Trinity River Watershed Council

December 12th, 2023 at 10:00am – 12:00pm

TCRCD Conference Room, #30 Horseshoe Lane, Weaverville

Our Mission:

To protect, enhance, restore and revitalize the watershed through collaborative efforts that leverage external resources, work toward common goals, educate and engage community stakeholders, address natural resource issues, and support healthy ecosystems for future generations.

Agenda

10:00-10:10   Welcome and Introductions

10:10-10:15   Announcements

10:10-10:45   Guest Speaker Topic – Modeling Meadows in Trinity County with Bridger Cohan from the Watershed Research and Training Center

10:45-11:55   Partner Updates

a. USFS – Shasta Trinity National Forest

b. USFS- Six Rivers National Forest

c. Bureau of Land Management (BLM)

d. California Department of Fish and Wildlife (CDFW)

e. Natural Resources Conservation Service (NRCS)

f. Trinity River Restoration Program (TRRP)/ Bureau of Reclamation (BOR)

g. Trinity County

h. The Nature Conservancy

i. North Coast Regional Water Quality Control Board (NCRWQCB)

j. Hoopa Tribal Fisheries

k. Yurok Tribal Fisheries

l. Tsnungwe Tribe

m. Nor Rel Muk Wintu Nation

n. Trinity County Resource Conservation District

o. The Watershed Research and Training Center

p. 5 Counties Salmonid Conservation Program/ Northwest California Resource Conservation & Development Council

q. Trinity County Fish and Game Commission

r. Trinity County Agricultural Alliance

s. Safe Alternatives for our Forest Environment (SAFE)

t. Sierra Pacific Industries

u. Flowra

v. New Attendees

11:55-12:00   Close

Next Meeting is March 12th, 2024 at 10am-12pm

> ### Virtual Meeting Information
>
> Zoom link: https://us02web.zoom.us/j/89707228772?pwd=WUo1VW5hS2x0UC85ODE4dFViNEFYUT09
> Meeting ID: **897 0722 8772**
> Passcode: **96093**
> +16694449171,,89707228772#,,,,*96093# US   +16699009128,,89707228772#,,,,*96093# US (San Jose)

Questions?
Contact Annyssa Interrante at 530 623 6004 X 209 or email at ainterrante@tcrcd.net

Trinity River Watershed Council – December 12th, 2023

Meeting Notes

Attendance

In Person (4):
- Annyssa Interrante- Watershed Program Coordinator Trinity County Resource Conservation District (TCRCD)
- Bridger Cohen- Program Associate Watershed Research & Training Center (WRTC)
- Oliver Rodgers – Civil engineer Trinity River Restoration Program (TRRP)
- Christine Burchinal—Watershed Stewards Program (WSP) Corpsmember TCRCD

Online (21):
- Dave DeLange – Trinity Public Utilities District (TPUD)
- Gregory Pasternack – Professor UC Davis River Science, Trinity resident
- Kellan Korcheck – Environmental Consultant Flowra
- Chris Cole – District Conservationist Natural Resources Conservation Service (NRCS) Weaverville
- Brandt Gutermuth – interested local
- Gabrielle Bohlman – Ecologist US Forest Service (USFS), Klamath Meadows Partnership
- Veronica Yates – Riparian Ecologist Hoopa Valley Tribe TRRP
- Lesli Mounivong – Watershed Stewardship Program Associate & Environmental Compliance WRTC
- David Colbeck – Environmental Compliance Specialist Trinity County Natural Resources Division
- Janelle Chojnacki – interested community member
- Emily Coooper – Yurok Tribe Fisheries Restoration Biologist
- Eli Asarian – Riverbend Sciences Eureka
- Justin Garwood – CDFW Region 1 Fisheries
- Kelly Sheen – TC RCD Director
- Karla Avila – Executive Director Trinity County Agriculture Alliance
- Monique Rea – Partnership Coordinator Shasta-Trinity National Forest USFS
- Eric Wiseman – Fish Biologist USFS Weaverville
- Sandra Perez – Environmental Specialist Yurok Tribe
- Josh Smith – Program Director Watershed Research & Training Center
- Kayla Meyer – Watershed Program Manager TC RCD
- Jon Cluff – Botany Manager WRTC

Total Attendance: 25 people

Meeting Start: 10:03am

Announcements
Annyssa Interrante: Inquiring for commentary about BLM document

Christine Burchinal: A requirement of the WSP service term is that each Corpsmember must coordinate and lead a hands-on restoration event called a Watershed Awareness Restoration Event (WAVE) in our local watershed. The main objective of this project is to restore and enhance salmonid habitat. I will be recruiting community volunteers to take part in a watershed restoration project that a partner organization might be wanting to implement, but may not otherwise have the capacity or resources to complete it. If you have any ideas for this restoration project—any restoration sites that you or your organization might have in mind, please feel free to share in the partner updates and my email was just put in the chat if you would like to message me directly.

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Notes from the chat:

- Trinity County RCD: Christine Burchinal cburchinal@tcrcd.net

Guest Speaker Topic: Bridger Cohen—Meadow Modeling in the Upper Trinity Watershed
This presentation will be looking at some work that we have done as part of an assessment of the Upper-Trinity Watershed generally, supported by the Bureau of Reclamation (BoR) and partnering with the RCD. We looked at a number of things, but one of the main things that we were interested in, both for their hydrology benefits to the watershed as a whole and also their local habitat benefits, were meadows. There are a number of meadow systems in the Trinity basin and some of them look really good, and some are pretty badly degraded. It is not always obvious where meadows have existed in the past, but luckily we have some tools to look into that and model those areas that probably could support wet meadows but don't currently and therefore might be really good restoration targets. This presentation is going to be looking at those tools and the datasets we use to get those tools set up.

Modeling Case Study – Upper Trinity Watershed
<u>Datasets:</u>
Garwood wet meadows assessment:

- Wetland/ wet meadow locations and extents hand-delineated by Justin Garwood and associates for the Upper Trinity watershed
- Only areas that support amphibian breeding habitat
- Not focused on meadows specifically, but captures the best, wettest meadows!

National Wetlands inventory (NWI)

- US Fish and Wildlife Service data product.
- Collection guidelines are not totally consistent, but most data from Trinity County appears to have been delineated by hand in the 1970's based on infrared aerial photography.
- Wetland inventory, not specifically meadows, but they are often synonymous in our case.
- Main issue: Dataset has a lot of situations where the polygons provided do not match up well with actual wetlands in landscape. Projection error is not consistent, so it can be hard to follow.
- Complete geographic coverage for Klamath area, and wetlands are typed.
- Prone to odd projection errors in some areas, often incomplete, and will generally miss drier meadows.

<u>Models:</u>
Lost Meadow Model:

- Developed by USFS PSW Research Staff to estimate 'lost' meadows area, originally in the Sierras.
- Uses machine learning algorithms to identify potential meadow areas with similar hydro geomorphic conditions to extant meadows.
- Predictor variables include 'local relative elevation, slope, distance to nearest stream channel, and topographic wetness index'.
- Training data for Upper Trinity basin was from Garwood's amphibian-supporting meadows dataset.

Wetlands Intrinsic Potential Model ('UW Wetlands Model'):

- Designed to 'map likely wetland areas in forested watersheds' in the Pacific Northwest by 'detecting hydrological and geomorphological controls', based on DEMs and other remote sensing data.
- Developed by TerrainWorks and University of Washington, in collaboration with WS DoE and WA DNR.
- Looks for amphibian breeding habitats
- Generates probability raster files, rather than polygons.

Questions?
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- Not specifically for wet meadows, but trained on the same Garwood dataset as the Lost Meadow Model.
- Looks less clean than lost meadow model

Overview of the Upper Trinity basin wet meadows using these datasets and models:
- Most wetland/ meadow features in the lost meadow model are in the trinity alps wilderness headwater basins, or they are riparian adjacent
- Garwood inventoried only <0.3% of total watershed as wet meadow habitat
  - That small percentage is incredibly important ecologically and hydrologically for the basin
- Lost meadow model (trained on Garwood data) shows >6x potential meadow area
- Total potential meadow area is probably even higher since Garwood dataset is only amphibian-supporting meadows.

Mumbo Basin Meadows:
- Garwood dataset is limited to lakes and ponds.
- NWI is actually pretty accurate in both coverage and classing.
- WRTC went to this area and did a field survey here.
  - There are some very unique wetland/ wet meadow features in this area.
  - Issues with incision coming off of the road that could be addressed with restoration to expand the meadow area.
- Both predictive models show much larger areas of wet meadow/wetland than either NWI or Garwood inventory.
- Reasonably close agreement although UW model is more optimistic.
- Lost meadow model calls out forested wetlands as non-meadow.

Upper-Masterson meadows (closer to Scott mtn)
- NWI captures some meadow area, but limited.
- Upper Masterson meadows mostly not captured by Garwood dataset.
- Nevertheless, pretty clearly meadow!
- Not good amphibian breeding habitat.
- Neither models did a good job here
  - Calls out a lot of upper areas as meadows when they definitely are not, they are more exposed ridgeline.
- UW model shows some likelihood for meadow, but not slam-dunk.
- UW model also shows ridgetop in the upper left as a probably meadow…

Bear creek meadows (Close to Mt eddy, south of the dead fall basin)
- Both Garwood data set and NWI call meadows in this area.
- Very good NWI coverage for this area, including slopes.
- Garwood captures all large flat meadows, but not slopes and pockets.
- Lost meadow model shows much larger area of meadow in valley bottom but does not include side slope meadows.
- Pretty close match overall.
- Problems with side slope wetlands in particular.
- Field validation showed issues with areas of talus/rocky debris on otherwise suitable terrain.
- Good reminder that field visits are always important.
- UW model also fails to capture slopes, is even more optimistic!

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Upper Trinity River Meadows (Carrville)
- Lost meadow model and data sources are not all aligned!
- Very flat area in general, with heavy human modification.
- UW model shows all floodplain surfaces as wetlands, no matter how many tailings there are.

Norwegian Meadows
- Large, semi-intact meadow area at a relatively low elevation.
- All the datasets and models agree that wet meadow is present, but extends are dramatically different.
- A lot of restoration opportunity here.
- Seems to be room for restoration/enlargement based on size of flat basin area.
- Has been partially drained, remembered as larger.
- What acreage of meadow is desirable and feasible?

Takeaways:
Model validation:
Still extremely preliminary, no metrics

Positives:
- Have a lot of potential for steering us into basins to look for potential meadows.
- Generally predict existing meadows, especially Lost Meadow Model.
- Can be extremely accurate in delineating extent of meadows, where substrate and hydrology are consistent.
- Useful to identify general restoration areas in current state.

Struggles:
- Do not deal well with idiosyncratic geologic and hydrologic features (no data).
- Rely on current geomorphic data, cannot assess historic conditions.
- Based on amphibian breeding habitat, so do not predict dryer or sloped meadows.
- Meadow formation in the upper Trinity Basin may not always rely on the same processes as in the Sierras.
    - The way that the model setup for the Sierras is not totally appropriate for the Klamath and Trinity basin- they have different geology and climates.

Paths Forward:
Additional modeling opportunities:
- Refining the models themselves?
- More complete training datasets?
- Discreet training datasets to cover different landforms (basin, sloping, floodplain)?
- Using additional data (hyperspectral remote sensing, geology reports) to refine geomorphic modeling predictions?

Prioritization:
- Already possible at a sub-basin scale for the Upper Trinity Watershed.
    - Is continuing to refine modeling worthwhile?
    - Or should we just focus on field work?
- Primary prioritization metrics?

- o 'Lost': 'Found' ratio
- What are the goals for restoration?
  - o Something the models do not do?
  - o Amphibian breeding habitat? Or plant species habitat? Basin-wide/hydrology benefits?

Questions?

- Did you consider using any other satellite datasets? There may be some water indices and online tools that make generating that data relatively easy like the sentinel hub EO browser and the climate engine. Those can either be based on the Landsat satellite data with a 30m resolution or the sentinel-2 which is 10m. These could be helpful for the case studies that you were looking at.
  - o Using additional data like that is something that we have talked about, not something we have incorporated just yet. Right now, we are looking into some satellite data that we have access to currently. It is something we are hoping to utilize in the future.
- Have you guys had a chance to check out those potential meadows identified by the Lost Meadows model, but that are disconnected from any existing meadows, and if so, are you seeing potential for those areas actually becoming future meadows with restoration.
  - o We have not had time to do many field visits yet, but I did look at some of them with LIDAR and some of the infrared imagery just to check them out. In most cases, I could see why the Lost Meadow model was calling them out as a sort of field basin, but without spending that time in the field, it is hard to say specifically on a case-by-case basis, but I believe there is potential there.
- I wanted you to go back over the general input that did point out these wetlands. It sounded like there was some elevation data, lidar, all sorts of things… just looking at depressions and all… Could you describe that again?
  - o I am not an expert, so there may be things that I am missing here. Particularly for the UW model, there were additional datasets that we could have used to refine that model and just didn't have the time to setup to provide. I believe for both of them they were primarily looking at just the relative position of, essentially, pixels on the landscape. The Lost Meadow model I think is based off of a 10m digital elevation map (DEM) and I believe the UW model is based off of LIDAR, which is a 1m DEM. So, the models are looking at the drainage area into those pixels and essentially looking for basins. Proximity to streams is also an indicator in these models, with a streams layer input in the Lost Meadows model. If there was a basin and it was near a water feature on the landscape that we knew about, then that ranks pretty high in probability as a wet meadow feature. It was primarily based on the different landscape features and looking at the relative elevations and different morphological features of the landscape.
- The UW model was so optimistic-- in wet years they are a lot wetter. How are you classifying the weather and taking into account the variability with dry versus wet years.
  - o We used the CDFW Justin Garwood dataset to train our models, and I believe that dataset is from a number of years, not just from 2022. I think it probably is a bit better at looking at a comprehensive suite of wetlands on the landscape than just if we had looked at 2021 or 2022 when those real droughts were happening. But I do not have the exact dates from when that data was collected.

