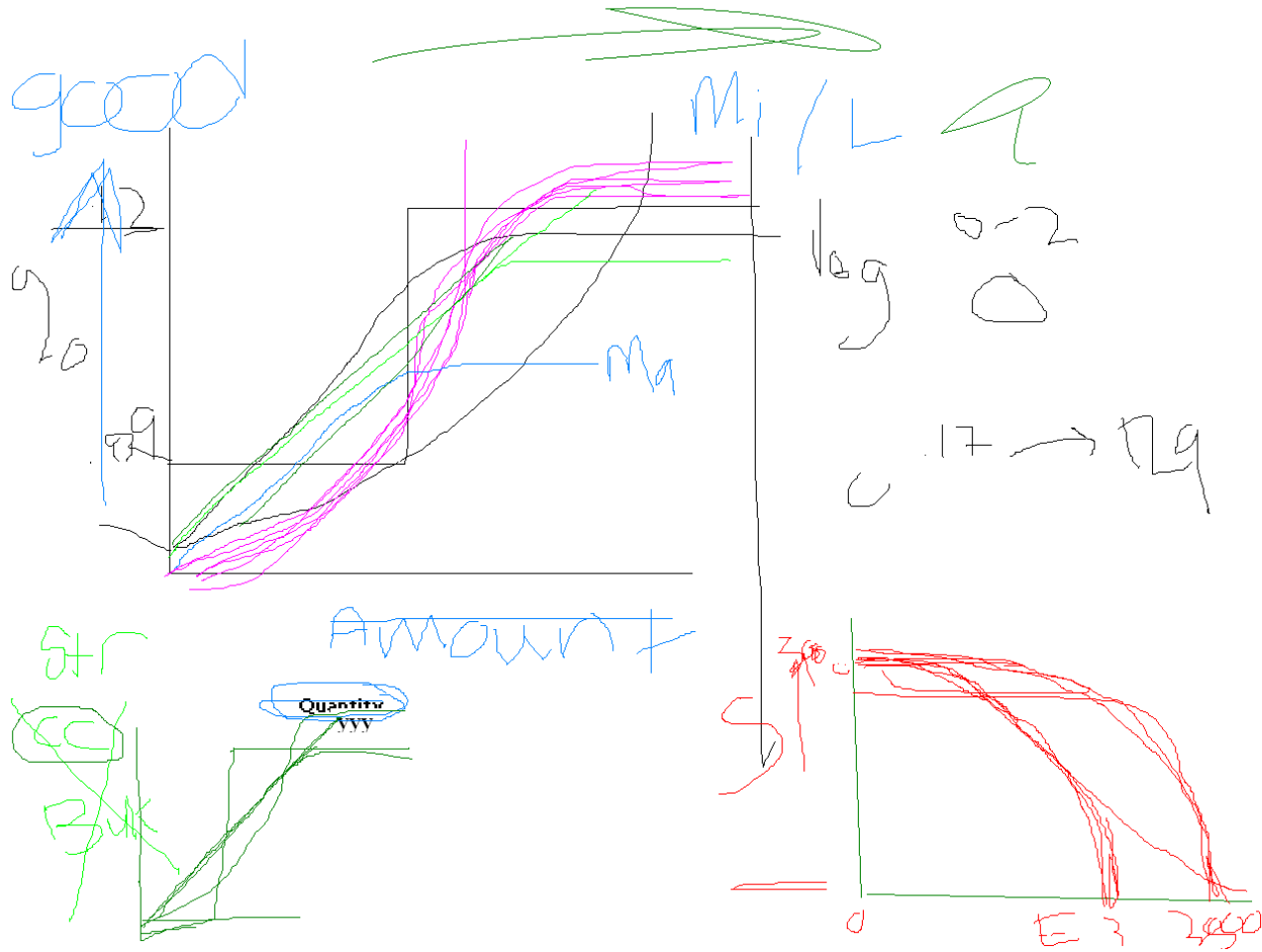
- **Habitat generally near**
 - Medium to slow streams
 - Seasonal and permanent ponds and lakes
 - temporary ponds and ditches
 - riparian/riverine corridors
 - Marshes
- **Found in**
 - damp woods
 - moist deciduous and coniferous forests
 - forested wetlands and meadows
- **Estivation sites**
 - include small mammal burrows, moist leaf litter in dense riparian vegetation up to 26 m from water (Rathbun et al. 1993, cited by USFWS 1994)
- **Require .5 – 2m deep water to breed** (Corkran and Thoms 2006)
 - usually cool, well-shaded, lake edges, slow streams
 - eggs are attached to stiff submerged stems
- **Suitable habitat patches are separated by less than 1 km of upland habitat** (Reaser 2003)
- **Unsuitable habitat**
 - upland habitat devoid of wetlands, streams, ponds, or lakes
 - water dominated by predatory fishes should be regarded as unsuitable habitat (Pope and Matthews 2001)



