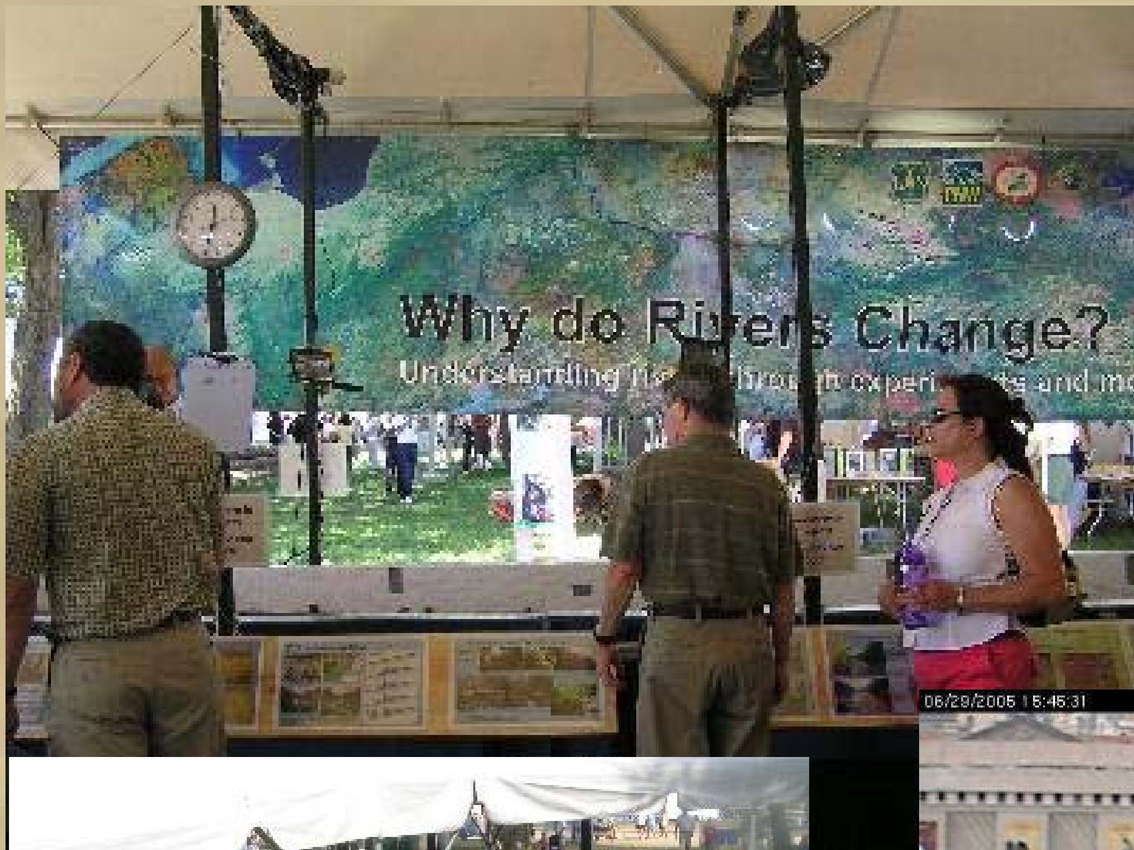
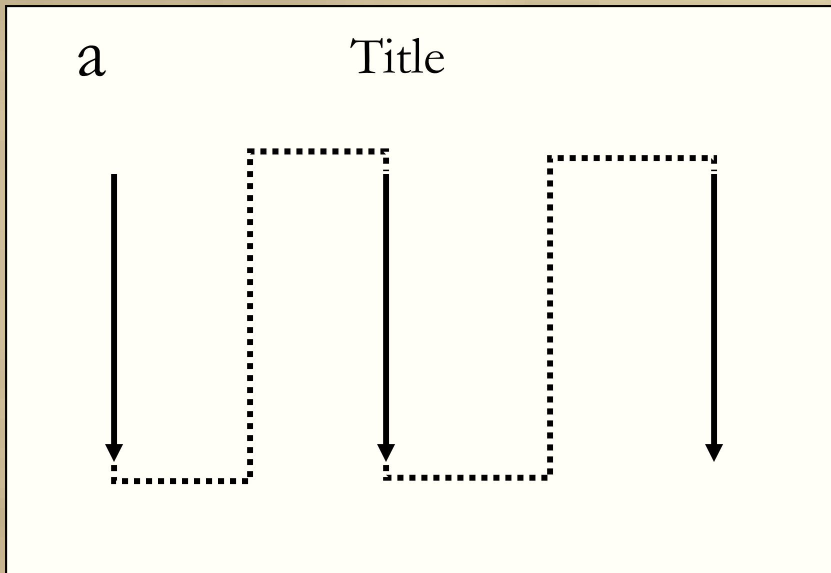
# Ten Steps to Better Poster Design

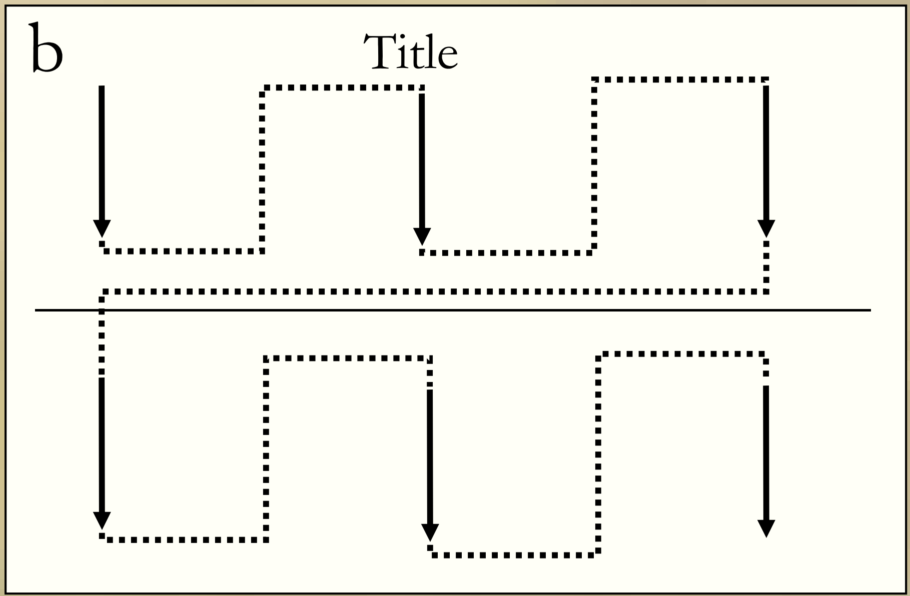
Kathryn Ronnenberg

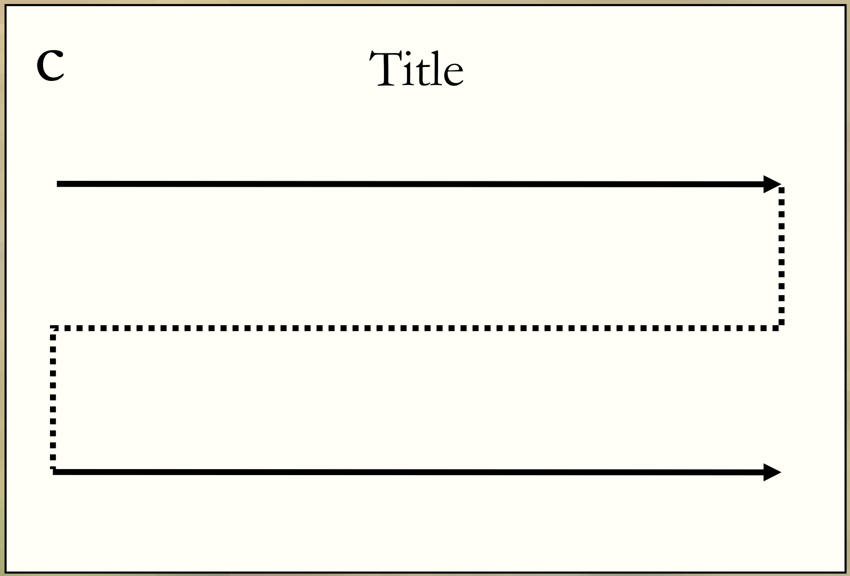
USDA Forest Service
PNW Research Station


Why do Rivers Change?


06/29/2005 15:46:31
Smithsonian
Folklife Festival



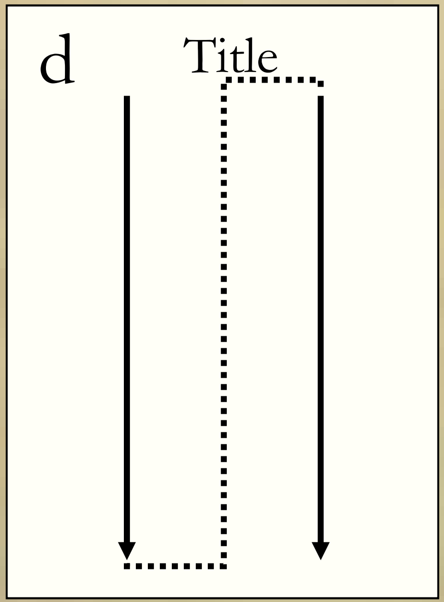



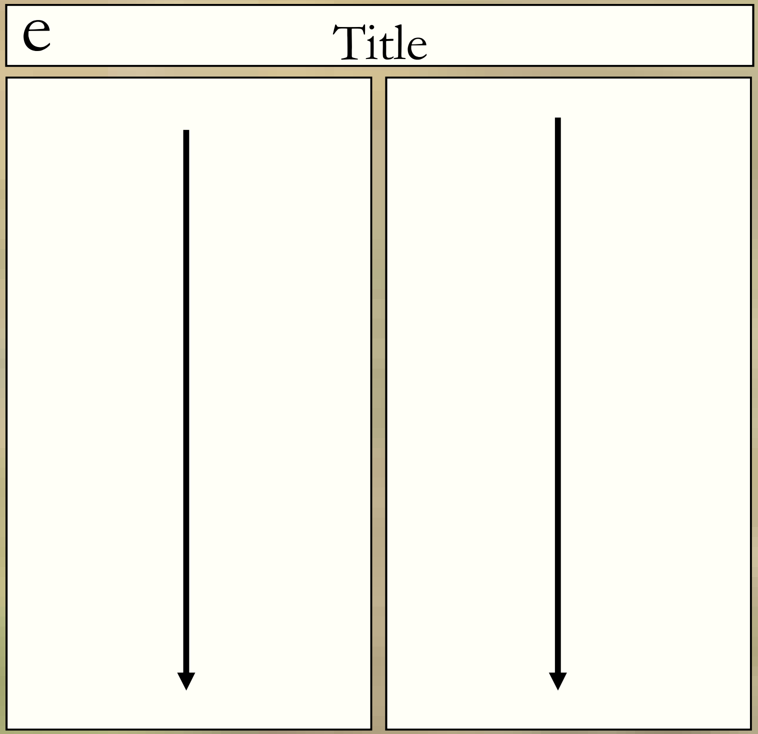



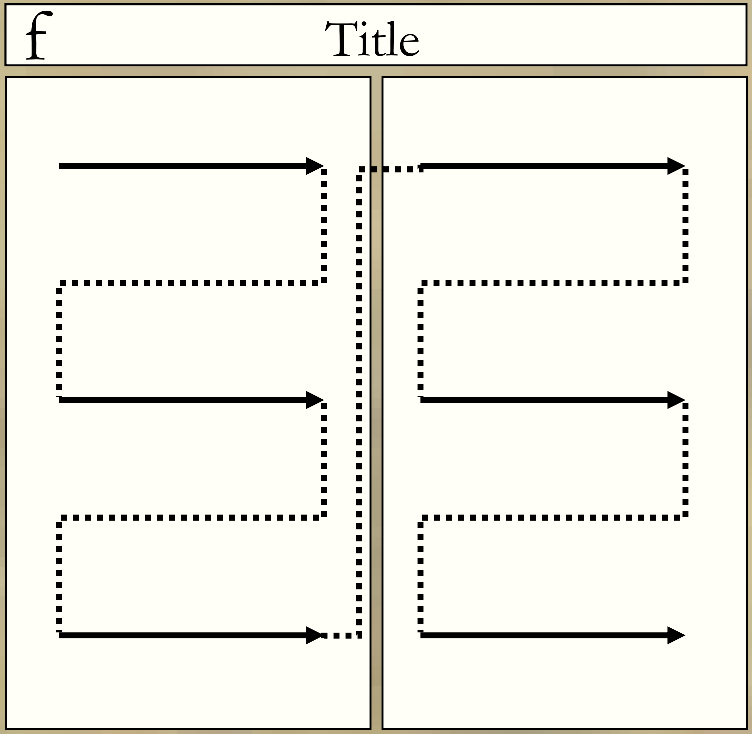

## Landscape layouts

Don’t use layout **c** on very wide posters (anything over about a meter)—viewers will be forced to walk back and forth to read comfortably.