Comments in the chat:

- Justin Garwood: "Yes we used all available google earth images between drought and good water years."
  - o "Justin, do you know what years?"

- Justin Garwood: "2012-2021"

Partner Updates

- USFS – Shasta Trinity National Forest:
    - Been busy this fall doing spawning surveys on many upper tributaries. It was a decent year.
    - Saw some spring-run chinook. Not many individuals.
    - Fall-run chinooks continued to spawn until the last week of November.
    - It tracked with the main stem spawning survey numbers which showed about average for the long-term 25-year dataset.
    - Saw a good amount of redds in tributaries and saw some Coho.
    - Tributary numbers are highly influenced by precipitation events. If we do not have enough rain to allow fish to push upstream into tributaries, we do not see those fish in the tributaries. Conversely, if it is not a great salmon return year and we get a lot of rain and the tributaries are running high, we will see a disproportionate amount of those fish getting into the tributaries to spawn.
- USFS – Six Rivers National Forest – not present
- BLM – not present
- CDFW – Informal update.
    - Just finished the 3-year grant doing visual encounter surveys throughout the Klamath Mountains and southern Cascades for cascades frogs, other amphibians, and fish. The goal was to visit the same footprint that was visited about 20 years ago to see how patterns and distribution has changed. We visited about 1100 sites. Had massive teams doing that work, so it's a big dataset. We will be ready to share next spring.
    - Restoration work removing fish populations from key habitats: high mountain lakes that were historically fish-less. Started with 8 waters and 2 were in Trinity River watershed that we have started. One was upper-Deadfall Lake and the other was Bull Lake. Those were high-value amphibian spots, but also there was nearby fisheries, so it wasn't impacting the entire recreational community. We just started that work. It will take a few years to get those populations removed—it is an ongoing process.
    - We are trying to get the word out and doing a lot of public outreach. We are restoring a small fraction—fish populations are still in hundreds of lakes—they are really resilient. It is a very small number of waterbodies compared to how many have fish currently. It is a work in progress.
- NRCS:
    - We hold a wetland easement in Weaverville. There has been a resurgence of interest in restoring this wetland easement. The first step was to re-survey it. That survey has begun. I met with them yesterday and things are going well. There will likely be some issues, but it is going well.
- TRRP/Bureau of Reclamation:
    - Sediment & Wood Augmentation EA has completed public scoping and comments have been received. Waiting on cultural. Responding to few comments we received. Gravel augmentation is at 5 existing sites downstream of Lewiston Sites and other 4 sites. Includes sediment from fines to 5 inch minus, but there is also inclusion for larger sediment at a few select sites. Also includes wood augmentation into the river at those nine locations.
    - Trinity River Watershed Restoration programmatic EA
        - Hopefully many people on this call are familiar with that. We sent out the info to the implementers to review by this Friday. Please respond to survey by this Friday. Most of those

watershed restoration projects on federal land that are federally funded are covered by that programmatic EA. We expect to have a signed document by spring of 2024.

- o TMC is meeting this week and just approved the budget for FY2024. The watershed restoration grant for TRRP is managed by NFWF currently, and is up from $500,000 to $1m for FY2024.
- o Upper Conner creek channel rehab site will be our big push for a channel rehab projects next year
  - ▪ Hoping to start late spring 2024
  - ▪ Can see info on TRRP website
  - ▪ Doing a bi-project EA for that, so the Upper-Conner Creek project and the Sawmill gravel processing site are a combined EA, and they are open for public scoping currently
  - ▪ Hoping to have public comment by late February-March and plan to finish that EA by March 2024
  - ▪ The main contact for those EAs and the environmental compliance side of things is no longer Brandt Gutermuth as he is retired, and is now Lauren Alvares as she has stepped up into that position.
- o Finished Oregon Gulch Channel Rehab Project
  - ▪ Huge project—over 550,000 cubic yards of materials was moved from the historic floodplain. Some was relocated onto higher ground on BLM lands and some was exported and disposed of at the local quarry, Eagle Rock, in Junction City.
  - ▪ Project took more or less 15 months for implementation
  - ▪ Project would not have been so efficient without addition funding from BOI, Yurok Tribe, CDFW
  - ▪ Big success—one of the biggest projects we have done to date by far
- Trinity County (Natural Resources Division):
  - o Creation of the Natural Resources Division with the county. I do a lot of compliance work—NEPA and CEQA work—with the Watershed Center, the RCD, etc. I am trying to represent and cover county natural resources interests throughout all of your good work and looking for opportunities and ways that I can support good work occurring throughout the county.
  - o BLM IRWP: Looking to draft a letter to sign. I want the board to weigh in on the topics of land acquisition and land disposal criteria.
- Nature Conservancy: not present
- North coast Regional Water Quality Control Board: not present
- Hoopa Tribal Fisheries:
  - o Have had a big year on the reservation and off.
  - o Invasive species removal:
    - ▪ Removed almost 3 tons of scotch broom, butterfly bush, and Himalaya blackberry.
  - o Fish passage barrier removal project added 3.8 miles of fish habitat.
  - o Off-reservation—working on redd surveys. Conducting scale samples to get an idea of the age-class composition (ongoing work continually).
  - o Also, just completed Oregon Gulch project and the Hoopa crew is responsible for all revegetation efforts. Were out there for about over four months planting about 10,000 shrubs and trees, 1,500 pounds of seed, and 7,000 willow cuttings and cottonwood cuttings.
  - o Also, Hoopa has a Trinity weeds workgroup. Seeking the input of all stakeholders. If anyone in this group would like to participate in this workgroup, we encourage your participation. We are looking to revisit our memorandum of understanding and our strategic plan so that we can reinitiate the weeds management area and that would provide additional outlets for invasive species funding for all partners

in that group. Please reach out if you are interested. Veronica Yates is currently leading this weeds workgroup.

- Yurok Tribal Fisheries (Sanda Perez):
  - We did a ton of work at Oregon gulch and that has been finished. Still have some environmental compliance obligations to do.
  - Current focus in Trinity River basin for programs that I am involved with is Weaver creek restoration project
    - Right now, we have a 60% design and we are looking to move to 90% design in early 2024.
    - We hope to finish environmental compliance in time to begin construction in 2024 pending funding.
- Tsnungwe Tribe: not present
- Nor Rel Muk Wintu Nation: not present
- Trinity County Resource Conservation District:
  - Have been working with contractors and Annyssa has been preparing an outline for the riparian element in the conservation plan for the Travis Ranch property—will be wrapped up in the spring.
  - Working with the Watershed Research & Training Center on the Upper Trinity headwaters restoration plan.
    - Annyssa just provided a priority ranking list of sites utilizing the Beaver Restoration Assessment tool (BRAT) model.
    - Bridger and Annyssa have been comparing meadow models and BRAT tool models to try to identify priority sites for low-tech process-based restoration.
    - That list will come out in the assessment that will be submitted at the end of January. We look forward to sharing more information on that as it finalizes.
  - We have been working with Christine, our new WSP member, and supporting some of her outreach components for her term.
- The Watershed Research and Training Center:
  - We are also working on that Upper Trinity assessment, nearing the end of that. We have a bunch of other sub-assessments that are getting merged right now. We are also just about ready to submit for funding to support the Corral Gulch restoration project for the South Fork of the Trinity River—looking to do a meadow restoration project down there which would have some benefits for downstream waters quality, especially in the summer.
  - No updates on salt creek. Just trying to get through a few permitting and design hurdles before we try to get that submitted for funding.
  - Also, the redd surveys are being completed today on south fork of Trinity River. It seems to have been a really good season for fall Chinook salmon. I believe there were well over 250 redds counted and that was before the last survey so there may be more.
  - Water tank projects update: water storage and forbearance projects
    - The WRTC provides water tanks to landowners so that they can store water in the spring and use that tank water in the summer, keeping that waters for fish and other people to use in streams during the summer
    - This fall, we completed two tank projects and that totaled to 85,000 gallons in browns creek.
    - At the end of all 14 projects currently funded, we will have 505,000 gallons of water stored in the summer, which leaves 4,500 gallons per day in the creeks in the summer. We have 3 more landowners interested, and hopefully can get them constructed and completed by next summer.
  - Forest service roads and the Mcfarland fire footprint

- - - Did some emergency culvert maintenance cleaning—dug out all the sediment from last winter and spring. Hopefully water will flow through culverts now and not contribute sediment to waterways.
  - o Salmon gathering event in Hyampom: youth event and adult event.
    - - Talked about some of the river restoration project and showed people the spawning fall Chinook salmon.
  - o Have been working on the barker creek roads project looking at final designs and environmental compliance
    - - Looking at road updates for sediment reduction
  - o TPL project working with a Siskiyou restoration group
    - - Decommissioned tons of roads and pulled out so many culverts.
    - - Pulled invasive species out with botany crew and reseeded with lots of native meadow seeds. Hopefully this will help kick start those meadows again. Decreased sediment will hopefully help rehabilitate those meadows.
    - - The decommissioning of those roads is part of an effort to transfer some lands from SPI ownership over to the USFS eventually. Most of these were up by Scot mountain and down towards eagle creek
    - - Also improved the tangle blue and eagle creek trails as a decommissioned road to trail project.
- 5 Counties Salmonid Conservation Program/ Northwest California Resource Conservation & Development Council: not present
- Trinity County Fish and Game Commission: not present
- Trinity County Agriculture Alliance (Karla Avila):
  - o We are in the middle of a strategic planning development phase to grow our scope of work around 501 C3 C4 in education research and to really be able to focus in a broader way on the intersection of private land and watershed stewardship and sustainability and rural economic development. We are working on a scope of work there and we are also in the middle of implementing mitigation measures from the programmatic EIR on about 300 sites across the county and monitoring that process.
  - o We are trying to help landowners winterize and make sure everyone has any resources they need for winterization, getting soils winterized, cover cropping, looking at roads. There were eye-opening events for landowners last winter with the amount of water we had last year.
- Safe Alternatives for our Forest Environment (SAFE): not present
- Sierra Pacific Industries (SPI): not present
- Flowra: not present

Commentary on the Bureau of Land Management (BLM) Northwest California Integrated Resource Management Plan (NCIP) and Environmental Impact Statement letter of support. The Trinity River Watershed Council (TRWC) met the following Monday, December 18th, to finalize a letter of support for this plan. See Attached final letter submission.
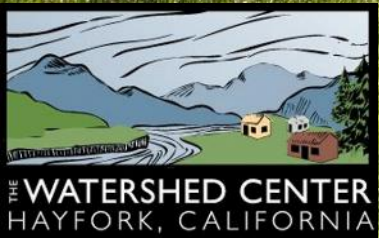
Meeting Close: 12:00pm

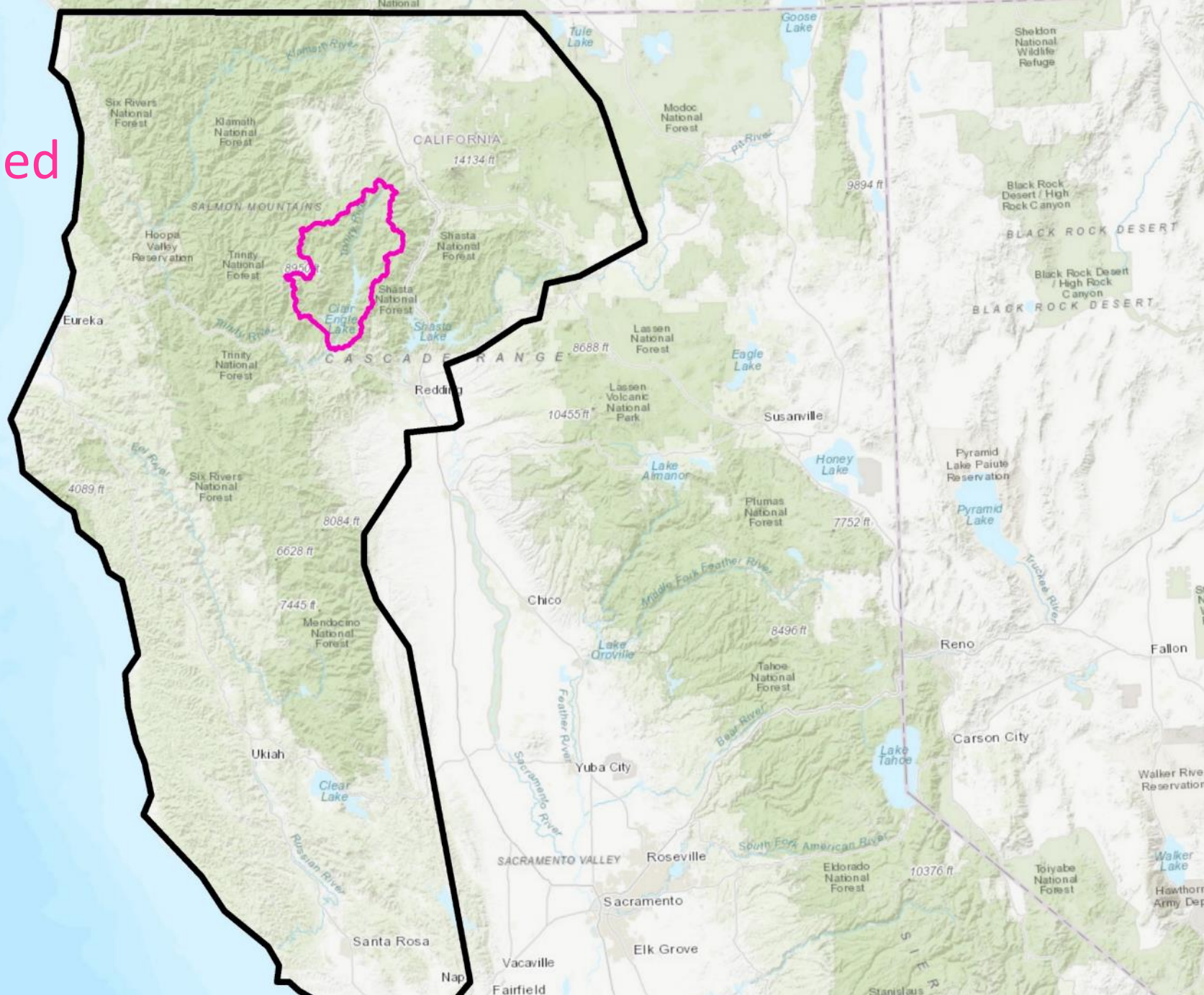**Next Meeting is March 12th, 2024 at 10am-12pm**

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Meadow Modeling in the Upper Trinity Watershed

Upper Trinity Watershed

Modeling Case Study – Upper Trinity Watershed

Datasets:

Garwood wet meadows assessment:

- Wetland/wet meadow locations and extents hand-delineated by Justin Garwood and associates for the Upper Trinity watershed.