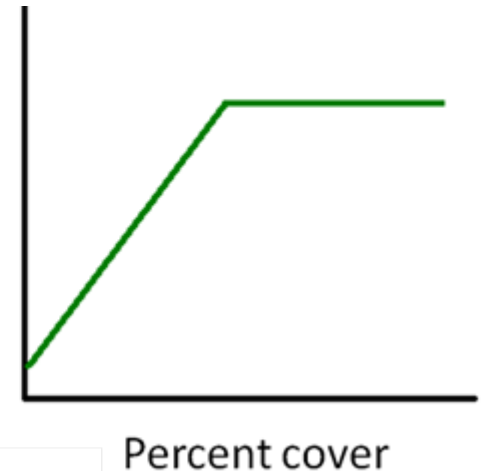
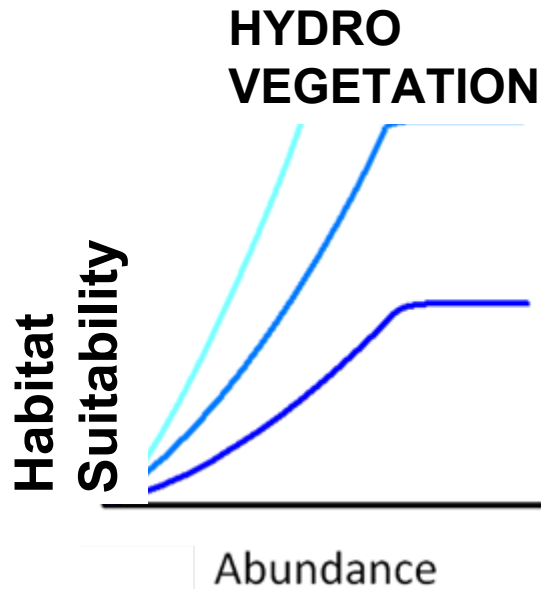
Variables

- **Hydro**
 - Lakes and ponds
 - Minor streams
 - Major streams
- **Vegetation**
 - Canopy Cover
 - Structural class
- **Elevation**
- **Unavailable CRW Data**
 - Lake and pond depth
 - Stream classes
 - Aquatic plants
 - Seasonal ponds
 - Predators
- **Uncertainty**
 - Effects from roads
 - Required litter/duff layer
 - Elevation
 - CWD
 - Buffers
 - Home range

Variable suitability



Classifying variables



Lakes and ponds

0 = 0 1 = $x < .001$
 2 = $.001 \leq x \leq .009$
 3 = $x \geq .009$

Minor streams

0 = 0 1 = $x < .0005$
 2 = $.0005 \leq x \leq .0009$
 3 = $x \geq .001$

Major streams

0 = 0 1 = $x < .001$
 2 = $.001 \leq x \leq .009$
 3 = $x > .009$

Elevation

(Ft) 1 = $x \geq 3000$
 2 = $3000 \geq x \leq 2000$
 3 = $x < 2000$

Structural class

1 = 0,1 2 = 2
 3 = 3 – 6

Canopy cover %

0 = $x < .10$ 1 = $.10 \leq x < .25$
 2 = $.25 \leq x < 1$

Habitat Suitability Index (HSI)