# Portrait layouts

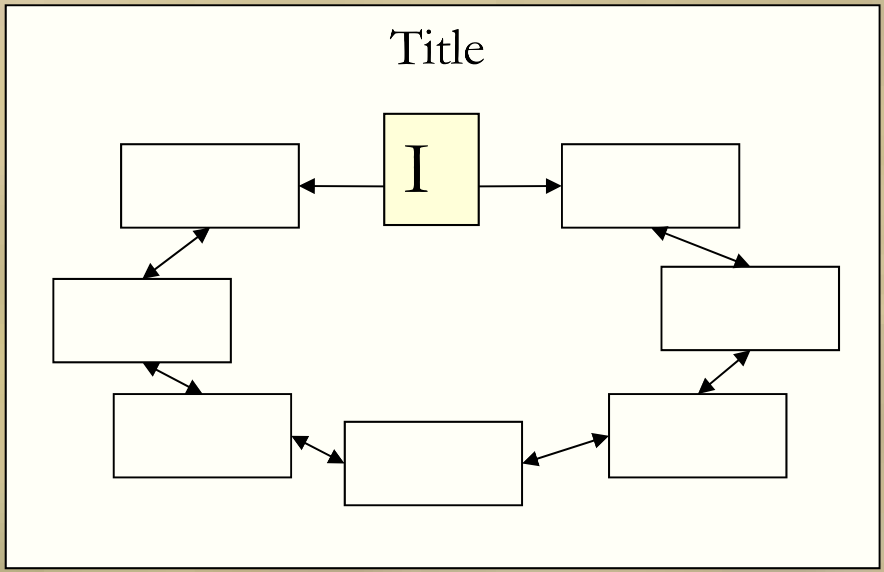


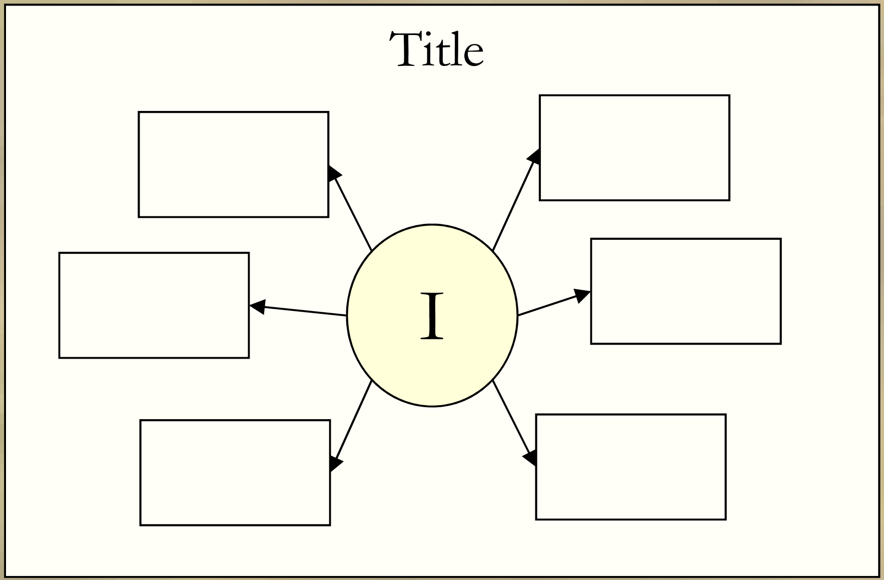



# Unusual layouts for special purposes

These layouts should be used only where the information has no inherent order, or you don't want any given segment to dominate.



Times New Roman,
a serif font

Aa

serifs

Bb

Variation in thickness of stroke

Cc

Arial,
a sans-serif font

Aa

no serifs

Bb

Uniform thickness of stroke

Cc

## Serif

- Times (New) Roman
- Palatino linotype
- Georgia
- Garamond
- Book Antiqua
- Century Schoolbook
- Californian
- Lucida Bright

## Sans-serif

- Arial family
- Helvetica (Mac)
- Tahoma
- Trebuchet
- Verdana
- *Comic Sans*
- Avant Garde
- ***Eras family***

A rare species management provision of the United States federal Northwest Forest Plan, termed “Survey and Manage,” is applied to 24 million acres of Forest Service and Bureau of Land Management lands in western Washington, Oregon, and California.  Through Survey and Manage guidelines, the likelihood of persistence is increased for rare and uncommon species …

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Text overlaid on a photo can be pretty hard to read, especially if the photo contains busy patterns.
Changing the color may help somewhat, or may not.

Even with the photo filtered or lightened, strong linear components may still make text hard to decipher.

Contact Information:
jina.sagar@oregonstate.edu

# The Effect of Stream Crossing Culverts on the Movement of Coastal Giant Salamanders (*Dicamptodon tenebrosus*)

**Jina P. Sagar**, *Dept of Fisheries and Wildlife, Oregon State University*; **Deanna Olson**, *USDA Pacific Northwest Research Station*; **Richard Schmitz**, *Oregon State University*; **John Guetterman**, *Bureau of Land Management, Coos Bay, OR*

## Introduction

Barriers to the movement of aquatic organisms can increase the genetic and spatial isolation of populations. In addition, disruption to stream habitat continuity for organisms can alter dispersal and access to food resources, reproductive sites and refugia.

Stream crossing culverts occur throughout the managed forest landscape and are a potential barrier to the movement of stream obligate organisms. Current research indicates that culverts block passage of some fishes (Warren and Pardew, 1998; Toepfer et al., 1999). While studies have focused on anadromous fish passage, the effect of stream crossing culverts on the movement of other aquatic organisms is not known.

## Coastal Giant Salamanders


Larval Coastal giant salamanders are aquatic and may spend several years in the stream before metamorphosing into terrestrial adults. Some individuals may remain in the stream as paedomorphic adults. *D. tenebrosus* are found in a variety of aquatic habitats (Hunter, 1998) and often represent the most abundant vertebrates in headwater streams (Hawkins et al. 1983). The abundance of *D. tenebrosus* in streams, its wide-ranging use of habitats and complex life history make them an appropriate indicator of amphibian culvert passage issues.

## Objectives

1. Determine the movement distances and directionality of larval ***D. tenebrosus***

2. Determine the incidence and frequency of movement of larval ***D. tenebrosus*** through culverts

3. Identify what physical characteristics of a culvert may facilitate passage of ***D. tenebrosus***.

## Literature Cited

Hawkins, C.P., M.L. Murphy, N.H. Anderson, and M.A. Wilzbach. 1983. Density of fish and salamanders in relation to riparian canopy and physical habitat and streams of the Northwestern United States. Candadian Journal of Fisheries and Aquatic Sciences 40: 1173-1183

Hunter, M. 1998. Watershed-level patterns among stream amphibians in the Blue River watershed, West-Central Cascades of Oregon. Thesis, Oregon State University, Corvallis, Oregon.

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Warren, M.L. Jr., and M.G. Pardew. 1998 Road crossings as barriers to small-stream fish movement. Transactions of the American Fisheries Society 127:637-644

## Methods

Study sites included fourteen 3rd and 4th order streams in the Coquille basin on lands administered by the Coos Bay Bureau of Land Management (Figure 1). The 14 sites were comprised of streams with pipe design culverts (Figure 2), streams with arch design culverts (Figure 3) and reference streams without culverts (~five sites in each category). Average culvert length was 22 m. Selection criteria for study streams was based on size (average active channel width < 3m), slope, substrate type, and presence of larval *D. tenebrosus*.

Figure 1



Figure 2


Figure 3

Stream segments were approximately 80 m in length (Figure 4). Study streams and culverts were surveyed five times, once each month, from June-August 2002 and June, July 2003 (Figure 5). Salamanders were captured using hand nets.

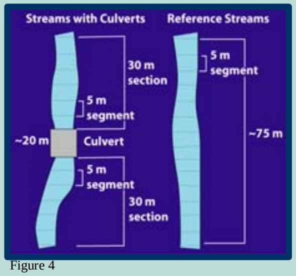


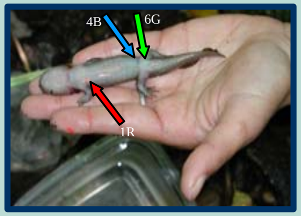

Figure 4

Figure 5 Survey inside culvert.

## Marking Methods

Marking occurred on the first two visits to each stream. Salamanders were recaptured but not marked on subsequent visits.

Salamanders were placed in a dilute solution of Tricaine methanesulfonate (MS 222) until anesthetized.

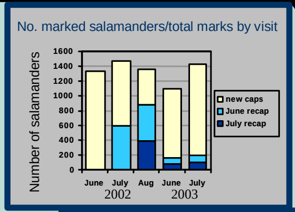



Anesthetized salamanders were marked with small subcutaneous injections of a colored biocompatible elastomer (Visible Implant Fluorescent Elastomer by Northwest Technologies). Salamanders were individually coded with three injections from a combination of four possible colors (red, orange, green, blue) at six possible ventral locations.

## Results

### Recapture

A total of 2,215 individuals were marked during the study and 1,200 were recaptured on at least one occasion (54%). Recapture rates varied by stream and month.

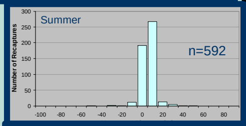


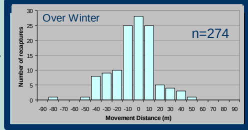

### Movement Distances

*Summer*–The majority of movement distances in the summer (68%) were less than 2 m. The average movement distance was 3.1m and a maximum of 51 m.

*Over-winter*-Movement was slightly greater than summer movement. Less than 19% of movements over-winter were < 2 m. The average movement distance was 13 m and a maximum of 90 m.

*Treatment differences*-There was no difference in movement distances when all movements were compared across the three stream types (reference, arch, pipe, p=0.28). There were, however, differences in long distance movements (movements > the culvert length) between the stream types. Salamanders on reference streams were 5 times as likely to move longer distances (>30 m) than salamanders on pipe streams and three times more likely than on arch streams

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*Complete downstream passage*-Fourteen larval salamanders passed through 7 culverts (arch and pipe)

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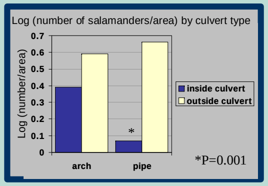
Limited upstream movement occurred in all 5 arch culverts but not in pipe culverts.

Fewer salamanders/area were captured in pipe culverts than in arch culverts and in adjacent stream reaches (p=0.001).




The number of salamanders/area found in arch culverts was similar to the natural adjacent stream sections.

## Conclusions

The majority of movements were small, although a portion moved longer distances.

- *D. tenebrosus* moved more upstream in summer, downstream in winter
- No upstream movement through pipe culverts, summer and winter
- Fewer long distance movements on culvert streams than reference streams
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Salamanders dispersing longer distances on streams with one or more pipe culverts may be limited in their upstream movement. Culverts appear to serve as stream habitat for *D. tenebrosus*, when filled with a diversity of substrates.

## Management Implications

- Many culverts were installed in the 1980s and are now nearing the end of their lifespan. As these culverts become obsolete, managers may need to consider a wide range of aquatic organisms for culvert replacement.

- Substrate appears to play a large role in larval salamander culvert use and may facilitate upstream movement through culverts.

- Given the limited passage success of Coastal Giant Salamanders, studies designed to investigate the effect of culverts on other stream species are needed.

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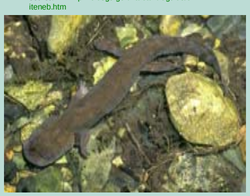
Source:www.npwrc.usgs.gov/narcam/idguide/diteneb.htm



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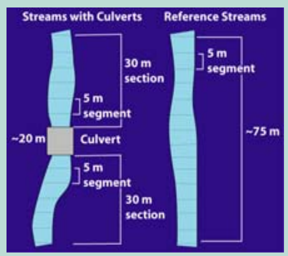


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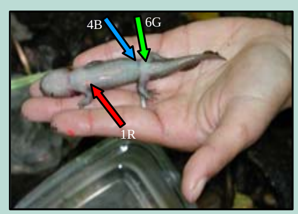


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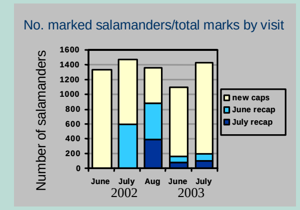


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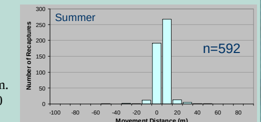


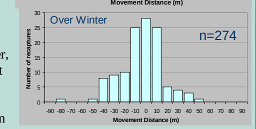


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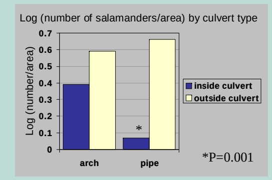


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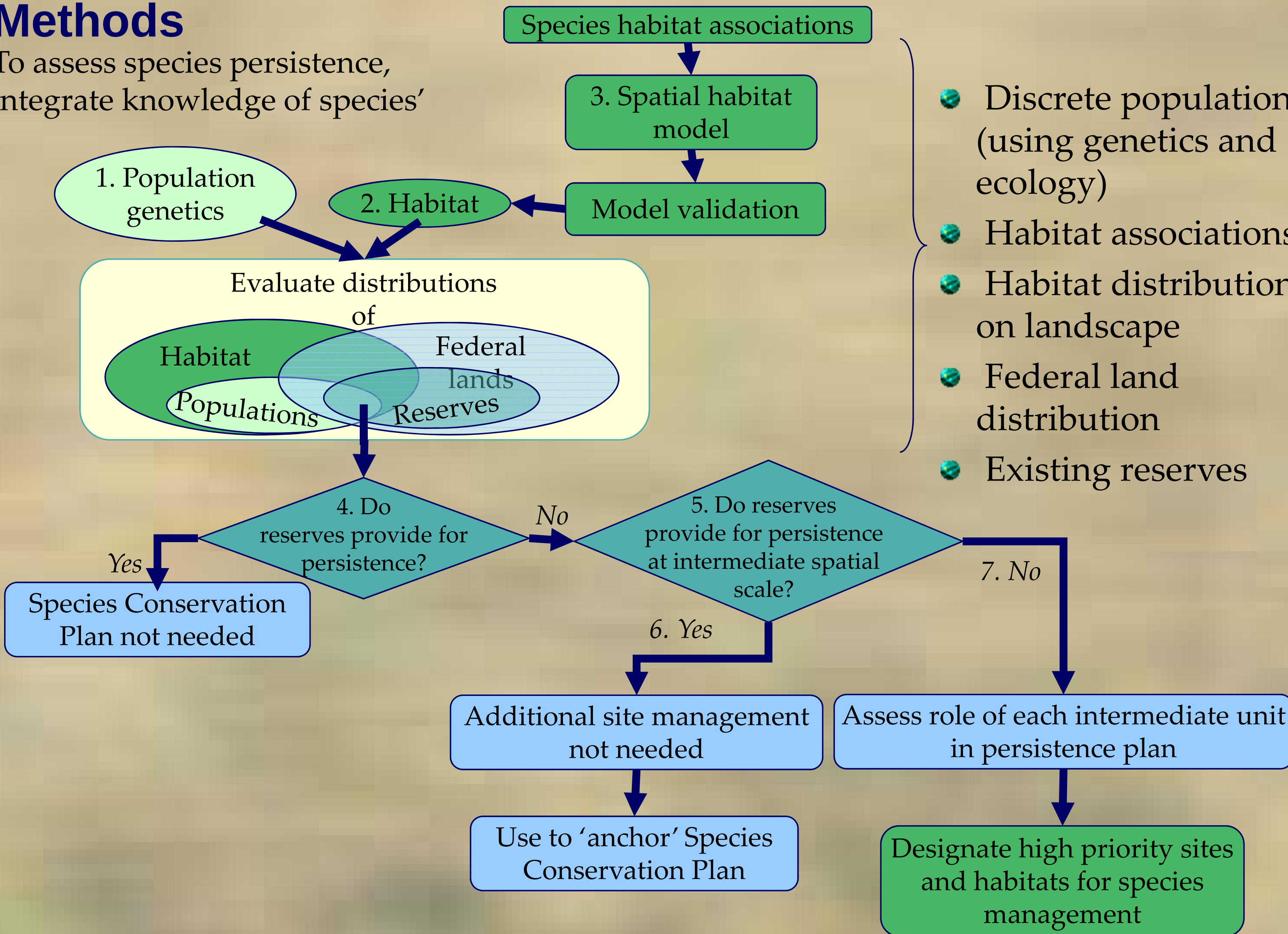
# Methods

