***DRAFT* - SUMMARY**

STAKEHOLDER SCIENCE COMMITTEE

LAKE TAHOE WEST RESTORATION PARTNERSHIP

Tuesday, August 6th, 2019, 11:00am to 3:30pm

Tahoe Regional Planning Agency, Sierra Room, Avenue, 128 Market St, Stateline, NV 89410

All meeting materials are publicly available on the Lake Tahoe West website http://nationalforests.org/laketahoewest. For questions please contact the program manager/facilitator Sarah Di Vittorio at sdivittorio@nationalforests.org or (530) 902-8281.

Meeting Synopsis

On August 6, 2019, the Lake Tahoe West (LTW) Stakeholder Science Committee met with the Interagency Design Team (IADT) to view and discuss the updated Ecosystem Management Decision Support (EMDS) system. The Lake Tahoe West partners are using this tool to interpret and explore thousands of data points from modeling of potential management approaches on the west shore. This tool, including the numeric weightings in the diagram, supports decision making and understanding of complex data, but is not a substitute for the decision-making process. The EMDS presentation reviewed both the logic model results (consisting of 8 topics) and the Science Team results (consisting of 8 topics). The IADT followed this presentation by sharing the changes that were made to the Strategies and Prioritization Guidelines regarding forest gaps. The rest of the Stakeholder Science Committee meeting time was spent discussing the feedback from Stakeholders on the Landscape Restoration Strategy (LRS) Draft 2.

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Meeting Synopsis 1

Action Items ..... **Error! Bookmark not defined.**

Opening Remarks ..... **Error! Bookmark not defined.**

Presentation: Lake Tahoe West Modeling Results ..... **Error! Bookmark not defined.**

Key Points for the Landscape Restoration Strategy ..... **Error! Bookmark not defined.**

Discussion of Modeling Findings ..... **Error! Bookmark not defined.**

Decision Model Weighting ..... **Error! Bookmark not defined.**

Meeting Attendees 1

Updated EMDS Results

- Review: What is the Ecosystem Management Decision Support (EMDS)?

- EMDS is a tool that supports decision makers by assessing large amounts of complex data.
- EMDS assembles all data and evaluates different scenarios (given decision-maker-based priorities).
- EMDS produces 40 model outputs at 10 different time steps.
- The EMDS figures:
    - The Y axis seen on all of the figures is the CDP performance which ranges from 0 to 1—where 0 is very poor and 1 suggests that the conditions "on the ground" are meeting desired conditions perfectly.
    - The X axis is time.

- The Decision model inputs:
    - Logic model results.
    - Science team results.
    - 16 topics (per scenario & time-step):
        - 8 processed by logic model.
        - 8 directly from science team.
    - The Logic model assesses complex landscape conditions (e.g. hydrology, wildlife, vegetation).
        - The UNION vs AND operators can be considered the "inner workings" of the logic model.
        - The logic model topics have subtopics:
            - Wildlife conservation:
                - Species richness.
                - Ecological function.
                - Species diversity:
                    - Early seral beta diversity.
                    - Mid seral beta diversity.
                    - Late seral beta diversity.
        - How does the logic model assess subtopics?
            - In the LTW project, topics use:
                - UNION operator = average.
                - AND operator = a minimum-biased weighted average (though if any subtopic is in a worst case condition then so is the higher level topic).
        - Structure of logic model topics:
            - 8 logic model topics:
                - Wildlife conservation.
                - Quality water.
                - Upland vegetation health.
                - Functional fire.
                - WUI fire.
                - Quality air.
                - Recreation.

- Cultural resource quality.

- EMDS Results:
    - Total LTW scenario performance over time: Values calculated by CDP.
        - The total LTW scenario performance over time results rolled up all of the subtopics (will be reviewed later in presentation) and compared each of the scenarios with one another.
        - Results showed that management on the landscape does make a difference, as Scenario 3 and Scenario 4 are realizing more optimal conditions over time.
        - Scenario 3 and Scenario 4 in terms of absolute value tend to be in the band of very good/good condition.
        - All scenarios do more poorly over time, this is likely due to climate change.
        - Scenario 1 dips into the lowest absolute condition.
    - Topic one: Cultural resource quality (Union).
        - Subtopics:
            - Restoration of low intensity fire.
            - Habitat for cultural keystone species (Union).
            - Cultural water quantity and timing.
        - Results from cultural resource quality show that management does make a difference.
            - Scenario 3 remains the leader followed by Scenario 4.
            - Scenario 3 performs very well in water quantity and time, but gets dragged down in performance by restoration of low intensity fire.
        - Questions from Stakeholders:
            - Looking at the restoring low intensity fire subtopic, what are the management implications for moving forward with this result that all scenarios are performing poorly?
                - Response: The desired condition for restoring low intensity fire in the cultural resource quality subtopic is a very high bar to meet. This same variable in the functional fire subtopic won't look this poor because the bar is not as high.
                - Expectations were set up differently per subtopic in the EMDS.
    - Topic two: Upland veg health (Union).
        - Subtopics:
            - Big trees.
            - Forest cover (Union).
            - Composition Union).
            - Seral stage (Union).
                - High elevation (Union).
                - Mid elevation (Union).
        - Scenario 3 and 4 perform best.
        - Scenario 3 and 4 are in the “good” condition for upland health compared to Scenario 1 and 2 which are in the “intermediate” condition band.

- The most significant difference between scenarios is in the “Big trees” subtopic, with Scenario 3 and Scenario 4 performing dramatically better than Scenario 1 and Scenario 2.
- Questions from Stakeholders:
    - Why is there a significant increase in forest cover, almost a jump, and then it levels off?
        - Forest cover is based on the proportion of the landscape occupied by forest vs. hardwood vs. aspen vs. shrub.
        - There could be a dramatic increase and then a sharp decline because forest cover increases until about mid-century when there starts to be dramatic impacts as a result of climate change and fire.
        - More detail is available in the EMDS data if Stakeholders would like to see it.

- Topic three: Functional fire (Union).
    - Subtopics:
        - High severity patches.
        - Percent landscape burned.
    - Scenario 3 and 4 perform best.
    - Generally speaking, Scenario 3 and 4 stay in the “good” condition band, Scenario 1 and 2 dip into the “intermediate” condition band.
        - Scenario 3 and 4 do have trade-offs. Scenario 3 is performing best for high severity patches of fire.
- Topic four: Wildlife conservation (Union).
    - In wildlife conservation, management doesn’t make much of a difference given the model weighting.
    - Subtopics:
        - Species richness.
        - Ecological function (union).
        - Species diversity (union).
        - Apex predators (union).
    - Species diversity is excellent and stays stable.
- Topic 5: Quality water (Union).
    - Subtopics:
        - Phosphorous load.
        - Fine sediment load.
    - The quality water analysis only goes out to year fifty.
    - Management does not make a significant difference.
    - Fine sediment load is pulled down in year 40 due to a wildfire event.
        - This wildfire event highlights another key use of EMDS—EMDS can be used to determine how scenarios will respond to specific events.
            - Scenario 4 did not respond well to a wildfire event.

                - It's helpful to know if a drastic event happens on the landscape which scenario will be best.
        - Stakeholder questions:
            - Why does the model not go past 50 years?
                - The water quality model is very computationally intensive. It takes a lot of time to take LANDIS results and turn these results into water quality outputs. The Science Team is still working on trying to increase modeling results for the full 100 years.
                - The first 50 years were prioritized.
    - Topic 6: Quality air (AND).
        - Subtopics:
            - Extreme emission days.
            - Very high emission days.
            - High emission days.
            - Moderate emission days.
        - Management produced a significant difference in results.
            - Scenario 1 performs worse than other scenarios and gets even worse with time.
        - With air quality there are thresholds—past a certain level becomes unacceptable.
        - The optimal scenario for air quality might not be the one that achieves the highest overall condition, it might be the scenario that is most stable over time.
            - Scenario 3 is stable and performs well.
            - Stability is a key trend to look for in scenario performance.
    - Topic 7: WUI fire (AND).
        - Subtopics:
            - Threat zone fire severity (AND).
            - Defense zone fire severity (AND).
        - There is no tolerance for fire in the defense zone so it is easy to get into a poor condition.
        - Defense vs. threat zone:
            - Defense zone: Within 1/4 mile of structures.
            - Threat zone: Up to 1.5 miles away from structures.
        - Stakeholder questions:
            - Do these results call for the need of another strategy?
                - For one, it is not realistic to expect that fire will be kept totally out of the threat and defense zones.
                - It is difficult to tell what success is here because these results don't highlight how much is moderate severity vs. high severity fire. If one scenario is showing that its majorly low or moderate severity, that could be interpreted as successful.

                - Since fire is so severely penalized, to interpret the scenarios as totally "failing" is probably not correct.
    - Topic 8: Recreation (summer-time air quality, And).
        - Subtopics:
            - Summer extreme emission days.
            - Summer very high emission days.
            - Summer high emission days.
            - Summer moderate emission days.
        - Model tolerance for poor air quality is very low.
        - Scenario 3 over the time period performs the best and has little variability until year 80. Scenario 3 is not as variable as the other scenarios which is important.
        - Scenario 1 is probably what would be considered socially "unacceptable".
        - The air quality results are reminiscent of fire results.
        - Stakeholder questions:
            - It would be interesting to see these results compared to a regulatory graph for emission.
                - These results are based on health standards.
    - EMDS Result: Science team results:
        - Net treatment Cost: Scenario 1 has no cost because there is no treatment being done on the landscape.
        - Restoration by-product: Biomass harvested.
        - Water quantity Timing.
        - Carbon sequestration: Scenario 1 has greatest carbon sequestration because no biomass is being removed.
        - Days intentionally burned: Relatively simple metric based on pile burning and prescribed burning.
        - Staffing: Can be seen as a general proxy for management intensity.
        - Life and property: Scenarios 1 and 2 pose a much greater risk to life and property than Scenarios 3 and 4.
        - Suppression cost: There is not a strong relationship between suppression cost and fire severity which is surprising.
- If anyone is interested in seeing more of the data, Eric has tools/figures/approaches. Stakeholders/IADT members can send Eric an email or reach out if additional interpretation of the EMDS results is needed.
- Take home messages:
    - EMDS is a tool to help consider many data-streams and to explore future landscape conditions over a long time horizon.
    - Generally speaking, Scenario 3 and 4 outperform Scenario 1 and 2--suggesting that management is predicted to be important to achieve desired conditions.
    - Scenario performance variability, for some topics more than others, demonstrates tradeoffs over time.
- Questions/thoughts on EMDS results?

    - What corresponds to the "Total LTW scenario performance over time" drop in year 60, which of the results are affecting year 60?
        - This drop is likely a reflection of fire events.
    - Are these results being coordinated with the Climate Adaptation Action Plan?
        - Yes. CTC is using LTW modeling efforts and coordination is occurring.
- The EMDS result slides will be posted online and passed out with this meeting summary.
- Sarah took time to give thanks to Eric and Keith. The EMDS process was a massive undertaking and they have both put significant time and effort into this analysis.

Landscape Restoration Strategy Draft Two

- Upcoming dates and process to finalize the LRS:
    - Feedback on Draft 2 is due by this Friday the 9th.
    - The goal is still to have the LRS finalized on September 3rd.
    - Once Stakeholder approval of the LRS is received, the LRS will be sent to a graphic designer.
- In Draft 2 the IADT addressed the comments submitted on the first draft of the LRS, including:
    - Added a Call To Action before the Executive Summary.
    - Expanded and increased the robustness of the description of key modeling results and uncertainties.
    - Clarified recommendations regarding Protected Activity Centers, treatment on steep slopes, and conditions in which we would remove large trees.
    - Revised the table in the first chapter comparing conventional approaches to Lake Tahoe West's resilience based approach.
    - Inserted information about expected costs and avoided costs of implementing the Strategy (note the table with this information is still in progress).
    - Added information about other collaborative efforts that influenced Lake Tahoe West.
    - Added an inset and key findings of the Landscape Resilience Assessment.
    - Acknowledged benefits of mixed severity fire.
    - Clarified recommendations in light of short and long term benefits and tradeoffs (e.g. short term vs. long term air quality).
    - Added an objective to Goal 5 regarding communication with the public, recreation constituencies, and other stakeholders.
    - Clarified, added to, or changed the wording of several objectives and strategies and prioritization guidelines. (Note we will specifically discuss Objective 1C, which we revised for consistency with the LTBMU Forest Plan, at our August 6th meeting.)
    - Made many clarifications, minor additions, and editorial changes throughout the text and matrix.
- Review revised strategies and prioritization guidelines regarding gaps.
    - The strategies and prioritization guidelines regarding gaps were basically changed to be consistent with the LTBMU forest plan.

- The overall target for how much of the landscape was wanted in gaps was not changed, just the size of the gaps was changed. Gaps can now be up to ten acres in size.

- Feedback from Stakeholders on Draft 2 of the LRS:
  - Main comments from Stakeholder 1:
    - Language needs to be more consistent in addressing short and long term benefits and risks of managed fire. This inconsistency is likely due to the fact that there have been multiple authors on the LRS.
    - Needs a more cohesive discussion on sedimentation risks from steep slopes and fire within confines of analysis.
    - Stakeholder 1 wants to see updated LANDIS results and provide feedback.
    - Stakeholder 1 has some suggestions on spotted owls and PACs.
  - Main comments from Stakeholder 2:
    - In Draft 2 continue to make a more thorough connection between the LRS and any impacts on clarity of Lake Tahoe.
      - Meadows.
      - Riparian restoration.
      - Where restoration of aspen stands could help reduce sediment load.
      - Etc.
    - The LRS does not get very specific on location, but areas will be prioritized for treatment/restoration starting in the planning phase.
    - There needs to be a tightening of messaging around short vs. long term benefits:
      - Modeling was showing that prescribed burns will result in more short term impacts to sediment runoff. The LRS also says that in the long term the sediment runoff from a prescribed burn is insignificant compared to background runoff/the sediment load from a wildfire. However, these two comments don't happen in the same place in the LRS. This messaging needs to be connected.
      - IADT Response: There does need to be some caution with this messaging though because there is still some uncertainty regarding the impacts of prescribed fire vs. wildfire.
        - Second round of LANDIS results should dial in on this issue.
  - Main comments from Stakeholder 3:
    - The level of detail in the LRS is right where it should be. More detail will just result in more questions.
    - Comment for the recreation piece: Those trails that are out there on the landscape already can be used as fire lines. If they can be utilized in any way, that's line someone doesn't have to dig. Granted, this might be more of project planning comment as opposed to a LRS comment.
  - Main comment from Stakeholder 4:
    - Stakeholder 4 would like to see more discussion of modeling uncertainty.

        - Stakeholder 4 would like to see more information on the role of adaptive management and specific examples.
        - Add more to the financial point: emphasize the cost of treatments in relation to the cost of suppression.
        - More discussion needed on social acceptance of treatments:
            - There will be more smoke in the basin.
            - The landscape will not look good immediately after thinning.
- Summary of Stakeholder feedback:
    - Add messaging about BMPs in inset.
    - Short term vs ling term impacts on what LTW is recommending.
    - Clarify final LANDIS results and what pieces of LRS use original vs updated scenarios.
    - Connect dots between LTW and Lake clarity.
    - Social acceptability.
    - Consistent analysis/discussion of sedimentation.
- IADT feedback to Stakeholder feedback:
    - Stakeholder 4 comment on more discussion of modeling uncertainty:
        - The way the modeling discussion was written up was purposefully not number-intensive, and instead focused on the relative performance of scenarios.
        - New LANDIS results will help tighten up this section.
        - The table that specifies what the IADT intended to do vs. what was done in the modeling effort will be cleaned up once new LANDIS results are delivered to solely discuss what LANDIS modeled.
            - In certain downstream efforts (like wildlife) the IADT can mention that these efforts do not have the updated results.
        - Given that LANDIS will be updated, the IADT would like to move forward with just a clear table saying, "this is the LANDIS output" and not spend more time on modeling uncertainties.
            - The Stakeholder agreed that this proposal made sense.
    - Several stakeholders made comments on short term impacts vs. long term benefits. What should this discussion look like?
        - Stakeholder response: Be clear on the messaging point in regards to social acceptability of treatments. There will be short term impacts such as smoke from prescribed fire, but the long term benefits (i.e. not having a wildfire in the basin) will be significant. The more the LRS can reiterate this point the better.
            - In example, Placer County has regulations about not burning on holidays—moving forward this could be challenged as a regulation.
        - Some of the water quality issues in relation to short term impacts vs. long term benefits could fit in the "Priorities" section of the LRS.
    - What would the Stakeholders like to see added in regards to monitoring and adaptive management?
        - It could be helpful to have an inset on BMPs.