Formatting variables

- $V_H = \text{Hydro} \Rightarrow (l/p + \text{minstrm} + \text{mastrm}) / 3$
 - (l/p)Lakes and ponds x 2
 - (minstrm)Minor streams x 2
 - (mastrm)Major streams x 1.5
- $V_G = \text{Vegetation} \Rightarrow (c.c. + s.c.) / 2$
 - (c.c.)% Canopy cover x 1
 - (s.c.)structural class x 1
- $V_E = \text{Elevation} (x 1)$
- *Standardized across groups*



HSI Model



All variables

$$HSI = V_H d(2) * V_E * V_G$$

– Range from 0.0 – 1.67

– **Blocking**

- 0 = 0
- 1 = $0 < x \leq .50$
- 2 = $.50 < x \leq 1$
- 3 = $1 < x$
- 4 = N/A

Water and elevation

$$HSI = V_H d(2) * V_E * V_G$$

V_G

– Range from 0.0 – 1.67

– **Blocking**

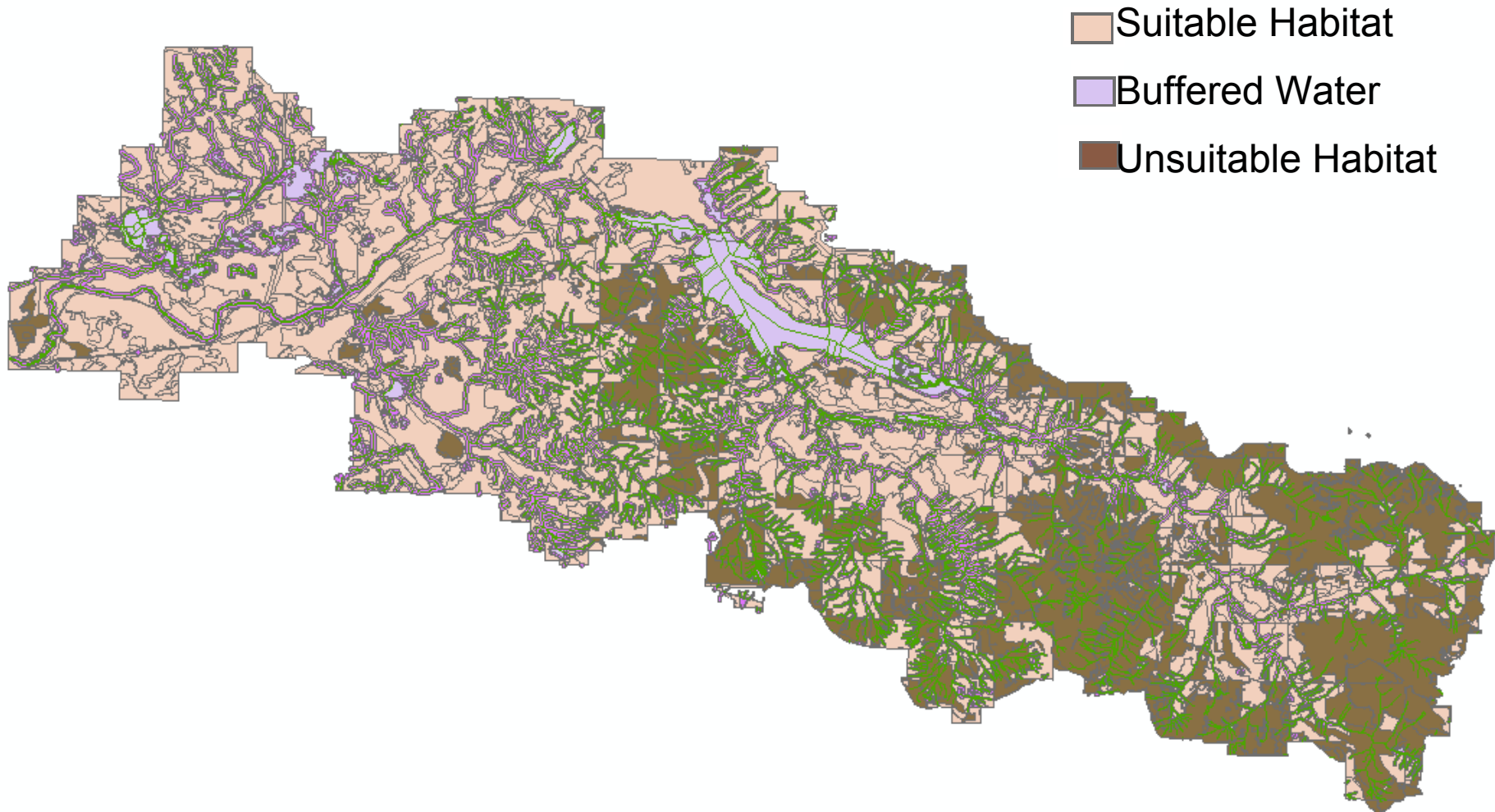
- 0 = 0
- 1 = $x \leq .50$
- 2 = $50 < x \leq 1.25$
- 3 = $1.25 < x$
- 4 = N/A