- Only areas that support amphibian breeding habitat.

- Not focused on meadows specifically, but captures the best, wettest meadows!

Modeling Case Study – Upper Trinity Watershed

Datasets:

National Wetlands Inventory (NWI):

- US Fish and Wildlife Service data product.

- Collection guidelines not totally consistent, but most data from Trinity County appears to have been delineated by hand in the 1970's based on infrared aerial photography.

- Complete geographic coverage for Klamath area, and wetlands are typed.

- Prone to odd projection errors in some areas, often incomplete, and generally misses drier meadows.
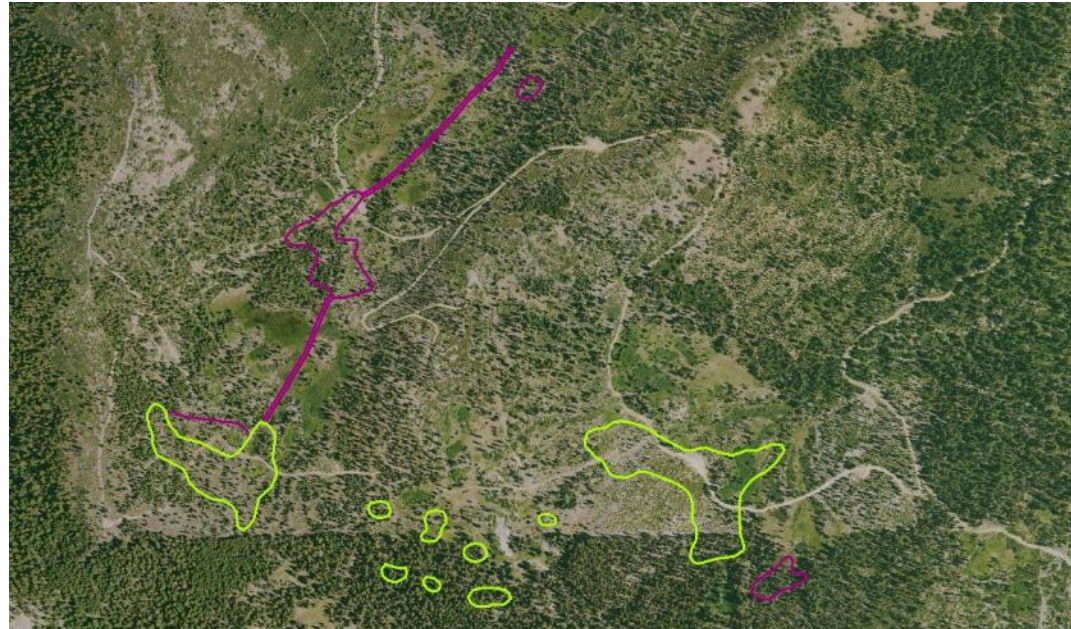
Modeling Case Study – Upper Trinity Watershed

Models:

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- Uses machine learning algorithms to identify potential meadow areas with similar hydrogeomorphic conditions to extant meadows.

- Predictor variables include 'local relative elevation, slope, distance to nearest stream channel, and topographic wetness index'.

- Training data for Upper Trinity basin was from Garwood's amphibian-supporting meadows dataset.
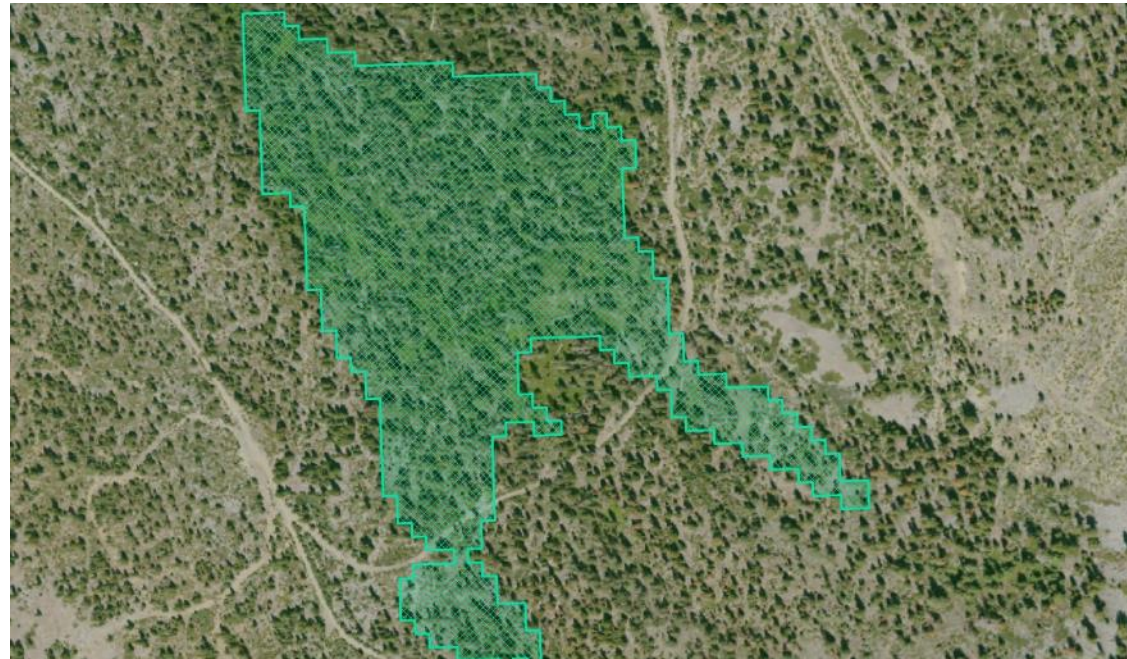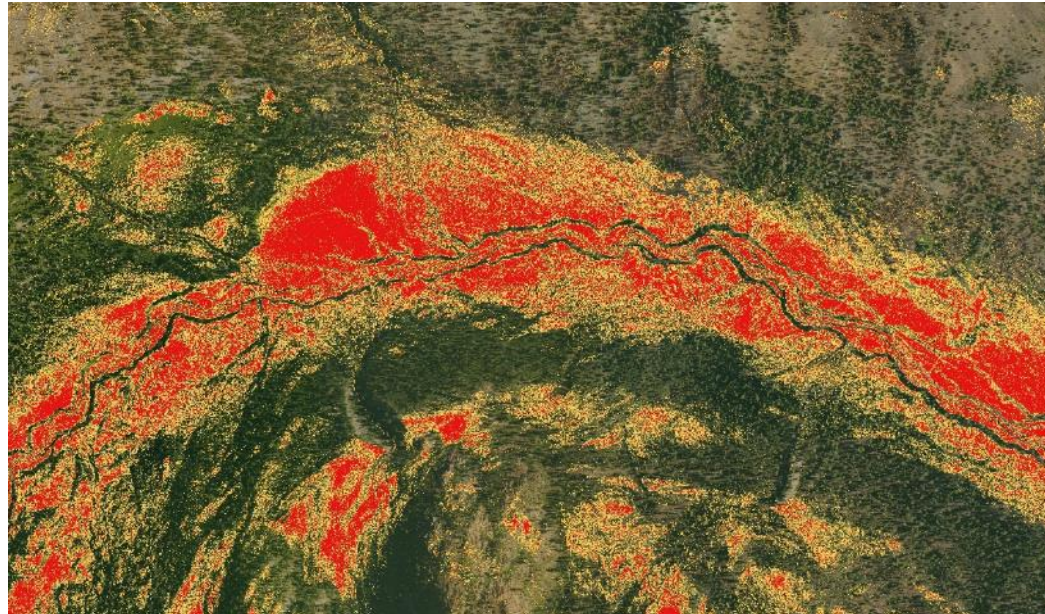
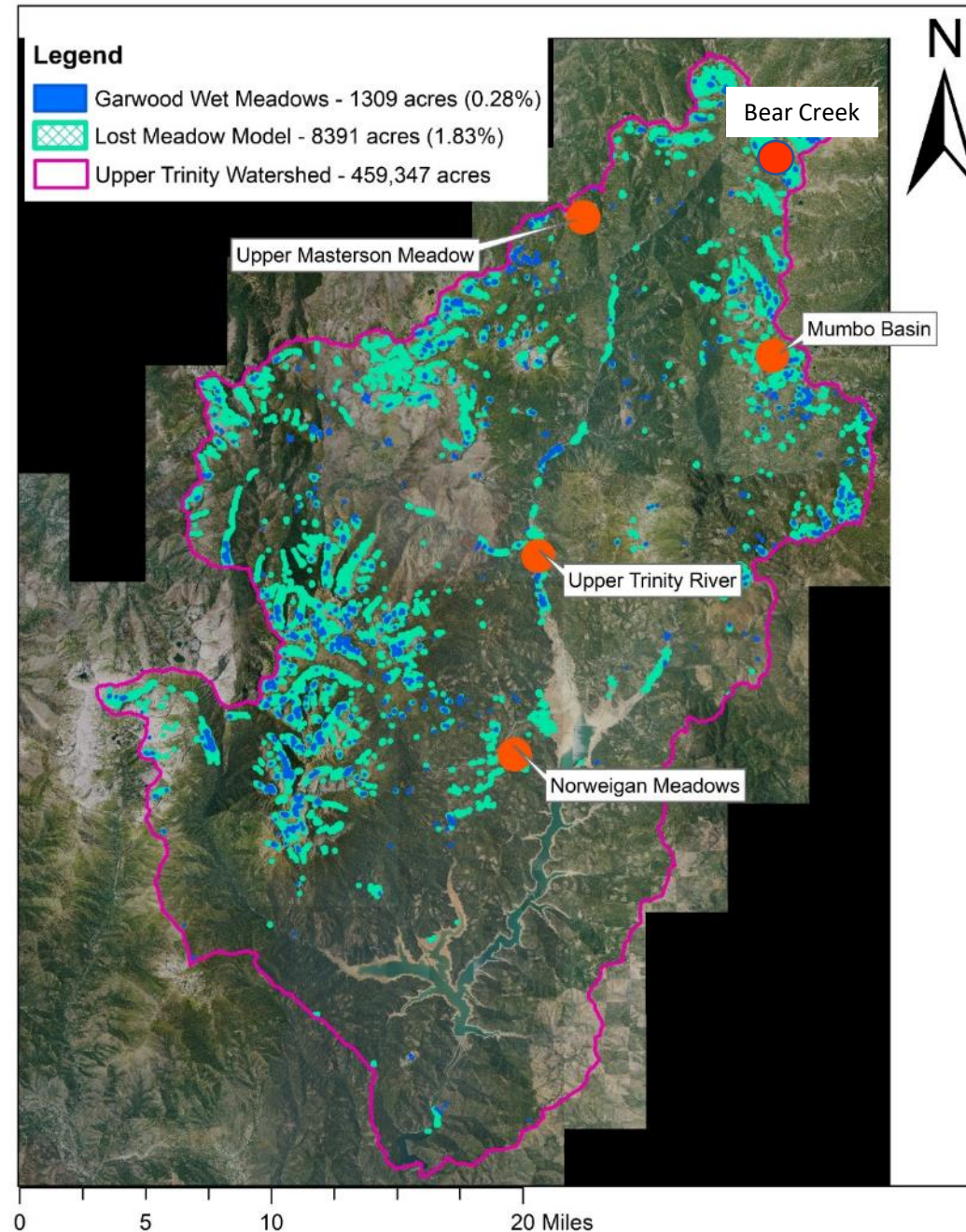# Modeling Case Study – Upper Trinity Watershed

<u>Models:</u>

Wetlands Intrinsic Potential Model ('UW Wetlands Model'):

- Designed to 'map likely wetland areas in forested watersheds' in the Pacific Northwest by 'detecting hydrological and geomorphological controls', based on DEMs and other remote sensing data.