        - In example, when discussing the ghost roads section the IADT could say something as simple as, "forest managers have BMPs that will be used in these areas".
    - Is the IADT in the right ballpark on document layout, structure, readability, etc.?
        - The Stakeholders agreed that the LRS was in the right ballpark in terms of layout and structure.
        - The Stakeholders suggested that some additional figures throughout the LRS could be helpful and could potentially reduce some of the verbiage.
        - The Stakeholders liked the idea of a LTW website idea with all of the data/information accessible.

Meeting Attendees

Organizing and Participating Agencies

CTC – California Tahoe Conservancy
FWS – Friends of the West Shore
NFF – National Forest Foundation
USFS LTBMU – U.S. Forest Service Lake Tahoe Basin Management Unit
USFS PSW – U.S. Forest Service Pacific Southwest Research Station
USFS PNW – U.S. Forest Service Pacific Northwest Research Station
NDF – Nevada Division of Forestry
KTB – Keep Tahoe Blue/The League to Save Lake Tahoe
HSR – Homewood Ski Resort
PCAPCD – Placer County Air Pollution Control District

Stakeholder Science Committee Members

1. Jennifer Quashnick, FOWS
2. Roland Shaw, NDF
3. Zach Bradford, KTB
4. Bruce Springsten, PCAPCD

Stakeholder Community Committee Members

1. Dan Blood, HSR

Staff

1. Christine Aralia, CTC
2. Sarah Di Vittorio, NFF
3. Brian Garrett, USFS LTBMU
4. Bri Tiffany, NFF
5. Keith Reynolds, USFS PNW
6. Stephanie Coppeto, USFS LTBMU
7. Pat Manley, USFS PSW
8. Eric Abelson, USFS PSW
9. Whitney Brennan, CTC

EMDS Results: decision model output (and supporting data)

August 6, 2019

Roadmap

Review: what is EMDS?

Roadmap

- Review: what is EMDS?
- EMDS results
  - Decision model results

Roadmap

Review: what is EMDS?

EMDS results

Decision model results

Decision model inputs

-Logic model results

-Science team results

Review: what is EMDS?

EMDS

Support decision makers by assessing large amounts of complex data

Roadmap

Review: what is EMDS?

EMDS results

Decision model results

Decision model

Assemble all data and evaluate scenarios (given decision-maker-based priorities)

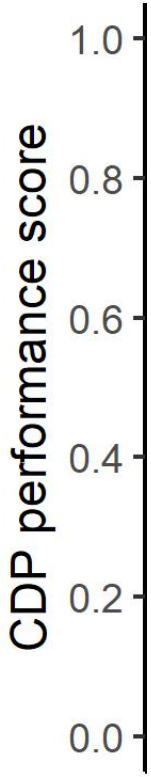
Decision model

Assemble all data and evaluate scenarios (given decision-maker priorities)

40 model outputs

Lake Tahoe West scenario performance over time

Values calculated by CDP (decision model)



CDP assessments range from 0 to 1
where 1 suggests that conditions 'on the ground' are
meeting desired conditions perfectly

Lake Tahoe West scenario performance over time

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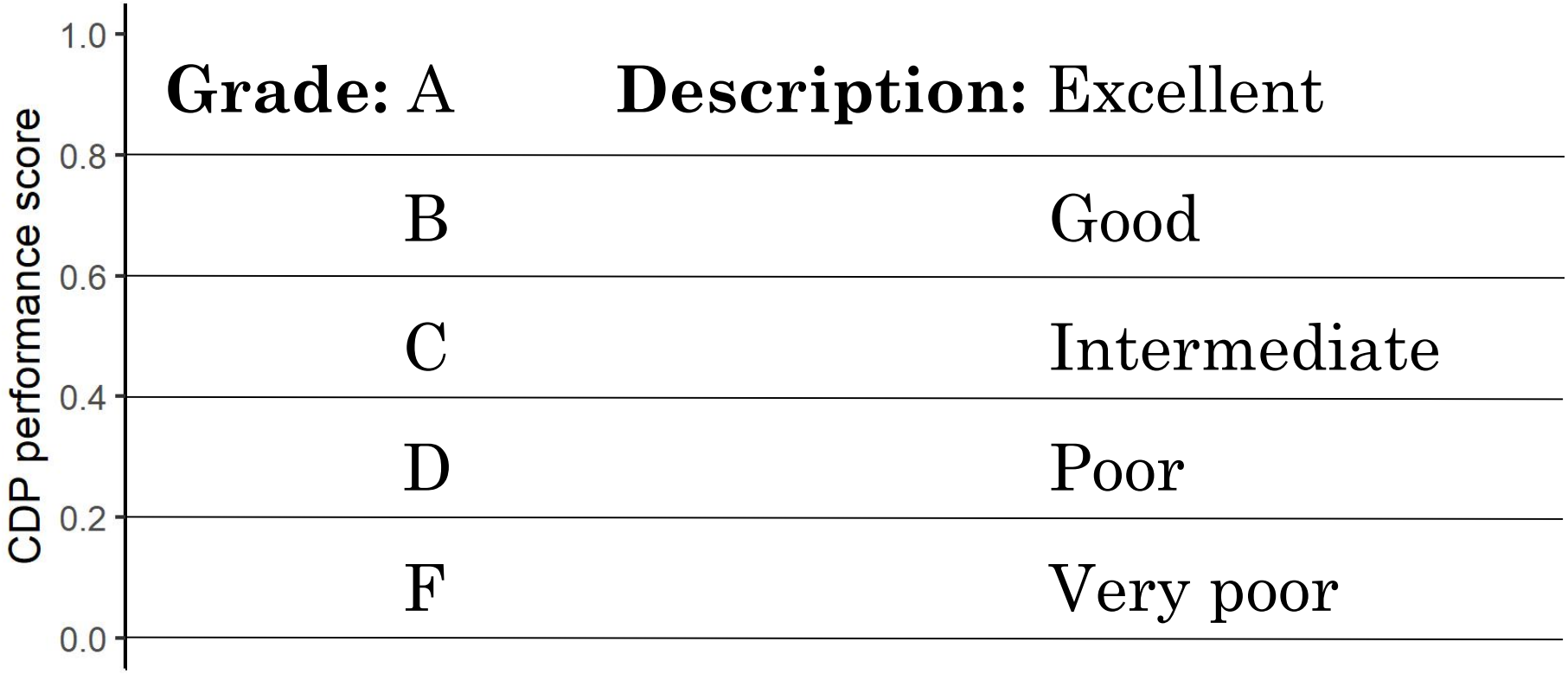

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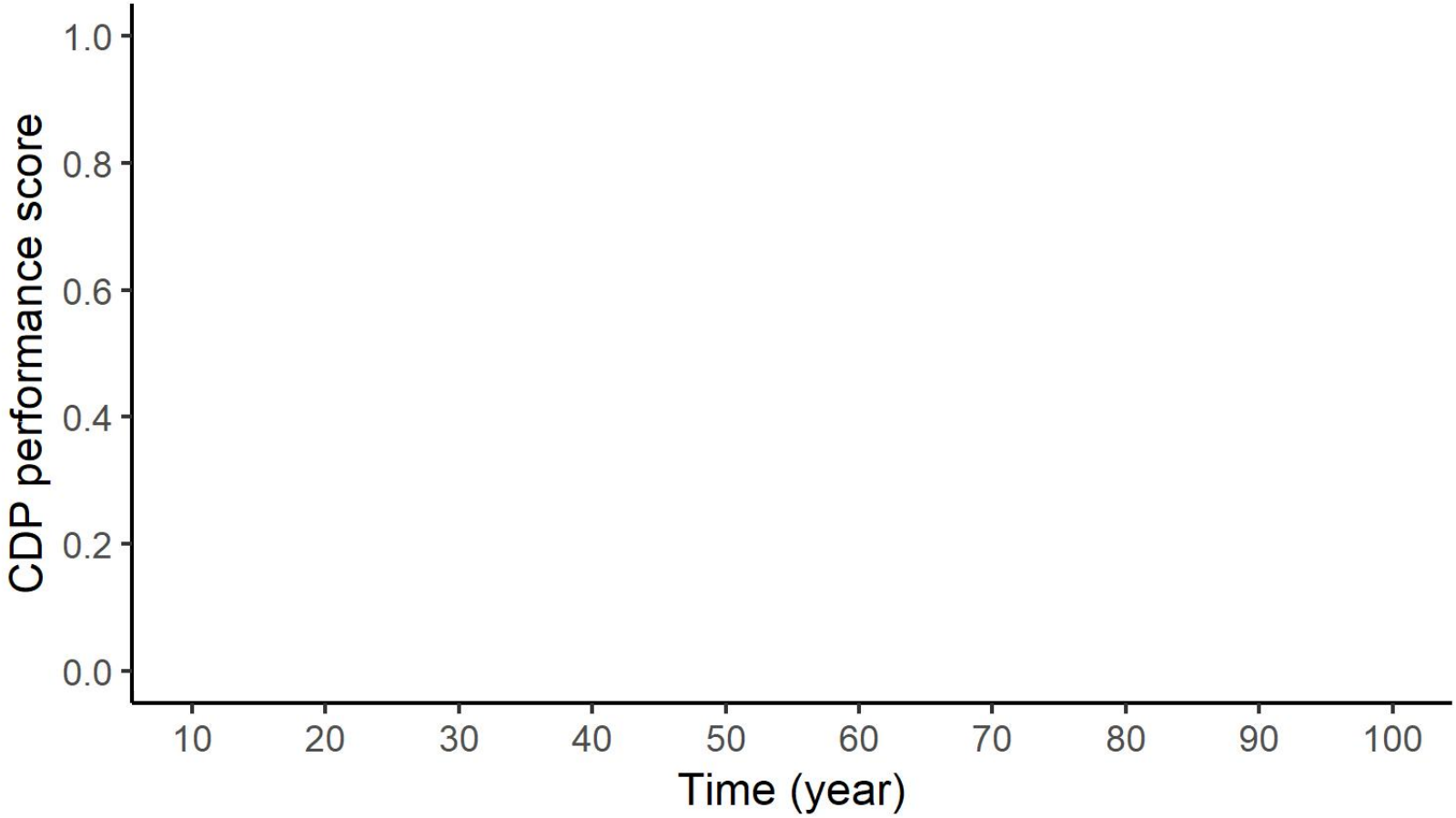

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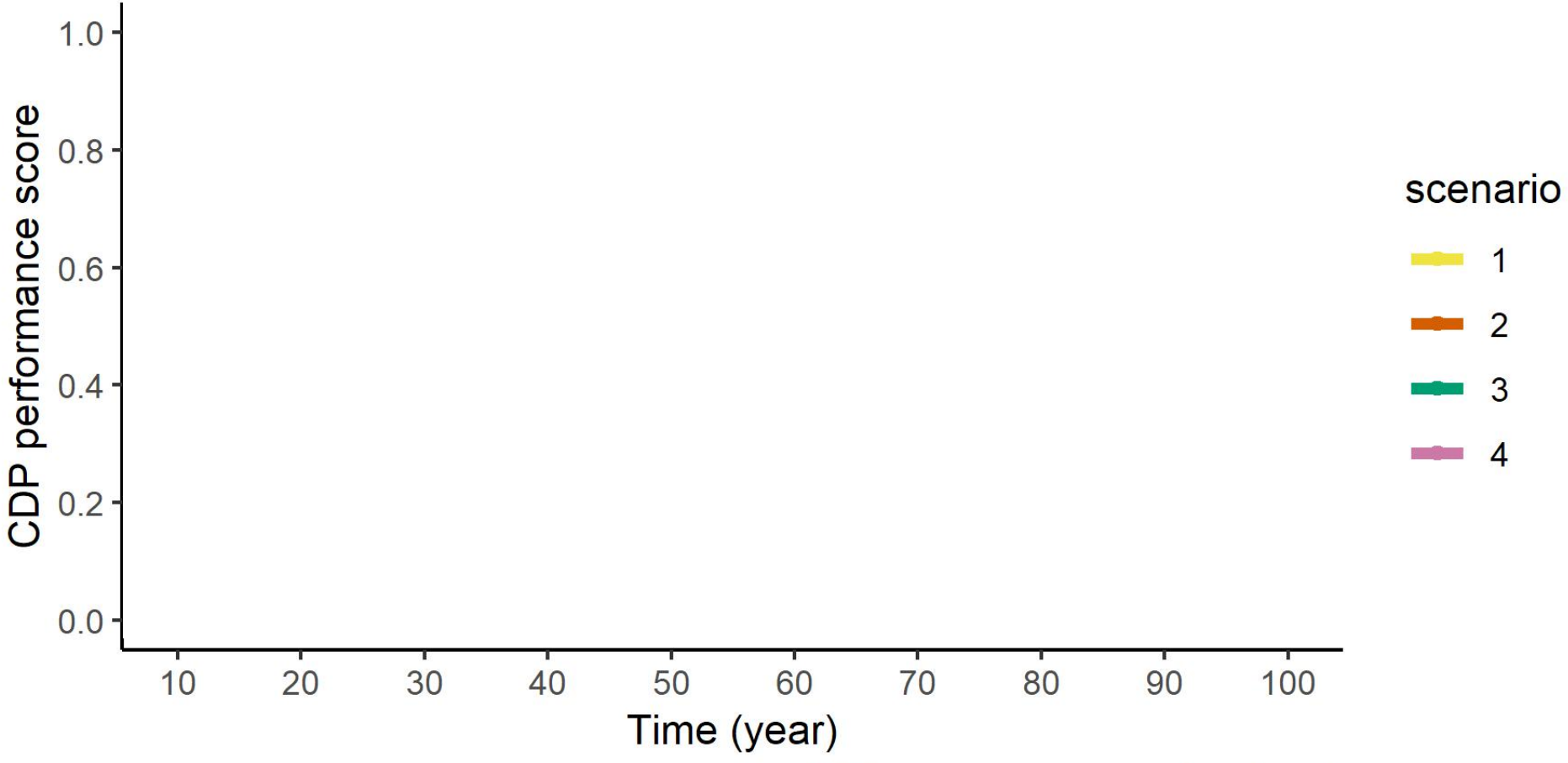