Model assumptions

- Persistent water sources
- Minor and major streams held constant
- Management units as whole were analyzed
- Equal pond suitability
 - Structure, Aquatic vegetation
- Adequate water quality
 - pH, temperature, organic matter
- Population dynamics stability
- Barriers
- Adequate food availability
- Other limiting factors ignores



Habitat configuration

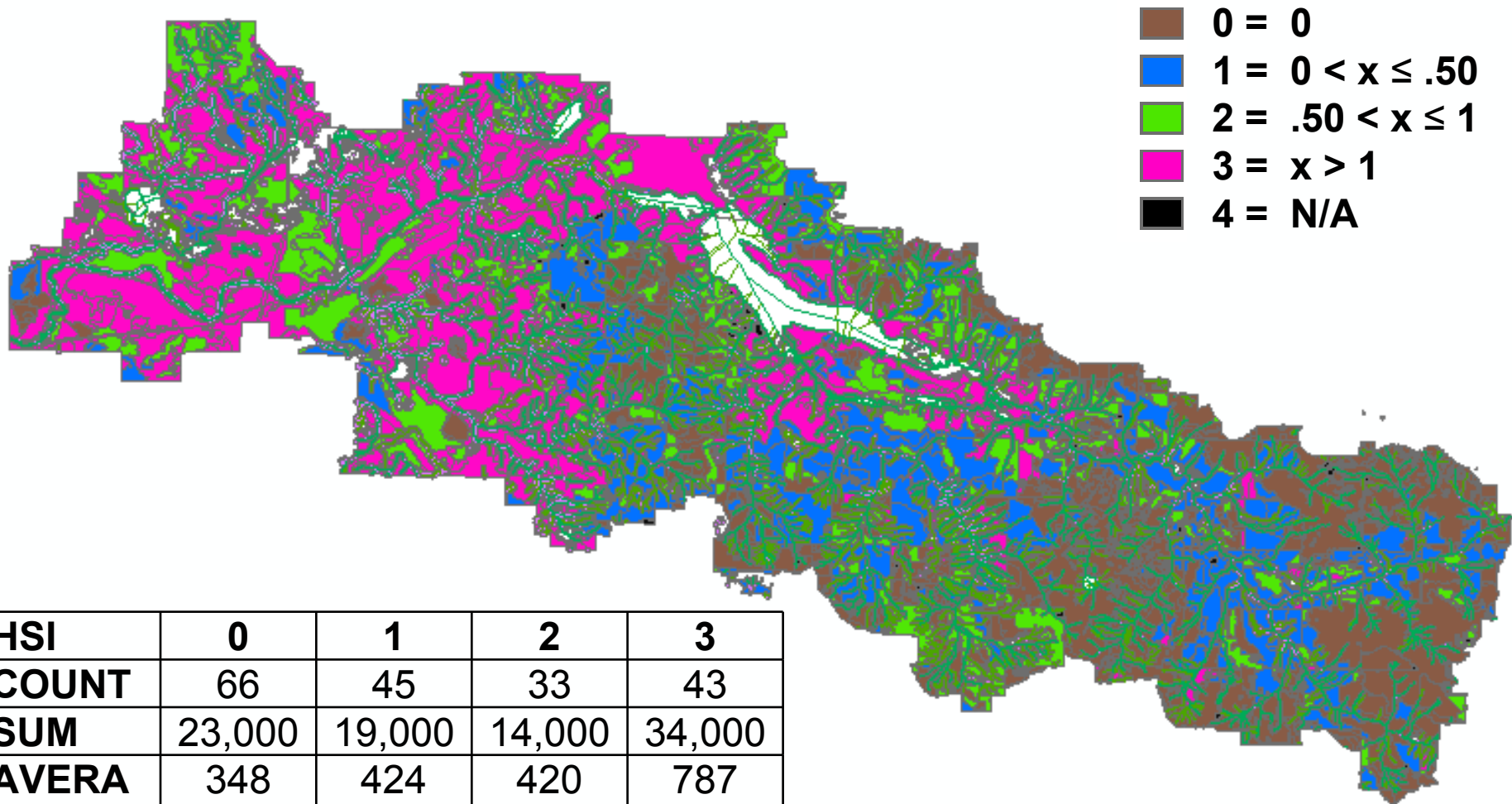


Mapping limitations

- **Missing MU data**
 - Surrogate MU's
 - Neighboring MU's
 - Elevation
- **Discontinuity**
 - Dispersed MU's
- **Conflicting information**
 - Inadequate surrogate MU