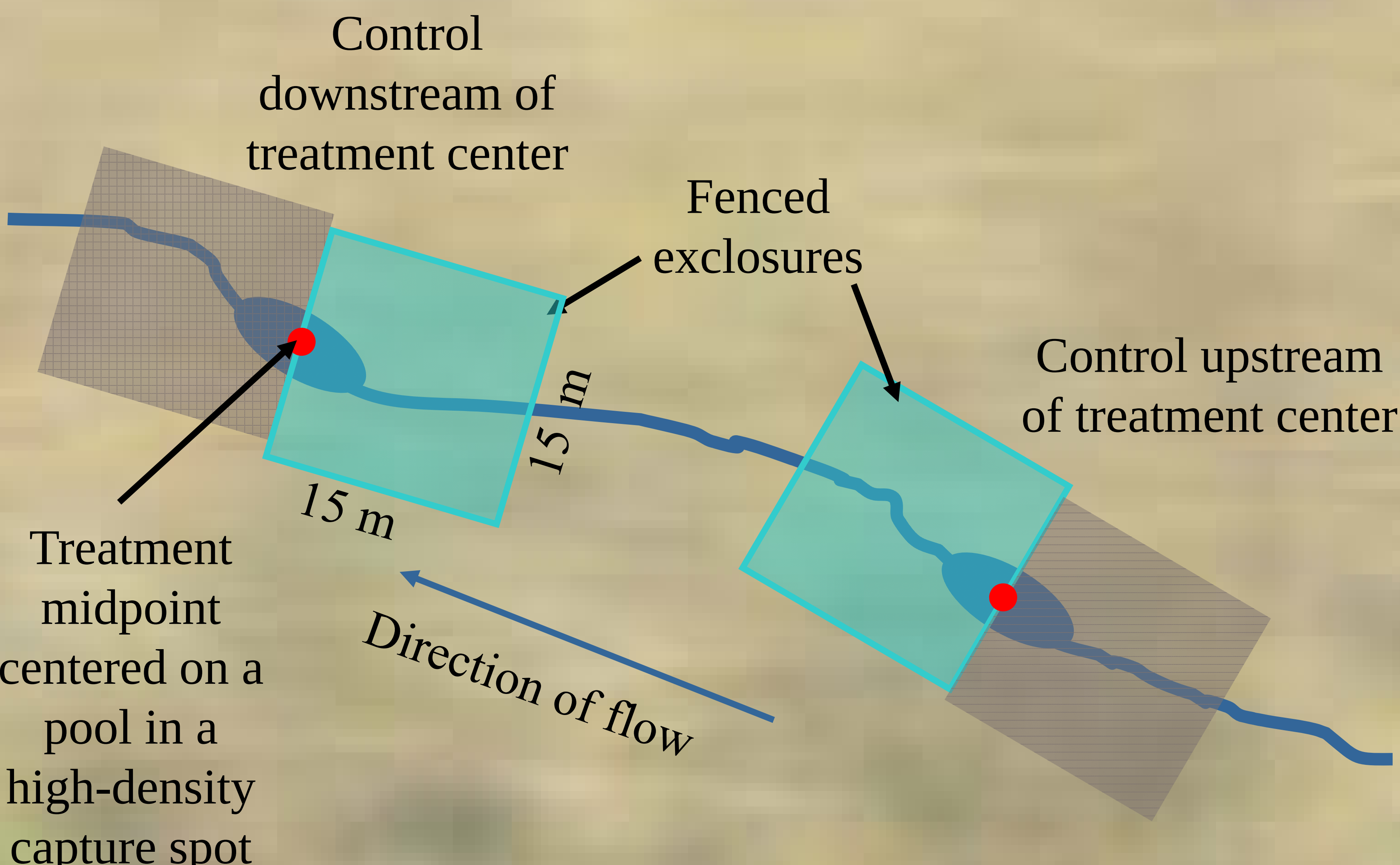
To assess species persistence, integrate knowledge of species'




- Discrete populations (using genetics and ecology)
- Habitat associations
- Habitat distribution on landscape
- Federal land distribution
- Existing reserves

From Clayton et al. 2002

# Conduct of Experiment




From Shovlain et al. 2005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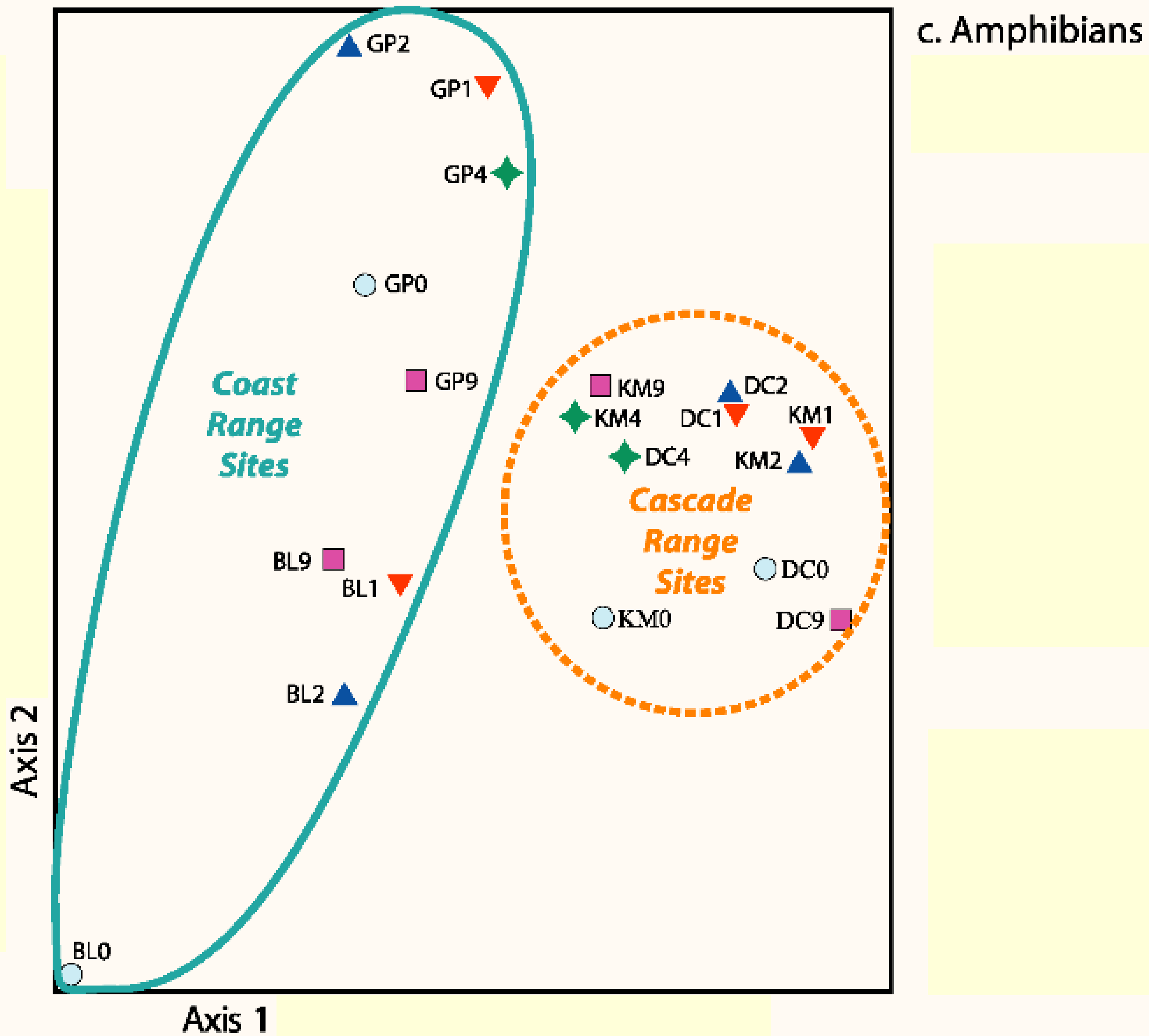
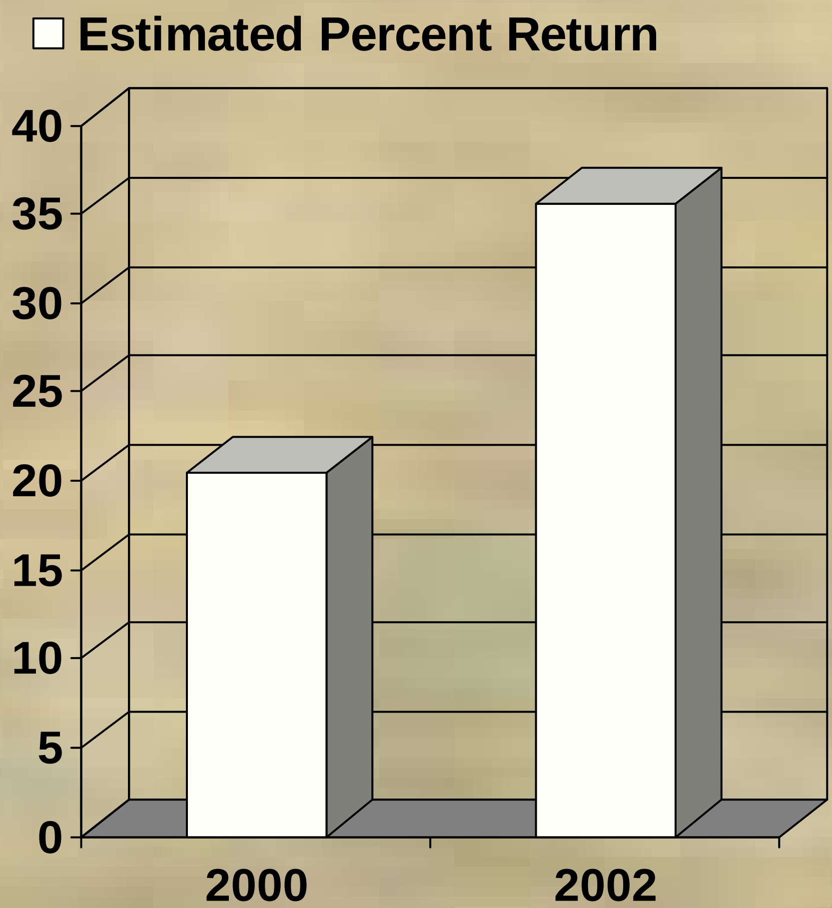
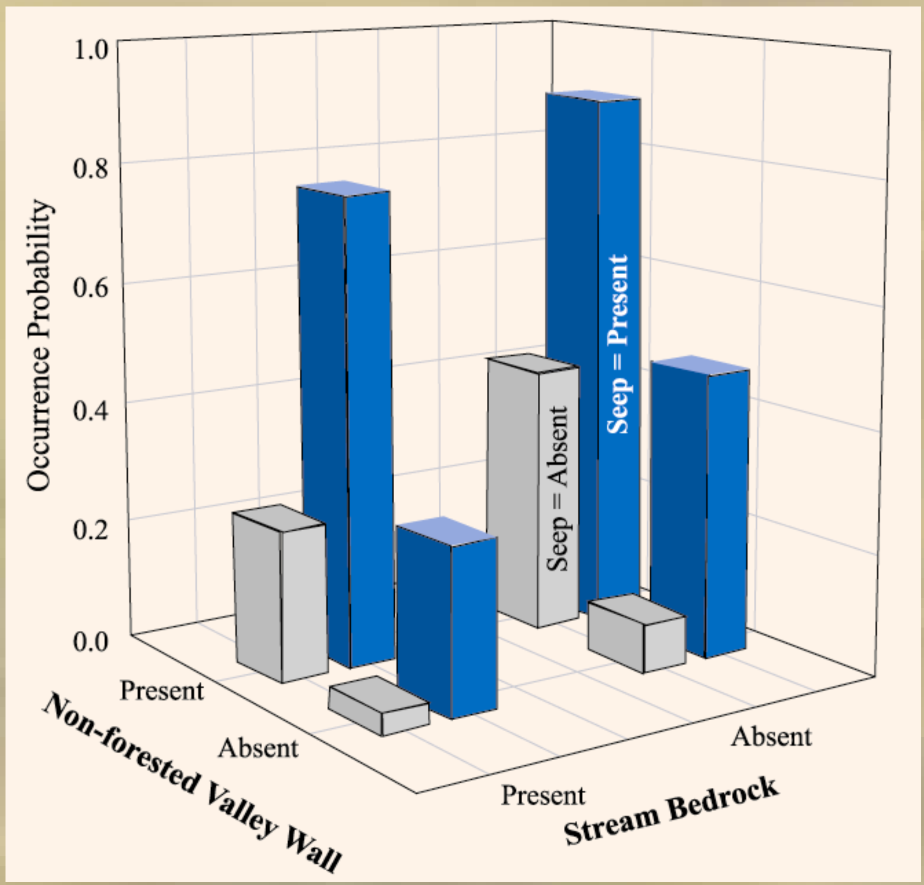