- Developed by TerrainWorks and the University of Washington, in collaboration with WA DoE and WA DNR.

- Generates probability raster files, rather than polygons.

- Not specifically for wet meadows, but trained on the same Garwood dataset as the Lost Meadow Model.
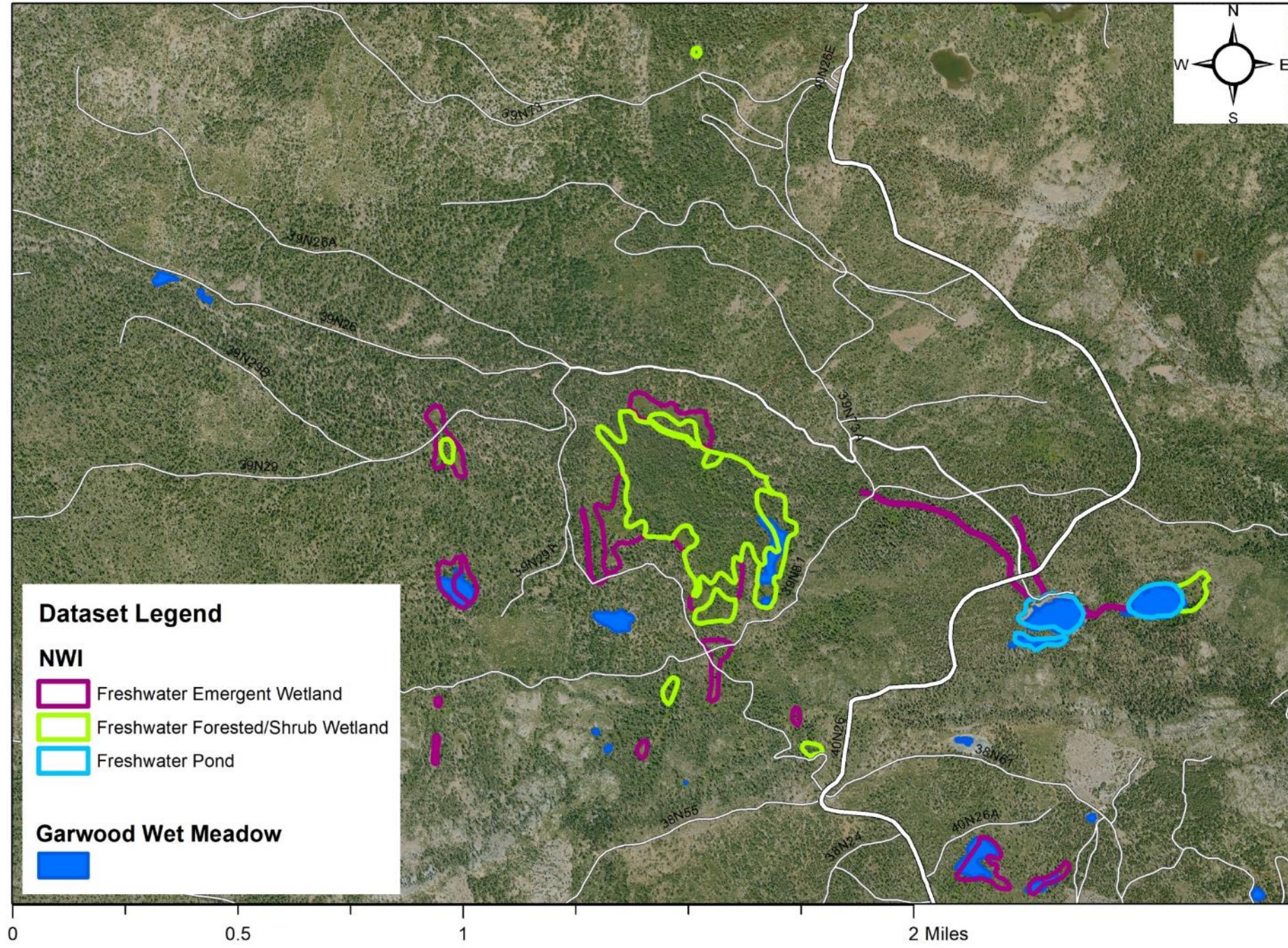
- Wetland/meadow features primarily in headwater basins.

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- Lost meadow model (trained on Garwood data) shows >6x potential meadow area.

- Total potential meadow area is probably even higher since Garwood dataset is only amphibian-supporting meadows.


Upper Trinity Watershed wet meadows

Legend
- Garwood Wet Meadows - 1309 acres (0.28%)
- Lost Meadow Model - 8391 acres (1.83%)
- Upper Trinity Watershed - 459,347 acres

Bear Creek
Upper Masterson Meadow
Mumbo Basin
Upper Trinity River
Norweigan Meadows

0   5   10   20 Miles

Mumbo Basin Meadows

- Garwood dataset is limited to lakes and ponds.

- NWI is actually pretty accurate in both coverage and classing.

Dataset Legend

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

Garwood Wet Meadow

Mumbo Basin Meadows

- Both predictive models show much larger areas of wet meadow/wetland than either NWI or Garwood inventory.

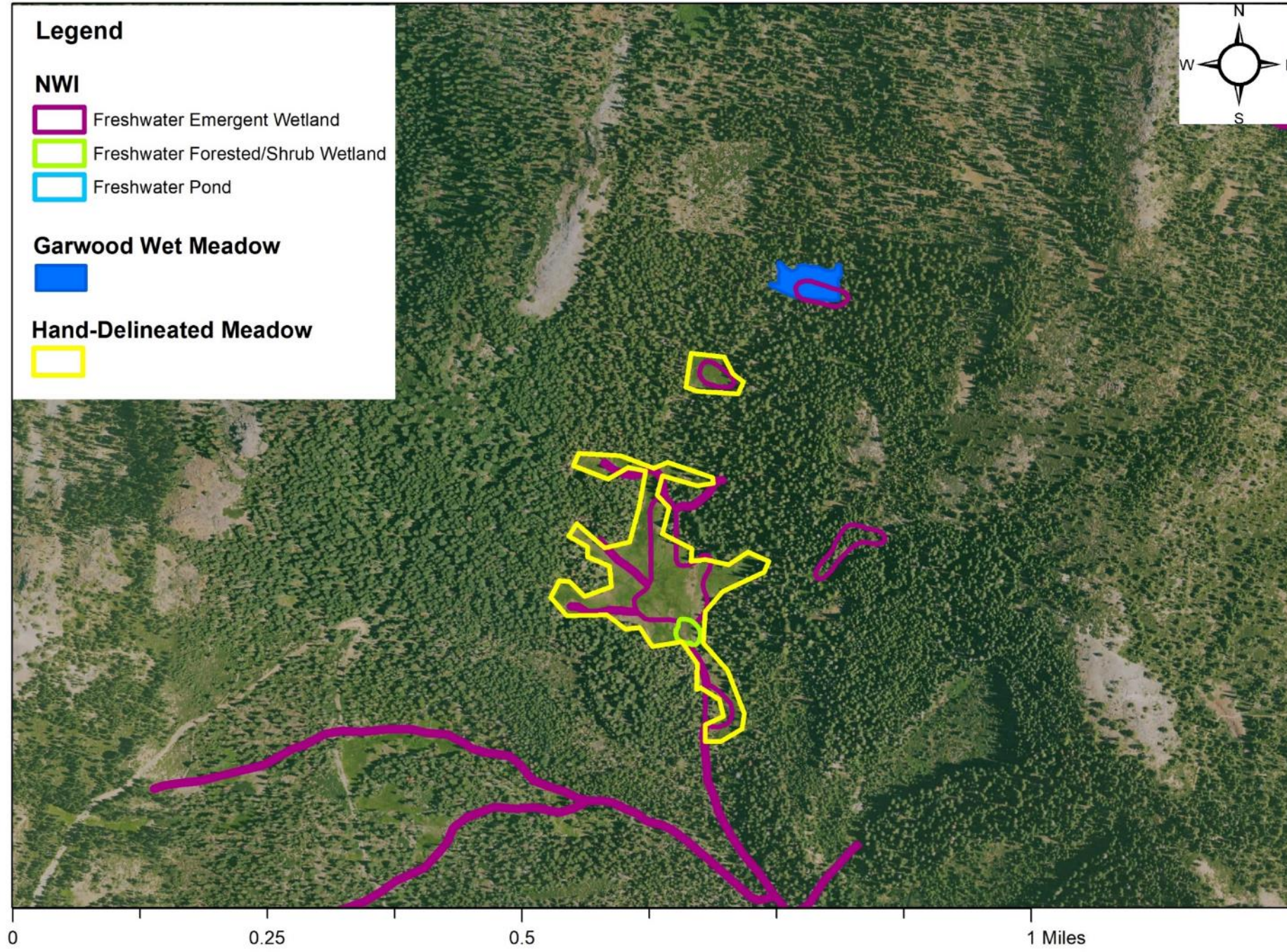- Reasonably close agreement although UW model is more optimistic.

Model Legend

Lost Meadow Model

UW Wetlands Model Probabilities
- 0.5 - 0.8
- 0.8 - 1

0   0.5   1   2 Miles
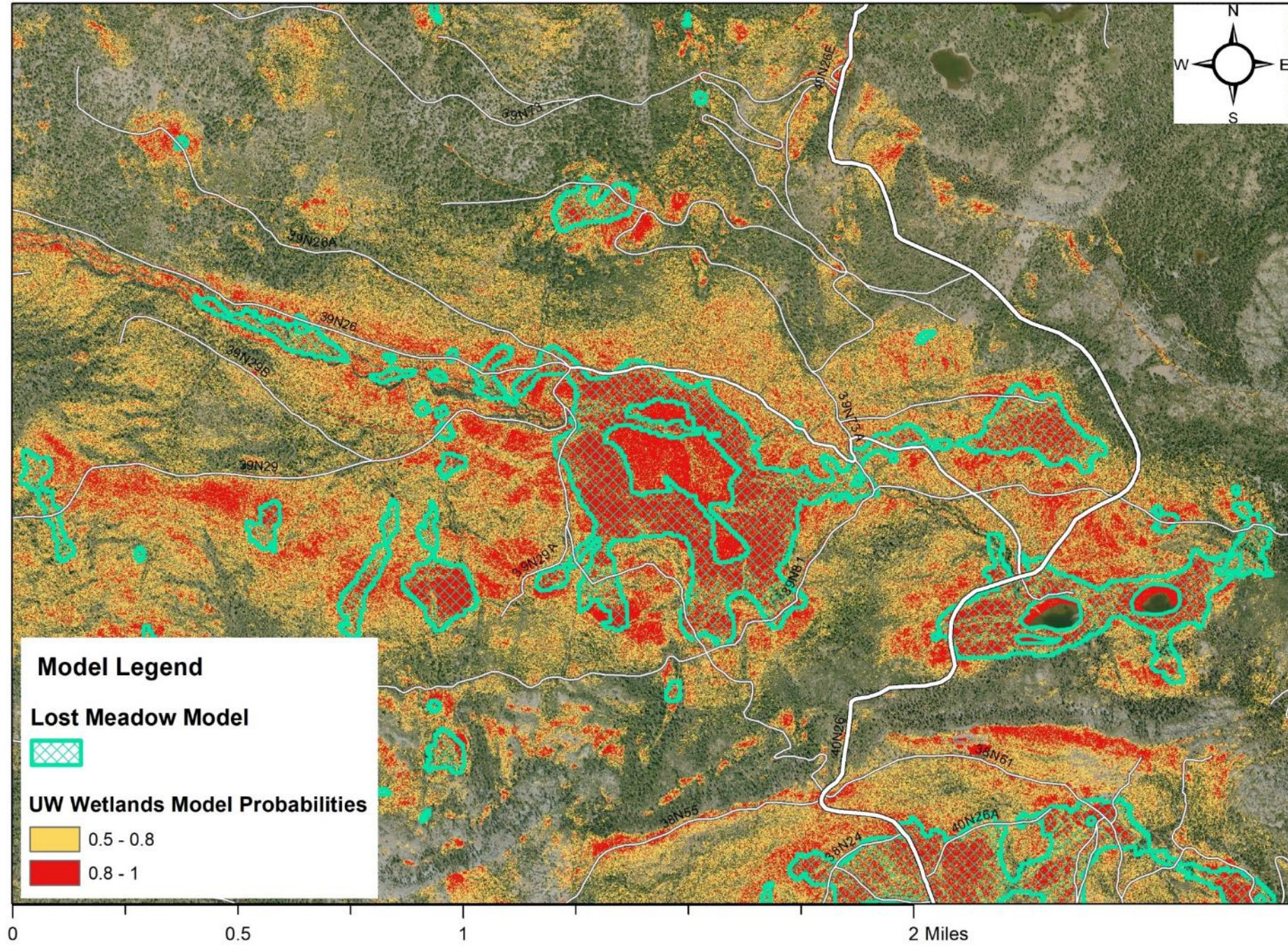
Mumbo basin meadows model comparison

- Lost Meadow Model calls out forested wetland as non-meadow.