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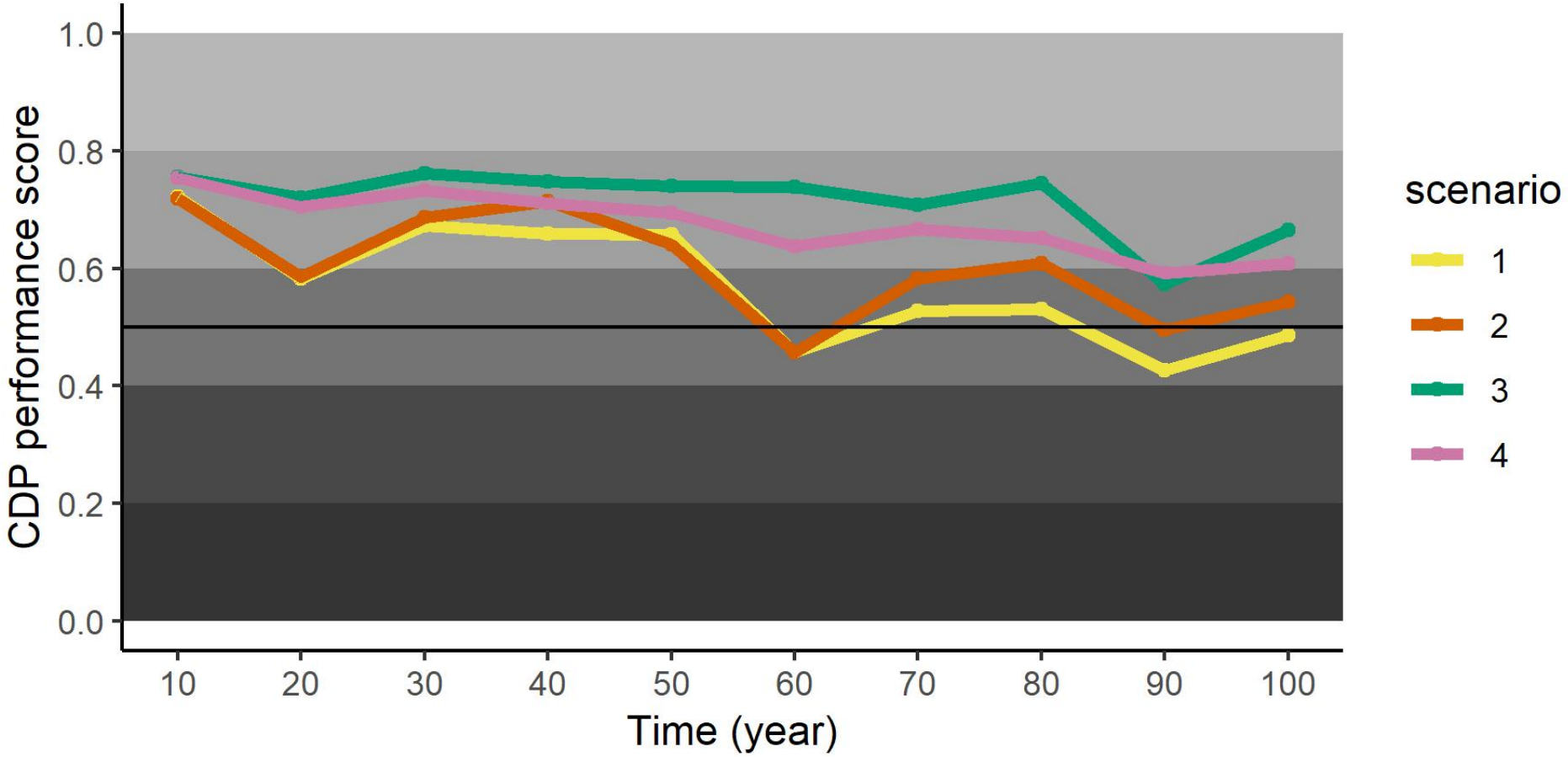

CDP assessments range from 0 to 1
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meeting desired conditions perfectly

A quick word about topic weighting

Roadmap

Review: what is EMDS?

EMDS results

Decision model results

Decision model inputs

-Logic model results

-Science team results

16 topics (per scenario & time-step)

8 processed by logic model

8 directly from science team

- WUI fire risk
- Life & property
- Quality air
- Recreation quality
- Cultural resource quality
- Carbon sequestration
- Restoration byproducts
- Functional fire
- Upland vegetation health
- Wildlife conservation
- Quality water
- Water quantity & timing
- Net treatment costs
- Suppression costs
- Staffing
- Days of intent. burning

Logic model

Assess complex landscape conditions (e.g. hydrology, wildlife, vegetation…)

UNION vs. AND operators

A bit on the “inner workings” of the logic model

Logic model topics

- Wildlife conservation

Logic model

Logic model topics have subtopics

- Wildlife conservation
  - Species richness
  - Ecological function
  - Species diversity
  - Apex predators

Logic model

Sometimes subtopics have subtopics

- Wildlife conservation
  - Species richness
  - Ecological function
  - Species diversity
    - Early seral beta diversity
    - Mid seral beta diversity
    - Late seral beta diversity
  - Apex predators

Logic model

How does the logic model assess subtopics?

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In the LTW project, topics use:

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Structure of logic model output

Logic model

8 Logic model topics

- Wildlife conservation
- Quality water
- Upland vegetation health
- Functional fire
- WUI fire
- Quality air
- Recreation
- Cultural resource quality

Logic model

8 logic model topics

4 Scenarios

Logic model

8 logic model topics

4 Scenarios

10 Time steps (year 10, 20, 30, … , 100)

Logic model

8 logic model topics

4 Scenarios

10 Time steps (year 10, 20, 30, … , 100)

320 model outputs

Logic model

8 logic model topics

4 Scenarios

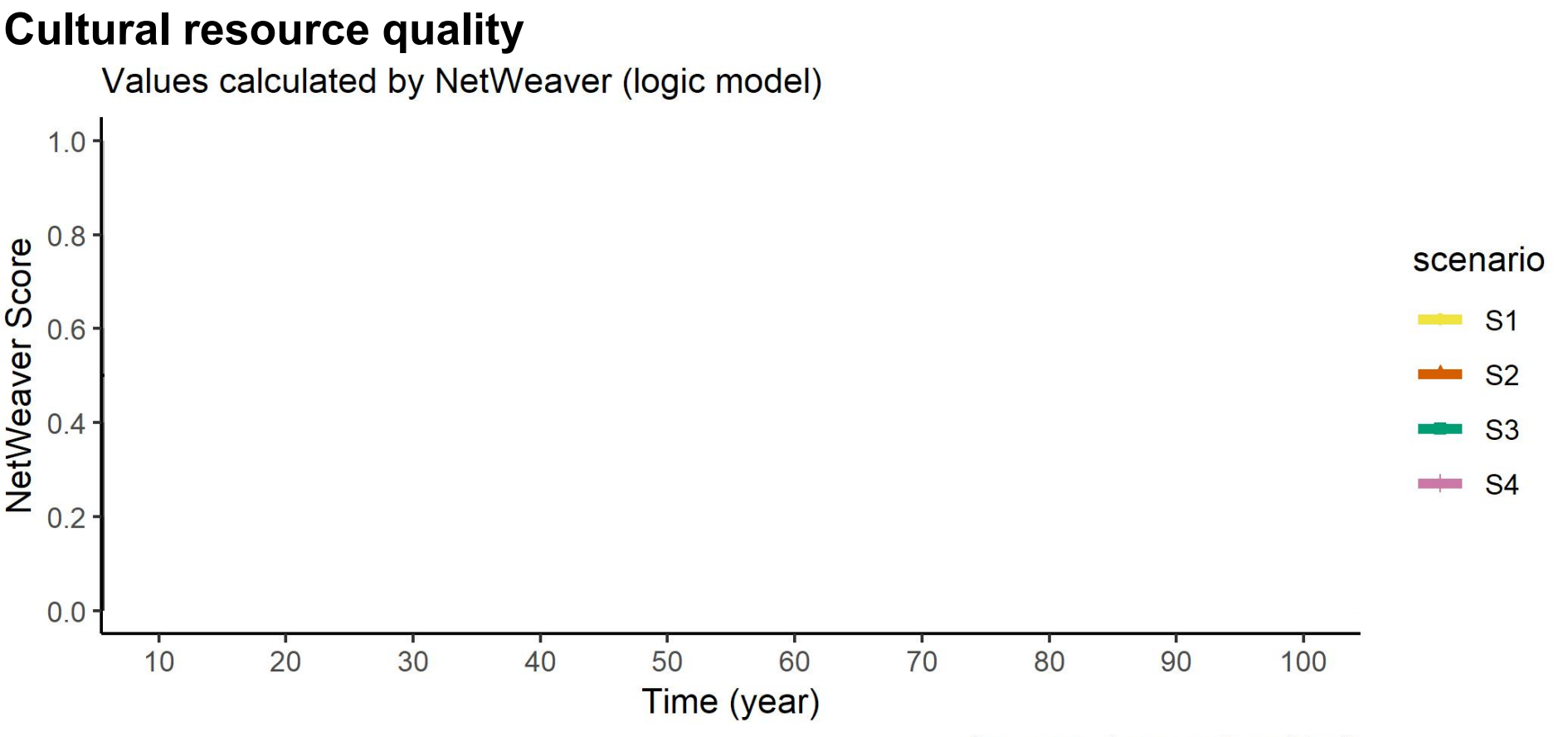
10 Time steps (year 10, 20, 30, … , 100)

320 model outputs

to follow: 8 figures ea. with 40 data-points

Logic model

- Cultural resource quality (Union)
  - Restoration of low intensity fire
  - Habitat for cultural keystone species (Union)
  - Cultural water quantity and timing



Logic model

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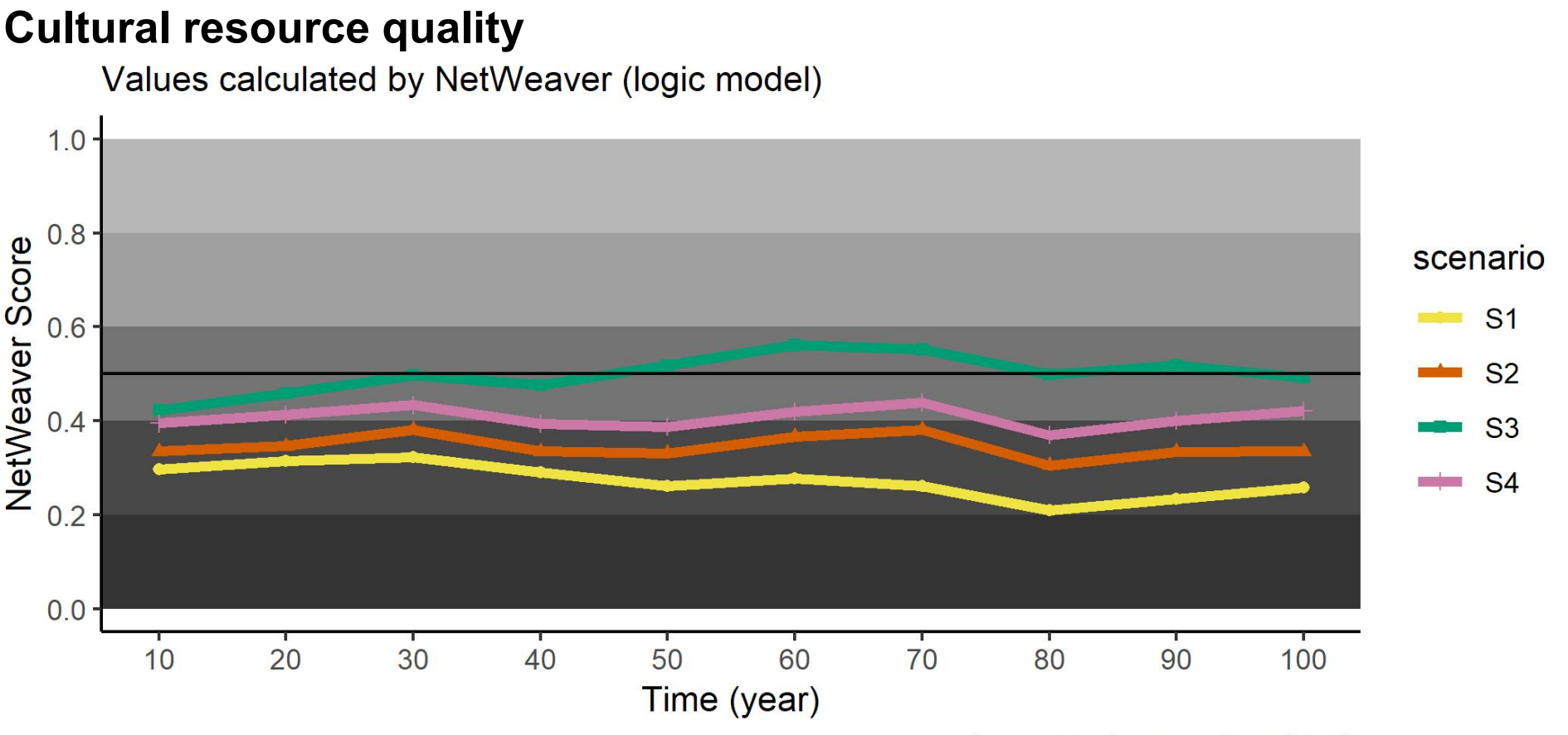
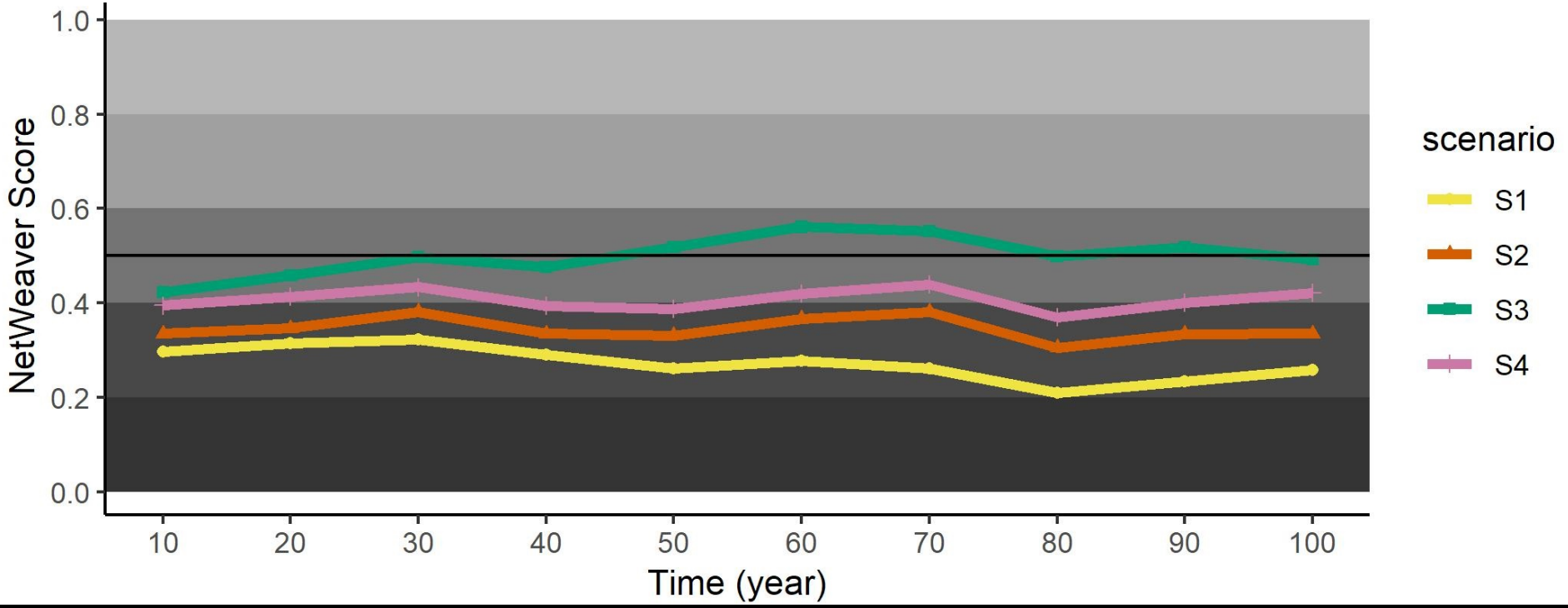
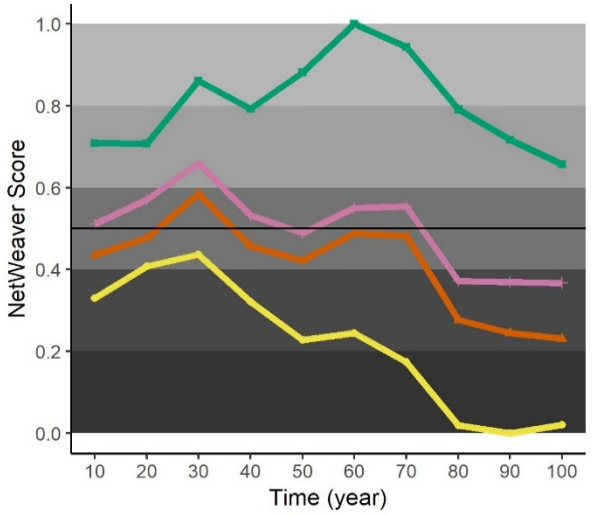