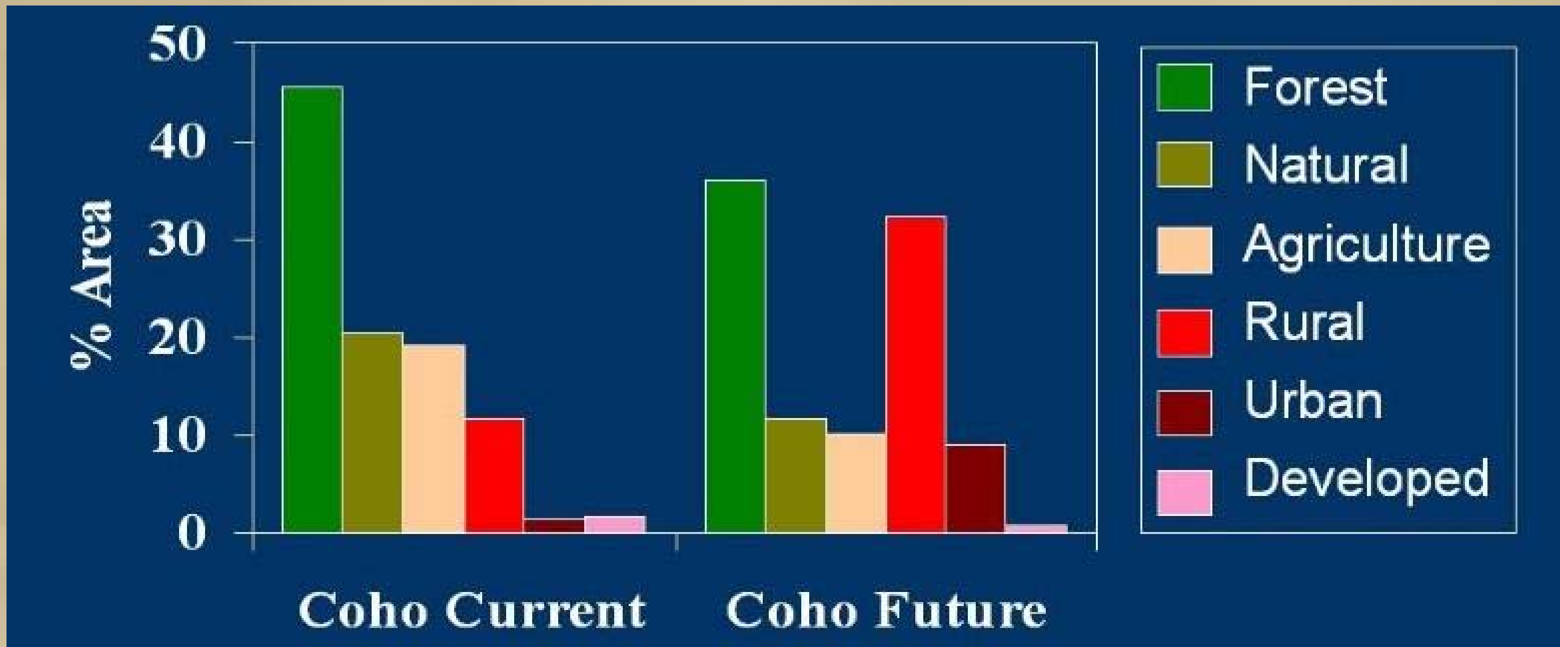

From Wessell, Olson and Schmitz, 2005.

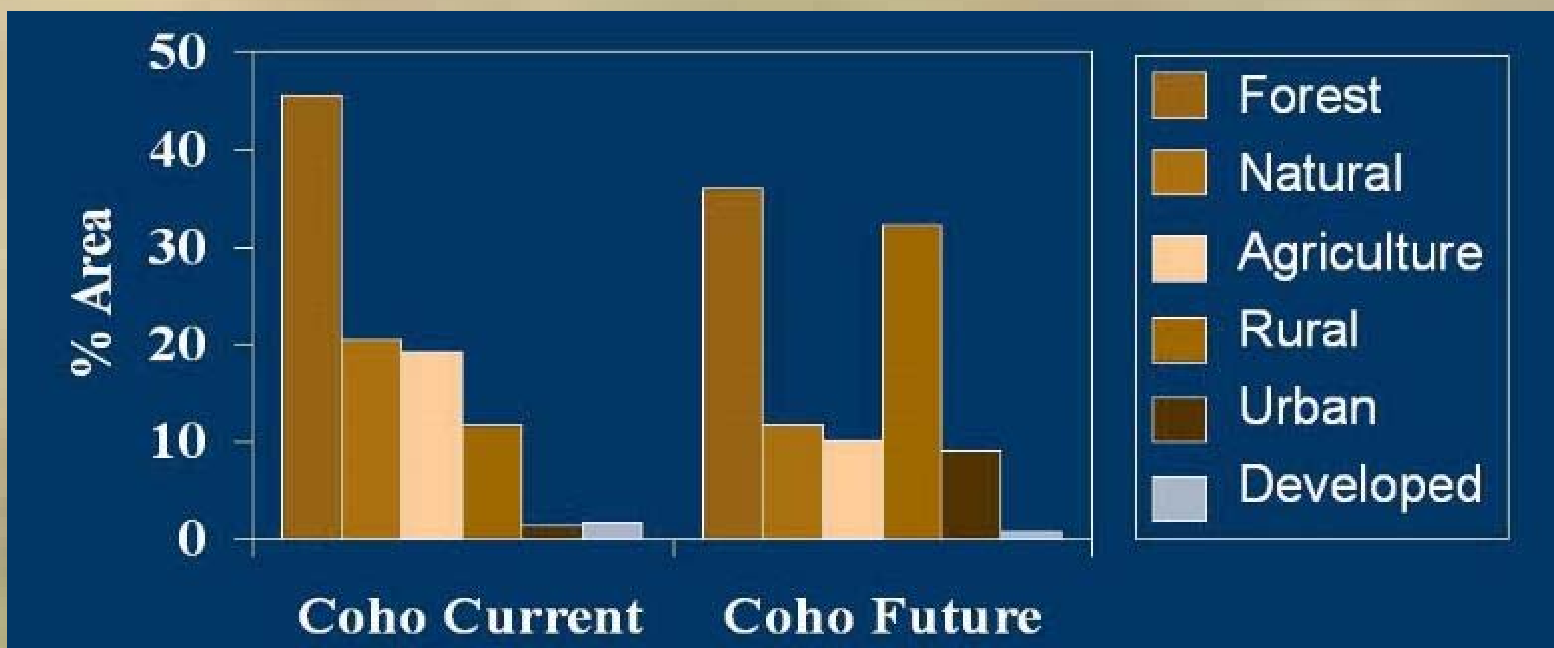



2 dimensions (in fact, only 2 numbers) = BAD

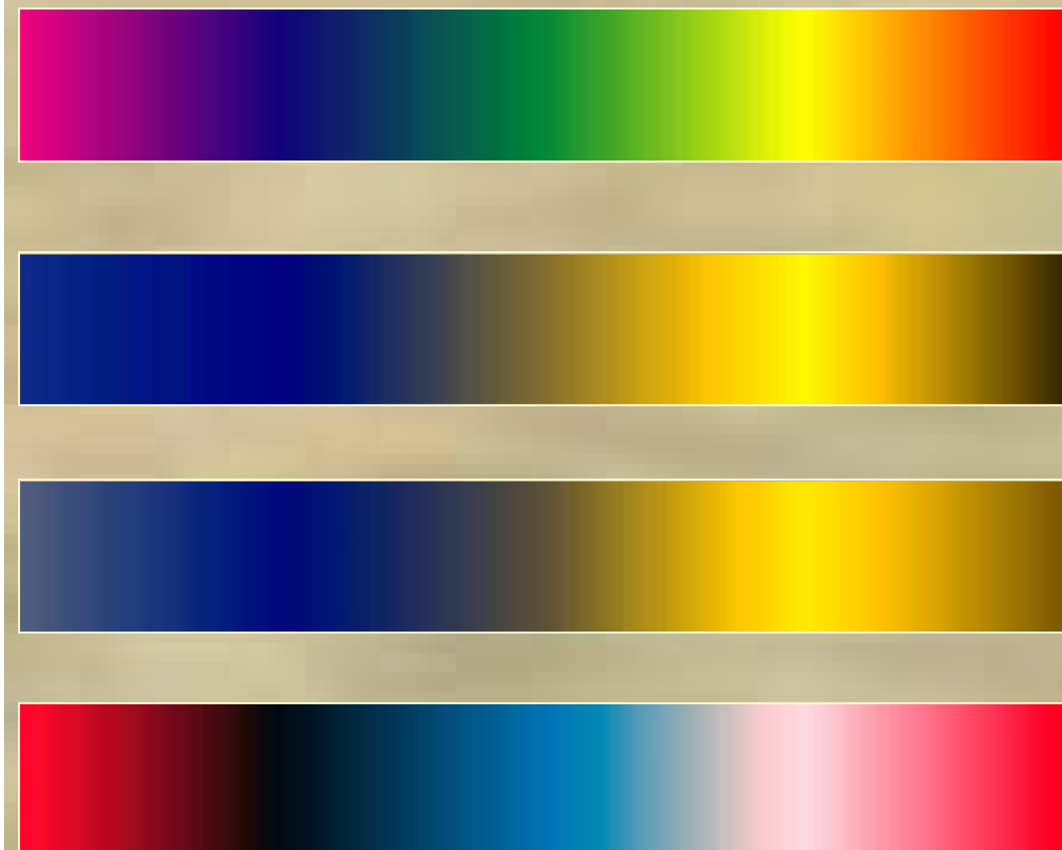
Genuinely 3 dimensions ACCEPTABLE




Graphs: Ken Vance-Borland

# Can color blind people see colors? Do they see everything black and white?



**non color blind**

**protanope**
**(red cone cells defective)**

**deuteranope**
**(green cone cells defective)**

**tritanope**
**(blue cone cells defective)**

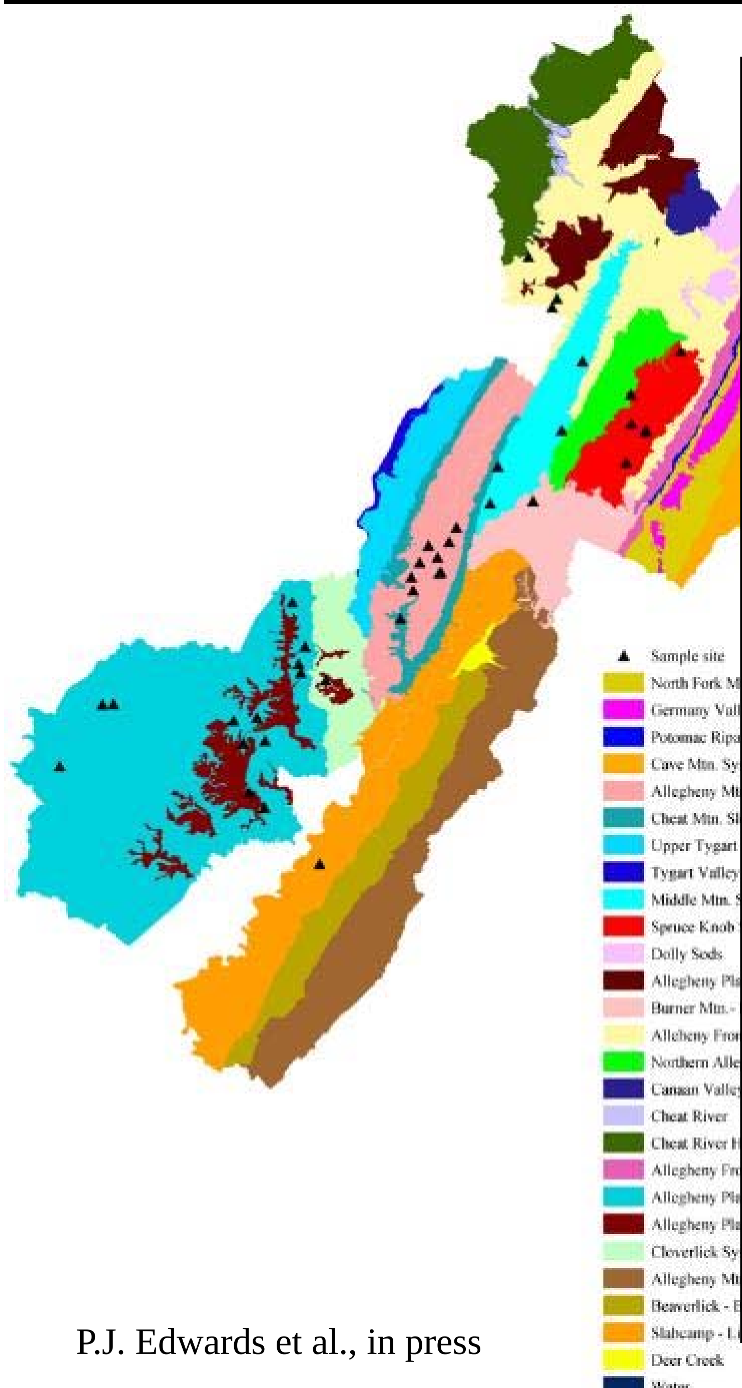
Color blind simulator: VisCheck (http://vischeck.com)