Legend

Lost Meadow Model

UW Wetlands Model Probabilities:
0.5 - 0.8
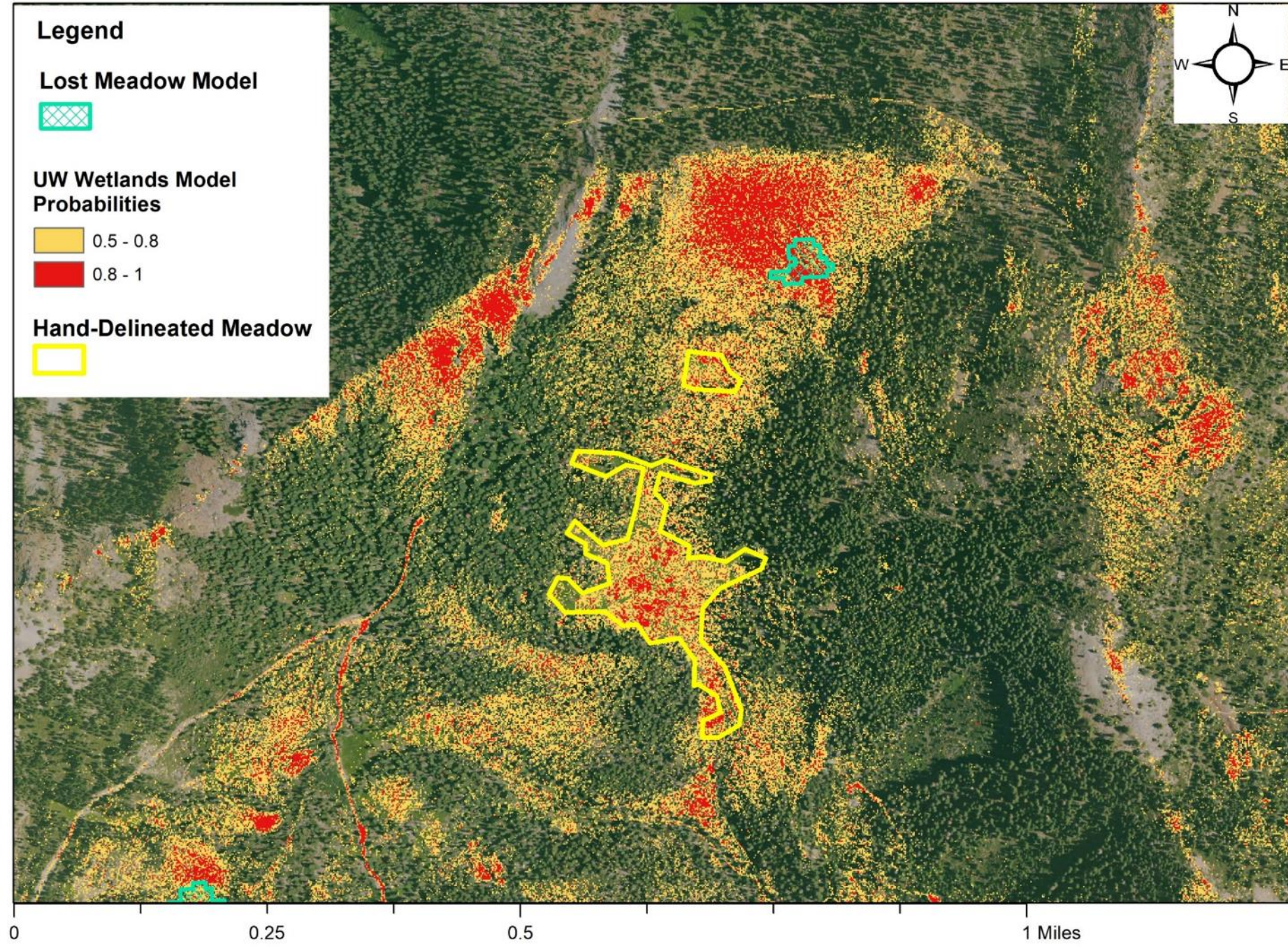0.8 - 1

0   0.25   0.5   1 Miles
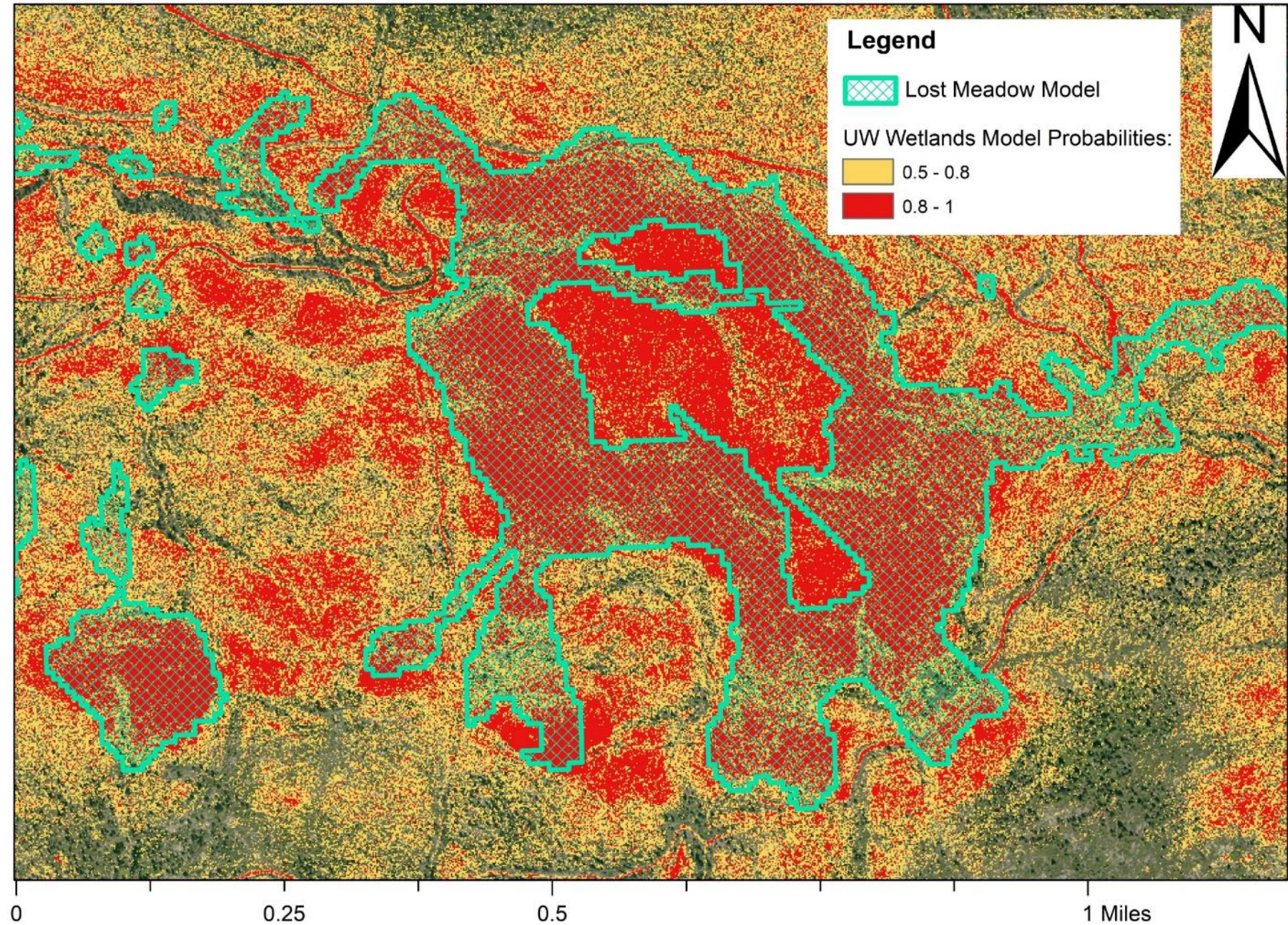
Upper Masterson Meadows

- NWI captures some meadow area, but limited.

- Upper Masterson Meadows mostly not captured by Garwood datatset.

- Nevertheless, pretty clearly all meadow!

Legend

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

Garwood Wet Meadow

Hand-Delineated Meadow
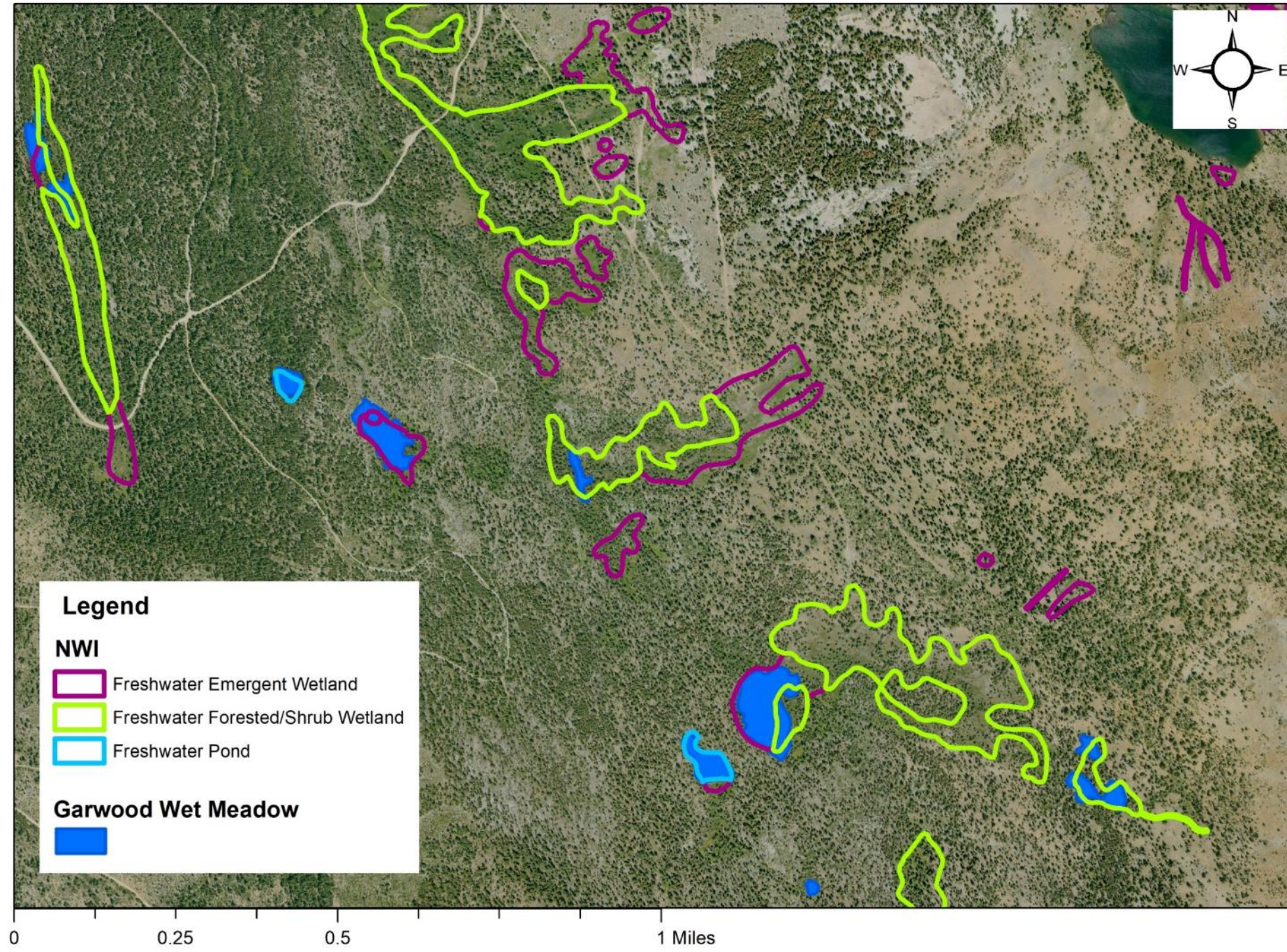
0   0.25   0.5   1 Miles

Upper Masterson Meadows

- UW model shows some likelihood for meadow, but not slam-dunk.