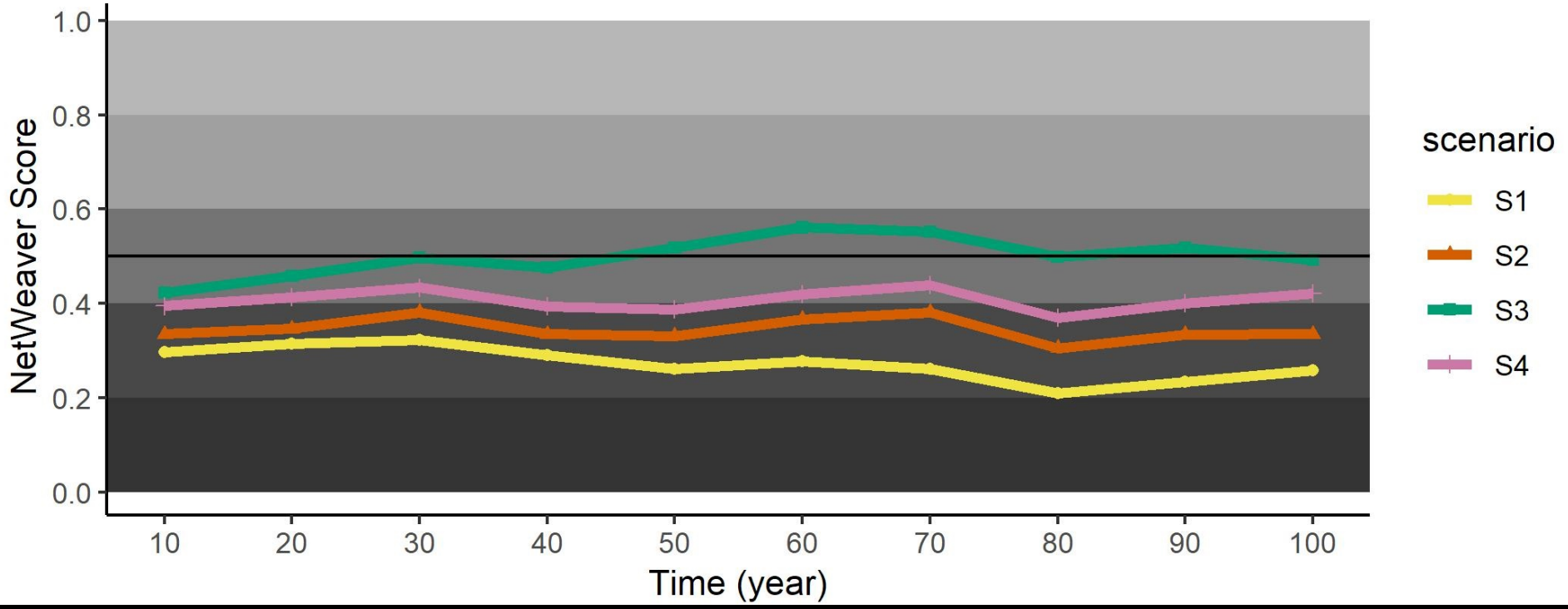
Cultural resource quality



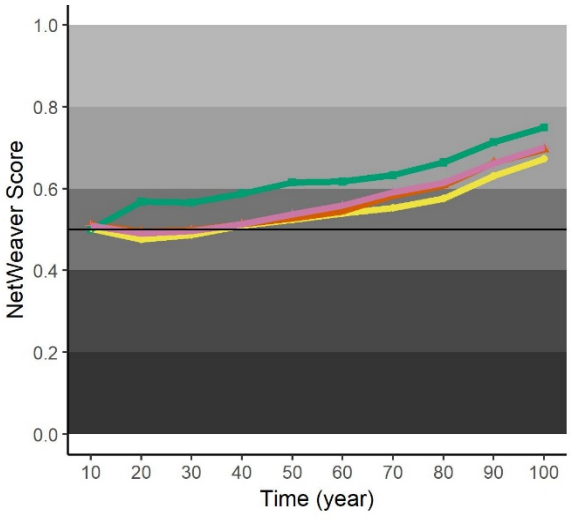
Water quant. & time.



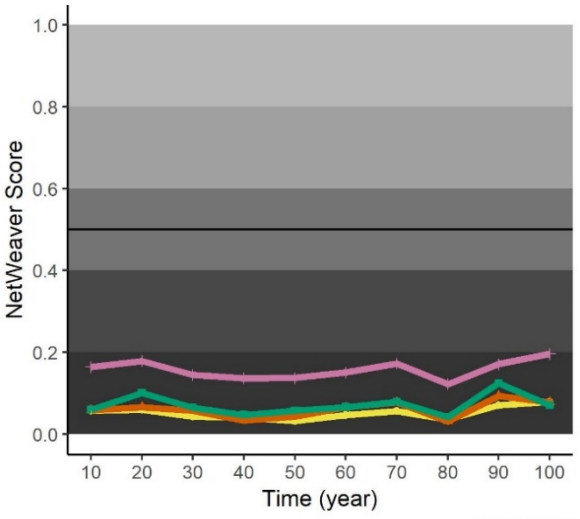
Cultural resource quality



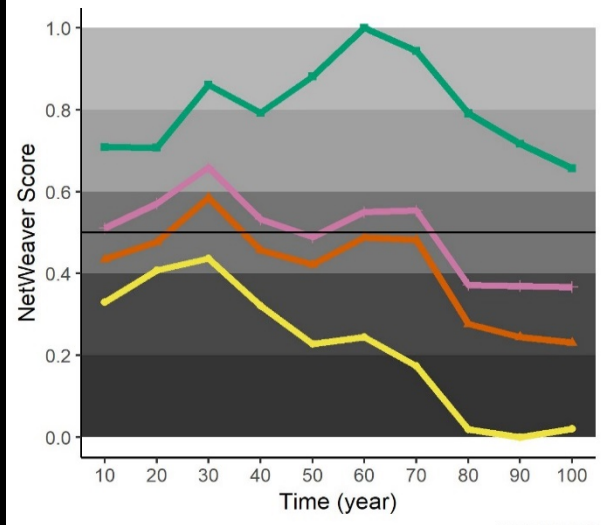
Habitat for cult. keystn. sp



Rest. low intensity fire

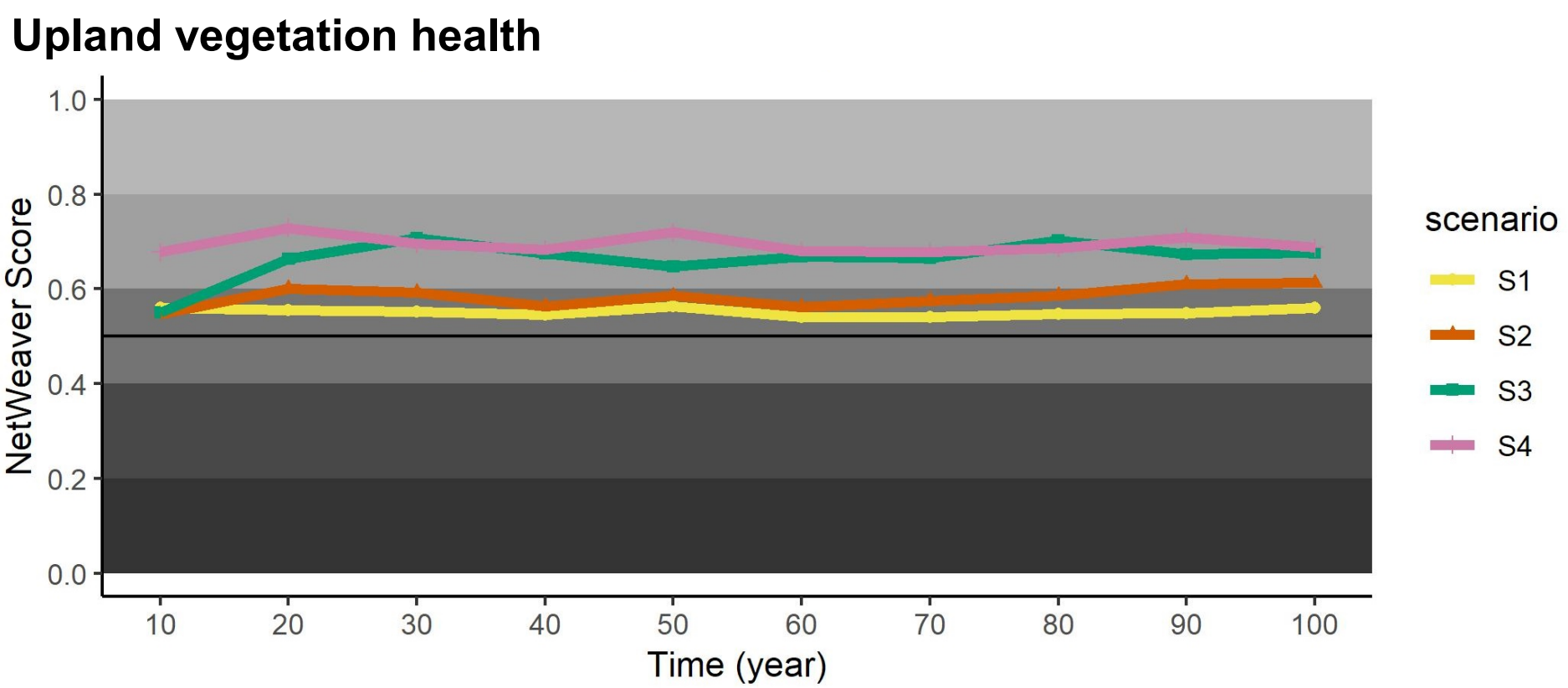


Water quant. & time.

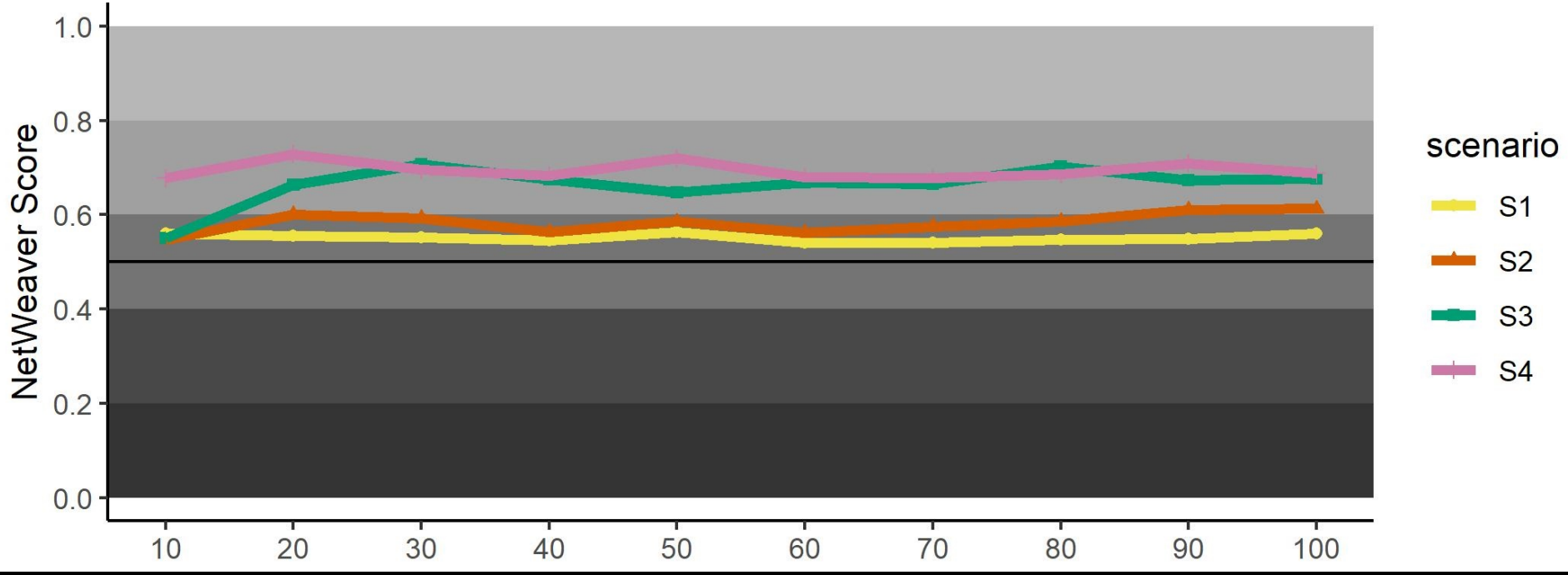


Logic model

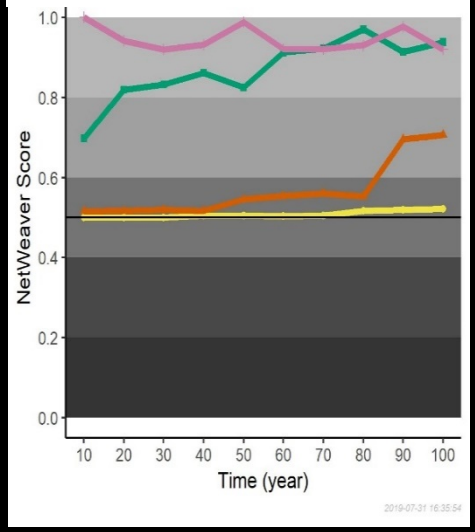
- Upland vegetation health (Union)
  - Big Trees
  - Forest cover (Union)
  - Seral stage (Union)
    - High elevation (Union)
    - Mid Elevation (Union)
  - Composition (Union)