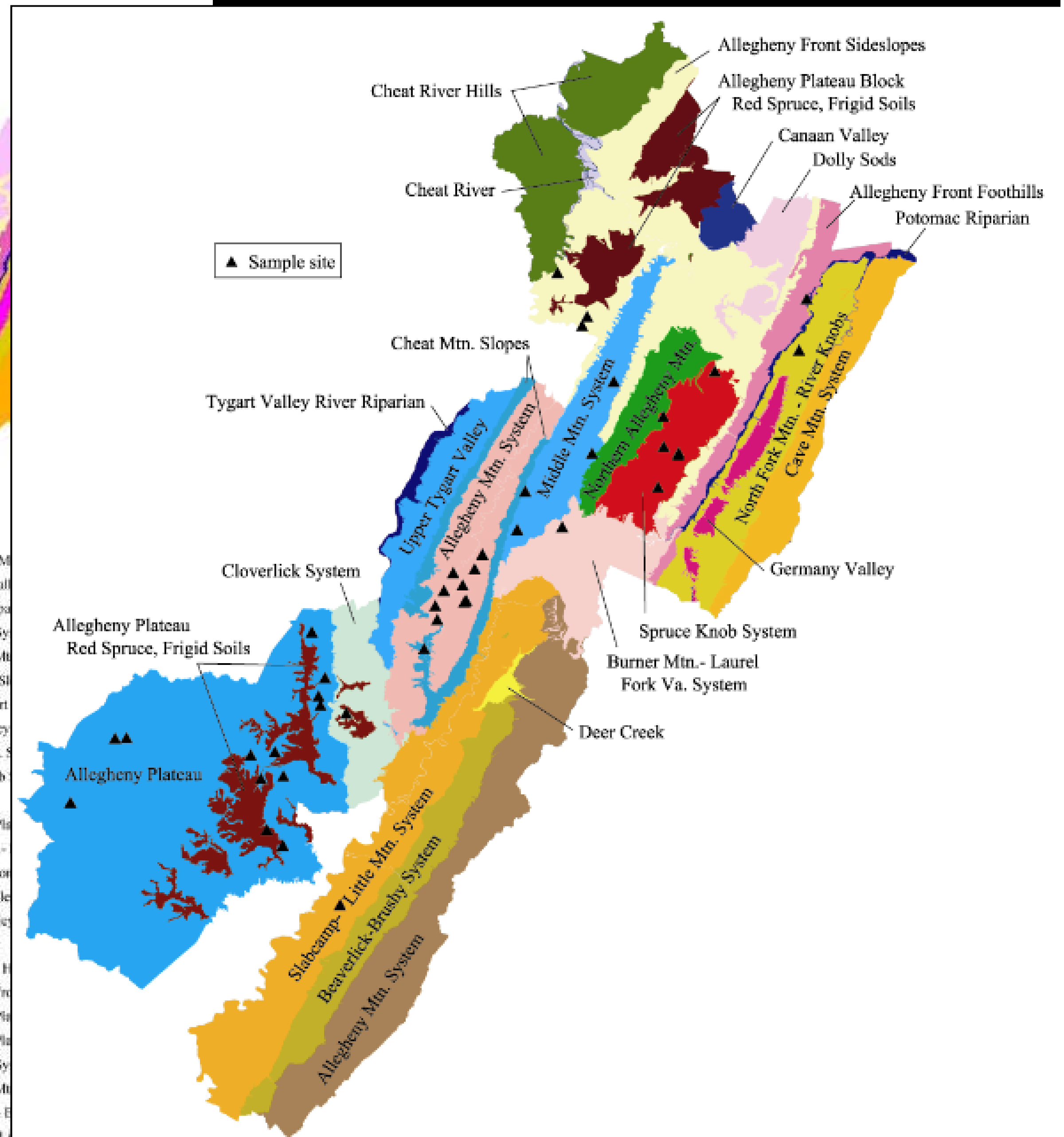
From: *Masataka Okabe* and *Kei Ito*

# Example of colors that are easier to identify

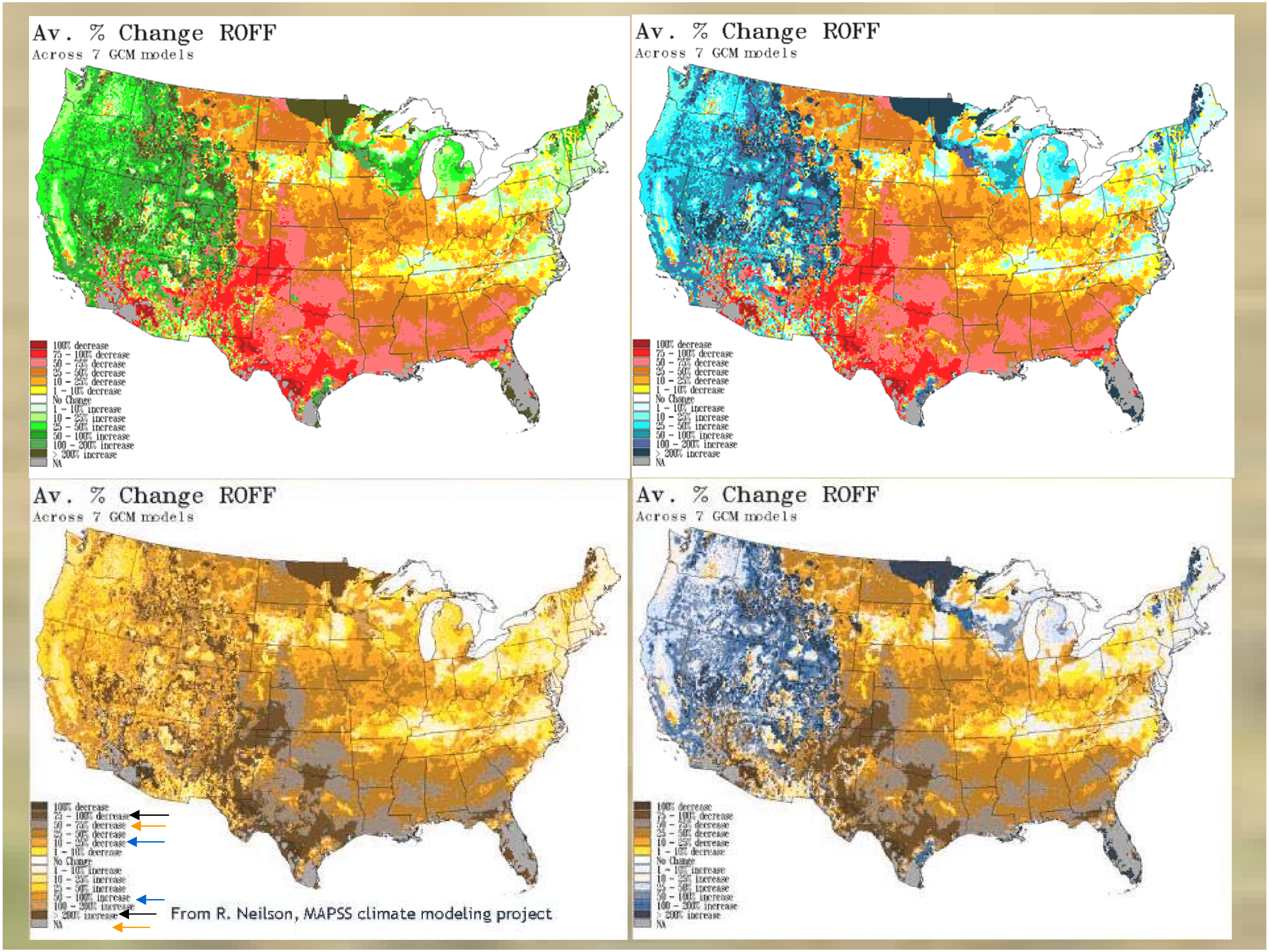

| | Hue | C,M,Y,K (%) for Photoshop, Illustrator, Freehand, etc. | R,G,B (0-255) | R,G,B (%) for Word, Power Point, Canvas, etc. |
|---|---|---|---|---|
| Black | – ° | (0,0,0,100) | (0,0,0) | (0,0,0) |
| Orange | 41° | (0,50,100,0) | (230,159,0) | (90,60,0) |
| Sky Blue | 202° | (80,0,0,0) | (86,180,233) | (35,70,90) |
| bluish Green | 164° | (97,0,75,0) | (0,158,115) | (0,60,50) |
| Yellow | 56° | (10,5,90,0) | (240,228,66) | (95,90,25) |
| Blue | 202° | (100,50,0,0) | (0,114,178) | (0,45,70) |
| Vermilion | 27° | (0,80,100,0) | (213,94,0) | (80,40,0) |
| reddish Purple | 326° | (10,70,0,0) | (204,121,167) | (80,60,70) |

1. **Red:** **Avoid pure red** (RGB=100,0,0%). ***Use vermilion*** (RGB=80,40,0%) **or *change to orange*** (RGB=90,60,0%).
2. **Green:** **Avoid pure green** (RGB=0,50,0%), **which is confusing with red or brown.** ***Use bluish green*** (RGB=0,60,50%)
3. **Light green** (RGB=0,100,0%) **and yellow** (RGB=100,100,0%) **will appear the same to the color blind.**
   ***Avoid using colors between yellow and green.***