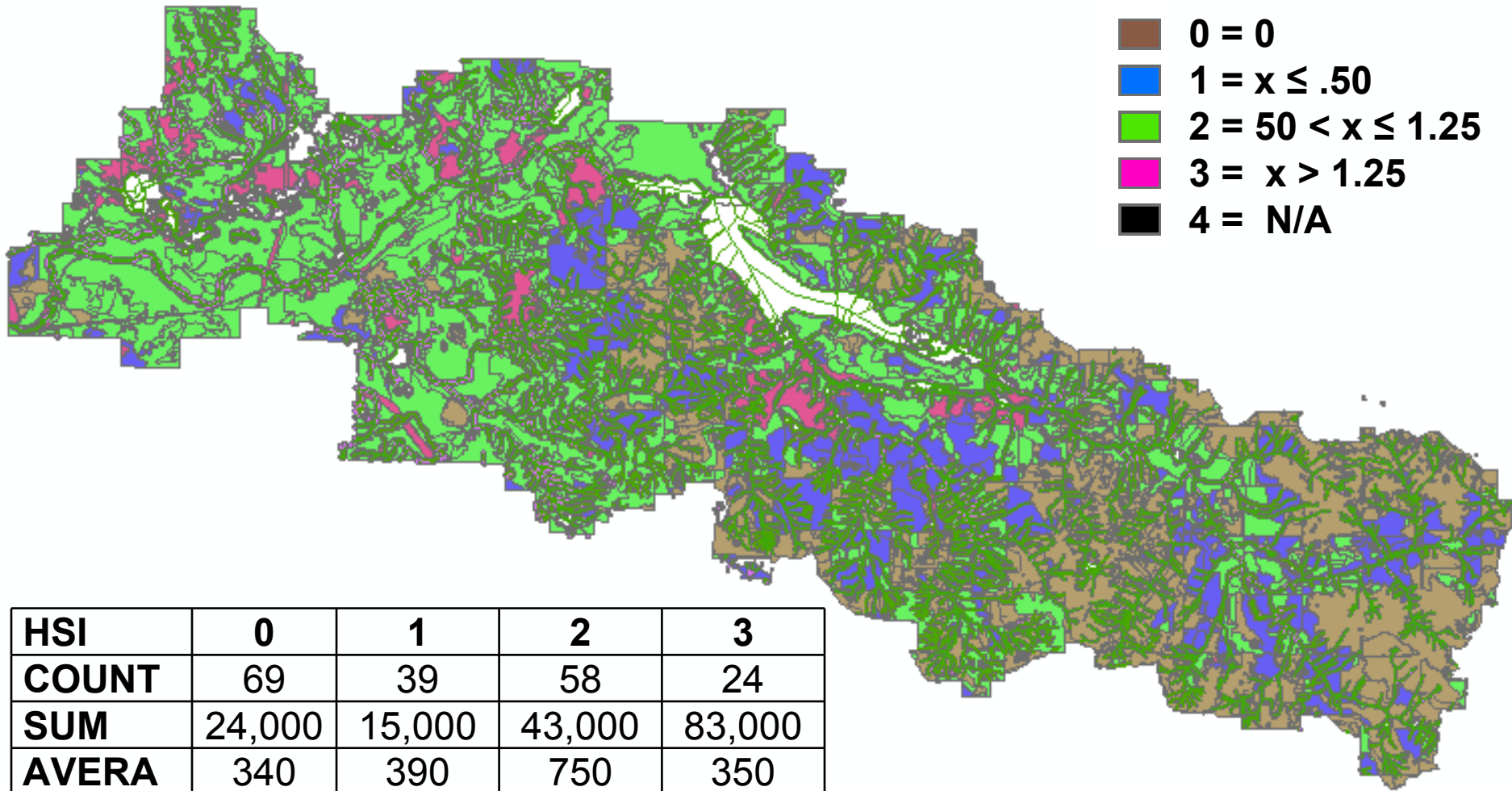


Hydrology Vegetation Elevation



HSI	0	1	2	3
COUNT	66	45	33	43
SUM	23,000	19,000	14,000	34,000
AVERAGE	348	424	420	787

Hydrology and Elevation



HSI	0	1	2	3
COUNT	69	39	58	24
SUM	24,000	15,000	43,000	83,000
AVERAGE	340	390	750	350

Current Population . . . ?