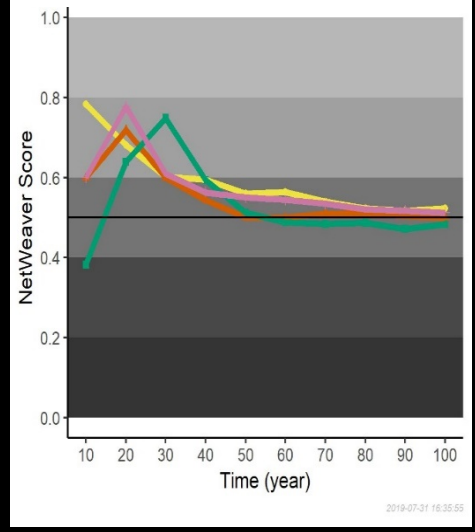
Upland vegetation health



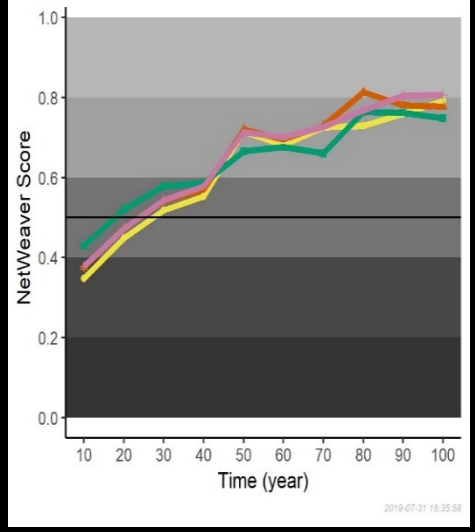
Big trees



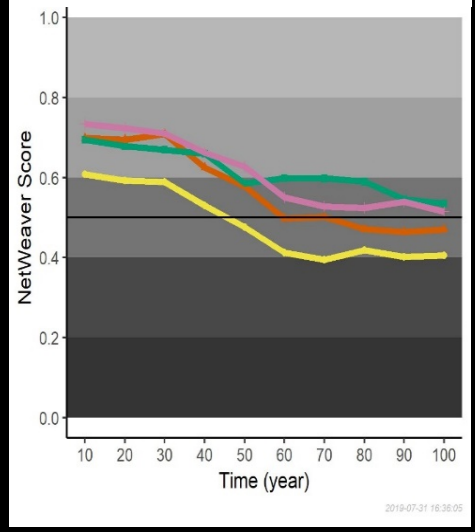
Forest cover



Seral stage



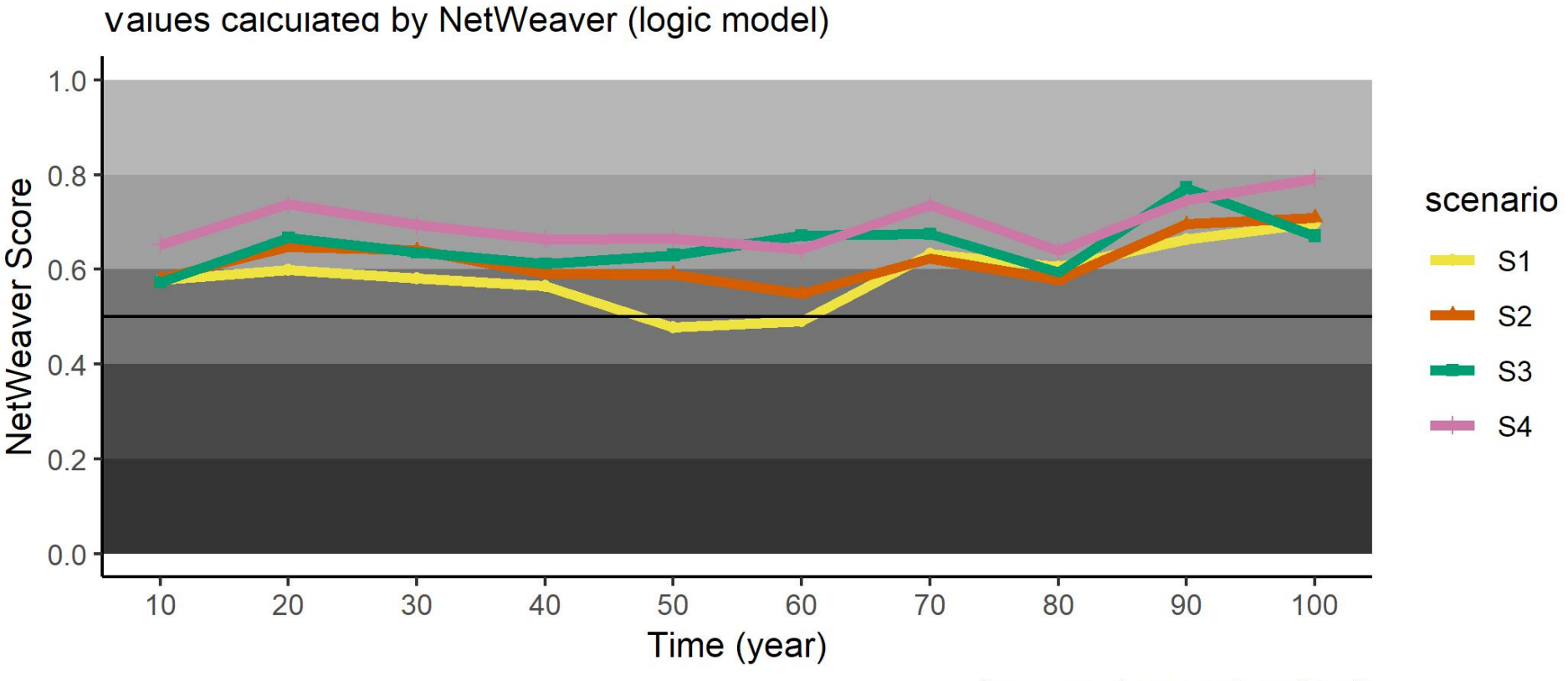
Composition



Logic model

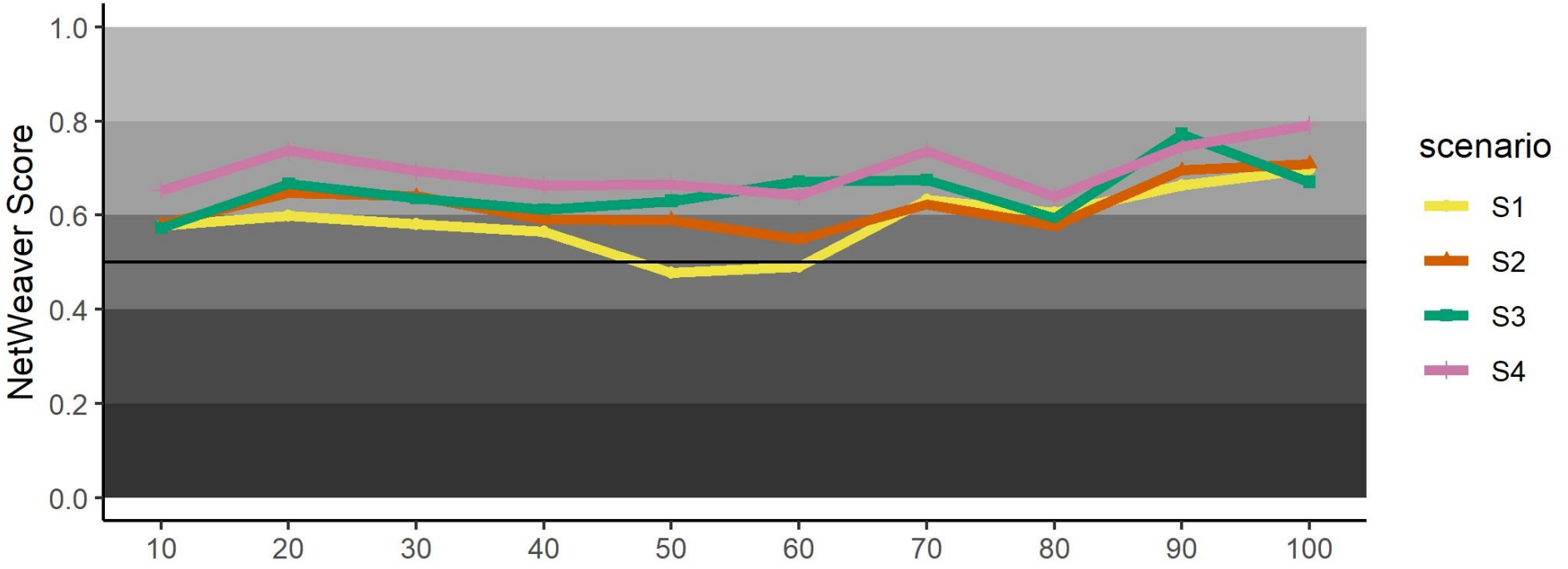
- Functional fire (Union)
  - High severity patches
  - Percent landscape burned (Union)

Functional fire

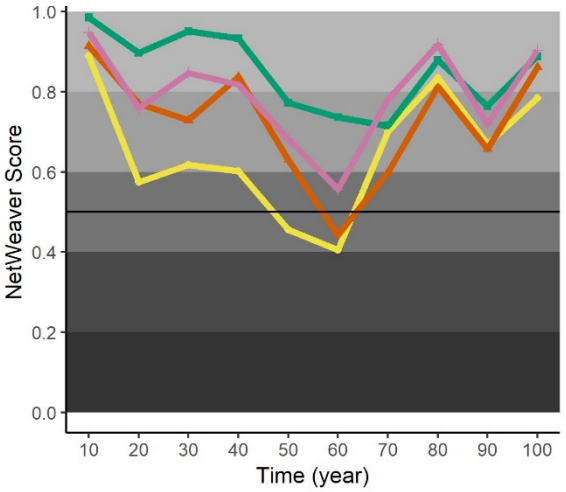


Functional fire

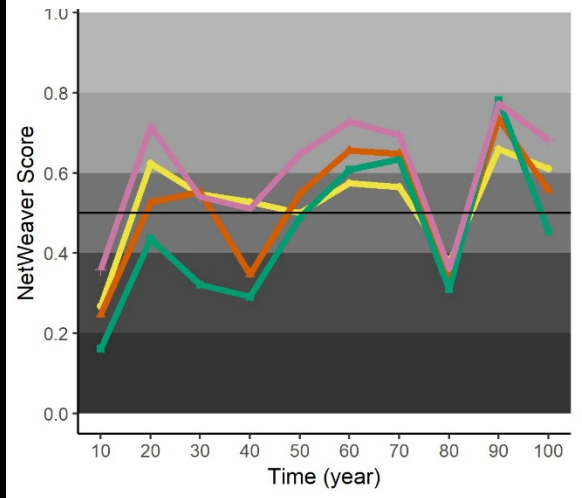
values calculated by NetWeaver (logic model)



High severity patch

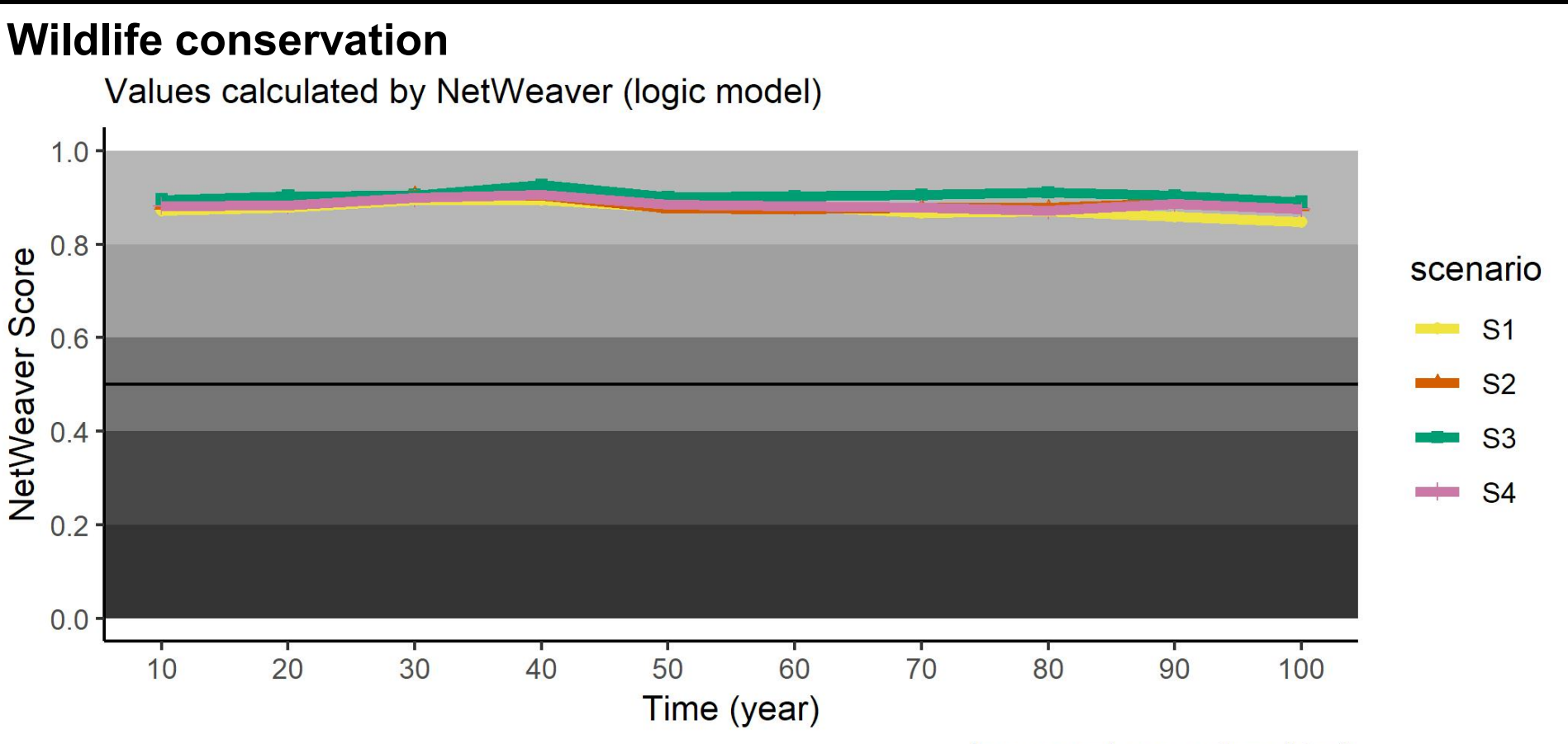


% land burned (by severity)



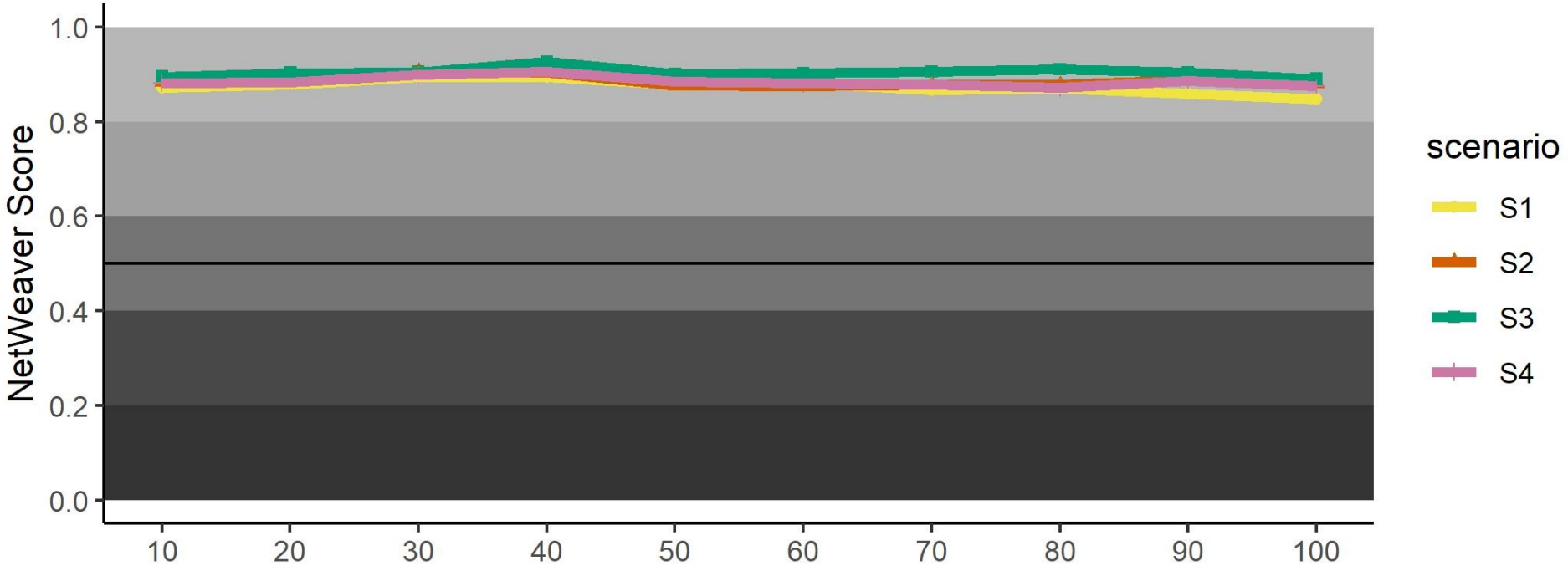
Logic model

- Wildlife conservation (Union)
  - Species richness
  - Ecological function (Union)
  - Species diversity (Union)
  - Apex predators (Union)

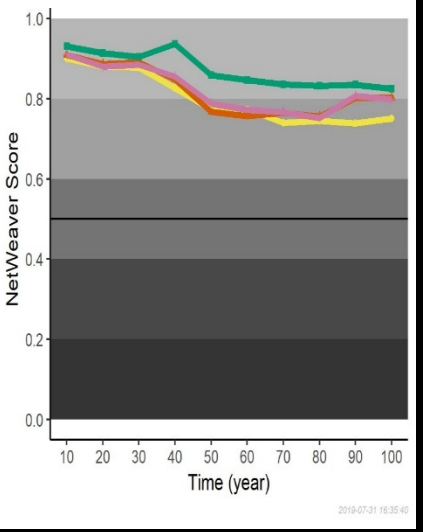


Wildlife conservation

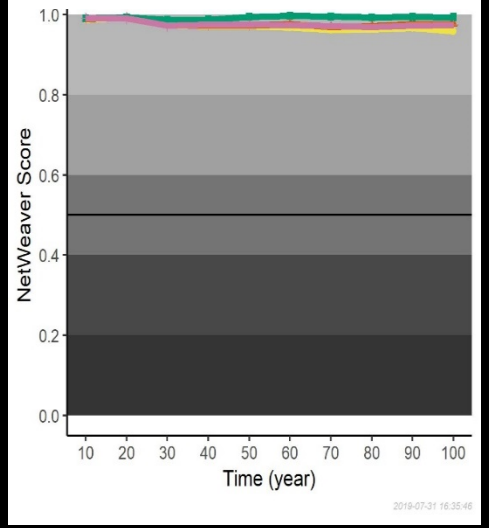
Values calculated by NetWeaver (logic model)



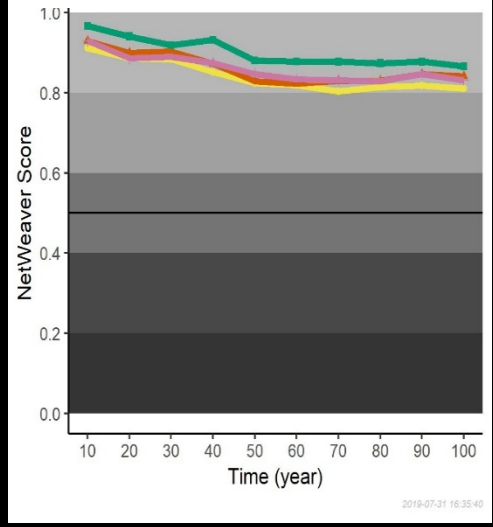
Ecological funct.