P.J. Edwards et al., in press


Av. % Change ROFF
Across 7 GCM models
100% decrease
75 – 100% decrease
50 – 75% decrease
25 – 50% decrease
10 – 25% decrease
1 – 10% decrease
No Change
1 – 10% increase
10 – 25% increase
25 – 50% increase
50 – 100% increase
100 – 200% increase
> 200% increase
NA
Av. % Change ROFF
Across 7 GCM models
100% decrease
75 – 100% decrease
50 – 75% decrease
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Av. % Change ROFF
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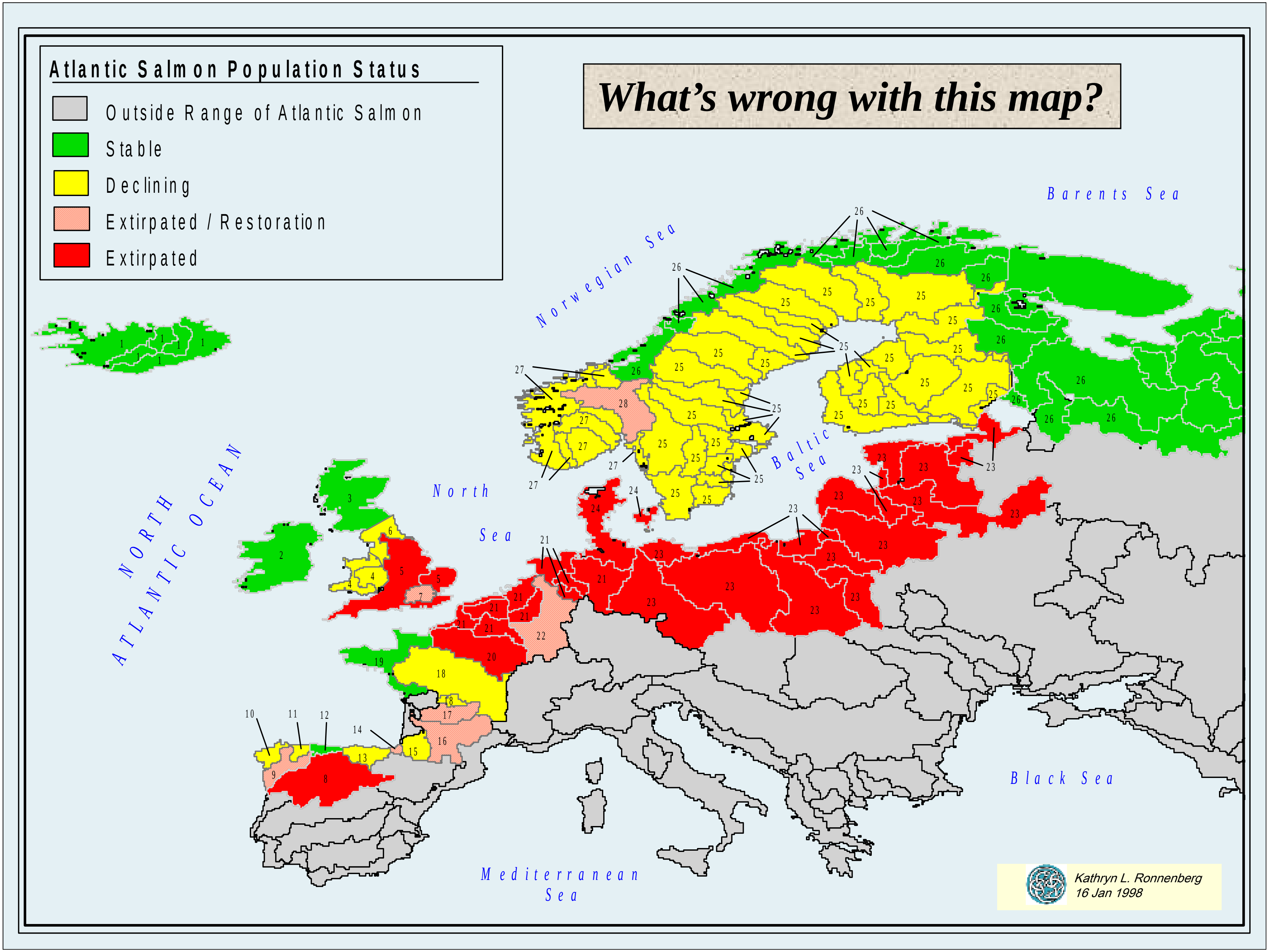
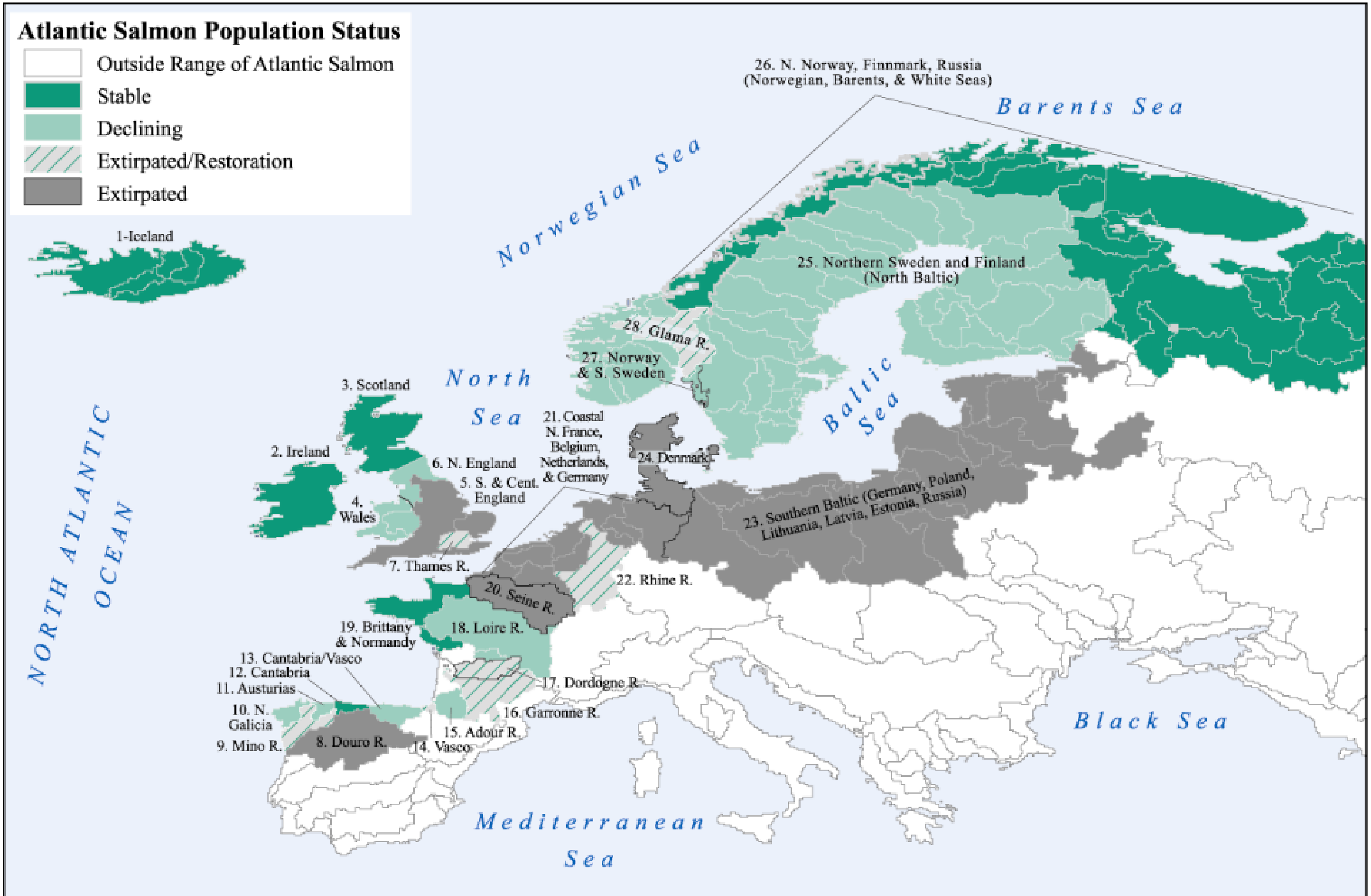
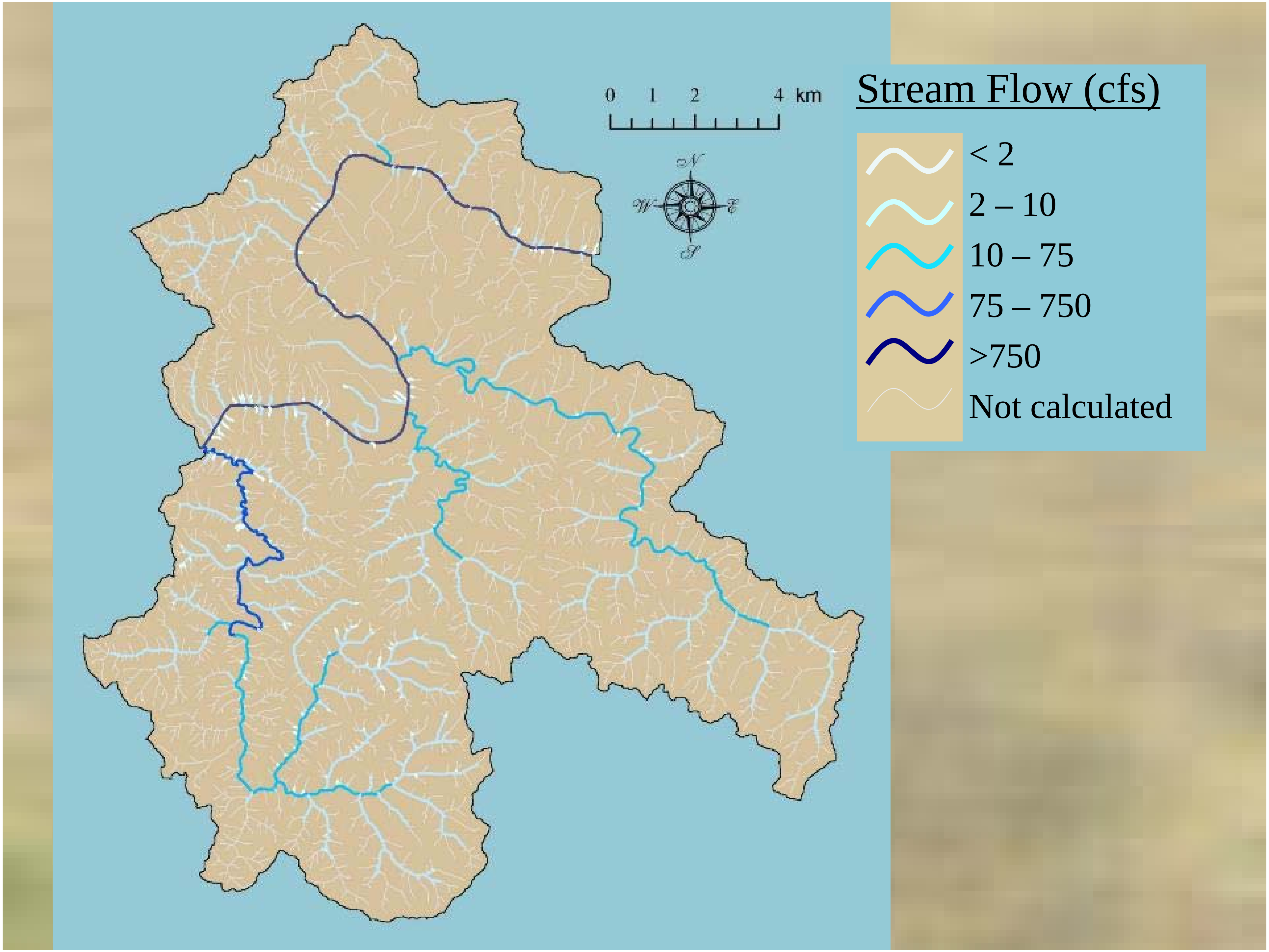

Atlantic Salmon Population Status
Outside Range of Atlantic Salmon
Stable
Declining
Extirpated / Restoration
Extirpated
What's wrong with this map?
Barents Sea
Norwegian Sea
North Sea
NORTH ATLANTIC OCEAN
Baltic Sea
Black Sea
Mediterranean Sea
Kathryn L. Ronnenberg
16 Jan 1998



Atlantic Salmon Population Status
Outside Range of Atlantic Salmon
Stable
Declining
Extirpated/Restoration
Extirpated
1-Iceland
2. Ireland
3. Scotland
4. Wales
5. S. & Cent. England
6. N. England
7. Thames R.
8. Douro R.
9. Mino R.
10. N. Galicia
11. Austurias
12. Cantabria
13. Cantabria/Vasco
14. Vasco
15. Adour R.
16. Garronne R.
17. Dordogne R.
18. Loire R.
19. Brittany & Normandy
20. Seine R.
21. Coastal N. France, Belgium, Netherlands, & Germany
22. Rhine R.
23. Southern Baltic (Germany, Poland, Lithuania, Latvia, Estonia, Russia)
24. Denmark
25. Northern Sweden and Finland (North Baltic)
26. N. Norway, Finnmark, Russia (Norwegian, Barents, & White Seas)
27. Norway & S. Sweden
28. Glama R.
Barents Sea
Norwegian Sea
North Sea
Baltic Sea
NORTH ATLANTIC OCEAN
Black Sea
Mediterranean Sea


Stream Flow (cfs)
< 2
2 – 10
10 – 75
75 – 750
>750
Not calculated
0 1 2 4 km
N
W
E
S

# The Society for Northwestern Vertebrate Biology

*The Board of the Society for Northwest Vertebrate Biology*

## Who we are...

The Society for Northwestern Vertebrate Biology (SNVB) is the oldest scientific association devoted to the study of terrestrial vertebrates in the Pacific Northwest. Founded in 1920 as the Pacific Northwest Bird and Mammal Society, it has long been recognized as the pre-eminent union of ornithologists and mammalogists in the Pacific Northwest. The Society adopted its current name in 1998 to reflect an expanded taxonomic scope that includes amphibians and reptiles; in 1999, fish were added to that scope.

## What we aspire to...

The SNVB strives to:

- promote close working relationships among herpetologists, ichthyologists, ornithologists, and mammalogists in the Pacific Northwest;
- foster exchange of scientific information and interest in the study of vertebrates; and
- offer a forum for these activities through meetings and publications.

## What affiliates exist...

The Pacific Northwest Amphibian and Reptile Consortium (PNARC) is special arm of SNVB. PNARC serves as an umbrella organization encompassing all regional Working Groups and topics in herpetology, but emphasizes native species ecology and conservation. Networking and training are the basic PNARC functions.

The Gilbert Ichthyological Society (GIS), an affiliate since the inclusion of fish to the Society scope in 1999, fosters communication on all ichthyological topics. The special interest that SNVB members have in fish-amphibian interactions, and how fishery and management methods (e.g., electrofishing, rotenone treatments) may influence other vertebrates, provides a close tie to GIS.

## Where we are...

The geographic scope of the SNVB (Figure 1) and its flagship publication, the Northwestern Naturalist, is northwestern North America west of the Great Plains and north of the Mojave Desert, which includes the following US States and Canadian Provinces and Territories: Alaska, Alberta, British Columbia, California (central and northern), Colorado (western), Idaho, MacKenzie District, Montana, Nevada (north of the Mojave Desert), Northwest Territories (western), Oregon, Saskatchewan, Utah, Washington, Wyoming (western), and Yukon.

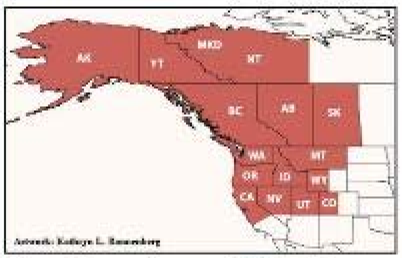



Figure 1. Geographic scope of SNVB (red).

## Who can participate...

All persons or institutions interested in the study of birds, mammals, amphibians, and reptiles are eligible for membership.

## What does it cost...

Annual membership rates:

- Student ($15)
- Regular ($25)
- Additional family member ($10)
- Contributing ($35)
- Sustaining ($50)
- Life ($325 one-time payment)
- Institutional - domestic & foreign ($60)

## What do you get...

Individual members receive the journal Northwestern Naturalist and the Murreletter, our newsletter. All other SNVB publications, such as Northwest Fauna, are available to members at a reduced rate. Family memberships include one mailing, but both members can get discounts. Other privileges of membership include notification of all meetings of SNVB, power to vote in SNVB meetings and elections, and the privilege of holding office in SNVB.

However, the best part of SNVB membership is the intangibles…new friends and colleagues…new interactions…and new possibilities in study, work, research, and play.

## How are we organized...

Society Officers, elected by the membership of the Society, consist of a President, one Vice-President from each of five regions, a Secretary, and a Treasurer. Society Officers and three Trustees elected at large comprise the Executive Board (Figure 2), and collectively address Society business based on a Constitution and Bylaws. All Board members attend and participate in quarterly meetings (in person or by teleconference) and the annual meeting, though selected Board members have specific quarterly and annual meeting responsibilities.

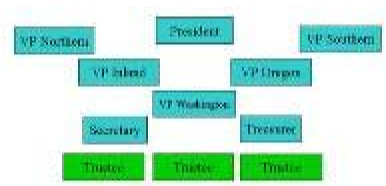



Figure 2. The SNVB Executive Board

Besides the Executive Board, the SNVB also has three editorial positions that handle Society publications and a webmaster who keeps the SNVB website current.

## The annual event...

The Annual Meeting, the flagship annual event of the SNVB, is often held jointly with other societies. It provides the membership special opportunity to present their work, exchange ideas, collaborate with new colleagues, identify new opportunities, socialize, and generally have a good time.

## For more information...

See the SNVB website at: http://www.snwvb.org


## Acknowledgments

Much of the language in this poster represents the collective contribution of many generations of SNVB officers. The current SNVB Executive Board provided suggestions for improvement. Marcia Repaci drew the logo. Kathryn Ronnenberg drew Figure 1. Marc Hayes assembled the poster.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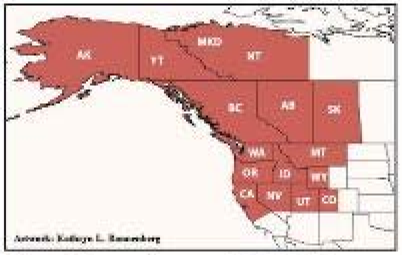


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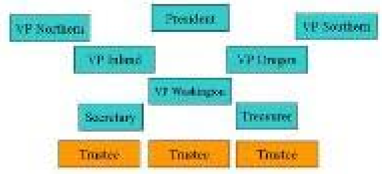


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## Current SNVB Board

# The Effect of Stream Crossing Culverts on the Movement of Coastal Giant Salamanders (*Dicamptodon tenebrosus*)

**Jina P. Sagar**, *Dept of Fisheries and Wildlife, Oregon State University*; **Deanna Olson**, *USDA Pacific Northwest Research Station*; **Richard Schmitz**, *Oregon State University*; **John Guetterman**, *Bureau of Land Management, Coos Bay, OR*

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jina.sagar@oregonstate.edu

## Introduction

Barriers to the movement of aquatic organisms can increase the genetic and spatial isolation of populations. In addition, disruption to stream habitat continuity for organisms can alter dispersal and access to food resources, reproductive sites and refugia.