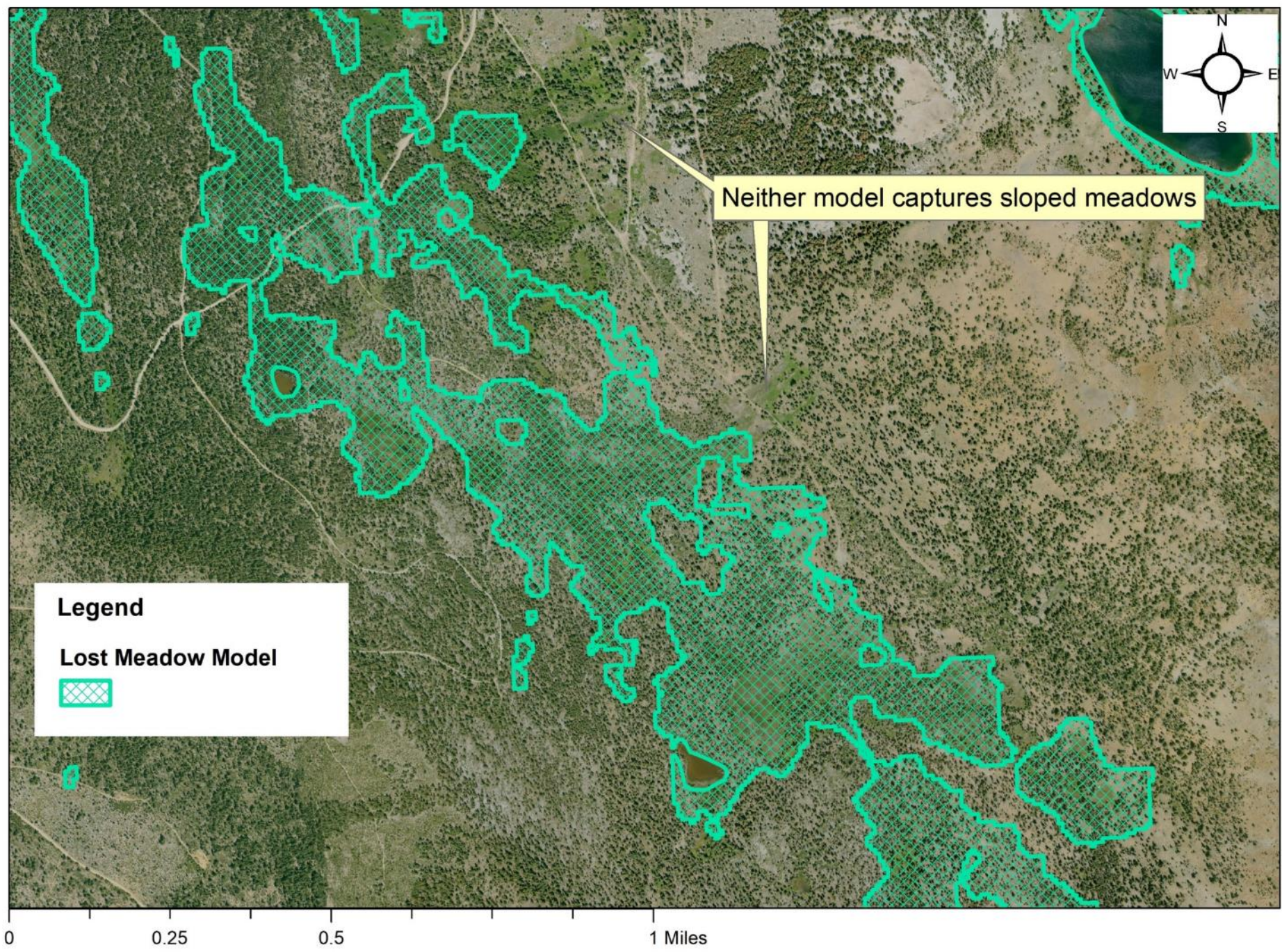- UW model also shows ridgetop in the upper left as a probable meadow...

Legend

Lost Meadow Model

UW Wetlands Model Probabilities
- 0.5 - 0.8
- 0.8 - 1

Hand-Delineated Meadow

0   0.25   0.5   1 Miles

Bear Creek Meadows

- Very good NWI coverage for this area, including slopes.

- Garwood captures all large flat meadows, but not slopes and pockets.

Legend

NWI

- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

Garwood Wet Meadow

0   0.25   0.5   1 Miles

Bear Creek Meadows

- Lost Meadow Model shows much larger area of meadow in valley bottom but does not include side slope meadows.

Neither model captures sloped meadows

Legend

Lost Meadow Model

0   0.25   0.5   1 Miles

Bear Creek Meadows - Closeup

- Pretty good match overall.

- Problems with side slope wetlands in particular.

- Field validation showed issues with areas of talus/rocky debris on otherwise suitable terrain.
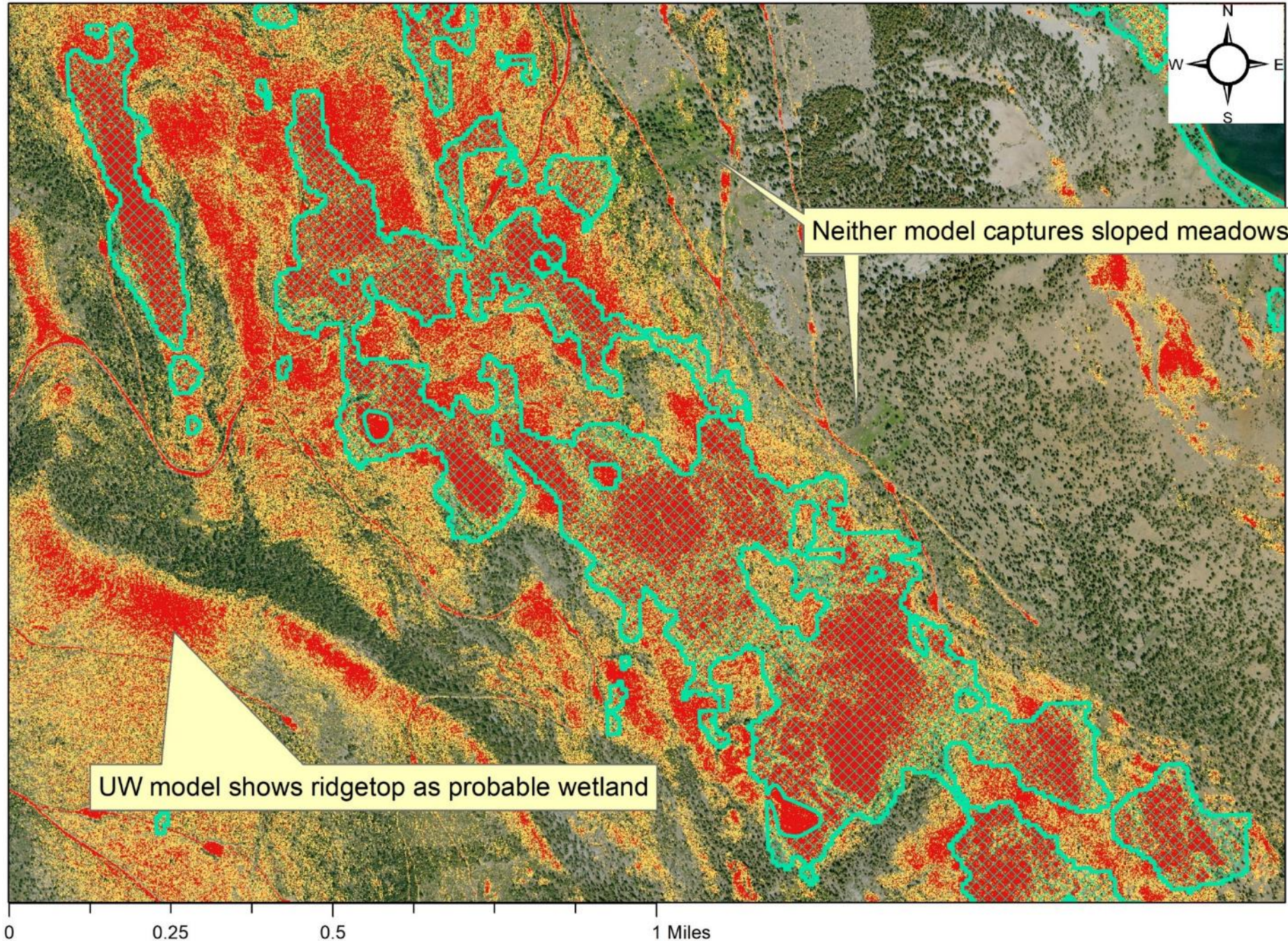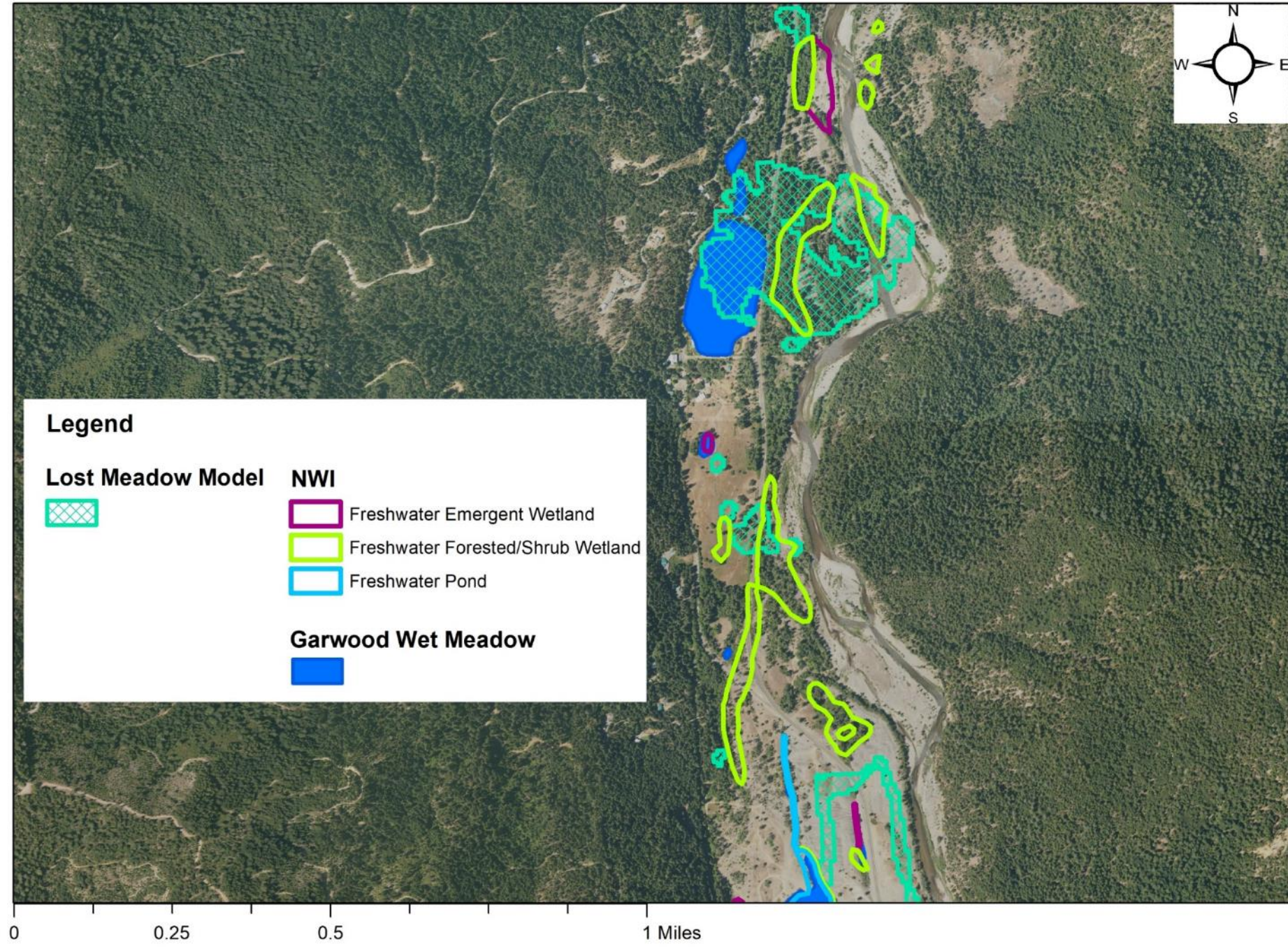

Sloped Meadow

Dry Slope
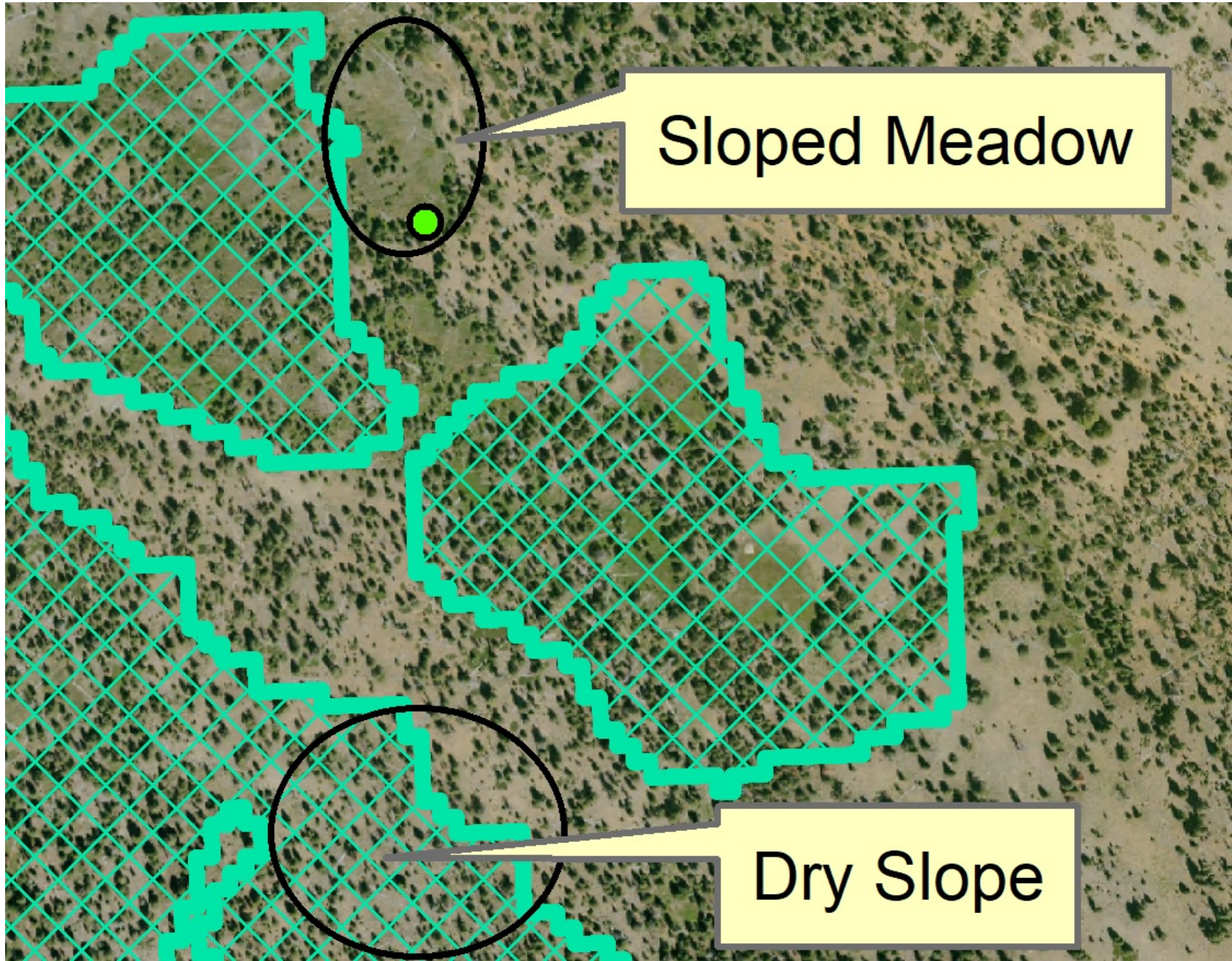
Bear Creek Meadows

Bear Creek Meadows

- UW model also fails to capture slopes, is even more optimistic!