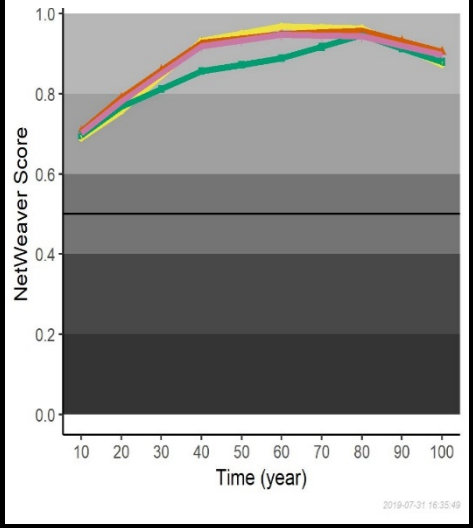
Species diversity



Species richness

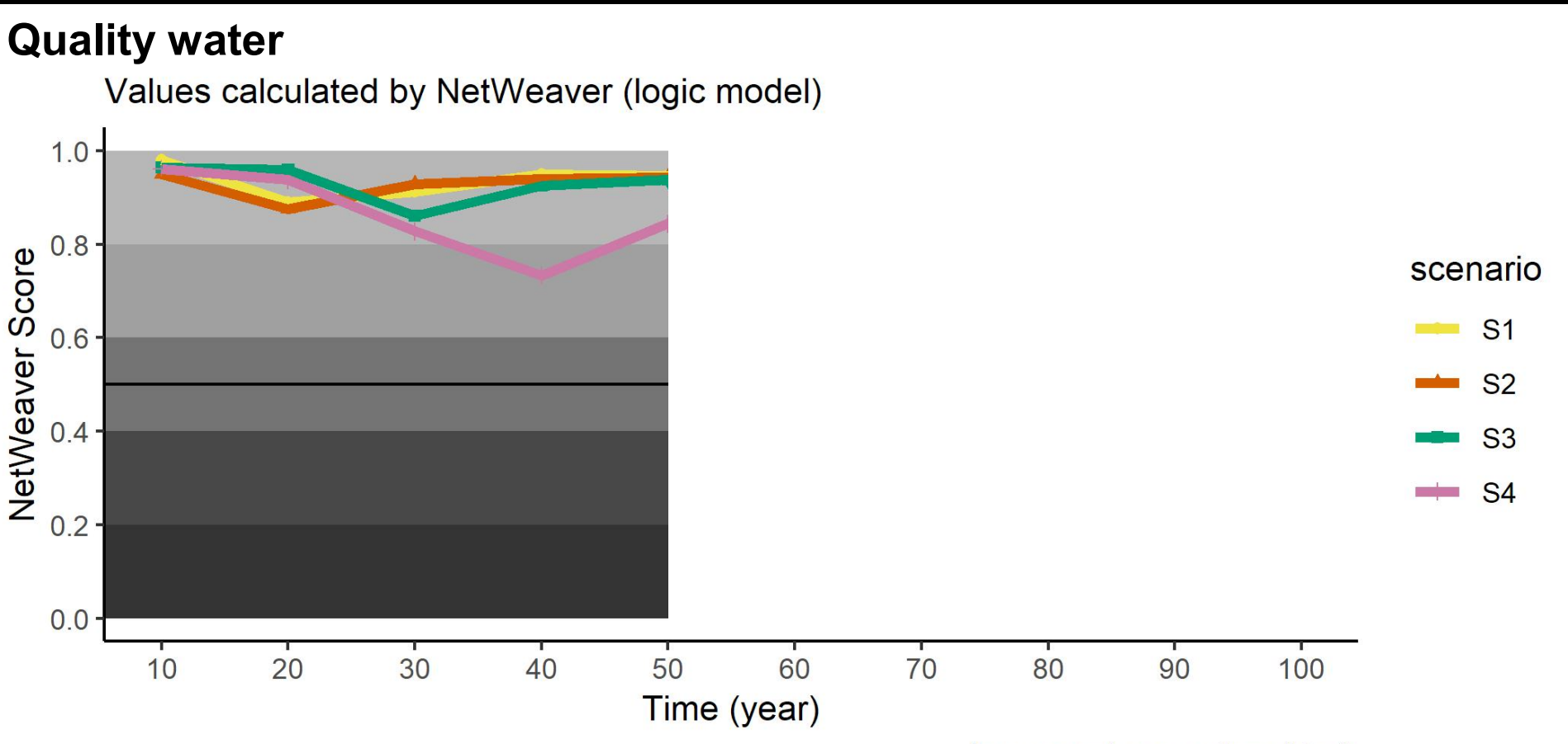


Apex predators

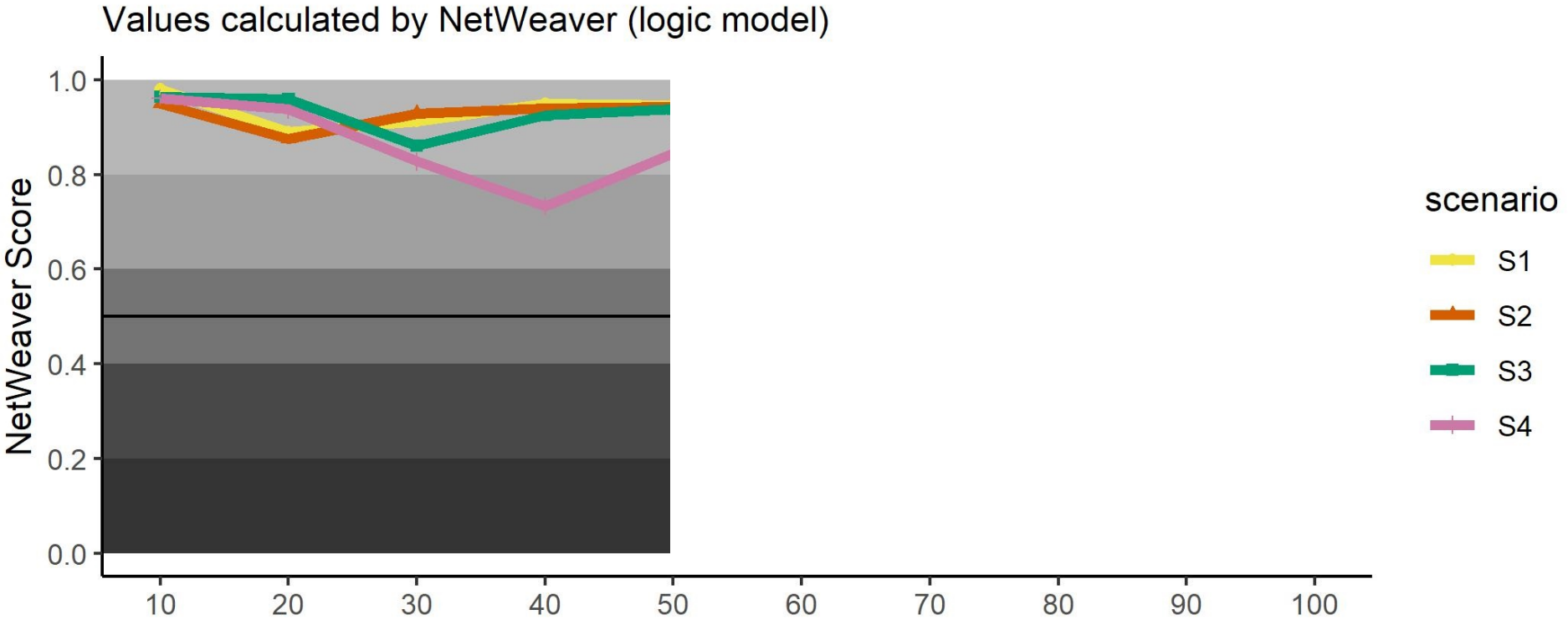


Logic model

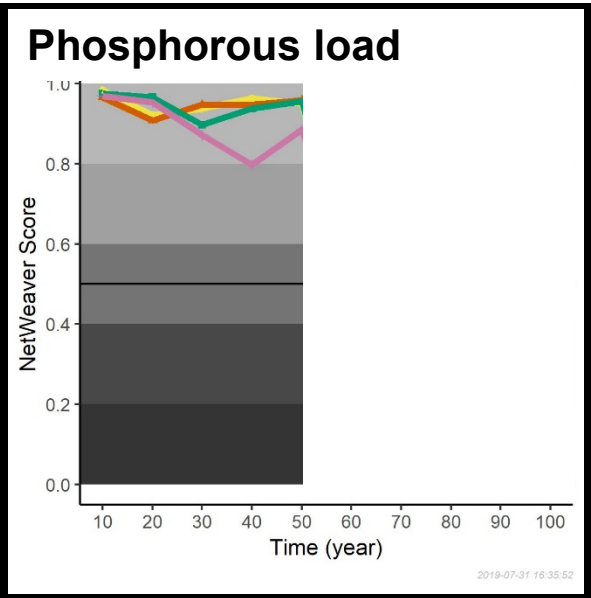
- Quality water (Union)
  - Phosphorus load
  - Fine sediment load



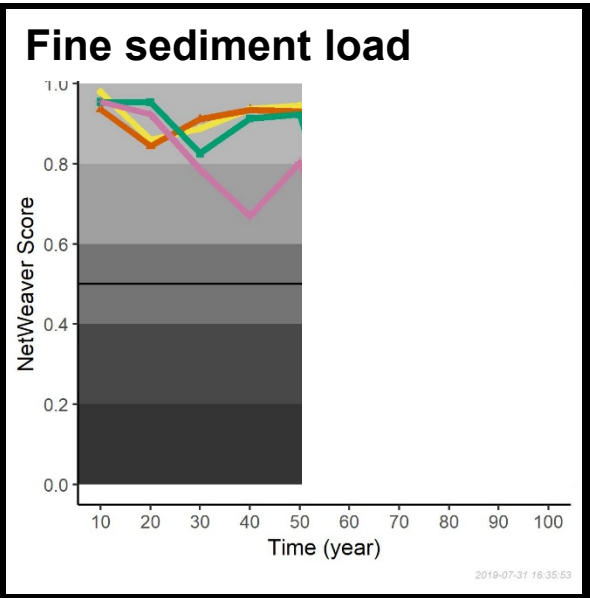
Quality water



Phosphorous load

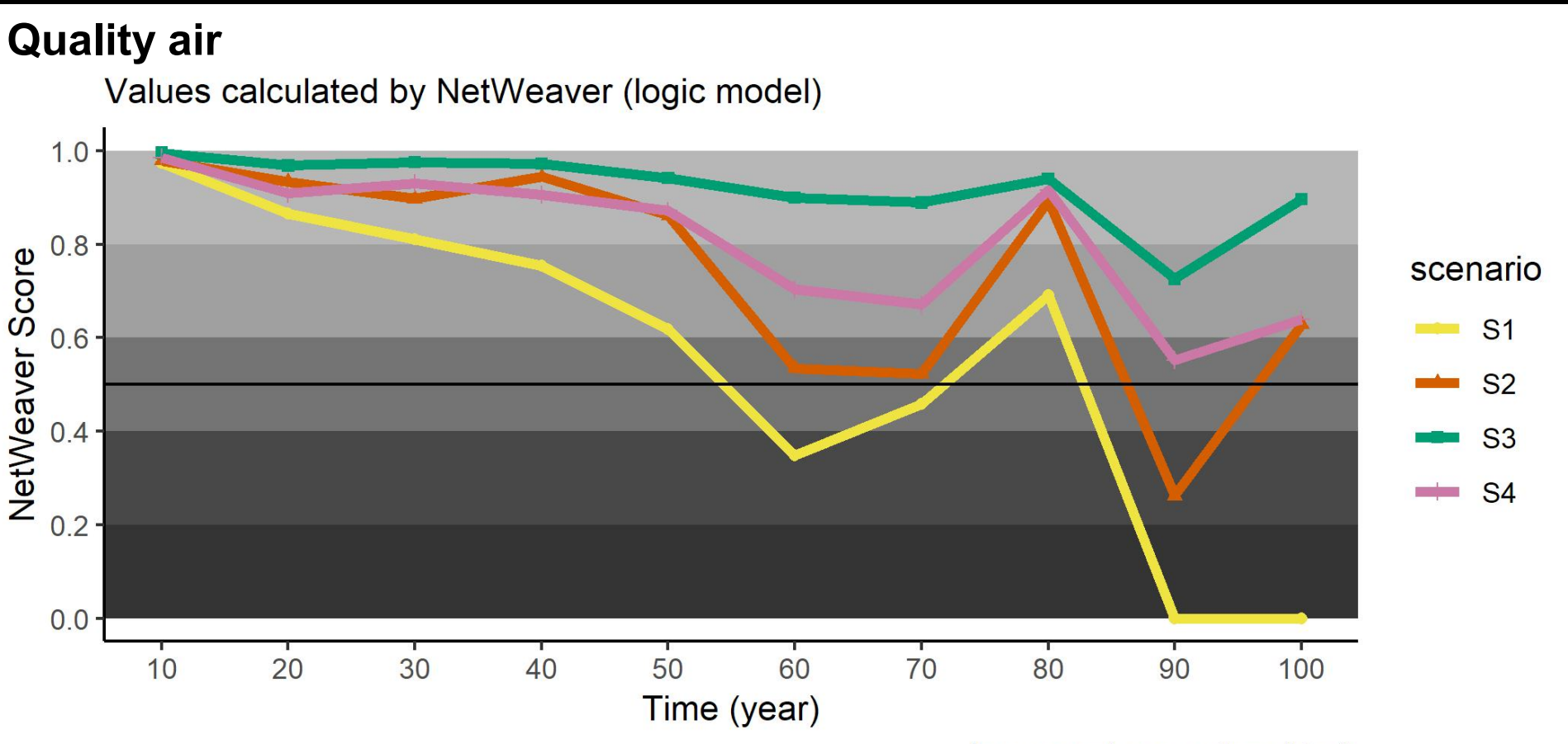


Fine sediment load



Logic model

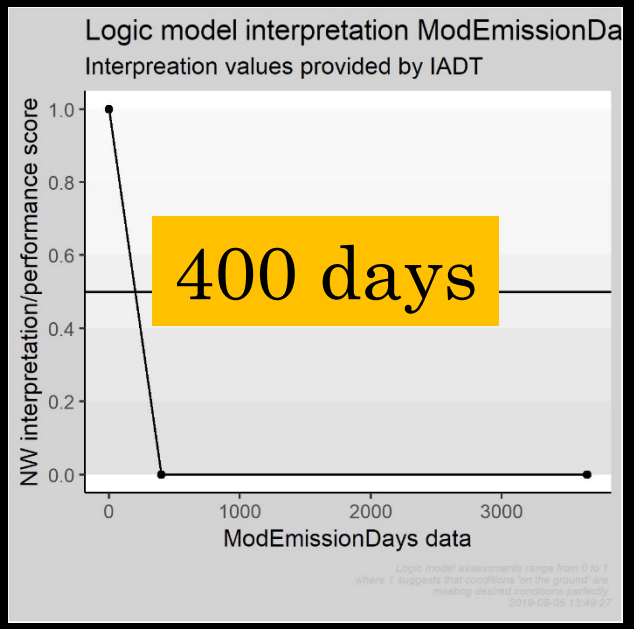
- Quality air (AND)
  - Extreme emission days
  - Very high emission days
  - High emission days
  - Moderate emission days