Stream crossing culverts occur throughout the managed forest landscape and are a potential barrier to the movement of stream obligate organisms. Current research indicates that culverts block passage of some fishes (Warren and Pardew, 1998; Toepfer et al., 1999). While studies have focused on anadromous fish passage, the effect of stream crossing culverts on the movement of other aquatic organisms is not known.

## Coastal Giant Salamanders


Source:www.npwrc.usgs.gov/narcam/idguide/diteneb.htm

Larval Coastal giant salamanders are aquatic and may spend several years in the stream before metamorphosing into terrestrial adults. Some individuals may remain in the stream as paedomorphic adults. *D. tenebrosus* are found in a variety of aquatic habitats (Hunter, 1998) and often represent the most abundant vertebrates in headwater streams (Hawkins et al. 1983). The abundance of *D. tenebrosus* in streams, its wide-ranging use of habitats and complex life history make them an appropriate indicator of amphibian culvert passage issues.

## Objectives

1. Determine the movement distances and directionality of larval ***D. tenebrosus***

2. Determine the incidence and frequency of movement of larval ***D. tenebrosus*** through culverts

3. Identify what physical characteristics of a culvert may facilitate passage of ***D. tenebrosus***.

## Literature Cited

Hawkins, C.P., M.L. Murphy, N.H. Anderson, and M.A. Wilzbach. 1983. Density of fish and salamanders in relation to riparian canopy and physical habitat and streams of the Northwestern United States. Candadian Journal of Fisheries and Aquatic Sciences 40: 1173-1183

Hunter, M. 1998. Watershed-level patterns among stream amphibians in the Blue River watershed, West-Central Cascades of Oregon. Thesis, Oregon State University, Corvallis, Oregon.

Toepfer, C.S., W.L. Fisher, and J.A. Haubelt. 1999. Swimming performance of the threatened leopard darter in relation to road culverts. Transactions of the American Fisheries Society 128:

Warren, M.L. Jr., and M.G. Pardew. 1998 Road crossings as barriers to small-stream fish movement. Transactions of the American Fisheries Society 127:637-644

## Methods

Study sites included fourteen 3rd and 4th order streams in the Coquille basin on lands administered by the Coos Bay Bureau of Land Management (Figure 1). The 14 sites were comprised of streams with pipe design culverts (Figure 2), streams with arch design culverts (Figure 3) and reference streams without culverts (~five sites in each category). Average culvert length was 22 m. Selection criteria for study streams was based on size (average active channel width < 3m), slope, substrate type, and presence of larval *D. tenebrosus*.

Figure 1


Figure 2

Figure 3

Stream segments were approximately 80 m in length (Figure 4). Study streams and culverts were surveyed five times, once each month, from June-August 2002 and June, July 2003 (Figure 5). Salamanders were captured using hand nets.

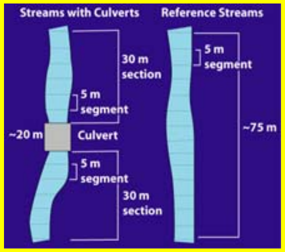


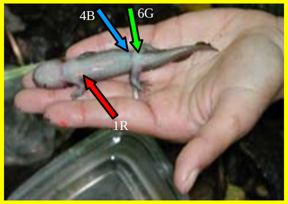

Figure 4

Figure 5 Survey inside culvert.

## Marking Methods

Marking occurred on the first two visits to each stream. Salamanders were recaptured but not marked on subsequent visits.

Salamanders were placed in a dilute solution of Tricaine methanesulfonate (MS 222) until anesthetized.

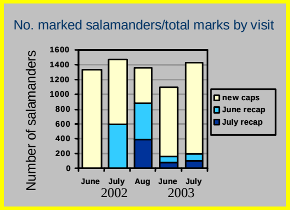



Anesthetized salamanders were marked with small subcutaneous injections of a colored biocompatible elastomer (Visible Implant Fluorescent Elastomer by Northwest Technologies). Salamanders were individually coded with three injections from a combination of four possible colors (red, orange, green, blue) at six possible ventral locations.

## Results

### Recapture

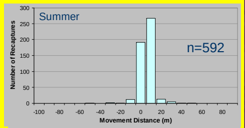
A total of 2,215 individuals were marked during the study and 1,200 were recaptured on at least one occasion (54%). Recapture rates varied by stream and month.

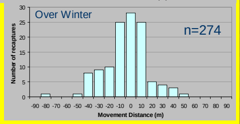



### Movement Distances

*Summer*–The majority of movement distances in the summer (68%) were less than 2 m. The average movement distance was 3.1m and a maximum of 51 m.

*Over-winter*-Movement was slightly greater than summer movement. Less than 19% of movements over-winter were < 2 m. The average movement distance was 13 m and a maximum of 90 m.




*Treatment differences*-There was no difference in movement distances when all movements were compared across the three stream types (reference, arch, pipe, p=0.28). There were, however, differences in long distance movements (movements > the culvert length) between the stream types. Salamanders on reference streams were 5 times as likely to move longer distances (>30 m) than salamanders on pipe streams and three times more likely than on arch streams

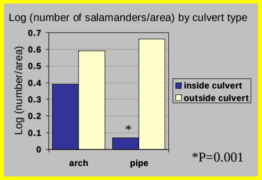
### Culvert Use and Passage

*Complete downstream passage*-Fourteen larval salamanders passed through 7 culverts (arch and pipe)

*Complete upstream passage*- Two larval salamanders passed through two arch culverts.

Limited upstream movement occurred in all 5 arch culverts but not in pipe culverts.

Fewer salamanders/area were captured in pipe culverts than in arch culverts and in adjacent stream reaches (p=0.001).




The number of salamanders/area found in arch culverts was similar to the natural adjacent stream sections.

## Conclusions

The majority of movements were small, although a portion moved longer distances.

- *D. tenebrosus* moved more upstream in summer, downstream in winter
- No upstream movement through pipe culverts, summer and winter
- Fewer long distance movements on culvert streams than reference streams
- *D. tenebrosus* habitat use of arch culverts greater than pipe culverts and similar to natural stream reaches

Salamanders dispersing longer distances on streams with one or more pipe culverts may be limited in their upstream movement. Culverts appear to serve as stream habitat for *D. tenebrosus*, when filled with a diversity of substrates.

## Management Implications

- Many culverts were installed in the 1980s and are now nearing the end of their lifespan. As these culverts become obsolete, managers may need to consider a wide range of aquatic organisms for culvert replacement.
- Substrate appears to play a large role in larval salamander culvert use and may facilitate upstream movement through culverts.
- Given the limited passage success of Coastal Giant Salamanders, studies designed to investigate the effect of culverts on other stream species are needed.

# Rare and Uncommon Terrestrial Salamanders in Northwestern Forests

Dede Olson, Steve Morey, David Clayton, Ed Reilly, John Guetterman, Brenda Devlin, Richard Nauman, Hart Welsh, and Kathryn Ronnenberg

Title & affiliations

Logos

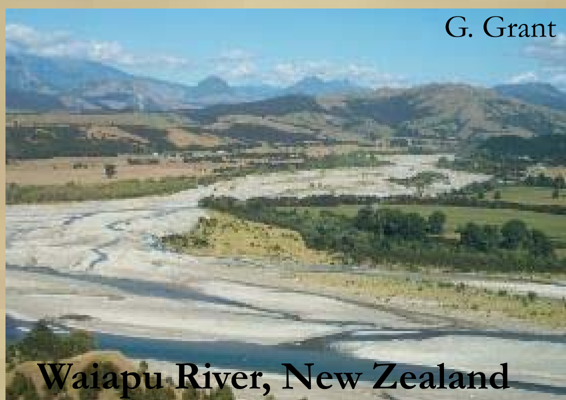



Photo credits

Acknowledgements

Literature Cited

Contact info

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**J. Guetterman[1], E. Reilly[2], D. Clayton[3], R. Nauman[4], D. Olson[4], B. Devlin[5] and H. Welsh Jr.[6]**

**[1]Coos Bay BLM, North Bend, OR; [2]USFS, Rogue River National Forest, Jacksonville, OR; [3]USFWS, Regional Office, Portland, OR; [4]USFS, Forestry Sciences Laboratory, Corvallis, OR; [5]USFS, Six Rivers National Forest, Gasquet, CA; [6]USFS, Redwood Sciences Laboratory, Arcata, CA**

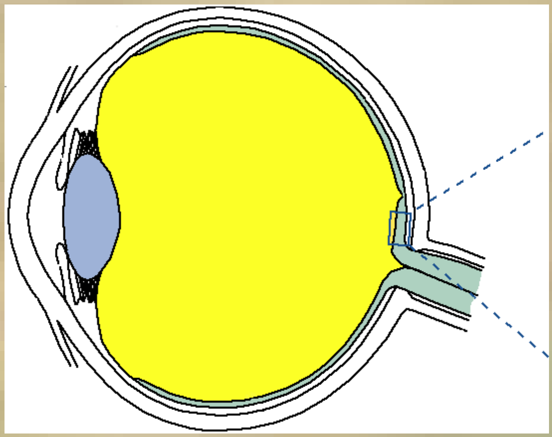
**For more information contact Team Leader** –Steve Morey, *US Fish and Wildlife Service Regional Office, 911 NE 11th Ave., Portland, OR 97232-4181, phone: (503) 231-6131*

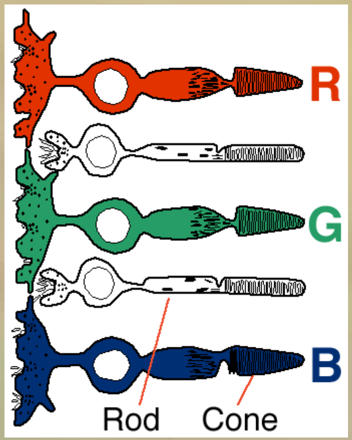

J. Brazier, Oct. 2004

# How common is color blindness?

***One in twelve*** **males (8%) and *one in 200* females (0.5%) are red-green color blind.**

**(Asian: 5%, French and Scandinavian : >10%)**






**Type 1 (protanopes) and Type 2 (deuteranopes): functional defects in red and green cone cells, respectively.**

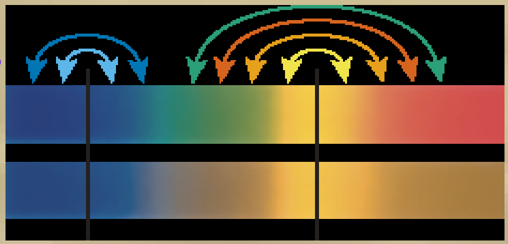
**People with defects in blue cone cells (type 3: tritanopes) are relatively rare (*one in tens of thousands*.)**

**Red-green color blindness is *commoner than AB blood group*. There should be around 10 color blind people in the room with 250 people !**

# How about characters and drawings?

**Four problems that color blind people suffer:**

1. **Cannot distinguish certain colors.**

   **Symbols and lines in:**

   **blue and violet;**

   **red, orange, yellow, yellow green and green**

   Non color blinds

   Color blinds

2. **Fail to see some objects.**

   **Dark red or magenta symbols and** thin lines **over black or dark blue background.**

3. **Difficult to see emphasized parts.**

   **Dark red characters in black text.**

   **(For protanopes, dark red appears similar to black…)**

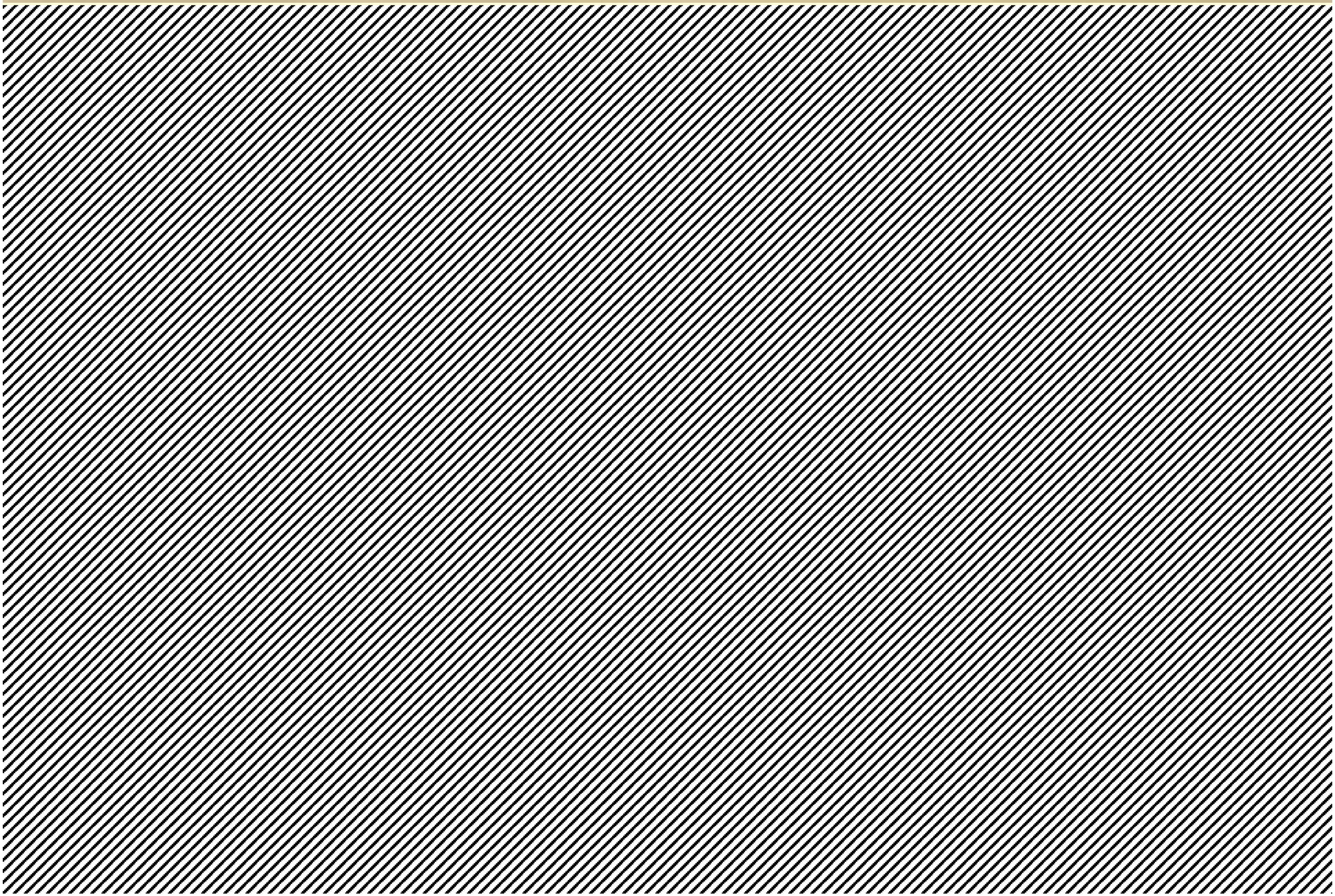
4. **Very difficult to tell the name of colors.**