Neither model captures sloped meadows

UW model shows ridgetop as probable wetland

0   0.25   0.5   1 Miles

Upper Trinity River Meadows (Carrville)

- Lost Meadow Model and data sources are not at all aligned!

- Very flat area in general, with heavy human modification.

Legend

Lost Meadow Model

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
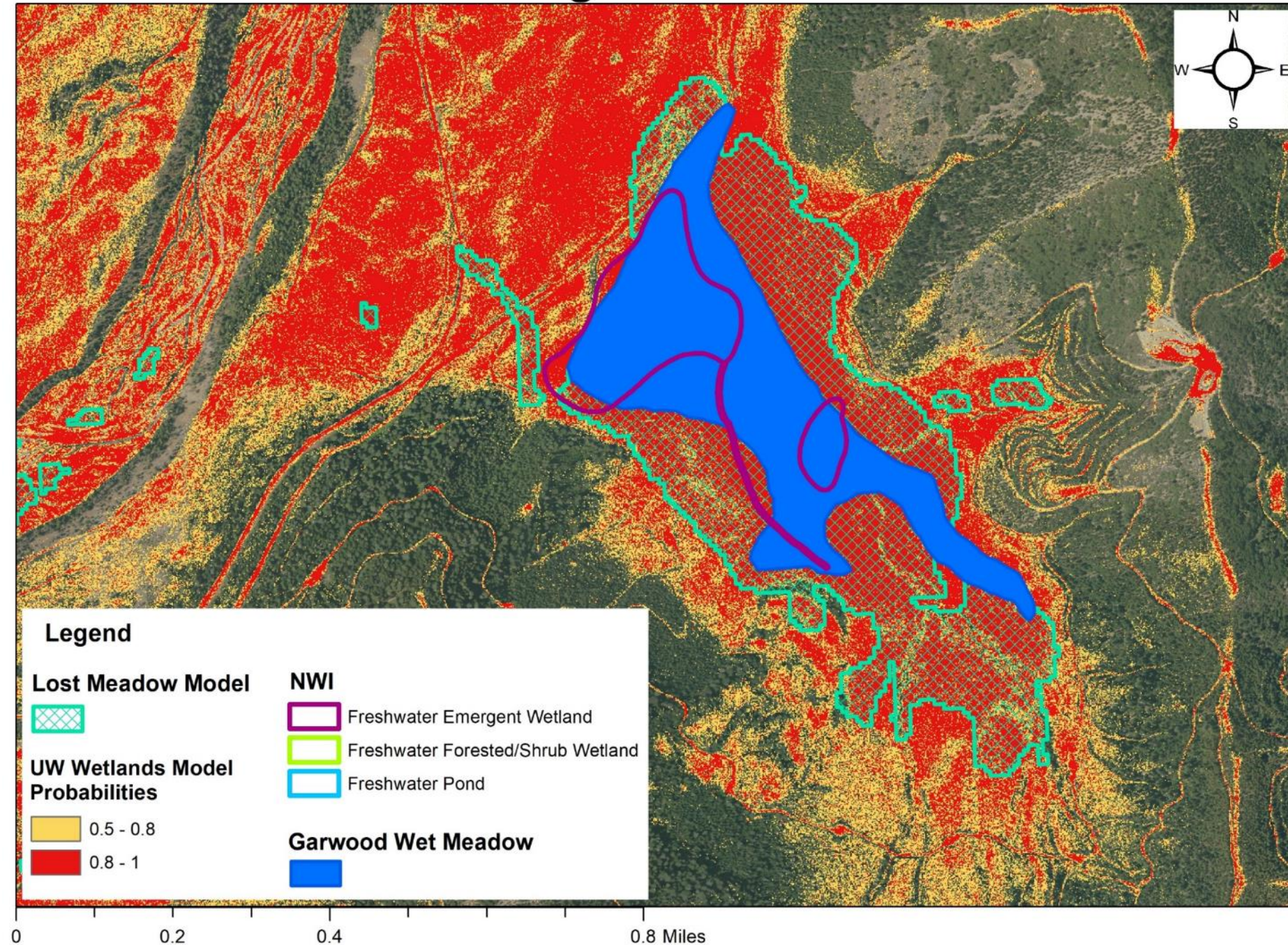
Garwood Wet Meadow

0   0.25   0.5   1 Miles

Upper Trinity River Meadows (Carrville)

- UW model shows all floodplain surfaces as wetlands, no matter how many tailings there are!
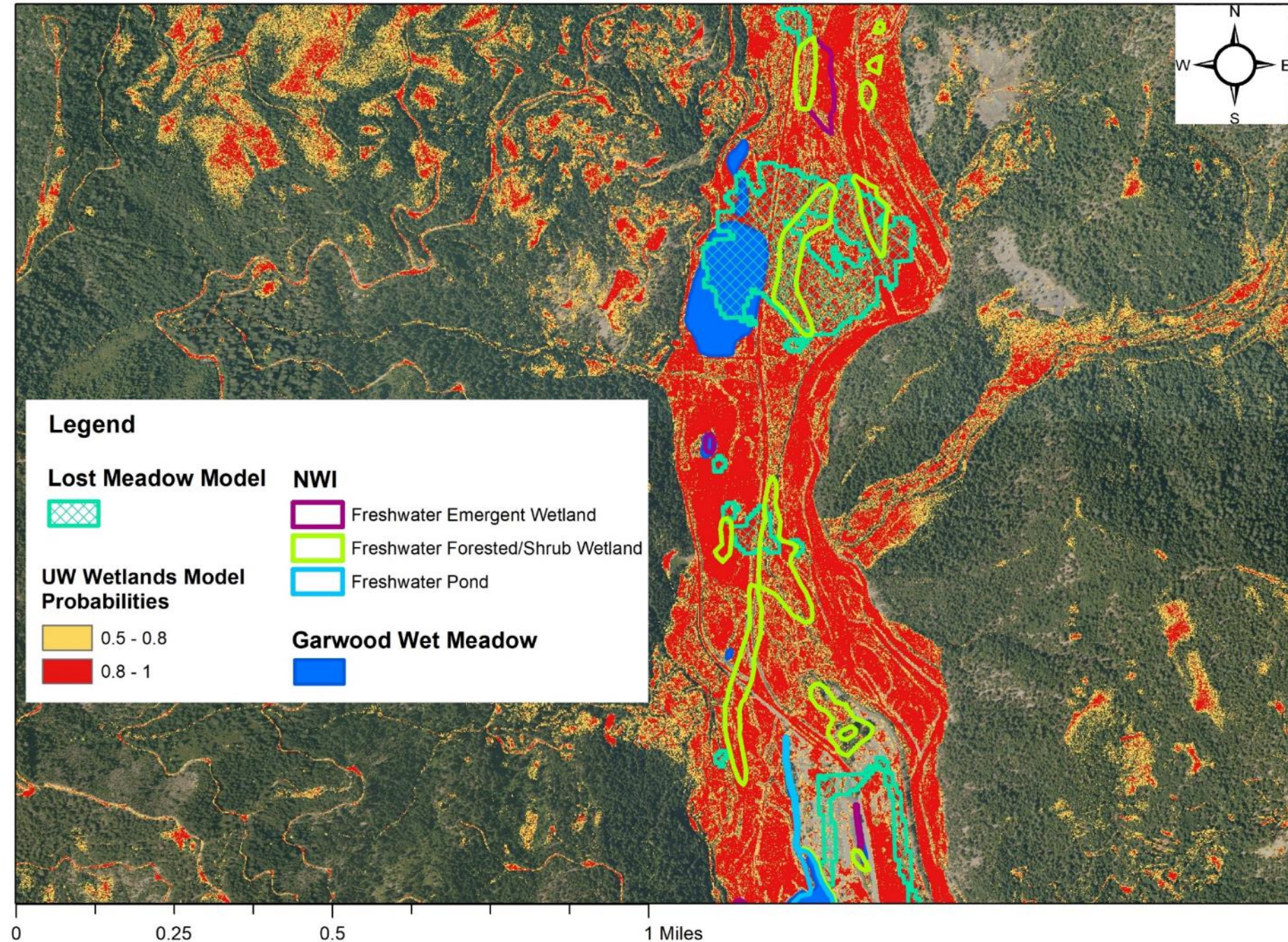
Norweigan Meadows

- Large, semi-intact meadow area at a relatively low elevation.

- All the datasets and models agree that wet meadow is present, but extents are dramatically different.

Legend

Lost Meadow Model

UW Wetlands Model Probabilities
- 0.5 - 0.8
- 0.8 - 1

NWI
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond

Garwood Wet Meadow

0   0.2   0.4   0.8 Miles

- Seems to be room for restoration/enlargement based on size of flat basin area.

- Has been partially drained, remembered as larger.

- What acreage of meadow is desirable and feasible?

Norweigan Meadows area

Legend
Garwood Wet Meadows

0   0.2   0.4   0.8 Miles
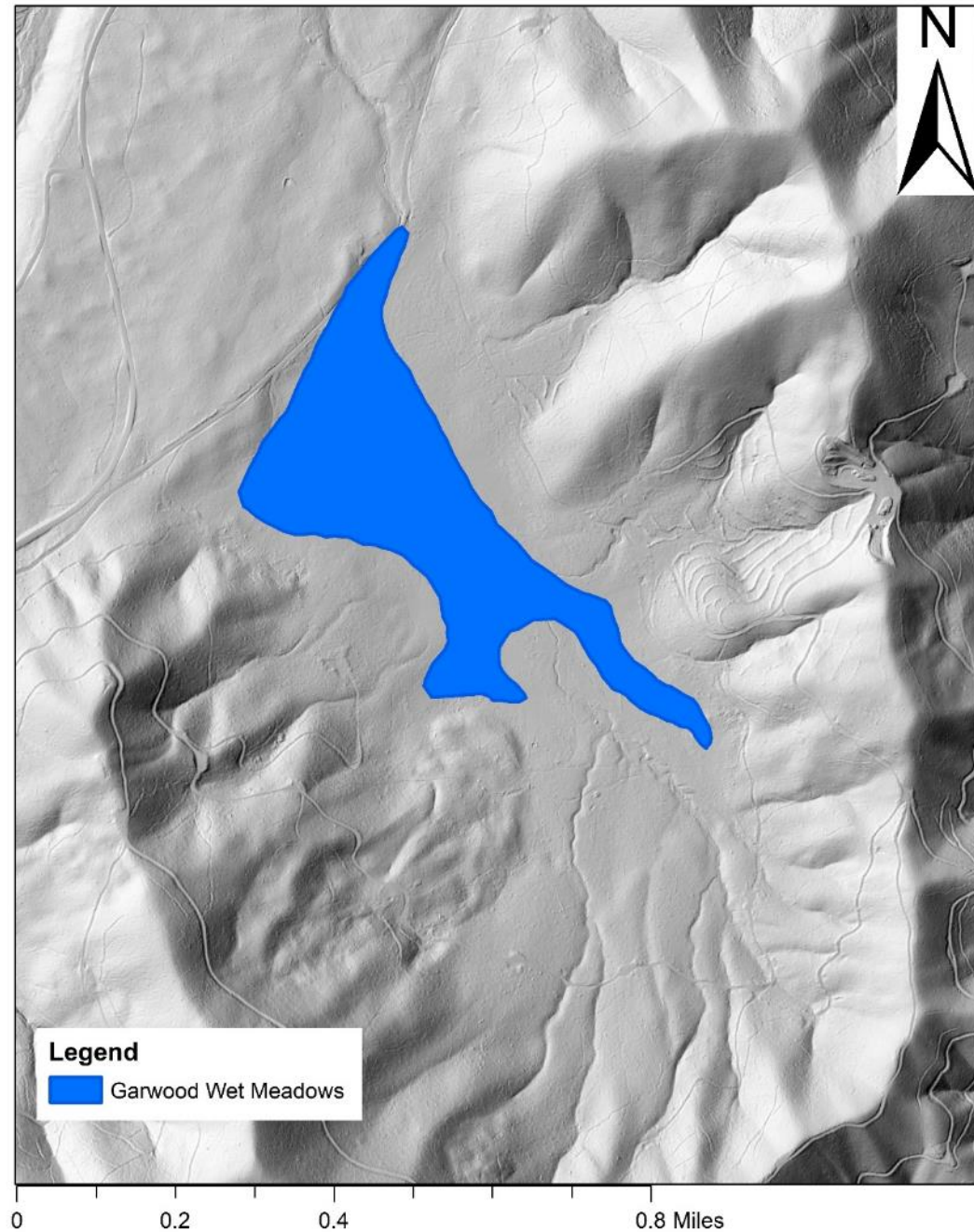
Modeling Case Study – Upper Trinity Watershed

Model Validation:

Still extremely preliminary, no metrics.