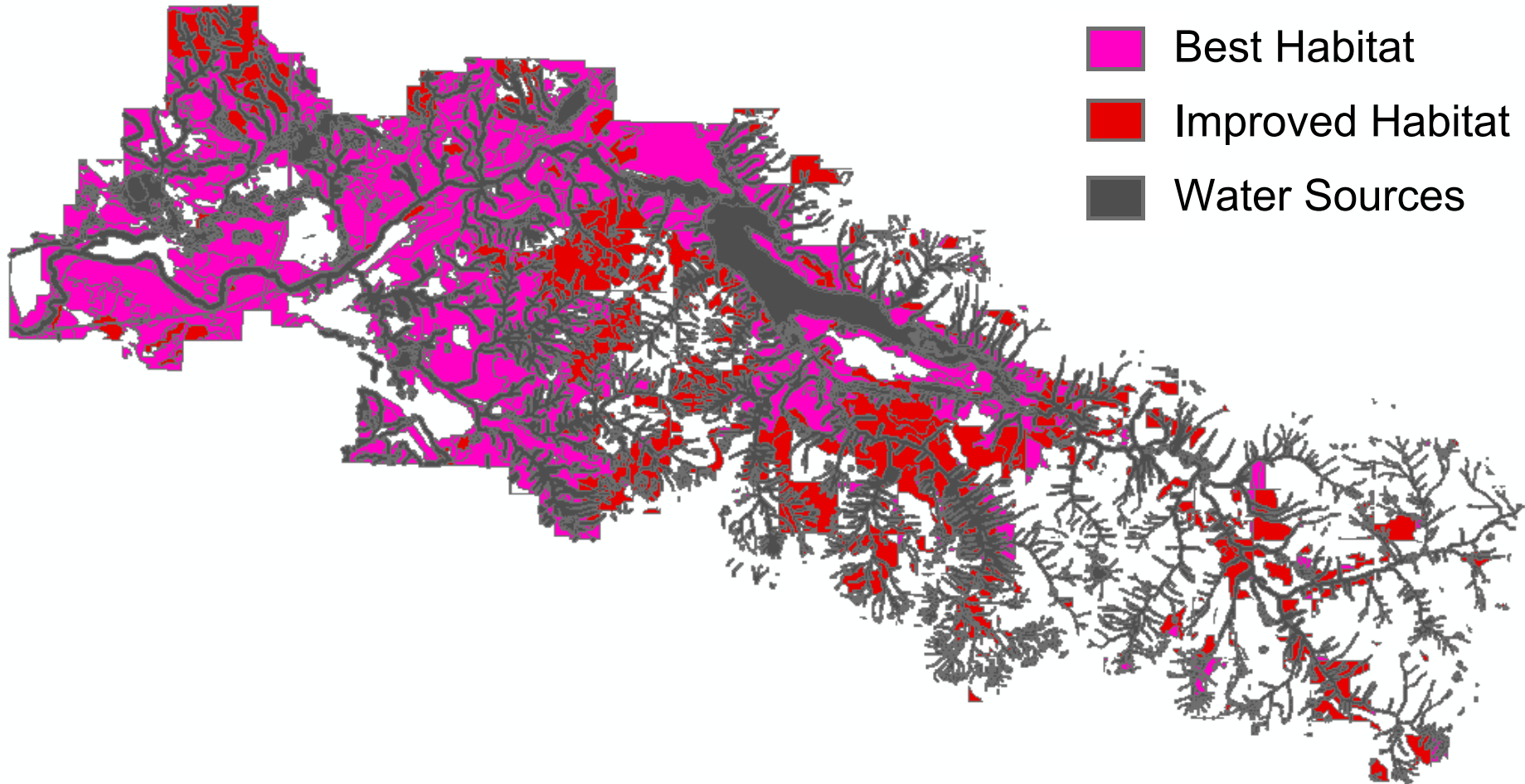
- **Population dynamics unknown in Washington (sustained?)**
- **Heavily based on water quality and availability**
- **“Home range size is unknown, but adults are wide ranging.”** (Nussbaum et al. 1983)
- **Generally disperse 500 m from water** (Hayes et al. 2001)
- **>1 km in moist environments** (Stringer, A. 1997)
- **Not considered territorial** (except during breeding March-July for one 1 to 2 weeks)

Habitat improvement plan

- **Creating water bodies**
 - 0.5 - 5m deep (Calef, 1973b)
 - Varying diameter
- **Habitat connectivity**
 - Streams, ponds, wetlands
 - Moist forest environment
- **Retention of vegetative cover in and around water bodies for egg laying and protection from predators**
 - Emergent and submergent
- **Population survey**
- **Predator survey**
- **Coarse woody debris, duff and liter requirements**