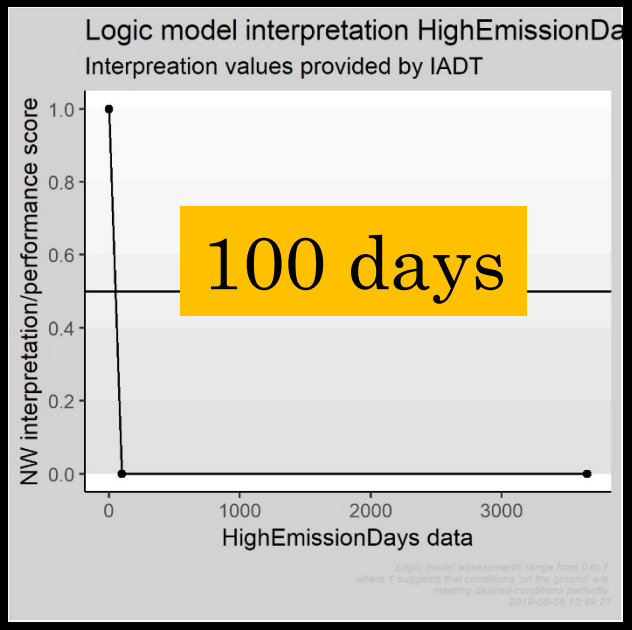


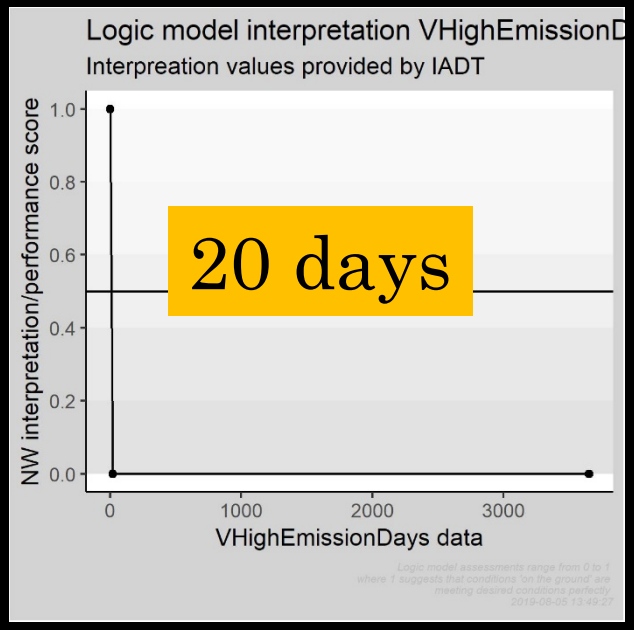
Logic model

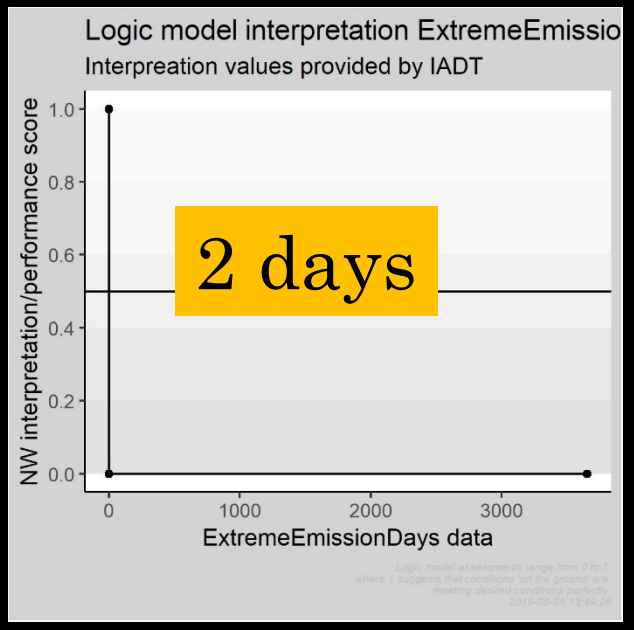
- Quality air (AND)
  - Extreme emission days
  - Very high emission days
  - High emission days
  - Moderate emission days

INTERPRETATION FIGURES



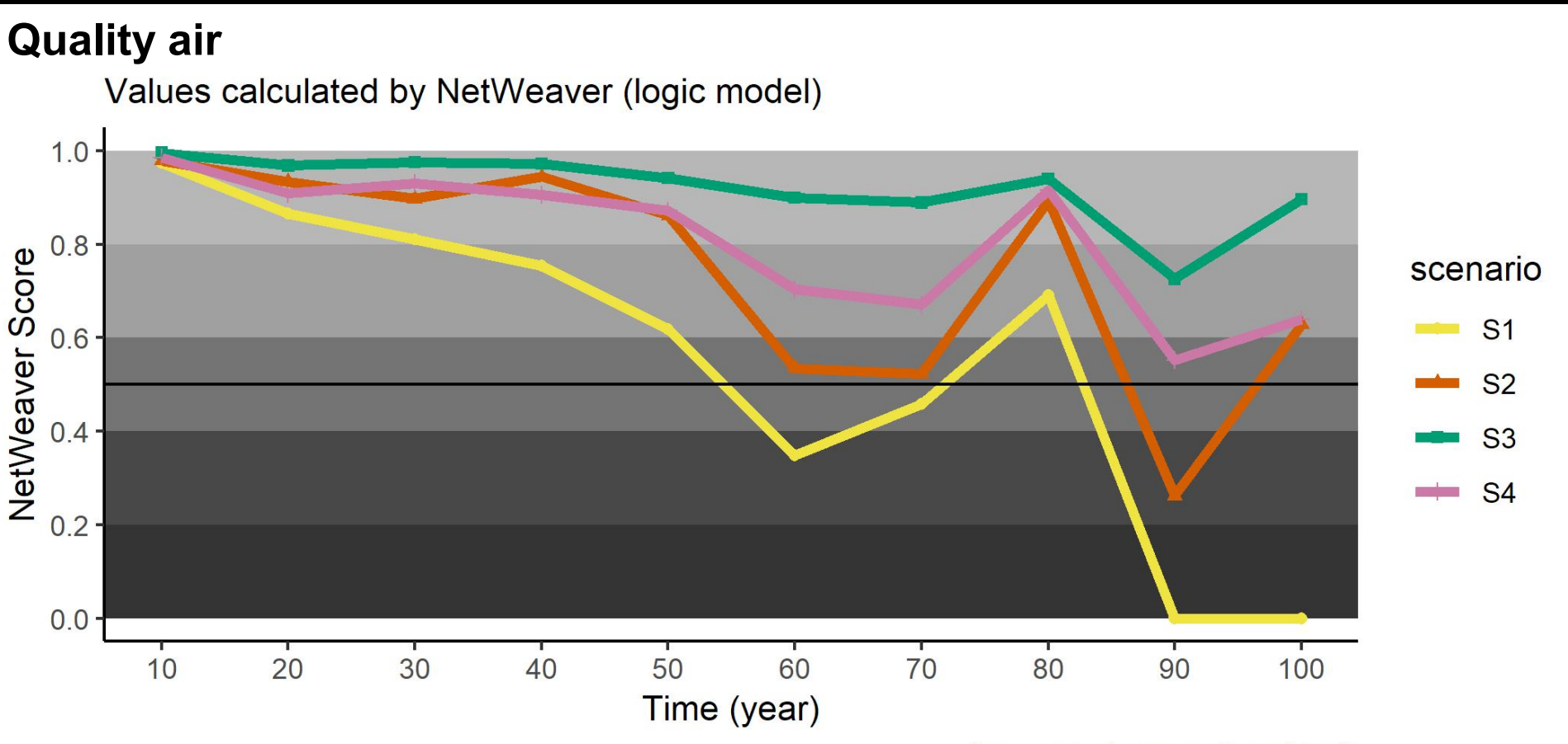






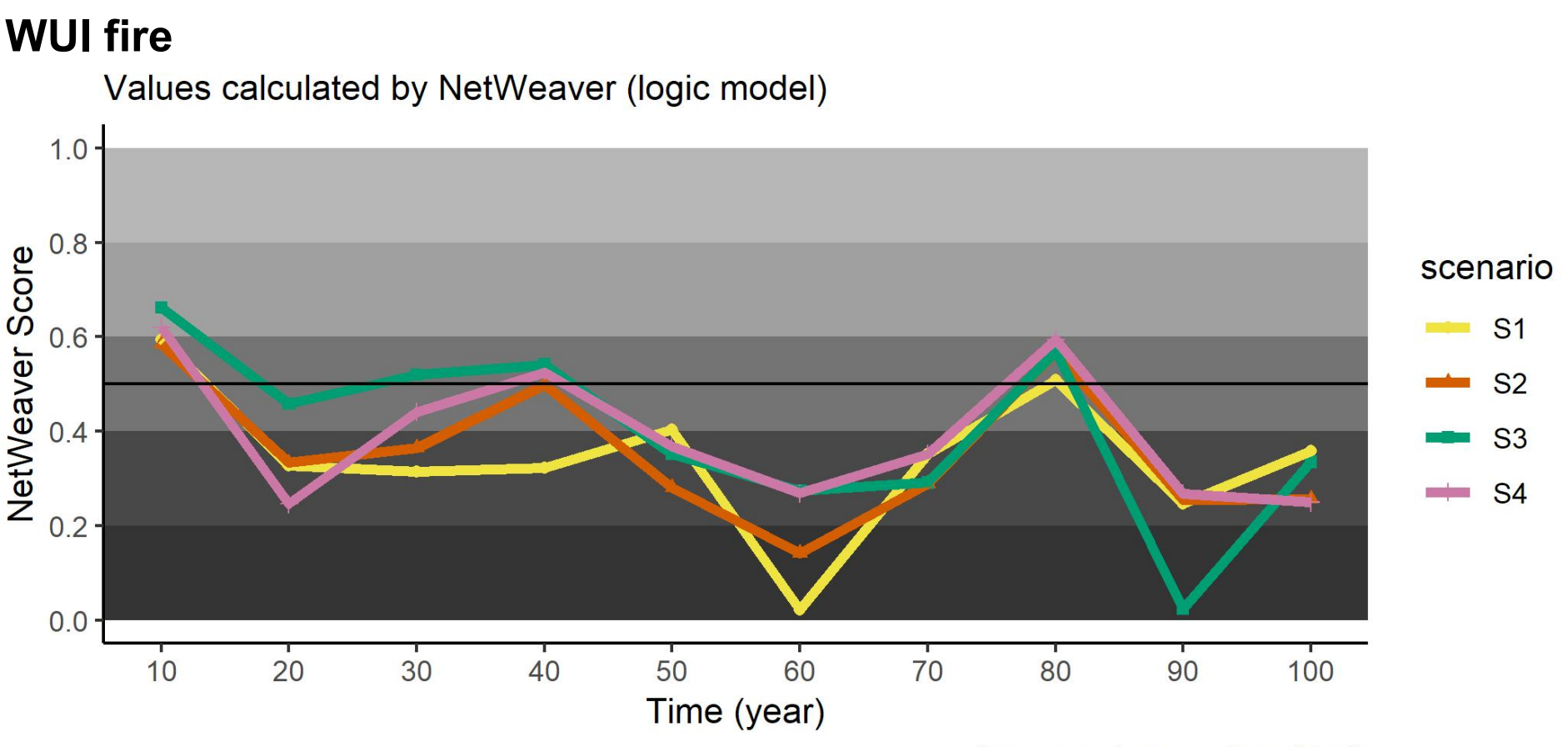
Logic model

- Quality air (AND)
  - Extreme emission days
  - Very high emission days
  - High emission days
  - Moderate emission days

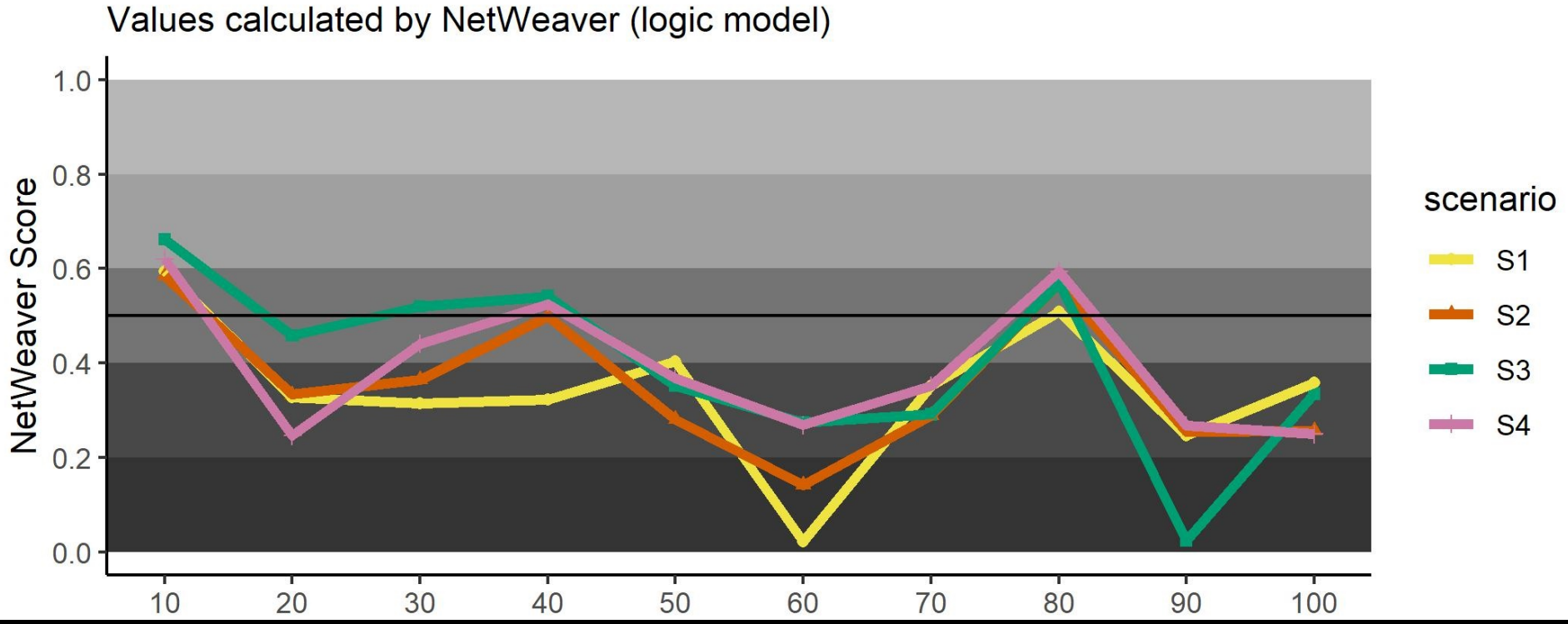


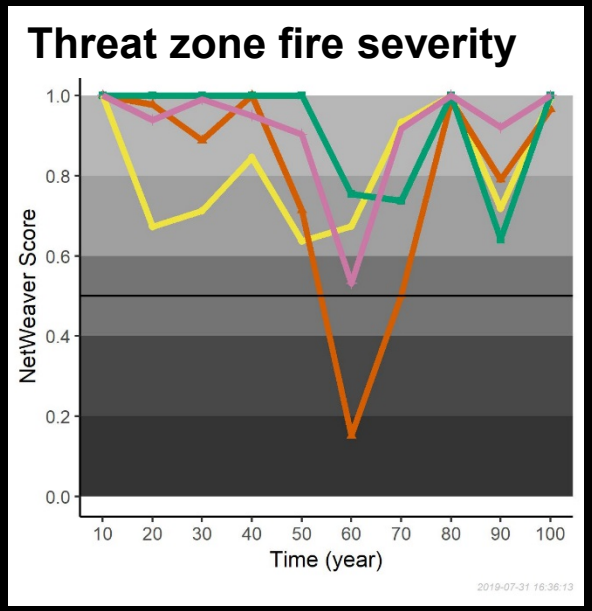
Logic model

- WUI fire (AND)
  - Threat zone fire severity (AND)
  - Defense zone fire severity (AND)