   **"*Recognition of color difference*" and "*identification of color names*" are totally different task.**

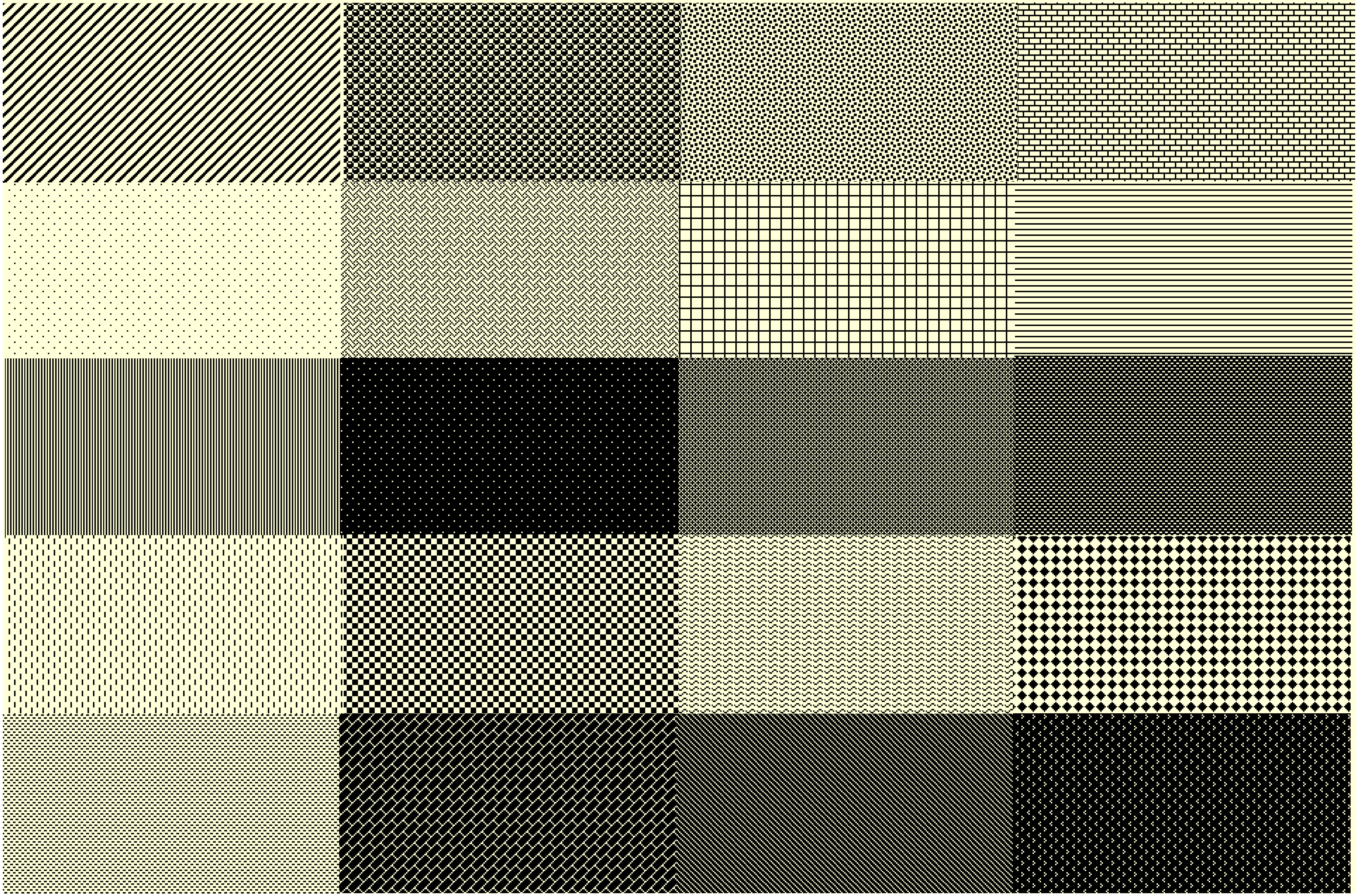
# Useful URLs

1: Color Blind Simulator
   Vischeck
   http://vischeck.com/
2: Green Laser Pointer
   DeHarpporte Trading Company
   http://store.yahoo.com/deharpport/
3: Download the PDF and PowerPoint files of this presentation
   http://jfly.nibb.ac.jp/html/color_blind
4:Java Applets on Colour Vision Deficiencies
   http://www.tsi.enst.fr/~brettel/
5: Color Brewer
http://www.personal.psu.edu/faculty/c/a/cab38/ColorBrewerBeta2.html

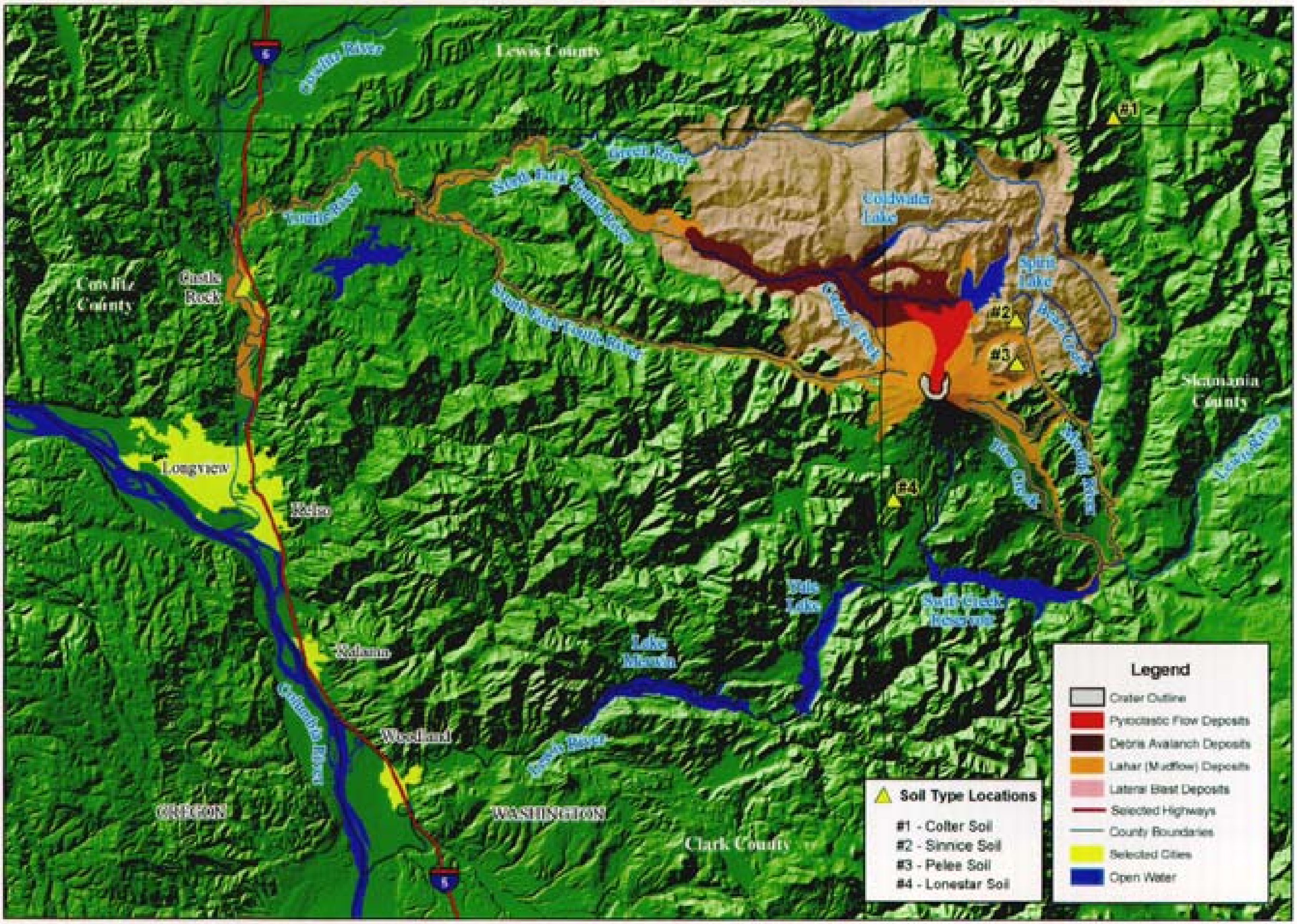
# …That's a <u>Moiré</u>!



# …and Moiré and Moiré…

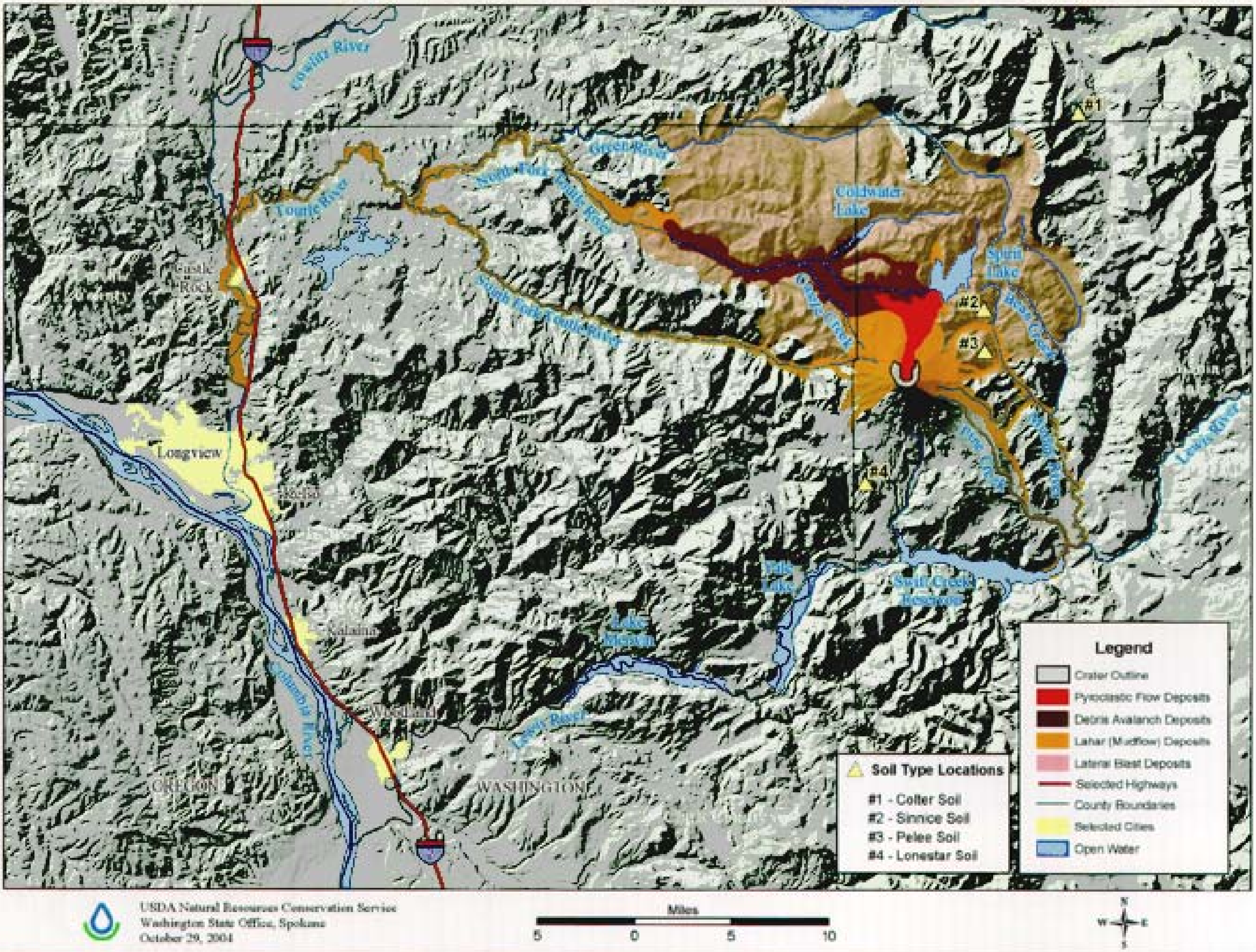


**Devastation And Lahar (Mudflow) Area**
**From Mount St. Helens Eruption, May 1980**




USDA Natural Resources Conservation Service
Washington State Office, Spokane
October 29, 2004

From Mount St. Helens Eruption, May 1980

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