Positives:

- Generally predict existing meadows, especially Lost Meadow Model.
- Can be extremely accurate in delineating extent of meadows, where substrate and hydrology are consistent.
- Useful to identify general restoration areas in current state.

Struggles:

- Dealing with idiosyncratic geologic and hydrologic features (no data).
- Rely on current geomorphic data, cannot assess historic conditions.
- Based on amphibian breeding habitat, so do not predict dryer or sloped meadows.
- Meadow formation in the upper Trinity Basin may not always rely on the same processes as in the Sierras.

Modeling Case Study – Upper Trinity Watershed

Paths Forward:

Additional Modeling Opportunities:

- Refining the models themselves?

- More complete training datasets?

- Discreet training datasets to cover different landforms (basin, sloping, floodplain)?

- Using additional data (hyperspectral remote sensing, geology reports) to refine geomorphic modeling predictions?

Prioritization:

- Already possible at a sub-basin scale for the Upper Trinity Watershed.
    - Is continuing to refine modeling worthwhile?

- Primary prioritization metrics?
    - 'Lost' : 'Found' ratio

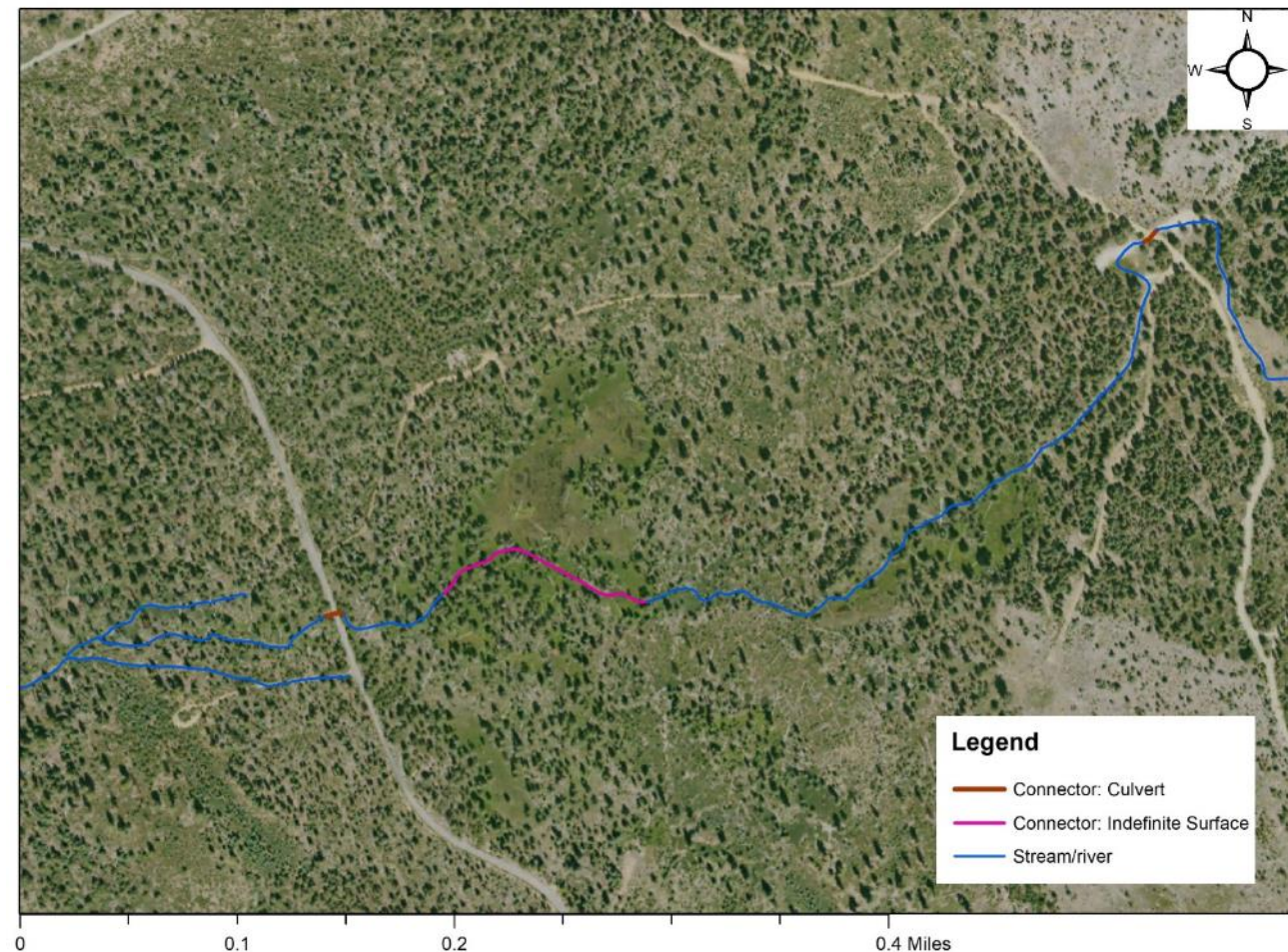- What are the goals for restoration?

Questions?

Modeling Case Study – Upper Trinity Watershed
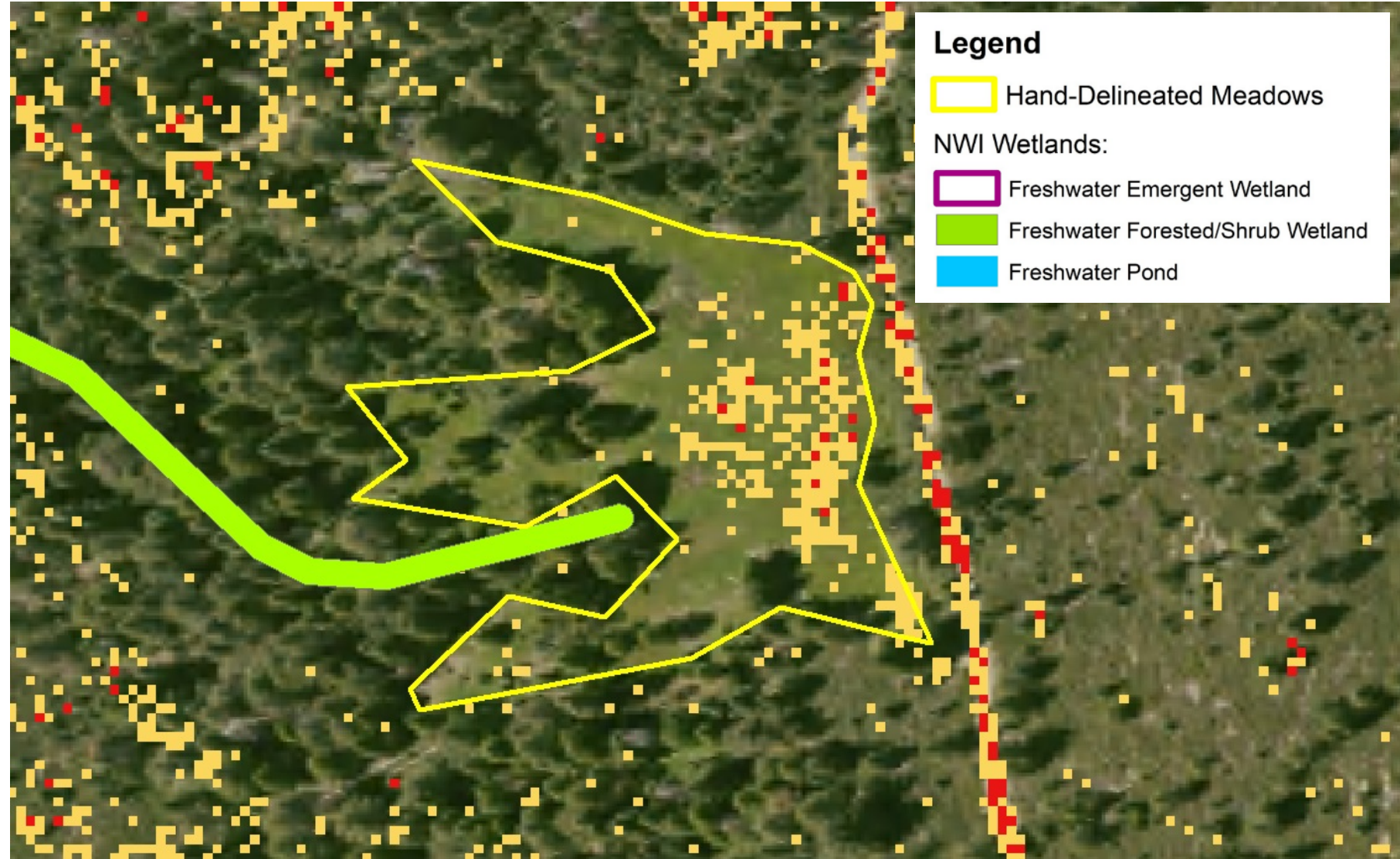
Bonus Slide – Updated Hydrography Layer:

3D National Hydrography Program, replacement for National Hydrography Dataset

Sloped Meadows

- Sloped meadows are not identified well by any dataset or model.

- Relatively small percentage of all meadows in Upper Trinity, but not inconsequential.

- Often contain unique botanical assemblages.

- Often have issues with bisecting roads.

Legend

Hand-Delineated Meadows

NWI Wetlands:

Freshwater Emergent Wetland

Freshwater Forested/Shrub Wetland

Freshwater Pond

Trinity River Watershed Council

Trinity County RCD, P.O. BOX 1450, #30 Horseshoe Lane, Weaverville, CA, 96093

Attention: BLM Arcata Field Office
1695 Heindon Road
Arcata, CA 95521
707-825-2315

December 18th, 2023

Subject: Support for the Northwest California Integrated Resource Management Plan Draft by the Trinity River Watershed Council

Dear Planning Team of the Northwest California Integrated Resource Management Plan,

The Trinity River Watershed Council (TRWC) extends its endorsement for the draft of the Northwest California Integrated Resource Management Plan (NCIP) and support of Alternative D with the consideration of Alternative C in regards to the Land Tenure program practices of acquisition and disposal. As committed partners and community stakeholders, our objective is to safeguard, enhance, restore, and rejuvenate the watershed through collaborative initiatives. We firmly believe that fostering cooperation with the Bureau of Land Management (BLM) will contribute to the establishment of robust ecosystems for generations to come.

Within the NCIP, the BLM has rightly designated the Grass Valley Creek Watershed as an Area of Critical Environmental Concern (ACEC). Originally identified by the Trinity County Resource Conservation District (TCRCD) in 2002 due to its highly erodible Decomposed Granite and detrimental sediment loads impacting salmon, the TCRCD and BLM subsequently embarked on extensive reforestation and sediment reduction projects. The TRWC acknowledges and supports the NCIP's ACEC designation for the Grass Valley Creek Watershed, recognizing its pivotal role in the overall health of the Trinity River.

Understanding the significance of tributaries to the Trinity River and the broader riverine ecosystems, the TRWC urges the BLM Land Tenure program to expand its focus beyond the mainstem. Emphasizing the consolidation of parcel ownership in key tributaries will enhance and preserve aquatic ecosystem connectivity. The TRWC recommends the consolidation of contiguous parcels along the Trinity River to facilitate homogeneous adaptive land management, thereby contributing to the sustainability of aquatic ecosystems. We support disposal or exchange criteria of parcels with roads that access private land and lands adjacent to private property.

The TRWC has observed an increase in public use at Recreation areas designated by the Wild & Scenic Rivers Act under the ownership of BLM. The TRWC encourages the BLM to engage in good land use stewardship with the addition of developed recreation waste facilities and management for heavy use river access locations. This will ensure water quality and public health and safety along the Trinity River and its tributaries. The lack of facilities at these locations and high public use results in excessive amounts of inorganic and organic debris on the riverbanks that adversely affects the health of the Trinity River and its communities.

It has been well documented that the addition of large woody debris to riverine ecosystems assists in the slow and spread of water, increases salmonid spawning habitat, and increases overall ecosystem diversity and health. The TRWC acknowledges the increased need for fuels reduction and in BLM's future implementation projects recommends the targeted disposal of large woody debris in tributaries instead of pile burning to increase ecosystem benefits.

It is imperative that the NCIP align with locally adopted and approved plans, policies, resolutions, ordinances, and environmental perspectives such as the Trinity County Herbicide Spraying Nuisance Resolution adopted in 2004. The TRWC advocates for an explicit statement within the NCIP affirming its consistency with collaborative stewardship efforts and current and future plans, including Floodplain Development Permitting, the Trinity County Wildfire Protection Plan, and the Decomposed Granite Grading Ordinance.

The TRWC expresses deep gratitude for the dedication of time, effort, and collaboration invested in developing the NCIP. We eagerly anticipate ongoing partnerships and cooperation with the BLM to champion the health of the aquatic ecosystems in the Trinity River Watershed.

Sincerely,

Annyssa Interrante,
Coordinator, The Trinity River Watershed Council