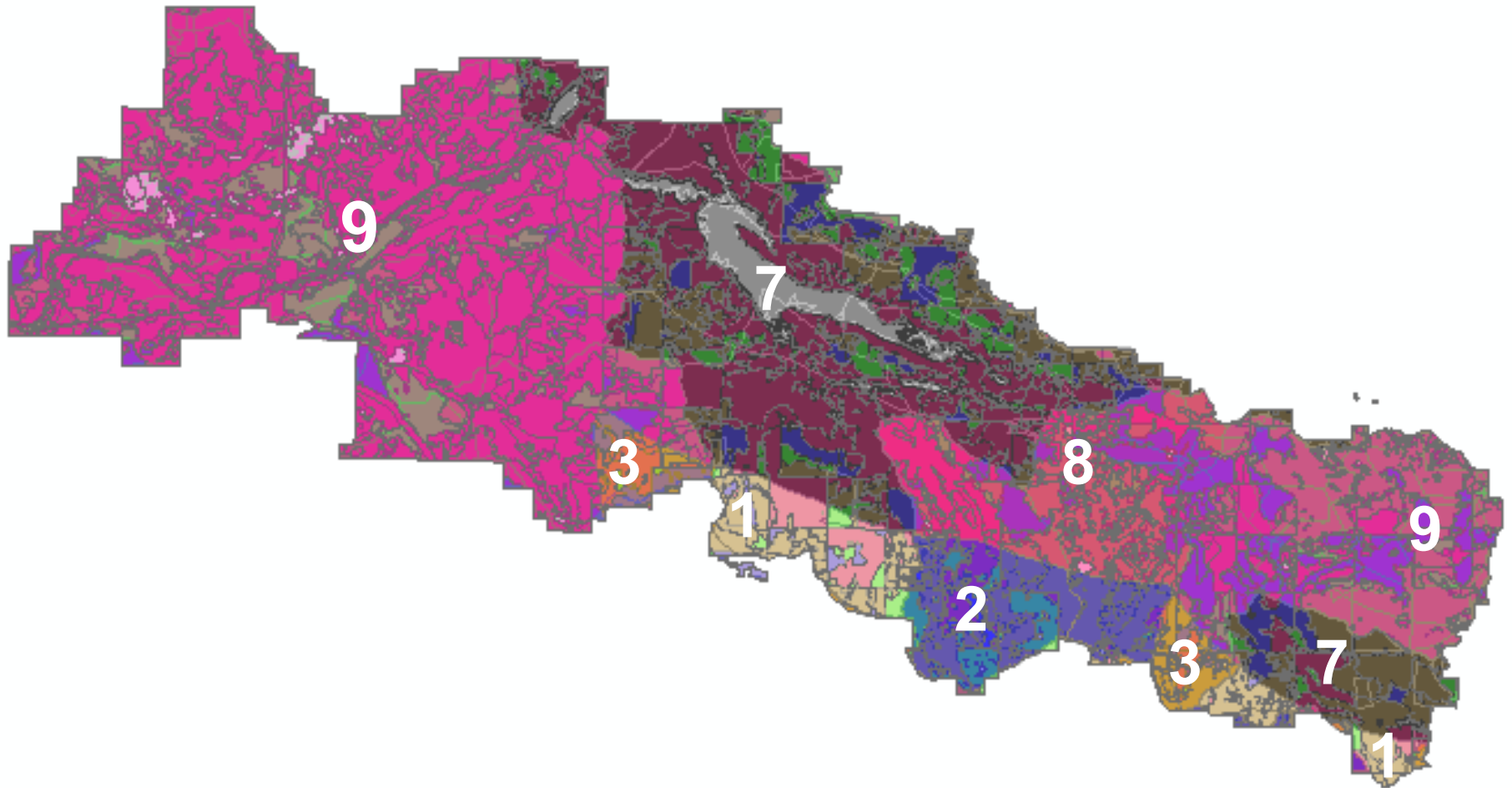
HSI Improvement



Threats & suitability measures for long-term conservation

- “Dispersal habitats were ubiquitous and widely distributed, making their protection difficult.”
(Bulger et al. 2003)
- Prevent or decrease large disturbances in habitat
 - Reduce thinning near riparian areas and forested environment to retain moisture and cover
- Predator management
 - Invasion of bullfrogs, other exotic species, and fish (Kiesector & Blaustein, 1997; Kiesector & Blaustein, 1998)
- Population monitoring
 - dip netting, visual surveys, drift netting, audio surveys, night lighting fish monitoring
- Water pH, temperature, and organic matter monitoring
- Food availability assessments
- Frog crossing projects for road safety
- Public education

Conservation Overlay





Conclusion

- Major habitat areas are not within high priority conservation areas
- Further research is necessary to quantify frog populations and evaluate habitat quality
- Model's precision has room for improvement specifically with additional/improved elevation data
- Need for distinguished stream classes to properly quantify habitat
- Future land use change should will not have large impact
- Frogs generally have adequate habitat available
- Non-native predators (especially bullfrogs) should be monitored carefully

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