WUI fire


Values calculated by NetWeaver (logic model)
NetWeaver Score
1.0
0.8
0.6
0.4
0.2
0.0
10
20
30
40
50
60
70
80
90
100
scenario
S1
S2
S3
S4


Threat zone fire severity
NetWeaver Score
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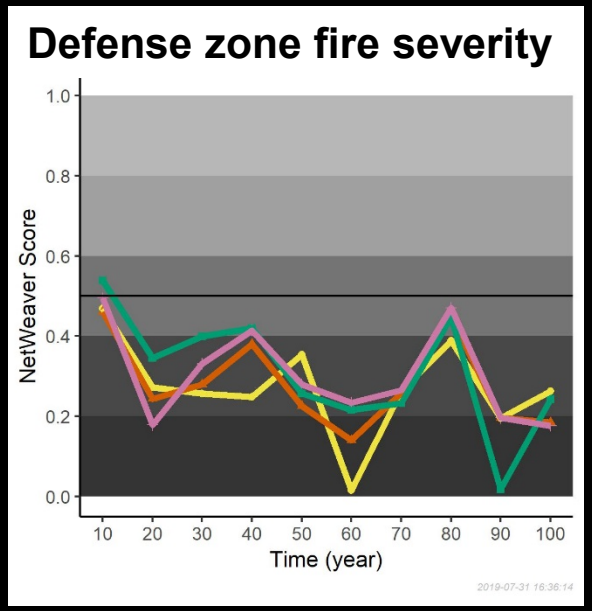
20
30
40
50
60
70
80
90
100
Time (year)


Defense zone fire severity
NetWeaver Score
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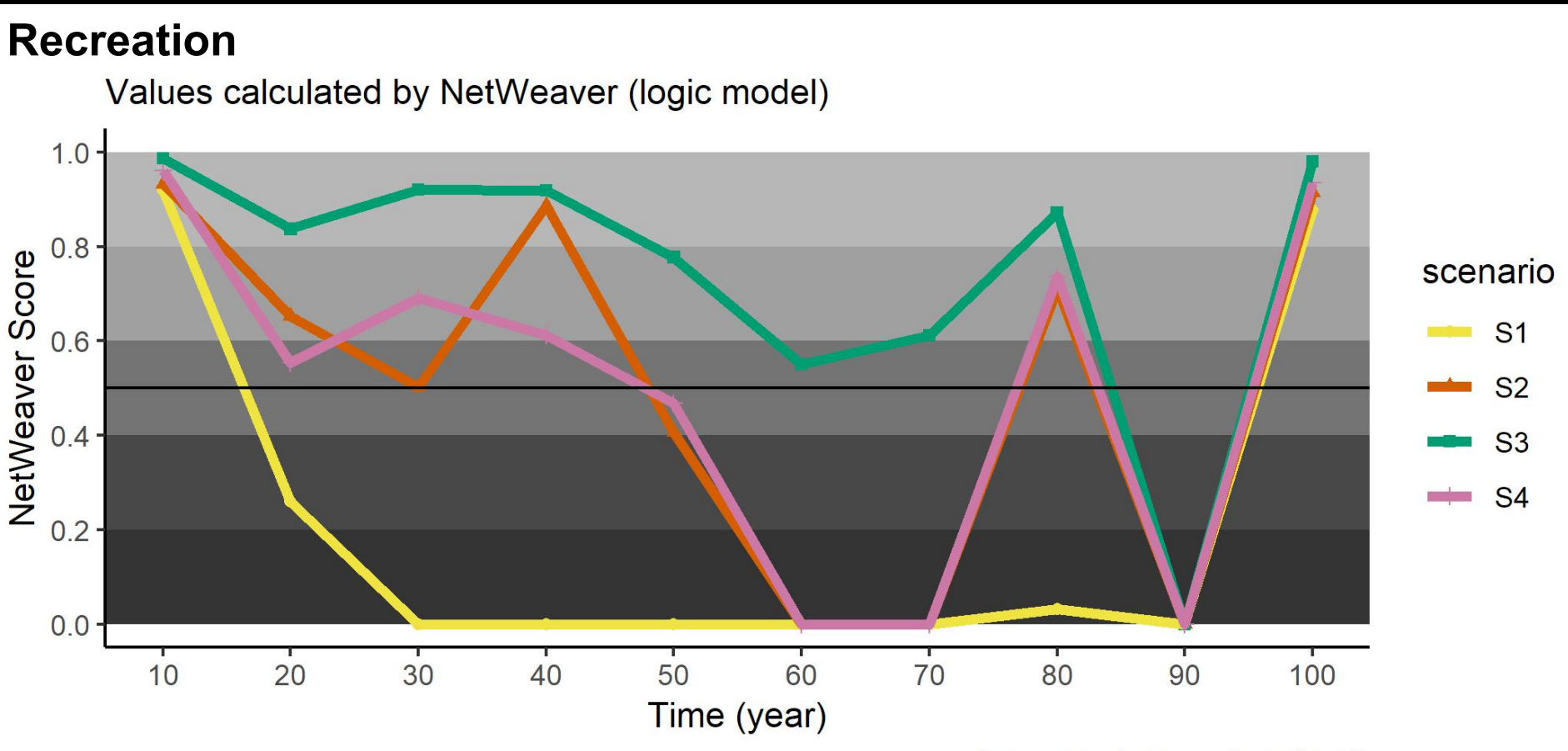
0.6
0.4
0.2
0.0
10
20
30
40
50
60
70
80
90
100
Time (year)

Logic model

- Recreation (summer-time air quality) (AND)
  - Summer extreme emission days
  - Summer very high emission days
  - Summer high emission days
  - Summer moderate emission days



Roadmap

Review: what is EMDS?

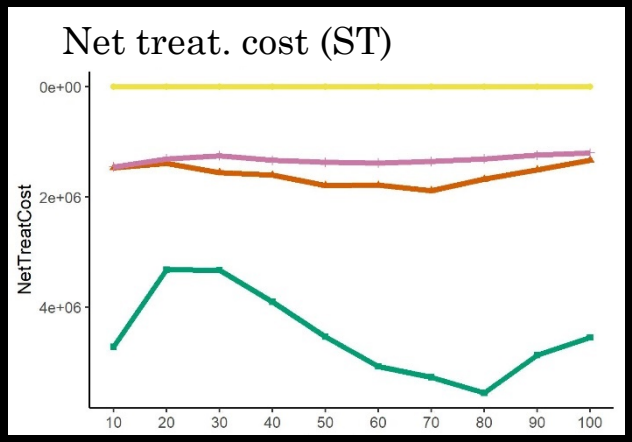
EMDS results

Decision model results

Decision model inputs

-Logic model results

-Science team results


Net treat. cost (ST)
NetTreatCost
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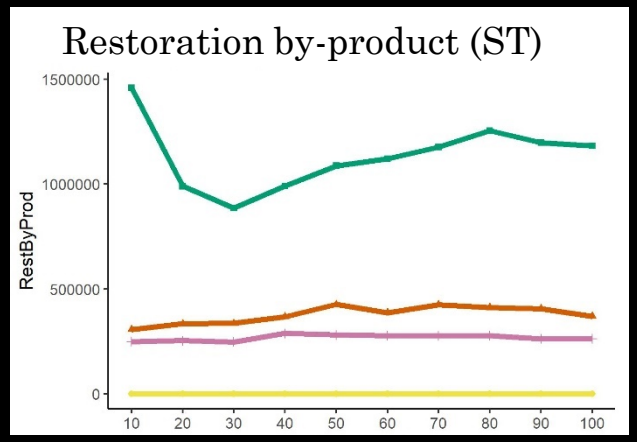
2e+06
4e+06
10 20 30 40 50 60 70 80 90 100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RestByProd
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500000
0
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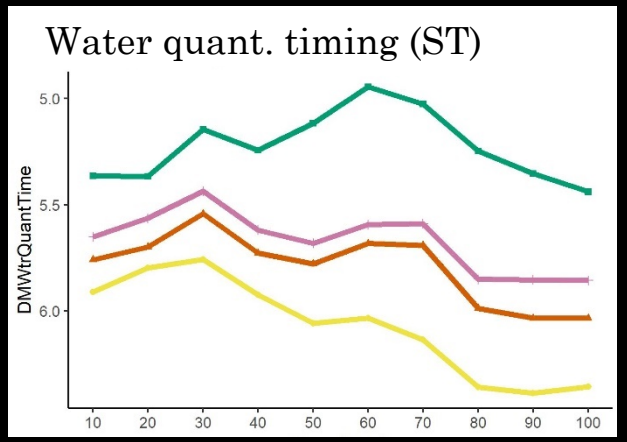
Water quant. timing (ST)
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6.0
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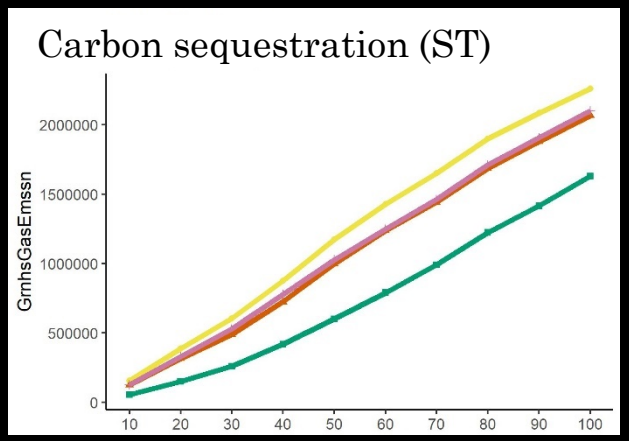
Carbon sequestration (ST)
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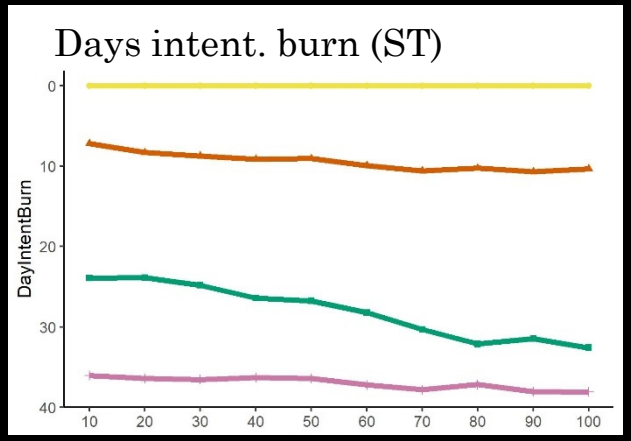
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20
30
40
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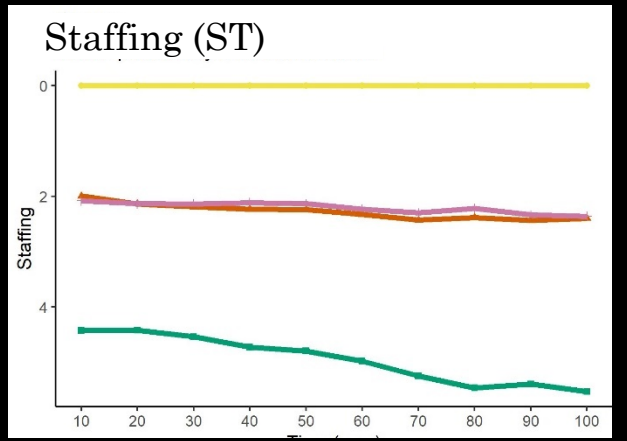
Staffing (ST)
Staffing
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2
4
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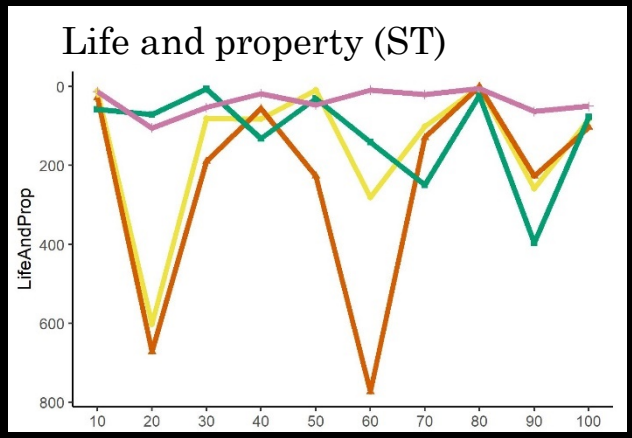
Life and property (ST)
LifeAndProp
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200
400
600
800
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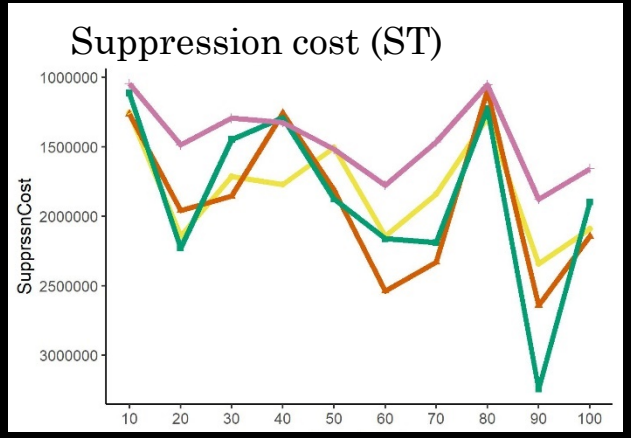
Suppression cost (ST)
SupprssnCost
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2000000
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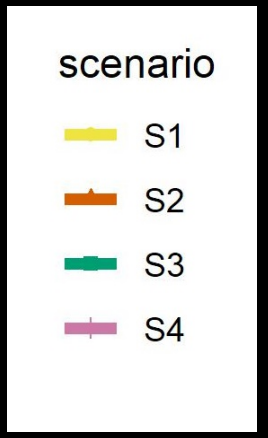
scenario
S1
S2
S3
S4

Take home messages:

EMDS is a tool to help consider many data-streams and to explore future landscape conditions over a long time horizon

Generally speaking, S3 & S4 outperform S1 & S2 suggesting that management is predicted to be important to achieve desired conditions

Scenario performance variability, for some topics more than others, demonstrates tradeoffs over time